

GRE RC (No. 2—No. 9)

No. 2-1

SECTION A

Extended debate concerning the exact point of origin of individual folktales told by Afro-American slaves has unfortunately taken precedence over analysis of the tales' meaning and function. Cultural continuities with Africa were not dependent on importation and perpetuation of specific folktales in their pristine form. It is in the place that tales occupied in the lives of the slaves and in the meaning slaves derived from them that the clearest resemblances to African tradition can be found. Afro-American slaves did not borrow tales indiscriminately from the Whites among whom they lived. Black people were most influenced by those Euro-American tales whose functional meaning and aesthetic appeal had the greatest similarity to the tales with deep roots in their ancestral homeland. Regardless of where slave tales came from, the essential point is that, with respect to language, delivery, details of characterization, and plot, slaves quickly made them their own.

17. The author claims that most studies of folktales told by Afro-American slaves are inadequate because the studies
  - (A) fail to recognize any possible Euro-American influence on the folktales
  - (B) do not pay enough attention to the features of a folktale that best reveal an African influence
  - (C) overestimate the number of folktales brought from Africa by the slaves
  - (D) do not consider the fact that a folktale can be changed as it is retold many times
  - (E) oversimplify the diverse and complex traditions of the slaves ancestral homeland
18. The author's main purpose is to
  - (A) create a new field of study
  - (B) discredit an existing field of study
  - (C) change the focus of a field of study
  - (D) transplant scholarly techniques from one field of study to another
  - (E) restrict the scope of a burgeoning new field of study
19. The passage suggests that the author would regard which of the following areas of inquiry as most likely to reveal the slaves' cultural continuities with Africa?
  - (A) The means by which Blacks disseminated their folktales in nineteenth-century America
  - (B) Specific regional differences in the styles of delivery used by the slaves in telling folktales
  - (C) The functional meaning of Black folktales in the lives of White children raised by slave
  - (D) The specific way the slaves used folktales to impart moral teaching to their children
  - (E) The complexities of plot that appear most frequently in the slaves' tales
20. Which of the following techniques is used by the author in developing the argument in the passage?
  - (A) Giving a cliché a new meaning
  - (B) Pointedly refusing to define key terms
  - (C) Alternately presenting generalities and concrete details

- (D) Concluding the passage with a restatement of the first point made in the passage
- (E) Juxtaposing statements of what is not the case and statements of what is the case

The energy contained in rock within the earth's crust represents a nearly unlimited energy source, but until recently commercial retrieval has been limited to underground hot water and/or steam recovery systems. These systems have been developed in areas of recent volcanic activity, where high rates of heat flow cause visible eruption of water in the form of geysers and hot springs. In other areas, however, hot rock also exists near the surface but there is insufficient water present to produce eruptive phenomena. Thus a potential hot dry rock (HDR) reservoir exists whenever the amount of spontaneously produced geothermal fluid has been judged inadequate for existing commercial systems.

As a result of recent energy crisis, new concepts for creating HDR recovery systems—which involve drilling holes and connecting them to artificial reservoirs placed deep within the crust—are being developed. In all attempts to retrieve energy from HDR's, artificial stimulation will be required to create either sufficient permeability or bounded flow paths to facilitate the removal of heat by circulation of a fluid over the surface of the rock.

The HDR resource base is generally defined to include crustal rock that is hotter than 150°C, is at depths less than ten kilometers, and can be drilled with presently available equipment. Although wells deeper than ten kilometers are technically feasible, prevailing economic factors will obviously determine the commercial feasibility of wells at such depths. Rock temperatures as low as 100°C may be useful for space heating; however, for producing electricity, temperatures greater than 200°C are desirable.

The geothermal gradient, which specifically determines the depth of drilling required to reach a desired temperature, is a major factor in the recoverability of geothermal resources. Temperature gradient maps generated from oil and gas well temperature-depth records kept by the American Association of Petroleum Geologists suggest that tappable high-temperature gradients are distributed all across the United States. (There are many areas, however, for which no temperature gradient records exist.)

Indications are that the HDR resource base is very large. If an average geothermal temperature gradient of 22°C per kilometer of depth is used, a staggering 13,000,000 quadrillion B.T.U.'s of total energy are calculated to be contained in crustal rock to a ten-kilometer depth in the United States. If we conservatively estimate that only about 0.2 percent is recoverable, we find a total of all the coal remaining in the United States. The remaining problem is to balance the economics of deeper, hotter, more costly wells and shallower, cooler, less expensive wells against the value of the final product, electricity and/or heat.

21. The primary purpose of the passage is to
- (A) alert readers to the existence of HDR's as an available energy source
  - (B) document the challenges that have been surmounted in the effort to recover energy from HDR's
  - (C) warn the users of coal and oil that HDR's are not an economically feasible alternative
  - (D) encourage the use of new techniques for the recovery of energy from underground hot water and steam
  - (E) urge consumers to demand quicker development of HDR resources for the production of energy
22. The passage would be most likely to appear in a
- (A) petrological research report focused on the history of temperature-depth records in the United States
  - (B) congressional report urging the conservation of oil and natural gas reserves in the United States

- (C) technical journal article concerned with the recoverability of newly identified energy sources
  - (D) consumer report describing the extent and accessibility of remaining coal resources
  - (E) pamphlet designed to introduce homeowners to the advantages of HDR space-heating systems
23. According the passage, an average geothermal gradient of 22°C per kilometer of depth can be used to
- (A) balance the economics of HDR energy retrieval against that of underground hot water or steam recovery systems
  - (B) determine the amount of energy that will used for space heating in the United States
  - (C) provide comparisons between hot water and HDR energy sources in United States
  - (D) revise the estimates on the extent of remaining coal resources in the United States
  - (E) estimate the total HDR resource base in the United States
24. It can be inferred from the passage that the availability of temperature-depth records for any specific area in the United States depends primarily on the
- (A) possibility that HDR's may be found in that area
  - (B) existence of previous attempts to obtain oil or gas in that area
  - (C) history of successful hot water or steam recovery efforts in that area
  - (D) failure of inhabitants to conserve oil gas reserves in that area
  - (E) use of coal as a substitute for oil or gas in that area
25. According to the passage, in all HDR recovery systems fluid will be necessary in order to allow
- (A) sufficient permeability
  - (B) artificial stimulation
  - (C) drilling of holes
  - (D) construction of reservoirs
  - (E) transfer of heat
26. According to the passage, if the average geothermal gradient in an area is 22°C per kilometer of depth, which of the following can be reliably predicted?
- I. The temperature at the base of a 10-kilometer well will be sufficient for the production of electricity.
  - II. Drilling of wells deeper than 10 kilometers will be economically feasible.
  - III. Insufficient water is present to produce eruptive phenomena.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
27. Which of the following would be the most appropriate title for the passage?

- (A) Energy from Water Sources: The Feasibility of Commercial Systems
- (B) Geothermal Energy Retrieval: Volcanic Activity and Hot Dry Rocks
- (C) Energy Underground: Geothermal Sources Give Way to Fossil Fuels
- (D) Tappable Energy for America's Future: Hot Dry Rocks
- (E) High Geothermal Gradients in the United States: Myth or Reality?

## SECTION B

Four legal approaches may be followed in attempting to channel technological development in socially useful direction: specific directives, market incentive modifications, criminal prohibitions, and changes in decision-making structures. Specific directives involve the government's identifying one or more factors controlling research, development, or implementation of a given technology. Directives affecting such factors may vary from administrative regulation of private activity to government ownership of a technological operation. Market incentive modifications are deliberate alterations of the market within which private decisions regarding the development and implementation of technology are made. Such modifications may consist of imposing taxes to cover the costs to society of a given technology, granting subsidies to pay for social benefits of a technology, creating the right to sue to prevent certain technological development, or easing procedural rules to enable the recovery of damages to compensate for harm caused by destructive technological activity. Criminal prohibitions may modify technological activity in areas impinging on fundamental social values, or they may modify human behavior likely to result from technological applications—for example, the deactivation of automotive pollution control devices in order to improve vehicle performance. Alteration of decision-making structures includes all possible modifications in the authority, constitution, or responsibility of private and public entities deciding questions of technological development and implementation. Such alterations include the addition of public-interest members to corporate boards, the imposition by statute of duties on governmental decision-makers, and the extension of warranties in response to consumer action.

Effective use of these methods to control technology depends on whether or not the goal of regulation is the optimal allocation of resources. When the object is optimal resource allocation, that combination of legal methods should be used that most nearly yields the allocation that would exist if there were no external costs resulting from allocating resources through market activity. There are external costs when the price set by buyers and sellers of goods fails to include some costs, to anyone, that result from the production and use of the goods. Such costs are internalized when buyers pay them.

Air pollution from motor vehicles imposes external costs on all those exposed to it, in the form of soiling, materials damage, and disease: these externalities result from failure to place a price on air, thus making it a free good, common to all. Such externalities lead to nonoptimal resource allocation, because the private net product and the social net product of market activity are not often identical. If all externalities were internalized, transactions would occur until bargaining could no longer improve the situation, thus giving an optimal allocation of resources at a given time.

17. The passage is primarily concerned with describing
  - (A) objectives and legal method for directing technological development
  - (B) technical approaches to the problem of controlling market activity
  - (C) economic procedures for facilitating transactions between buyers and sellers
  - (D) reasons for slowing the technological development in light of environmentalist objections
  - (E) technological innovations making it possible to achieve optimum allocation of resources
18. The author cites air pollution from motor vehicles in lines 54-56 in order to
  - (A) revise cost estimates calculated by including the costs of resources
  - (B) evaluate legal methods used to prevent technological developments

- (C) give examples of costs not included in buyer-seller bargains
  - (D) refute hypotheses not made on the basis of monetary exchange values
  - (E) commend technological research undertaken for the common welfare
19. According to the passage, transactions between private buyers and sellers have effects on society that generally
- (A) are harmful when all factors are considered
  - (B) give rise to ever-increasing resource costs
  - (C) reflect an optimal allocation of natural resources
  - (D) encompass more than the effects on the buyers and sellers alone
  - (E) are guided by legal controls on the development of technology
20. It can be inferred from the passage that the author does NOT favor which of the following?
- (A) Protecting the environment for future use
  - (B) Changing the balance of power between opposing interests in business
  - (C) Intervening in the activity of the free market
  - (D) Making prices reflect costs to everyone in society
  - (E) Causing technological development to cease
21. A gasoline-conservation tax on the purchase of large automobiles, with the proceeds of the tax rebated to purchasers of small automobiles, is an example of
- (A) a specific directive
  - (B) a market incentive modification
  - (C) an optimal resource allocation
  - (D) an alteration of a decision-making structure
  - (E) an external cost
22. If there were no external costs, as they are described in the passage, which of the following would be true?
- (A) All technology-control methods would be effective.
  - (B) Some resource allocations would be illegal.
  - (C) Prices would include all costs to members of society.
  - (D) Some decision-making structures would be altered.
  - (E) The availability of common goods would increase.
23. The author assumes that, in determining what would be an optimal allocation of resources, it would be possible to
- (A) assign monetary value to all damage resulting from the use of technology
  - (B) combine legal methods to yield the theoretical optimum
  - (C) convince buyers to bear the burden of damage from technological developments
  - (D) predict the costs of new technological developments
  - (E) derive an equation making costs depend on prices
24. On the basis of the passage, it can be inferred that the author would agree with which of the following statements concerning technological development?

- (A) The government should own technological operations.
- (B) The effect of technological development cannot be controlled.
- (C) Some technological developments are beneficial.
- (D) The current state of technological development results in a good allocation of resources.
- (E) Applications of technological developments are criminally destructive.

The whole biosphere, like the individual organisms that live inside it, exists in a chemically **dynamic state**. In this homeostatic system, a great number of organic compounds are synthesized, transformed, and decomposed continuously; together, these processes constitute the major parts of the carbon cycle. For the smooth operation of this cycle, degradation is just as important as synthesis: the green plants produce great quantities of polymers, such as cellulose, and innumerable other compounds like alkaloids, terpenes, and flavonoids, that green plants cannot use as sources of energy during respiration. The release of the carbon in these compounds for recycling depends almost entirely on the action of both aerobic and anaerobic bacteria and certain types of fungi. Some bacteria and fungi possess the unique and extremely important biochemical asset of being able to catalyze the oxidation of numerous inert products, thereby initiating reaction sequences that produce carbon dioxide and so return much carbon to a form that actively enters into life cycles once again.

25. The passage contains information that would answer which of the following questions about the carbon cycle?
- I. What are some of the compounds that are broken down in the carbon cycle?
  - II. Why are some compounds that are involved in the carbon cycle less reactive than others?
  - III. What role do bacteria and fungi play in the carbon cycle?
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II only
  - (E) I and III only
26. The author implies that which of the following is the primary reason that degradation is as important as synthesis to the smooth operation of the carbon cycle?
- (A) Most of the polymers and organic compounds found in the plant kingdom are chemically unstable.
  - (B) The synthesis of some organic material deprives life processes of an energy source.
  - (C) Decomposition permits the recycling of carbon that would otherwise be fixed in certain substances.
  - (D) Many organisms cannot use plants as a source of food, but can feed on bacteria and fungi.
  - (E) Bacteria and fungi could not survive if some carbon compounds were not degraded.
27. The author's contention about the importance of bacteria and fungi in the production of energy for life processes would be most clearly strengthened if which of the following were found to be true?
- (A) Both aerobes and anaerobes provide sources of energy through the decomposition of organic material.
  - (B) Most compounds containing carbon are unavailable as energy sources except to some

bacteria and fungi.

- (C) Bacteria and fungi break down inert material in ways that do not involve oxidation.
- (D) Many compounds remain inert, even in the presence of bacteria and fungi.
- (E) Bacteria and fungi assist in the synthesis of many organic compounds.

## No. 2-2

### SECTION A

Even as the number of females processed through juvenile courts climbs steadily, an implicit consensus remains among scholars in criminal justice that male adolescents define the delinquency problem in the United States. We suggest two reasons why this view persists. First, female adolescents are accused primarily of victimless crimes, such as truancy, that do not involve clear-cut damage to persons or property. If committed by adults, these actions are not even considered prosecutable; if committed by juvenile males, they have traditionally been looked on leniently by the courts. Thus, ironically, the plight of female delinquents receives little scrutiny because they are accused of committing relatively minor offenses. Second, the courts have long justified so-called preventive intervention into the lives of young females viewed as antisocial with the rationale that women are especially vulnerable. Traditional stereotypes of women as the weaker and more dependent sex have led to earlier intervention and longer periods of misdirected supervision for female delinquents than for males.

17. Which of the following statements best expresses the irony pointed out by the authors in lines 13-16 of the passage?
  - (A) Female delinquents tend to commit victimless crimes more frequently than their male counterparts.
  - (B) The predicament of male delinquents receives more attention than that of females because males are accused of more serious crimes.
  - (C) Adults are frequently punished less severely than adolescents for committing more serious crimes.
  - (D) The juvenile justice system cannot correct its biases because it does not even recognize them.
  - (E) Although the number of female delinquents is steadily increasing, the crimes of which they are accused are not particularly serious.
18. It can be inferred from the passage that the authors believe traditional stereotypes of women to be
  - (A) frequently challenged
  - (B) persistently inexplicable
  - (C) potentially harmful
  - (D) rapidly changing
  - (E) habitually disregarded
19. The passage suggests that scholars in criminal justice could be criticized for which of the following?
  - (A) Underestimating the seriousness of juvenile crime
  - (B) Rationalizing the distinction made between juveniles and adults in the legal system
  - (C) Concerning themselves too little with the prevention of juvenile delinquency
  - (D) Focusing on those whose crimes have involved damage to persons or property

(E) Failing to point out injustices in the correctional system

Scattered around the globe are more than one hundred regions of volcanic activity known as **hot spots**. Unlike most volcanoes, hot spots are rarely found along the boundaries of the continental and oceanic plates that comprise the Earth's crust; most hot spots lie deep in the interior of plates and are anchored deep in the layers of the Earth's surface. Hot spots are also distinguished from other volcanoes by their lavas, which contain greater amounts of alkali metals than do those from volcanoes at plate margins.

In some cases, plates moving past hot spots have left trails of extinct volcanoes in much the same way that wind passing over a chimney carries off puffs of smoke. It appears that the Hawaiian Islands were created in such a manner by a single source of lava, welling up from a hot spot, over which the Pacific Ocean plate passed on a course roughly from the east toward the northwest, carrying off a line of volcanoes of increasing age. Two other Pacific island chains—the Austral Ridge and the Tuamotu Ridge—parallel the configuration of the Hawaiian chain; they are also aligned from the east toward the northwest, with the most recent volcanic activity near their eastern terminuses.

That the Pacific plate and the other plates are moving is now beyond dispute; the relative motion of the plates has been reconstructed in detail. However, the relative motion of the plates with respect to the Earth's interior cannot be determined easily. Hot spots provide the measuring instruments for resolving the question of whether two continental plates are moving in opposite directions or whether one is stationary and the other is drifting away from it. The most compelling evidence that a continental plate is stationary is that, at some hot spots, lavas of several ages are superposed instead of being spread out in chronological sequence. Of course, reconstruction of plate motion from the tracks of hot-spot volcanoes assumes that hot spots are immobile, or nearly so. Several studies support such an assumption, including one that has shown that prominent hot spots throughout the world seem not to have moved during the past ten million years.

Beyond acting as frames of reference, hot spots apparently influence the geophysical processes that propel the plates across the globe. When a continental plate comes to rest over a hot spot, material welling up from deeper layers forms a broad dome that, as it grows, develops deep fissures. In some instances, the continental plate may rupture entirely along some of the fissures so that the hot spot initiates the formation of a new ocean. Thus, just as earlier theories have explained the mobility of the continental plates, so hot-spot activity may suggest a theory to explain their mutability.

20. The primary purpose of the passage is to
- (A) describe the way in which hot spots influence the extinction of volcanoes
  - (B) describe and explain the formation of the oceans and continents
  - (C) explain how to estimate the age of lava flows from extinct volcanoes
  - (D) describe hot spots and explain how they appear to influence and record the motion of plates
  - (E) describe the formation and orientation of island chains in the Pacific Ocean
21. According to the passage, hot spots differ from most volcanoes in that hot spots
- (A) can only be found near islands
  - (B) are active whereas all other volcanoes are extinct
  - (C) are situated closer to the earth's surface
  - (D) can be found along the edges of the plates
  - (E) have greater amounts of alkali metals in their lavas
22. It can be inferred from the passage that evidence for the apparent course of the Pacific plate has been provided by the
- (A) contours of the continents



- (B) dimensions of ocean hot spots
  - (C) concurrent movement of two hot spots
  - (D) pattern of fissures in the ocean floor
  - (E) configurations of several mid-ocean island chains
23. It can be inferred from the passage that the spreading out of lavas of different ages at hot spots indicates that a
- (A) hot spot is active
  - (B) continental plate has moved
  - (C) continental rupture is imminent
  - (D) hot spot had been moving very rapidly
  - (E) volcano contains large concentrations of alkali metals
24. The passage suggests which of the following about the Hawaiian Islands, the Austral Ridge, and the Tuamotu Ridge?
- (A) The three chains of islands are moving eastward.
  - (B) All the islands in the three chains have stopped moving.
  - (C) The three island chains are a result of the same plate movement.
  - (D) The Hawaiian Islands are receding from the other two island chains at a relatively rapid rate.
  - (E) The Austral Ridge and the Tuamotu Ridge chains have moved closer together whereas the Hawaiian Islands have remained stationary.
25. Which of the following, if true, would best support the author's statement that hot-spot activity may explain the mutability of continental plates?
- (A) Hot spots move more rapidly than the continental and oceanic plates.
  - (B) Hot spots are reliable indicators of the age of continental plates.
  - (C) Hot spots are regions of volcanic activity found only in the interiors of the continental plates.
  - (D) The alignment of hot spots in the Pacific Ocean parallels the alignment of Pacific Ocean islands.
  - (E) The coastlines of Africa and South America suggest that they may once have constituted a single continent that ruptured along a line of hot spots.
26. The author's argument that hot spots can be used to reconstruct the movement of continental plates is weakened by the fact that
- (A) hot spots are never found at the boundaries of plates
  - (B) only extinct volcanoes remain after a plate moves over a hot spot
  - (C) lava flow patterns for all hot spots have not been shown to be the same
  - (D) the immobility or near immobility of hot spots has not been conclusively proven
  - (E) the changing configurations of islands make pinpointing the locations of hot spots difficult
27. The author's style can best be described as
- (A) dramatic

- (B) archaic
- (C) esoteric
- (D) objective
- (E) humanistic

## SECTION B

Although scientists observe that an organism's behavior falls into rhythmic patterns, they disagree about how these patterns are affected when the organism is transported to a new environment. One experimenter, Brown, brought oysters from Connecticut waters to Illinois waters. She noted that the oysters initially opened their shells widest when it was high tide in Connecticut, but that after fourteen days their rhythms had adapted to the tide schedule in Illinois. Although she could not posit an unequivocal causal relationship between behavior and environmental change, Brown concluded that a change in tide schedule is one of several possible exogenous influences (those outside the organism) on the oysters' rhythms. Another experimenter, Hamner, however, discovered that hamsters from California maintain their original rhythms even at the South Pole. He concluded that endogenous influences (those inside the organism) seem to affect an organism's rhythmic behavior.

17. All of the following could be considered examples of exogenous influences on an organism EXCEPT the influence of the
  - (A) level of a hormone on a field mouse's readiness for mating
  - (B) temperature of a region on a bear's hibernation
  - (C) salt level of a river on a fish's migration
  - (D) humidity of an area on a cat's shedding of its fur
  - (E) proximity of an owl on a lizard's searching for food
18. Which of the following statements best describes the conclusion drawn by Brown (lines 14-17)
  - (A) A change in tide schedule is the primary influence on an oyster's rhythms.
  - (B) A change in tide schedule may be an important exogenous influence on an oyster's rhythms.
  - (C) Exogenous influences, such as a change in tide schedule, seldom affect an oyster's rhythms.
  - (D) Endogenous influences have no effect on an oyster's rhythms.
  - (E) Endogenous influences are the only influences on an oyster's rhythms.
19. The passage suggests that Brown's study was similar to Hamner's in which of the following ways?
  - I. Both experimenters discovered that a new environment had a significant effect on an organism's behavior rhythms.
  - II. Both experimenters observed an organism's behavioral rhythms after the organism had been transported to a new environment.
  - III. Both experimenters knew an organism's rhythmic patterns in its original environment.
  - (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only

(E) I, II, and III

20. Which of the following, if true, would most weaken Brown's conclusion?

- (A) The oyster gradually closed their shells after high tide in Illinois had passed.
- (B) The oysters' behavioral rhythms maintained their adaptation to the tide schedule in Illinois throughout thirty days of observation.
- (C) Sixteen days after they were moved to Illinois, the oysters opened their shells widest when it was high tide in Connecticut.
- (D) A scientist who brought Maryland oysters to Maine found that the oysters opened their shells widest when it was high tide in Maine.
- (E) In an experiment similar to Brown's, a scientist was able to establish a clear causal relationship between environmental change and behavioral rhythms.

Picture-taking is a technique both for annexing the objective world and for expressing the singular self. Photographs depict objective realities that already exist, though only the camera can disclose them. And they depict an individual photographer's temperament, discovering itself through the camera's cropping of reality. That is, photography has two antithetical ideals: in the first, photography is about the world and the photographer is a mere observe who counts for little; but in the second, photography is the instrument of intrepid, questing subjectivity and the photographer is all.

These conflicting ideals arise from a fundamental uneasiness on the part of both photographers and viewers of photographs toward the aggressive component in "taking" a picture. Accordingly, the ideal of a photographer as observer is attractive because it implicitly denies that picture-taking is an aggressive act. The issue, of course, is not so clear-cut. What photographers do cannot be characterized as simply predatory or as simply, and essentially, benevolent. As a consequence, one ideal of picture-taking or the other is always being rediscovered and championed.

An important result of the coexistence of these two ideals is a recurrent ambivalence toward photography's means. Whatever the claims that photography might make to be a form of personal expression **on a par** with painting, its originality is inextricably linked to the powers of a machine. The steady growth of these powers has made possible the extraordinary informativeness and imaginative formal beauty of many photographs, like Harold Edgerton's high-speed photographs of a bullet hitting its target or of the swirls and eddies of a tennis stroke. But as cameras become more sophisticated, more automated, some photographers are tempted to disarm themselves or to suggest that they are not really armed, preferring to submit themselves to the limits imposed by premodern camera technology because a cruder, less high-powered machine is thought to give more interesting or emotive results, to leave more room for creative accident. For example, it has been virtually a point of honor for many photographers, including Walker Evans and Cartier-Bresson, to refuse to use modern equipment. These photographers have come to doubt the value of the camera as an instrument of "fast seeing." Cartier-Bresson, in fact, claims that the modern camera may see too fast.

This ambivalence toward photographic means determines trends in taste. The cult of the future (of faster and faster seeing) alternates **over time** with the wish to return to a purer past—when images had a handmade quality. This nostalgia for some pristine state of the photographic enterprise is currently widespread and underlies the present-day enthusiasm for daguerreotypes and the work of forgotten nineteenth-century provincial photographers. Photographers and viewers of photographs, it seems, need periodically to resist their own knowingness.

21. According to the passage, interest among photographers in each of photography's two ideals can be described as

- (A) rapidly changing
- (B) cyclically recurring
- (C) steadily growing

- (D) unimportant to the viewers of photographs
  - (E) unrelated to changes in technology
22. The author is primarily concerned with
- (A) establishing new technical standards for contemporary photography
  - (B) analyzing the influence of photographic ideals on picture-taking
  - (C) tracing the development of camera technology in the twentieth century
  - (D) describing how photographers' individual temperaments are reflected in their work
  - (E) explaining how the technical limitations imposed by certain photographers on themselves affect their work
23. The passage states all of the following about photographs EXCEPT:
- (A) They can display a cropped reality.
  - (B) They can convey information.
  - (C) They can depict the photographer's temperament.
  - (D) They can possess great formal beauty.
  - (E) They can change the viewer's sensibilities.
24. The author mentions the work of Harold Edgerton in order to provide an example of
- (A) how a controlled ambivalence toward photography's means can produce outstanding pictures
  - (B) how the content of photographs has changed from the nineteenth century to the twentieth
  - (C) the popularity of high-speed photography in the twentieth century
  - (D) the relationship between photographic originality and technology
  - (E) the primacy of formal beauty over emotional content
25. The passage suggests that photographers such as Walker Evans prefer old-fashioned techniques and equipment because these photographers
- (A) admire instruments of fast seeing
  - (B) need to feel armed by technology
  - (C) strive for intense formal beauty in their photographs
  - (D) like the discipline that comes from self-imposed limitations
  - (E) dislike the dependence of photographic effectiveness on the powers of a machine
26. According to the passage, the two antithetical ideals of photography differ primarily in the
- (A) value that each places on the beauty of the finished product
  - (B) emphasis that each places on the emotional impact of the finished product
  - (C) degree of technical knowledge that each requires of the photographer
  - (D) extent of the power that each requires of the photographer's equipment
  - (E) way in which each defines the role of the photographer
27. Which of the following statements would be most likely to begin the paragraph immediately following the passage?
- (A) Photographers, as a result of their heightened awareness of time, are constantly trying to capture events and actions that are fleeting.

- (B) Thus the cult of the future, the worship of machines and speed, is firmly established in spite of efforts to the contrary by some photographers.
- (C) The rejection of technical knowledge, however, can never be complete and photography cannot for any length of time pretend that it has no weapons.
- (D) The point of honor involved in rejecting complex equipment is, however, of no significance to the viewer of a photograph.
- (E) Consequently the impulse to return to the past through images that suggest a handwrought quality is nothing more than a passing fad.

No. 2-3

## SECTION A

It is well known that biological changes at the molecular level have morphogenetic consequences, consequences affecting the formation and differentiation of tissues and organs. It is superfluous to point out that gene mutations and disturbances of the bio-synthetic processes in the embryo may result in abnormalities in the morphology (structure) of an organism. However, whereas much is known about causes and consequences at the molecular level, and in spite of an enormous accumulation of chemical and morphological data on embryos of various kinds, our understanding of how genes control morphogenesis is still far from complete. Perhaps one reason for this is that molecular biologists and morphologists speak different languages. Whereas the former speak about messenger-RNA and conformational changes of protein molecules, the latter speak of ectoderms, hypoblasts, and neural crests.

One solution to this predicament is to try to find some phenomena relevant to morphogenesis which both the molecular biologist and the morphologist can understand and discuss. As morphogenesis must be basically the result of changes in behavior of the individual cells, it seems logical to ask morphologists to describe the morphogenetic events observed in terms of changes in cellular contact, changes in the rate of proliferation of cells, or similar phenomena. Once this is done, it may be appropriate to ask questions about the molecular background for these changes. One may, for instance, ask whether variations in cell contact reflect alterations in the populations of molecules at the cell surface, or one may inquire about the molecular basis for the increased cell mobility involved in cell dispersion.

Studies of this kind have been carried out with cells released from tissues in various ways and then allowed to reveal their behavior after being spread out into a thin layer. In many cases, such cells show the ability to reaggregate, after which different cell types may sort themselves out into different layers and even take part in still more intricate morphogenetic events. But in most cases, the behavior of cells in the intact embryo is difficult to study because of the thickness and opacity of the cell masses. The sea urchin embryo, however, has the advantage that it is so transparent that each cell can be easily observed throughout development. Thus, by recording the development of a sea urchin embryo with time-lapse photography, the research scientist might discover previously unknown features of cellular behavior. Perhaps the study of the sea urchin in this manner can provide a medium by which the molecular biologist and the morphologist can begin communicating with each other more effectively about the way in which genes control morphogenesis.

17. The author's primary purpose is to
  - (A) outline a procedure and discuss possible applications
  - (B) evaluate an experiment in terms of its applicability to medical research
  - (C) propose a method for curing specific genetic disorders
  - (D) explain a problem and suggest a solution for it
  - (E) reveal the shortcomings of several attitudes toward genetic research
18. The author states that research into the genetic control of morphogenesis has been impeded

by

- (A) an incomplete understanding of biomolecular reactions that are highly complex
  - (B) a lack of communication between scientists whose work could be complementary
  - (C) a reluctance on the part of morphologists to share data with molecular biologists
  - (D) a lack of research in the area of morphology
  - (E) the unavailability of suitable research equipment
19. The major objective of the author's proposal is to
- (A) devise a technique for proving that abnormalities in morphology result from gene mutations
  - (B) improve the procedures for organizing chemical and morphological data
  - (C) increase the accuracy of measurements of cell populations and cell mobility
  - (D) reduce the margin of error in the study of conformational changes of protein molecules
  - (E) provide a plan for increasing knowledge about the influence of genes on morphogenesis
20. It can be inferred from the passage that some cells that have been isolated from an organism have the ability to
- (A) control morphogenesis
  - (B) reform to make higher organisms
  - (C) reorganize to form clusters of cells
  - (D) regulate the transmission of light through the cell wall
  - (E) regulate the rate of tissue formation
21. It can be inferred from the passage that the study of the effects of genes on morphogenesis is best accomplished by observing
- (A) intact developing embryos
  - (B) adult sea urchins
  - (C) isolated living cells
  - (D) groups of genetically mutated cells
  - (E) cells from the same kind of tissue
22. According to the passage, it is difficult to study cells in most intact embryos because
- (A) morphogenetic events cannot be isolated
  - (B) embryos die quickly
  - (C) embryos are difficult to obtain
  - (D) individual cells reaggregate too quickly
  - (E) individual cells are difficult to see
23. Which of the following sequences best describes the author's suggestion for future research on morphogenesis?
- (A) Accumulation of data, simplification of language, explanation of morphogenesis
  - (B) Dispersion of cells, evaluation of cell activity, development of an explanatory hypothesis
  - (C) Classification of cell types, separation of cells, observation of cell activity
  - (D) Observation of cell development, description of cell behavior, explanation at the

molecular level

(E) Differentiation of cell types, description of cell structure, analysis of molecular components

24. The tone of the author's discussion of the difference in the language used by morphologists and that used by molecular biologists is one of
- (A) indifference
  - (B) neutrality
  - (C) derision
  - (D) approbation
  - (E) indignation

The black experience, one might automatically assume, is known to every Black author. Henry James was pondering a similar assumption when he said: "You were to suffer your fate. That was not necessarily to know it." This disparity between an experience and knowledge of that experience is the longest bridge an artist must cross. Don L. Lee, in his picture of the Black poet, "studying his own poetry and the poetry of other Black poets," touches on the crucial point. In order to transform his own sufferings—or joys—as a Black person into usable knowledge for his readers, the author must first order his experiences in his mind. Only then can he create feelingly and coherently the combination of fact and meaning that Black audiences require for the reexploration of their lives. A cultural community of Black authors studying one another's best works systematically would represent a dynamic interchange of the spirit—corrective and instructive and increasingly beautiful in its recorded expression.

25. It can be inferred from the passage that the author considers poetry to be which of the following?
- (A) A means of diversion in which suffering is transformed into joy
  - (B) An art form that sometimes stifles creative energy
  - (C) A bridge between the mundane and the unreal
  - (D) A medium for conveying important information
  - (E) An area where beauty must be sacrificed for accuracy
26. It can be inferred from the passage that the author would be LEAST likely to approve of which of the following?
- (A) Courses that promote cultural awareness through the study of contemporary art
  - (B) The development of creative writing courses that encourage mutual criticism of student work
  - (C) Growing interest in extemporaneous writing that records experiences as they occur
  - (D) A shift in interest from abstract philosophical poetry to concrete autobiographical poetry
  - (E) Workshops and newsletters designed to promote dialogues between poets
27. The author refers to Henry James primarily in order to
- (A) support his own perception of the "longest bridge" (lines 6-7)
  - (B) illustrate a coherent "combination of fact and meaning" (lines 14-15)
  - (C) provide an example of "dynamic interchange of the spirit" (line 19)
  - (D) establish the pervasiveness of lack of self-knowledge
  - (E) contrast James's ideas about poetry with those of Don L. Lee

## SECTION B

My objective is to analyze certain forms of knowledge, not in terms of repression or law, but in terms of power. But the word power is apt to lead to misunderstandings about the nature, form, and unity of power. By power, I do not mean a group of institutions and mechanisms that ensure the subservience of the citizenry. I do not mean, either, a mode of subjugation that, in contrast to violence, has the form of the rule. Finally, I do not have in mind a general system of domination exerted by one group over another, a system whose effects, through successive derivations, pervade the entire social body. The sovereignty of the state, the form of law, or the overall unity of a domination are only the terminal forms power takes.

It seems to me that power must be understood as the multiplicity of force relations that are immanent in the social sphere; as the process that, through ceaseless struggle and confrontation, transforms, strengthens, or reverses them; as the support that these force relations find in one another, or on the contrary, the disjunctions and contradictions that isolate them from one another; and lastly, as the strategies in which they take effect, whose general design or institutional crystallization is embodied in the state apparatus, in the formulation of the law, in the various social hegemonies.

Thus, the viewpoint that permits one to understand the exercise of power, even in its more “peripheral” effects, and that also makes it possible to use its mechanisms as a structural framework for analyzing the social order, must not be sought in a unique source of sovereignty from which secondary and descendent forms of power emanate but in the moving substrate of force relations that, by virtue of their inequality, constantly engender local and unstable states of power. If power seems omnipresent, it is not because it has the privilege of consolidating everything under its invincible unity, but because it is produced from one moment to the next, at every point, or rather in every relation from one point to another. Power is everywhere, not because it embraces everything, but because it comes from everywhere. And if power at times seems to be permanent, repetitious, inert, and self-reproducing, it is simply because the overall effect that emerges from all these mobilities is a concatenation that rests on each of them and seeks in turn to arrest their movement. One needs to be nominalistic, no doubt: power is not an institution, and not a structure; neither is it a certain strength we are endowed with; it is the name that one attributes to a complex strategic situation in a particular society.

17. The author’s primary purpose in defining power is to
  - (A) counteract self-serving and confusing uses of the term
  - (B) establish a compromise among those who have defined the term in different ways
  - (C) increase comprehension of the term by providing concrete examples
  - (D) demonstrate how the meaning of the term has evolved
  - (E) avoid possible misinterpretations resulting from the more common uses of the term
18. According to the passage, which of the following best describes the relationship between law and power?
  - (A) Law is the protector of power.
  - (B) Law is the source of power.
  - (C) Law sets bounds to power.
  - (D) Law is a product of power.
  - (E) Law is a stabilizer of power.
19. Which of the following methods is NOT used extensively by the author in describing his own conception of power?
  - (A) Restatement of central ideas
  - (B) Provision of concrete examples



- (C) Analysis and classification
  - (D) Comparison and contrast
  - (E) Statement of cause and effect
20. With which of the following statement would the author be most likely to agree?
- (A) Power tends to corrupt; absolute power corrupts absolutely.
  - (B) The highest proof of virtue is to possess boundless power without abusing it.
  - (C) To love knowledge is to love power.
  - (D) It is from the people and their deeds that power springs.
  - (E) The health of the people as a state is the foundation on which all their power depends.
21. The author's attitude toward the various kinds of compulsion employed by social institutions is best described as
- (A) concerned and sympathetic
  - (B) scientific and detached
  - (C) suspicious and cautious
  - (D) reproachful and disturbed
  - (E) meditative and wistful
22. According to the passage, states of power are transient because of the
- (A) differing natures and directions of the forces that create them
  - (B) rigid structural framework in which they operate
  - (C) unique source from which they emanate
  - (D) pervasive nature and complexity of the mechanisms by which they operate
  - (E) concatenation that seeks to arrest their movement
23. It can be inferred from the passage that the author believes the conflict among social forces to be
- (A) essentially the same from one society to another even though its outward manifestation may seem different
  - (B) usually the result of misunderstandings that impede social progress
  - (C) an inevitable feature of the social order of any state
  - (D) wrongly blamed for disrupting the stability of society
  - (E) best moderated in states that possess a strong central government

The hypothesis of an expanding Earth has never attracted notable support, and if it were not for the historical example of continental drift, such indifference might be a legitimate response to an apparently improbable concept. It should be remembered, however, that drift too was once regarded as illusory, but the idea was kept alive until evidence from physicists compelled geologists to reinterpret their data.

Of course, it would be as dangerous to overreact to history by concluding that the majority must now be wrong about expansion as it would be to reenact the response that greeted the suggestion that the continents had drifted. The cases are not precisely analogous. There were serious problems with the pre-drift world view that a drift theory could help to resolve, whereas Earth expansion appears to offer no comparable advantages. If, however, physicists could show that the Earth's gravitational force has decreased with time, expansion would have to be reconsidered and accommodated.

24. The passage indicates that one reason why the expansion hypothesis has attracted little

- support is that it will not
- (A) overcome deficiencies in current geologic hypotheses
  - (B) clarify theories concerning the Earth's gravitational forces
  - (C) complement the theory of continental drift
  - (D) accommodate relevant theories from the field of physics
  - (E) withstand criticism from scientists outside the field of geology
25. The final acceptance of a drift theory could best be used to support the argument that
- (A) physicists are reluctant to communicate with other scientists
  - (B) improbable hypotheses usually turn out to be valid
  - (C) there should be cooperation between different fields of science
  - (D) there is a need for governmental control of scientific research
  - (E) scientific theories are often proved by accident
26. In developing his argument, the author warns against
- (A) relying on incomplete measurements
  - (B) introducing irrelevant information
  - (C) rejecting corroborative evidence
  - (D) accepting uninformed opinions
  - (E) making unwarranted comparisons
27. It can be deduced from the passage that the gravitational force at a point on the Earth's surface is
- (A) representative of the geologic age of the Earth
  - (B) analogous to the movement of land masses
  - (C) similar to optical phenomena such as mirages
  - (D) proportional to the size of the Earth
  - (E) dependent on the speed of the Earth's rotation

No. 3-1

SECTION A

Notable as important nineteenth-century novels by women, Mary Shelley's *Frankenstein* and Emily Bronte's *Wuthering Heights* treat women very differently. Shelley produced a "masculine" text in which the fates of subordinate female characters seem entirely dependent on the actions of male heroes or anti-heroes. Bronte produced a more realistic narrative, portraying a world where men battle for the favors of apparently high-spirited, independent women. Nevertheless, these two novels are alike in several crucial ways. Many readers are convinced that the compelling mysteries of each plot conceal elaborate structures of allusion and fierce, though shadowy, moral ambitions that seem to indicate metaphysical intentions, though efforts by critics to articulate these intentions have generated much controversy. Both novelists use a storytelling method that emphasizes ironic disjunctions between different perspectives on the same events as well as ironic tensions that inhere in the relationship between surface drama and concealed authorial intention, a method I call an evidentiary narrative technique.

17. The primary purpose of the passage is to
- (A) defend a controversial interpretation of two novels

- (B) explain the source of widely recognized responses to two novels
  - (C) delineate broad differences between two novels
  - (D) compare and contrast two novels
  - (E) criticize and evaluate two novels
18. According to the passage, *Frankenstein* differs from *Wuthering Heights* in its
- (A) use of multiple narrators
  - (B) method of disguising the author's real purposes
  - (C) portrayal of men as determiners of the novel's action
  - (D) creation of a realistic story
  - (E) controversial effect on readers
19. Which of the following narrative strategies best exemplifies the "evidentiary narrative technique" mentioned in line 24?
- (A) Telling a story in such a way that the author's real intentions are discernible only through interpretations of allusions to a world outside that of the story
  - (B) Telling a story in such a way that the reader is aware as events unfold of the author's underlying purposes and the ways these purposes conflict with the drama of the plot
  - (C) Telling a story in a way that both directs attention to the incongruities among the points of view of several characters and hints that the plot has a significance other than that suggested by its mere events
  - (D) Telling a story as a mystery in which the reader must deduce, from the conflicting evidence presented by several narrators, the moral and philosophical significance of character and event
  - (E) Telling a story from the author's point of view in a way that implies both the author's and the reader's ironic distance from the dramatic unfolding of events
20. According to the passage, the plots of *Wuthering Heights* and *Frankenstein* are notable for their elements of
- (A) drama and secrecy
  - (B) heroism and tension
  - (C) realism and ambition
  - (D) mystery and irony
  - (E) morality and metaphysics

Climatic conditions are delicately adjusted to the composition of the Earth's atmosphere. If there were a change in the atmosphere—for example, in the relative proportions of atmospheric gases—the climate would probably change also. A slight increase in water vapor, for instance, would increase the heat-retaining capacity of the atmosphere and would lead to a rise in global temperatures. In contrast, a large increase in water vapor would increase the thickness and extent of the cloud layer, reducing the amount of solar energy reaching the Earth's surface.

The level of carbon dioxide, CO<sub>2</sub>, in the atmosphere has an important effect on climatic change. Most of the Earth's incoming energy is short-wavelength radiation, which tends to pass through atmospheric CO<sub>2</sub> easily. The Earth, however, reradiates much of the received energy as long-wavelength radiation, which CO<sub>2</sub> absorbs and then remits toward the Earth. This phenomenon, known as the greenhouse effect, can result in an increase in the surface temperature of a planet. An extreme example of the effect is shown by Venus, a planet covered by heavy clouds composed mostly of CO<sub>2</sub>, whose surface

temperatures have been measured at 430°C. If the CO<sub>2</sub> content of the atmosphere is reduced, the temperature falls. According to one respectable theory, if the atmospheric CO<sub>2</sub> concentration were halved, the Earth would become completely covered with ice. Another equally respectable theory, however, states that a halving of the CO<sub>2</sub> concentration would lead only to a reduction in global temperatures of 3°C.

If, because of an increase in forest fires or volcanic activity, the CO<sub>2</sub> content of the atmosphere increased, a warmer climate would be produced. Plant growth, which relies on both the warmth and the availability of CO<sub>2</sub> would probably increase. As a consequence, plants would use more and more CO<sub>2</sub>. Eventually CO<sub>2</sub> levels would diminish and the climate, in turn, would become cooler. With reduced temperatures many plants would die; CO<sub>2</sub> would thereby be returned to the atmosphere and gradually the temperature would rise again. Thus, if this process occurred, there might be a long-term oscillation in the amount of CO<sub>2</sub> present in the atmosphere, with regular temperature increases and decreases of a set magnitude.

Some climatologists argue that the burning of fossil fuels has raised the level of CO<sub>2</sub> in the atmosphere and has caused a global temperature increase of at least 1°C. But a supposed global temperature rise of 1°C may in reality be only several regional temperature increases, restricted to areas where there are many meteorological stations and caused simply by shifts in the pattern of atmospheric circulation. Other areas, for example the Southern Hemisphere oceanic zone, may be experiencing an equivalent temperature decrease that is unrecognized because of the shortage of meteorological recording stations.

21. The passage supplies information for answering which of the following questions?
  - (A) Why are projections of the effects of changes in water vapor levels on the climate so inaccurate?
  - (B) What are the steps in the process that takes place as CO<sub>2</sub> absorbs long-wavelength radiation?
  - (C) How might our understanding of the greenhouse effect be improved if the burning of fossil fuels were decreased?
  - (D) What might cause a series of regular increases and decreases in the amount of CO<sub>2</sub> in the atmosphere?
  - (E) Why are there fewer meteorological recording stations in the Southern Hemisphere oceanic zone than elsewhere?
22. The author is primarily concerned with
  - (A) explaining the effects that the burning of fossil fuels might have on climate
  - (B) illustrating the effects of CO<sub>2</sub> on atmospheric radiation
  - (C) discussing effects that changes in the CO<sub>2</sub> level in the atmosphere might have on climate
  - (D) challenging hypotheses about the effects of water vapor and CO<sub>2</sub> on climate
  - (E) refuting hypotheses by climatologists about the causes of global temperature fluctuations
23. The passage suggests that a large decrease in the amount of CO<sub>2</sub> in the atmosphere would result in
  - (A) at least a slight decrease in global temperatures
  - (B) at the most a slight increase in short-wavelength radiation reaching the Earth
  - (C) a slight long-term increase in global temperatures
  - (D) a large long-term increase in the amount of volcanic activity
  - (E) a slight short-term increase in atmosphere water vapor content
24. The author refers to Venus primarily in order to

- (A) show the inherent weakness of the greenhouse effect theory
  - (B) show that the greenhouse effect works on other planets but not on Earth
  - (C) show the extent to which Earth's atmosphere differs from that of Venus
  - (D) support the contention that as water vapor increase, the amount of CO<sub>2</sub> increases
  - (E) support the argument that the CO<sub>2</sub> level in the atmosphere has a significant effect on climate
25. The passage suggests that if there were a slight global warming at the present time, it would be
- (A) easy to measure the exact increase in temperature because of the abundance of temperature recording stations throughout the world
  - (B) difficult to measure the increase of CO<sub>2</sub> in the atmosphere because of local variations in amounts
  - (C) easy to demonstrate the effects of the warming on the water vapor in the atmosphere
  - (D) difficult to prove that the warming was caused by the burning of fossil fuels
  - (E) easy to prove that the warming was caused by an increase of cloud cover
26. The discussion of climate in the passage suggests which of the following conclusion?
- I. Climate is not perfectly stable, and slight regional temperature variations can be considered a normal feature of the environment.
  - II. We are unable at present to measure global temperature changes precisely.
  - III. The most important cause of regional climatic fluctuations is the change in CO<sub>2</sub> levels in the atmosphere.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
27. All of the following can be found in the author's discussion of climate EXCEPT
- (A) a statement about the effects of increased volcanic activity on the Earth's temperatures
  - (B) an indication of the effect of an increase in water vapor in the atmosphere
  - (C) a contrast between two theories about the effects of a lowering of CO<sub>2</sub> levels in the atmosphere
  - (D) a generalization about the efficiency of meteorological recording stations
  - (E) a hypothesis about the relationship between atmospheric gases and changes in climate

## SECTION B

The Food and Drug Administration has recently proposed severe restrictions on the use of antibiotics to promote the health and growth of meat animals. Medications added to feeds kill many microorganisms but also encourage the appearance of bacterial strains that are resistant to anti-infective drugs. Already, for example, penicillin and the tetracyclines are not as effective therapeutically as they once were. The drug resistance is chiefly conferred by tiny circlets of genes, called plasmids, that can be exchanged between different strains and even different species of bacteria. Plasmids are also one of the two kinds of vehicles (the other being viruses) that molecular biologists depend on when performing gene transplant

experiments. Even present guidelines forbid the laboratory use of plasmids bearing genes for resistance to antibiotics. Yet, while congressional debate rages over whether or not to toughen these restrictions on scientists in their laboratories, little congressional attention has been focused on an ill-advised agricultural practice that produces known deleterious effects.

17. In the passage, the author is primarily concerned with
- (A) discovering methods of eliminating harmful microorganisms without subsequently generating drug-resistant bacteria
  - (B) explaining reasons for congressional inaction on the regulation of gene transplant experiments
  - (C) describing a problematic agricultural practice and its serious genetic consequences
  - (D) verifying the therapeutic ineffectiveness of anti-infective drugs
  - (E) evaluating recently proposed restrictions intended to promote the growth of meat animals
18. According to the passage, the exchange of plasmids between different bacteria can result in which of the following?
- (A) Microorganisms resistant to drugs
  - (B) Therapeutically useful circlets of genes
  - (C) Anti-infective drugs like penicillin
  - (D) Viruses for use by molecular biologists
  - (E) Vehicles for performing gene transplant experiments
19. It can be inferred from the passage that the author believes that those in favor of stiffening the restrictions on gene transplant research should logically also
- (A) encourage experiments with any plasmids except those bearing genes for antibiotic resistance
  - (B) question the addition of anti-infective drugs to livestock feeds
  - (C) resist the use of penicillin and tetracyclines to kill microorganisms
  - (D) agree to the development of meatier livestock through the use of antibiotics
  - (E) favor congressional debate and discussion of all science and health issues
20. The author's attitude toward the development of bacterial strains that render antibiotic drugs ineffective can best be described as
- (A) indifferent
  - (B) perplexed
  - (C) pretentious
  - (D) insincere
  - (E) apprehensive

During adolescence, the development of political ideology becomes apparent in the individual; ideology here is defined as the presence of roughly consistent attitudes, *more or less* organized in reference to a more encompassing, though perhaps tacit, set of general principles. *As such*, political ideology is dim or absent at the beginning of adolescence. Its acquisition by the adolescent, in even the most modest sense, requires the acquisition of relatively sophisticated cognitive skills: the ability to manage abstractness, to synthesize and generalize, to imagine the future. These are accompanied by a steady advance in the ability to understand principles.

The child's rapid acquisition of political knowledge also promotes the growth of political ideology during adolescence. By knowledge I mean more than the dreary "facts," such as the composition of county government that the child is exposed to in the conventional ninth-grade civics course. Nor do I mean only information on current political realities. These are facets of knowledge, but they are less critical than the adolescent's absorption, often unwitting, of a feeling for those many unspoken assumptions about the political system that comprise the common ground of understanding—for example, what the state can appropriately demand of its citizens, and *vice versa*, or the proper relationship of government to subsidiary social institutions, such as the schools and churches. Thus political knowledge is the awareness of social assumptions and relationships as well as of objective facts. Much of the naiveté that characterizes the younger adolescent's grasp of politics stems not from an ignorance of "facts" but from conventions of the system, of what is and is not customarily done, and of how and why it is or is not done.

Yet I do not want to overemphasize the significance of increased political knowledge in forming adolescent ideology. Over the years I have become progressively disenchanted about the centrality of such knowledge and have come to believe that much current work in political socialization, by relying too heavily on its apparent acquisition, has been misled about the tempo of political understanding in adolescence. Just as young children can count numbers in series without grasping the principle of ordination, young adolescents may have in their heads many random bits of political information without a secure understanding of those concepts that would give order and meaning to the information.

Like magpies, children's minds pick up *bits and pieces* of data. If you encourage them, they will drop these at your feet—Republicans and Democrats, the tripartite division of the federal system, perhaps even the capital of Massachusetts. But until the adolescent has grasped the integumental function that concepts and principles provide, the data remain fragmented, random, disordered.

21. The author's primary purpose in the passage is to
- (A) clarify the kinds of understanding an adolescent must have in order to develop a political ideology
  - (B) dispute the theory that a political ideology can be acquired during adolescence
  - (C) explain why adolescents are generally uninterested in political arguments
  - (D) suggest various means of encouraging adolescents to develop personal political ideologies
  - (E) explain why an adolescent's political ideology usually appears more sophisticated than it actually is
22. According to the author, which of the following contributes to the development of political ideology during adolescence?
- (A) Conscious recognition by the adolescent of his or her own naiveté
  - (B) Thorough comprehension of the concept of ordination
  - (C) Evaluation by the adolescent of the general principles encompassing his or her specific political ideas
  - (D) Intuitive understanding of relationships among various components of society
  - (E) Rejection of abstract reasoning in favor of involvement with pragmatic situations
23. The author uses the term "common ground of understanding" (line 27) to refer to
- (A) familiar legislation regarding political activity
  - (B) the experiences that all adolescents share
  - (C) a society's general sense of its own political activity
  - (D) a society's willingness to resolve political tensions

- (E) the assumption that the state controls social institutions
24. The passage suggests that, during early adolescence, a child would find which of the following most difficult to understand?
- (A) A book chronicling the ways in which the presidential inauguration ceremony has changed over the years
  - (B) An essay in which an incident in British history is used to explain the system of monarchic succession
  - (C) A summary of the respective responsibilities of the legislative, executive, and judicial branches of government
  - (D) A debate in which the participants argue, respectively, that the federal government should or should not support private schools
  - (E) An article detailing the specific religious groups that founded American colonies and the guiding principles of each one
25. It can be inferred from the passage that the author would be most likely to agree with which of the following statements about schools?
- (A) They should present political information according to carefully planned, schematic arrangements.
  - (B) They themselves constitute part of a general sociopolitical system that adolescents are learning to understand.
  - (C) If they were to introduce political subject matter in the primary grades, students would understand current political realities at an earlier age.
  - (D) They are ineffectual to the degree that they disregard adolescents' political naiveté.
  - (E) Because they are subsidiary to government their contribution to the political understanding of adolescent must be limited.
26. Which of the following best summarizes the author's evaluation of the accumulation of political knowledge by adolescents?
- (A) It is unquestionably necessary, but its significance can easily be overestimated.
  - (B) It is important, but not as important as is the ability to appear knowledgeable.
  - (C) It delays the necessity of considering underlying principles.
  - (D) It is primarily relevant to an understanding of limited, local concerns, such as county politics.
  - (E) It is primarily dependent on information gleaned from high school courses such as civics.
27. Which of the following statements best describes the organization of the author's discussion of the role of political knowledge in the formation of political ideology during adolescence?
- (A) He acknowledges its importance, but then modifies his initial assertion of that importance.
  - (B) He consistently resists the idea that it is important, using a series of examples to support his stand.
  - (C) He wavers in evaluating it and finally uses analogies to explain why he is indecisive.
  - (D) He begins by questioning conventional ideas about its importance, but finally concedes



that they are correct.

- (E) He carefully refrains from making an initial judgment about it, but later confirms its critical role.

### No. 3-2

#### SECTION A

The making of classifications by literary historians can be a somewhat risky enterprise. When Black poets are discussed separately as a group, for instance, the extent to which their work reflects the development of poetry in general should not be forgotten, or a distortion of literary history may result. This caution is particularly relevant in an assessment of the differences between Black poets at the turn of the century (1900-1909) and those of the generation of the 1920's. These differences include the bolder and more forthright speech of the later generation and its technical inventiveness. It should be remembered, though, that comparable differences also existed for similar generations of White poets.

When poets of the 1910's and 1920's are considered together, however, the distinctions that literary historians might make between "conservative" and "experimental" would be of little significance in a discussion of Black poets, although these remain helpful classifications for White poets of these decades. Certainly differences can be noted between "conservative" Black poets such as Countee Cullen and Claude McKay and "experimental" ones such as Jean Toomer and Langston Hughes. But Black poets were not battling over old or new styles; rather, one accomplished Black poet was ready to welcome another, whatever his or her style, for what mattered was racial pride.

However, in the 1920's Black poets did debate whether they should deal with specifically racial subjects. They asked whether they should only write about Black experience for a Black audience or whether such demands were restrictive. It may be said, though, that virtually all these poets wrote their best poems when they spoke out of racial feeling, race being, as James Weldon Johnson rightly put it, "performance the thing the Negro poet knows best."

At the turn of the century, by contrast, most Black poets generally wrote in the conventional manner of the age and expressed noble, if vague, emotions in their poetry. These poets were not unusually gifted, though Roscoe Jamison and G. M. McClellan may be mentioned as exceptions. They chose not to write in dialect, which, as Sterling Brown has suggested, "meant a rejection of stereotypes of Negro life," and they refused to write only about racial subjects. This refusal had both a positive and a negative consequence. As Brown observes, "Valuably insisting that Negro poets should not be confined to issues of race, these poets committed [an] error... they refused to look into their hearts and write." These are important insights, but one must stress that this refusal to look within was also typical of most White poets of the United States at the time. They, too, often turned from their own experience and consequently produced not very memorable poems about vague topics, such as the peace of nature.

17. According to the passage, most turn-of-the-century Black poets generally did which of the following?
- (A) Wrote in ways that did not challenge accepted literary practice.
  - (B) Described scenes from their own lives.
  - (C) Aroused patriotic feelings by expressing devotion to the land.
  - (D) Expressed complex feelings in the words of ordinary people.
  - (E) Interpreted the frustrations of Blacks to an audience of Whites.
18. According to the passage, an issue facing Black poets in the 1920's was whether they should
- (A) seek a consensus on new techniques of poetry
  - (B) write exclusively about and for Blacks
  - (C) withdraw their support from a repressive society

- (D) turn away from social questions to recollect the tranquility of nature
  - (E) identify themselves with an international movement of Black writers
19. It can be inferred from the passage that classifying a poet as either conservative or experimental would be of “little significance” (line 21) when discussing Black poets of the 1910’s and the 1920’s because
- (A) these poets wrote in very similar styles
  - (B) these poets all wrote about nature in the same way
  - (C) these poets were fundamentally united by a sense of racial achievement despite differences in poetic style
  - (D) such a method of classification would fail to take account of the influence of general poetic practice
  - (E) such a method of classification would be relevant only in a discussion of poets separated in time by more than three decades
20. The author quotes Sterling Brown in lines 53-56 in order to
- (A) present an interpretation of some black poets that contradicts the author’s own assertion about their acceptance of various poetic styles
  - (B) introduce a distinction between Black poets who used dialect and White poets who did not
  - (C) disprove James Weldon Johnson’s claim that race is what “the Negro poet knows best”
  - (D) suggest what were the effects of some Black poets’ decision not to write only about racial subjects
  - (E) prove that Black poets at the turn of the century wrote less conventionally than did their White counterparts
21. It can be inferred from the passage that the author finds the work of the majority of the Black poets at the turn of the century to be
- (A) unexciting
  - (B) calming
  - (C) confusing
  - (D) delightful
  - (E) inspiring
22. The author would be most likely to agree that poets tend to produce better poems when they
- (A) express a love of nature
  - (B) declaim noble emotions
  - (C) avoid technical questions about style
  - (D) emulate the best work of their predecessors
  - (E) write from personal experience
23. Which of the following best describes the attitude of the author toward classification as a technique in literary history?
- (A) Enthusiastic
  - (B) Indifferent

- (C) Wary
- (D) Derisive
- (E) Defensive

The primary method previously used by paleontologists to estimate climatic changes that occurred during Pleistocene glacial cycles was the determination of  $^{18}\text{O}/^{16}\text{O}$  ratios in calcareous fossils. However, because this ratio is influenced by a number of factors, the absolute magnitude of the temperature difference between Pleistocene glacial and interglacial cycles could not be unequivocally ascertained. For example, both temperature fluctuations and isotopic changes in seawater affect the  $^{18}\text{O}/^{16}\text{O}$  ratio. And, since both factors influence the ratio in the same direction, the contribution of each to the  $^{18}\text{O}/^{16}\text{O}$  cannot be determined.

Fortunately, recent studies indicate that the racemization reaction of amino acids can be used to determine more accurately temperatures that occurred during Pleistocene glacial cycles. Only L-amino acids are usually found in the proteins of living organisms, but over long periods of geological time these acids undergo racemization, producing D-amino acids, which are not found in proteins. This reaction depends on both time and temperature; thus, if one variable is known, the reaction can be used to calculate the other.

24. It can be inferred from the passage that determination of the temperatures mentioned in line 17 through  $^{18}\text{O}/^{16}\text{O}$  ratios and determination through racemization reactions both require which of the following?
- (A) Calcium deposits known to be from Pleistocene seas
  - (B) Proteins containing both L-amino acids and D-amino acids
  - (C) Glacial debris from both before and after the Pleistocene period
  - (D) Fossil material from organisms living during the Pleistocene period
  - (E) Proteins containing both amino acids and  $^{18}\text{O}$
25. The passage suggests that the  $^{18}\text{O}/^{16}\text{O}$  ratio could be used more successfully as a means of measurement if scientists were able to
- (A) determine the  $^{18}\text{O}/^{16}\text{O}$  ratio in living animals as well as in fossil remains
  - (B) locate a greater number of calcareous fossils from the Pleistocene glacial and interglacial cycles
  - (C) locate the factors other than temperature fluctuations and isotopic changes in seawater that affect the  $^{18}\text{O}/^{16}\text{O}$  ratio
  - (D) arrive at more exact determinations of which amino acids are found in the proteins of living organisms
  - (E) isolate the relative effects of temperature fluctuations and isotopic changes in seawater on  $^{18}\text{O}/^{16}\text{O}$  ratios
26. The information in the passage can be used to answer which of the following questions?
- I. Do temperature variations and isotopic changes in seawater cause the  $^{18}\text{O}/^{16}\text{O}$  ratio to shift in the same direction?
  - II. What are the methods used to determine the  $^{18}\text{O}/^{16}\text{O}$  ratio?
  - III. Is the study of racemization reactions useful in estimating climatic changes that occurred during Pleistocene glacial cycles if only one of the two important variables is known?
- (A) I only

- (B) I and II only
  - (C) I and III only
  - (D) II and III only
  - (E) I, II, and III
27. According to the passage, before the recent experiments described in the passage were completed, scientists could
- (A) determine temperatures only for Pleistocene seas
  - (B) determine temperatures that occurred during Pleistocene glacial cycles only by examining fossil remains
  - (C) measure changes in temperatures that occurred during Pleistocene glacial cycles with only questionable accuracy
  - (D) only partially identify factors tending to lower Pleistocene temperatures
  - (E) accurately determine temperatures only for land masses affected by glaciation

## SECTION B

Chimps and children, gulls and Greeks—the ethologists go their merry way, comparing bits of human cultural behavior with bits of genetically programmed animal behavior. True, humans are animals; they share certain anatomical features with other animals, and some items of human behavior may seem analogous to the behavior of other animals. But such analogies can seriously mislead if we fail to look at the context of a particular item of behavior. Thus one ethologist compares the presentation of a twig by a cormorant with gift-giving in humans. Yet the cormorant's twig-presentation simply inhibits attack and is comparable to other appeasement rituals found in many species. Human gift-giving differs in form and purpose not only from culture to culture, but within the same culture in various social contexts. Everything significant about it derives from its social context. Thus, ethologists can accomplish little—beyond reminding us that we are animals—until they study humans as cultural beings.

17. The author is primarily concerned with
- (A) demonstrating the usefulness of ethology in discovering the behavioral limits within which humans operate
  - (B) objecting to the degradation of humanity implicit in the ethologists equation of humans and animals
  - (C) pointing out the dangers inherent in comparing highly dissimilar species, such as humans and cormorants, rather than similar ones, such as humans and apes
  - (D) refuting the idea that the appeasement rituals in human cultural behavior can be profitably subjected to ethological analysis
  - (E) arguing that the ethologists' assumption that human behavior can be straightforwardly compared with animal behavior is invalid
18. The author believes that gift-giving in humans
- (A) is instinctive behavior
  - (B) is analogous to appeasement rituals in other animals
  - (C) is not an appropriate subject of study for ethologists
  - (D) must be considered within its social context to be properly understood
  - (E) may be a cultural remnant of behavior originally designed to inhibit attack
19. The author's attitude toward contemporary ethologists can best be described as

- (A) puzzled
  - (B) conciliatory
  - (C) defensive
  - (D) amused
  - (E) disparaging
20. Which of the following statements from a report on a cross-cultural study of gift-giving would, if true, most strongly support the author's assertions concerning human gift-giving?
- (A) In every culture studied, it was found that some forms of gift-giving are acts of aggression that place the receiver under obligation to the giver.
  - (B) Most governmental taxation systems differentiate between gifts of property given to children during a parent's lifetime, and a child's inheritance of the same property from a parent dying without a will.
  - (C) Some gift-giving customs have analogous forms in nearly every culture, as in the almost universal custom of welcoming strangers with gifts of food.
  - (D) In North America, generally speaking, money is an acceptable holiday gift to one's letter carrier or garbage collector, but is often considered an insult if given to one's employer, friends, or relatives.
  - (E) Some gifts, being conciliatory in nature, indicate by their costliness the degree of hostility they must appease in the recipient.

Few areas of neurobehavioral research seemed more promising in the early sixties than that investigating the relationship between protein synthesis and learning. The conceptual framework for this research was derived directly from molecular biology, which had shown that genetic information is stored in nucleic acids and expressed in proteins. Why not acquired information as well?

The first step toward establishing a connection between protein synthesis and learning seemed to be block memory (cause amnesia) by interrupting the production of protein. We were fortunate in finding a nonlethal dosage of puromycin that could, it first appeared, thoroughly inhibit brain protein synthesis as well as reliably produce amnesia.

Before the actual connection between protein synthesis and learning could be established, however, we began to have doubts about whether inhibition of protein synthesis was in fact the method by which puromycin produced amnesia. First, other drugs, glutarimides—themselves potent protein-synthesis inhibitors—either failed to cause amnesia in some situations where it could easily be induced by puromycin or produced an amnesia with a different time course from that of puromycin. Second, puromycin was found to inhibit protein synthesis by breaking certain amino-acid chains, and the resulting fragments were suspected of being the actual cause of amnesia in some cases. Third, puromycin was reported to cause abnormalities in the brain, including **seizures**. Thus, not only were decreased protein synthesis and amnesia dissociated, but alternative mechanisms for the amnestic action of puromycin were readily suggested.

So, puromycin turned out to be a disappointment. It came to be regarded as a poor agent for amnesia studies, although, of course, it was poor only in the context of our original paradigm of protein-synthesis inhibition. In our frustration, our initial response was simply to change drugs rather than our conceptual orientation. After many such disappointments, however, it now appears unlikely that we will make a firm connection between protein synthesis and learning merely by pursuing the approaches of the past. Our experience with drugs has shown that all the amnestic agents often interfere with memory in ways that seem unrelated to their inhibition of protein synthesis. More importantly, the notion that the interruption or intensification of protein production in the brain can be related in cause-and-effect fashion to learning now seems simplistic and unproductive. Remove the battery from a car and the car will not go. Drive the car a long distance at high speed and the battery will become more highly charged. Neither

of these facts proves that the battery powers the car; only a knowledge of the overall automotive system will reveal its mechanism of the locomotion and the role of the battery within that system.

21. This passage was most likely excerpted from
  - (A) a diary kept by a practicing neurobehavioral researcher
  - (B) a newspaper article on recent advances in the biochemistry of learning
  - (C) a technical article on experimental techniques in the field of molecular biology
  - (D) an article summarizing a series of scientific investigations in neurobehavioral research
  - (E) a book review in a leading journal devoted to genetic research
22. The primary purpose of the passage is to show that extensive experimentation has
  - (A) demonstrated the importance of amino-acid fragmentation in the induction of amnesia
  - (B) cast doubt on the value of puromycin in the neurobehavioral investigation of learning
  - (C) revealed the importance of amnesia in the neurobehavioral study of learning
  - (D) not yet demonstrated the applicability of molecular biology to neurobehavioral research
  - (E) not supported the hypothesis that learning is directly dependent on protein synthesis
23. According to the passage, neurobehaviorists initially based their belief that protein synthesis was related to learning on which of the following?
  - (A) Traditional theories about learning
  - (B) New techniques in protein synthesis
  - (C) Previous discoveries in molecular biology
  - (D) Specific research into learning and amnesia
  - (E) Historic experiments on the effects of puromycin
24. The passage mentions all of the following as effects of puromycin EXCEPT:
  - (A) brain seizures
  - (B) memory loss
  - (C) inhibition of protein synthesis
  - (D) destruction of genetic information
  - (E) fragmentation of amino-acid chains
25. It can be inferred from the passage that, after puromycin was perceived to be a disappointment, researchers did which of the following?
  - (A) They ceased to experiment with puromycin and shifted to other promising protein-synthesis inhibitors.
  - (B) They ceased to experiment with puromycin, and reexamined through experiments the relationship between genetic information and acquired information.
  - (C) They continued to experiment with puromycin, but applied their results to other facets of memory research.
  - (D) They continued to experiment with puromycin, but also tried other protein-synthesis inhibitors.
  - (E) They continued to experiment with puromycin until a new neuroanatomical framework was developed.
26. In the example of the car (lines 58-65), the battery is meant to represent which of the

following elements in the neurobehavioral research program?

- (A) Puromycin
  - (B) Amnesia
  - (C) Glutarimides
  - (D) Protein synthesis
  - (E) Acquired information
27. Which of the following statements could be most likely to come after the last sentence of the passage?
- (A) The failures of the past, however, must not impede further research into the amnestic action of protein-synthesis inhibitors.
  - (B) It is a legacy of this research, therefore, that molecular biology's genetic models have led to disagreements among neurobehaviorists.
  - (C) The ambivalent status of current research, however, should not deter neurobehaviorists from exploring the deeper connections between protein production and learning.
  - (D) It is important in the future, therefore, for behavioral biochemists to emphasize more strongly the place of their specific findings within the overall protein-synthesis model of learning.
  - (E) It is important in the future, therefore, for behavioral biochemists to focus on the several components of the total learning system.

### No. 3-3

### SECTION A

Although pathogenic organisms constantly alight on the skin, they find it a very unfavorable environment and, in the absence of injury, have great difficulty colonizing it. This "self-sterilizing" capacity of the skin results from the tendency of all well-developed ecosystems toward homeostasis, or the maintenance of the status quo.

Species that typically live in soil, water, and elsewhere rarely multiply on the skin. Undamaged skin is also unfavorable to most human pathogens. The skin is too acid and too arid for some species. The constant shedding of the surface skin layers further hinders the establishment of invaders. The most interesting defense mechanism, however, results from the metabolic activities of the **resident flora**. Unsaturated fatty acids, an important component of the lipids in sebum collected from the skin surface, inhibit the growth of several bacterial and fungal cutaneous pathogens. These acids are a metabolic product of certain gram-positive members of the cutaneous community, which break down the more complex lipids in freshly secreted sebum.

17. The primary purpose of the passage is to
- (A) offer an analysis of metabolic processes
  - (B) detail the ways in which bacteria and fungi can be inhibited
  - (C) describe mechanisms by which the skin protects itself against pathogens
  - (D) analyze the methods whereby biological systems maintain the status quo
  - (E) provide a specific example of the skin's basic defenses against pathogens
18. The "resident flora" mentioned in line 16 refer to
- (A) "Unsaturated fatty acids" (line 17)
  - (B) "sebum collected from the skin surface" (lines 18-19)

- (C) “bacterial and fungal cutaneous pathogens” (lines 19-20)
- (D) “certain gram-positive members of the cutaneous community” (lines 21-22)
- (E) “more complex lipids” (lines 23)

19. Among the natural defenses of the skin against pathogenic organisms are all of the following EXCEPT the
- (A) dryness of the skin
  - (B) acidity of the skin
  - (C) tendency of the pathogens toward homeostasis
  - (D) shedding of surface layers of the skin
  - (E) metabolic breakdown of lipids
20. The author presents her material in which of the following ways?
- (A) Stating a problem and then supplying a solution
  - (B) Presenting a phenomenon and then analyzing reason for it
  - (C) Providing information and then drawing a conclusion from it
  - (D) Making a general statement and then arguing by analogy
  - (E) Making an inference and then developing it by illustration

“Masterpieces are dumb,” wrote Flaubert, “They have a tranquil aspect like the very products of nature, like large animals and mountains.” He might have been thinking of *War and Peace*, that vast, silent work, unfathomable and simple, provoking endless questions through the majesty of its being. Tolstoi’s simplicity is “overpowering,” says the critic Bayley, “disconcerting,” because it comes from “his casual assumption that the world is as he sees it.” Like other nineteenth-century Russian writers he is “impressive” because he “means what he says,” but he stands apart from all others and from most Western writers in his identity with life, which is so complete as to make us forget he is an artist. He is the center of his work, but his egocentricity is of a special kind. Goethe, for example, says Bayley, “cared for nothing but himself. Tolstoi was nothing but himself.”

For all his varied modes of writing and the multiplicity of characters in his fiction, Tolstoi and his work are of a piece. The famous “conversion” of his middle years, movingly recounted in his *Confession*, was a culmination of his early spiritual life, not a departure from it. The apparently fundamental changes that led from epic narrative to dogmatic parable, from a joyous, buoyant attitude toward life to pessimism and cynicism, from *War and Peace* to *The Kreutzer Sonata*, came from the same restless, impressionable depths of an independent spirit yearning to get at the truth of its experience. “Truth is my hero,” wrote Tolstoi in his youth, reporting the fighting in Sebastopol. Truth remained his hero—his own, not others’, truth. Others were awed by Napoleon, believed that a single man could change the destinies of nations, adhered to meaningless rituals, formed their tastes on established canons of art. Tolstoi reversed all preconceptions; and in every reversal he overthrew the “system,” the “machine,” the externally ordained belief, the conventional behavior in favor of unsystematic, impulsive life, of inward motivation and the solutions of independent thought.

In his work the artificial and the genuine are always exhibited in dramatic opposition: the supposedly great Napoleon and the truly great, unregarded little Captain Tushin, or Nicholas Rostov’s actual experience in battle and his later account of it. The simple is always pitted against the elaborate, knowledge gained from observation against assertions of borrowed faiths. Tolstoi’s magical simplicity is a product of these tensions; his work is a record of the questions he put to himself and of the answers he found in his search. The greatest characters of his fiction exemplify this search, and their happiness depends on the measure of their answers. Tolstoi wanted happiness, but only hard-won happiness, that emotional fulfillment and intellectual clarity which could come only as the prize of all-consuming effort. He scorned lesser satisfactions.



21. Which of the following best characterizes the author's attitude toward Tolstoi?
- (A) She deprecates the cynicism of his later works.
  - (B) She finds his theatricality artificial.
  - (C) She admires his wholehearted sincerity.
  - (D) She thinks his inconsistency disturbing.
  - (E) She respects his devotion to orthodoxy.
22. Which of the following best paraphrases Flaubert's statement quoted in lines 1-4?
- (A) Masterpiece seem ordinary and unremarkable from the perspective of a later age.
  - (B) Great works of art do not explain themselves to us any more than natural objects do.
  - (C) Important works of art take their place in the pageant of history because of their uniqueness.
  - (D) The most important aspects of good art are the orderliness and tranquility it reflects.
  - (E) Masterpieces which are of enduring value represent the forces of nature.
23. The author quotes from Bayley (line 8-20) to show that
- (A) although Tolstoi observes and interprets life, he maintains no self-conscious distance from his experience
  - (B) the realism of Tolstoi's work gives the illusion that his novels are reports of actual events
  - (C) unfortunately, Tolstoi is unaware of his own limitation, though he is sincere in his attempt to describe experience
  - (D) although Tolstoi works casually and makes unwarranted assumption, his work has an inexplicable appearance of truth
  - (E) Tolstoi's personal perspective makes his work almost unintelligible to the majority of his readers
24. The author states that Tolstoi's conversion represented
- (A) a radical renunciation of the world
  - (B) the rejection of avant-garde ideas
  - (C) the natural outcome of his earlier beliefs
  - (D) the acceptance of religion he had earlier rejected
  - (E) a fundamental change in his writing style
25. According to the passage, Tolstoi's response to the accepted intellectual and artistic values of his times was to
- (A) select the most valid from among them
  - (B) combine opposing viewpoints into a new doctrine
  - (C) reject the claims of religion in order to serve his art
  - (D) subvert them in order to defend a new political viewpoint
  - (E) upset them in order to be faithful to his experience
26. It can be inferred from the passage that which of the following is true of *War and Peace*?
- (A) It belongs to an early period of Tolstoi's work.
  - (B) It incorporates a polemic against the disorderliness of Russian life.

- (C) It has a simple structural outline.
  - (D) It is a work that reflects an ironic view of life.
  - (E) It conforms to the standard of aesthetic refinement favored by Tolstoi's contemporaries.
27. According to the passage, the explanation of Tolstoi's "magical simplicity" (line 55) lies partly in his
- (A) remarkable power of observation and his facility in exact description
  - (B) persistent disregard for conventional restraints together with his great energy
  - (C) unusual ability to reduce the description of complex situations to a few words
  - (D) abiding hatred of religious doctrine and preference for new scientism
  - (E) continuing attempt to represent the natural in opposition to the pretentious

## SECTION B

The stratospheric ozone layer is not a completely uniform stratum, nor does it occur at the same altitude around the globe. It lies closest to the Earth over the poles and rises to maximum altitude over the equator. In the stratosphere, ozone is continuously being made and destroyed by natural processes. During the day the Sun breaks down some of the oxygen molecules to single oxygen atoms, and these reacting with the oxygen molecules that have not been dissociated, form ozone. However, the sunlight also breaks down ozone by converting some of it back to normal oxygen. In addition naturally occurring nitrogen oxides enter into the cycle and speed the breakdown reactions. The amount of ozone present at any one time is the balance between the processes that create it and those that destroy it.

Since the splitting of the oxygen molecules depends directly upon the intensity of solar radiation, the greatest rate of ozone production occurs over the tropics. However ozone is also destroyed most rapidly there, and wind circulation patterns carry the ozone-enriched upper layers of the atmosphere away from the equator. It turns out that the largest total ozone amounts are found at high latitudes. On a typical day the amount of ozone over Minnesota, for example, is 30 percent greater than the amount over Texas, 900 miles farther south. The density and altitude of the ozone layer also change with the seasons, the weather, and the amount of solar activity. Nevertheless, at any one place above the Earth's surface, the long-term averages maintained by natural processes are believed to be reasonably constant.

The amount of ozone near the Earth is only a small percent of the amount in the stratosphere, and exchange of molecules between the ozone layer and the air at ground level is thought to be relatively small. Furthermore, the ozone molecule is so unstable that only a tiny fraction of ground-level ozone could survive the long trip to the stratosphere, so the ozone layer will not be replenished to any significant degree by the increasing concentrations of ozone that have been detected in recent years near the earth's surface. The long-term averages of ozone both near **ground level** and in the stratosphere are regulated by continuous processes that are constantly destroying and creating it in each of these places. This is why scientists are so concerned about human beings injection into the stratosphere of chemicals like nitrogen oxides, which are catalysts that facilitate the breakdown of ozone. If the ozone layer is depleted significantly, more ultraviolet radiation would penetrate to the Earth's surface and damage many living organisms.

17. The passage suggests that factors contributing to the variation in the amount of ozone above different areas of the Earth's surface include which of the following?
- I. Some of the ozone found at higher latitudes was produced elsewhere.
  - II. There is usually a smaller amount of naturally occurring nitrogen oxide over high latitudes.
  - III. The rate of ozone production over the poles is less than that over the tropics.
- (A) II only
  - (B) III only

- (C) I and II only
- (D) I and III only
- (E) I, II, and III

18. Which of the following best states the central idea of the passage?
- (A) Naturally occurring nitrogen oxides, as well as those introduced by humans, threaten to deplete the layer of ozone in the stratosphere.
  - (B) A delicate but reasonably constant balance exists between the natural processes that produce and those that destroy ozone in the stratosphere.
  - (C) There is little hope that the increased concentrations of ground-level ozone observed in recent years can offset any future depletion of stratospheric ozone.
  - (D) Meteorologically induced changes in the concentration of ozone in the stratosphere tend to cancel themselves out over a period of time.
  - (E) Solar radiation not only produces and destroys ozone but also poses a hazard to human life.
19. The processes that determine the amount of ozone in a given portion of the stratosphere most resemble which of the following?
- (A) Automobile emissions and seasonal fog that create a layer of smog over a city
  - (B) Planting and harvesting activities that produce a crop whose size is always about the same
  - (C) Withdrawals and deposits made in a bank account whose average balance remains about the same
  - (D) Assets and liabilities that determine the net worth of a corporation
  - (E) High grades and low grades made by a student whose average remains about the same from term to term
20. According to the passage, which of the following has the LEAST effect on the amount of ozone at a given location in the upper atmosphere?
- (A) Latitude
  - (B) Weather
  - (C) Season
  - (D) Ground-level ozone
  - (E) Solar activity
21. The author provides information that answers which of the following questions?
- I. What is the average thickness of the stratospheric ozone layer?
  - II. Why does increased exposure to ultraviolet radiation damage many living organisms?
  - III. What is the role of oxygen in the production of stratospheric ozone?
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II
  - (E) II and III

22. In explaining what determines the amount of ozone in the stratosphere, the author describes natural processes that form
- (A) an interactive relationship
  - (B) a reductive system
  - (C) a linear progression
  - (D) a set of randomly occurring phenomena
  - (E) a set of sporadically recurring events

Feelings of hopelessness among medieval workers trapped in the poverty cycle gradually lessened as it became possible for women's labor to supplement a family's money income by more than pennies. By 1300, women spinners could be found working **on their own** for wealthy sponsors, even after the introduction in Italy and France of prohibition against advancing money for supplies to women spinners. Historians have usually interpreted this prohibition simply as evidence of women's economic subjection, since it obliged them to turn to usurers; however, it was also almost certainly a response to a trend toward differential reward for women's higher skill. Yarn can be spun irregularly and lumpily, but perfectly smooth yarn is worth more. Working for merchant entrepreneurs on time rates, women had been paid hardly more than children; working as entrepreneurs themselves and producing good work by the piece, they could **break into** the rational system of differential rewards.

23. The primary purpose of the passage is to
- (A) propose and defend a theory about the consequences of a certain historical event
  - (B) present historical facts and offer a broader interpretation of those facts than has been offered in the past
  - (C) describe the socioeconomic effects of a widely held attitude during a particular historical period
  - (D) demonstrate the superiority of using an economic approach to historical analysis
  - (E) call attention to the influence of the textile industry on society during a particular historical period
24. It can be inferred from the passage that the author views the system of paying all workers equally on time rates as
- (A) unfair and not rational
  - (B) undesirable but unavoidable
  - (C) efficient and profitable
  - (D) advantageous to most women workers
  - (E) evidence of a trend toward a more modern wage system
25. The passage implies which of the following about women spinners in medieval Europe?
- (A) Most of them worked independently for wealthy sponsors.
  - (B) They were not typical of medieval women entrepreneurs.
  - (C) Some of them were paid for their work after it was done, according to its value.
  - (D) They would have been able to contribute substantial amounts to their families incomes were it not for the prohibition against advancing money to them.
  - (E) They were inevitably disadvantaged in the marketplace because they were obliged to obtain money for their supplies from usurers.
26. The passage implies that feelings of hopelessness among medieval workers

- (A) resulted primarily from the lack of a rational system of differential rewards
  - (B) disappeared completely once medieval textile workers were able to break the cycle of poverty
  - (C) were more prevalent among female workers than among male workers
  - (D) came into being in part because of women's limited earning capacity
  - (E) were particularly common among textile workers in Italy and France
27. The author suggests that historians have done which of the following?
- (A) Failed to give adequate consideration to the economic contribution of women during the medieval period.
  - (B) Overestimated the degree of hopelessness experienced by medieval workers trapped in the poverty cycle.
  - (C) Ignored the fact that by 1300 many women spinners were working independently rather than for merchant entrepreneurs.
  - (D) Regard the economic status of women in Italy and France as representative of women's status throughout medieval Europe.
  - (E) Overlooked part of the significance of a prohibition governing one aspect of yarn production in medieval Europe.

No. 4-1

## SECTION A

By the time the American colonists took up arms against Great Britain in order to secure their independence, the institution of Black slavery was deeply entrenched. But the contradiction inherent in this situation was, for many, a source of constant embarrassment. "It always appeared a most iniquitous scheme to me," Abigail Adams wrote her husband in 1774, "to fight ourselves for what we are daily robbing and plundering from those who have as good a right to freedom as we have."

Many Americans besides Abigail Adams were struck by the inconsistency of their stand during the War of Independence, and they were not averse to making moves to emancipate the slaves. Quakers and other religious groups organized antislavery societies, while numerous individuals manumitted their slaves. In fact, within several years of the end of the War of Independence, most of the Eastern states had made provisions for the gradual emancipation of slaves.

17. Which of the following best states the central idea of the passage?
- (A) The War of Independence produced among many Black Americans a heightened consciousness of the inequities in American society.
  - (B) The War of Independence strengthened the bonds of slavery of many Black Americans while intensifying their desire to be free.
  - (C) The War of Independence exposed to many Americans the contradiction of slavery in a country seeking its freedom and resulted in efforts to resolve that contradiction.
  - (D) The War of Independence provoked strong criticisms by many Americans of the institution of slavery, but produced little substantive action against it.
  - (E) The War of Independence renewed the efforts of many American groups toward achieving Black emancipation.
18. The passage contains information that would support which of the following statements about the colonies before the War of Independence?

- (A) They contained organized antislavery societies.
  - (B) They allowed individuals to own slaves.
  - (C) They prohibited religious groups from political action.
  - (D) They were inconsistent in their legal definitions of slave status.
  - (E) They encouraged abolitionist societies to expand their influence.
19. According to the passage, the War of Independence was embarrassing to some Americans for which of the following reasons?
- I. It involved a struggle for many of the same liberties that Americans were denying to others.
  - II. It involved a struggle for independence from the very nation that had founded the colonies.
  - III. It involved a struggle based on inconsistencies in the participants' conceptions of freedom.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) I and III only
  - (E) I, II, and III
20. Which of the following statements regarding American society in the years immediately following the War of Independence is best supported by the passage?
- (A) The unexpected successes of the antislavery societies led to their gradual demise in the Eastern states.
  - (B) Some of the newly independent American states had begun to make progress toward abolishing slavery.
  - (C) Americans like Abigail Adams became disillusioned with the slow progress of emancipation and gradually abandoned the cause.
  - (D) Emancipated slaves gradually were accepted in the Eastern states as equal members of American society.
  - (E) The abolition of slavery in many Eastern states was the result of close cooperation between religious groups and free Blacks.

The evolution of sex ratios has produced, in most plants and animals with separate sexes, approximately equal numbers of males and females. Why should this be so? Two main kinds of answers have been offered. One is **couched** in terms of advantage to population. It is argued that the **sex ratio** will evolve so as to maximize the number of meetings between individuals of the opposite sex. This is essentially a "**group selection**" argument. The other, and in my view correct, type of answer was first put forward by Fisher in 1930. This "genetic" argument starts from the assumption that genes can influence the relative numbers of male and female offspring produced by an individual carrying the genes. That sex ratio will be favored which maximizes the number of descendants an individual will have and hence the number of gene copies transmitted. Suppose that the population consisted mostly of females: then an individual who produced sons only would have more grandchildren. In contrast, if the population consisted mostly of males, it would **pay** to have daughters. If, however, the population consisted of equal numbers of males and females, sons and daughters would be equally valuable. Thus a one-to-one sex ratio is the only stable ratio; it is an "evolutionarily stable strategy." Although Fisher wrote before the mathematical theory of games had been developed, his theory incorporates the essential feature of a

game—that the best strategy to adopt depends on what others are doing.

Since Fisher's time, it has been realized that genes can sometimes influence the chromosome or gamete in which they find themselves so that the gamete will be more likely to participate in fertilization. If such a gene occurs on a sex-determining (X or Y) chromosome, then highly aberrant sex ratios can occur. But more immediately relevant to **game theory** are the sex ratios in certain parasitic wasp species that have a large excess of females. In these species, fertilized eggs develop into females and unfertilized eggs into males. A female stores sperm and can determine the sex of each egg she lays by fertilizing it or leaving it unfertilized. By Fisher's argument, it should still pay a female to produce equal numbers of sons and daughters. Hamilton, noting that the eggs develop within their host—the larva of another insect—and that the newly emerged adult wasps mate immediately and disperse, offered a remarkably cogent analysis. Since only one female usually lays eggs in a given larva, it would pay her to produce one male only, because this one male could fertilize all his sisters on emergence. Like Fisher, Hamilton looked for an evolutionarily stable strategy, but he went a step further in *recognizing* that he was looking for a strategy.

21. The author suggests that the work of Fisher and Hamilton was similar in that both scientists
  - (A) conducted their research at approximately the same time
  - (B) sought to manipulate the sex ratios of some of the animals they studied
  - (C) sought an explanation of why certain sex ratios exist and remain stable
  - (D) studied game theory, thereby providing important groundwork for the later development of strategy theory
  - (E) studied reproduction in the same animal species
22. It can be inferred from the passage that the author considers Fisher's work to be
  - (A) fallacious and unprofessional
  - (B) definitive and thorough
  - (C) inaccurate but popular, compared with Hamilton's work
  - (D) admirable, but not as up-to-date as Hamilton's work
  - (E) accurate, but trivial compared with Hamilton's work
23. The passage contains information that would answer which of the following questions about wasps?
  - I. How many eggs does the female wasp usually lay in a single host larva?
  - II. Can some species of wasp determine sex ratios among their offspring?
  - III. What is the approximate sex ratio among the offspring of parasitic wasps?
  - (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II only
  - (E) II and III only
24. It can be inferred that the author discusses the genetic theory in greater detail than the group selection theory primarily because he believes that the genetic theory is more
  - (A) complicated
  - (B) accurate
  - (C) popular
  - (D) comprehensive

- (E) accessible
25. According to the passage, successful game strategy depends on
- (A) the ability to adjust one's behavior in light of the behavior of others
  - (B) one's awareness that there is safety in numbers
  - (C) the degree of stability one can create in one's immediate environment
  - (D) the accuracy with which one can predict future events
  - (E) the success one achieves in conserving and storing one's resources
26. It can be inferred from the passage that the mathematical theory of games has been
- (A) developed by scientists with an interest in genetics
  - (B) adopted by Hamilton in his research
  - (C) helpful in explaining how genes can sometimes influence gametes
  - (D) based on animals studies conducted prior to 1930
  - (E) useful in explaining some biological phenomena
27. Which of the following is NOT true of the species of parasitic wasps discussed in the passage?
- (A) Adult female wasps are capable of storing sperm.
  - (B) Female wasps lay their eggs in the larvae of other insects.
  - (C) The adult female wasp can be fertilized by a male that was hatched in the same larva as herself.
  - (D) So few male wasps are produced that extinction is almost certain.
  - (E) Male wasps do not emerge from their hosts until they reach sexual maturity.

## SECTION B

Thomas Hardy's impulses as a writer, all of which he indulged in his novels, were numerous and divergent, and they did not always work together in harmony. Hardy was to some degree interested in exploring his characters' psychologies, though impelled less by curiosity than by sympathy. Occasionally he felt the impulse to comedy (in all its detached coldness) as well as the impulse to farce, but he was more often inclined to see tragedy and record it. He was also inclined to literary realism in the several senses of that phrase. He wanted to describe ordinary human beings; he wanted to **speculate on** their dilemmas rationally (and, unfortunately, even schematically); and he wanted to record precisely the material universe. Finally, he wanted to be more than a realist. He wanted to transcend what he considered to be the banality of solely recording things exactly and to express as well his awareness of the occult and the strange.

In his novels these various impulses were sacrificed to each other inevitably and often. Inevitably, because Hardy did not care in the way that novelists such as Flaubert or James cared, and therefore took paths of least resistance. Thus, one impulse often surrendered to a fresher one and, unfortunately, instead of exacting a compromise, simply disappeared. A desire to throw over reality a light that never was might give way abruptly to the desire **on the part of** what we might consider a novelist-scientist to record exactly and concretely the structure and texture of a flower. In this instance, the new impulse was at least an energetic one, and thus its indulgence did not result in a relaxed style. But on other occasions Hardy abandoned a perilous, risky, and highly energizing impulse in favor of what was for him the fatally relaxing impulse to classify and schematize abstractly. When a relaxing impulse was indulged, the style—that sure index of an author's literary worth—was certain to become verbose. Hardy's weakness derived from his apparent inability to control the comings and goings of these divergent impulses and from his unwillingness to cultivate and sustain the energetic and risky ones. He submitted to first one and then



another, and the spirit blew where it **listed**; hence the unevenness of any one of his novels. His most controlled novel, *Under the Greenwood Tree*, prominently exhibits two different but reconcilable impulses—a desire to be a realist-historian and a desire to be a psychologist of love—but the slight interlockings of plot are not enough to bind the two completely together. Thus even this book splits into two distinct parts.

17. Which of the following is the most appropriate title for the passage, based on its content?
  - (A) *Under the Greenwood Tree*: Hardy's Ambiguous Triumph
  - (B) The Real and the Strange: The Novelist's Shifting Realms
  - (C) Energy *Versus* Repose: The Role of Ordinary People in Hardy's Fiction
  - (D) Hardy's Novelistic Impulses: The Problem of Control
  - (E) Divergent Impulses: The Issue of Unity in the Novel
18. The passage suggests that the author would be most likely to agree with which of the following statements about literary realism?
  - (A) Literary realism is most concerned with the exploration of the internal lives of ordinary human beings.
  - (B) The term "literary realism" is susceptible to more than a single definition.
  - (C) Literary realism and an interest in psychology are likely to be at odds in a novelist's work.
  - (D) "Literary realism" is the term most often used by critics in describing the method of Hardy's novels.
  - (E) A propensity toward literary realism is a less interesting novelistic impulse than is an interest in the occult and the strange.
19. The author of the passage considers a writer's style to be
  - (A) a reliable means by which to measure the writer's literary merit
  - (B) most apparent in those parts of the writer's work that are not realistic
  - (C) problematic when the writer attempts to follow perilous or risky impulses
  - (D) shaped primarily by the writer's desire to classify and schematize
  - (E) the most accurate index of the writer's literary reputation
20. Which of the following words could best be substituted for "relaxed" (line 37) without substantially changing the author's meaning?
  - (A) informal
  - (B) confined
  - (C) risky
  - (D) wordy
  - (E) metaphoric
21. The passage supplies information to suggest that its author would be most likely to agree with which of the following statements about the novelists Flaubert and James?
  - (A) They indulged more impulses in their novels than did Hardy in his novels.
  - (B) They have elicited a greater degree of favorable response from most literary critics than has Hardy.
  - (C) In the writing of their novels, they often took pains to effect a compromise among their

various novelistic impulses.

- (D) Regarding novelistic construction, they cared more about the opinions of other novelists than about the opinions of ordinary readers.
- (E) They wrote novels in which the impulse toward realism and the impulse away from realism were evident in equal measure.
22. Which of the following statements best describes the organization of lines 27 to 41 of the passage (“Thus...abstractly”)?
- (A) The author makes a disapproving observation and then presents two cases, one of which leads to a qualification of his disapproval and the other of which does not.
- (B) The author draws a conclusion from a previous statement, explains his conclusion in detail, and then gives a series of examples that have the effect of resolving an inconsistency.
- (C) The author concedes a point and then makes a counterargument, using an extended comparison and contrast that qualifies his original concession.
- (D) The author makes a judgment, points out an exception to his judgment, and then contradicts his original assertion.
- (E) The author summarizes and explains an argument and then advances a brief history of opposing arguments.
23. Which of the following statements about the use of comedy in Hardy’s novels is best supported by the passage?
- (A) Hardy’s use of comedy in his novels tended to weaken his literary style.
- (B) Hardy’s use of comedy in his novels was inspired by his natural sympathy.
- (C) Comedy appeared less frequently in Hardy’s novels than did tragedy.
- (D) Comedy played an important role in Hardy’s novels though that comedy was usually in the form of farce.
- (E) Comedy played a secondary role in Hardy’s more controlled novels only.
24. The author implies which of the following about *Under the Greenwood Tree* in relation to Hardy’s other novels?
- (A) It is Hardy’s most thorough investigation of the psychology of love.
- (B) Although it is his most controlled novel, it does not exhibit any harsh or risky impulses.
- (C) It, more than his other novels, reveals Hardy as a realist interested in the history of ordinary human beings.
- (D) In it Hardy’s novelistic impulses are managed somewhat better than in his other novels.
- (E) Its plot, like the plots of all of Hardy’s other novels, splits into two distinct parts.

Upwards of a billion stars in our galaxy have burnt up their internal energy sources, and so can no longer produce the heat a star needs to oppose the inward force of gravity. These stars, of more than a few solar masses, evolve, in general, much more rapidly than does a star like the Sun. Moreover, it is just these more massive stars whose collapse does not halt at intermediate stages (that is, as white dwarfs or neutron stars). Instead, the collapse continues until a singularity (an infinitely dense concentration of matter) is reached.

It would be wonderful to observe a singularity and obtain direct evidence of the undoubtedly bizarre phenomena that occur near one. Unfortunately in most cases a distant observer cannot see the singularity; outgoing light rays are dragged back by gravity so forcefully that even if they could **start out**

within a few kilometers of the singularity, they would **end up** in the singularity itself.

25. The author's primary purpose in the passage is to
- (A) describe the formation and nature of singularities
  - (B) explain why large numbers of stars become singularities
  - (C) compare the characteristics of singularities with those of stars
  - (D) explain what happens during the stages of a singularity's formation
  - (E) imply that singularities could be more easily studied if observers could get closer to them
26. The passage suggests which of the following about the Sun?
- I. The Sun could evolve to a stage of collapse that is less dense than a singularity.
  - II. In the Sun, the inward force of gravity is balanced by the generation of heat.
  - III. The Sun emits more observable light than does a white dwarf or a neutron star.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
27. Which of the following sentences would most probably follow the last sentence of the passage?
- (A) Thus, a physicist interested in studying phenomena near singularities would necessarily hope to find a singularity with a measurable gravitational field.
  - (B) Accordingly, physicists to date have been unable to observe directly any singularity.
  - (C) It is specifically this startling phenomenon that has allowed us to codify the scant information currently available about singularities.
  - (D) Moreover, the existence of this extraordinary phenomenon is implied in the extensive reports of several physicists.
  - (E) Although unanticipated, phenomena such as these are consistent with the structure of a singularity.

No. 4-2

## SECTION A

The evolution of intelligence among early large mammals of the grasslands was due in great measure to the interaction between two ecologically synchronized groups of these animals, the hunting carnivores and the herbivores that they hunted. The interaction resulting from the differences between predator and prey led to a general improvement in brain functions; however, certain components of intelligence were improved far more than others.

The kind of intelligence favored by the interplay of increasingly smarter catchers and increasingly keener escapers is defined by attention—that aspect of mind carrying consciousness forward from one moment to the next. It ranges from a passive, free-floating awareness to a highly focused, active fixation. The range through these states is mediated by the arousal system, a network of tracts converging from sensory systems to integrating centers in the brain stem. From the more relaxed to the more vigorous levels, sensitivity to novelty is increased. The organism is more awake, more vigilant; this increased vigilance results in the apprehension of ever more subtle signals as the organism becomes more sensitive to its surroundings. The processes of arousal and concentration give attention its direction. Arousal is at

first general, with a flooding of impulses in the brain stem; then gradually the activation is channeled. Thus begins concentration, the holding of consistent images. One meaning of intelligence is the way in which these images and other alertly searched information are used in the context of previous experience. Consciousness links past attention to the present and permits the integration of details with perceived ends and purposes.

The elements of intelligence and consciousness come together marvelously to produce different styles in predator and prey. Herbivores and carnivores develop different kinds of attention related to escaping or chasing. Although in both kinds of animal, arousal stimulates the production of adrenaline and norepinephrine by the adrenal glands, the effect in herbivores is primarily fear, whereas in carnivores the effect is primarily aggression. For both, arousal attunes the animal to what is ahead. Perhaps it does not experience forethought as we know it, but the animal does experience something like it. The predator is searchingly aggressive, innerdirected, tuned by the nervous system and the adrenal hormones, but aware in a sense closer to human consciousness than, say, a hungry lizard's instinctive snap at a passing beetle. Using past events as a framework, the large mammal predator is working out a relationship between movement and food, sensitive to possibilities in cold trails and distant sounds—and yesterday's unforgotten lessons. The herbivore prey is of a different mind. Its mood of wariness rather than searching and its attitude of general expectancy instead of anticipating are silk-thin veils of tranquility over an explosive endocrine system.

17. The author is primarily concerned with
  - (A) disproving the view that herbivores are less intelligent than carnivores
  - (B) describing a relationship between animals' intelligence and their ecological roles
  - (C) establishing a direct link between early large mammals and their modern counterparts
  - (D) analyzing the ecological basis for the dominance of some carnivores over other carnivores
  - (E) demonstrating the importance of hormones in mental activity
18. The author refers to a hungry lizard (line 55) primarily in order to
  - (A) demonstrate the similarity between the hunting methods of mammals and those of nonmammals
  - (B) broaden the application of his argument by including an insectivore as an example
  - (C) make a distinction between higher and lower levels of consciousness
  - (D) provide an additional illustration of the brutality characteristic of predators
  - (E) offer an objection to suggestions that all animals lack consciousness
19. It can be inferred from the passage that in animals less intelligent than the mammals discussed in the passage
  - (A) past experience is less helpful in ensuring survival
  - (B) attention is more highly focused
  - (C) muscular coordination is less highly developed
  - (D) there is less need for competition among species
  - (E) environment is more important in establishing the proper ratio of prey to predator
20. The sensitivity described in lines 56-61 is most clearly an example of
  - (A) "free-floating awareness" (lines 16-17)
  - (B) "flooding of impulses in the brain stem" (lines 29-30)
  - (C) "the holding of consistent images" (lines 31-32)

- (D) “integration of details with perceived ends and purposes” (lines 37-38)  
(E) “silk-thin veils of tranquility” (line 64)
21. The author’s attitude toward the mammals discussed in the passage is best described as  
(A) superior and condescending  
(B) lighthearted and jocular  
(C) apologetic and conciliatory  
(D) wistful and tender  
(E) respectful and admiring
22. The author provides information that would answer which of the following questions?  
I. Why is an aroused herbivore usually fearful?  
II. What are some of the degrees of attention in large mammals?  
III. What occurs when the stimulus that causes arousal of a mammal is removed?  
(A) I only  
(B) III only  
(C) I and II only  
(D) II and III only  
(E) I, II and III
23. According to the passage, improvement in brain function among early large mammals resulted primarily from which of the following?  
(A) Interplay of predator and prey  
(B) Persistence of free-floating awareness in animals of the grasslands  
(C) Gradual dominance of warm-blooded mammals over cold-blooded reptiles  
(D) Interaction of early large mammals with less intelligent species  
(E) Improvement of the capacity for memory among herbivores and carnivores
24. According to the passage, as the process of arousal in an organism continues, all of the following may occur EXCEPT:  
(A) the production of adrenaline  
(B) the production of norepinephrine  
(C) a heightening of sensitivity to stimuli  
(D) an increase in selectivity with respect to stimuli  
(E) an expansion of the range of states mediated by the brain stem

Tocqueville, apparently, was wrong. Jacksonian America was not a fluid, egalitarian society where individual wealth and poverty were ephemeral conditions. At least so argues E. Pessen in his iconoclastic study of the very rich in the United States between 1825 and 1850.

Pessen does present a quantity of examples, together with some refreshingly intelligible statistics, to establish the existence of an inordinately wealthy class. Though active in commerce or the professions, most of the wealthy were not self-made, but had inherited family fortunes. In no sense mercurial, these great fortunes survived the financial panics that destroyed lesser ones. Indeed, in several cities the wealthiest one percent constantly increased its share until by 1850 it owned half of the community’s wealth. Although these observations are true, Pessen overestimates their importance by concluding from them that the undoubted progress toward inequality in the late eighteenth century continued in the

Jacksonian period and that the United States was a class-ridden, plutocratic society even before industrialization.

25. According to the passage, Pessen indicates that all of the following were true of the very wealthy in the United States between 1825 and 1850 EXCEPT:
- (A) They formed a distinct upper class.
  - (B) Many of them were able to increase their holdings.
  - (C) Some of them worked as professionals or in business.
  - (D) Most of them accumulated their own fortunes.
  - (E) Many of them retained their wealth in spite of financial upheavals.
26. The author's attitude toward Pessen's presentation of statistics can be best described as
- (A) disapproving
  - (B) shocked
  - (C) suspicious
  - (D) amused
  - (E) laudatory
27. Which of the following best states the author's main point?
- (A) Pessen's study has overturned the previously established view of the social and economic structure of early nineteenth-century America.
  - (B) Tocqueville's analysis of the United States in the Jacksonian era remains the definitive account of this period.
  - (C) Pessen's study is valuable primarily because it shows the continuity of the social system in the United States throughout the nineteenth century.
  - (D) The social patterns and political power of the extremely wealthy in the United States between 1825 and 1850 are well documented.
  - (E) Pessen challenges a view of the social and economic system in the United States from 1825 to 1850, but he draws conclusions that are incorrect.

## SECTION B

"I want to criticize the social system, and to show it at work, at its most intense." Virginia Woolf's provocative statement about her intentions in writing *Mrs. Dalloway* has regularly been ignored by the critics, since it highlights an aspect of her literary interests very different from the traditional picture of the "poetic" novelist concerned with examining states of reverie and vision and with following the intricate pathways of individual consciousness. But Virginia Woolf was a realistic as well as a poetic novelist, a satirist and social critic as well as a visionary: literary critics' cavalier dismissal of Woolf's social vision will not withstand scrutiny.

In her novels, Woolf is deeply engaged by the questions of how individuals are shaped (or deformed) by their social environments, how historical forces **impinge on** people's lives, how class, wealth, and gender help to determine people's fates. Most of her novels are rooted in a realistically rendered social setting and in a precise historical time.

Woolf's focus on society has not been generally recognized because of her intense antipathy to propaganda in art. The pictures of reformers in her novels are usually satiric or sharply critical. Even when Woolf is fundamentally sympathetic to their causes, she portrays people anxious to reform their society and possessed of a message or program as arrogant or dishonest, unaware of how their political ideas serve their own psychological needs. (Her *Writer's Diary* notes: "the only honest people are the artists," whereas "these social reformers and philanthropists...harbor...discreditable desires under the

disguise of loving their kind...") Woolf detested what she called "preaching" in fiction, too, and criticized novelist D. H. Lawrence (among others) for working by this method.

Woolf's own social criticism is expressed in the language of observation rather than in direct commentary, since for her, fiction is a contemplative, not an active art. She describes phenomena and provides materials for a judgment about society and social issues; it is the reader's work to put the observations together and understand the coherent point of view behind them. As a moralist, Woolf works by indirection, subtly undermining officially accepted mores, mocking, suggesting, calling into question, rather than asserting, advocating, bearing witness: hers is the satirist's art.

Woolf's literary models were acute social observers like Chekhov and Chaucer. As she put it in *The Common Reader*, "It is safe to say that not a single law has been framed or one stone set upon another because of anything Chaucer said or wrote; and yet, as we read him, we are absorbing morality at every pore." Like Chaucer, Woolf chose to understand as well as to judge, to know her society root and branch—a decision crucial in order to produce art rather than polemic.

17. Which of the following would be the most appropriate title for the passage?
  - (A) Poetry and Satire as Influences on the Novels of Virginia Woolf
  - (B) Virginia Woolf: Critic and Commentator on the Twentieth-Century Novel
  - (C) Trends in Contemporary Reform Movements as a Key to Understanding Virginia Woolf's Novels
  - (D) Society as Allegory for the Individual in the Novels of Virginia Woolf
  - (E) Virginia Woolf's Novels: Critical Reflections on the Individual and on Society
18. In the first paragraph of the passage, the author's attitude toward the literary critics mentioned can best be described as
  - (A) disparaging
  - (B) ironic
  - (C) facetious
  - (D) skeptical but resigned
  - (E) disappointed but hopeful
19. It can be inferred from the passage that Woolf chose Chaucer as a literary model because she believed that
  - (A) Chaucer was the first English author to focus on society as a whole as well as on individual characters
  - (B) Chaucer was an honest and forthright author, whereas novelists like D. H. Lawrence did not sincerely wish to change society
  - (C) Chaucer was more concerned with understanding his society than with calling its accepted mores into question
  - (D) Chaucer's writing was greatly, if subtly, effective in influencing the moral attitudes of his readers
  - (E) her own novels would be more widely read if, like Chaucer, she did not overtly and vehemently criticize contemporary society
20. It can be inferred from the passage that the most probable reason Woolf realistically described the social setting in the majority of her novels was that she
  - (A) was aware that contemporary literary critics considered the novel to be the most realistic of literary genres

- (B) was interested in the effect of a person's social milieu on his or her character and actions
  - (C) needed to be as attentive to detail as possible in her novels in order to support the arguments she advanced in them
  - (D) wanted to show that a painstaking fidelity in the representation of reality did not in any way hamper the artist
  - (E) wished to prevent critics from charging that her novels were written in an ambiguous and inexact style
21. Which of the following phrases best expresses the sense of the word "contemplative" as it is used in lines 43-44 of the passage?
- (A) Gradually elucidating the rational structures underlying accepted mores
  - (B) Reflecting on issues in society without prejudice or emotional commitment
  - (C) Avoiding the aggressive assertion of the author's perspective to the exclusion of the reader's judgment
  - (D) Conveying a broad view of society as a whole rather than focusing on an isolated individual consciousness
  - (E) Appreciating the world as the artist sees it rather than judging it in moral terms
22. The author implies that a major element of the satirist's art is the satirist's
- (A) consistent adherence to a position of lofty disdain when viewing the foibles of humanity
  - (B) insistence on the helplessness of individuals against the social forces that seek to determine an individual's fate
  - (C) cynical disbelief that visionaries can either enlighten or improve their societies
  - (D) fundamental assumption that some ambiguity must remain in a work of art in order for it to reflect society and social mores accurately
  - (E) refusal to indulge in polemic when presenting social mores to readers for their scrutiny
23. The passage supplies information for answering which of the following questions?
- (A) Have literary critics ignored the social criticism inherent in the works of Chekhov and Chaucer?
  - (B) Does the author believe that Woolf is solely an introspective and visionary novelist?
  - (C) What are the social causes with which Woolf shows herself to be sympathetic in her writings?
  - (D) Was D. H. Lawrence as concerned as Woolf was with creating realistic settings for his novels?
  - (E) Does Woolf attribute more power to social environment or to historical forces as shapers of a person's life?

It is a popular misconception that nuclear fusion power is free of radioactivity; in fact, the deuterium-tritium reaction that nuclear scientists are currently exploring with such zeal produces both alpha particles and neutrons. (The neutrons are used to produce tritium from a lithium blanket surrounding the reactor.) Another common misconception is that nuclear fusion power is a virtually unlimited source of energy because of the enormous quantity of deuterium in the sea. Actually, its limits are set by the amount of available lithium, which is about as plentiful as uranium in the Earth's crust. Research should certainly continue on controlled nuclear fusion, but no energy program should be premised on its existence until it has proven practical. For the immediate future, we must continue to use hydroelectric power, nuclear fission, and fossil fuels to meet our energy needs. The energy sources already in major use are in major



use for good reason.

24. The primary purpose of the passage is to
- (A) criticize scientists who believe that the deuterium-tritium fusion reaction can be made feasible as an energy source
  - (B) admonish scientists who have failed to correctly calculate the amount of lithium available for use in nuclear fusion reactors
  - (C) defend the continued short-term use of fossil fuels as a major energy source
  - (D) caution against uncritical embrace of nuclear fusion power as a major energy source
  - (E) correct the misconception that nuclear fusion power is entirely free of radioactivity
25. It can be inferred from the passage that the author believes which of the following about the current state of public awareness concerning nuclear fusion power?
- (A) The public has been deliberately misinformed about the advantages and disadvantages of nuclear fusion power.
  - (B) The public is unaware of the principal advantage of nuclear fusion over nuclear fission as an energy source.
  - (C) The public's awareness of the scientific facts concerning nuclear fusion power is somewhat distorted and incomplete.
  - (D) The public is not interested in increasing its awareness of the advantages and disadvantages of nuclear fusion power.
  - (E) The public is aware of the disadvantages of nuclear fusion power but not of its advantages.
26. The passage provides information that would answer which of the following questions?
- (A) What is likely to be the principal source of deuterium for nuclear fusion power?
  - (B) How much incidental radiation is produced in the deuterium tritium fusion reaction?
  - (C) Why are scientists exploring the deuterium-tritium fusion reaction with such zeal?
  - (D) Why must the tritium for nuclear fusion be synthesized from lithium?
  - (E) Why does the deuterium-tritium reaction yield both alpha particles and neutrons?
27. Which of the following statements concerning nuclear scientists is most directly suggested in the passage?
- (A) Nuclear scientists are not themselves aware of all of the facts surrounding the deuterium-tritium fusion reaction.
  - (B) Nuclear scientists exploring the deuterium-tritium reaction have overlooked key facts in their eagerness to prove nuclear fusion practical.
  - (C) Nuclear scientists may have overestimated the amount of lithium actually available in the Earth's crust.
  - (D) Nuclear scientists have not been entirely dispassionate in their investigation of the deuterium-tritium reaction.
  - (E) Nuclear scientists have insufficiently investigated the lithium-to-tritium reaction in nuclear fusion.

## SECTION A

Great comic art is never otherworldly, it does not seek to mystify us, and it does not deny ambiguity by branding as evil whatever differs from good. Great comic artists assume that truth may bear all lights, and thus they seek to accentuate contradictions in social action, not gloss over or transcend them by appeals to extrasocial symbols of divine ends, cosmic purpose, or laws of nature. The moment of transcendence in great comic art is a social moment, born out of the conviction that we are human, even though we try to be gods. The comic community to which artists address themselves is a community of reasoning, loving, joyful, compassionate beings, who are willing to assume the human risks of acting rationally. Without invoking gods or demons, great comic art arouses courage in reason, courage which grows out of trust in what human beings can do as humans.

17. The passage suggests that great comic art can be characterized as optimistic about the ability of humans to
  - (A) rid themselves of pride
  - (B) transcend the human condition
  - (C) differentiate clearly between good and evil
  - (D) avoid social conflicts
  - (E) act rationally
18. It can be inferred from the passage that the author admires great comic artists primarily for their
  - (A) ability to understand the frequently subtle differences between good and evil
  - (B) ability to reconcile the contradictions in human behavior
  - (C) ability to distinguish between rational and irrational behavior
  - (D) insistence on confronting the truth about the human condition
  - (E) insistence on condemning human faults and weaknesses
19. Which of the following is the most accurate description of the organization of the passage?
  - (A) A sequence of observations leading to a prediction
  - (B) A list of inferences drawn from facts stated at the beginning of the passage
  - (C) A series of assertions related to one general subject
  - (D) A statement of the major idea, followed by specific examples
  - (E) A succession of ideas moving from specific to general

It has long been known that the rate of oxidative metabolism (the process that uses oxygen to convert food into energy) in any animal has a profound effect on its living patterns. The high metabolic rate of small animals, for example, gives them sustained power and activity per unit of weight, but at the cost of requiring constant consumption of food and water. Very large animals, with their relatively low metabolic rates, can survive well on a sporadic food supply, but can generate little metabolic energy per gram of body weight. If only oxidative metabolic rate is considered, therefore, one might assume that smaller, more active, animals could prey on larger ones, at least if they attacked in groups. Perhaps they could if it were not for anaerobic glycolysis, the great equalizer.

Anaerobic glycolysis is a process in which energy is produced, without oxygen, through the breakdown of muscle glycogen into lactic acid and adenosine triphosphate (ATP), the energy provider. The amount of energy that can be produced anaerobically is a function of the amount of glycogen present—in all vertebrates about 0.5 percent of their muscles' wet weight. Thus the anaerobic energy reserves of a vertebrate are proportional to the size of the animal. If, for example, some predators had attacked a 100-ton dinosaur, normally torpid, the dinosaur would have been able to generate almost instantaneously, via anaerobic glycolysis, the energy of 3,000 humans at maximum oxidative metabolic

energy production. This explains how many large species have managed to compete with their more active neighbors: the compensation for a low oxidative metabolic rate is glycolysis.

There are limitations, however, to this compensation. The glycogen reserves of any animal are good, at most, for only about two minutes at maximum effort, after which only the normal oxidative metabolic source of energy remains. With the conclusion of a burst of activity, the lactic acid level is high in the body fluids, leaving the large animal vulnerable to attack until the acid is reconverted, via oxidative metabolism, by the liver into glucose, which is then sent (in part) back to the muscles for glycogen resynthesis. During this process the enormous energy debt that the animal has **run up** through anaerobic glycolysis must be repaid, a debt that is proportionally much greater for the larger vertebrates than for the smaller ones. Whereas the tiny shrew can replace in minutes the glycogen used for maximum effort, for example, the gigantic dinosaur would have required more than three weeks. It might seem that this interminably long recovery time in a large vertebrate would prove a grave disadvantage for survival. Fortunately, muscle glycogen is used only when needed and even then only in whatever quantity is necessary. Only in times of panic or during mortal combat would the entire reserves be consumed.

20. The primary purpose of the passage is to
  - (A) refute a misconception about anaerobic glycolysis
  - (B) introduce a new hypothesis about anaerobic glycolysis
  - (C) describe the limitations of anaerobic glycolysis
  - (D) analyze the chemistry of anaerobic glycolysis and its similarity to oxidative metabolism
  - (E) explain anaerobic glycolysis and its effects on animal survival
21. According to the author, glycogen is crucial to the process of anaerobic glycolysis because glycogen
  - (A) increases the organism's need for ATP
  - (B) reduces the amount of ATP in the tissues
  - (C) is an inhibitor of the oxidative metabolic production of ATP
  - (D) ensures that the synthesis of ATP will occur speedily
  - (E) is the material from which ATP is derived
22. According to the author, a major limitation of anaerobic glycolysis is that it can
  - (A) produce in large animals more lactic acid than the liver can safely reconvert
  - (B) necessitate a dangerously long recovery period in large animals
  - (C) produce energy more slowly than it can be used by large animals
  - (D) consume all of the available glycogen regardless of need
  - (E) reduce significantly the rate at which energy is produced by oxidative metabolism
23. The passage suggests that the total anaerobic energy reserves of a vertebrate are proportional to the vertebrate's size because
  - (A) larger vertebrates conserve more energy than smaller vertebrates
  - (B) larger vertebrates use less oxygen per unit weight than smaller vertebrates
  - (C) the ability of a vertebrate to consume food is a function of its size
  - (D) the amount of muscle tissue in a vertebrate is directly related to its size
  - (E) the size of a vertebrate is proportional to the quantity of energy it can utilize
24. The author suggests that, on the basis of energy production, a 100-ton dinosaur would have been markedly vulnerable to which of the following?

- I. Repeated attacks by a single smaller, more active adversary
  - II. Sustained attack by numerous smaller, more active adversaries
  - III. An attack by an individual adversary of similar size
- (A) II only  
(B) I and II only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III
25. It can be inferred from the passage that the time required to replenish muscle glycogen following anaerobic glycolysis is determined by which of the following factors?
- I. Rate of oxidative metabolism
  - II. Quantity of lactic acid in the body fluids
  - III. Percentage of glucose that is returned to the muscles
- (A) I only  
(B) III only  
(C) I and II only  
(D) I and III only  
(E) I, II, and III
26. The author is most probably addressing which of the following audiences?
- (A) College students in an introductory course on animal physiology
  - (B) Historians of science investigating the discovery of anaerobic glycolysis
  - (C) Graduate students with specialized training in comparative anatomy
  - (D) Zoologists interested in prehistoric animals
  - (E) Biochemists doing research on oxidative metabolism
27. Which of the following best states the central idea of the passage?
- (A) The disadvantage of a low oxidative metabolic rate in large animals can be offset by their ability to convert substantial amounts of glycogen into energy.
  - (B) The most significant problem facing animals that have used anaerobic glycolysis for energy is the resynthesis of its by-product, glucose, into glycogen.
  - (C) The benefits to animals of anaerobic glycolysis are offset by the profound costs that must be paid.
  - (D) The major factor ensuring that a large animal will triumph over a smaller animal is the large animal's ability to produce energy via anaerobic glycolysis.
  - (E) The great differences that exist in metabolic rates between species of small animals and species of large animals can have important effects on the patterns of their activities.

## SECTION B

The dark regions in the starry night sky are not pockets in the universe that are devoid of stars as had long been thought. Rather, they are dark because of interstellar dust that hides the stars behind it. Although its visual effect is so pronounced, dust is only a minor constituent of the material, extremely low in density, that lies between the stars. Dust accounts for about one percent of the total mass of interstellar matter. The rest is hydrogen and helium gas, with small amounts of other elements. The

interstellar material, rather like terrestrial clouds, comes in all shapes and sizes. The average density of interstellar material in the vicinity of our Sun is 1,000 to 10,000 times less than the best terrestrial laboratory vacuum. It is only because of the enormous interstellar distances that so little material per unit of volume becomes so significant. Optical astronomy is most directly affected, for although interstellar gas is perfectly transparent, the dust is not.

17. According to the passage, which of the following is a direct perceptual consequence of interstellar dust?
- (A) Some stars are rendered invisible to observers on Earth.
  - (B) Many visible stars are made to seem brighter than they really are.
  - (C) The presence of hydrogen and helium gas is revealed.
  - (D) The night sky appears dusty at all times to observers on Earth.
  - (E) The dust is conspicuously visible against a background of bright stars.
18. It can be inferred from the passage that the density of interstellar material is
- (A) higher where distances between the stars are shorter
  - (B) equal to that of interstellar dust
  - (C) unusually low in the vicinity of our Sun
  - (D) independent of the incidence of gaseous components
  - (E) not homogeneous throughout interstellar space
19. It can be inferred from the passage that it is because space is so vast that
- (A) little of the interstellar material in it seems substantial
  - (B) normal units of volume seem futile for measurements of density
  - (C) stars can be far enough from Earth to be obscured even by very sparsely distributed matter
  - (D) interstellar gases can, for all practical purposes, be regarded as transparent
  - (E) optical astronomy would be of little use even if no interstellar dust existed

In his 1976 study of slavery in the United States, Herbert Gutman, like Fogel, Engerman, and Genovese, has rightly stressed the slaves' achievements. But unlike these historians, Gutman gives plantation owners little credit for these achievements. Rather, Gutman argues that one must look to the Black family and the slaves' extended kinship system to understand how crucial achievements, such as the maintenance of a cultural heritage and the development of a communal consciousness, were possible. His findings compel attention.

Gutman recreates the family and extended kinship structure mainly through an ingenious use of what any historian should **draw upon**, quantifiable data, derived in this case mostly from plantation birth registers. He also uses accounts of ex-slaves to probe the human reality behind his statistics. These sources indicate that the two-parent household predominated in slave quarters just as it did among freed slaves after emancipation. Although Gutman admits that forced separation by sale was frequent, he shows that the slaves' preference, revealed most clearly on plantations where sale was infrequent, was very much for stable monogamy. In less conclusive fashion Fogel, Engerman, and Genovese had already indicated the predominance of two-parent households; however, only Gutman emphasizes the preference for stable monogamy and points out what stable monogamy meant for the slaves' cultural heritage. Gutman argues convincingly that the stability of the Black family encouraged the transmission of—and so was crucial in sustaining—the Black heritage of folklore, music, and religious expression from one generation to another, a heritage that slaves were continually fashioning out of their African and American experiences.

Gutman's examination of other facets of kinship also produces important findings. Gutman discovers

that cousins rarely married, an exogamous tendency that contrasted sharply with the endogamy practiced by the plantation owners. This preference for exogamy, Gutman suggests, may have derived from West African rules governing marriage, which, though they differed from one tribal group to another, all involved some kind of prohibition against unions with close kin. This taboo against cousins' marrying is important, argues Gutman, because it is one of many indications of a strong awareness among slaves of an extended kinship network. The fact that distantly related kin would care for children separated from their families also suggests this awareness. When blood relationships were few, as in newly created plantations in the Southwest, "fictive" kinship arrangements took their place until a new pattern of consanguinity developed. Gutman presents convincing evidence that this extended kinship structure—which he believes developed by the mid-to-late eighteenth century—provided the foundations for the strong communal consciousness that existed among slaves.

In sum, Gutman's study is significant because it offers a closely reasoned and original explanation of some of the slaves' achievements, one that correctly emphasizes the resources that slaves themselves possessed.

20. According to the passage, Fogel, Engerman, Genovese, and Gutman have all done which of the following?
- I. Discounted the influence of plantation owners on slaves' achievements.
  - II. Emphasized the achievements of slaves.
  - III. Pointed out the prevalence of the two-parent household among slaves.
  - IV. Showed the connection between stable monogamy and slaves' cultural heritage.
- (A) I and II only  
(B) I and IV only  
(C) II and III only  
(D) I, III, and IV only  
(E) II, III, and IV only
21. With which of the following statements regarding the resources that historians ought to use would the author of the passage be most likely to agree?
- (A) Historians ought to make use of written rather than oral accounts.  
(B) Historians should rely primarily on birth registers.  
(C) Historians should rely exclusively on data that can be quantified.  
(D) Historians ought to make use of data that can be quantified.  
(E) Historians ought to draw on earlier historical research but they should do so in order to refute it.
22. Which of the following statements about the formation of the Black heritage of folklore, music, and religious expression is best supported by the information presented in the passage?
- (A) The heritage was formed primarily out of the experiences of those slaves who attempted to preserve the stability of their families.  
(B) The heritage was not formed out of the experiences of those slaves who married their cousins.  
(C) The heritage was formed more out of the African than out of the American experiences of slaves.  
(D) The heritage was not formed out of the experiences of only a single generation of slaves.

- (E) The heritage was formed primarily out of slaves' experiences of interdependence on newly created plantations in the Southwest.
23. It can be inferred from the passage that, of the following, the most probable reason why a historian of slavery might be interested in studying the type of plantations mentioned in line 25 is that this type would
- (A) give the historian access to the most complete plantation birth registers
  - (B) permit the historian to observe the kinship patterns that had been most popular among West African tribes
  - (C) provide the historian with evidence concerning the preference of freed slaves for stable monogamy
  - (D) furnish the historian with the opportunity to discover the kind of marital commitment that slaves themselves chose to have
  - (E) allow the historian to examine the influence of slaves' preferences on the actions of plantation owners
24. According to the passage, all of the following are true of the West African rules governing marriage mentioned in lines 46-50 EXCEPT:
- (A) The rules were derived from rules governing fictive kinship arrangements.
  - (B) The rules forbade marriages between close kin.
  - (C) The rules are mentioned in Herbert Gutman's study.
  - (D) The rules were not uniform in all respects from one West African tribe to another.
  - (E) The rules have been considered to be a possible source of slaves' marriage preferences.
25. Which of the following statements concerning the marriage practices of plantation owners during the period of Black slavery in the United States can most logically be inferred from the information in the passage?
- (A) These practices began to alter sometime around the mid-eighteenth century.
  - (B) These practices varied markedly from one region of the country to another.
  - (C) Plantation owners usually based their choice of marriage partners on economic considerations.
  - (D) Plantation owners often married earlier than slaves.
  - (E) Plantation owners often married their cousins.
26. Which of the following best describes the organization of the passage?
- (A) The author compares and contrasts the work of several historians and then discusses areas for possible new research.
  - (B) The author presents his thesis, draws on the work of several historians for evidence to support his thesis, and concludes by reiterating his thesis.
  - (C) The author describes some features of a historical study and then uses those features to put forth his own argument.
  - (D) The author summarizes a historical study, examines two main arguments from the study, and then shows how the arguments are potentially in conflict with one another.
  - (E) The author presents the general argument of a historical study, describes the study in more detail, and concludes with a brief judgments of the study's value.

27. Which of the following is the most appropriate title for the passage, based on its content?
- (A) The Influence of Herbert Gutman on Historians of Slavery in the United States
  - (B) Gutman's Explanation of How Slaves Could Maintain a Cultural Heritage and Develop a Communal Consciousness
  - (C) Slavery in the United States: New Controversy About an Old Subject
  - (D) The Black Heritage of Folklore, Music, and Religious Expression: Its Growing Influence
  - (E) The Black Family and Extended Kinship Structure: How They Were Important for the Freed Slave

No. 5-1

### SECTION A

A Marxist sociologist has argued that racism stems from the class struggle that is unique to the capitalist system—that racial prejudice is generated by capitalists as a means of controlling workers. His thesis works relatively well when applied to discrimination against Blacks in the United States, but his definition of racial prejudice as “racially-based negative prejudgments against a group generally accepted as a race in any given region of ethnic competition,” can be interpreted as also including hostility toward such ethnic groups as the Chinese in California and the Jews in medieval Europe. However, since prejudice against these latter peoples was not inspired by capitalists, he has to reason that such antagonisms were not really based on race. He **disposes** thusly (albeit unconvincingly) **of** both the intolerance faced by Jews before the rise of capitalism and the early twentieth-century discrimination against Oriental people in California, which, inconveniently, was instigated by workers.

17. The passage supplies information that would answer which of the following questions?
- (A) What accounts for the prejudice against the Jews in medieval Europe?
  - (B) What conditions caused the discrimination against Oriental people in California in the early twentieth century?
  - (C) Which groups are not in ethnic competition with each other in the United States?
  - (D) What explanation did the Marxist sociologist give for the existence of racial prejudice?
  - (E) What evidence did the Marxist sociologist provide to support his thesis?
18. The author considers the Marxist sociologist's thesis about the origins of racial prejudice to be
- (A) unoriginal
  - (B) unpersuasive
  - (C) offensive
  - (D) obscure
  - (E) speculative
19. It can be inferred from the passage that the Marxist sociologist would argue that in a noncapitalist society racial prejudice would be
- (A) pervasive
  - (B) tolerated
  - (C) ignored
  - (D) forbidden



(E) nonexistent

20. According to the passage, the Marxist sociologist's chain of reasoning required him to assert that prejudice toward Oriental people in California was

(A) directed primarily against the Chinese

(B) similar in origin to prejudice against the Jews

(C) understood by Oriental people as ethnic competition

(D) provoked by workers

(E) nonracial in character

By 1950, the results of attempts to relate brain processes to mental experience appeared rather discouraging. Such variations in size, shape, chemistry, conduction speed, excitation threshold, and the like as had been demonstrated in nerve cells remained negligible in significance for any possible correlation with the manifold dimensions of mental experience.

Near the turn of the century, it had been suggested by Hering that different modes of sensation, such as pain, taste, and color, might be correlated with the discharge of specific kinds of nervous energy. However, subsequently developed methods of recording and analyzing nerve potentials failed to reveal any such qualitative diversity. It was possible to demonstrate by other methods refined structural differences among neuron types; however, proof was lacking that the quality of the impulse or its condition was influenced by these differences, which seemed instead to influence the developmental patterning of the neural circuits. Although qualitative variance among nerve energies was never rigidly disproved, the doctrine was generally abandoned in favor of the opposing view, namely, that nerve impulses are essentially homogeneous in quality and are transmitted as "common currency" throughout the nervous system. According to this theory, it is not the quality of the **sensory nerve** impulses that determines the diverse conscious sensations they produce, but rather the different areas of the brain into which they discharge, and there is some evidence for this view. In one experiment, when an electric stimulus was applied to a given sensory field of the cerebral cortex of a conscious human subject, it produced a sensation of the appropriate **modality** for that particular locus, that is, a visual sensation from the visual cortex, an auditory sensation from the auditory cortex, and so on. Other experiments revealed slight variations in the size, number, arrangement, and interconnection of the nerve cells, but as far as psychoneural correlations were concerned, the obvious similarities of these sensory fields to each other seemed much more remarkable than any of the minute differences.

However, cortical locus, in itself, turned out to have little explanatory value. Studies showed that sensations as diverse as those of red, black, green, and white, or touch, cold, warmth, movement, pain, posture, and pressure apparently may arise through activation of the same cortical areas. What seemed to remain was some kind of differential patterning effects in the brain excitation: it is the difference in the central distribution of impulses that counts. In short, brain theory suggested a correlation between mental experience and the activity of relatively homogeneous nerve-cell units conducting essentially homogeneous impulses through homogeneous cerebral tissue. To match the multiple dimensions of mental experience psychologists could only point to a limitless variation in the spatiotemporal patterning of nerve impulses.

21. The author suggests that, by 1950, attempts to correlate mental experience with brain processes would probably have been viewed with

(A) indignation

(B) impatience

(C) pessimism

(D) indifference

(E) defiance

22. The author mentions "common currency" in line 26 primarily in order to emphasize the

- (A) lack of differentiation among nerve impulses in human beings
  - (B) similarity of the sensations that all human beings experience
  - (C) similarities in the views of scientists who have studied the human nervous system
  - (D) continuous passage of nerve impulses through the nervous system
  - (E) recurrent questioning by scientists of an accepted explanation about the nervous system
23. The description in lines 32-38 of an experiment in which electric stimuli were applied to different sensory fields of the cerebral cortex tends to support the theory that
- (A) the simple presence of different cortical areas cannot account for the diversity of mental experience
  - (B) variation in spatiotemporal patterning of nerve impulses correlates with variation in subjective experience
  - (C) nerve impulses are essentially homogeneous and are relatively unaffected as they travel through the nervous system
  - (D) the mental experiences produced by sensory nerve impulses are determined by the cortical area activated
  - (E) variation in neuron types affects the quality of nerve impulses
24. According to the passage, some evidence exists that the area of the cortex activated by a sensory stimulus determines which of the following?
- I. The nature of the nerve impulse
  - II. The modality of the sensory experience
  - III. Qualitative differences within a modality
- (A) II only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II and III
25. The passage can most accurately be described as a discussion concerning historical views of the
- (A) anatomy of the brain
  - (B) manner in which nerve impulses are conducted
  - (C) significance of different cortical areas in mental experience
  - (D) mechanics of sense perception
  - (E) physiological correlates of mental experience
26. Which of the following best summarizes the author's opinion of the suggestion that different areas of the brain determine perceptions produced by sensory nerve impulses?
- (A) It is a plausible explanation, but it has not been completely proved.
  - (B) It is the best explanation of brain processes currently available.
  - (C) It is disproved by the fact that the various areas of the brain are physiologically very similar.
  - (D) There is some evidence to support it, but it fails to explain the diversity of mental

experience.

(E) There is experimental evidence that confirms its correctness.

27. It can be inferred from the passage that which of the following exhibit the LEAST qualitative variation?
- (A) Nerve cells
  - (B) Nerve impulses
  - (C) Cortical areas
  - (D) Spatial patterns of nerve impulses
  - (E) Temporal patterns of nerve impulses

## SECTION B

The transfer of heat and water vapor from the ocean to the air above it depends on a disequilibrium at the interface of the water and the air. Within about a millimeter of the water, air temperature is close to that of the **surface water**, and the air is nearly saturated with water vapor. But the differences, however small, are crucial, and the disequilibrium is maintained by air near the surface mixing with air higher up, which is typically appreciably cooler and lower in water-vapor content. The air is mixed by means of turbulence that depends on the wind for its energy. As wind speed increases, so does turbulence, and thus the rate of heat and moisture transfer. Detailed understanding of this phenomenon awaits further study. An interacting—and complicating—phenomenon is wind-to-water transfer of momentum that occurs when waves are formed. When the wind makes waves, it transfers important amounts of energy—energy that is therefore not available to provide turbulence.

17. The primary purpose of the passage is to
- (A) resolve a controversy
  - (B) describe a phenomenon
  - (C) outline a theory
  - (D) confirm research findings
  - (E) classify various observations
18. According to the passage, wind over the ocean generally does which of the following?
- I. Causes relatively cool, dry air to come into proximity with the ocean surface.
  - II. Maintains a steady rate of heat and moisture transfer between the ocean and the air.
  - III. Causes frequent changes in the temperature of the water at the ocean's surface.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
19. It can be inferred from the passage that the author regards current knowledge about heat and moisture transfer from the ocean to air as
- (A) revolutionary
  - (B) inconsequential
  - (C) outdated
  - (D) derivative

(E) incomplete

20. The passage suggests that if on a certain day the wind were to decrease until there was no wind at all which of the following would occur?
- (A) The air closest to the ocean surface would become saturated with water vapor.
  - (B) The air closest to the ocean surface would be warmer than the water.
  - (C) The amount of moisture in the air closest to the ocean surface would decrease.
  - (D) The rate of heat and moisture transfer would increase.
  - (E) The air closest to the ocean would be at the same temperature as air higher up.

Extraordinary creative activity has been characterized as revolutionary, flying in the face of what is established and producing not what is acceptable but what will become accepted. According to this formulation, highly creative activity transcends the limits of an existing form and establishes a new principle of organization. However, the idea that extraordinary creativity transcends established limits is misleading when it is applied to the arts, even though it may be valid for the sciences. Differences between highly creative art and highly creative science arise in part from a difference in their goals. For the sciences, a new theory is the goal and end result of the creative act. Innovative science produces new propositions in terms of which diverse phenomena can be related to one another in more coherent ways. Such phenomena as a brilliant diamond or a nesting bird are relegated to the role of data, serving as the means for formulating or testing a new theory. The goal of highly creative art is very different: the phenomenon itself becomes the direct product of the creative act. Shakespeare's *Hamlet* is not a tract about the behavior of indecisive princes or the uses of political power; nor is Picasso's painting *Guernica* primarily a propositional statement about the Spanish Civil War or the evils of fascism. What highly creative artistic activity produces is not a new generalization that transcends established limits, but rather an aesthetic particular. Aesthetic particulars produced by the highly creative artist extend or exploit, in an innovative way, the limits of an existing form, rather than transcend that form.

This is not to deny that a highly creative artist sometimes establishes a new principle of organization in the history of an artistic field; the composer Monteverdi, who created music of the highest aesthetic value, comes to mind. More generally, however, **whether or not** a composition establishes a new principle in the history of music has little bearing on its aesthetic worth. Because they embody a new principle of organization, some musical works, such as the operas of the Florentine Camerata, are of signal historical importance, but few listeners or musicologists would include these among the great works of music. On the other hand, Mozart's *The Marriage of Figaro* is surely among the masterpieces of music even though its modest innovations are confined to extending existing means. It has been said of Beethoven that he toppled the rules and freed music from the stifling confines of convention. But a close study of his compositions reveals that Beethoven overturned no fundamental rules. Rather, he was an incomparable strategist who exploited limits—the rules, forms, and conventions that he inherited from predecessors such as Haydn and Mozart, Handel and Bach—in strikingly original ways.

21. The author considers a new theory that coherently relates diverse phenomena to one another to be the
- (A) basis for reaffirming a well-established scientific formulation
  - (B) byproduct of an aesthetic experience
  - (C) tool used by a scientist to discover a new particular
  - (D) synthesis underlying a great work of art
  - (E) result of highly creative scientific activity
22. The author implies that Beethoven's music was strikingly original because Beethoven
- (A) strove to outdo his predecessors by becoming the first composer to exploit limits
  - (B) fundamentally changed the musical forms of his predecessors by adopting a richly

inventive strategy

- (C) embellished and interwove the melodies of several of the great composers who preceded him
  - (D) manipulated the established conventions of musical composition in a highly innovative fashion
  - (E) attempted to create the illusion of having transcended the musical forms of his predecessors
23. The passage states that the operas of the Florentine Camerata are
- (A) unjustifiably ignored by musicologists
  - (B) not generally considered to be of high aesthetic value even though they are important in the history of music
  - (C) among those works in which popular historical themes were portrayed in a musical production
  - (D) often inappropriately cited as examples of musical works in which a new principle of organization was introduced
  - (E) minor exceptions to the well-established generalization that the aesthetic worth of a composition determines its importance in the history of music
24. The passage supplies information for answering all of the following questions EXCEPT:
- (A) Has unusual creative activity been characterized as revolutionary?
  - (B) Did Beethoven work within a musical tradition that also included Handel and Bach?
  - (C) Is Mozart's *The Marriage of Figaro* an example of a creative work that transcended limits?
  - (D) Who besides Monteverdi wrote music that the author would consider to embody new principles of organization and to be of high aesthetic value?
  - (E) Does anyone claim that the goal of extraordinary creative activity in the arts differs from that of extraordinary creative activity in the sciences?
25. The author regards the idea that all highly creative artistic activity transcends limits with
- (A) deep skepticism
  - (B) strong indignation
  - (C) marked indifference
  - (D) moderate amusement
  - (E) sharp derision
26. The author implies that an innovative scientific contribution is one that
- (A) is cited with high frequency in the publications of other scientists
  - (B) is accepted immediately by the scientific community
  - (C) does not relegate particulars to the role of data
  - (D) presents the discovery of a new scientific fact
  - (E) introduces a new valid generalization
27. Which of the following statements would most logically concluded the last paragraph of the passage?

- (A) Unlike Beethoven, however, even the greatest of modern composers, such as Stravinsky, did not transcend existing musical forms.
- (B) In similar fashion, existing musical forms were even further exploited by the next generation of great European composers.
- (C) Thus, many of the great composers displayed the same combination of talents exhibited by Monteverdi.
- (D) By contrast, the view that creativity in the arts exploits but does not transcend limits is supported in the field of literature.
- (E) Actually, Beethoven's most original works were largely unappreciated at the time that they were first performed.

No. 5-2

SECTION A

Visual recognition involves storing and retrieving memories. Neural activity, triggered by the eye, forms an image in the brain's memory system that constitutes an internal representation of the viewed object. When an object is encountered again, it is matched with its internal representation and thereby recognized. Controversy surrounds the question of whether recognition is a parallel, one-step process or a serial, step-by-step one. Psychologists of the Gestalt school maintain that objects are recognized as wholes in a parallel procedure: the internal representation is matched with the **retinal image** in a single operation. Other psychologists have proposed that internal representation features are matched serially with an object's features. Although some experiments show that, as an object becomes familiar, its internal representation becomes more holistic and the recognition process correspondingly more parallel, the weight of evidence seems to support the serial hypothesis, at least for objects that are not notably simple and familiar.

- 17. The author is primarily concerned with
  - (A) explaining how the brain receives images
  - (B) synthesizing hypotheses of visual recognition
  - (C) examining the evidence supporting the serial recognition hypothesis
  - (D) discussing visual recognition and some hypotheses proposed to explain it
  - (E) reporting on recent experiments dealing with memory systems and their relationship to neural activity
- 18. According to the passage, Gestalt psychologists make which of the following suppositions about visual recognition?
  - I. A retinal image is in exactly the same forms as its internal representation.
  - II. An object is recognized as a whole without any need for analysis into component parts.
  - III. The matching of an object with its internal representation occurs in only one step.
  - (A) II only
  - (B) III only
  - (C) I and III only
  - (D) II and III only
  - (E) I, II, and III
- 19. It can be inferred from the passage that the matching process in visual recognition is
  - (A) not a neural activity

- (B) not possible when an object is viewed for the very first time
- (C) not possible if a feature of a familiar object is changed in some way
- (D) only possible when a retinal image is received in the brain as a unitary whole
- (E) now fully understood as a combination of the serial and parallel processes

20. In terms of its tone and form, the passage can best be characterized as

- (A) a biased exposition
- (B) a speculative study
- (C) a dispassionate presentation
- (D) an indignant denial
- (E) a dogmatic explanation

In large part as a consequence of the feminist movement, historians have focused a great deal of attention in recent years on determining more accurately the status of women in various periods. Although much has been accomplished for the modern period, premodern cultures have proved more difficult: sources are restricted in number, fragmentary, difficult to interpret, and often contradictory. Thus it is not particularly surprising that some earlier scholarship concerning such cultures has so far gone unchallenged. An example is Johann Bachofen's 1861 treatise on Amazons, women-ruled societies of questionable existence contemporary with ancient Greece.

Starting from the premise that mythology and legend preserve at least a nucleus of historical fact, Bachofen argued that women were dominant in many ancient societies. His work was based on a comprehensive survey of references in the ancient sources to Amazonian and other societies with matrilineal customs—societies in which descent and property rights are traced through the female line. Some support for his theory can be found in evidence such as that drawn from Herodotus, the Greek "historian" of the fifth century B. C., who speaks of an Amazonian society, the Sauromatae, where the women hunted and fought in wars. A woman in this society was not allowed to marry until she had killed a person in battle.

Nonetheless, this assumption that the first recorders of ancient myths have preserved facts is problematic. If one begins by examining why ancients refer to Amazons, it becomes clear that ancient Greek descriptions of such societies were meant not so much to represent observed historical fact—real Amazonian societies—but rather to offer "moral lessons" on the supposed outcome of women's rule in their own society. The Amazons were often characterized, for example, as the equivalents of giants and centaurs, enemies to be slain by Greek heroes. Their customs were presented not as those of a respectable society, but as the very antitheses of ordinary Greek practices.

Thus, I would argue, the purpose of accounts of the Amazons for their male Greek recorders was didactic, to teach both male and female Greeks that all-female groups, formed by withdrawal from traditional society, are destructive and dangerous. Myths about the Amazons were used as arguments for the male-dominated status quo, in which groups composed exclusively of either sex were not permitted to segregate themselves permanently from society. Bachofen was thus misled in his reliance on myths for information about the status of women. The sources that will probably tell contemporary historians most about women in the ancient world are such social documents as gravestones, wills, and marriage contracts. Studies of such documents have already begun to show how mistaken we are when we try to derive our picture of the ancient world exclusively from literary sources, especially myths.

21. The primary purpose of the passage is to

- (A) compare competing new approaches to understanding the role of women in ancient societies
- (B) investigate the ramifications of Bachofen's theory about the dominance of women in ancient societies
- (C) explain the burgeoning interest among historians in determining the actual status of

women in various societies

- (D) analyze the nature of Amazonian society and uncover similarities between it and the Greek world
  - (E) criticize the value of ancient myths in determining the status of women in ancient societies
22. All of the following are stated by the author as problems connected with the sources for knowledge of premodern cultures EXCEPT:
- (A) partial completeness
  - (B) restricted accessibility
  - (C) difficulty of interpretation
  - (D) limited quantity
  - (E) tendency toward contradiction
23. Which of the following can be inferred from the passage about the myths recorded by the ancient Greeks?
- I. They sometimes included portrayals of women holding positions of power.
  - II. They sometimes contained elaborate explanations of inheritance customs.
  - III. They comprise almost all of the material available to historians about ancient Greece.
- (A) I only
  - (B) III only
  - (C) I and III only
  - (D) II and III only
  - (E) I, II, and III
24. Which of the following is presented in the passage as evidence supporting the author's view of the ancient Greeks' descriptions of the Amazons?
- (A) The requirement that Sauromatae women kill in battle before marrying
  - (B) The failure of historians to verify that women were ever governors of ancient societies
  - (C) The classing of Amazons with giants and centaurs
  - (D) The well-established unreliability of Herodotus as a source of information about ancient societies
  - (E) The recent discovery of ancient societies with matrilineal customs
25. It can be inferred from the passage that the probable reactions of many males in ancient Greece to the idea of a society ruled by women could best be characterized as
- (A) confused and dismayed
  - (B) wary and hostile
  - (C) cynical and disinterested
  - (D) curious but fearful
  - (E) excited but anxious
26. The author suggests that the main reason for the persisting influence of Bachofen's work is that
- (A) feminists have shown little interest in ancient societies



- (B) Bachofen's knowledge of Amazonian culture is unparalleled
  - (C) reliable information about the ancient world is difficult to acquire
  - (D) ancient societies show the best evidence of women in positions of power
  - (E) historians have been primarily interested in the modern period
27. The author's attitude toward Bachofen's treatise is best described as one of
- (A) qualified approval
  - (B) profound ambivalence
  - (C) studied neutrality
  - (D) pointed disagreement
  - (E) unmitigated hostility

## SECTION B

Initially the Vinaver theory that Malory's eight romances, once thought to be fundamentally unified, were in fact eight independent works produced both a sense of relief and an unpleasant shock. Vinaver's theory comfortably explained away the apparent contradictions of chronology and made each romance independently satisfying. It was, however, disagreeable to find that what had been thought of as one book was now eight books. Part of this response was the natural reaction to the disturbance of set ideas. Nevertheless, even now, after lengthy consideration of the theory's refined but legitimate observations, one cannot avoid the conclusion that the eight romances are only one work. It is not quite a matter of disagreeing with the theory of independence, but of rejecting its implications: that the romances may be taken in any or no particular order, that they have no cumulative effect, and that they are as separate as the works of a modern novelist.

17. The primary purpose of the passage is to
- (A) discuss the validity of a hypothesis
  - (B) summarize a system of general principles
  - (C) propose guidelines for future argument
  - (D) stipulate conditions for acceptance of an interpretation
  - (E) deny accusations about an apparent contradiction
18. It can be inferred from the passage that the author believes which of the following about Malory's works?
- I. There are meaningful links between and among the romances.
  - II. The subtleties of the romances are obscured when they are taken as one work.
  - III. Any contradictions in chronology among the romances are less important than their overall unity.
- (A) I only
  - (B) III only
  - (C) I and III only
  - (D) II and III only
  - (E) I, II, and III
19. The author of the passage concedes which of the following about the Vinaver theory?
- (A) It gives a clearer understanding of the unity of Malory's romances.
  - (B) It demonstrates the irrationality of considering Malory's romances to be unified.

- (C) It establishes acceptable links between Malory's romances and modern novels.
- (D) It unifies earlier and later theories concerning the chronology of Malory's romances.
- (E) It makes valid and subtle comments about Malory's romances.

20. It can be inferred from the passage that, in evaluating the Vinaver theory, some critics were
- (A) frequently misled by the inconsistencies in Malory's work
  - (B) initially biased by previous interpretations of Malory's work
  - (C) conceptually displeased by the general interpretation that Vinaver rejected
  - (D) generally in agreement with Vinaver's comparisons between Malory and modern novelists
  - (E) originally skeptical about Vinaver's early conclusions with respect to modern novels

We can distinguish three different realms of matter, three levels on the quantum ladder. The first is the atomic realm, which includes the world of atoms, their interactions, and the structures that are formed by them, such as molecules, liquids and solids, and gases and plasmas. This realm includes all the phenomena of atomic physics, chemistry, and, in a certain sense, biology. The energy exchanges taking place in this realm are of a relatively low order. If these exchanges are below one electron volt, such as in the collisions between molecules of the air in a room, then atoms and molecules can be regarded as elementary particles. That is, they have "conditional elementarity" because they keep their identity and do not change in any collisions or in other processes at these low energy exchanges. If one goes to higher energy exchanges, say  $10^4$  electron volts, then atoms and molecules will decompose into nuclei and electrons; at this level, the latter particles must be considered as elementary. We find examples of structures and processes of this first rung of the quantum ladder on Earth, on planets, and on the surfaces of stars.

The next rung is the nuclear realm. Here the energy exchanges are much higher, on the order of millions of electron volts. As long as we are dealing with phenomena in the atomic realm, such amounts of energy are unavailable, and most nuclei are inert: they do not change. However, if one applies energies of millions of electron volts, nuclear reactions, fission and fusion, and the processes of radioactivity occur; our elementary particles then are protons, neutrons, and electrons. In addition, nuclear processes produce neutrinos, particles that have no detectable mass or charge. In the universe, energies at this level are available in the centers of stars and in star explosions. Indeed, the energy radiated by the stars is produced by nuclear reactions. The natural radioactivity we find on Earth is the long-lived remnant of the time when now-earthly matter was expelled into space by a major stellar explosion.

The third rung of the quantum ladder is the subnuclear realm. Here we are dealing with energy exchanges of many billions of electron volts. We encounter excited nucleons, new types of particles such as mesons, heavy electrons, quarks, and gluons, and also antimatter in large quantities. The gluons are the quanta, or smallest units, of the force (the strong force) that keeps the quarks together. As long as we are dealing with the atomic or nuclear realm, these new types of particles do not occur and the nucleons remain inert. But at subnuclear energy levels, the nucleons and mesons appear to be composed of quarks, so that the quarks and gluons figure as elementary particles.

21. The primary topic of the passage is which of the following?
- (A) The interaction of the realms on the quantum ladder
  - (B) Atomic structures found on Earth, on other planets, and on the surfaces of stars
  - (C) Levels of energy that are released in nuclear reactions on Earth and in stars
  - (D) Particles and processes found in the atomic, nuclear, and subnuclear realms
  - (E) New types of particles occurring in the atomic realm
22. According to the passage, radioactivity that occurs naturally on Earth is the result of

- (A) the production of particles that have no detectable mass or electric charge
  - (B) high energy exchanges on the nuclear level that occurred in an ancient explosion in a star
  - (C) processes that occur in the center of the Sun, which emits radiation to the Earth
  - (D) phenomena in the atomic realm that cause atoms and molecules to decompose into nuclei and electrons
  - (E) high-voltage discharges of electricity that took place in the atmosphere of the Earth shortly after the Earth was formed
23. The author organizes the passage by
- (A) making distinctions between two groups of particles, those that are elementary and those that are composite
  - (B) explaining three methods of transferring energy to atoms and to the smaller particles that constitute atoms
  - (C) describing several levels of processes, increasing in energy, and corresponding sets of particles, generally decreasing in size
  - (D) putting forth an argument concerning energy levels and then conceding that several qualifications of that argument are necessary
  - (E) making several successive refinements of a definition of elementarity on the basis of several groups of experimental results
24. According to the passage, which of the following can be found in the atomic realm?
- (A) More than one level of energy exchange
  - (B) Exactly one elementary particle
  - (C) Exactly three kinds of atomic structures
  - (D) Three levels on the quantum ladder
  - (E) No particles smaller than atoms
25. According to the author, gluons are not
- (A) considered to be detectable
  - (B) produced in nuclear reactions
  - (C) encountered in subnuclear energy exchanges
  - (D) related to the strong force
  - (E) found to be conditionally elementary
26. At a higher energy level than the subnuclear level described, if such a higher level exists, it can be expected on the basis of the information in the passage that there would probably be
- (A) excited nucleons
  - (B) elementary mesons
  - (C) a kind of particle without detectable mass or charge
  - (D) exchanges of energy on the order of millions of electron volts
  - (E) another set of elementary particles
27. The passage speaks of particles as having conditional elementarity if they
- (A) remain unchanged at given level of energy exchange
  - (B) cannot be decomposed into smaller constituents

- (C) are mathematically simpler than some other set of particles
- (D) release energy at a low level in collisions
- (E) belong to the nuclear level on the quantum ladder

No. 5-3

### SECTION A

The belief that art originates in intuitive rather than rational faculties was worked out historically and philosophically in the somewhat wearisome volumes of Benedetto Croce, who is usually considered the originator of a new aesthetic. Croce was, in fact, expressing a very old idea. Long before the Romantics stressed intuition and self-expression, the frenzy of inspiration was regarded as fundamental to art, but philosophers had always assumed it must be controlled by law and by the intellectual power of putting things into harmonious order. This general philosophic concept of art was supported by technical necessities. It was necessary to master certain laws and to use intellect in order to build Gothic cathedrals, or set up the stained glass windows of Chartres. When this bracing element of craftsmanship ceased to dominate artists' outlook, new technical elements had to be adopted to maintain the intellectual element in art. Such were **linear perspective** and anatomy.

17. The passage suggests that which of the following would most likely have occurred if linear perspective and anatomy had not come to influence artistic endeavor?
  - (A) The craftsmanship that shaped Gothic architecture would have continued to dominate artists' outlooks.
  - (B) Some other technical elements would have been adopted to discipline artistic inspiration.
  - (C) Intellectual control over artistic inspiration would not have influenced painting as it did architecture.
  - (D) The role of intuitive inspiration would not have remained fundamental to theories of artistic creation.
  - (E) The assumptions of aesthetic philosophers before Croce would have been invalidated.
18. The passage supplies information for answering which of the following questions?
  - (A) Does Romantic art exhibit the triumph of intuition over intellect?
  - (B) Did an emphasis on linear perspective and anatomy dominate Romantic art?
  - (C) Are the intellectual and intuitive faculties harmoniously balanced in post-Romantic art?
  - (D) Are the effects of the rational control of artistic inspiration evident in the great works of pre-Romantic eras?
  - (E) Was the artistic craftsmanship displayed in Gothic cathedrals also an element in paintings of this period?
19. The passage implies that which of the following was a traditional assumption of aesthetic philosophers?
  - (A) Intellectual elements in art exert a necessary control over artistic inspiration.
  - (B) Architecture has never again reached the artistic greatness of the Gothic cathedrals.
  - (C) Aesthetic philosophy is determined by the technical necessities of art.
  - (D) Artistic craftsmanship is more important in architectural art than in pictorial art.
  - (E) Paintings lacked the intellectual element before the invention of linear perspective and anatomy.
20. The author mentions "linear perspective and anatomy" in the last sentence in order to do

which of the following?

- (A) Expand his argument to include painting as well as architecture
- (B) Indicate his disagreement with Croce's theory of the origins of art
- (C) Support his point that rational order of some kind has often seemed to discipline artistic inspiration
- (D) Explain the rational elements in Gothic painting that corresponded to craftsmanship in Gothic architecture
- (E) Show the increasing sophistication of artists after the Gothic period

(The passage below is drawn from an article published in 1962.)

Computer programmers often remark that computing machines, with a perfect lack of discrimination, will do any foolish thing they are told to do. The reason for this lies, of course, in the narrow fixation of the computing machine's "intelligence" on the details of its own perceptions—its inability to be guided by any large context. In a psychological description of the computer intelligence, three related adjectives come to mind: single-minded, literal-minded, and simpleminded. Recognizing this, we should at the same time recognize that this single-mindedness, literal-mindedness, and simplemindedness also characterizes theoretical mathematics, though to a lesser extent.

Since science tries to deal with reality, even the most precise sciences normally work with more or less imperfectly understood approximations toward which scientists must maintain an appropriate skepticism. Thus, for instance, it may come as a shock to mathematicians to learn that the **Schrodinger equation** for the hydrogen atom is not a literally correct description of this atom, but only an approximation to a somewhat more correct equation taking account of spin, **magnetic dipole**, and relativistic effects; and that this corrected equation is itself only an imperfect approximation to an infinite set of quantum field-theoretical equations. Physicists, looking at the original Schrodinger equation, learn to sense in it the presence of many invisible terms in addition to the differential terms visible, and this sense inspires an entirely appropriate disregard for the purely technical features of the equation. This very healthy skepticism is foreign to the mathematical approach.

Mathematics must deal with well-defined situations. Thus, mathematicians depend on an intellectual effort outside of mathematics for the crucial specification of the approximation that mathematics is to take literally. Give mathematicians a situation that is the least bit ill-defined, and they will make it well-defined, perhaps appropriately, but perhaps inappropriately. In some cases, the mathematicians' literal-mindedness may have unfortunate consequences. The mathematicians turn the scientists' theoretical assumptions, that is, their convenient points of analytical emphasis, into axioms, and then take these axioms literally. This brings the danger that they may also persuade the scientists to take these axioms literally. The question, central to the scientific investigation but intensely disturbing in the mathematical context—what happens if the axioms are relaxed?—is thereby ignored.

The physicist rightly dreads precise argument, since an argument that is convincing only if it is precise loses all its force if the assumptions on which it is based are slightly changed, whereas an argument that is convincing though imprecise may well be stable under small perturbations of its underlying assumptions.

21. The author discusses computing machines in the first paragraph primarily in order to do which of the following?
- (A) Indicate the dangers inherent in relying to a great extent on machines
  - (B) Illustrate his views about the approach of mathematicians to problem solving
  - (C) Compare the work of mathematicians with that of computer programmers
  - (D) Provide one definition of intelligence
  - (E) Emphasize the importance of computers in modern technological society
22. According to the passage, scientists are skeptical toward their equations because scientists

- (A) work to explain real, rather than theoretical or simplified, situations
  - (B) know that well-defined problems are often the most difficult to solve
  - (C) are unable to express their data in terms of multiple variables
  - (D) are unwilling to relax the axioms they have developed
  - (E) are unable to accept mathematical explanations of natural phenomena
23. It can be inferred from the passage that scientists make which of the following assumptions about scientific arguments?
- (A) The literal truth of the arguments can be made clear only in a mathematical context.
  - (B) The arguments necessarily ignore the central question of scientific investigation.
  - (C) The arguments probably will be convincing only to other scientists.
  - (D) The conclusions of the arguments do not necessarily follow from their premises.
  - (E) The premises on which the arguments are based may change.
24. According to the passage, mathematicians present a danger to scientists for which of the following reasons?
- (A) Mathematicians may provide theories that are incompatible with those already developed by scientists.
  - (B) Mathematicians may define situation in a way that is incomprehensible to scientists.
  - (C) Mathematicians may convince scientists that theoretical assumptions are facts.
  - (D) Scientists may come to believe that axiomatic statements are untrue.
  - (E) Scientists may begin to provide arguments that are convincing but imprecise.
25. The author suggests that the approach of physicists to solving scientific problems is which of the following?
- (A) Practical for scientific purposes
  - (B) Detrimental to scientific progress
  - (C) Unimportant in most situations
  - (D) Expedient, but of little long-term value
  - (E) Effective, but rarely recognized as such
26. The author suggests that a mathematician asked to solve a problem in an ill-defined situation would first attempt to do which of the following?
- (A) Identify an analogous situation
  - (B) Simplify and define the situation
  - (C) Vary the underlying assumptions of a description of the situation
  - (D) Determine what use would be made of the solution provided
  - (E) Evaluate the theoretical assumptions that might explain the situation
27. The author implies that scientists develop a healthy skepticism because they are aware that
- (A) mathematicians are better able to solve problems than are scientists
  - (B) changes in axiomatic propositions will inevitably undermine scientific arguments
  - (C) well-defined situations are necessary for the design of reliable experiments
  - (D) mathematical solutions can rarely be applied to real problems

(E) some factors in most situations must remain unknown

## SECTION B

In eighteenth-century France and England, reformers rallied around egalitarian ideals, but few reformers advocated higher education for women. Although the public decried women's lack of education, it did not encourage learning for its own sake for women. In spite of the general prejudice against learned women, there was one place where women could exhibit their erudition: the literary salon. Many writers have defined the woman's role in the salon as that of an intelligent hostess, but the salon had more than a social function for women. It was an informal university, too, where women exchanged ideas with educated persons, read their own works and heard those of others, and received and gave criticism.

In the 1750's, when salons were firmly established in France, some English women, who called themselves "Bluestocking," followed the example of the *salonnières* (French salon hostesses) and formed their own salons. Most Bluestockings did not wish to mirror the *salonnières*; they simply desired to adapt a proven formula to their own purpose—the elevation of women's status through moral and intellectual training. Differences in social orientation and background can account perhaps for differences in the nature of French and English salons. The French salon incorporated aristocratic attitudes that exalted courtly pleasure and emphasized artistic accomplishments. The English Bluestockings, originating from a more modest background, emphasized learning and work over pleasure. Accustomed to the regimented life of court circles, *salonnières* tended toward formality in their salons. The English women, though somewhat puritanical, were more casual in their approach.

At first, the Bluestockings did imitate the *salonnières* by including men in their circles. However, as they gained cohesion, the Bluestockings came to regard themselves as a women's group and to possess a sense of female solidarity lacking in the *salonnières*, who remained isolated from one another by the primacy each held in her own salon. In an atmosphere of mutual support, the Bluestockings went beyond the salon experience. They traveled, studied, worked, wrote for publication, and by their activities challenged the stereotype of the passive woman. Although the *salonnières* were aware of sexual inequality, the narrow boundaries of their world kept their intellectual pursuits within conventional limits. Many *salonnières*, in fact, camouflaged their nontraditional activities behind the role of hostess and deferred to men **in public**.

Though the Bluestockings were trailblazers when compared with the *salonnières*, they were not feminists. They were too traditional, too **hemmed in** by their generation to demand social and political rights. Nonetheless, in their desire for education, their willingness to **go beyond** the confines of the salon in pursuing their interests, and their championing of unity among women, the Bluestockings began the process of questioning women's role in society.

17. Which of the following best states the central idea of the passage?

- (A) The establishment of literary salons was a response to reformers' demands for social rights for women.
- (B) Literary salons were originally intended to be a meeting ground for intellectuals of both sexes, but eventually became social gatherings with little educational value.
- (C) In England, as in France, the general prejudice against higher education for women limited women's function in literary salons to a primarily social one.
- (D) The literary salons provided a sounding board for French and English women who called for access to all the educational institutions in their societies on an equal basis with men.
- (E) For women, who did not have access to higher education as men did, literary salons provided an alternate route to learning and a challenge to some of society's basic assumptions about women.

18. According to the passage, a significant distinction between the *salonnières* and

Bluestockings was in the way each group regarded which of the following?

- (A) The value of acquiring knowledge
  - (B) The role of pleasure in the activities of the literary salon
  - (C) The desirability of a complete break with societal traditions
  - (D) The inclusion of women of different backgrounds in the salons
  - (E) The attainment of full social and political equality with men
19. The author refers to differences in social background between *salonnières* and Bluestockings in order to do which of the following?
- (A) Criticize the view that their choices of activities were significantly influenced by male salon members
  - (B) Discuss the reasons why literary salons in France were established before those in England
  - (C) Question the importance of the Bluestockings in shaping public attitudes toward educated women
  - (D) Refute the argument that the French salons had little influence over the direction the English salons took
  - (E) Explain the differences in atmosphere and style in their salons
20. Which of the following statements is most compatible with the principles of the *salonnières* as described in the passage?
- (A) Women should aspire to be not only educated but independent as well.
  - (B) The duty of the educated women is to provide an active political model for less educated women.
  - (C) Devotion to pleasure and art is justified in itself.
  - (D) Substance, rather than form, is the most important consideration in holding a literary salon.
  - (E) Men should be excluded from groups of women's rights supporters.
21. The passage suggests that the Bluestockings might have had a more significant impact on society if it had not been for which of the following?
- (A) Competitiveness among their salons
  - (B) Their emphasis on individualism
  - (C) The limited scope of their activities
  - (D) Their acceptance of the French salon as a model for their own salons
  - (E) Their unwillingness to defy aggressively the conventions of their age
22. Which of the following could best be considered a twentieth-century counterpart of an eighteenth century literary salon as it is described in the passage?
- (A) A social sorority
  - (B) A community center
  - (C) A lecture course on art
  - (D) A humanities study group
  - (E) An association of moral reformers



23. To an assertion that Bluestockings were feminists, the author would most probably respond with which of the following?
- (A) Admitted uncertainty
  - (B) Qualified disagreement
  - (C) Unquestioning approval
  - (D) Complete indifference
  - (E) Strong disparagement

24. Which of the following titles best describes the content of the passage?
- (A) Eighteenth-Century Egalitarianism
  - (B) Feminists of the Eighteenth Century
  - (C) Eighteenth-Century Precursors of Feminism
  - (D) Intellectual Life in the Eighteenth Century
  - (E) Female Education Reform in the Eighteenth Century

When the same parameters and quantitative theory are used to analyze both termite colonies and troops of rhesus macaques, we will have a unified science of sociobiology. Can this ever really happen? As my own studies have advanced, I have been increasingly impressed with the functional similarities between insect and vertebrate societies and less so with the structural differences that seem, **at first glance**, to constitute such an immense gulf between them. Consider **for a moment** termites and macaques. Both form cooperative groups that occupy territories. In both kinds of society there is a well-marked **division of labor**. Members of both groups communicate to each other hunger, alarm, hostility, caste status or rank, and reproductive status. From the specialist's point of view, this comparison may at first seem facile—or worse. But it is out of such deliberate oversimplification that the beginnings of a general theory are made.

25. Which of the following best summarizes the author's main point?
- (A) Oversimplified comparisons of animal societies could diminish the likelihood of developing a unified science of sociobiology.
  - (B) Understanding the ways in which animals as different as termites and rhesus macaques resemble each other requires train in both biology and sociology.
  - (C) Most animals organize themselves into societies that exhibit patterns of group behavior similar to those of human societies.
  - (D) Animals as different as termites and rhesus macaques follow certain similar and predictable patterns of behavior.
  - (E) A study of the similarities between insect and vertebrate societies could provide the basis for a unified science of sociobiology.
26. The author's attitude toward the possibility of a unified theory in sociobiology is best described as which of the following?
- (A) Guarded optimism
  - (B) Unqualified enthusiasm
  - (C) Objective indifference
  - (D) Resignation
  - (E) Dissatisfaction
27. In discussing insect and vertebrate societies, the author suggests which of the following?

- (A) A distinguishing characteristic of most insect and vertebrate societies is a well-marked division of labor.
- (B) The caste structure of insect societies is similar to that of vertebrate societies.
- (C) Most insect and vertebrate societies form cooperative groups in order to occupy territory.
- (D) The means of communication among members of insect societies is similar to that among members of vertebrate societies.
- (E) There are significant structural differences between insect and vertebrate societies.

### No. 6-1

### SECTION A

A mysterious phenomenon is the ability of over-water migrants to travel on course. Birds, bees, and other species can **keep track of** time without any sensory cues from the outside world, and such "biological clocks" clearly contribute to their "compass sense." For example, they can use the position of the Sun or stars, along with **the time of day**, to find north. But compass sense alone cannot explain how birds navigate the ocean: after a flock traveling east is blown far south by a storm, it will assume the proper northeasterly course to compensate. Perhaps, some scientists thought, migrants determine their geographic position on Earth by celestial navigation, almost as human navigators use stars and planets, but this would **demand of** the animals a fantastic map sense. Researchers now know that some species have a magnetic sense, which might allow migrants to determine their geographic location by detecting variations in the strength of the Earth's magnetic field.

17. The main idea of the passage is that
  - (A) migration over land requires a simpler explanation than migration over water does
  - (B) the means by which animals migrate over water are complex and only partly understood
  - (C) the ability of migrant animals to keep track of time is related to their magnetic sense
  - (D) knowledge of geographic location is essential to migrants with little or no compass sense
  - (E) explanations of how animals migrate tend to replace, rather than build on, one another
18. It can be inferred from the passage that if the flock of birds described in lines 8-12 were navigating by compass sense alone, they would, after the storm, fly
  - (A) east
  - (B) north
  - (C) northwest
  - (D) south
  - (E) southeast
19. In maintaining that migrating animals would need "a fantastic map sense" (line 17) to determine their geographic position by celestial navigation, the author intends to express
  - (A) admiration for the ability of the migrants
  - (B) skepticism about celestial navigation as an explanation
  - (C) certainly that the phenomenon of migration will remain mysterious
  - (D) interest in a new method of accounting for over-water migration
  - (E) surprise that animals apparently navigate in much the same way that human beings do
20. Of the following descriptions of migrating animals, which most strongly suggests that the animals are depending on magnetic cues to orient themselves?

- (A) Pigeons can properly readjust their course even when flying long distances through exceedingly dense fogs.
- (B) Bison are able to reach their destination by passing through a landscape that has been partially altered by a recent fire.
- (C) Elephants are able to find grounds that some members of the herd have never seen before.
- (D) Swallows are able to return to a given spot at the same time every year.
- (E) Monarch butterflies coming from different parts of North America are able to arrive at the same location each winter.

Roger Rosenblatt's book *Black Fiction*, in attempting to apply literary rather than sociopolitical criteria to its subject, successfully alters the approach taken by most previous studies. As Rosenblatt notes, criticism of Black writing has often served as a pretext for expounding on Black history. Addison Gayle's recent work, for example, judges the value of Black fiction by overtly political standards, rating each work according to the notions of Black identity which it propounds.

Although fiction assuredly springs from political circumstances, its authors react to those circumstances in ways other than ideological, and talking about novels and stories primarily as instruments of ideology circumvents much of the fictional enterprise. Rosenblatt's literary analysis discloses affinities and connections among works of Black fiction which solely political studies have overlooked or ignored.

Writing acceptable criticism of Black fiction, however, presupposes giving satisfactory answers to a number of questions. First of all, is there a sufficient reason, other than the racial identity of the authors, to group together works by Black authors? Second, how does Black fiction make itself distinct from other modern fiction with which it is largely contemporaneous? Rosenblatt shows that Black fiction constitutes a distinct body of writing that has an identifiable, coherent literary tradition. Looking at novels written by Blacks over the last eighty years, he discovers recurring concerns and designs independent of chronology. These structures are thematic, and they spring, not surprisingly, from the central fact that the Black characters in these novels exist in a predominantly White culture, whether they try to conform to that culture of **rebel against** it.

*Black Fiction* does leave some aesthetic questions open. Rosenblatt's thematic analysis permits considerable objectivity; he even explicitly states that it is not his intention to judge the merit of the various works—yet his reluctance seems misplaced, especially since an attempt to appraise might have led to interesting results. For instance, some of the novels appear to be structurally diffuse. Is this a defect, or are the authors working out of, or trying to forge, a different kind of aesthetic? In addition, the style of some Black novels, like Jean Toomer's *Cane*, **verges on** expressionism or surrealism; does this technique provide a **counterpoint** to the prevalent theme that portrays the fate against which Black heroes are pitted, a theme usually conveyed by more naturalistic modes of expression?

In spite of such omissions, what Rosenblatt does include in his discussion makes for an astute and worthwhile study. *Black Fiction* surveys a wide variety of novels, bringing to our attention in the process some fascinating and little-known works like James Weldon Johnson's *Autobiography of an Ex-Colored Man*. Its argument is tightly constructed, and its forthright, lucid style exemplifies levelheaded and penetrating criticism.

21. The author of the passage objects to criticism of Black fiction like that by Addison Gayle because it
- (A) emphasizes purely literary aspects of such fiction
  - (B) misinterprets the ideological content of such fiction
  - (C) misunderstands the notions of Black identity contained in such fiction
  - (D) substitutes political for literary criteria in evaluating such fiction

- (E) ignores the interplay between Black history and Black identity displayed in such fiction
22. The author of the passage is primarily concerned with
- (A) evaluating the soundness of a work of criticism
  - (B) comparing various critical approaches to a subject
  - (C) discussing the limitations of a particular kind of criticism
  - (D) summarizing the major points made in a work of criticism
  - (E) explaining the theoretical background of a certain kind of criticism
23. The author of the passage believes that *Black Fiction* would have been improved had Rosenblatt
- (A) evaluated more carefully the ideological and historical aspects of Black fiction
  - (B) attempted to be more objective in his approach to novels and stories by Black authors
  - (C) explored in greater detail the recurrent thematic concerns of Black fiction throughout its history
  - (D) established a basis for placing Black fiction within its own unique literary tradition
  - (E) assessed the relative literary merit of the novels he analyzes thematically
24. The author's discussion of *Black Fiction* can be best described as
- (A) pedantic and contentious
  - (B) critical but admiring
  - (C) ironic and deprecating
  - (D) argumentative but unfocused
  - (E) stilted and insincere
25. It can be inferred that the author of the passage would be LEAST likely to approve of which of the following?
- (A) An analysis of the influence of political events on the personal ideology of Black writers
  - (B) A critical study that applies sociopolitical criteria to autobiographies by Black authors
  - (C) A literary study of Black poetry that appraises the merits of poems according to the political acceptability of their themes
  - (D) An examination of the growth of a distinct Black literary tradition within the context of Black history
  - (E) A literary study that attempts to isolate aesthetic qualities unique to Black fiction
26. The author of the passage uses all of the following in the discussion of Rosenblatt's book EXCEPT
- (A) rhetorical questions
  - (B) specific examples
  - (C) comparison and contrast
  - (D) definition of terms
  - (E) personal opinion
27. The author of the passage refers to James Weldon Johnson's *Autobiography of an Ex-Colored Man* most probably in order to

- (A) point out affinities between Rosenblatt's method of thematic analysis and earlier criticism
- (B) clarify the point about expressionistic style made earlier in the passage
- (C) qualify the assessment of Rosenblatt's book made in the first paragraph of the passage
- (D) illustrate the affinities among Black novels disclosed by Rosenblatt's literary analysis
- (E) give a specific example of one of the accomplishments of Rosenblatt's work

## SECTION B

The molecules of carbon dioxide in the Earth's atmosphere affect the heat balance of the Earth by acting as a one-way screen. Although these molecules allow radiation at visible wavelengths, where most of the energy of sunlight is concentrated, to pass through, they absorb some of the longer-wavelength, infrared emissions radiated from the Earth's surface, radiation that would otherwise be transmitted back into space. For the Earth to maintain a constant average temperature, such emissions from the planet must balance incoming solar radiation. If there were no carbon dioxide in the atmosphere, heat would escape from the Earth much more easily. The surface temperature would be so much lower that the oceans might be a **solid mass** of ice.

Today, however, the potential problem is too much carbon dioxide. The burning of fossil fuels and the clearing of forests have increased atmospheric carbon dioxide by about 15 percent in the last hundred years, and we continue to add carbon dioxide to the atmosphere. Could the increase in carbon dioxide cause a global rise in average temperature, and could such a rise have serious consequences for human society? Mathematical models that allow us to calculate the rise in temperature as a function of the increase indicate that the answer is probably yes.

Under present conditions a temperature of  $-18^{\circ}\text{C}$  can be observed at an altitude of 5 to 6 kilometers above the Earth. Below this altitude (called the radiating level), the temperature increases by about  $6^{\circ}\text{C}$  per kilometer approaching the Earth's surface, where the average temperature is about  $15^{\circ}\text{C}$ . An increase in the amount of carbon dioxide means that there are more molecules of carbon dioxide to absorb infrared radiation. As the capacity of the atmosphere to absorb infrared radiation increases, the radiating level and the temperature of the surface must rise.

One mathematical model predicts that doubling the atmospheric carbon dioxide would raise the global mean surface temperature by  $2.5^{\circ}\text{C}$ . This model assumes that the atmosphere's **relative humidity** remains constant and the temperature decreases with altitude at a rate of  $6.5^{\circ}\text{C}$  per kilometer. The assumption of constant relative humidity is important, because water vapor in the atmosphere is another efficient absorber of radiation at infrared wavelengths. Because warm air can hold more moisture than cool air, the relative humidity will be constant only if the amount of water vapor in the atmosphere increases as the temperature rises. Therefore, more infrared radiation would be absorbed and reradiated back to the Earth's surface. The resultant warming at the surface could be expected to melt snow and ice, reducing the Earth's reflectivity. More solar radiation would then be absorbed, leading to a further increase in temperature.

17. The primary purpose of the passage is to
- (A) warn of the dangers of continued burning of fossil fuels
  - (B) discuss the significance of increasing the amount of carbon dioxide in the atmosphere
  - (C) explain how a constant temperature is maintained on the Earth's surface
  - (D) describe the ways in which various atmospheric and climatic conditions contribute to the Earth's weather
  - (E) demonstrate the usefulness of mathematical models in predicting long-range climatic change
18. According to the passage, the greatest part of the solar energy that reaches the Earth is

- (A) concentrated in the infrared spectrum
  - (B) concentrated at visible wavelengths
  - (C) absorbed by carbon dioxide molecules
  - (D) absorbed by atmospheric water vapor
  - (E) reflected back to space by snow and ice
19. According to the passage, atmospheric carbon dioxide performs all of the following functions EXCEPT:
- (A) absorbing radiation at visible wavelengths
  - (B) absorbing infrared radiation
  - (C) absorbing outgoing radiation from the Earth
  - (D) helping to retain heat near the Earth's surface
  - (E) helping to maintain a constant average temperature on the Earth's surface
20. Which of the following best describes the author's attitude toward the increasing amount of carbon dioxide in the atmosphere and its consequences?
- (A) Incredulous
  - (B) Completely detached
  - (C) Interested but skeptical
  - (D) Angry yet resigned
  - (E) Objective yet concerned
21. It can be concluded from information contained in the passage that the average temperature at an altitude of 1 kilometer above the Earth is about
- (A) 15°C
  - (B) 9°C
  - (C) 2.5°C
  - (D) -12°C
  - (E) -18°C
22. It can be inferred from the passage that the construction of the mathematical model mentioned in the passage involved the formulation of which of the following?
- (A) An assumption that the amount of carbon dioxide added to the atmosphere would in reality steadily increase
  - (B) An assumption that human activities are the only agencies by which carbon dioxide is added to the atmosphere
  - (C) Assumptions about the social and political consequences of any curtailment of the use of fossil fuels
  - (D) Assumptions about the physical conditions that are likely to prevail during the period for which the model was made
  - (E) Assumptions about the differential behavior of carbon dioxide molecules at the various levels of temperature calculated in the model
23. According to the passage, which of the following is true of the last hundred years?

- (A) Fossil fuels were burned for the first time.
- (B) Greater amounts of land were cleared than at any time before.
- (C) The average temperature at the Earth's surface has become 2°C cooler.
- (D) The amount of carbon dioxide in the atmosphere has increased measurably.
- (E) The amount of farmland worldwide has doubled.

Some modern anthropologists hold that biological evolution has shaped not only human morphology but also human behavior. The role those anthropologists ascribe to evolution is not of dictating the details of human behavior but one of imposing constraints—ways of feeling, thinking, and acting that “come naturally” in archetypal situations in any culture. Our “frailties”—emotions and motives such as rage, fear, greed, gluttony, joy, lust, love—may be a very mixed assortment, but they share at least one immediate quality: we are, as we say, “in the grip” of them. And thus they give us our sense of constraints.

Unhappily, some of those frailties—our need for ever-increasing security among them—are presently maladaptive. Yet beneath the overlay of cultural detail, they, too, are said to be biological in direction, and therefore as natural to us as are our appendixes. We would need to comprehend thoroughly their adaptive origins in order to understand how badly they guide us now. And we might then begin to resist their pressure.

24. The primary purpose of the passage is to present
  - (A) a position on the foundations of human behavior and on what those foundations imply
  - (B) a theory outlining the parallel development of human morphology and of human behavior
  - (C) a diagnostic test for separating biologically determined behavior patterns from culture-specific detail
  - (D) a practical method for resisting the pressures of biologically determined drives
  - (E) an overview of those human emotions and motives that impose constraints on human behavior
25. The author implies that control to any extent over the “frailties” that constrain our behavior is thought to presuppose
  - (A) that those frailties are recognized as currently beneficial and adaptive
  - (B) that there is little or no overlay of cultural detail that masks their true nature
  - (C) that there are cultures in which those frailties do not “come naturally” and from which such control can be learned
  - (D) a full understanding of why those frailties evolved and of how they function now
  - (E) a thorough grasp of the principle that cultural detail in human behavior can differ arbitrarily from society to society
26. Which of the following most probably provides an appropriate analogy from human morphology for the “details” versus “constraints” distinction made in the passage in relation to human behavior?
  - (A) The ability of most people to see all the colors of the visible spectrum as against most people's inability to name any but the primary colors
  - (B) The ability of even the least fortunate people to show compassion as against people's inability to mask their feelings completely
  - (C) The ability of some people to dive to great depths as against most people's inability to swim long distances

- (D) The psychological profile of those people who are able to delay gratification as against people's inability to control their lives completely
  - (E) The greater lung capacity of mountain peoples that helps them live in oxygen-poor air as against people's inability to fly without special apparatus
27. It can be inferred that in his discussion of maladaptive frailties the author assumes that
- (A) evolution does not favor the emergence of adaptive characteristics over the emergence of maladaptive ones
  - (B) any structure or behavior not positively adaptive is regarded as transitory in evolutionary theory
  - (C) maladaptive characteristics, once fixed, make the emergence of other maladaptive characteristics more likely
  - (D) the designation of a characteristic as being maladaptive must always remain highly tentative
  - (E) changes in the total human environment can outpace evolutionary change

## No. 6-2

### SECTION A

Whether the languages of the ancient American peoples were used for expressing abstract universal concepts can be clearly answered in the case of Nahuatl. Nahuatl, like Greek and German, is a language that allows the formation of extensive compounds. By the combination of radicals or semantic elements, single compound words can express complex conceptual relations, often of an abstract universal character.

The *tlamatinime* ("those who know") were able to use this rich stock of abstract terms to express the nuances of their thought. They also availed themselves of other forms of expression with metaphorical meaning, some probably original, some derived from Toltec coinages. Of these forms the most characteristic in Nahuatl is the juxtaposition of two words that, because they are synonyms, associated terms, or even contraries, complement each other to evoke one single idea. Used as metaphor, the juxtaposed terms connote specific or essential traits of the being they refer to, introducing a mode of poetry as an almost habitual form of expression.

17. A main purpose of the passage is to
- (A) delineate the function of the *tlamatinime* in Nahuatl society
  - (B) explain the abstract philosophy of the Nahuatl thinkers
  - (C) argue against a theory of poetic expression by citing evidence about the Nahuatl
  - (D) explore the rich metaphorical heritage the Nahuatl received from the Toltecs
  - (E) describe some conceptual and aesthetic resources of the Nahuatl language
18. According to the passage, some abstract universal ideas can be expressed in Nahuatl by
- (A) taking away from a word any reference to particular instances
  - (B) removing a word from its associations with other words
  - (C) giving a word a new and opposite meaning
  - (D) putting various meaningful elements together in one word
  - (E) turning each word of a phrase into a poetic metaphor
19. It can be inferred solely from the information in the passage that
- (A) there are many languages that, like Greek or German, allow extensive compounding



- (B) all abstract universal ideas are ideas of complex relations
- (C) some record or evidence of the thought of the *tlamatinime* exists
- (D) metaphors are always used in Nahuatl to express abstract conceptual relationships
- (E) the abstract terms of the Nahuatl language are habitually used in poetry

Many theories have been formulated to explain the role of grazers such as zooplankton in controlling the amount of planktonic algae (phytoplankton) in lakes. The first theories of such grazer control were merely based on observations of negative correlations between algal and zooplankton numbers. A low number of algal cells in the presence of a high number of grazers suggested, but did not prove, that the grazers had removed most of the algae. The converse observation, of the absence of grazers in areas of high phytoplankton concentration, led Hardy to propose his principle of animal exclusion, which hypothesized that phytoplankton produced a repellent that excluded grazers from regions of high phytoplankton concentration. This was the first suggestion of algal defenses against grazing.

Perhaps the fact that many of these first studies considered only algae of a size that could be collected in a net (net phytoplankton), a practice that overlooked the smaller phytoplankton (nannoplankton) that we now know grazers are most likely to feed on, led to a de-emphasis of the role of grazers in subsequent research. Increasingly, as in the individual studies of Lund, Round, and Reynolds, researchers began to stress the importance of environmental factors such as temperature, light, and water movements in controlling algal numbers. These environmental factors were amenable to field monitoring and to simulation in the laboratory. Grazing was believed to have some effect on algal numbers, especially after phytoplankton growth rates declined at the end of bloom periods, but grazing was considered a minor component of models that predicted algal **population dynamics**.

The potential magnitude of grazing pressure on freshwater phytoplankton has only recently been determined empirically. Studies by Hargrave and Geen estimated natural community grazing rates by measuring feeding rates of individual zooplankton species in the laboratory and then computing community grazing rates for field conditions using the known population density of grazers. The high estimates of grazing pressure postulated by these researchers were not fully accepted, however, until the grazing rates of zooplankton were determined directly in the field, by means of new experimental techniques. Using a specially prepared feeding chamber, Haney was able to record zooplankton grazing rates in natural field conditions. In the periods of peak zooplankton abundance, that is, in the late spring and in the summer, Haney recorded maximum daily community grazing rates, for nutrient-poor lakes and bog lakes, respectively, of 6.6 percent and 114 percent of daily phytoplankton production. Cladocerans had higher grazing rates than copepods, usually accounting for 80 percent of the community grazing rate. These rates varied seasonally, reaching the lowest point in the winter and early spring. Haney's thorough research provides convincing field evidence that grazers can exert significant pressure on phytoplankton population.

20. The author most likely mentions Hardy's principle of animal exclusion in order to
  - (A) give an example of one theory about the interaction of grazers and phytoplankton
  - (B) defend the first theory of algal defenses against grazing
  - (C) support the contention that phytoplankton numbers are controlled primarily by environmental factors
  - (D) demonstrate the superiority of laboratory studies of zooplankton feeding rates to other kinds of studies of such rates
  - (E) refute researchers who believed that low numbers of phytoplankton indicated the grazing effect of low numbers of zooplankton
21. It can be inferred from the passage that the "first theories" of grazer control mentioned in line 4 would have been more convincing if researchers had been able to
  - (A) observe high phytoplankton numbers under natural lake conditions

- (B) discover negative correlations between algae and zooplankton numbers from their field research
  - (C) understand the central importance of environmental factors in controlling the growth rates of phytoplankton
  - (D) make verifiable correlations of cause and effect between zooplankton and phytoplankton numbers
  - (E) invent laboratory techniques that would have allowed them to bypass their field research concerning grazer control
22. Which of the following, if true, would call into question Hardy's principle of animal exclusion?
- (A) Zooplankton are not the only organisms that are affected by phytoplankton repellents.
  - (B) Zooplankton exclusion is unrelated to phytoplankton population density.
  - (C) Zooplankton population density is higher during some parts of the year than during others.
  - (D) Net phytoplankton are more likely to exclude zooplankton than are nannoplankton.
  - (E) Phytoplankton numbers can be strongly affected by environmental factors.
23. The author would be likely to agree with which of the following statements regarding the pressure of grazers on phytoplankton numbers?
- I. Grazing pressure can vary according to the individual type of zooplankton.
  - II. Grazing pressure can be lower in nutrient-poor lakes than in bog lakes.
  - III. Grazing tends to exert about the same pressure as does temperature.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
24. The passage supplies information to indicate that Hargrave and Geen's conclusion regarding the grazing pressure exerted by zooplankton on phytoplankton numbers was most similar to the conclusion regarding grazing pressure reached by which of the following researchers?
- (A) Hardy
  - (B) Lund
  - (C) Round
  - (D) Reynolds
  - (E) Haney
25. It can be inferred from the passage that one way in which many of the early researchers on grazer control could have improved their data would have been to
- (A) emphasize the effects of temperature, rather than of light, on phytoplankton
  - (B) disregard nannoplankton in their analysis of phytoplankton numbers
  - (C) collect phytoplankton of all sizes before analyzing the extent of phytoplankton concentration

- (D) recognize that phytoplankton other than net phytoplankton could be collected in a net  
(E) understand the crucial significance of net phytoplankton in the diet of zooplankton
26. According to the passage, Hargrave and Geen did which of the following in their experiments?
- (A) They compared the grazing rates of individual zooplankton species in the laboratory with the natural grazing rates of these species.  
(B) They hypothesized about the population density of grazers in natural habitats by using data concerning the population density of grazers in the laboratory.  
(C) They estimated the community grazing rates of zooplankton in the laboratory by using data concerning the natural community grazing rates of zooplankton.  
(D) They estimated the natural community grazing rates of zooplankton by using data concerning the known population density of phytoplankton.  
(E) They estimated the natural community grazing rates of zooplankton by using laboratory data concerning the grazing rates of individual zooplankton species.
27. Which of the following is a true statement about the zooplankton numbers and zooplankton grazing rates observed in Haney's experiments?
- (A) While zooplankton numbers began to decline in August, zooplankton grazing rates began to increase.  
(B) Although zooplankton numbers were high in May, grazing rates did not become high until January.  
(C) Both zooplankton numbers and grazing rates were higher in December than in November.  
(D) Both zooplankton numbers and grazing rates were lower in March than in June.  
(E) Both zooplankton numbers and grazing rates were highest in February.

## SECTION B

Hydrogeology is a science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere. The hydrologic cycle, a major topic in this science, is the complete cycle of phenomena through which water passes, beginning as atmospheric water vapor, passing into liquid and solid form as precipitation, thence along and into the ground surface, and finally again returning to the form of atmospheric water vapor by means of evaporation and transpiration.

The term "geohydrology" is sometimes erroneously used as a synonym for "hydrogeology." Geohydrology is concerned with underground water. There are many formations that contain water but are not part of the hydrologic cycle because of geologic changes that have isolated them underground. These systems are properly termed geohydrologic but not hydrogeologic. Only when a system possesses natural or artificial boundaries that associate the water within it with the hydrologic cycle may the entire system properly be termed hydrogeologic.

17. The author's primary purpose is most probably to
- (A) present a hypothesis  
(B) refute an argument  
(C) correct a misconception  
(D) predict an occurrence  
(E) describe an enigma

18. It can be inferred that which of the following is most likely to be the subject of study by a geohydrologist?
- (A) Soft, porous rock being worn away by a waterfall
  - (B) Water depositing minerals on the banks of a gorge through which the water runs
  - (C) The trapping of water in a sealed underground rock cavern through the action of an earthquake
  - (D) Water becoming unfit to drink through the release of pollutants into it from a manufacturing plant
  - (E) The changing course of a river channel as the action of the water wears away the rocks past which the river flows
19. The author refers to “many formations” (line 16) primarily in order to
- (A) clarify a distinction
  - (B) introduce a subject
  - (C) draw an analogy
  - (D) emphasize a similarity
  - (E) resolve a conflict

The historian Frederick J. Turner wrote in the 1890's that the agrarian discontent that had been developing steadily in the United States since about 1870 had been precipitated by the closing of the internal frontier—that is, the depletion of available new land needed for further expansion of the American farming system. Not only was Turner's thesis influential at the time, it was later adopted and elaborated by other scholars, such as John D. Hicks in *The Populist Revolt* (1931). Actually, however, new lands were taken up for farming in the United States throughout and beyond the nineteenth century. In the 1890's, when agrarian discontent had become most acute, 1,100,000 new farms were settled, which was 500,000 more than had been settled during the previous decade. After 1890, under the terms of the Homestead Act and its successors, more new land was taken up for farming than had been taken up for this purpose in the United States up until that time. It is true that a high proportion of the newly farmed land was suitable only for grazing and dry farming, but agricultural practices had become sufficiently advanced to make it possible to increase the profitability of farming by utilizing even these relatively barren lands.

The emphasis given by both scholars and statesmen to the presumed disappearance of the American frontier helped to obscure the great importance of changes in the conditions and consequences of international trade that occurred during the second half of the nineteenth century. In 1869 the Suez Canal was opened and the first transcontinental railroad in the United States was completed. An extensive network of telegraph and telephone communications was spun: Europe was connected by submarine cable with the United States in 1866 and with South America in 1874. By about 1870 improvements in agricultural technology made possible the full exploitation of areas that were most suitable for **extensive farming** on a mechanized basis. Huge tracts of land were being settled and farmed in Argentina, Australia, Canada, and in the American West, and these areas were joined with one another and with the countries of Europe into an interdependent market system. As a consequence, agrarian depressions no longer were local or national in scope, and they struck several nations whose internal frontiers had not vanished or were not about to vanish. Between the early 1870's and the 1890's, the mounting agrarian discontent in America paralleled the almost uninterrupted decline in the prices of American agricultural products on foreign markets. Those staple-growing farmers in the United States who exhibited the greatest discontent were those who had become most dependent on foreign markets for the sale of their products. **Insofar as** Americans had been deterred from taking up new land for farming, it was because market conditions had made this period a perilous time in which to do so.

20. The author is primarily concerned with

- (A) showing that a certain interpretation is better supported by the evidence than is an alternative explanation
  - (B) developing an alternative interpretation by using sources of evidence that formerly had been unavailable
  - (C) questioning the accuracy of the evidence that most scholars have used to counter the author's own interpretation
  - (D) reviewing the evidence that formerly had been thought to obscure a valid interpretation
  - (E) presenting evidence in support of a controversial version of an earlier interpretation
21. According to the author, changes in the conditions of international trade resulted in an
- (A) underestimation of the amount of new land that was being farmed in the United States
  - (B) underutilization of relatively small but rich plots of land
  - (C) overexpansion of the world transportation network for shipping agricultural products
  - (D) extension of agrarian depressions beyond national boundaries
  - (E) emphasis on the importance of market forces in determining the prices of agricultural products
22. The author implies that the change in the state of the American farmer's morale during the latter part of the nineteenth century was traceable to the American farmer's increasing perception that the
- (A) costs of cultivating the land were prohibitive within the United States
  - (B) development of the first transcontinental railroad in the United States occurred at the expense of the American farmer
  - (C) American farming system was about to run out of the new farmland that was required for its expansion
  - (D) prices of American agricultural products were deteriorating especially rapidly on domestic markets
  - (E) proceeds from the sales of American agricultural products on foreign markets were unsatisfactory
23. According to the passage, which of the following occurred prior to 1890?
- (A) Frederick J. Turner's thesis regarding the American frontier became influential.
  - (B) The Homestead Act led to an increase in the amount of newly farmed land in the United States.
  - (C) The manufacturers of technologically advanced agricultural machinery rapidly increased their marketing efforts.
  - (D) Direct lines of communication were constructed between the United States and South America.
  - (E) Technological advances made it fruitful to farm extensively on a mechanized basis.
24. The author implies that, after certain territories and countries had been joined into an interdependent market system in the nineteenth century, agrarian depressions within that system
- (A) spread to several nations, excluding those in which the internal frontier remained open
  - (B) manifested themselves in several nations, including those in which new land remained

- available for farming
- (C) slowed down the pace of new technological developments in international communications and transportation
- (D) affected the local and national prices of the nonagricultural products of several nations
- (E) encouraged several nations to sell more of their agricultural products on foreign markets
25. The author provides information concerning newly farmed lands in the United States (lines 11-27) as evidence in direct support of which of the following?
- (A) A proposal by Frederick J. Turner that was later disputed by John D. Hicks
- (B) An elaboration by John D. Hicks of a thesis that formerly had been questioned by Frederick J. Turner
- (C) The established view that was disputed by those scholars who adopted the thesis of Frederick J. Turner
- (D) The thesis that important changes occurred in the nature of international trade during the second half of the nineteenth century
- (E) The view that the American frontier did not become closed during the nineteenth century or soon thereafter
26. The author implies that the cause of the agrarian discontent was
- (A) masked by the vagueness of the official records on newly settled farms
- (B) overshadowed by disputes on the reliability of the existing historical evidence
- (C) misidentified as a result of influential but erroneous theorizing
- (D) overlooked because of a preoccupation with market conditions
- (E) undetected because visible indications of the cause occurred so gradually and sporadically
27. The author's argument implies that, compared to the yearly price changes that actually occurred on foreign agricultural markets during the 1880's, American farmers would have most preferred yearly price changes that were
- (A) much smaller and in the same direction
- (B) much smaller but in the opposite direction
- (C) slightly smaller and in the same direction
- (D) similar in size but in the opposite direction
- (E) slightly greater and in the same direction

No. 6-3

## SECTION A

The use of heat pumps has been held back largely by skepticism about advertisers' claims that heat pumps can provide as many as two units of thermal energy for each unit of electrical energy used, thus apparently contradicting the principle of **energy conservation**. Heat pumps circulate a fluid refrigerant that cycles alternatively from its liquid phase to its vapor phase in a **closed loop**. The refrigerant, starting as a low-temperature, low-pressure vapor, enters a compressor driven by an electric motor. The refrigerant leaves the compressor as a hot, dense vapor and flows through a heat exchanger called the condenser, which transfers heat from the refrigerant to a body of air. Now the refrigerant, as a high-pressure, cooled liquid, confronts a flow restriction which causes the pressure to drop. As the pressure falls, the refrigerant expands and partially vaporizes, becoming chilled. It then passes through a second heat exchanger, the

evaporator, which transfers heat from the air to the refrigerant, reducing the temperature of this second body of air. Of the two heat exchangers, one is located inside, and the other one outside the house, so each is in contact with a different body of air: room air and outside air, respectively.

The flow direction of refrigerant through a heat pump is controlled by valves. When the refrigerant flow is reversed, the heat exchangers switch function. This flow-reversal capability allows heat pumps either to heat or cool room air. Now, if under certain conditions a heat pump puts out more thermal energy than it consumes in electrical energy, has the law of energy conservation been challenged? No, not even remotely: the additional input of thermal energy into the circulating refrigerant via the evaporator accounts for the difference in the energy equation.

Unfortunately, there is one real problem. The heating capacity of a heat pump decreases as the outdoor temperature falls. The drop in capacity is caused by the lessening amount of refrigerant mass moved through the compressor at one time. The heating capacity is proportional to this mass flow rate: the less the mass of refrigerant being compressed, the less the thermal load it can transfer through the heat-pump cycle. The volume flow rate of refrigerant vapor through the single-speed rotary compressor used in heat pumps is approximately constant. But cold refrigerant vapor entering a compressor is at lower pressure than warmer vapor. Therefore, the mass of cold refrigerant—and thus the thermal energy it carries—is less than if the refrigerant vapor were warmer before compression.

Here, then, lies a genuine drawback of heat pumps: in extremely cold climates—where the most heat is needed—heat pumps are least able to supply enough heat.

17. The primary purpose of the passage is to
  - (A) explain the differences in the working of a heat pump when the outdoor temperature changes
  - (B) contrast the heating and the cooling modes of heat pumps
  - (C) describe heat pumps, their use, and factors affecting their use
  - (D) advocate the more widespread use of heat pumps
  - (E) expose extravagant claims about heat pumps as false
18. The author resolves the question of whether heat pumps run counter to the principle of energy conservation by
  - (A) carefully qualifying the meaning of that principle
  - (B) pointing out a factual error in the statement that gives rise to this question
  - (C) supplying additional relevant facts
  - (D) denying the relevance of that principle to heat pumps
  - (E) explaining that heat pumps can cool, as well as heat, room air
19. It can be inferred from the passage that, in the course of a heating season, the heating capacity of a heat pump is greatest when
  - (A) heating is least essential
  - (B) electricity rates are lowest
  - (C) its compressor runs the fastest
  - (D) outdoor temperatures hold steady
  - (E) the heating demand surges
20. If the author's assessment of the use of heat pumps (lines 1-6) is correct, which of the following best expresses the lesson that advertisers should learn from this case?
  - (A) Do not make exaggerated claims about the products you are trying to promote.

- (B) Focus your advertising campaign on vague analogies and veiled implications instead of on facts.
  - (C) Do not use facts in your advertising that will strain the prospective client's ability to believe.
  - (D) Do not assume in your advertising that the prospective clients know even the most elementary scientific principles.
  - (E) Concentrate your advertising firmly on financially relevant issues such as price discounts and efficiency of operation.
21. The passage suggests that heat pumps would be used more widely if
- (A) they could also be used as air conditioners
  - (B) they could be moved around to supply heat where it is most needed
  - (C) their heat output could be thermostatically controlled
  - (D) models with truly superior cooling capacity were advertised more effectively
  - (E) people appreciated the role of the evaporator in the energy equation
22. According to the passage, the role of the flow restriction (lines 16-17) in a heat pump is to
- (A) measure accurately the flow rate of the refrigerant mass at that point
  - (B) compress and heat the refrigerant vapor
  - (C) bring about the evaporation and cooling of refrigerant
  - (D) exchange heat between the refrigerant and the air at that point
  - (E) reverse the direction of refrigerant flow when needed
23. The author regards the notion that heat pumps have a genuine drawback as a
- (A) cause for regret
  - (B) sign of premature defeatism
  - (C) welcome challenge
  - (D) case of sloppy thinking
  - (E) focus for an educational campaign

All of Françoise Duparc's surviving paintings blend portraiture and genre. Her subjects appear to be acquaintances whom she has asked to pose; she has captured both their self-consciousness and the spontaneity of their everyday activities, the depiction of which characterizes genre painting. But genre painting, especially when it portrayed members of the humblest classes, was never popular in eighteenth-century France. The Le Nain brothers and Georges de La Tour, who also chose such themes, were largely ignored. Their present high standing is due to a different, more democratic political climate and to different aesthetic values: we no longer require artists to provide ideal images of humanity for our moral edification but rather regard such idealization as a falsification of the truth. Duparc gives no improving message and discreetly refrains from judging her subjects. In brief, her works neither elevate nor instruct. This restraint largely explains her lack of popular success during her lifetime, even if her talent did not go completely unrecognized by her eighteenth-century French contemporaries.

24. According to the passage, modern viewers are not likely to value which of the following qualities in a painting?
- (A) The technical elements of the painting
  - (B) The spontaneity of the painting
  - (C) The moral lesson imparted by the painting



- (D) The degree to which the painting realistically depicts its subject  
(E) The degree to which the artist's personality is revealed in the painting
25. If the history of Duparc's artistic reputation were to follow that of the Le Nain brothers and Georges de La Tour, present-day assessments of her work would be likely to contain which of the following?  
(A) An evaluation that accords high status to her work  
(B) Acknowledgement of her technical expertise but dismissal of her subject matter as trivial  
(C) Agreement with assessments made in her own time but acknowledgements of the exceptional quality of a few of her paintings  
(D) Placement of her among the foremost artists of her century  
(E) A reclassification of her work as portraiture rather than genre painting
26. It can be inferred from the passage that the term "genre painting" would most likely apply to which of the following?  
(A) A painting depicting a glorious moment of victory following a battle  
(B) A painting illustrating a narrative from the Bible  
(C) A portrayal of a mythological Greek goddess  
(D) A portrayal of a servant engaged in his work  
(E) A formal portrait of an eighteenth-century king
27. The argument of the passage best supports which of the following contentions concerning judgments of artistic work?  
(A) Aesthetic judgments can be influenced by the political beliefs of those making the judgment.  
(B) Judgments of the value of an artist's work made by his or her contemporaries must be discounted before a true judgment can be made.  
(C) Modern aesthetic taste is once again moving in the direction of regarding idealistic painting as the most desirable form of painting.  
(D) In order to be highly regarded, an artist cannot be solely identified with one particular kind of painting.  
(E) Spontaneity is the most valuable quality a portrait painter can have.

## SECTION B

**Mycorrhizal fungi** infect more plants than do any other fungi and are necessary for many plants to thrive, but they have escaped widespread investigation until recently for two reasons. First, the symbiotic association is so well-balanced that the roots of host plants show no damage even when densely infected. Second, the fungi cannot **as yet** be cultivated in the absence of a living root. Despite these difficulties, there has been important new work that suggests that this symbiotic association can be harnessed to achieve more economical use of costly **superphosphate fertilizer** and to permit better exploitation of cheaper, less soluble rock phosphate. Mycorrhizal benefits are not limited to improved phosphate uptake in host plants. In legumes, mycorrhizal inoculation has increased nitrogen fixation beyond levels achieved by adding **phosphate fertilizer** alone. Certain symbiotic associations also increase the host plant's resistance to harmful root fungi. Whether this resistance results from exclusion of harmful fungi through competition for sites, from metabolic change involving antibiotic production, or from increased vigor is undetermined.

17. Which of the following most accurately describes the passage?

- (A) A description of a replicable experiment
  - (B) A summary report of new findings
  - (C) A recommendation for abandoning a difficult area of research
  - (D) A refutation of an earlier hypothesis
  - (E) A confirmation of earlier research
18. The level of information in the passage above is suited to the needs of all of the following people EXCEPT:
- (A) a researcher whose job is to identify potentially profitable areas for research and product development
  - (B) a state official whose position requires her to alert farmers about possible innovations in farming
  - (C) an official of a research foundation who identifies research projects for potential funding
  - (D) a biologist attempting to keep up with scientific developments in an area outside of his immediate area of specialization
  - (E) a botanist conducting experiments to determine the relationship between degree of mycorrhizal infection and expected uptake of phosphate
19. It can be inferred from the passage that which of the following has been a factor influencing the extent to which research on mycorrhizal fungi has progressed?
- (A) Lack of funding for such research
  - (B) Lack of immediate application of such research
  - (C) Lack of a method for identifying mycorrhizal fungi
  - (D) Difficulties surrounding laboratory production of specimens for study
  - (E) Difficulties ensuing from the high cost and scarcity of superphosphate fertilizers
20. The passage suggests which of the following about the increased resistance to harmful root fungi that some plants infected with mycorrhizal fungi seem to exhibit?
- (A) There are at least three hypotheses that might account for the increase.
  - (B) An explanation lies in the fact that mycorrhizal fungi increase more rapidly in number than harmful root fungi do.
  - (C) The plants that show increased resistance also exhibit improved nitrogen fixation.
  - (D) Such increases may be independent of mycorrhizal infection.
  - (E) It is unlikely that a satisfactory explanation can be found to account for the increase.

In the early 1950's, historians who studied preindustrial Europe (which we may define here as Europe in the period from roughly 1300 to 1800) began, for the first time in large numbers, to investigate more of the preindustrial European population than the 2 or 3 percent who comprised the political and social elite: the kings, generals, judges, nobles, bishops, and local magnates who had hitherto usually filled history books. One difficulty, however, was that few of the remaining 97 percent recorded their thoughts or had them chronicled by contemporaries. Faced with this situation, many historians based their investigations on the only records that seemed to exist: birth, marriage, and death records. As a result, much of the early work on the nonelite was aridly statistical in nature; reducing the vast majority of the population to a set of numbers was hardly more enlightening than ignoring them altogether. Historians still did not know what these people thought or felt.

One way out of this dilemma was to turn to the records of legal courts, for here the voices of the nonelite can most often be heard, as witnesses, plaintiffs, and defendants. These documents have acted

as “a point of entry into the mental world of the poor.” Historians such as Le Roy Ladurie have used the documents to extract case histories, which have illuminated the attitudes of different social groups (these attitudes include, but are not confined to, attitudes toward crime and the law) and have revealed how the authorities administered justice. It has been societies that have had a developed police system and practiced **Roman law**, with its written depositions, whose court records have yielded the most data to historians. In Anglo-Saxon countries hardly any of these benefits obtain, but it has still been possible to glean information from the study of legal documents.

The extraction of case histories is not, however, the only use to which court records may be put. Historians who study preindustrial Europe have used the records to establish a series of categories of crime and to quantify indictments that were issued over a given number of years. This use of the records does yield some information about the nonelite, but this information gives us little insight into the mental lives of the nonelite. We also know that the number of indictments in preindustrial Europe bears little relation to the number of actual criminal acts, and we strongly suspect that the relationship has varied widely over time. In addition, aggregate population estimates are very shaky, which makes it difficult for historians to compare rates of crime per thousand in one decade of the preindustrial period with rates in another decade. Given these inadequacies, it is clear why the case history use of court records is to be preferred.

21. The author suggests that, before the early 1950's, most historians who studied preindustrial Europe did which of the following?
  - (A) Failed to make distinctions among members of the preindustrial European political and social elite.
  - (B) Used investigatory methods that were almost exclusively statistical in nature.
  - (C) Inaccurately estimated the influence of the preindustrial European political and social elite.
  - (D) Confined their work to a narrow range of the preindustrial European population.
  - (E) Tended to rely heavily on birth, marriage, and death records.
22. According to the passage, the case histories extracted by historians have
  - (A) scarcely illuminated the attitudes of the political and social elite
  - (B) indicated the manner in which those in power apportioned justice
  - (C) focused almost entirely on the thoughts and feelings of different social groups toward crime and the law
  - (D) been considered the first kind of historical writing that utilized the records of legal courts
  - (E) been based for the most part on the trial testimony of police and other legal authorities
23. It can be inferred from the passage that much of the early work by historians on the European nonelite of the preindustrial period might have been more illuminating if these historians had
  - (A) used different methods of statistical analysis to investigate the nonelite
  - (B) been more successful in identifying the attitudes of civil authorities, especially those who administered justice, toward the nonelite
  - (C) been able to draw on more accounts, written by contemporaries of the nonelite, that described what this nonelite thought
  - (D) relied more heavily on the personal records left by members of the European political and social elite who lived during the period in question

- (E) been more willing to base their research on the birth, marriage, and death records of the nonelite
24. The author mentions Le Roy Ladurie (line 26) in order to
- (A) give an example of a historian who has made one kind of use of court records
  - (B) cite a historian who has based case histories on the birth, marriage, and death records of the nonelite
  - (C) identify the author of the quotation cited in the previous sentence
  - (D) gain authoritative support for the view that the case history approach is the most fruitful approach to court records
  - (E) point out the first historian to realize the value of court records in illuminating the beliefs and values of the nonelite
25. According to the passage, which of the following is true of indictments for crime in Europe in the preindustrial period?
- (A) They have, in terms of their numbers, remained relatively constant over time.
  - (B) They give the historian important information about the mental lives of those indicted.
  - (C) They are not a particularly accurate indication of the extent of actual criminal activity.
  - (D) Their importance to historians of the nonelite has been generally overestimated.
  - (E) Their problematic relationship to actual crime has not been acknowledged by most historians.
26. It can be inferred from the passage that a historian who wished to compare crime rates per thousand in a European city in one decade of the fifteenth century with crime rates in another decade of that century would probably be most aided by better information about which of the following?
- (A) The causes of unrest in the city during the two decades
  - (B) The aggregate number of indictments in the city nearest to the city under investigation during the two decades
  - (C) The number of people who lived in the city during each of the decades under investigation
  - (D) The mental attitudes of criminals in the city, including their feelings about authority, during each of the decades under investigation
  - (E) The possibilities for a member of the city's nonelite to become a member of the political and social elite during the two decades
27. The passage would be most likely to appear as part of
- (A) a book review summarizing the achievements of historians of the European aristocracy
  - (B) an essay describing trends in the practice of writing history
  - (C) a textbook on the application of statistical methods in the social sciences
  - (D) a report to the historical profession on the work of early-twentieth-century historians
  - (E) an article urging the adoption of historical methods by the legal profession

Our visual perception depends on the reception of energy reflecting or radiating from that which we wish to perceive. If our eyes could receive and measure infinitely delicate sense-data, we could perceive the world with infinite precision. The natural limits of our eyes have, of course, been extended by mechanical instruments; telescopes and microscopes, for example, expand our capabilities greatly. There is, however, an ultimate limit beyond which no instrument can take us; this limit is imposed by our inability to receive sense-data smaller than those conveyed by an individual quantum of energy. Since these quanta are believed to be indivisible packages of energy and so cannot be further refined, we reach a point beyond which further resolution of the world is not possible. It is like a drawing a child might make by sticking indivisible discs of color onto a canvas.

We might think that we could avoid this limitation by using quanta with extremely long wavelengths; such quanta would be sufficiently sensitive to convey extremely delicate sense-data. And these quanta would be useful, as long as we only wanted to measure energy, but a completely accurate perception of the world will depend also on the exact measurement of the lengths and positions of what we wish to perceive. For this, quanta of extremely long wavelengths are useless. To measure a length accurately to within a millionth of an inch, we must have a measure graduated in millionths of an inch; a yardstick graduated in inches is useless. Quanta with a wavelength of one inch would be, in a sense, measures that are graduated in inches. Quanta of extremely long wavelength are useless in measuring anything except extremely large dimensions.

Despite these difficulties, quanta have important theoretical implications for physics. It used to be supposed that, in the observation of nature, the universe could be divided into two distinct parts, a perceiving subject and a perceived object. In physics, subject and object were supposed to be entirely distinct, so that a description of any part of the universe would be independent of the observer. The **quantum theory**, however, suggests otherwise, for every observation involves the passage of a complete quantum from the object to the subject, and it now appears that this passage constitutes an important coupling between observer and observed. We can no longer make a sharp division between the two in an effort to observe nature objectively. Such an attempt at objectivity would distort the crucial interrelationship of observer and observed as parts of a single whole. But, even for scientists, it is only in the world of atoms that this new development makes any appreciable difference in the explanation of observations.

17. The primary purpose of the passage is to
  - (A) discuss a problem that hinders precise perception of the world
  - (B) point out the inadequacies of accepted units of measurement
  - (C) criticize attempts to distinguish between perceiving subjects and perceived objects
  - (D) compare and contrast rival scientific hypotheses about how the world should be measured and observed
  - (E) suggest the limited function of sensory observation
18. According to the passage, quanta with an extremely long wavelength cannot be used to give complete information about the physical world because they
  - (A) exist independently of sense-data
  - (B) are graduated only in inches
  - (C) have an insignificant amount of energy
  - (D) cannot, with present-day instruments, be isolated from quanta of shorter wavelength
  - (E) provide an insufficiently precise means of measuring length and position
19. Which of the following describes a situation most analogous to the situation discussed in lines 9-13?
  - (A) A mathematician can only solve problems the solution of which can be deduced from

known axiom.

- (B) An animal can respond to no command that is more complicated syntactically than any it has previously received.
  - (C) A viewer who has not learned, at least intuitively, the conventions of painting, cannot understand perspective in a drawing.
  - (D) A sensitized film will record no detail on a scale that is smaller than the grain of the film.
  - (E) A shadow cast on a screen by an opaque object will have sharp edge only if the light source is small or very distant.
20. The author uses the analogy of the child's drawing (lines 17-19) primarily in order to
- (A) illustrate the ultimate limitation in the precision of sense-data conveyed by quanta
  - (B) show the sense of helplessness scientists feel in the face of significant observational problems
  - (C) anticipate the objections of those scientists who believe that no instrumental aid to observation is entirely reliable
  - (D) exemplify the similarities between packages of energy and varieties of color
  - (E) disparage those scientists who believe that measurement by means of quanta offers an accurate picture of the world
21. The author implies that making a sharp division between subject and object in physics is
- (A) possible in a measurement of object's length and position, but not in a measurement of its energy
  - (B) still theoretically possible in the small-scale world of atoms and electrons
  - (C) possible in the case of observations involving the passage of a complete quantum
  - (D) no longer an entirely accurate way to describe observation of the universe
  - (E) a goal at which scientists still aim
22. The author's use of the phrase "in a sense" (line 34) implies which of the following?
- (A) Quanta of extremely long wavelength are essentially graduated in inches.
  - (B) quanta of one-inch wavelength are not precisely analogous to yardsticks graduated in inches.
  - (C) Quanta of extremely long wavelength, in at least one respect, resemble quanta of shorter wavelength.
  - (D) quanta of one-inch wavelength and quanta of extremely long wavelength do not differ only in their wavelengths.
  - (E) quanta of one-inch wavelength must be measured by different standards than quanta of extremely long wavelength.
23. According to the passage, the quantum theory can be distinguished from previous theories of physics by its
- (A) insistence on scrupulously precise mathematical formulations
  - (B) understanding of the inherent interrelationship of perceiver and perceived
  - (C) recognition of the need for sophisticated instruments of measurement
  - (D) emphasis on small-scale rather than on large-scale phenomena
  - (E) regard for philosophical issues as well as for strictly scientific ones

Tillie Olsen's fiction and essays have been widely and rightly acknowledged as major contributions to American literature. Her work has been particularly valued by contemporary feminists. Yet few of Olsen's readers realize the extent to which her vision and choice of subject are rooted in an earlier literary heritage—the tradition of radical political thought, mostly socialist and anarchist, of the 1910's and 1920's, and the Old Left tradition of the 1930's. I do not mean that one can adequately explain the eloquence of her work in terms of its political origins, or that left-wing politics were the single most important influence on it. My point is that its central consciousness—its profound understanding of class and gender as shaping influences on people's lives—owes much to that earlier literary heritage, a heritage that, in general, has not been sufficiently valued by most contemporary literary critics.

24. The primary purpose of the passage is to
- (A) argue that Olsen's understanding of class and gender is her greatest gift as a writer
  - (B) acknowledge Olsen's importance as the leading spokesperson for a radical literary heritage
  - (C) point out a literary heritage to which Olsen's work is related
  - (D) urge literary critics to investigate the origins of a literary heritage
  - (E) suggest that Olsen's work has been placed in a literary heritage to which it does not belong
25. According to the author, which of the following is true of the heritage mentioned in the passage?
- (A) It emphasizes gender as the determinate influence on people's lives.
  - (B) It has been the most important influence on Olsen's work.
  - (C) It includes political traditions that span three decades of the twentieth century.
  - (D) It explains the eloquence but not the subject matter of Olsen's work.
  - (E) It reflects primarily the development of socialist political thought in the early twentieth century.
26. In the sentence "I do not ... influence on it" (lines 10-14), the author does which of the following?
- (A) Broadens an existing classification.
  - (B) Contradicts the passage's central thesis.
  - (C) Qualifies a commonly accepted point of view.
  - (D) Presents conflicting explanations for a phenomenon.
  - (E) Denies possible interpretations of an earlier assertion.
27. According to the author, Olsen's work has been
- (A) rightly acknowledged for its contribution to political thought
  - (B) thought to represent the beginning of new literary tradition
  - (C) a needed impetus for social change
  - (D) most clearly influenced by feminism
  - (E) deservedly admired by readers

## SECTION B

Currently, the paramount problem in the field of biomaterials, the science of replacing diseased tissue with human-made implants, is control over the interface, or surface, between implanted biomaterials and living tissues. The physical properties of most tissues can be matched by careful selection of raw



materials: metals, ceramics, or several varieties of polymer materials. Even the requirement that biomaterials processed from these materials be nontoxic to host tissue can be met by techniques derived from studying the reactions of tissue cultures to biomaterials or from short-term implants. But achieving necessary matches in physical properties across interfaces between living and non-living matter requires knowledge of which molecules control the bonding of cells to each other—an area that we have not yet explored thoroughly. Although recent research has allowed us to stabilize the tissue-biomaterial interface by controlling either the chemical reactions or the microstructure of the biomaterial, our fundamental understanding of how implant devices adhere to tissues remains woefully incomplete.

17. According to the passage, the major problem currently facing scientists in the field of biomaterials is
- (A) assessing and regulating the bonding between host tissue and implants
  - (B) controlling the transfer of potentially toxic materials across the interface of tissue and implant
  - (C) discovering new materials from which to construct implant devices
  - (D) deciding in what situations implants are needed
  - (E) determining the importance of short-term implants to long-term stability of tissue-implant interfaces
18. The passage suggests which of the following about the recent research mentioned in lines 19-25?
- (A) It has solved one set of problems but has created another.
  - (B) It has concentrated on secondary concerns but has ignored primary concerns.
  - (C) It has improved practical applications of biomaterial technology without providing a complete theoretical explanation of that improvement.
  - (D) It has thoroughly investigated properties of biomaterials but has paid little attention to relevant characteristics of human tissue.
  - (E) It has provided considerable information on short-term implant technology but little on long-term implant technology.
19. The author's primary purpose is to
- (A) answer a theoretical question in the field of biomaterials
  - (B) discuss the current state of technology in the field of biomaterials
  - (C) resolve a research dispute in the field of biomaterial
  - (D) predict an ethical crisis for biomaterials researchers
  - (E) suggest some practical benefits of biomaterial implants

Islamic law is a particularly instructive example of "sacred law." Islamic law is a phenomenon so different from all other forms of law—notwithstanding, of course, a considerable and inevitable number of coincidences with one or the other of them as far as subject matter and positive enactments are concerned—that its study is indispensable in order to appreciate adequately the full range of possible legal phenomena. Even the two other representatives of sacred law that are historically and geographically nearest to it, Jewish law and Roman Catholic **canon law**, are perceptibly different.

Both Jewish law and canon law are more uniform than Islamic law. Though historically there is a discernible break between Jewish law of the sovereign state of ancient Israel and of the Diaspora (the dispersion of Jewish people after the conquest of Israel), the spirit of the legal matter in later parts of the Old Testament is very close to that of the Talmud, one of the primary codifications of Jewish law in the Diaspora. Islam, on the other hand, represented a radical breakaway from the Arab paganism that preceded it; Islamic law is the result of an examination, from a religious angle, of legal subject matter



that was far from uniform, comprising as it did the various components of the laws of pre-Islamic Arabia and numerous legal elements taken over from the non-Arab peoples of the conquered territories. All this was unified by being subjected to the same kind of religious scrutiny, the impact of which varied greatly, being almost nonexistent in some fields, and in others originating novel institutions. This central duality of legal subject matter and religious norm is additional to the variety of legal, ethical, and ritual rules that is typical of sacred law.

In its relation to the secular state, Islamic law differed from both Jewish and canon law. Jewish law was buttressed by the cohesion of the community, reinforced by pressure from outside; its rules are the direct expression of this feeling of cohesion, tending toward the accommodation of dissent. Canon and Islamic law, on the contrary, were dominated by the dualism of religion and state, where the state was not, in contrast with Judaism, an alien power but the political expression of the same religion. But the conflict between state and religion took different forms; in Christianity it appeared as the struggle for political power on the part of a tightly organized ecclesiastical hierarchy, and canon law was one of its political weapons. Islamic law, on the other hand, was never supported by an organized institution; consequently, there never developed an overt trial of strength. There merely existed discordance between application of the sacred law and many of the regulations framed by Islamic states; this antagonism varied according to place and time.

20. The author's purpose in comparing Islamic law to Jewish law and canon law is most probably to
- (A) contend that traditional legal subject matter does not play a large role in Islamic law
  - (B) support his argument that Islamic law is a unique kind of legal phenomenon
  - (C) emphasize the variety of forms that can all be considered sacred law
  - (D) provide an example of how he believes comparative institutional study should be undertaken
  - (E) argue that geographical and historical proximity does not necessarily lead to parallel institutional development
21. The passage provides information to answer which of the following questions?
- (A) Does Islamic law depend on sources other than Arab legal principles?
  - (B) What secular practices of Islamic states conflicted with Islamic law?
  - (C) Are Jewish law and canon law the most typical examples of sacred law?
  - (D) Is Jewish law more uniform than canon law?
  - (E) What characterized Arab law of the pre-Islamic era?
22. According to the passage, which of the following statements about sacred law is correct?
- (A) The various systems of sacred law originated in a limited geographical area.
  - (B) The various systems of sacred law have had marked influence on one another.
  - (C) Systems of sacred law usually rely on a wide variety of precedents.
  - (D) Systems of sacred law generally contain prescriptions governing diverse aspects of human activity.
  - (E) Systems of sacred law function most effectively in communities with relatively small populations.
23. It can be inferred from the passage that the application of Islamic law in Islamic states has
- (A) systematically been opposed by groups who believe it is contrary to their interests
  - (B) suffered irreparably from the lack of firm institutional backing
  - (C) frequently been at odds with the legal activity of government institutions

- (D) remained unaffected by the political forces operating alongside it  
(E) benefited from the fact that it never experienced a direct confrontation with the state
24. Which of the following most accurately describes the organization of the passage?
- (A) A universal principle is advanced and then discussed in relation to a particular historical phenomenon.  
(B) A methodological innovation is suggested and then examples of its efficacy are provided.  
(C) A traditional interpretation is questioned and then modified to include new data.  
(D) A general opinion is expressed and then supportive illustrations are advanced.  
(E) A controversial viewpoint is presented and then both supportive evidence and contradictory evidence are cited.
25. The passage implies that the relationship of Islamic, Jewish, and canon law is correctly described by which of the following statements?
- I. Because each constitutes an example of sacred law, they necessarily share some features.  
II. They each developed in reaction to the interference of secular political institutions.  
III. The differences among them result partly from their differing emphasis on purely ethical rules.
- (A) I only  
(B) III only  
(C) I and II only  
(D) II and III only  
(E) I, II, and III
26. The passage suggests that canon law differs from Islamic law in that only canon law
- (A) contains prescriptions that nonsacred legal systems might regard as properly legal  
(B) concerns itself with the duties of a person in regard to the community as a whole  
(C) was affected by the tension of the conflict between religion and state  
(D) developed in a political environment that did not challenge its fundamental existence  
(E) played a role in the direct confrontation between institutions vying for power
27. All of the following statements about the development of Islamic law are implied in the passage EXCEPT:
- (A) Pre-Islamic legal principles were incorporated into Islamic law with widely differing degrees of change.  
(B) Diverse legal elements were joined together through the application of a purely religious criterion.  
(C) Although some of the sources of Islamic law were pagan, its integrity as a sacred law was not compromised by their incorporation.  
(D) There was a fundamental shared characteristic in all pre-Islamic legal matter taken over by Islamic law.  
(E) Although Islam emerged among the Arabs, Islamic law was influenced by ethnically diverse elements.

## SECTION A

Eight percent of the Earth's crust is aluminum, and there are hundreds of aluminum-bearing minerals and vast quantities of the rocks that contain them. The best aluminum ore is bauxite, defined as aggregates of aluminous minerals, more or less impure, in which aluminum is present as hydrated oxides. Bauxite is the richest of all those aluminous rocks that occur in large quantities, and it yields alumina, the intermediate product required for the production of aluminum. Alumina also occurs naturally as the mineral corundum, but corundum is not found in large deposits of high purity, and therefore it is an impractical source for making aluminum. Most of the many abundant nonbauxite aluminous minerals are silicates, and, like all silicate minerals, they are refractory, resistant to analysis, and extremely difficult to process. The aluminum silicates are therefore generally unsuitable alternatives to bauxite because considerably more energy is required to extract alumina from them.

17. The author implies that a mineral must either be or readily supply which of the following in order to be classified as an aluminum ore?
  - (A) An aggregate
  - (B) Bauxite
  - (C) Alumina
  - (D) Corundum
  - (E) An aluminum silicate
18. The passage supplies information for answering all of the following questions regarding aluminous minerals EXCEPT:
  - (A) What percentage of the aluminum in the Earth's crust is in the form of bauxite?
  - (B) Are aluminum-bearing nonbauxite minerals plentiful?
  - (C) Do the aluminous minerals found in bauxite contain hydrated oxides?
  - (D) Are aluminous hydrated oxides found in rocks?
  - (E) Do large quantities of bauxite exist?
19. The author implies that corundum would be used to produce aluminum if
  - (A) corundum could be found that is not contaminated by silicates
  - (B) the production of alumina could be eliminated as an intermediate step in manufacturing aluminum
  - (C) many large deposits of very high quality corundum were to be discovered
  - (D) new technologies were to make it possible to convert corundum to a silicate
  - (E) manufacturers were to realize that the world's supply of bauxite is not unlimited

Traditionally, the study of history has had fixed boundaries and focal points—periods, countries, dramatic events, and great leaders. It also has had clear and firm notions of scholarly procedure: how one inquires into a historical problem, how one presents and documents one's findings, what constitutes admissible and adequate proof.

Anyone who has followed recent historical literature can testify to the revolution that is taking place in historical studies. The currently fashionable subjects come directly from the sociology catalog: childhood, work, leisure. The new subjects are accompanied by new methods. Where history once was primarily narrative, it is now entirely analytic. The old questions "What happened?" and "How did it happen?" have given way to the question "Why did it happen?" Prominent among the methods used to answer the question "Why" is psychoanalysis, and its use has given rise to psychohistory.

Psychohistory does not merely use psychological explanations in historical contexts. Historians have always used such explanations when they were appropriate and when there was sufficient evidence for them. But this pragmatic use of psychology is not what psychohistorians intend. They are committed, not just to psychology in general, but to Freudian psychoanalysis. This commitment precludes a commitment to history as historians have always understood it. Psychohistory derives its "facts" not from history, the detailed records of events and their consequences, but from psychoanalysis of the individuals who made history, and deduces its theories not from this or that instance in their lives, but from a view of human nature that transcends history. It denies the basic criterion of historical evidence: that evidence be publicly accessible to, and therefore assessable by, all historians. And it violates the basic tenet of historical method: that historians be alert to the negative instances that would refute their theses. Psychohistorians, convinced of the absolute rightness of their own theories, are also convinced that theirs is the "deepest" explanation of any event, that other explanations fall short of the truth.

Psychohistory is not content to violate the discipline of history (in the sense of the proper mode of studying and writing about the past); it also violates the past itself. It denies to the past an integrity and will of its own, in which people acted out of a variety of motives and in which events had a multiplicity of causes and effects. It imposes upon the past the same determinism that it imposes upon the present, thus robbing people and events of their individuality and of their complexity. Instead of respecting the particularity of the past, it assimilates all events, past and present, into a single deterministic schema that is presumed to be true at all times and in all circumstances.

20. Which of the following best states the main point of the passage?
- (A) The approach of psychohistorians to historical study is currently in vogue even though it lacks the rigor and verifiability of traditional historical method.
  - (B) Traditional historians can benefit from studying the techniques and findings of psychohistorians.
  - (C) Areas of sociological study such as childhood and work are of little interest to traditional historians.
  - (D) The psychological assessment of an individual's behavior and attitudes is more informative than the details of his or her daily life.
  - (E) History is composed of unique and nonrepeating events that must be individually analyzed on the basis of publicly verifiable evidence.
21. It can be inferred from the passage that one way in which traditional history can be distinguished from psychohistory is that traditional history usually
- (A) views past events as complex and having their own individuality
  - (B) relies on a single interpretation of human behavior to explain historical events
  - (C) interprets historical events in such a way that their specific nature is transcended
  - (D) turns to psychological explanations in historical contexts to account for events
  - (E) relies strictly on data that are concrete and quantifiable
22. It can be inferred from the passage that the methods used by psychohistorians probably prevent them from
- (A) presenting their material in chronological order
  - (B) producing a one-sided picture of an individual's personality and motivations
  - (C) uncovering alternative explanations that might cause them to question their own conclusions
  - (D) offering a consistent interpretation of the impact of personality on historical events
  - (E) recognizing connections between a government's political actions and the aspirations of

government leaders

23. The passage supplies information for answering which of the following questions?
- (A) What are some specific examples of the use of psychohistory in historical interpretation?
  - (B) When were the conventions governing the practice of traditional history first established?
  - (C) When do traditional historians consider psychological explanations of historical developments appropriate?
  - (D) What sort of historical figure is best suited for psychohistorical analysis?
  - (E) What is the basic criterion of historical evidence required by traditional historians?
24. The author mentions which of the following as a characteristic of the practice of psychohistorians?
- (A) The lives of historical figures are presented in episodic rather than narrative form.
  - (B) Archives used by psychohistorians to gather material are not accessible to other scholars.
  - (C) Past and current events are all placed within the same deterministic schema.
  - (D) Events in the adult life of a historical figure are seen to be more consequential than are those in the childhood of the figure.
  - (E) Analysis is focused on group behavior rather than on particular events in an individual's life.
25. The author of the passage suggests that psychohistorians view history primarily as
- (A) a report of events, causes, and effects that is generally accepted by historians but which is, for the most part, unverifiable
  - (B) an episodic account that lacks cohesion because records of the role of childhood, work, and leisure in the lives of historical figures are rare
  - (C) an uncharted sea of seemingly unexplainable events that have meaning only when examined as discrete units
  - (D) a record of the way in which a closed set of immutable psychological laws seems to have shaped events
  - (E) a proof of the existence of intricate causal interrelationships between past and present events
26. The author of the passage puts the word "deepest" (line 44) in quotation marks most probably in order to
- (A) signal her reservations about the accuracy of psychohistorians' claims for their work
  - (B) draw attention to a contradiction in the psychohistorians' method
  - (C) emphasize the major difference between the traditional historians' method and that of psychohistorians
  - (D) disassociate her opinion of the psychohistorians' claims from her opinion of their method
  - (E) question the usefulness of psychohistorians' insights into traditional historical scholarship
27. In presenting her analysis, the author does all of the following EXCEPT:
- (A) Make general statement without reference to specific examples.

- (B) Describe some of the criteria employed by traditional historians.
- (C) Question the adequacy of the psychohistorians' interpretation of events.
- (D) Point out inconsistencies in the psychohistorians' application of their methods.
- (E) Contrast the underlying assumptions of psychohistorians with those of traditional historians.

## SECTION B

Jean Wagner's most enduring contribution to the study of Afro-American poetry is his insistence that it be analyzed in a religious, as well as secular, frame of reference. The appropriateness of such an approach may seem self-evident for a tradition commencing with spirituals and owing its early forms, rhythms, vocabulary, and evangelical fervor to Wesleyan hymnals. But before Wagner a secular outlook that analyzed Black poetry solely within the context of political and social protest was dominant in the field.

It is Wagner who first demonstrated the essential fusion of racial and religious feeling in Afro-American poetry. The two, he argued, form a symbiotic union in which religious feelings are often applied to racial issues and racial problems are often projected onto a metaphysical plane. Wagner found this most eloquently illustrated in the Black spiritual, where the desire for freedom in this world and the hope for salvation in the next are inextricably intertwined.

17. The primary purpose of the passage is to
  - (A) contrast the theories of Jean Wagner with those of other contemporary critics
  - (B) document the influence of Jean Wagner on the development of Afro-American poetry
  - (C) explain the relevance of Jean Wagner's work to the study of Afro-American religion
  - (D) indicate the importance of Jean Wagner's analysis of Afro-American poetry
  - (E) present the contributions of Jean Wagner to the study of Black spirituals
18. All of the following aspects of Afro-American poetry are referred to in the passage as having been influenced by Wesleyan hymnals EXCEPT:
  - (A) subject matter
  - (B) word choice
  - (C) rhythm
  - (D) structure
  - (E) tone
19. It can be inferred from the passage that, before Wagner, most students of Afro-American poetry did which of the following?
  - (A) Contributed appreciably to the transfer of political protest from Afro-American poetry to direct political action.
  - (B) Ignored at least some of the historical roots of Afro-American poetry.
  - (C) Analyzed fully the aspects of social protest to be found in such traditional forms of Afro-American poetry as the Black spiritual.
  - (D) Regarded as unimportant the development of fervent emotionalism in a portion of Afro-American poetry.
  - (E) Concentrated on the complex relations between the technical elements in Afro-American poetry and its political content.

Two relatively recent independent developments **stand behind** the current major research effort on

nitrogen fixation, the process by which bacteria symbiotically render leguminous plants independent of nitrogen fertilizer. The one development has been the rapid, sustained increase in the price of **nitrogen fertilizer**. The other development has been the rapid growth of knowledge of and technical sophistication in genetic engineering. Fertilizer prices, largely tied to the price of natural gas, huge amounts of which go into the manufacture of fertilizer, will continue to represent an enormous and escalating economic burden on modern agriculture, spurring the search for alternatives to synthetic fertilizers. And genetic engineering is just the sort of fundamental breakthrough that opens up prospects of wholly novel alternatives. One such novel idea is that of inserting into the chromosomes of plants discrete genes that are not a part of the plants' natural constitution: specifically, the idea of inserting into nonleguminous plants the genes, if they can be identified and isolated, that fit the leguminous plants to be hosts for nitrogen-fixing bacteria. Hence, the intensified research on legumes.

Nitrogen fixation is a process in which certain bacteria use atmospheric nitrogen gas, which green plants cannot directly utilize, to produce ammonia, a nitrogen compound plants can use. It is one of nature's great ironies that the availability of nitrogen in the soil frequently sets an upper limit on plant growth even though the plants' leaves are bathed in a sea of nitrogen gas. The leguminous plants—among them crop plants such as soybeans, peas, alfalfa, and clover—have solved the nitrogen supply problem by entering into a symbiotic relationship with the bacterial genus *Rhizobium*; **as a matter of fact**, there is a specific strain of *Rhizobium* for each species of legume. The host plant supplies the bacteria with food and a protected habitat and receives surplus ammonia in exchange. Hence, legumes can thrive in nitrogen-depleted soil.

Unfortunately, most of the major food crops—including maize, wheat, rice, and potatoes—cannot. On the contrary, many of the high-yielding hybrid varieties of these food crops bred during the Green Revolution of the 1960's were selected specifically to give high yields in response to generous applications of nitrogen fertilizer. This poses an additional, formidable challenge to plant geneticists: they must work on enhancing fixation within the existing symbioses. Unless they succeed, the yield gains of the Green Revolution will be largely lost even if the genes in legumes that equip those plants to enter into a symbiosis with nitrogen fixers are identified and isolated, and even if the transfer of those gene complexes, once they are found, becomes possible. The overall task looks forbidding, but the stakes are too high not to undertake it.

20. The primary purpose of the passage is to
- (A) expose the fragile nature of the foundations on which the high yields of modern agriculture rest
  - (B) argue that genetic engineering promises to lead to even higher yields than are achievable with synthetic fertilizers
  - (C) argue that the capacity for nitrogen-fixing symbioses is transferable to nonleguminous plants
  - (D) explain the reasons for and the objectives of current research on nitrogen-fixing symbioses
  - (E) describe the nature of the genes that regulate the symbiosis between legumes and certain bacteria
21. According to the passage, there is currently no strain of *Rhizobium* that can enter into a symbiosis with
- (A) alfalfa
  - (B) clover
  - (C) maize
  - (D) peas
  - (E) soybeans

22. The passage implies that which of the following is true of the bacterial genus *Rhizobium*?
- (A) *Rhizobium* bacteria are found primarily in nitrogen-depleted soils.
  - (B) Some strains of *Rhizobium* are not capable of entering into a symbiosis with any plant.
  - (C) Newly bred varieties of legumes cannot be hosts to any strain of *Rhizobium*.
  - (D) *Rhizobium* bacteria cannot survive outside the protected habitat provided by host plants.
  - (E) *Rhizobium* bacteria produce some ammonia for their own purposes.
23. It can be inferred from the passage that which of the following was the most influential factor in bringing about intensified research on nitrogen fixation?
- (A) The high yields of the Green Revolution
  - (B) The persistent upward surge in natural gas prices
  - (C) The variety of *Rhizobium* strains
  - (D) The mechanization of modern agriculture
  - (E) The environmental ill effects of synthetic fertilizers
24. Which of the following situations is most closely analogous to the situation described by the author as one of nature's great ironies (lines 28-32)?
- (A) That of a farmer whose crops have failed because the normal midseason rains did not materialize and no preparations for irrigation had been made
  - (B) That of a long-distance runner who loses a marathon race because of a wrong turn that cost him twenty seconds
  - (C) That of shipwrecked sailors at sea in a lifeboat, with one flask of drinking water to share among them
  - (D) That of a motorist who runs out of gas a mere five miles from the nearest gas station
  - (E) That of travelers who want to reach their destination as fast and as cheaply as possible, but find that cost increases as travel speed increases
25. According to the passage, the ultimate goal of the current research on nitrogen fixation is to develop
- (A) strains of *Rhizobium* that can enter into symbioses with existing varieties of wheat, rice, and other nonlegumes
  - (B) strains of *Rhizobium* that produce more ammonia for leguminous host plants than do any of the strains presently known
  - (C) varieties of wheat, rice, and other nonlegumes that yield as much as do existing varieties, but require less nitrogen
  - (D) varieties of wheat, rice, and other nonlegumes that maintain an adequate symbiotic relationship with nitrogen-fixing bacteria and produce high yields
  - (E) high-yielding varieties of wheat, rice, and other nonlegumes that are genetically equipped to fix nitrogen from the air without the aid of bacteria
26. The author regards the research program under discussion as
- (A) original and extensive but ill-defined as to method
  - (B) necessary and ambitious but vulnerable to failure
  - (C) cogent and worthwhile but severely under-funded
  - (D) prohibitively expensive but conceptually elegant



- (E) theoretically fascinating but practically useless
27. Most nearly parallel, in its fundamental approach, to the research program described in the passage would be a program designed to
- (A) achieve greater frost resistance in frost-tender food plants by means of selective breeding, thereby expanding those plants' area of cultivation
  - (B) achieve greater yields from food plants by interplanting crop plants that are mutually beneficial
  - (C) find inexpensive and abundant natural substances that could, without reducing yields, be substituted for expensive synthetic fertilizers
  - (D) change the genetic makeup of food plants that cannot live in water with high salinity, using genes from plants adapted to salt water
  - (E) develop, through genetic engineering, a genetic configuration for the major food plants that improves the storage characteristics of the edible portion of the plants

No. 7-3

### SECTION A

Of Homer's two epic poems, the *Odyssey* has always been more popular than the *Iliad*, perhaps because it includes more features of mythology that are accessible to readers. Its subject (to use Maynard Mack's categories) is "life-as-spectacle," for readers, diverted by its various incidents, observe its hero Odysseus primarily from without; the tragic *Iliad*, however, presents "life-as-experience": readers are asked to identify with the mind of Achilles, whose motivations render him a not particularly likable hero. In addition, the *Iliad*, more than the *Odyssey*, suggests the complexity of the gods' involvement in human actions, and to the extent that modern readers find this complexity a needless complication, the *Iliad* is less satisfying than the *Odyssey*, with its simpler scheme of divine justice. Finally, since the *Iliad* presents a historically verifiable action, Troy's siege, the poem raises historical questions that are absent from the *Odyssey's* blithely imaginative world.

17. The author uses Mack's "categories" (lines 4-5) most probably in order to
- (A) argue that the *Iliad* should replace the *Odyssey* as the more popular poem
  - (B) indicate Mack's importance as a commentator on the *Iliad* and the *Odyssey*
  - (C) suggest one way in which the *Iliad* and the *Odyssey* can be distinguished
  - (D) point out some of the difficulties faced by readers of the *Iliad* and the *Odyssey*
  - (E) demonstrate that the *Iliad* and the *Odyssey* can best be distinguished by comparing their respective heroes
18. The author suggests that the variety of incidents in the *Odyssey* is likely to deter the reader from
- (A) concentrating on the poem's mythological features
  - (B) concentrating on the psychological states of the poem's central character
  - (C) accepting the explanation that have been offered for the poem's popularity
  - (D) accepting the poem's scheme of divine justice
  - (E) accepting Maynard Mack's theory that the poem's subject is "life-as-spectacle"
19. The passage is primarily concerned with
- (A) distinguishing arguments
  - (B) applying classifications

- (C) initiating a debate
- (D) resolving a dispute
- (E) developing a contrast

20. It can be inferred from the passage that a reader of the *Iliad* is likely to have trouble identifying with the poem's hero for which of the following reasons?
- (A) The hero is eventually revealed to be unheroic.
  - (B) The hero can be observed by the reader only from without.
  - (C) The hero's psychology is not historically verifiable.
  - (D) The hero's emotions often do not seem appealing to the reader.
  - (E) The hero's emotions are not sufficiently various to engage the reader's attention.

Flatfish, such as the flounder, are among the few vertebrates that lack approximate bilateral symmetry (symmetry in which structures to the left and right of the body's midline are mirror images). Most striking among the many asymmetries evident in an adult flatfish is eye placement: before maturity one eye migrates, so that in an adult flatfish both eyes are on the same side of the head. While in most species with asymmetries virtually all adults share the same asymmetry, members of the **starry flounder** species can be either left-eyed (both eyes on the left side of head) or right-eyed. In the waters between the United States and Japan, the starry flounder populations vary from about 50 percent left-eyed off the United States West Coast, through about 70 percent left-eyed halfway between the United States and Japan, to nearly 100 percent left-eyed off the Japanese coast.

Biologists call this kind of gradual variation over a certain geographic range a "**cline**" and interpret clines as strong indications that the variation is adaptive, a response to environmental differences. For the starry flounder this interpretation implies that a geometric difference (between fish that are mirror images of one another) is adaptive, that left-eyedness in the Japanese starry flounder has been selected for, which provokes a perplexing questions: what is the **selective advantage** in having both eyes on one side rather than on the other?

The ease with which a fish can reverse the effect of the sidedness of its eye asymmetry simply by turning around has caused biologists to study internal anatomy, especially the optic nerves, for the answer. In all flatfish the optic nerves cross, so that the right optic nerve is joined to the brain's left side and vice versa. This crossing introduces an asymmetry, as one optic nerve must cross above or below the other. G. H. Parker reasoned that if, for example, a flatfish's left eye migrated when the right optic nerve was on top, there would be a twisting of nerves, which might be mechanically disadvantageous. For starry flounders, then, the left-eyed variety would be selected against, since in a starry flounder the left optic nerve is uppermost.

The problem with the above explanation is that the Japanese starry flounder population is almost exclusively left-eyed, an natural selection never promotes a purely less advantageous variation. As other explanations proved equally untenable, biologists concluded that there is no important adaptive difference between left-eyedness and right-eyedness, and that the two characteristics are genetically associated with some other adaptively significant characteristic. This situation is one commonly encountered by evolutionary biologists, who must often decide whether a characteristic is adaptive or selectively neutral. As for the left-eyed and right-eyed flatfish, their difference, however striking, appears to be an evolutionary **red herring**.

21. According to the passage, starry flounder differ from most other species of flatfish in that starry flounder
- (A) are not basically bilaterally symmetric
  - (B) do not become asymmetric until adulthood
  - (C) do not all share the same asymmetry
  - (D) have both eyes on the same side of the head

- (E) tend to cluster in only certain geographic regions
22. The author would be most likely to agree with which of the following statements about left-eyedness and right-eyedness in the starry flounder?
- I. They are adaptive variations by the starry flounder to environmental differences.
  - II. They do not seem to give obvious selective advantages to the starry flounder.
  - III. They occur in different proportions in different locations.
- (A) I only  
(B) II only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III
23. According to the passage, a possible disadvantage associated with eye migration in flatfish is that the optic nerves can
- (A) adhere to one another  
(B) detach from the eyes  
(C) cross  
(D) stretch  
(E) twist
24. Which of the following best describes the organization of the passage as a whole?
- (A) A phenomenon is described and an interpretation presented and rejected.  
(B) A generalization is made and supporting evidence is supplied and weighed.  
(C) A contradiction is noted and a resolution is suggested and then modified.  
(D) A series of observations is presented and explained in terms of the dominant theory.  
(E) A hypothesis is introduced and corroborated in the light of new evidence.
25. The passage supplies information for answering which of the following questions?
- (A) Why are Japanese starry flounder mostly left-eyed?  
(B) Why should the eye-sidedness in starry flounder be considered selectively neutral?  
(C) Why have biologists recently become interested in whether a characteristic is adaptive or selectively neutral?  
(D) How do the eyes in flatfish migrate?  
(E) How did Parker make his discoveries about the anatomy of optic nerves in flatfish?
26. Which of the following is most clearly similar to a cline as it is described in the second paragraph of the passage?
- (A) A vegetable market in which the various items are grouped according to place of origin  
(B) A wheat field in which different varieties of wheat are planted to yield a crop that will bring the maximum profit  
(C) A flower stall in which the various species of flowers are arranged according to their price  
(D) A housing development in which the length of the front struts supporting the porch of each house increases as houses are built up the hill

- (E) A national park in which the ranger stations are placed so as to be inconspicuous, and yet as easily accessible as possible
27. Which of the following phrases from the passage best expresses the author's conclusion about the meaning of the difference between left-eyed and right-eyed flatfish?
- (A) "Most striking" (line 4)  
(B) "variation is adaptive" (line 19)  
(C) "mechanically disadvantageous" (lines 37-38)  
(D) "adaptively significant" (lines 48-49)  
(E) "evolutionary red herring" (line 54)

## SECTION B

If a supernova (the explosion of a massive star) triggered star formation from dense clouds of gas and dust, and if the most massive star to be formed from the cloud evolved into a supernova and triggered a new round of star formation, and so on, then a chain of star-forming regions would result. If many such chains were created in a differentially rotating galaxy, the distribution of stars would resemble the observed distribution in a **spiral galaxy**.

This line of reasoning underlies an exciting new theory of spiral-galaxy structure. A computer simulation based on this theory has reproduced the appearance of many spiral galaxies without assuming an underlying density wave, the **hallmark** of the most widely accepted theory of the large-scale structure of spiral galaxies. That theory maintains that a density wave of spiral form sweeps through the central plane of a galaxy, compressing clouds of gas and dust, which collapse into stars that form a spiral pattern.

17. The primary purpose of the passage is to
- (A) describe what results when a supernova triggers the creation of chains of star-forming regions  
(B) propose a modification in the most widely accepted theory of spiral-galaxy structure  
(C) compare and contrast the roles of clouds of gas and dust in two theories of spiral-galaxy structure  
(D) describe a new theory of spiral-galaxy structure and contrast it with the most widely accepted theory  
(E) describe a new theory of spiral-galaxy structure and discuss a reason why it is inferior to the most widely accepted theory
18. The passage implies that, according to the new theory of spiral-galaxy structure, a spiral galaxy can be created by supernovas when the supernovas are
- (A) producing an underlying density wave  
(B) affected by a density wave of spiral form  
(C) distributed in a spiral pattern  
(D) located in the central plane of a galaxy  
(E) located in a differentially rotating galaxy
19. Which of the following, if true, would most discredit the new theory as described in the passage?
- (A) The exact mechanism by which a star becomes a supernova is not yet completely known and may even differ for different stars.

- (B) Chains of star-forming regions like those postulated in the new theory have been observed in the vicinity of dense clouds of gas and dust.
  - (C) The most massive stars formed from supernova explosions are unlikely to evolve into supernovas.
  - (D) Computer simulations of supernovas provide a poor picture of what occurs just before a supernova explosion.
  - (E) A density wave cannot compress clouds of gas and dust to a density high enough to create a star.
20. The author's attitude toward the new theory of spiral-galaxy structure can best be described as
- (A) euphoric
  - (B) enthusiastic
  - (C) concerned
  - (D) critical
  - (E) disputatious

The first mention of slavery in the statutes of the English colonies of North America does not occur until after 1660—some forty years after the importation of the first Black people. Lest we think that slavery existed in fact before it did in law, Oscar and Mary Handlin assure us that the status of Black people **down to** the 1660's was that of servants. A critique of the Handlins' interpretation of why legal slavery did not appear until the 1660's suggests that assumptions about the relation between slavery and racial prejudice should be reexamined, and that explanations for the different treatment of Black slaves in North and South America should be expanded.

The Handlins explain the appearance of legal slavery by arguing that, during the 1660's, the position of White servants was improving relative to that of Black servants. Thus, the Handlins contend, Black and White servants, heretofore treated alike, each attained a different status. There are, however, important objections to this argument. First, the Handlins cannot adequately demonstrate that the White servant's position was improving during and after the 1660's; several acts of the Maryland and Virginia legislatures indicate otherwise. Another flaw in the Handlins' interpretation is their assumption that prior to the establishment of legal slavery there was no discrimination against Black people. It is true that before the 1660's Black people were rarely called slaves. But this should not overshadow evidence from the 1630's on that points to racial discrimination without using the term slavery. Such discrimination sometimes stopped short of lifetime servitude or inherited status—the two attributes of true slavery—yet in other cases it included both. The Handlins' argument excludes the real possibility that Black people in the English colonies were never treated as the equals of White people.

This possibility has important ramifications. If from the outset Black people were discriminated against, then legal slavery should be viewed as a reflection and an extension of racial prejudice rather than, as many historians including the Handlins have argued, the cause of prejudice. In addition, the existence of discrimination before the advent of legal slavery offers a further explanation for the harsher treatment of Black slaves in North than in South America. Freyre and Tannenbaum have rightly argued that the lack of certain traditions in North America—such as a Roman conception of slavery and a Roman Catholic emphasis on equality—explains why the treatment of Black slaves was more severe there than in the Spanish and Portuguese colonies of South America. But this cannot be the whole explanation since it is merely negative, based only on a lack of something. A more compelling explanation is that the early and sometimes extreme racial discrimination in the English colonies helped determine the particular nature of the slavery that followed.

21. Which of the following statements best describes the organization of lines 1-8 of the passage?

- (A) A historical trend is sketched and an exception to that trend is cited.
  - (B) Evidence for a historical irregularity is mentioned and a generalization from that evidence is advanced.
  - (C) A paradox about the origins of an institution is pointed out and the author's explanation of the paradox is expounded.
  - (D) A statement about a historical phenomenon is offered and a possible misinterpretation of that statement is addressed.
  - (E) An interpretation of the rise of an institution is stated and evidence for that interpretation is provided.
22. Which of the following is the most logical inference to be drawn from the passage about the effects of "several acts of the Maryland and Virginia legislatures" (lines 22-23) passed during and after the 1660's?
- (A) The acts negatively affected the pre-1660's position of Black as well as of White servants.
  - (B) The acts had the effect of impairing rather than improving the position of White servants relative to what it had been before the 1660's.
  - (C) The acts had a different effect on the position of White servants than did many of the acts passed during this time by the legislatures of other colonies.
  - (D) The acts, at the very least, caused the position of White servants to remain no better than it had been before the 1660's.
  - (E) The acts, at the very least, tended to reflect the attitudes toward Black servants that already existed before the 1660's.
23. With which of the following statements regarding the status of Black people in the English colonies of North America before the 1660's would the author be LEAST likely to agree?
- (A) Although Black people were not legally considered to be slaves, they were often called slaves.
  - (B) Although subject to some discrimination, Black people had a higher legal status than they did after the 1660's.
  - (C) Although sometimes subject to lifetime servitude, Black people were not legally considered to be slaves.
  - (D) Although often not treated the same as White people, Black people, like many White people, possessed the legal status of servants.
  - (E) Although apparently subject to more discrimination after 1630 than before 1630, Black people from 1620 to the 1660's were legally considered to be servants.
24. According to the passage, the Handlins have argued which of the following about the relationship between racial prejudice and the institution of legal slavery in the English colonies of North America?
- (A) Racial prejudice and the institution of slavery arose simultaneously.
  - (B) Racial prejudice most often took the form of the imposition of inherited status, one of the attributes of slavery.
  - (C) The source of racial prejudice was the institution of slavery.
  - (D) Because of the influence of the Roman Catholic church, racial prejudice sometimes did

not result in slavery.

- (E) Although existing in a lesser form before the 1660's, racial prejudice increased sharply after slavery was legalized.
25. The passage suggests that the existence of a Roman conception of slavery in Spanish and Portuguese colonies had the effect of
- (A) extending rather than causing racial prejudice in these colonies
  - (B) hastening the legalization of slavery in these colonies
  - (C) mitigating some of the conditions of slavery for Black people in these colonies
  - (D) delaying the introduction of slavery into the English colonies
  - (E) bringing about an improvement in the treatment of Black slaves in the English colonies
26. The author considers the explanation put forward by Freyre and Tannenbaum for the treatment accorded Black slaves in the English colonies of North America to be
- (A) ambitious but misguided
  - (B) valid but limited
  - (C) popular but suspect
  - (D) anachronistic and controversial
  - (E) premature and illogical
27. With which of the following statements regarding the reason for the introduction of legal slavery in the English colonies of North America would the author be most likely to agree?
- (A) The introduction is partly to be explained by reference to the origins of slavery, before the 1660's, in the Spanish and Portuguese colonies.
  - (B) The introduction is to be explained by reference to a growing consensus beginning in the 1630's about what were the attributes of true slavery.
  - (C) The introduction is more likely to be explained by reference to a decline than to an improvement in the position of White servants in the colonies during and after the 1660's.
  - (D) The introduction is more likely to be explained by reference to the position of Black servants in the colonies in the 1630's than by reference to their position in the 1640's and 1650's.
  - (E) The introduction is more likely to be explained by reference to the history of Black people in the colonies before 1660 than by reference to the improving position of White servants during and after the 1660's.

## No. 8-1

### SECTION A

Geologists have long known that the Earth's mantle is heterogeneous, but its spatial arrangement remains unresolved—is the mantle essentially layered or irregularly heterogeneous? The best evidence for the layered mantle thesis is the well-established fact that volcanic rocks found on oceanic islands, islands believed to result from mantle **plumes** arising from the lower mantle, are composed of material fundamentally different from that of the midocean ridge system, whose source, most geologists contend, is the upper mantle.

Some geologists, however, on the basis of observations concerning mantle xenoliths, argue that the mantle is not layered, but that heterogeneity is created by fluids rich in "incompatible elements"

(elements tending toward liquid rather than solid state) percolating upward and transforming portions of the upper mantle irregularly, according to the vagaries of the fluids' pathways. We believe, perhaps unimaginatively, that this debate can be resolved through further study, and that the underexplored midocean ridge system is the key.

17. Which of the following best expresses the main idea of the passage?
- (A) Current theories regarding the structure of the Earth's mantle cannot account for new discoveries regarding the composition of mantle xenoliths.
  - (B) There are conflicting hypotheses about the heterogeneity of the Earth's mantle because few mantle elements have been thoroughly studied.
  - (C) Further research is needed to resolve the debate among geologists over the composition of the midocean ridge system.
  - (D) There is clear-cut disagreement within the geological community over the structure of the Earth's mantle.
  - (E) There has recently been a strong and exciting challenge to geologists' long-standing belief in the heterogeneity of the Earth's mantle.
18. According to the passage, it is believed that oceanic islands are formed from
- (A) the same material as mantle xenoliths
  - (B) the same material as the midocean ridge system
  - (C) volcanic rocks from the upper mantle
  - (D) incompatible elements percolating up from the lower mantle
  - (E) mantle plumes arising from the lower mantle
19. It can be inferred from the passage that the supporters of the "layered-mantle" theory believe which of the following?
- I. The volcanic rocks on oceanic islands are composed of material derived from the lower part of the mantle.
  - II. The materials of which volcanic rocks on oceanic islands and midocean ridges are composed are typical of the layers from which they are thought to originate.
  - III. The differences in composition between volcanic rocks on oceanic islands and the midocean ridges are a result of different concentrations of incompatible elements.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
20. The authors suggest that their proposal for determining the nature of the mantle's heterogeneity might be considered by many to be
- (A) pedestrian
  - (B) controversial
  - (C) unrealistic
  - (D) novel
  - (E) paradoxical



Many literary detectives have **pored over** a great puzzle concerning the writer Marcel Proust: what happened in 1909? How did *Contre Saint-Beuve*, an essay attacking the methods of the critic Saint Beuve, turn into the start of the novel *Remembrance of Things Past*? A recently published letter from Proust to the editor Vallette confirms that Fallois, the editor of the 1954 edition of *Contre Saint-Beuve*, made an essentially correct guess about the relationship of the essay to the novel. Fallois proposed that Proust had tried to begin a novel in 1908, abandoned it for what was to be a long demonstration of Saint-Beuve's blindness to the real nature of great writing, found the essay giving rise to personal memories and fictional developments, and allowed these to take over in a steadily developing novel.

Draft passages in Proust's 1909 notebooks indicate that the transition from essay to novel began in *Contre Saint-Beuve*, when Proust introduced several examples to show the powerful influence that involuntary memory exerts over the creative imagination. In effect, in trying to demonstrate that the imagination is more profound and less submissive to the intellect than Saint-Beuve assumed, Proust elicited vital memories of his own and, finding subtle connections between them, began to amass the material for *Remembrance*. By August, Proust was writing to Vallette, informing him of his intention to develop the material as a novel. Maurice Bardeche, in *Marcel Proust, romancier*, has shown the importance in the drafts of *Remembrance* of spontaneous and apparently random associations of Proust's subconscious. As incidents and reflections occurred to Proust, he continually inserted new passages altering and expanding his narrative. But he found it difficult to control the drift of his inspiration. The very richness and complexity of the meaningful relationships that kept presenting and rearranging themselves on all levels, from abstract intelligence to profound dreamy feelings, made it difficult for Proust to set them out coherently. The beginning of control came when he saw how to connect the beginning and the end of his novel.

Intrigued by Proust's claim that he had "begun and finished" *Remembrance* at the same time, Henri Bonnet discovered that parts of *Remembrance's* last book were actually started in 1909. Already in that year, Proust had drafted descriptions of his novel's characters in their old age that would appear in the final book of *Remembrance*, where the permanence of art is set against the ravages of time. The letter to Vallette, drafts of the essay and novel, and Bonnet's researches establish in broad outline the process by which Proust generated his novel out of the ruins of his essay. But those of us who hoped, with Kolb, that Kolb's newly published complete edition of Proust's correspondence for 1909 would document the process in greater detail are disappointed. For until Proust was confident that he was at last in sight of a viable structure for *Remembrance*, he told few correspondents that he was producing anything more ambitious than *Contre Saint-Beuve*.

21. The passage is primarily concerned with
  - (A) the role of involuntary memory in Proust's writing
  - (B) evidence concerning the genesis of Proust's novel *Remembrance of Things Past*
  - (C) conflicting scholarly opinions about the value of studying the drafts of *Remembrance of Things Past*
  - (D) Proust's correspondence and what it reveals about *Remembrance of Things Past*
  - (E) the influence of Saint-Beuve's criticism on Proust's novel *Remembrance of Things Past*
22. It can be inferred from the passage that all of the following are literary detectives who have tried, by means of either scholarship or criticism, to help solve the "great puzzle" mentioned in lines 1-2 EXCEPT:
  - (A) Bardeche
  - (B) Bonnet
  - (C) Fallois
  - (D) Kolb
  - (E) Vallette

23. According to the passage, in drafts of *Contre Saint Beuve* Proust set out to show that Saint-Beuve made which of the following mistakes as a critic?
- I. Saint-Beuve made no effort to study the development of a novel through its drafts and revisions.
  - II. Saint-Beuve assigned too great a role in the creative process to a writer's conscious intellect.
  - III. Saint-Beuve concentrated too much on plots and not enough on imagery and other elements of style.
- (A) II only  
(B) III only  
(C) I and II only  
(D) I and III only  
(E) I, II, and III
24. Which of the following best states the author's attitude toward the information that scholars have gathered about Proust's writing in 1909?
- (A) The author is disappointed that no new documents have come to light since Fallois's speculations.
- (B) The author is dissatisfied because there are too many gaps and inconsistencies in the drafts.
- (C) The author is confident that Fallois's 1954 guess has been proved largely correct, but regrets that still more detailed documentation concerning Proust's transition from the essay to the novel has not emerged.
- (D) The author is satisfied that Fallois's judgment was largely correct, but feels that Proust's early work in designing and writing the novel was probably far more deliberate than Fallois's description of the process would suggest.
- (E) The author is satisfied that the facts of Proust's life in 1909 have been thoroughly established, but believes such documents as drafts and correspondence are only of limited value in a critical assessment of Proust's writing.
25. The author of the passage implies that which of the following would be the LEAST useful source of information about Proust's transition from working on *Contre Saint-Beuve* to having a viable structure for *Remembrance of Things Past*?
- (A) Fallois's comments in the 1954 edition of *Contre Saint-Beuve*
- (B) Proust's 1909 notebooks, including the drafts of *Remembrance of Things Past*
- (C) Proust's 1909 correspondence, excluding the letter to Vallette
- (D) Bardeche's Marcel Proust, romancier
- (E) Bonnet's researches concerning Proust's drafts of the final book of *Remembrance of Things Past*
26. The passage offers information to answer which of the following questions?
- (A) Precisely when in 1909 did Proust decide to abandon *Contre Saint-Beuve*?
- (B) Precisely when in 1909 did Proust decide to connect the beginning and the end of *Remembrance of Things Past*?

- (C) What was the subject of the novel that Proust attempted in 1908?
  - (D) What specific criticisms of Saint-Beuve appear, in fictional form, in *Remembrance of Things Past*?
  - (E) What is a theme concerning art that appears in the final book of *Remembrance of Things Past*?
27. Which of the following best describes the relationship between *Contre Saint-Beuve* and *Remembrance of Things Past* as it is explained in the passage?
- (A) Immediately after abandoning *Contre Saint-Beuve*, at Vallette's suggestion, Proust started *Remembrance* as a fictional demonstration that Saint-Beuve was wrong about the imagination.
  - (B) Immediately after abandoning *Contre Saint-Beuve*, at Vallette's suggestion, Proust turned his attention to *Remembrance*, starting with incidents that had occurred to him while planning the essay.
  - (C) Despondent that he could not find a coherent structure for *Contre Saint-Beuve*, an essay about the role of memory in fiction, Proust began instead to write *Remembrance*, a novel devoted to important early memories.
  - (D) While developing his argument about the imagination in *Contre Saint-Beuve*, Proust described and began to link together personal memories that became a foundation for *Remembrance*.
  - (E) While developing his argument about memory and imagination in *Contre Saint-Beuve*, Proust created fictional characters to embody the abstract themes in his essay.

## SECTION B

Traditional research has confronted only Mexican and United States interpretations of Mexican-American culture. Now we must also examine the culture as we Mexican Americans have experienced it, passing from a sovereign people to compatriots with newly arriving settlers to, finally, a conquered people—a **charter** minority on our own land.

When the Spanish first came to Mexico, they intermarried with and absorbed the culture of the indigenous Indians. This policy of colonization through acculturation was continued when Mexico acquired Texas in the early 1800's and brought the indigenous Indians into Mexican life and government. In the 1820's, United States citizens migrated to Texas, attracted by land suitable for cotton. As their numbers became more substantial, their policy of acquiring land by subduing native populations began to dominate. The two ideologies clashed repeatedly, culminating in a military conflict that led to victory for the United States. Thus, suddenly deprived of our parent culture, we had to evolve uniquely Mexican-American modes of thought and action in order to survive.

17. The author's purpose in writing this passage is primarily to
- (A) suggest the motives behind Mexican and United States intervention in Texas
  - (B) document certain early objectives of Mexican-American society
  - (C) provide a historical perspective for a new analysis of Mexican-American culture
  - (D) appeal to both Mexican and United States scholars to give greater consideration to economic interpretations of history
  - (E) bring to light previously overlooked research on Mexican Americans
18. The author most probably uses the phrase "charter minority" (lines 6-7) to reinforce the idea that Mexican Americans

- (A) are a native rather than an immigrant group in the United States
  - (B) played an active political role when Texas first became part of the United States
  - (C) recognized very early in the nineteenth century the need for official confirmation of their rights of citizenship
  - (D) have been misunderstood by scholars trying to interpret their culture
  - (E) identify more closely with their Indian heritage than with their Spanish heritage
19. According to the passage, a major difference between the colonization policy of the United States and that of Mexico in Texas in the 1800's was the
- (A) degree to which policies were based on tradition
  - (B) form of economic interdependency between different cultural groups
  - (C) number of people who came to settle new areas
  - (D) treatment of the native inhabitants
  - (E) relationship between the military and the settlers
20. Which of the following statements most clearly contradicts the information in this passage?
- (A) In the early 1800's, the Spanish committed more resources to settling California than to developing Texas.
  - (B) While Texas was under Mexican control, the population of Texas quadrupled, in spite of the fact that Mexico discouraged immigration from the United States.
  - (C) By the time Mexico acquired Texas, many Indians had already married people of Spanish heritage.
  - (D) Many Mexicans living in Texas returned to Mexico after Texas was annexed by the United States.
  - (E) Most Indians living in Texas resisted Spanish acculturation and were either killed or enslaved.

This passage was adapted from an article published in 1982.

Until about five years ago, the very idea that peptide hormones might be made anywhere in the brain besides the hypothalamus was astounding. Peptide hormones, scientists thought, were made by endocrine glands and the hypothalamus was thought to be the brains' only endocrine gland. What is more, because peptide hormones cannot cross the blood-brain barrier, researchers believed that they never got to any part of the brain other than the hypothalamus, where they were simply produced and then released into the bloodstream.

But these beliefs about peptide hormones were questioned as laboratory after laboratory found that antisera to peptide hormones, when injected into the brain, bind in places other than the hypothalamus, indicating that either the hormones or substances that cross-react with the antisera are present. The immunological method of detecting peptide hormones by means of antisera, however, is imprecise. Cross-reactions are possible and this method cannot determine whether the substances detected by the antisera really are the hormones, or merely close relatives. Furthermore, this method cannot be used to determine the location in the body where the detected substances are actually produced.

New techniques of molecular biology, however, provide a way to answer these questions. It is possible to make specific complementary DNA's (cDNA's) that can serve as molecular probes to seek out the messenger RNA's (mRNA's) of the peptide hormones. If brain cells are making the hormones, the cells will contain these mRNA's. If the products the brain cells make resemble the hormones but are not identical to them, then the cDNA's should still bind to these mRNA's, but should not bind as tightly as they would to mRNA's for the true hormones. The cells containing these mRNA's can then be isolated and their

mRNA's decoded to determine just what their protein products are and how closely the products resemble the true peptide hormones.

The molecular approach to detecting peptide hormones using cDNA probes should also be much faster than the immunological method because it can take years of tedious purifications to isolate peptide hormones and then develop antiserums to them. Roberts, expressing the sentiment of many researchers, states: "I was trained as an endocrinologist. But it became clear to me that the field of endocrinology needed molecular biology input. The process of grinding out protein purifications is just too slow."

If, as the initial tests with cDNA probes suggest, peptide hormones really are made in the brain in areas other than the hypothalamus, a theory must be developed that explains their function in the brain. Some have suggested that the hormones are all growth regulators, but Rosen's work on rat brains indicates that this cannot be true. A number of other researchers propose that they might be used for intercellular communication in the brain.

21. Which of the following titles best summarizes the passage?
  - (A) Is Molecular Biology the Key to Understanding Intercellular Communication in the Brain?
  - (B) Molecular Biology: Can Researchers Exploit Its Techniques to Synthesize Peptide Hormones?
  - (C) The Advantages and Disadvantages of the Immunological Approach to Detecting Peptide Hormones
  - (D) Peptide Hormones: How Scientists Are Attempting to Solve Problems of Their Detection and to Understand Their Function
  - (E) Peptide Hormones: The Role Played by Messenger RNA's in Their Detection
22. The passage suggests that a substance detected in the brain by use of antiserums to peptide hormones may
  - (A) have been stored in the brain for a long period of time
  - (B) play no role in the functioning of the brain
  - (C) have been produced in some part of the body other than the brain
  - (D) have escaped detection by molecular methods
  - (E) play an important role in the functioning of the hypothalamus
23. According to the passage, confirmation of the belief that peptide hormones are made in the brain in areas other than the hypothalamus would force scientists to
  - (A) reject the theory that peptide hormones are made by endocrine glands
  - (B) revise their beliefs about the ability of antiserums to detect peptide hormones
  - (C) invent techniques that would allow them to locate accurately brain cells that produce peptide hormones
  - (D) search for techniques that would enable them to distinguish peptide hormones from their close relatives
  - (E) develop a theory that explains the role played by peptide hormones in the brain
24. Which of the following is mentioned in the passage as a drawback of the immunological method of detecting peptide hormones?
  - (A) It cannot be used to detect the presence of growth regulators in the brain.
  - (B) It cannot distinguish between the peptide hormones and substances that are very similar to them.

- (C) It uses antiserums that are unable to cross the blood-brain barrier.
  - (D) It involves a purification process that requires extensive training in endocrinology.
  - (E) It involves injecting foreign substances directly into the bloodstream.
25. The passage implies that, in doing research on rat brains, Rosen discovered that
- (A) peptide hormones are used for intercellular communication
  - (B) complementary DNA's do not bind to cells producing peptide hormones
  - (C) products closely resembling peptide hormones are not identical to peptide hormones
  - (D) some peptide hormones do not function as growth regulators
  - (E) antiserums cross-react with substances that are not peptide hormones
26. Which of the following is a way in which the immunological method of detecting peptide hormones differs from the molecular method?
- (A) The immunological method uses substances that react with products of hormone-producing cells, whereas the molecular method uses substances that react with a specific component of the cells themselves.
  - (B) The immunological method has produced results consistent with long-held beliefs about peptide hormones, whereas the molecular method has produced results that upset these beliefs.
  - (C) The immunological method requires a great deal of expertise, whereas the molecular method has been used successfully by nonspecialists.
  - (D) The immunological method can only be used to test for the presence of peptide hormones within the hypothalamus, whereas the molecular method can be used throughout the brain.
  - (E) The immunological method uses probes that can only bind with peptide hormones, whereas the molecular method uses probes that bind with peptide hormones and substances similar to them.
27. The idea that the field of endocrinology can gain from developments in molecular biology is regarded by Roberts with
- (A) incredulity
  - (B) derision
  - (C) indifference
  - (D) pride
  - (E) enthusiasm

## No. 8-2

### SECTION A

Ragtime is a musical form that synthesizes folk melodies and musical techniques into a brief quadrille-like structure, designed to be played—exactly as written—on the piano. A strong analogy exists between European composers like Ralph Vaughan Williams, Edvard Grieg, and Anton Dvorak who combined folk tunes and their own original materials in larger compositions and the pioneer ragtime composers in the United States. Composers like Scott Joplin and James Scott were in a sense collectors or musicologists, collecting dance and folk music in Black communities and consciously shaping it into brief suites or anthologies called piano rags.

It has sometimes been charged that ragtime is mechanical. For instance, Wilfred Mellers comments, "rags were transferred to the pianola roll and, even if not played by a machine, should be played like a machine, with meticulous precision." However, there is no reason to assume that ragtime is inherently mechanical simply because commercial manufacturers applied a mechanical recording method to ragtime, the only way to record pianos at that date. Ragtime's is not a mechanical precision, and it is not precision limited to the style of performance. It arises from ragtime's following a well-defined form and obeying simple rules within that form.

The classic formula for the piano rag disposes three to five themes in sixteen-bar strains, often organized with repeats. The rag opens with a bright, memorable strain or theme, followed by a similar theme, leading to a trio of marked lyrical character, with the structure concluded by a lyrical strain that parallels the rhythmic developments of the earlier themes. The aim of the structure is to rise from one theme to another in a stair-step manner, ending on a note of triumph or exhilaration. Typically, each strain is divided into two 8-bar segments that are essentially alike, so the rhythmic-melodic unit of ragtime is only eight bars of 2/4 measure. Therefore, themes must be brief with clear, sharp melodic figures. Not concerned with development of musical themes, the ragtime composer instead sets a theme down intact, in finished form, and links it to various related themes. Tension in ragtime compositions arises from a polarity between two basic ingredients: a continuous bass—called by jazz musicians a boom-chick bass—in the pianist's left hand, and its melodic, syncopated counterpart in the right hand.

Ragtime remains distinct from jazz both as an instrumental style and as a genre. Ragtime style stresses a pattern of repeated rhythms, not the constant inventions and variations of jazz. As a genre, ragtime requires strict attention to structure, not inventiveness or virtuosity. It exists as a tradition, a set of conventions, a body of written scores, separate from the individual players associated with it. In this sense ragtime is more akin to folk music of the nineteenth century than to jazz.

17. Which of the following best describes the main purpose of the passage?
  - (A) To contrast ragtime music and jazz
  - (B) To acknowledge and counter significant adverse criticisms of ragtime music
  - (C) To define ragtime music as an art form and describe its structural characteristics
  - (D) To review the history of ragtime music and analyze ragtime's effect on listeners
  - (E) To explore the similarities between ragtime music and certain European musical compositions
18. According to the passage, each of the following is a characteristic of ragtime compositions that follow the classic ragtime formula EXCEPT:
  - (A) syncopation
  - (B) well-defined melodic figures
  - (C) rising rhythmic-melodic intensity
  - (D) full development of musical themes
  - (E) a bass line distinct from the melodic line
19. According to the passage, Ralph Vaughan Williams, Anton Dvorak, and Scott Joplin are similar in that they all
  - (A) conducted research into musicological history
  - (B) wrote original compositions based on folk tunes
  - (C) collected and recorded abbreviated piano suites
  - (D) created intricate sonata-like musical structures
  - (E) explored the relations between Black music and continental folk music
20. The author rejects the argument that ragtime is a mechanical music because that argument

- (A) overlooks the precision required of the ragtime player
  - (B) does not accurately describe the sound of ragtime pianola music
  - (C) confuses the means of recording and the essential character of the music
  - (D) exaggerates the influence of the performance style of professional ragtime players on the reputation of the genre
  - (E) improperly identifies commercial ragtime music with the subtler classic ragtime style
21. It can be inferred that the author of the passage believes that the most important feature of ragtime music is its
- (A) commercial success
  - (B) formal structure
  - (C) emotional range
  - (D) improvisational opportunities
  - (E) role as a forerunner of jazz
22. It can be inferred from the passage that the essential nature of ragtime has been obscured by commentaries based on
- (A) the way ragtime music was first recorded
  - (B) interpretations of ragtime by jazz musicians
  - (C) the dance fashions that were contemporary with ragtime
  - (D) early reviewers' accounts of characteristic structure
  - (E) the musical sources used by Scott Joplin and James Scott
23. Which of the following is most nearly analogous in source and artistic character to a ragtime composition as described in the passage?
- (A) Symphonic music derived from complex jazz motifs
  - (B) An experimental novel based on well-known cartoon characters
  - (C) A dramatic production in which actors invent scenes and improvise lines
  - (D) A ballet whose disciplined choreography is based on folk-dance steps
  - (E) A painting whose abstract shapes evoke familiar objects in a natural landscape

Echolocating bats emit sounds in patterns—characteristic of each species—that contain both frequency-modulated (FM) and constant-frequency (CF) signals. The broadband FM signals and the narrowband CF signals travel out to a target, reflect from it, and return to the hunting bat. In this process of transmission and reflection, the sounds are changed, and the changes in the echoes enable the bat to perceive features of the target.

The FM signals report information about target characteristics that modify the timing and the fine frequency structure, or spectrum, of echoes—for example, the target's size, shape, texture, surface structure, and direction in space. Because of their narrow bandwidth, CF signals portray only the target's presence and, in the case of some bat species, its motion relative to the bat's. Responding to changes in the CF echo's frequency, bats of some species correct in flight for the direction and velocity of their moving prey.

24. According to the passage, the information provided to the bat by CF echoes differs from that provided by FM echoes in which of the following ways?
- (A) Only CF echoes alert the bat to moving targets.
  - (B) Only CF echoes identify the range of widely spaced targets.



- (C) Only CF echoes report the target's presence to the bat.
  - (D) In some species, CF echoes enable the bat to judge whether it is closing in on its target.
  - (E) In some species, CF echoes enable the bat to discriminate the size of its target and the direction in which the target is moving.
25. According to the passage, the configuration of the target is reported to the echolocating bat by changes in the
- (A) echo spectrum of CF signals
  - (B) echo spectrum of FM signals
  - (C) direction and velocity of the FM echoes
  - (D) delay between transmission and reflection of the CF signals
  - (E) relative frequencies of the FM and the CF echoes
26. The author presents the information concerning bat sonar in a manner that could be best described as
- (A) argumentative
  - (B) commendatory
  - (C) critical
  - (D) disbelieving
  - (E) objective
27. Which of the following best describes the organization of the passage?
- (A) A fact is stated, a process is outlined, and specific details of the process are described.
  - (B) A fact is stated, and examples suggesting that a distinction needs correction are considered.
  - (C) A fact is stated, a theory is presented to explain that fact, and additional facts are introduced to validate the theory.
  - (D) A fact is stated, and two theories are compared in light of their explanations of this fact.
  - (E) A fact is stated, a process is described, and examples of still another process are illustrated in detail.

## SECTION B

The social sciences are less likely than other intellectual enterprises to **get credit** for their accomplishments. Arguably, this is so because the theories and conceptual constructs of the social sciences are especially accessible: human intelligence apprehends truths about human affairs with particular facility. And the discoveries of the social sciences, once isolated and labeled, are quickly absorbed into conventional wisdom, **whereupon** they lose their distinctiveness as scientific advances.

This underappreciation of the social sciences contrasts oddly with what many see as their overutilization. Game theory is **pressed into service** in studies of shifting international alliances. Evaluation research is called upon to demonstrate successes or failures of social programs. Models from economics and demography become the definitive tools for examining the financial base of social security. Yet this rush into practical applications is itself quite understandable: public policy must continually be made, and policymakers rightly feel that even tentative findings and untested theories are better guides to decision-making than no findings and no theories at all.

17. The author is primarily concerned with
- (A) advocating a more modest view, and less widespread utilization, of the social sciences

- (B) analyzing the mechanisms for translating discoveries into applications in the social sciences
  - (C) dissolving the air of paradox inherent in human beings studying themselves
  - (D) explaining a peculiar dilemma that the social sciences are in
  - (E) maintaining a strict separation between pure and applied social science
18. Which of the following is a social science discipline that the author mentions as being possibly overutilized?
- (A) Conventional theories of social change
  - (B) Game theory
  - (C) Decision-making theory
  - (D) Economic theories of international alliances
  - (E) Systems analysis
19. It can be inferred from the passage that, when speaking of the “overutilization” (line 11) of the social sciences, the author is referring to the
- (A) premature practical application of social science advances
  - (B) habitual reliance on the social sciences even where common sense would serve equally well
  - (C) practice of bringing a greater variety of social science disciplines to bear on a problem than the nature of the problem warrants
  - (D) use of social science constructs by people who do not fully understand them
  - (E) tendency on the part of social scientists to recast everyday truths in social science jargon
20. The author confronts the claim that the social sciences are being overutilized with
- (A) proof that overextensions of social science results are self-correcting
  - (B) evidence that some public policy is made without any recourse to social science findings or theories
  - (C) a long list of social science applications that are perfectly appropriate and extremely fruitful
  - (D) the argument that overutilization is by and large the exception rather than the rule
  - (E) the observation that this practice represents the lesser of two evils under existing circumstances

The term “Ice Age” may give a wrong impression. The epoch that geologists know as the Pleistocene and that spanned the 1.5 to 2.0 million years prior to the current geologic epoch was not one long continuous glaciation, but a period of oscillating climate with ice advances punctuated by times of interglacial climate not very different from the climate experienced now. Ice sheets that derived from an ice cap centered on northern Scandinavia reached southward to Central Europe. And Beyond the margins of the ice sheets, climatic oscillations affected most of the rest of the world; for example, in the deserts, periods of wetter conditions (pluvials) contrasted with drier, interpluvial periods. Although the time involved is so short, about 0.04 percent of the total age of the Earth, the amount of attention devoted to the Pleistocene has been incredibly large, probably because of its immediacy, and because the epoch largely coincides with the appearance on Earth of humans and their immediate ancestors.

There is no reliable way of dating much of the Ice Age. Geological dates are usually obtained by using the rates of decay of various radioactive elements found in minerals. Some of these rates are suitable for very old rocks but involve increasing errors when used for young rocks; others are suitable for

very young rocks and errors increase rapidly in older rocks. Most of the Ice Age spans a period of time for which no element has an appropriate decay rate.

Nevertheless, researchers of the Pleistocene epoch have developed **all sorts of** more or less fanciful model schemes of how they would have arranged the Ice Age had they been in charge of events. For example, an early classification of Alpine glaciation suggested the existence there of four glaciations, named the Gunz, Mindel, Riss, and Wurm. This succession was based primarily on a series of deposits and events not directly related to glacial and interglacial periods, rather than on the more usual modern method of studying biological remains found in interglacial beds themselves interstratified within glacial deposits. Yet this succession was forced willy-nilly onto the glaciated parts of Northern Europe, where there are partial successions of true glacial ground moraines and interglacial deposits, with hopes of ultimately piecing them together to provide a complete Pleistocene succession. Eradication of the Alpine nomenclature is still proving a **Herculean task**.

There is no conclusive evidence about the relative length, complexity, and temperatures of the various glacial and interglacial periods. We do not know whether we live in a postglacial period or an interglacial period. The chill truth seems to be that we are already past the optimum climate of postglacial time. Studies of certain fossil distributions and of the pollen of certain temperate plants suggest decreases of a degree or two in both summer and winter temperatures and, therefore, that we may be in the declining climatic phase leading to glaciation and extinction.

21. In the passage, the author is primarily concerned with
  - (A) searching for an accurate method of dating the Pleistocene epoch
  - (B) discussing problems involved in providing an accurate picture of the Pleistocene epoch
  - (C) declaring opposition to the use of the term “Ice Age” for the Pleistocene epoch
  - (D) criticizing fanciful schemes about what happened in the Pleistocene epoch
  - (E) refuting the idea that there is no way to tell if we are now living in an Ice Age
22. The “wrong impression” (line 1) to which the author refers is the idea that the
  - (A) climate of the Pleistocene epoch was not very different from the climate we are now experiencing
  - (B) climate of the Pleistocene epoch was composed of periods of violent storms
  - (C) Pleistocene epoch consisted of very wet, cold periods mixed with very dry, hot periods
  - (D) Pleistocene epoch comprised one period of continuous glaciation during which Northern Europe was covered with ice sheets
  - (E) Pleistocene epoch had no long periods during which much of the Earth was covered by ice
23. According to the passage, one of the reasons for the deficiencies of the “early classification of Alpine glaciation” (lines 32-33) is that it was
  - (A) derived from evidence that was only tangentially related to times of actual glaciation
  - (B) based primarily on fossil remains rather than on actual living organisms
  - (C) an abstract, imaginative scheme of how the period might have been structured
  - (D) based on unmethodical examinations of randomly chosen glacial biological remains
  - (E) derived from evidence that had been haphazardly gathered from glacial deposits and inaccurately evaluated
24. Which of the following does the passage imply about the “early classification of Alpine glaciation” (lines 32-33)?
  - (A) It should not have been applied as widely as it was.

- (B) It represents the best possible scientific practice, given the tools available at the time.
  - (C) It was a valuable tool, in its time, for measuring the length of the four periods of glaciation.
  - (D) It could be useful, but only as a general guide to the events of the Pleistocene epoch.
  - (E) It does not shed any light on the methods used at the time for investigating periods of glaciation.
25. It can be inferred from the passage that an important result of producing an accurate chronology of events of the Pleistocene epoch would be a
- (A) clearer idea of the origin of the Earth
  - (B) clearer picture of the Earth during the time that humans developed
  - (C) clearer understanding of the reasons for the existence of deserts
  - (D) more detailed understanding of how radioactive dating of minerals works
  - (E) firmer understanding of how the northern polar ice cap developed
26. The author refers to deserts primarily in order to
- (A) illustrate the idea that an interglacial climate is marked by oscillations of wet and dry periods
  - (B) illustrate the idea that what happened in the deserts during the Ice Age had far-reaching effects even on the ice sheets of Central and Northern Europe
  - (C) illustrate the idea that the effects of the Ice Age's climatic variations extended beyond the areas of ice
  - (D) support the view that during the Ice Age sheets of ice covered some of the deserts of the world
  - (E) support the view that we are probably living in a postglacial period
27. The author would regard the idea that we are living in an interglacial period as
- (A) unimportant
  - (B) unscientific
  - (C) self-evident
  - (D) plausible
  - (E) absurd

No. 8-3

## SECTION A

(This passage is excerpted from an article that was published in 1981.)

The deep sea typically has a sparse fauna dominated by tiny worms and crustaceans, with an even sparser distribution of larger animals. However, near **hydrothermal** vents, areas of the ocean where warm water emerges from subterranean sources, live remarkable densities of huge clams, blind crabs, and fish.

Most deep-sea faunas rely for food on **particulate matter**, ultimately derived from photosynthesis, falling from above. The food supplies necessary to sustain the large vent communities, however, must be many times the ordinary fallout. The first reports describing vent faunas proposed two possible sources of nutrition: bacterial chemosynthesis, production of food by bacteria using energy derived from chemical changes, and advection, the drifting of food materials from surrounding regions. Later, evidence in support of the idea of intense local chemosynthesis was accumulated: hydrogen sulfide was found in vent

water; many vent-site bacteria were found to be capable of chemosynthesis; and extremely large concentrations of bacteria were found in samples of vent water thought to be pure. This final observation seemed decisive. If such astonishing concentrations of bacteria were typical of vent outflow, then food within the vent would dwarf any contribution from advection. Hence, the widely quoted conclusion was reached that bacterial chemosynthesis provides the foundation for hydrothermal-vent food chains—an exciting prospect because no other communities on Earth are independent of photosynthesis.

There are, however, certain difficulties with this interpretation. For example, some of the large sedentary organisms associated with vents are also found at ordinary deep-sea temperatures many meters from the nearest hydrothermal sources. This suggests that bacterial chemosynthesis is not a sufficient source of nutrition for these creatures. Another difficulty is that similarly dense populations of large deep-sea animals have been found in the proximity of “smokers”—vents where water emerges at temperatures up to 350°C. No bacteria can survive such heat, and no bacteria were found there. Unless smokers are consistently located near more hospitable warm-water vents, chemosynthesis can account for only a fraction of the vent faunas. It is conceivable, however, that these large, sedentary organisms do in fact feed on bacteria that grow in warm-water vents, rise in the vent water, and then **rain in** peripheral areas to nourish animals living some distance from the warm-water vents.

Nonetheless advection is a more likely alternative food source. Research has demonstrated that advective flow, which originates near the surface of the ocean where suspended particulate matter accumulates, transports some of that matter and water to the vents. Estimates suggest that for every cubic meter of vent discharge, 350 milligrams of particulate organic material would be advected into the vent area. Thus, for an average-sized vent, advection could provide more than 30 kilograms of potential food per day. In addition, it is likely that small live animals in the advected water might be killed or stunned by thermal and/or chemical shock, thereby contributing to the food supply of vents.

16. The passage provides information for answering which of the following questions?
  - (A) What causes warm-water vents to form?
  - (B) Do vent faunas consume more than do deep-sea faunas of similar size?
  - (C) Do bacteria live in the vent water of smokers?
  - (D) What role does **hydrogen sulfide** play in chemosynthesis?
  - (E) What accounts for the locations of deep-sea smokers?
17. The information in the passage suggests that the majority of deep-sea faunas that live in nonvent habitats have which of the following characteristics?
  - (A) They do not normally feed on particles of food in the water.
  - (B) They are smaller than many vent faunas.
  - (C) They are predators.
  - (D) They derive nutrition from a chemosynthetic food source.
  - (E) They congregate around a single main food source.
18. The primary purpose of the passage is to
  - (A) describe a previously unknown natural phenomenon
  - (B) reconstruct the evolution of a natural phenomenon
  - (C) establish unequivocally the accuracy of a hypothesis
  - (D) survey explanations for a natural phenomenon and determine which is best supported by evidence
  - (E) entertain criticism of the author’s research and provide an effective response
19. Which of the following does the author cite as a weakness in the argument that bacterial

chemosynthesis provides the foundation for the food chains at deep-sea vents?

- (A) Vents are colonized by some of the same animals found in other areas of the ocean floor.
  - (B) Vent water does not contain sufficient quantities of hydrogen sulfide.
  - (C) Bacteria cannot produce large quantities of food quickly enough.
  - (D) Large concentrations of minerals are found in vent water.
  - (E) Some bacteria found in the vents are incapable of chemosynthesis.
20. Which of the following is information supplied in the passage that would support the statement that the food supplies necessary to sustain vent communities must be many times that of ordinary fallout?
- I. Large vent faunas move from vent to vent in search of food.
  - II. Vent faunas are not able to consume food produced by photosynthesis.
  - III. Vents are more densely populated than are other deep-sea areas.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
21. The author refers to “smokers” (line 38) most probably in order to
- (A) show how thermal shock can provide food for some vent faunas by stunning small animals
  - (B) prove that the habitat of most deep-sea animals is limited to warm-water vents
  - (C) explain how bacteria carry out chemosynthesis
  - (D) demonstrate how advection compensates for the lack of food sources on the seafloor
  - (E) present evidence that bacterial chemosynthesis may be an inadequate source of food for some vent faunas
22. Which of the following can be inferred from the passage about the particulate matter that is carried down from the surface of the ocean?
- (A) It is the basis of bacterial chemosynthesis in the vents.
  - (B) It may provide an important source of nutrition for vent faunas.
  - (C) It may cause the internal temperature of the vents to change significantly.
  - (D) It is transported as large aggregates of particles.
  - (E) It contains hydrogen sulfide.

Throughout human history there have been many stringent taboos concerning watching other people eat or eating in the presence of others. There have been attempts to explain these taboos in terms of inappropriate social relationships either between those who are involved and those who are not simultaneously involved in the satisfaction of a bodily need, or between those already satiated and those who appear to be shamelessly gorging. Undoubtedly such elements exist in the taboos, but there is an additional element with a much more fundamental importance. In prehistoric times, when food was so precious and the on-lookers so hungry, not to offer half of the little food one had was unthinkable, since every glance was a plea for life. Further, during those times, people existed in nuclear or extended family groups, and the sharing of food was quite literally supporting one's family or, by extension, preserving one's self.

23. If the argument in the passage is valid, taboos against eating in the presence of others who are not also eating would be LEAST likely in a society that
- (A) had always had a plentiful supply of food
  - (B) emphasized the need to share worldly goods
  - (C) had a nomadic rather than an agricultural way of life
  - (D) emphasized the value of privacy
  - (E) discouraged overindulgence
24. The author's hypothesis concerning the origin of taboos against watching other people eat emphasizes the
- (A) general palatability of food
  - (B) religious significance of food
  - (C) limited availability of food
  - (D) various sources of food
  - (E) nutritional value of food
25. According to the passage, the author believes that past attempts to explain some taboos concerning eating are
- (A) unimaginative
  - (B) implausible
  - (C) inelegant
  - (D) incomplete
  - (E) unclear
26. In developing the main idea of the passage, the author does which of the following?
- (A) Downplays earlier attempts to explain the origins of a social prohibition.
  - (B) Adapts a scientific theory and applies it to a spiritual relationship.
  - (C) Simplifies a complex biological phenomenon by explaining it in terms of social needs.
  - (D) Reorganizes a system designed to guide personal behavior.
  - (E) Codifies earlier, unsystematized conjectures about family life.

## SECTION B

(This passage is from a book published in 1975.)

That Louise Nevelson is believed by many critics to be the greatest twentieth-century sculptor is all the more remarkable because the greatest resistance to women artists has been, until recently, in the field of sculpture. Since Neolithic times, sculpture has been considered the prerogative of men, partly, perhaps, for purely physical reasons: it was erroneously assumed that women were not suited for the hard manual labor required in sculpting stone, carving wood, or working in metal. It has been only during the twentieth century that women sculptors have been recognized as major artists, and it has been in the United States, especially since the decades of the fifties and sixties, that women sculptors have shown the greatest originality and creative power. Their rise to prominence parallels the development of sculpture itself in the United States: while there had been a few talented sculptors in the United States before the 1940's, it was only after 1945—when New York was rapidly becoming the art capital of the world—that major sculpture was produced in the United States. Some of the best was the work of women.

By far the most outstanding of these women is Louise Nevelson, who in the eyes of many critics is



the most original female artist alive today. One famous and influential critic, Hilton Kramer, said of her work, "For myself, I think Ms. Nevelson succeeds where the painters often fail."

Her works have been compared to the Cubist constructions of Picasso, the Surrealistic objects of Miro, and the Merzbau of Schwitters. Nevelson would be the first to admit that she has been influenced by all of these, as well as by African sculpture, and by Native American and pre-Columbian art, but she has absorbed all these influences and still created a distinctive art that expresses the urban landscape and the aesthetic sensibility of the twentieth century. Nevelson says, "I have always wanted to show the world that art is everywhere, except that it has to pass through a creative mind."

Using mostly discarded wooden objects like packing crates, broken pieces of furniture, and abandoned architectural ornaments, all of which she has hoarded for years, she assembles architectural constructions of great beauty and power. Creating very freely with no sketches, she glues and nails objects together, paints them black, or more rarely white or gold, and places them in boxes. These assemblages, walls, even entire environments create a mysterious, almost awe-inspiring atmosphere. Although she has denied any symbolic or religious intent in her works, their three-dimensional grandeur and even their titles, such as *Sky Cathedral* and *Night Cathedral*, suggest such connotations. In some ways, her most ambitious works are closer to architecture than to traditional sculpture, but then neither Louise Nevelson nor her art fits into any neat category.

17. The passage focuses primarily on which of the following?
  - (A) A general tendency in twentieth-century art
  - (B) The work of a particular artist
  - (C) The artistic influences on women sculptors
  - (D) Critical responses to twentieth-century sculpture
  - (E) Materials used by twentieth-century sculptors
18. Which of the following statements is supported by information given in the passage?
  - (A) Since 1945 women sculptors in the United States have produced more sculpture than have men sculptors.
  - (B) Since 1950 sculpture produced in the United States has been the most original and creative sculpture produced anywhere.
  - (C) From 1900 to 1950 women sculptors in Europe enjoyed more recognition for their work than did women sculptors in the United States.
  - (D) Prior to 1945 there were many women sculptors whose work was ignored by critics.
  - (E) Prior to 1945 there was little major sculpture produced by men or women sculptors working in the United States.
19. The author quotes Hilton Kramer in lines 25-27 most probably in order to illustrate which of the following?
  - (A) The realism of Nevelson's work
  - (B) The unique qualities of Nevelson's style
  - (C) The extent of critical approval of Nevelson's work
  - (D) A distinction between sculpture and painting
  - (E) A reason for the prominence of women sculptors since the 1950's
20. Which of the following is one way in which Nevelson's art illustrates her theory as it is expressed in lines 36-38?
  - (A) She sculpts in wood rather than in metal or stone.



- (B) She paints her sculptures and frames them in boxes.
  - (C) She makes no preliminary sketches but rather allows the sculpture to develop as she works.
  - (D) She puts together pieces of ordinary objects once used for different purposes to make her sculptures.
  - (E) She does not deliberately attempt to convey symbolic or religious meanings through her sculpture.
21. It can be inferred from the passage that the author believes which of the following about Nevelson's sculptures?
- (A) They suggest religious and symbolic meanings.
  - (B) They do not have qualities characteristic of sculpture.
  - (C) They are mysterious and awe-inspiring, but not beautiful.
  - (D) They are uniquely American in style and sensibility.
  - (E) They show the influence of twentieth-century architecture.
22. The author regards Nevelson's stature in the art world as "remarkable" (line 3) in part because of which of the following?
- (A) Her work is currently overrated.
  - (B) Women sculptors have found it especially difficult to be accepted and recognized as major artists.
  - (C) Nevelson's sculptures are difficult to understand.
  - (D) Many art critics have favored painting over sculpture in writing about developments in the art world.
  - (E) Few of the artists prominent in the twentieth century have been sculptors.
23. Which of the following statements about Nevelson's sculptures can be inferred from the passage?
- (A) They are meant for display outdoors.
  - (B) They are often painted in several colors.
  - (C) They are sometimes very large.
  - (D) They are hand carved by Nevelson.
  - (E) They are built around a central wooden object.

Volcanic rock that forms as fluid lava chills rapidly is called **pillow lava**. This rapid chilling occurs when lava erupts directly into water (or beneath ice) or when it flows across a shoreline and into a body of water. While the term "pillow lava" suggests a definite shape, in fact geologists disagree. Some geologists argue that pillow lava is characterized by discrete, ellipsoidal masses. Others describe pillow lava as a tangled mass of cylindrical, interconnected flow lobes. Much of this controversy probably results from unwarranted extrapolations of the original configuration of pillow flows from two-dimensional cross sections of eroded pillows in land **outcroppings**. Virtually any **cross section** cut through a tangled mass of interconnected flow lobes would give the appearance of a pile of discrete ellipsoidal masses. Adequate three-dimensional images of intact pillows are essential for defining the true geometry of pillowed flows and thus ascertaining their mode of origin. Indeed, the term "pillow," itself suggestive of discrete masses, is probably a misnomer.

24. Which of the following is a fact presented in the passage?
- (A) The shape of the connections between the separate, sacklike masses in pillow lava is

unknown.

- (B) More accurate cross sections of pillow lava would reveal the mode of origin.
  - (C) Water or ice is necessary for the formation of pillow lava.
  - (D) No three-dimensional examples of intact pillows currently exist.
  - (E) The origin of pillow lava is not yet known.
25. In the passage, the author is primarily interested in
- (A) analyzing the source of a scientific controversy
  - (B) criticizing some geologists' methodology
  - (C) pointing out the flaws in a geological study
  - (D) proposing a new theory to explain existing scientific evidence
  - (E) describing a physical phenomenon
26. The author of the passage would most probably agree that the geologists mentioned in line 6 ("Some geologists") have made which of the following errors in reasoning?
- I. Generalized unjustifiably from available evidence.
  - II. Deliberately ignored existing counterevidence.
  - III. Repeatedly failed to take new evidence into account.
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II only
  - (E) II and III only
27. The author implies that the "controversy" (line 9) might be resolved if
- (A) geologists did not persist in using the term "pillow"
  - (B) geologists did not rely on potentially misleading information
  - (C) geologists were more willing to confer directly with one another
  - (D) two-dimensional cross sections of eroded pillows were available
  - (E) existing pillows in land outcroppings were not so badly eroded

No. 9-1

## SECTION A

Many critics of Emily Bronte's novel *Wuthering Heights* see its second part as a **counterpoint** that comments on, if it does not reverse, the first part, where a "romantic" reading receives more confirmation. Seeing the two parts as a whole is encouraged by the novel's sophisticated structure, revealed in its complex use of narrators and time shifts. Granted that the presence of these elements need not argue an authorial awareness of novelistic construction comparable to that of Henry James, their presence does encourage attempts to unify the novel's heterogeneous parts. However, any interpretation that seeks to unify all of the novel's diverse elements is bound to be somewhat unconvincing. This is not because such an interpretation necessarily stiffens into a thesis (although rigidity in any interpretation of this or of any novel is always a danger), but because *Wuthering Heights* has recalcitrant elements of undeniable power that, ultimately, resist inclusion in an all-encompassing interpretation. In this respect, *Wuthering Heights* shares a feature of *Hamlet*.

17. According to the passage, which of the following is a true statement about the first and

second parts of *Wuthering Heights*?

- (A) The second part has received more attention from critics.
  - (B) The second part has little relation to the first part.
  - (C) The second part annuls the force of the first part.
  - (D) The second part provides less substantiation for a “romantic” reading.
  - (E) The second part is better because it is more realistic.
18. Which of the following inferences about Henry James’s awareness of novelistic construction is best supported by the passage?
- (A) James, more than any other novelist, was aware of the difficulties of novelistic construction.
  - (B) James was very aware of the details of novelistic construction.
  - (C) James’s awareness of novelistic construction derived from his reading of Bronte.
  - (D) James’s awareness of novelistic construction has led most commentators to see unity in his individual novels.
  - (E) James’s awareness of novelistic construction precluded him from violating the unity of his novels.
19. The author of the passage would be most likely to agree that an interpretation of a novel should
- (A) not try to unite heterogeneous elements in the novel
  - (B) not be inflexible in its treatment of the elements in the novel
  - (C) not argue that the complex use of narrators or of time shifts indicates a sophisticated structure
  - (D) concentrate on those recalcitrant elements of the novel that are outside the novel’s main structure
  - (E) primarily consider those elements of novelistic construction of which the author of the novel was aware
20. The author of the passage suggests which of the following about *Hamlet*?
- I. *Hamlet* has usually attracted critical interpretations that tend to stiffen into theses.
  - II. *Hamlet* has elements that are not amenable to an all-encompassing critical interpretation.
  - III. *Hamlet* is less open to an all-encompassing critical interpretation than is *Wuthering Heights*.
  - IV. *Hamlet* has not received a critical interpretation that has been widely accepted by readers.
- (A) I only
  - (B) II only
  - (C) I and IV only
  - (D) III and IV only
  - (E) I, II, and III only

The determination of the sources of copper ore used in the manufacture of copper and bronze artifacts of **Bronze Age** civilizations would add greatly to our knowledge of cultural contacts and trade in

that era. Researchers have analyzed artifacts and ores for their concentrations of elements, but for a variety of reasons, these studies have generally failed to provide evidence of the sources of the copper used in the objects. Elemental composition can vary within the same copper-ore lode, usually because of varying admixtures of other elements, especially iron, lead, zinc, and arsenic. And high concentrations of cobalt or zinc, noticed in some artifacts, appear in a variety of copper-ore sources. Moreover, the processing of ores introduced poorly controlled changes in the concentrations of minor and trace elements in the resulting metal. Some elements evaporate during smelting and roasting; different temperatures and processes produce different degrees of loss. Finally, flux, which is sometimes added during smelting to remove waste material from the ore, could add quantities of elements to the final product.

An elemental property that is unchanged through these chemical processes is the isotopic composition of each metallic element in the ore. Isotopic composition, the percentages of the different isotopes of an element in a given sample of the element, is therefore particularly suitable as an indicator of the sources of the ore. Of course, for this purpose it is necessary to find an element whose isotopic composition is more or less constant throughout a given ore body, but varies from one copper ore body to another or, at least, from one geographic region to another.

The ideal choice, when isotopic composition is used to investigate the source of copper ore, would seem to be copper itself. It has been shown that small but measurable variations occur naturally in the isotopic composition of copper. However, the variations are large enough only in rare ores; between samples of the common ore minerals of copper, isotopic variations greater than the measurement error have not been found. An alternative choice is lead, which occurs in most copper and bronze artifacts of the Bronze Age in amounts consistent with the lead being derived from the copper ores and possibly from the fluxes. The isotopic composition of lead often varies from one source of common copper ore to another, with variations exceeding the measurement error; and preliminary studies indicate virtually uniform isotopic composition of the lead from a single copper-ore source. While some of the lead found in an artifact may have been introduced from flux or when other metals were added to the copper ore, lead so added in Bronze Age processing would usually have the same isotopic composition as the lead in the copper ore. Lead isotope studies may thus prove useful for interpreting the archaeological record of the Bronze Age.

21. The primary purpose of the passage is to
  - (A) discuss the techniques of analyzing lead isotope composition
  - (B) propose a way to determine the origin of the copper in certain artifacts
  - (C) resolve a dispute concerning the analysis of copper ore
  - (D) describe the deficiencies of a currently used method of chemical analysis of certain metals
  - (E) offer an interpretation of the archaeological record of the Bronze Age
22. The author first mentions the addition of flux during smelting (lines 18-21) in order to
  - (A) give a reason for the failure of elemental composition studies to determine ore sources
  - (B) illustrate differences between various Bronze Age civilizations
  - (C) show the need for using high smelting temperatures
  - (D) illustrate the uniformity of lead isotope composition
  - (E) explain the success of copper isotope composition analysis
23. The author suggests which of the following about a Bronze Age artifact containing high concentrations of cobalt or zinc?
  - (A) It could not be reliably tested for its elemental composition.
  - (B) It could not be reliably tested for its copper isotope composition.

- (C) It could not be reliably tested for its lead isotope composition.
- (D) It could have been manufactured from ore from any one of a variety of sources.
- (E) It could have been produced by the addition of other metals during the processing of the copper ore.
24. According to the passage, possible sources of the lead found in a copper or bronze artifact include which of the following?
- I. The copper ore used to manufacture the artifact
  - II. Flux added during processing of the copper ore
  - III. Other metal added during processing of the copper ore
- (A) I only
- (B) II only
- (C) III only
- (D) II and III only
- (E) I, II, and III
25. The author rejects copper as the “ideal choice” mentioned in line 33 because
- (A) the concentration of copper in Bronze Age artifacts varies
- (B) elements other than copper may be introduced during smelting
- (C) the isotopic composition of copper changes during smelting
- (D) among common copper ores, differences in copper isotope composition are too small
- (E) within a single source of copper ore, copper isotope composition can vary substantially
26. The author makes which of the following statements about lead isotope composition?
- (A) It often varies from one copper-ore source to another.
- (B) It sometimes varies over short distances in a single copper-ore source.
- (C) It can vary during the testing of artifacts, producing a measurement error.
- (D) It frequently changes during smelting and roasting.
- (E) It may change when artifacts are buried for thousands of years.
27. It can be inferred from the passage that the use of flux in processing copper ore can alter the lead isotope composition of the resulting metal EXCEPT when
- (A) there is a smaller concentration of lead in the flux than in the copper ore
- (B) the concentration of lead in the flux is equivalent to that of the lead in the ore
- (C) some of the lead in the flux evaporates during processing
- (D) any lead in the flux has the same isotopic composition as the lead in the ore
- (E) other metals are added during processing

## SECTION B

Since the Hawaiian Islands have never been connected to other land masses, the great variety of plants in Hawaii must be a result of the long-distance dispersal of seeds, a process that requires both a method of transport and an equivalence between the ecology of the source area and that of the recipient area.

There is some dispute about the method of transport involved. Some biologists argue that ocean and air currents are responsible for the transport of plant seeds to Hawaii. Yet the results of flotation

experiments and the low temperatures of air currents cast doubt on these hypotheses. More probable is bird transport, either externally, by accidental attachment of the seeds to feathers, or internally, by the swallowing of fruit and subsequent excretion of the seeds. While it is likely that fewer varieties of plant seeds have reached Hawaii externally than internally, more varieties are known to be adapted to external than to internal transport.

17. The author of the passage is primarily concerned with
  - (A) discussing different approaches biologists have taken to testing theories about the distribution of plants in Hawaii
  - (B) discussing different theories about the transport of plant seeds to Hawaii
  - (C) discussing the extent to which air currents are responsible for the dispersal of plant seeds to Hawaii
  - (D) resolving a dispute about the adaptability of plant seeds to bird transport
  - (E) resolving a dispute about the ability of birds to carry plant seeds long distances
18. The author mentions the results of flotation experiments on plant seeds (lines 10-12) most probably in order to
  - (A) support the claim that the distribution of plants in Hawaii is the result of the long-distance dispersal of seeds
  - (B) lend credibility to the thesis that air currents provide a method of transport for plant seeds to Hawaii
  - (C) suggest that the long-distance dispersal of seeds is a process that requires long periods of time
  - (D) challenge the claim that ocean currents are responsible for the transport of plant seeds to Hawaii
  - (E) refute the claim that Hawaiian flora evolved independently from flora in other parts of the world
19. It can be inferred from information in the passage that the existence in alpine regions of Hawaii of a plant species that also grows in the southwestern United States would justify which of the following conclusions?
  - (A) The ecology of the southwestern United States is similar in important respects to the ecology of alpine regions of Hawaii.
  - (B) There are ocean currents that flow from the southwestern United States to Hawaii.
  - (C) The plant species discovered in Hawaii must have traveled from the southwestern United States only very recently.
  - (D) The plant species discovered in Hawaii reached there by attaching to the feathers of birds migrating from the southwestern United States.
  - (E) The plant species discovered in Hawaii is especially well adapted to transport over long distances.
20. The passage supplies information for answering which of the following questions?
  - (A) Why does successful long-distance dispersal of plant seeds require an equivalence between the ecology of the source area and that of the recipient area?
  - (B) Why are more varieties of plant seeds adapted to external rather than to internal bird transport?

- (C) What varieties of plant seeds are birds that fly long distances most likely to swallow?
- (D) What is a reason for accepting the long-distance dispersal of plant seeds as an explanation for the origin of Hawaiian flora?
- (E) What evidence do biologists cite to argue that ocean and air currents are responsible for the transport of plant seeds to Hawaii?

A long-held view of the history of the English colonies that became the United States has been that England's policy toward these colonies before 1763 was dictated by commercial interests and that a change to a more imperial policy, dominated by expansionist militarist objectives, generated the tensions that ultimately led to the American Revolution. In a recent study, Stephen Saunders Webb has presented a formidable challenge to this view. According to Webb, England already had a military imperial policy for more than a century before the American Revolution. He sees Charles II, the English monarch between 1660 and 1685, as the proper successor of the Tudor monarchs of the sixteenth century and of Oliver Cromwell, all of whom were bent on extending centralized executive power over England's possessions through the use of what Webb calls "garrison government." Garrison government allowed the colonists a legislative assembly, but real authority, in Webb's view, belonged to the colonial governor, who was appointed by the king and supported by the "garrison," that is, by the local contingent of English troops under the colonial governor's command.

According to Webb, the purpose of garrison government was to provide military support for a royal policy designed to limit the power of the upper classes in the American colonies. Webb argues that the colonial legislative assemblies represented the interests not of the common people but of the colonial upper classes, a coalition of merchants and nobility who favored self-rule and sought to elevate legislative authority at the expense of the executive. It was, according to Webb, the colonial governors who favored the small farmer, opposed the plantation system, and tried through taxation to break up large holdings of land. Backed by the military presence of the garrison, these governors tried to prevent the gentry and merchants, allied in the colonial assemblies, from transforming colonial America into a capitalistic oligarchy.

Webb's study illuminates the political alignments that existed in the colonies in the century prior to the American Revolution, but his view of the crown's use of the military as an instrument of colonial policy is not entirely convincing. England during the seventeenth century was not noted for its military achievements. Cromwell did mount England's most ambitious overseas military expedition in more than a century, but it proved to be an utter failure. Under Charles II, the English army was too small to be a major instrument of government. Not until the war with France in 1697 did William III persuade Parliament to create a professional standing army, and Parliament's price for doing so was to keep the army under tight legislative control. While it may be true that the crown attempted to curtail the power of the colonial upper classes, it is hard to imagine how the English army during the seventeenth century could have provided significant military support for such a policy.

21. The passage can best be described as a
- (A) survey of the inadequacies of a conventional viewpoint
  - (B) reconciliation of opposing points of view
  - (C) summary and evaluation of a recent study
  - (D) defense of a new thesis from anticipated objections
  - (E) review of the subtle distinctions between apparently similar views
22. The passage suggests that the view referred to in lines 1-7 argued that
- (A) the colonial governors were sympathetic to the demands of the common people
  - (B) Charles II was a pivotal figure in the shift of English monarchs toward a more imperial policy in their governorship of the American colonies
  - (C) the American Revolution was generated largely out of a conflict between the colonial

upper classes and an alliance of merchants and small farmers

(D) the military did not play a major role as an instrument of colonial policy until 1763

(E) the colonial legislative assemblies in the colonies had little influence over the colonial governors

23. It can be inferred from the passage that Webb would be most likely to agree with which of the following statements regarding garrison government?
- (A) Garrison government gave legislative assemblies in the colonies relatively little authority, compared to the authority that it gave the colonial governors.
  - (B) Garrison government proved relatively ineffective until it was used by Charles II to curb the power of colonial legislatures.
  - (C) Garrison government became a less viable colonial policy as the English Parliament began to exert tighter legislative control over the English military.
  - (D) Oliver Cromwell was the first English ruler to make use of garrison government on a large scale.
  - (E) The creation of a professional standing army in England in 1697 actually weakened garrison government by diverting troops from the garrisons stationed in the American colonies.
24. According to the passage, Webb views Charles II as the “proper successor” (line 13) of the Tudor monarchs and Cromwell because Charles II
- (A) used colonial tax revenues to fund overseas military expeditions
  - (B) used the military to extend executive power over the English colonies
  - (C) wished to transform the American colonies into capitalistic oligarchies
  - (D) resisted the English Parliament’s efforts to exert control over the military
  - (E) allowed the American colonists to use legislative assemblies as a forum for resolving grievances against the crown
25. Which of the following, if true, would most seriously weaken the author’s assertion in lines 54-58?
- (A) Because they were poorly administered, Cromwell’s overseas military expeditions were doomed to failure.
  - (B) Because it relied primarily on the symbolic presence of the military, garrison government could be effectively administered with a relatively small number of troops.
  - (C) Until early in the seventeenth century, no professional standing army in Europe had performed effectively in overseas military expeditions.
  - (D) Many of the colonial governors appointed by the crown were also commissioned army officers.
  - (E) Many of the English troops stationed in the American colonies were veterans of other overseas military expeditions.
26. According to Webb’s view of colonial history, which of the following was (were) true of the merchants and nobility mentioned in line 30?
- I. They were opposed to policies formulated by Charles II that would have transformed the colonies into capitalistic oligarchies.



- II. They were opposed to attempts by the English crown to limit the power of the legislative assemblies.
  - III. They were united with small farmers in their opposition to the stationing of English troops in the colonies.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
27. The author suggests that if William III had wanted to make use of the standing army mentioned in line 52 to administer garrison government in the American colonies, he would have had to.
- (A) make peace with France
  - (B) abolish the colonial legislative assemblies
  - (C) seek approval from the English Parliament
  - (D) appoint colonial governors who were more sympathetic to royal policy
  - (E) raise additional revenues by increasing taxation of large landholdings in the colonies

No. 9-2

SECTION A

A serious critic has to comprehend the particular content, unique structure, and special meaning of a work of art. And here she faces a dilemma. The critic must recognize the artistic element of uniqueness that requires subjective reaction; yet she must not be unduly prejudiced by such reactions. Her likes and dislikes are less important than what the work itself communicates, and her preferences may blind her to certain qualities of the work and thereby prevent an adequate understanding of it. Hence, it is necessary that a critic develop a sensibility informed by familiarity with the history of art and aesthetic theory. On the other hand, it is insufficient to treat the artwork solely historically, in relation to a fixed set of ideas or values. The critic's knowledge and training are, rather, a preparation of the cognitive and emotional abilities needed for an adequate personal response to an artwork's own particular qualities.

17. According to the author, a serious art critic may avoid being prejudiced by her subjective reactions if she
- (A) treats an artwork in relation to a fixed set of ideas and values
  - (B) brings to her observation a knowledge of art history and aesthetic theory
  - (C) allows more time for the observation of each artwork
  - (D) takes into account the preferences of other art critics
  - (E) limits herself to that art with which she has adequate familiarity
18. The author implies that it is insufficient to treat a work of art solely historically because
- (A) doing so would lead the critic into a dilemma
  - (B) doing so can blind the critic to some of the artwork's unique qualities
  - (C) doing so can insulate the critic from personally held beliefs
  - (D) subjective reactions can produce a biased response
  - (E) critics are not sufficiently familiar with art history

19. The passage suggests that the author would be most likely to agree with which of the following statements?
- (A) Art speaks to the passions as well as to the intellect.
  - (B) Most works of art express unconscious wishes or desires.
  - (C) The best art is accessible to the greatest number of people.
  - (D) The art produced in the last few decades is of inferior quality.
  - (E) The meaning of art is a function of the social conditions in which it was produced.
20. The author's argument is developed primarily by the use of
- (A) an attack on sentimentality
  - (B) an example of successful art criticism
  - (C) a critique of artists training
  - (D) a warning against extremes in art criticism
  - (E) an analogy between art criticism and art production

Viruses, infectious particles consisting of nucleic acid packaged in a protein coat (the capsid), are difficult to resist. Unable to reproduce outside a living cell, viruses reproduce only by subverting the genetic mechanisms of a host cell. In one kind of viral **life cycle**, the virus first binds to the cell's surface, then penetrates the cell and sheds its capsid. The exposed viral nucleic acid produces new viruses from the contents of the cell. Finally, the cell releases the viral progeny, and a new cell cycle of infection begins. The human body responds to a viral infection by producing antibodies: complex, highly specific proteins that selectively bind to foreign molecules such as viruses. An antibody can either interfere with a virus's ability to bind to a cell, or can prevent it from releasing its nucleic acid.

Unfortunately, the **common cold**, produced most often by rhinoviruses, is intractable to antiviral defense. Humans have difficulty resisting colds because rhinoviruses are so diverse, including at least 100 strains. The strains differ most in the molecular structure of the proteins in their capsids. Since disease-fighting antibodies bind to the capsid, an antibody developed to protect against one rhinovirus strain is useless against other strains. Different antibodies must be produced for each strain.

A defense against rhinoviruses might nonetheless succeed by exploiting hidden similarities among the rhinovirus strains. For example, most rhinovirus strains bind to the same kind of molecule (delta-receptors) on a cell's surface when they attack human cells. Colonno, taking advantage of these common receptors, devised a strategy for blocking the attachment of rhinoviruses to their appropriate receptors. Rather than fruitlessly searching for an antibody that would bind to all rhinoviruses, Colonno realized that an antibody binding to the common receptors of a human cell would prevent rhinoviruses from initiating an infection. Because human cells normally do not develop antibodies to components of their own cells, Colonno injected human cells into mice, which did produce an antibody to the common receptor. In isolated human cells, this antibody proved to be extraordinarily effective at thwarting the rhinovirus. Moreover, when the antibody was given to chimpanzees, it inhibited rhinoviral growth, and in humans it lessened both the severity and duration of cold symptoms.

Another possible defense against rhinoviruses was proposed by Rossman, who described rhinoviruses' detailed molecular structure. Rossman showed that protein sequences common to all rhinovirus strains lie at the base of a deep "canyon" **scoring** each face of the capsid. The narrow opening of this canyon possibly prevents the relatively large antibody molecules from binding to the common sequence, but smaller molecules might reach it. Among these smaller, nonantibody molecules, some might bind to the common sequence, lock the nucleic acid in its coat, and thereby prevent the virus from reproducing.

21. The primary purpose of the passage is to
- (A) discuss viral mechanisms and possible ways of circumventing certain kinds of those mechanisms

- (B) challenge recent research on how rhinoviruses bind to receptors on the surfaces of cells
  - (C) suggest future research on rhinoviral growth in chimpanzees
  - (D) defend a controversial research program whose purpose is to discover the molecular structure of rhinovirus capsids
  - (E) evaluate a dispute between advocates of two theories about the rhinovirus life cycle
22. It can be inferred from the passage that the protein sequences of the capsid that vary most among strains of rhinovirus are those
- (A) at the base of the “canyon”
  - (B) outside of the “canyon”
  - (C) responsible for producing nucleic acid
  - (D) responsible for preventing the formation of delta-receptors
  - (E) preventing the capsid from releasing its nucleic acid
23. It can be inferred from the passage that a cell lacking delta-receptors will be
- (A) unable to prevent the rhinoviral nucleic acid from shedding its capsid
  - (B) defenseless against most strains of rhinovirus
  - (C) unable to release the viral progeny it develops after infection
  - (D) protected from new infections by antibodies to the rhinovirus
  - (E) resistant to infection by most strains of rhinovirus
24. Which of the following research strategies for developing a defense against the common cold would the author be likely to find most promising?
- (A) Continuing to look for a general antirhinoviral antibody
  - (B) Searching for common cell-surface receptors in humans and mice
  - (C) Continuing to look for similarities among the various strains of rhinovirus
  - (D) Discovering how the human body produces antibodies in response to a rhinoviral infection
  - (E) Determining the detailed molecular structure of the nucleic acid of a rhinovirus
25. It can be inferred from the passage that the purpose of Colonno’s experiments was to determine whether
- (A) chimpanzees and humans can both be infected by rhinoviruses
  - (B) chimpanzees can produce antibodies to human cell-surface receptors
  - (C) a rhinovirus’ nucleic acid might be locked in its protein coat
  - (D) binding antibodies to common receptors could produce a possible defense against rhinoviruses
  - (E) rhinoviruses are vulnerable to human antibodies
26. According to the passage, Rossman’s research suggests that
- (A) a defense against rhinoviruses might exploit structural similarities among the strains of rhinovirus
  - (B) human cells normally do not develop antibodies to components of their own cells
  - (C) the various strains of rhinovirus differ in their ability to bind to the surface of a host cell
  - (D) rhinovirus versatility can work to the benefit of researchers trying to find a useful

antibody

(E) Colunno's research findings are probably invalid

27. According to the passage, in order for a given antibody to bind to a given rhinoviral capsid, which of the following must be true?
- (A) The capsid must have a deep "canyon" on each of its faces.
  - (B) The antibody must be specific to the molecular structure of the particular capsid.
  - (C) The capsid must separate from its nucleic acid before binding to an antibody.
  - (D) The antibody must bind to a particular cell-surface receptor before it can bind to a rhinovirus.
  - (E) The antibody must first enter a cell containing the particular rhinovirus.

## SECTION B

Diamonds, an occasional component of rare igneous rocks called lamproites and kimberlites, have never been dated satisfactorily. However, some diamonds contain minute inclusions of silicate minerals, commonly olivine, pyroxene, and garnet. These minerals can be dated by radioactive decay techniques because of the very small quantities of radioactive trace elements they, in turn, contain. Usually, it is possible to conclude that the inclusions are older than their diamond hosts, but with little indication of the time interval involved. Sometimes, however, the crystal form of the silicate inclusions is observed to resemble more closely the internal structure of diamond than that of other silicate minerals. It is not known how rare this resemblance is, or whether it is most often seen in inclusions of silicates such as garnet, whose crystallography is generally somewhat similar to that of diamond; but when present, the resemblance is regarded as compelling evidence that the diamonds and inclusions are truly cogenetic.

17. The author implies that silicate inclusions were most often formed
- (A) with small diamonds inside of them
  - (B) with trace elements derived from their host minerals
  - (C) by the radioactive decay of rare igneous rocks
  - (D) at an earlier period than were their host minerals
  - (E) from the crystallization of rare igneous material
18. According to the passage, the age of silicate minerals included in diamonds can be determined due to a feature of the
- (A) trace elements in the diamond hosts
  - (B) trace elements in the rock surrounding the diamonds
  - (C) trace elements in the silicate minerals
  - (D) silicate minerals' crystal structure
  - (E) host diamonds' crystal structure
19. The author states that which of the following generally has a crystal structure similar to that of diamond?
- (A) Lamproite
  - (B) Kimberlite
  - (C) Olivine
  - (D) Pyroxene
  - (E) Garnet

20. The main purpose of the passage is to
- (A) explain why it has not been possible to determine the age of diamonds
  - (B) explain how it might be possible to date some diamonds
  - (C) compare two alternative approaches to determining the age of diamonds
  - (D) compare a method of dating diamonds with a method used to date certain silicate minerals
  - (E) compare the age of diamonds with that of certain silicate minerals contained within them

Discussion of the assimilation of Puerto Ricans in the United States has focused on two factors: **social standing** and the loss of national culture. In general, excessive stress is placed on one factor or the other, depending on whether the commentator is North American or Puerto Rican. Many North American social scientists, such as Oscar Handlin, Joseph Fitzpatrick, and Oscar Lewis, consider Puerto Ricans as the most recent in a long line of ethnic entrants to occupy the lowest rung on the social ladder. Such a "sociodemographic" approach tends to regard assimilation as a benign process, taking for granted increased economic advantage and inevitable cultural integration, in a supposedly egalitarian context. However, this approach fails to take into account the colonial nature of the Puerto Rican case, with this group, unlike their European predecessors, coming from a nation politically subordinated to the United States. Even the "radical" critiques of this mainstream research model, such as the critique developed in *Divided Society*, attach the issue of ethnic assimilation too mechanically to factors of economic and social mobility and are thus unable to illuminate the cultural subordination of Puerto Ricans as a colonial minority.

In contrast, the "colonialist" approach of island-based writers such as Eduardo Seda-Bonilla, Manuel Maldonado-Denis, and Luis Nieves-Falcon tends to view assimilation as the forced loss of national culture in an unequal contest with imposed foreign values. There is, of course, a strong tradition of cultural accommodation among other Puerto Rican thinkers. The writings of Eugenio Fernandez Mendez clearly exemplify this tradition, and many supporters of Puerto Rico's commonwealth status share the same universalizing orientation. But the Puerto Rican intellectuals who have written most about the assimilation process in the United States all advance cultural nationalist views, advocating the preservation of minority cultural distinctions and rejecting what they see as the subjugation of colonial nationalities.

This cultural and political emphasis is appropriate, but the colonialist thinkers misdirect it, overlooking the class relations at work in both Puerto Rican and North American history. They pose the clash of national cultures as an absolute polarity, with each culture understood as static and undifferentiated. Yet both the Puerto Rican and North American traditions have been subject to constant challenge from cultural forces within their own societies, forces that may move toward each other in ways that cannot be written off as mere "assimilation." Consider, for example, the indigenous and Afro-Caribbean traditions in Puerto Rican culture and how they influence and are influenced by other Caribbean cultures and Black cultures in the United States. The elements of coercion and inequality, so central to cultural contact according to the colonialist framework play no role in this kind of convergence of racially and ethnically different elements of the same social class.

21. The author's main purpose is to
- (A) criticize the emphasis on social standing in discussions of the assimilation of Puerto Ricans in the United States
  - (B) support the thesis that assimilation has not been a benign process for Puerto Ricans
  - (C) defend a view of the assimilation of Puerto Ricans that emphasizes the preservation of national culture
  - (D) indicate deficiencies in two schools of thought on the assimilation of Puerto Ricans in the United States
  - (E) reject the attempt to formulate a general framework for discussion of the assimilation of Puerto Ricans in the United States

22. According to the passage, cultural accommodation is promoted by
- (A) Eduardo Seda-Bonilla
  - (B) Manuel Maldonado-Denis
  - (C) the author of *Divided Society*
  - (D) the majority of social scientists writing on immigration
  - (E) many supporters of Puerto Rico's commonwealth status
23. It can be inferred from the passage that a writer such as Eugenio Fernandez Mendez would most likely agree with which of the following statements concerning members of minority ethnic groups?
- (A) It is necessary for the members of such groups to adapt to the culture of the majority.
  - (B) The members of such groups generally encounter a culture that is static and undifferentiated.
  - (C) Social mobility is the most important feature of the experience of members of such groups.
  - (D) Social scientists should emphasize the cultural and political aspects of the experience of members of such groups.
  - (E) The assimilation of members of such groups requires the forced abandonment of their authentic national roots.
24. The author implies that the Puerto Rican writers who have written most about assimilation do NOT do which of the following?
- (A) Regard assimilation as benign.
  - (B) Resist cultural integration.
  - (C) Describe in detail the process of assimilation.
  - (D) Take into account the colonial nature of the Puerto Rican case.
  - (E) Criticize supporters of Puerto Rico's commonwealth status.
25. It can be inferred from the passage that the "colonialist" approach is so called because its practitioners
- (A) support Puerto Rico's commonwealth status
  - (B) have a strong tradition of cultural accommodation
  - (C) emphasize the class relations at work in both Puerto Rican and North American history
  - (D) pose the clash of national cultures as an absolute polarity in which each culture is understood as static and undifferentiated
  - (E) regard the political relation of Puerto Rico to the United States as a significant factor in the experience of Puerto Ricans
26. The author regards the emphasis by island-based writers on the cultural and political dimensions of assimilation as
- (A) ironic
  - (B) dangerous
  - (C) fitting but misdirected
  - (D) illuminating but easily misunderstood

- (E) peculiar but benign
27. The example discussed in lines 51-54 is intended by the author to illustrate a
- (A) strength of the sociodemographic approach
  - (B) strength of the “colonialist” approach
  - (C) weakness of the sociodemographic approach
  - (D) weakness of the “colonialist” approach
  - (E) weakness of the cultural-accommodationist approach

No. 9-3

### SECTION A

Classical physics defines the vacuum as a state of absence: a vacuum is said to exist in a region of space if there is nothing in it. In the quantum field theories that describe the physics of elementary particles, the vacuum becomes somewhat more complicated. Even in empty space, particles can appear spontaneously as a result of fluctuations of the vacuum. For example, an electron and a positron, or antielectron, can be created out of the void. Particles created in this way have only a fleeting existence; they are annihilated almost as soon as they appear, and their presence can never be detected directly. They are called virtual particles in order to distinguish them from real particles, whose lifetimes are not constrained in the same way, and which can be detected. Thus it is still possible to define that vacuum as a space that has no real particles in it.

One might expect that the vacuum would always be the state of lowest possible energy for a given region of space. If an area is initially empty and a real particle is put into it, the total energy, it seems, should be raised by at least the energy equivalent of the mass of the added particle. A surprising result of some recent theoretical investigations is that this assumption is not invariably true. There are conditions under which the introduction of a real particle of finite mass into an empty region of space can reduce the total energy. If the reduction in energy is great enough, an electron and a positron will be spontaneously created. Under these conditions the electron and positron are not a result of vacuum fluctuations but are real particles, which exist indefinitely and can be detected. In other words, under these conditions the vacuum is an unstable state and can decay into a state of lower energy; i.e., one in which real particles are created.

The essential condition for the decay of the vacuum is the presence of an intense electric field. As a result of the decay of the vacuum, the space permeated by such a field can be said to acquire an electric charge, and it can be called a charged vacuum. The particles that materialize in the space make the charge manifest. An electric field of sufficient intensity to create a charged vacuum is likely to be found in only one place: in the immediate vicinity of a superheavy atomic nucleus, one with about twice as many protons as the heaviest natural nuclei known. A nucleus that large cannot be stable, but it might be possible to assemble one next to a vacuum for long enough to observe the decay of the vacuum. Experiments attempting to achieve this are now **under way**.

17. Which of the following titles best describes the passage as a whole?
- (A) The Vacuum: Its Fluctuations and Decay
  - (B) The Vacuum: Its Creation and Instability
  - (C) The Vacuum: A State of Absence
  - (D) Particles That Materialize in the Vacuum
  - (E) Classical Physics and the Vacuum
18. According to the passage, the assumption that the introduction of a real particle into a vacuum raises the total energy of that region of space has been cast into doubt by which of the following?

- (A) Findings from laboratory experiments
  - (B) Findings from observational field experiments
  - (C) Accidental observations made during other experiments
  - (D) Discovery of several erroneous propositions in accepted theories
  - (E) Predictions based on theoretical work
19. It can be inferred from the passage that scientists are currently making efforts to observe which of the following events?
- (A) The decay of a vacuum in the presence of virtual particles
  - (B) The decay of a vacuum next to a superheavy atomic nucleus
  - (C) The creation of a superheavy atomic nucleus next to an intense electric field
  - (D) The creation of a virtual electron and a virtual positron as a result of fluctuations of a vacuum
  - (E) The creation of a charged vacuum in which only real electrons can be created in the vacuum's region of space
20. Physicists' recent investigations of the decay of the vacuum, as described in the passage, most closely resemble which of the following hypothetical events in other disciplines?
- (A) On the basis of data gathered in a carefully controlled laboratory experiment, a chemist predicts and then demonstrates the physical properties of a newly synthesized polymer.
  - (B) On the basis of manipulations of macroeconomic theory, an economist predicts that, contrary to accepted economic theory, inflation and unemployment will both decline under conditions of rapid economic growth.
  - (C) On the basis of a rereading of the texts of Jane Austen's novels, a literary critic suggests that, contrary to accepted literary interpretations, Austen's plots were actually metaphors for political events in early nineteenth-century England.
  - (D) On the basis of data gathered in carefully planned observations of several species of birds, a biologist proposes a modification in the accepted theory of interspecies competition.
  - (E) On the basis of a study of observations incidentally recorded in ethnographers' descriptions of non-Western societies, an anthropologist proposes a new theory of kinship relations.
21. According to the passage, the author considers the reduction of energy in an empty region of space to which a real particle has been added to be
- (A) a well-known process
  - (B) a frequent occurrence
  - (C) a fleeting aberration
  - (D) an unimportant event
  - (E) an unexpected outcome
22. According to the passage, virtual particles differ from real particles in which of the following ways?
- I. Virtual particles have extremely short lifetimes.
  - II. Virtual particles are created in an intense electric field.



III. Virtual particles cannot be detected directly.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I and III only

23. The author's assertions concerning the conditions that lead to the decay of the vacuum would be most weakened if which of the following occurred?

- (A) Scientists created an electric field next to a vacuum, but found that the electric field was not intense enough to create a charged vacuum.
- (B) Scientists assembled a superheavy atomic nucleus next to a vacuum, but found that no virtual particles were created in the vacuum's region of space.
- (C) Scientists assembled a superheavy atomic nucleus next to a vacuum, but found that they could not then detect any real particles in the vacuum's region of space.
- (D) Scientists introduced a virtual electron and a virtual positron into a vacuum's region of space, but found that the vacuum did not then fluctuate.
- (E) Scientists introduced a real electron and a real positron into a vacuum's region of space, but found that the total energy of the space increased by the energy equivalent of the mass of the particles.

Simone de Beauvoir's work greatly influenced Betty Friedan's—Indeed, made it possible. Why, then, was it Friedan who became the prophet of women's emancipation in the United States? Political conditions, as well as a certain anti-intellectual bias, prepared Americans and the American media to better receive Friedan's deradicalized and highly pragmatic *The Feminine Mystique*, published in 1963, than Beauvoir's theoretical reading of women's situation in *The Second Sex*. In 1953 when *The Second Sex* first appeared in translation in the United States, the country had entered the silent, fearful fortress of the anticommunist McCarthy years (1950-1954), and Beauvoir was suspected of Marxist sympathies. Even *The Nation*, a generally liberal magazine, warned its readers against "certain political leanings" of the author. Open acknowledgement of the existence of women's oppression was too radical for the United States in the fifties, and Beauvoir's conclusion, that change in women's economic condition, though insufficient by itself, "remains the basic factor" in improving women's situation, was particularly unacceptable.

24. According to the passage, one difference between *The Feminine Mystique* and *The Second Sex* is that Friedan's book

- (A) rejects the idea that women are oppressed
- (B) provides a primarily theoretical analysis of women's lives
- (C) does not reflect the political beliefs of its author
- (D) suggests that women's economic condition has no impact on their status
- (E) concentrates on the practical aspects of the questions of women's emancipation

25. The author quotes from *The Nation* most probably in order to

- (A) modify an earlier assertion
- (B) point out a possible exception to her argument
- (C) illustrate her central point
- (D) clarify the meaning of a term

- (E) cite an expert opinion
26. It can be inferred from the passage that which of the following is not a factor in the explanation of why *The Feminine Mystique* was received more positively in the United States than was *The Second Sex*?
- (A) By 1963 political conditions in the United States had changed.  
(B) Friedan's book was less intellectual and abstract than Beauvoir's.  
(C) Readers did not recognize the powerful influence of Beauvoir's book on Friedan's ideas.  
(D) Friedan's approach to the issue of women's emancipation was less radical than Beauvoir's.  
(E) American readers were more willing to consider the problem of the oppression of women in the sixties than they had been in the fifties.
27. According to the passage, Beauvoir's book asserted that the status of women
- (A) is the outcome of political oppression  
(B) is inherently tied to their economic condition  
(C) can be best improved under a communist government  
(D) is a theoretical, rather than a pragmatic, issue  
(E) is a critical area of discussion in Marxist economic theory

## SECTION B

One of the questions of interest in the study of the evolution of spiders is whether the weaving of orb webs evolved only once or several times. About half the 35,000 known kinds of spiders make webs; a third of the web weavers make orb webs. Since most orb weavers belong either to the Araneidae or the Uloboridae families, the origin of the orb web can be determined only by ascertaining whether the families are related.

Recent taxonomic analysis of individuals from both families indicates that the families evolved from different ancestors, thereby contradicting Wiehle's theory. This theory postulates that the families must be related, based on the assumption that complex behavior, such as web building, could evolve only once. According to Kullman, web structure is the only characteristic that suggests a relationship between families. The families differ in appearance, structure of body hair, and arrangement of eyes. Only Uloborids lack venom glands. Further identification and study of characteristic features will undoubtedly answer the question of the evolution of the orb web.

17. The primary purpose of the passage is to
- (A) settle the question of whether orb webs evolved once or more than once  
(B) describe scientific speculation concerning an issue related to the evolution of orb webs  
(C) analyze the differences between the characteristic features of spiders in the Araneidae and Uloboridae families  
(D) question the methods used by earlier investigators of the habits of spiders  
(E) demonstrate that Araneidae spiders are not related to Uloboridae spiders
18. It can be inferred from the passage that all orb-weaving spiders belong to types of spiders that
- (A) lack venom glands  
(B) are included either in the Uloboridae or Araneidae families  
(C) share few characteristic features with other spider types

- (D) comprise less than a third of all known types of spiders
  - (E) are more recently evolved than other types of spiders
19. According to the passage, members of the Araneidae family can be distinguished from members of the Uloboridae family by all of the following EXCEPT:
- (A) the presence of venom glands
  - (B) the type of web they spin
  - (C) the structure of their body hair
  - (D) the arrangement of their eyes
  - (E) their appearance
20. Which of the following statements, if true, most weakens Wiehle's theory that complex behavior could evolve only once?
- (A) Horses, introduced to the New World by the Spaniards, thrived under diverse climatic conditions.
  - (B) Plants of the Palmaceae family, descendants of a common ancestor, evolved unique seed forms even though the plants occupy similar habitats throughout the world.
  - (C) All mammals are descended from a small, rodentlike animal whose physical characteristics in some form are found in all its descendants.
  - (D) Plants in the Cactaceae and Euphorbiaceae families, although they often look alike and have developed similar mechanisms to meet the rigors of the desert, evolved independently.
  - (E) The Cuban anole, which was recently introduced in the Florida wilds, is quickly replacing the native Florida chameleon because the anole has no competitors.

"Popular art" has a number of meanings, impossible to define with any precision, which range from folklore to junk. The poles are clear enough, but the middle tends to blur. The Hollywood Western of the 1930's, for example, has elements of folklore, but is closer to junk than to high art or folk art. There can be great trash, just as there is bad high art. The musicals of George Gershwin are great popular art, never aspiring to high art. Schubert and Brahms, however, used elements of popular music—folk themes—in works clearly intended as high art. The case of Verdi is a different one: he took a popular genre—bourgeois melodrama set to music (an accurate definition of nineteenth-century opera)—and, without altering its fundamental nature, transmuted it into high art. This remains one of the greatest achievements in music, and one that cannot be fully appreciated without recognizing the essential trashiness of the genre.

As an example of such a transmutation, consider what Verdi made of the typical political elements of nineteenth-century opera. Generally in the plots of these operas, a hero or heroine—usually portrayed only as an individual, unfettered by class—is caught between the immoral corruption of the aristocracy and the doctrinaire rigidity or secret greed of the leaders of the proletariat. Verdi transforms this naive and unlikely formulation with music of extraordinary energy and rhythmic vitality, music more subtle than it seems at first hearing. There are scenes and arias that still sound like calls to arms and were clearly understood as such when they were first performed. Such pieces lend an immediacy to the otherwise veiled political message of these operas and **call up** feelings beyond those of the opera itself.

Or consider Verdi's treatment of character. Before Verdi, there were rarely any characters at all in musical drama, only a series of situations which allowed the singers to express a series of emotional states. Any attempt to find coherent psychological portrayal in these operas is misplaced ingenuity. The only coherence was the singer's vocal technique: when the cast changed, new arias were almost always substituted, generally adapted from other operas. Verdi's characters, on the other hand, have genuine consistency and integrity, even if, in many cases, the consistency is that of pasteboard melodrama. The

integrity of the character is achieved through the music: once he had become established, Verdi did not rewrite his music for different singers or countenance alterations or substitutions of somebody else's arias in one of his operas, as every eighteenth-century composer had done. When he revised an opera, it was only for dramatic economy and effectiveness.

21. The author refers to Schubert and Brahms in order to suggest
  - (A) that their achievements are no less substantial than those of Verdi
  - (B) that their works are examples of great trash
  - (C) the extent to which Schubert and Brahms influenced the later compositions of Verdi
  - (D) a contrast between the conventions of nineteenth-century opera and those of other musical forms
  - (E) that popular music could be employed in compositions intended as high art
22. According to the passage, the immediacy of the political message in Verdi's operas stems from the
  - (A) vitality and subtlety of the music
  - (B) audience's familiarity with earlier operas
  - (C) portrayal of heightened emotional states
  - (D) individual talents of the singers
  - (E) verisimilitude of the characters
23. According to the passage, all of the following characterize musical drama before Verdi EXCEPT:
  - (A) arias tailored to a particular singer's ability
  - (B) adaptation of music from other operas
  - (C) psychological inconsistency in the portrayal of characters
  - (D) expression of emotional states in a series of dramatic situations
  - (E) music used for the purpose of defining a character
24. It can be inferred that the author regards Verdi's revisions to his operas with
  - (A) regret that the original music and texts were altered
  - (B) concern that many of the revisions altered the plots of the original work
  - (C) approval for the intentions that motivated the revisions
  - (D) puzzlement, since the revisions seem largely insignificant
  - (E) enthusiasm, since the revisions were aimed at reducing the conventionality of the operas' plots
25. According to the passage, one of Verdi's achievements within the framework of nineteenth-century opera and its conventions was to
  - (A) limit the extent to which singers influenced the musical compositions and performance of his operas
  - (B) use his operas primarily as forums to protest both the moral corruption and dogmatic rigidity of the political leaders of his time
  - (C) portray psychologically complex characters shaped by the political environment surrounding them
  - (D) incorporate elements of folklore into both the music and plots of his operas

- (E) introduce political elements into an art form that had traditionally avoided political content
26. Which of the following best describes the relationship of the first paragraph of the passage to the passage as a whole?
- (A) It provides a group of specific examples from which generalizations are drawn later in the passage.
- (B) It leads to an assertion that is supported by examples later in the passage.
- (C) It defines terms and relationships that are challenged in an argument later in the passage.
- (D) It briefly compares and contrasts several achievements that are examined in detail later in the passage.
- (E) It explains a method of judging a work of art, a method that is used later in the passage.
27. It can be inferred that the author regards the independence from social class of the heroes and heroines of nineteenth-century opera as
- (A) an idealized but fundamentally accurate portrayal of bourgeois life
- (B) a plot convention with no real connection to political reality
- (C) a plot refinement unique to Verdi
- (D) a symbolic representation of the position of the bourgeoisie relative to the aristocracy and the proletariat
- (E) a convention largely seen as irrelevant by audiences

No. 9-4

### SECTION A

(The article from which the passage was taken appeared in 1982.)

Theorists are divided concerning the origin of the Moon. Some hypothesize that the Moon was formed in the same way as were the planets in the inner solar system (Mercury, Venus, Mars, and Earth)—from planet-forming materials in the presolar nebula. But, unlike the cores of the inner planets, the Moon's core contains little or no iron, while the typical planet-forming materials were quite rich in iron. Other theorists propose that the Moon was ripped out of the Earth's rocky mantle by the Earth's collision with another large celestial body after much of the Earth's iron fell to its core. One problem with the collision hypothesis is the question of how a satellite formed in this way could have settled into the nearly circular orbit that the Moon has today. Fortunately, the collision hypothesis is testable. If it is true, the mantlerocks of the Moon and the Earth should be the same geochemically.

17. The primary purpose of the passage is to
- (A) present two hypotheses concerning the origin of the Moon
- (B) discuss the strengths and weaknesses of the collision hypothesis concerning the origin of the Moon
- (C) propose that hypotheses concerning the Moon's origin be tested
- (D) argue that the Moon could not have been formed out of the typical planet-forming materials of the presolar nebula
- (E) describe one reason why the Moon's geochemical makeup should resemble that of the Earth
18. According to the passage, Mars and the Earth are similar in which of the following ways?

- I. Their satellites were formed by collisions with other celestial bodies.
- II. Their cores contain iron.
- III. They were formed from the presolar nebula.

- (A) III only
- (B) I and II only
- (C) I and III only
- (D) II and III only
- (E) I, II, and III

19. The author implies that a nearly circular orbit is unlikely for a satellite that
- (A) circles one of the inner planets
  - (B) is deficient in iron
  - (C) is different from its planet geochemically
  - (D) was formed by a collision between two celestial bodies
  - (E) was formed out of the planet-forming materials in the presolar nebula
20. Which of the following, if true, would be most likely to make it difficult to verify the collision hypothesis in the manner suggested by the author?
- (A) The Moon's core and mantlerock are almost inactive geologically.
  - (B) The mantlerock of the Earth has changed in composition since the formation of the Moon, while the mantlerock of the Moon has remained chemically inert.
  - (C) Much of the Earth's iron fell to the Earth's core long before the formation of the Moon, after which the Earth's mantlerock remained unchanged.
  - (D) Certain of the Earth's elements, such as platinum, gold, and iridium, followed iron to the Earth's core.
  - (E) The mantlerock of the Moon contains elements such as platinum, gold, and iridium.

Surprisingly enough, modern historians have rarely interested themselves in the history of the American South in the period before the South began to become self-consciously and distinctively "Southern"—the decades after 1815. Consequently, the cultural history of Britain's North American empire in the seventeenth and eighteenth centuries has been written almost as if the Southern colonies had never existed. The American culture that emerged during the Colonial and Revolutionary eras has been depicted as having been simply an extension of New England Puritan culture. However, Professor Davis has recently argued that the South stood apart from the rest of American society during this early period, following its own unique pattern of cultural development. The case for Southern distinctiveness rests upon two related premises: first, that the cultural similarities among the five Southern colonies were far more impressive than the differences, and second, that what made those colonies alike also made them different from the other colonies. The first, for which Davis offers an enormous amount of evidence, can be accepted without major reservations; the second is far more problematic.

What makes the second premise problematic is the use of the Puritan colonies as a basis for comparison. Quite properly, Davis decries the excessive influence ascribed by historians to the Puritans in the formation of American culture. Yet Davis inadvertently adds weight to such ascriptions by using the Puritans as the standard against which to assess the achievements and contributions of Southern colonials. Throughout, Davis focuses on the important, and undeniable, differences between the Southern and Puritan colonies in motives for and patterns of early settlement, in attitudes toward nature and Native Americans, and in the degree of receptivity to metropolitan cultural influences.

However, recent scholarship has strongly suggested that those aspects of early New England culture that seem to have been most distinctly Puritan, such as the strong religious orientation and the

communal impulse, were not even typical of New England as a whole, but were largely confined to the two colonies of Massachusetts and Connecticut. Thus, what in contrast to the Puritan colonies appears to Davis to be peculiarly Southern—acquisitiveness, a strong interest in politics and the law, and a tendency to cultivate metropolitan cultural models—was not only more typically English than the cultural patterns exhibited by Puritan Massachusetts and Connecticut, but also almost certainly characteristic of most other early modern British colonies from Barbados north to Rhode Island and New Hampshire. Within the larger framework of American colonial life, then, not the Southern but the Puritan colonies appear to have been distinctive, and even they seem to have been rapidly assimilating to the dominant cultural patterns by the late Colonial period.

21. The author is primarily concerned with
  - (A) refuting a claim about the influence of Puritan culture on the early American South
  - (B) refuting a thesis about the distinctiveness of the culture of the early American South
  - (C) refuting the two premises that underlie Davis' discussion of the culture of the American South in the period before 1815
  - (D) challenging the hypothesis that early American culture was homogeneous in nature
  - (E) challenging the contention that the American South made greater contributions to early American culture than Puritan New England did
22. The passage implies that the attitudes toward Native Americans that prevailed in the Southern colonies
  - (A) were in conflict with the cosmopolitan outlook of the South
  - (B) derived from Southerners' strong interest in the law
  - (C) were modeled after those that prevailed in the North
  - (D) differed from those that prevailed in the Puritan colonies
  - (E) developed as a response to attitudes that prevailed in Massachusetts and Connecticut
23. According to the author, the depiction of American culture during the Colonial and Revolutionary eras as an extension of New England Puritan culture reflects the
  - (A) fact that historians have overestimated the importance of the Puritans in the development of American culture
  - (B) fact that early American culture was deeply influenced by the strong religious orientation of the colonists
  - (C) failure to recognize important and undeniable cultural differences between New Hampshire and Rhode Island on the one hand and the Southern colonies on the other
  - (D) extent to which Massachusetts and Connecticut served as cultural models for the other American colonies
  - (E) extent to which colonial America resisted assimilating cultural patterns that were typically English
24. The author of the passage is in agreement with which of the following elements of Davis' book?
  - I. Davis' claim that acquisitiveness was a characteristic unique to the South during the Colonial period
  - II. Davis' argument that there were significant differences between Puritan and Southern culture during the Colonial period
  - III. Davis' thesis that the Southern colonies shared a common culture

- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II only
  - (E) II and III only
25. It can be inferred from the passage that the author would find Davis' second premise (lines 18-20) more plausible if it were true that
- (A) Puritan culture had displayed the tendency characteristic of the South to cultivate metropolitan cultural models
  - (B) Puritan culture had been dominant in all the non-Southern colonies during the seventeenth and eighteenth centuries
  - (C) the communal impulse and a strong religious orientation had been more prevalent in the South
  - (D) the various cultural patterns of the Southern colonies had more closely resembled each other
  - (E) the cultural patterns characteristic of most early modern British colonies had also been characteristic of the Puritan colonies
26. The passage suggests that by the late Colonial period the tendency to cultivate metropolitan cultural models was a cultural pattern that was
- (A) dying out as Puritan influence began to grow
  - (B) self-consciously and distinctively Southern
  - (C) spreading to Massachusetts and Connecticut
  - (D) more characteristic of the Southern colonies than of England
  - (E) beginning to spread to Rhode Island and New Hampshire
27. Which of the following statements could most logically follow the last sentence of the passage?
- (A) Thus, had more attention been paid to the evidence, Davis would not have been tempted to argue that the culture of the South diverged greatly from Puritan culture in the seventeenth century.
  - (B) Thus, convergence, not divergence, seems to have characterized the cultural development of the American colonies in the eighteenth century.
  - (C) Thus, without the cultural diversity represented by the America South, the culture of colonial America would certainly have been homogeneous in nature.
  - (D) Thus, the contribution of Southern colonials to American culture was certainly overshadowed by that of the Puritans.
  - (E) Thus, the culture of America during the Colonial period was far more sensitive to outside influences than historians are accustomed to acknowledge.

## SECTION B

For some time scientists have believed that cholesterol plays a major role in heart disease because people with familial **hypercholesterolemia**, a genetic defect, have six to eight times the normal level of cholesterol in their blood and they invariably develop heart disease. These people lack cell-surface



receptors for low-density lipoproteins (LDL's), which are the fundamental carriers of blood cholesterol to the body cells that use cholesterol. Without an adequate number of cell-surface receptors to remove LDL's from the blood, the cholesterol-carrying LDL's remain in the blood, increasing blood cholesterol levels. Scientists also noticed that people with familial hypercholesterolemia appear to produce more LDL's than normal individuals. How, scientists wondered, could a genetic mutation that causes a slowdown in the removal of LDL's from the blood also result in an increase in the synthesis of this cholesterol-carrying protein?

Since scientists could not experiment on human body tissue, their knowledge of familial hypercholesterolemia was severely limited. However, a breakthrough came in the laboratories of Yoshio Watanabe of Kobe University in Japan in 1980. Watanabe noticed that a male rabbit in his colony had ten times the normal concentration of cholesterol in its blood. By appropriate breeding, Watanabe obtained a strain of rabbits that had very high cholesterol levels. These rabbits spontaneously developed heart disease. To his surprise, Watanabe further found that the rabbits, like humans with familial hypercholesterolemia, lacked LDL receptors. Thus, scientists could study these Watanabe rabbits to gain a better understanding of familial hypercholesterolemia in humans.

Prior to the breakthrough at Kobe University, it was known that LDL's are secreted from the liver in the form of a precursor, called very low-density lipoproteins (VLDL's), which carry **triglycerides** as well as relatively small amounts of cholesterol. The triglycerides are removed from the VLDL's by fatty and other tissues. What remains is a remnant particle that must be removed from the blood. What scientists learned by studying the Watanabe rabbits is that the removal of the VLDL remnant requires the LDL receptor. Normally, the majority of the VLDL remnants go to the liver where they bind to LDL receptors and are degraded. In the Watanabe rabbit, due to a lack of LDL receptors on liver cells, the VLDL remnants remain in the blood and are eventually converted to LDL's. The LDL receptors thus have a dual effect in controlling LDL levels. They are necessary to prevent oversynthesis of LDL's from VLDL remnants and they are necessary for the normal removal of LDL's from the blood. With this knowledge, scientists are now well on the way toward developing drugs that dramatically lower cholesterol levels in people afflicted with certain forms of familial hypercholesterolemia.

17. In the passage, the author is primarily concerned with
  - (A) presenting a hypothesis and describing compelling evidence in support of it
  - (B) raising a question and describing an important discovery that led to an answer
  - (C) showing that a certain genetically caused disease can be treated effectively with drugs
  - (D) explaining what causes the genetic mutation that leads to heart disease
  - (E) discussing the importance of research on animals for the study of human disease
18. Which of the following drugs, if developed, would most likely be an example of the kind of drug mentioned in line 53?
  - (A) A drug that stimulates the production of VLDL remnants
  - (B) A drug that stimulates the production of LDL receptors on the liver
  - (C) A drug that stimulates the production of an enzyme needed for cholesterol production
  - (D) A drug that suppresses the production of body cells that use cholesterol
  - (E) A drug that prevents triglycerides from attaching to VLDL's
19. The passage supplies information to answer which of the following questions?
  - (A) Which body cells are the primary users of cholesterol?
  - (B) How did scientists discover that LDL's are secreted from the liver in the form of a precursor?
  - (C) Where in the body are VLDL remnants degraded?
  - (D) Which body tissues produce triglycerides?

- (E) What techniques are used to determine the presence or absence of cell-surface receptors?
20. According to the passage, by studying the Watanabe rabbits scientists learned that
- (A) VLDL remnants are removed from the blood by LDL receptors in the liver
  - (B) LDL's are secreted from the liver in the form of precursors called VLDL's
  - (C) VLDL remnant particles contain small amounts of cholesterol
  - (D) triglycerides are removed from VLDL's by fatty tissues
  - (E) LDL receptors remove LDL's from the blood
21. The development of drug treatments for some forms of familial hypercholesterolemia is regarded by the author as
- (A) possible, but not very important
  - (B) interesting, but too costly to be practical
  - (C) promising, but many years off
  - (D) extremely unlikely
  - (E) highly probable
22. The passage implies that if the Watanabe rabbits had had as many LDL receptors on their livers as do normal rabbits, the Watanabe rabbits would have been
- (A) less likely than normal rabbits to develop heart disease
  - (B) less likely than normal rabbits to develop high concentrations of cholesterol in their blood
  - (C) less useful than they actually were to scientists in the study of familial hypercholesterolemia in humans
  - (D) unable to secrete VLDL's from their livers
  - (E) immune to drugs that lower cholesterol levels in people with certain forms of familial hypercholesterolemia
23. The passage implies that Watanabe rabbits differ from normal rabbits in which of the following ways?
- (A) Watanabe rabbits have more LDL receptors than do normal rabbits.
  - (B) The blood of Watanabe rabbits contains more VLDL remnants than does the blood of normal rabbits.
  - (C) Watanabe rabbits have fewer fatty tissues than do normal rabbits.
  - (D) Watanabe rabbits secrete lower levels of VLDL's than do normal rabbits.
  - (E) The blood of Watanabe rabbits contains fewer LDL's than does the blood of normal rabbits.

(The article from which this passage was taken appeared in 1981.)

When speaking of Romare Bearden, one is tempted to say, "A great Black American artist." The subject matter of Bearden's collages is certainly Black. Portrayals of the folk of Mecklenburg County, North Carolina, whom he remembers from early childhood, of the jazz musicians and tenement roofs of his Harlem days, of Pittsburgh steelworkers, and his reconstruction of classical Greek myths in the guise of the ancient Black kingdom of Benin, attest to this. In natural harmony with this choice of subject matter are the social sensibilities of the artist, who remains active today with the Cinque Gallery in Manhattan, which he helped found and which is devoted to showing the work of minority artists.

Then why not call Bearden a Black American artist? Because ultimately this categorization is too

narrow. "What stands up in the end is structure," Bearden says. "What I try to do is amplify. If I were just creating a picture of a farm woman from back home, it would have meaning to her and people there. But art amplifies itself to something universal."

24. According to the passage, all of the following are depicted in Bearden's collages EXCEPT:
- (A) workers in Pittsburgh's steel mills
  - (B) scenes set in the ancient kingdom of Benin
  - (C) people Bearden knew as a child
  - (D) traditional representations of the classical heroes of Greek mythology
  - (E) the jazz musicians of the Harlem Bearden used to know
25. The author suggests that Bearden should not be called a Black American artist because
- (A) there are many collages by Bearden in which the subject matter is not Black
  - (B) Bearden's work reflects the Black American experience in a highly individual style
  - (C) through the structure of Bearden's art his Black subjects come to represent all of humankind
  - (D) Bearden's true significance lies not so much in his own work as in his efforts to help other minority artists
  - (E) much of Bearden's work uses the ancient Black kingdom of Benin for its setting
26. Bearden's social sensibilities and the subject matter of his collages are mentioned by the author in order to explain
- (A) why one might be tempted to call Bearden a Black American artist
  - (B) why Bearden cannot be readily categorized
  - (C) why Bearden's appeal is thought by many to be ultimately universal
  - (D) how deeply an artist's artistic creations are influenced by the artist's social conscience
  - (E) what makes Bearden unique among contemporary Black American artists
27. The author of the passage is chiefly concerned with
- (A) discussing Bearden's philosophy of art
  - (B) assessing the significance of the ethnic element in Bearden's work
  - (C) acknowledging Bearden's success in giving artistic expression to the Black American experience
  - (D) pointing out Bearden's helpfulness to other minority artists
  - (E) tracing Bearden's progress toward artistic maturity

No. 9-5

## SECTION A

Zooplankton, tiny animals adapted to an existence in the ocean, have evolved clever mechanisms for obtaining their food, miniscule phytoplankton (plant plankton). A very specialized feeding adaptation in zooplankton is that of the tadpolelike appendicularian who lives in a walnut-sized (or smaller) balloon of mucus equipped with filters that capture and concentrate phytoplankton. The balloon, a transparent structure that varies in design according to the type of appendicularian in habiting it, also protects the animal and helps to keep it afloat. Water containing phytoplankton is pumped by the appendicularian's muscular tail into the balloon's incurrent filters, passes through the feeding filter where the appendicularian sucks the food into its mouth, and then goes through an exit passage. Found in all the

oceans of the world, including the Arctic Ocean, appendicularians tend to remain near the water's surface where the density of phytoplankton is greatest.

17. It can be inferred from the passage that which of the following is true of appendicularians?
- (A) They are exclusively carnivorous.
  - (B) They have more than one method of obtaining food.
  - (C) They can tolerate frigid water.
  - (D) They can disguise themselves by secreting mucus.
  - (E) They are more sensitive to light than are other zooplankton.
18. The author is primarily concerned with
- (A) explaining how appendicularians obtain food
  - (B) examining the flotation methods of appendicularians
  - (C) mapping the distribution of appendicularians around the world
  - (D) describing how appendicularians differ from other zooplankton
  - (E) comparing the various types of balloons formed by appendicularians
19. According to the passage, all of the following are descriptive of appendicularians EXCEPT:
- (A) tailed
  - (B) vegetarian
  - (C) small-sized
  - (D) single-celled
  - (E) ocean-dwelling
20. The passage suggests that appendicularians tend to remain in surface waters because they
- (A) prefer the warmer water near the surface
  - (B) are unable to secrete mucus at the lower levels of the ocean
  - (C) use the contrast of light and shadow at the surface to hide from predators
  - (D) live in balloons that cannot withstand the water pressure deeper in the ocean
  - (E) eat food that grows more profusely near the surface

Students of United States history, seeking to identify the circumstances that encouraged the emergence of feminist movements, have thoroughly investigated the mid-nineteenth-century American economic and social conditions that affected the status of women. These historians, however, have analyzed less fully the development of specifically feminist ideas and activities during the same period. Furthermore, the ideological origins of feminism in the United States have been obscured because, even when historians did take into account those feminist ideas and activities occurring within the United States, they failed to recognize that feminism was then a truly international movement actually centered in Europe. American feminist activists who have been described as "solitary" and "individual theorists" were **in reality** connected to a movement—utopian socialism—which was already popularizing feminist ideas in Europe during the two decades that culminated in the first women's rights conference held at Seneca Falls, New York, in 1848. Thus, a complete understanding of the origins and development of nineteenth-century feminism in the United States requires that the geographical focus be widened to include Europe and that the detailed study already made of social conditions be expanded to include the ideological development of feminism.

The earliest and most popular of the utopian socialists were the Saint-Simonians. The specifically feminist part of Saint-Simonism has, however, been less studied than the group's contribution to early socialism. This is regrettable on two counts. **By** 1832 feminism was the central concern of Saint-

Simonianism and entirely absorbed its adherents' energy; hence, by ignoring its feminism, European historians have misunderstood Saint-Simonianism. Moreover, since many feminist ideas can be traced to Saint-Simonianism, European historians' appreciation of later feminism in France and the United States remained limited.

Saint-Simon's followers, many of whom were women, based their feminism on an interpretation of his project to reorganize the globe by replacing brute force with the rule of spiritual powers. The new world order would be ruled together by a male, to represent reflection, and a female, to represent sentiment. This complementarity reflects the fact that, while the Saint-Simonians did not reject the belief that there were innate differences between men and women, they nevertheless foresaw an equally important social and political role for both sexes in their utopia.

Only a few Saint-Simonians opposed a definition of sexual equality based on gender distinction. This minority believed that individuals of both sexes were born similar in capacity and character, and they ascribed male-female differences to socialization and education. The envisioned result of both currents of thought, however, was that women would enter public life in the new age and that sexual equality would reward men as well as women with an improved way of life.

21. It can be inferred that the author considers those historians who describe early feminists in the United States as "solitary" to be
  - (A) insufficiently familiar with the international origins of nineteenth-century American feminist thought
  - (B) overly concerned with the regional diversity of feminist ideas in the period before 1848
  - (C) not focused narrowly enough in their geographical scope
  - (D) insufficiently aware of the ideological consequences of the Seneca Falls conference
  - (E) insufficiently concerned with the social conditions out of which feminism developed
22. According to the passage, which of the following is true of the Seneca Falls conference on women's rights?
  - (A) It was primarily a product of nineteenth-century Saint-Simonian feminist thought.
  - (B) It was the work of American activists who were independent of feminists abroad.
  - (C) It was the culminating achievement of the utopian socialist movement.
  - (D) It was a manifestation of an international movement for social change and feminism.
  - (E) It was the final manifestation of the women's rights movement in the United States in the nineteenth century.
23. The author's attitude toward most European historians who have studied the Saint-Simonians is primarily one of
  - (A) approval of the specific focus of their research
  - (B) disapproval of their lack of attention to the issue that absorbed most of the Saint-Simonians' energy after 1832
  - (C) approval of their general focus on social conditions
  - (D) disapproval of their lack of attention to links between the Saint-Simonians and their American counterparts
  - (E) disagreement with their interpretation of the Saint-Simonian belief in sexual equality
24. The author mentions all of the following as characteristic of the Saint-Simonians EXCEPT:
  - (A) The group included many women among its members.
  - (B) The group believed in a world that would be characterized by sexual equality.

- (C) The group was among the earliest European socialist groups.
  - (D) Most members believed that women should enter public life.
  - (E) Most members believed that women and men were inherently similar in ability and character.
25. It can be inferred from the passage that the Saint-Simonians envisioned a utopian society having which of the following characteristics?
- (A) It would be worldwide.
  - (B) It would emphasize dogmatic religious principles.
  - (C) It would most influence the United States.
  - (D) It would have armies composed of women rather than of men.
  - (E) It would continue to develop new feminist ideas.
26. It can be inferred from the passage that the author believes that study of Saint-Simonianism is necessary for historians of American feminism because such study
- (A) would clarify the ideological origins of those feminist ideas that influenced American feminism
  - (B) would increase understanding of a movement that deeply influenced the utopian socialism of early American feminists
  - (C) would focus attention on the most important aspect of Saint-Simonian thought before 1832
  - (D) promises to offer insight into a movement that was a direct outgrowth of the Seneca Falls conference of 1848
  - (E) could increase understanding of those ideals that absorbed most of the energy of the earliest American feminists
27. According to the passage, which of the following would be the most accurate description of the society envisioned by most Saint-Simonians?
- (A) A society in which women were highly regarded for their extensive education
  - (B) A society in which the two genders played complementary roles and had equal status
  - (C) A society in which women did not enter public life
  - (D) A social order in which a body of men and women would rule together on the basis of their spiritual power
  - (E) A social order in which distinctions between male and female would not exist and all would share equally in political power

## SECTION B

Historically, a cornerstone of classical empiricism has been the notion that every true generalization must be confirmable by specific observations. In classical empiricism, the truth of "All balls are red," for example, is assessed by inspecting balls; any observation of a *non* red ball refutes unequivocally the proposed generalization.

For W. V. O. Quine, however, this constitutes an overly "narrow" conception of empiricism. "All balls are red," he maintains, forms one strand within an entire web of statements (our knowledge); individual observations can be referred only to this web as a whole. As new observations are collected, he explains, they must be integrated into the web. Problems occur only if a contradiction develops between a new observation, say, "That ball is blue," and the preexisting statements. In that case, he argues, *any*

statement or combination of statements (not merely the “offending” generalization, as in classical empiricism) can be altered to achieve the fundamental requirement, a system free of contradictions, even if, in some cases, the alteration consists of labeling the new observation a “hallucination.”

17. The author of the passage is primarily concerned with presenting
  - (A) criticisms of Quine’s views on the proper conceptualization of empiricism
  - (B) evidence to support Quine’s claims about the problems inherent in classical empiricism
  - (C) an account of Quine’s counterproposal to one of the traditional assumptions of classical empiricism
  - (D) an overview of classical empiricism and its contributions to Quine’s alternate understanding of empiricism
  - (E) a history of classical empiricism and Quine’s reservations about it
18. According to Quine’s conception of empiricism, if a new observation were to contradict some statement already within our system of knowledge, which of the following would be true?
  - (A) The new observation would be rejected as untrue.
  - (B) Both the observation and the statement in our system that it contradicted would be discarded.
  - (C) New observations would be added to our web of statements in order to expand our system of knowledge.
  - (D) The observation or some part of our web of statements would need to be adjusted to resolve the contradiction.
  - (E) An entirely new field of knowledge would be created.
19. As described in the passage, Quine’s specific argument against classical empiricism would be most strengthened if he did which of the following?
  - (A) Provided evidence that many observations are actually hallucinations.
  - (B) Explained why new observations often invalidate preexisting generalizations.
  - (C) Challenged the mechanism by which specific generalizations are derived from collections of particular observations.
  - (D) Mentioned other critics of classical empiricism and the substance of their approaches.
  - (E) Gave an example of a specific generalization that has not been invalidated despite a contrary observation.
20. It can be inferred from the passage that Quine considers classical empiricism to be “overly ‘narrow’ ” (lines 7-8) for which of the following reasons?
  - I. Classical empiricism requires that our system of generalizations be free of contradictions.
  - II. Classical empiricism demands that in the case of a contradiction between an individual observation and a generalization, the generalization must be abandoned.
  - III. Classical empiricism asserts that every observation will either confirm an existing generalization or initiate a new generalization.
  - (A) II only
  - (B) I and II only

- (C) I and III only
- (D) II and III only
- (E) I, II, and III

Until recently astronomers have been puzzled by the fate of **red giant** and supergiant stars. When the core of a giant star whose mass surpasses 1.4 times the present mass of our Sun ( $M_{\odot}$ ) exhausts its nuclear fuel, it is unable to support its own weight and collapses into a tiny **neutron star**. The gravitational energy released during this implosion of the core **blows off** the remainder of the star in a gigantic explosion, or a supernova. Since around 50 percent of all stars are believed to begin their lives with masses greater than  $1.4M_{\odot}$ , we might expect that one out of every two stars would die as a supernova. But in fact, only one star in thirty dies such a violent death. The rest expire much more peacefully as planetary nebulas. Apparently most massive stars manage to lose sufficient material that their masses drop below the critical value of  $1.4 M_{\odot}$  before they exhaust their nuclear fuel.

Evidence supporting this view comes from observations of IRC+10216, a pulsating **giant star** located 700 light-years away from Earth. A huge rate of mass loss ( $1 M_{\odot}$  every 10,000 years) has been deduced from infrared observations of ammonia ( $\text{NH}_3$ ) molecules located in the circumstellar cloud around IRC+10216. Recent microwave observations of carbon monoxide (CO) molecules indicate a similar rate of mass loss and demonstrate that the escaping material extends outward from the star for a distance of at least one light-year. Because we know the size of the cloud around IRC+10216 and can use our observations of either  $\text{NH}_3$  or CO to measure the outflow velocity, we can calculate an age for the circumstellar cloud. IRC+10216 has apparently expelled, in the form of molecules and dust grains, a mass equal to that of our entire Sun within the past ten thousand years. This implies that some stars can shed huge amounts of matter very quickly and thus may never expire as supernovas. Theoretical models as well as statistics on supernovas and planetary nebulas suggest that stars that begin their lives with masses around  $6 M_{\odot}$  shed sufficient material to drop below the critical value of  $1.4 M_{\odot}$ . IRC+10216, for example, should do this in a mere 50,000 years from its birth, only an instant in the life of a star.

But what place does IRC+10216 have in stellar evolution? Astronomers suggest that stars like IRC+10216 are actually "protoplanetary nebulas"—old giant stars whose dense cores have almost but not quite rid themselves of the fluffy envelopes of gas around them. Once the star has lost the entire envelope, its exposed core becomes the central star of the **planetary nebula** and heats and ionizes the last vestiges of the envelope as it flows away into space. This configuration is a full-fledged planetary nebula, long familiar to optical astronomers.

21. The primary purpose of the passage is to
  - (A) offer a method of calculating the age of circumstellar clouds
  - (B) describe the conditions that result in a star's expiring as a supernova
  - (C) discuss new evidence concerning the composition of planetary nebulas
  - (D) explain why fewer stars than predicted expire as supernovas
  - (E) survey conflicting theories concerning the composition of circumstellar clouds
22. The passage implies that at the beginning of the life of IRC+10216, its mass was approximately
  - (A)  $7.0 M_{\odot}$
  - (B)  $6.0 M_{\odot}$
  - (C)  $5.0 M_{\odot}$
  - (D)  $1.4 M_{\odot}$
  - (E)  $1.0 M_{\odot}$
23. The view to which line 18 refers serves to



- (A) reconcile seemingly contradictory facts
  - (B) undermine a previously held theory
  - (C) take into account data previously held to be insignificant
  - (D) resolve a controversy
  - (E) question new methods of gathering data
24. It can be inferred from the passage that the author assumes which of the following in the discussion of the rate at which IRC+10216 loses mass?
- (A) The circumstellar cloud surrounding IRC+10216 consists only of CO and NH<sub>3</sub> molecules.
  - (B) The circumstellar cloud surrounding IRC+10216 consists of material expelled from that star.
  - (C) The age of a star is equal to that of its circumstellar cloud.
  - (D) The rate at which IRC+10216 loses mass varies significantly from year to year.
  - (E) Stars with a mass greater than 6 M<sub>☉</sub> lose mass at a rate faster than stars with a mass less than 6 M<sub>☉</sub> do.
25. According to information provided by the passage, which of the following stars would astronomers most likely describe as a planetary nebula?
- (A) A star that began its life with a mass of 5.5 M<sub>☉</sub>, has exhausted its nuclear fuel, and has a core that is visible to astronomers
  - (B) A star that began its life with a mass of 6 M<sub>☉</sub>, lost mass at a rate of 1 M<sub>☉</sub> per 10,000 years, and exhausted its nuclear fuel in 40,000 years
  - (C) A star that has exhausted its nuclear fuel, has a mass of 1.2 M<sub>☉</sub>, and is surrounded by a circumstellar cloud that obscures its core from view
  - (D) A star that began its life with a mass greater than 6 M<sub>☉</sub>, has just recently exhausted its nuclear fuel, and is in the process of releasing massive amounts of gravitational energy
  - (E) A star that began its life with a mass of 5.5 M<sub>☉</sub>, has yet to exhaust its nuclear fuel, and exhibits a rate of mass loss similar to that of IRC+10216
26. Which of the following statements would be most likely to follow the last sentence of the passage?
- (A) Supernovas are not necessarily the most spectacular events that astronomers have occasion to observe.
  - (B) Apparently, stars that have a mass of greater than 6 M<sub>☉</sub> are somewhat rare.
  - (C) Recent studies of CO and NH<sub>3</sub> in the circumstellar clouds of stars similar to IRC+10216 have led astronomers to believe that the formation of planetary nebulas precedes the development of supernovas.
  - (D) It appears, then, that IRC+10216 actually represents an intermediate step in the evolution of a giant star into a planetary nebula.
  - (E) Astronomers have yet to develop a consistently accurate method for measuring the rate at which a star exhausts its nuclear fuel.
27. Which of the following titles best summarizes the content of the passage?

- (A) New Methods of Calculating the Age of Circumstellar Clouds
- (B) New Evidence Concerning the Composition of Planetary Nebulas
- (C) Protoplanetary Nebula: A Rarely Observed Phenomenon
- (D) Planetary Nebulas: An Enigma to Astronomers
- (E) The Diminution of a Star's Mass: A Crucial Factor in Stellar Evolution

No. 9-6

## SECTION A

(This passage is from an article published in 1973)

The recent change to all-volunteer armed forces in the United States will eventually produce a gradual increase in the proportion of women in the armed forces and in the variety of women's assignments, but probably not the dramatic gains for women that might have been expected. This is so even though the armed forces operate in an ethos of institutional change oriented toward occupational equality and under the federal sanction of equal pay for equal work. The difficulty is that women are unlikely to be trained for any direct combat operations. A significant portion of the larger society remains uncomfortable as yet with extending equality in this direction. Therefore, for women in the military, the search for equality will still be based on functional equivalence, not identity or even similarity of task. Opportunities seem certain to arise. The growing emphasis on deterrence is bound to offer increasing scope for women to become involved in novel types of noncombat military assignments.

17. The primary purpose of the passage is to
  - (A) present an overview of the different types of assignments available to women in the new United States all-volunteer armed forces
  - (B) present a **reasoned** prognosis of the status of women in the new United States all-volunteer armed forces
  - (C) present the new United States all-volunteer armed forces as a model case of equal employment policies in action
  - (D) analyze reforms in the new United States all-volunteer armed forces necessitated by the increasing number of women in the military
  - (E) analyze the use of functional equivalence as a substitute for occupational equality in the new United States all-volunteer armed forces
18. According to the passage, despite the United States armed forces' commitment to occupational equality for women in the military, certain other factors preclude women's
  - (A) receiving equal pay for equal work
  - (B) having access to positions of responsibility at most levels
  - (C) drawing assignments from a wider range of assignments than before
  - (D) benefiting from opportunities arising from new noncombat functions
  - (E) being assigned all of the military tasks that are assigned to men
19. The passage implies that which of the following is a factor conducive to a more equitable representation of women in the United States armed forces than has existed in the past?
  - (A) The all-volunteer character of the present armed forces
  - (B) The past service records of women who had assignments functionally equivalent to men's assignments
  - (C) The level of awareness on the part of the larger society of military issues

- (D) A decline in the proportion of deterrence oriented noncombat assignments  
(E) Restrictive past policies governing the military assignments open to women
20. The “dramatic gains for women” (line 5) and the attitude, as described in lines 11-12, of a “significant portion of the larger society” are logically related to each other **inasmuch as** the author puts forward the latter as
- (A) a public response to achievement of the former  
(B) the major reason for absence of the former  
(C) a precondition for any prospect of achieving the former  
(D) a catalyst for a further extension of the former  
(E) a reason for some of the former being lost again

Of the thousands of specimens of meteorites found on Earth and known to science, only about 100 are igneous; that is, they have undergone melting by volcanic action at some time since the planets were first formed. These igneous meteorites are known as achondrites because they lack chondrules—small stony spherules found in the thousands of meteorites (called “chondrites”) composed primarily of unaltered minerals that condensed from dust and gas at the origin of the solar system. Achondrites are the only known samples of volcanic rocks originating outside the Earth-Moon system. Most are thought to have been dislodged by interbody impact from asteroids, with diameters of from 10 to 500 kilometers, in solar orbit between Mars and Jupiter.

Shergottites, the name given to three anomalous achondrites so far discovered on Earth, present scientists with a genuine enigma. Shergottites crystallized from molten rock less than 1.1 billion years ago (some 3.5 billion years later than typical achondrites) and were presumably ejected into space when an object impacted on a body similar in chemical composition to Earth.

While most meteorites appear to derive from comparatively small bodies, shergottites exhibit properties that indicate that their source was a large planet, conceivably Mars. In order to account for such an unlikely source, some unusual factor must be invoked, because the impact needed to accelerate a fragment of rock to escape the gravitational field of a body even as small as the Moon is so great that no meteorites of lunar origin have been discovered.

While some scientists speculate that shergottites derive from Io (a volcanically active moon of Jupiter), recent measurements suggest that since Io’s surface is rich in sulfur and sodium, the chemical composition of its volcanic products would probably be unlike that of the shergottites. Moreover, any fragments dislodged from Io by interbody impact would be unlikely to escape the gravitational pull of Jupiter.

The only other logical source of shergottites is Mars. Space-probe photographs indicate the existence of giant volcanoes on the Martian surface. From the small number of impact craters that appear on Martian lava flows, one can estimate that the planet was volcanically active as recently as a half-billion years ago—and may be active today. The great objection to the Martian origin of shergottites is the absence of lunar meteorites on Earth. An impact capable of ejecting a fragment of the Martian surface into an Earth-intersecting orbit is even less probable than such an event on the Moon, **in view of** the Moon’s smaller size and closer proximity to Earth. A recent study suggests, however, that permafrost ices below the surface of Mars may have altered the effects of impact on it. If the ices had been rapidly vaporized by an impacting object, the expanding gases might have helped the ejected fragments reach **escape velocity**. Finally, analyses performed by space probes show a remarkable chemical similarity between Martian soil and the shergottites.

21. The passage implies which of the following about shergottites?
- I. They are products of volcanic activity.  
II. They derive from a planet larger than Earth.  
III. They come from a planetary body with a chemical composition similar to that of Io.

- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III
22. According to the passage, a meteorite discovered on Earth is unlikely to have come from a large planet for which of the following reasons?
- (A) There are fewer large planets in the solar system than there are asteroids.
  - (B) Most large planets have been volcanically inactive for more than a billion years.
  - (C) The gravitational pull of a large planet would probably prohibit fragments from escaping its orbit.
  - (D) There are no chondrites occurring naturally on Earth and probably none on other large planets.
  - (E) Interbody impact is much rarer on large than on small planets because of the density of the atmosphere on large planets.
23. The passage suggests that the age of shergottites is probably
- (A) still entirely undetermined
  - (B) less than that of most other achondrites
  - (C) about 3.5 billion years
  - (D) the same as that of typical achondrites
  - (E) greater than that of the Earth
24. According to the passage, the presence of chondrules in a meteorite indicates that the meteorite
- (A) has probably come from Mars
  - (B) is older than the solar system itself
  - (C) has not been melted since the solar system formed
  - (D) is certainly less than 4 billion years old
  - (E) is a small fragment of an asteroid
25. The passage provides information to answer which of the following questions?
- (A) What is the precise age of the solar system?
  - (B) How did shergottites get their name?
  - (C) What are the chemical properties shared by shergottites and Martian soils?
  - (D) How volcanically active is the planet Jupiter?
  - (E) What is a major feature of the Martian surface?
26. It can be inferred from the passage that each of the following is a consideration in determining whether a particular planet is a possible source of shergottites that have been discovered on Earth EXCEPT the
- (A) planet's size
  - (B) planet's distance from Earth
  - (C) strength of the planet's field of gravity

- (D) proximity of the planet to its moons
  - (E) chemical composition of the planet's surface
27. It can be inferred from the passage that most meteorites found on Earth contain which of the following?
- (A) Crystals
  - (B) Chondrules
  - (C) Metals
  - (D) Sodium
  - (E) Sulfur

## SECTION B

The transplantation of organs from one individual to another normally involves two major problems: (1) organ rejection is likely unless the transplantation **antigens** of both individuals are nearly identical, and (2) the introduction of any unmatched transplantation antigens induces the development by the recipient of donor-specific lymphocytes that will produce violent rejection of further transplantations from that donor. However, we have found that among many strains of rats these "normal" rules of transplantation are not obeyed by liver transplants. Not only are liver transplants never rejected, but they even induce a state of donor-specific unresponsiveness in which subsequent transplants of other organs, such as skin, from that donor are accepted permanently. Our hypothesis is that (1) many strains of rats simply cannot mount a sufficiently vigorous destructive immune-response (using lymphocytes) to outstrip the liver's relatively great capacity to protect itself from immune-response damage and that (2) the systemic unresponsiveness observed is due to concentration of the recipient's donor-specific lymphocytes at the site of the liver transplant.

17. The primary purpose of the passage is to treat the accepted generalizations about organ transplantation in which of the following ways?
- (A) Explicate their main features
  - (B) Suggest an alternative to them
  - (C) Examine their virtues and limitations
  - (D) Criticize the major evidence used to support them
  - (E) Present findings that qualify them
18. It can be inferred from the passage that the author believes that an important difference among strains of rats is the
- (A) size of their livers
  - (B) constitution of their skin
  - (C) strength of their immune-response reactions
  - (D) sensitivity of their antigens
  - (E) adaptability of their lymphocytes
19. According to the hypothesis of the author, after a successful liver transplant, the reason that rats do not reject further transplants of other organs from the same donor is that the
- (A) transplantation antigens of the donor and the recipient become matched
  - (B) lymphocytes of the recipient are weakened by the activity of the transplanted liver
  - (C) subsequently transplanted organ is able to repair the damage caused by the recipient's immune-response reaction

- (D) transplanted liver continues to be the primary locus for the recipient's immune-response reaction
- (E) recipient is unable to manufacture the lymphocytes necessary for the immune-response reaction
20. Which of the following new findings about strains of rats that do not normally reject liver transplants, if true, would support the authors' hypothesis?
- I. Stomach transplants are accepted by the recipients in all cases.
  - II. Increasing the strength of the recipient's immune-response reaction can induce liver-transplant rejection.
  - III. Organs from any other donor can be transplanted without rejection after liver transplantation.
  - IV. Preventing lymphocytes from being concentrated at the liver transplant produces acceptance of skin transplants.
- (A) II only
- (B) I and III only
- (C) II and IV only
- (D) I, II, and III only
- (E) I, III, and IV only

Practically speaking, the artistic maturing of the cinema was the single-handed achievement of David W. Griffith (1875-1948). Before Griffith, photography in dramatic films consisted of **little more than** placing the actors before a stationary camera and showing them in full length as they would have appeared on stage. From the beginning of his career as a director, however, Griffith, because of his love of Victorian painting, employed composition. He conceived of the camera image as having a foreground and a rear ground, as well as the middle distance preferred by most directors. By 1910 he was using close-ups to reveal significant details of the scene or of the acting and extreme long shots to achieve a sense of spectacle and distance. His appreciation of the camera's possibilities produced novel dramatic effects. By splitting an event into fragments and recording each from the most suitable camera position, he could significantly vary the emphasis from camera shot to camera shot.

Griffith also achieved dramatic effects by means of creative editing. By juxtaposing images and varying the speed and rhythm of their presentation, he could control the dramatic intensity of the events as the story progressed. Despite the reluctance of his producers, who feared that the public would not be able to follow a plot that was made up of such juxtaposed images, Griffith persisted, and experimented as well with other elements of cinematic syntax that have become standard **ever since**. These included the flashback, permitting broad psychological and emotional exploration as well as narrative that was not chronological, and the crosscut between two parallel actions to heighten suspense and excitement. In thus exploiting fully the possibilities of editing, Griffith transposed devices of the Victorian novel to film and gave film mastery of time as well as space.

Besides developing the cinema's language, Griffith immensely broadened its range and treatment of subjects. His early output was remarkably eclectic: it included not only the standard comedies, melodramas, westerns, and thrillers, but also such novelties as adaptations from Browning and Tennyson, and treatments of social issues. As his successes mounted, his ambitions grew, and with them the whole of American cinema. When he remade *Enoch Arden* in 1911, he insisted that a subject of such importance could not be treated in the then conventional length of one reel. Griffith's introduction of the American-made multireel picture began an immense revolution. Two years later, *Judith of Bethulia*, an elaborate historicophilosophical spectacle, reached the unprecedented length of four reels, or one hour's **running time**. From our contemporary viewpoint, the pretensions of this film may seem a trifle ludicrous, but at the time it provoked endless debate and discussion and gave a new intellectual respectability to

the cinema.

21. The primary purpose of the passage is to
  - (A) discuss the importance of Griffith to the development of the cinema
  - (B) describe the impact on cinema of the flashback and other editing innovations
  - (C) deplore the state of American cinema before the advent of Griffith
  - (D) analyze the changes in the cinema wrought by the introduction of the multireel film
  - (E) document Griffith's impact on the choice of subject matter in American films
22. The author suggests that Griffith's film innovations had a direct effect on all of the following EXCEPT:
  - (A) film editing
  - (B) camera work
  - (C) scene composing
  - (D) sound editing
  - (E) directing
23. It can be inferred from the passage that before 1910 the normal running time of a film was
  - (A) 15 minutes or less
  - (B) between 15 and 30 minutes
  - (C) between 30 and 45 minutes
  - (D) between 45 minutes and 1 hour
  - (E) 1 hour or more
24. The author asserts that Griffith introduced all of the following into American cinema EXCEPT:
  - (A) consideration of social issues
  - (B) adaptations from Tennyson
  - (C) the flashback and other editing techniques
  - (D) photographic approaches inspired by Victorian painting
  - (E) dramatic plots suggested by Victorian theater
25. The author suggests that Griffith's contributions to the cinema had which of the following results?
  - I. Literary works, especially Victorian novels, became popular sources for film subjects.
  - II. Audience appreciation of other film directors' experimentations with cinematic syntax was increased.
  - III. Many of the artistic limitations thought to be inherent in filmmaking were shown to be really nonexistent.
  - (A) II only
  - (B) III only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II, and III

26. It can be inferred from the passage that Griffith would be most likely to agree with which of the following statements?
- (A) The good director will attempt to explore new ideas as quickly as possible.
  - (B) The most important element contributing to a film's success is the ability of the actors.
  - (C) The camera must be considered an integral and active element in the creation of a film.
  - (D) The cinema should emphasize serious and sober examinations of fundamental human problems.
  - (E) The proper composition of scenes in a film is more important than the details of their editing.
27. The author's attitude toward photography in the cinema before Griffith can best be described as
- (A) sympathetic
  - (B) nostalgic
  - (C) amused
  - (D) condescending
  - (E) hostile

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SECTION A

Because of its accuracy in outlining the Earth's subsurface, the seismic-reflection method remains the most important tool in the search for **petroleum reserves**. In field practice, a subsurface is mapped by arranging a series of wave-train sources, such as small dynamite explosions, in a grid pattern. As each source is activated, it generates a wave train that moves downward at a speed determined uniquely by the rock's elastic characteristics. As rock interfaces are crossed, the elastic characteristics encountered generally change abruptly, which causes part of the energy to be reflected back to the surface, where it is recorded by seismic instruments. The seismic records must be processed to correct for positional differences between the source and the receiver, for unrelated wave trains, and for multiple reflections from the rock interfaces. Then the data acquired at each of the specific source locations are combined to generate a physical profile of the subsurface, which can eventually be used to select targets for drilling.

17. The passage is primarily concerned with
- (A) describing an important technique
  - (B) discussing a new method
  - (C) investigating a controversial procedure
  - (D) announcing a significant discovery
  - (E) promoting a novel application
18. According to the passage, in the seismic-reflection method all of the following have a significant effect on the signal detected by the seismic instruments EXCEPT the
- (A) presence of unrelated wave trains
  - (B) placement of the seismic instruments
  - (C) number of sources in the grid pattern
  - (D) nature of the reflectivity of the rock interfaces



- (E) properties of rocks through which the wave train has traveled
19. It can be inferred from the passage that the seismic-reflection method would be likely to yield an inaccurate physical profile of the subsurface in which of the following circumstances?
- (A) If the speed at which the wave train moved downward changed
  - (B) If the receiver were not positioned directly at the wave-train source
  - (C) If the rock on one side of a rock interface had similar elastic characteristics to those of the rock on the other side
  - (D) If the seismic records obtained for the different sources in a grid were highly similar to each other
  - (E) If there were no petroleum deposits beneath the area defined by the grid of wave-train sources
20. Which of the following best describes the organization of the passage?
- (A) A method is criticized, and an alternative is suggested.
  - (B) An illustration is examined, and some errors are exposed.
  - (C) An assertion is made, and a procedure is outlined.
  - (D) A series of examples is presented, and a conclusion is drawn.
  - (E) A hypothesis is advanced, and supporting evidence is supplied.

Modern archaeological finds can still contribute much to the study of ancient literature. For example, forty years ago a survey of the early Greek dramatist Aeschylus' plays would have started with *The Suppliant Women*. Many factors internal to the play, but perhaps most especially the prominence of the chorus (which in this play has the main role), led scholars to consider it one of Aeschylus' earlier works. The consensus was that here was a drama truly reflecting an early stage in the evolution of tragedy out of choral lyric. The play was dated as early as the 490's B.C., in any event, well before Aeschylus' play *The Persians* of 472 B.C. Then, in 1952, a fragment of papyrus found at Oxyrhynchus was published stating the official circumstances and results of a dramatic contest. The fragment announced that Aeschylus won first prize with his Danaid tetralogy, of which *The Suppliant Women* is the opening play, and defeated Sophocles in the process. Sophocles did not compete in any dramatic contest before 468 B.C., when he won his first victory. Hence, except by special pleading (e. g., that the tetralogy was composed early in Aeschylus' career but not produced until the 460's B.C.), the Danaid tetralogy must be put after 468 B.C. In addition, a few letters in the fragment suggest the name Archedemides, archon in 463 B.C., thus perhaps tying the plays to that precise date, almost exactly halfway between Aeschylus' *Seven Against Thebes* of 467 B.C. and his *Oresteia*.

The implication of the papyrus administered a severe shock to the vast majority of classical scholars, who had confidently asserted that not only the role of the chorus but also language, metrics, and characterization all pointed to an early date. The discovery has resulted in no less than a total reevaluation of every chronological criterion that has been applied to or derived from Aeschylus' plays. The activity has been brisk, and a new creed has now spread. The prominence of the chorus in *The Suppliant Women* now is seen not as a sign of primitivism but as analogous to the massive choral songs of the *Oresteia*. Statistics have been formulated, or reformulated, to show that stylistically *The Suppliant Women* does actually occupy a position after *The Persians* and *Seven Against Thebes*, which now become the "primitive" plays, and before the *Oresteia*. While the new doctrine seems almost certainly correct, the one papyrus fragment raises the specter that another may be unearthed, showing, for instance, that it was a posthumous production of the Danaid tetralogy which bested Sophocles, and throwing the date once more into utter confusion. This is unlikely to happen, but it warns us that perhaps the most salutary feature of the papyrus scrap is its message of the extreme difficulty of classifying and categorizing rigidly the development of a creative artist.

21. The author of the passage focuses primarily on
- (A) discussing a series of modern archaeological finds and their impact on the study of Greek literature
  - (B) recounting the effect of one archaeological find on modern ideas concerning a particular author's work
  - (C) giving a definitive and coherent account of the chronology of a particular author's work
  - (D) illustrating the many varieties of difficulties involved in establishing facts concerning ancient literature
  - (E) determining the exact value of archaeological finds in relation to the history of ancient literature
22. With respect to the study of ancient literature, which of the following statements best expresses the author's main point concerning modern archaeological finds?
- (A) They can profoundly alter accepted views of ancient literary works, and can encourage flexibility in the way scholars look at the creative development of any artist.
  - (B) They can be severely shocking and can have a revivifying effect on the study of ancient literature, which has recently suffered from a lack of interest on the part of scholars.
  - (C) They can raise more questions than they answer and can be unreliable sources of information.
  - (D) They generally confirm scholars' ideas about ancient literary works and allow them to dispense with inferences drawn from the works' internal structure.
  - (E) They often undermine scholarly consensus in certain areas and create utter confusion concerning an author's work.
23. According to the passage, in the absence of definite knowledge concerning the dates of composition of ancient literary works, literary historians do which of the following when trying to establish the chronology of an author's work?
- (A) Make assumptions about a single work's date of composition if such assumptions would not seriously affect interpretations of other works by the same author.
  - (B) Draw inferences concerning the date of a work's composition based on evidence internal to that work and on the author's other works.
  - (C) Ignore the date of a work's composition which is supplied by archaeological research when literary factors internal to the work contradict that date.
  - (D) Refrain from speculation concerning a work's date of composition unless archaeological finds produce information concerning it.
  - (E) Estimate the date of a work's composition without attempting to relate it to the author's development as an artist.
24. It can be inferred from the passage that which of the following plays or groups of plays is considered the latest in the date of its composition?
- (A) The Persians
  - (B) The Danaid tetralogy
  - (C) The *Oresteia*
  - (D) Seven Against Thebes
  - (E) The Suppliant Women

25. With which of the following statements regarding the chronological criteria mentioned in line 33-34 would the author be most likely to agree?
- (A) Such criteria, whether applied to or derived from the plays, should only be used to confirm already existing knowledge.
  - (B) Such criteria, although derived from reliable external and internal evidence, should be changed continually to avoid rigidity in thinking.
  - (C) Such criteria, based on statistical analysis, are inherently more reliable than those of forty years ago.
  - (D) Such criteria, even when unsupported by external evidence, can resolve most questions.
  - (E) Such criteria, based on often ambiguous internal evidence, can lead to erroneous reconstructions of the chronology of an author's work.
26. The author's attitude toward the "activity" mentioned in line 35 and its consequences can best be described as one of
- (A) amused tolerance
  - (B) mocking envy
  - (C) grave doubt
  - (D) angry disapproval
  - (E) unrestrained enthusiasm
27. The allusion to the hypothetical papyrus fragment in line 45-49 does which of the following?
- (A) Supports an argument concerning the date of *The Suppliant Women*.
  - (B) Refutes the views of the majority of scholars concerning the Oxyrhynchus papyrus find.
  - (C) Predicts the future results of archaeological research proposed in the passage.
  - (D) Undermines the validity of the currently accepted chronology of Aeschylus' works.
  - (E) **Qualifies** the author's agreement with the "new creed" developed since the Oxyrhynchus papyrus find.

## SECTION B

Scholars often fail to see that music played an important role in the preservation of African culture in the United States. They correctly note that slavery stripped some cultural elements from Black people—their political and economic systems—but they underestimate the significance of music in sustaining other African cultural values. African music, unlike the music of some other cultures, was based on a total vision of life in which music was not an isolated social domain. In African culture music was pervasive, serving not only religion, but all phases of life, including birth, death, work, and play. The methods that a community devises to perpetuate itself come into being to preserve aspects of the cultural legacy that that community perceives as essential. Music, like art in general, was so inextricably a part of African culture that it became a crucial means of preserving the culture during and after the dislocations of slavery.

17. The primary purpose of the passage is to
- (A) analyze the impact that slavery had on African political and economic systems
  - (B) review the attempt of recent scholarship to study the influence of African music on other music
  - (C) correct the failure of some scholars to appreciate the significance of music in African culture

- (D) survey the ways by which people attempt to preserve their culture against the effects of oppression
- (E) compare the relative importance of music with that of other art forms in culture
18. In line 9, the phrase “isolated social domain” refers to
- (A) African music in relation to contemporary culture as a whole
- (B) music as it may be perceived in non-African cultures
- (C) a feature of African music that aided in transmitting African cultural values
- (D) an aspect of the African cultural legacy
- (E) the influence of music on contemporary culture
19. Which of the following statements concerning the function of African music can be inferred from the passage?
- (A) It preserved cultural values because it was thoroughly integrated into the lives of the people.
- (B) It was more important in the development of African religious life than in other areas of culture.
- (C) It was developed in response to the loss of political and economic systems.
- (D) Its pervasiveness in African culture hindered its effectiveness in minimizing the impact of slavery.
- (E) Its isolation from the economic domains of life enabled it to survive the destructive impact of slavery.
20. According to the author, scholars would **err in** drawing which of the following conclusions?
- I. Slavery stripped the slaves of their political and economic systems.
- II. African music was similar to all other traditions of music in that it originated in a total vision of life.
- III. Music was a crucial part of the African cultural legacy.
- (A) I only
- (B) II only
- (C) I and II only
- (D) II and III only
- (E) I, II, and III

Traditionally, pollination by wind has been viewed as a reproductive process marked by random events in which the **vagaries** of the wind are compensated for by the generation of vast quantities of pollen, so that the ultimate production of new seeds is assured at the expense of producing much more pollen than is actually used. Because the potential hazards pollen grains are subject to as they are transported over long distances are enormous, wind-pollinated plants have, in the view above, compensated for the ensuing loss of pollen through happenstance by virtue of producing an amount of pollen that is one to three orders of magnitude greater than the amount produced by species pollinated by insects.

However, a number of features that are characteristic of wind-pollinated plants reduce pollen waste. For example, many wind-pollinated species fail to release pollen when wind speeds are low or when humid conditions prevail. Recent studies suggest another way in which species compensate for the inefficiency of wind pollination. These studies suggest that species frequently **take advantage of** the physics of pollen motion by generating specific aerodynamic environments within the immediate vicinity

of their female reproductive organs. It is the morphology of these organs that dictates the pattern of airflow disturbances through which pollen must travel. The speed and direction of the airflow disturbances can combine with the physical properties of a species' pollen to produce a species-specific pattern of pollen collision on the surfaces of female reproductive organs. Provided that these surfaces are strategically located, the consequences of this combination can significantly increase the pollen-capture efficiency of a female reproductive organ.

A critical question that remains to be answered is whether the morphological attributes of the female reproductive organs of wind-pollinated species are evolutionary adaptations to wind pollination or are merely fortuitous. A complete resolution of the question is as yet impossible since adaptation must be evaluated for each species within its own unique functional context. However, it must be said that, while evidence of such evolutionary adaptations does exist in some species, one must be careful about attributing morphology to adaptation. For example, the spiral arrangement of scale-bract complexes on ovule-bearing pine cones, where the female reproductive organs of conifers are located, is important to the production of airflow patterns that spiral over the cone's surfaces, thereby passing airborne pollen from one scale to the next. However, these patterns cannot be viewed as an adaptation to wind pollination because the spiral arrangement occurs in a number of non-wind-pollinated plant lineages and is regarded as a characteristic of vascular plants, of which conifers are only one kind, as a whole. Therefore, the spiral arrangement is not likely to be the result of a direct adaptation to wind pollination.

21. The author of the passage is primarily concerned with discussing
  - (A) the current debate on whether the morphological attributes of wind-pollinated plants are evolutionary adaptations
  - (B) the kinds of airflow patterns that permit wind-pollinated plants to capture pollen most efficiently
  - (C) the ways in which the reproductive processes of wind-pollinated plants are controlled by random events
  - (D) a recently proposed explanation of a way in which wind-pollinated plants reduce pollen waste
  - (E) a specific morphological attribute that permits one species of wind-pollinated plant to capture pollen
22. The author suggests that explanations of wind pollination that emphasize the production of vast quantities of pollen to compensate for the randomness of the pollination process are
  - (A) debatable and misleading
  - (B) ingenious and convincing
  - (C) accurate but incomplete
  - (D) intriguing but controversial
  - (E) plausible but unverifiable
23. According to the passage, the "aerodynamic environments" mentioned in line 23, when they are produced, are primarily determined by the
  - (A) presence of insects near the plant
  - (B) physical properties of the plant's pollen
  - (C) shape of the plant's female reproductive organs
  - (D) amount of pollen generated by the plant
  - (E) number of seeds produced by the plant
24. According to the passage, true statements about the release of pollen by wind-pollinated

plants include which of the following?

- I. The release can be affected by certain environmental factors.
- II. The amount of pollen released increases on a rainy day.
- III. Pollen is sometimes not released by plants when there is little wind.

- (A) II only
- (B) III only
- (C) I and II only
- (D) I and III only
- (E) I, II, and III

25. The passage suggests that the recent studies cited in lines 19-21 have not done which of the following?

- (A) Made any distinctions between different species of wind-pollinated plants.
- (B) Considered the physical properties of the pollen that is produced by wind-pollinated plants.
- (C) Indicated the general range within which plant-generated airflow disturbances are apt to occur.
- (D) Included investigations of the physics of pollen motion and its relationship to the efficient capture of pollen by the female reproductive organs of wind-pollinated plants.
- (E) Demonstrated that the morphological attributes of the female reproductive organs of wind-pollinated plants are usually evolutionary adaptations to wind pollination.

26. It can be inferred from the passage that the claim that the spiral arrangement of scale-bract complexes on an ovule-bearing pine cone is an adaptation to wind pollination would be more convincing if which of the following were true?

- (A) Such an arrangement occurred only in wind-pollinated plants.
- (B) Such an arrangement occurred in vascular plants as a whole.
- (C) Such an arrangement could be shown to be beneficial to pollen release.
- (D) The number of bracts could be shown to have increased over time.
- (E) The airflow patterns over the cone's surfaces could be shown to be produced by such arrangements.

27. Which of the following, if known, is likely to have been the kind of evidence used to support the view described in the first paragraph?

- (A) Wind speeds need not be very low for wind-pollinated plants to fail to release pollen.
- (B) The female reproductive organs of plants often have a sticky surface that allows them to trap airborne pollen systematically.
- (C) Grasses, as well as conifers, generate specific aerodynamic environments within the immediate vicinity of their reproductive organs.
- (D) Rain showers often wash airborne pollen out of the air before it ever reaches an appropriate plant.
- (E) The density and size of an airborne pollen grain are of equal importance in determining whether that grain will be captured by a plant.

## SECTION A

It has been known for many decades that the appearance of sunspots is roughly periodic, with an average cycle of eleven years. Moreover, the incidence of solar flares and the flux of solar cosmic rays, ultraviolet radiation, and x-radiation all vary directly with the **sunspot cycle**. But after more than a century of investigation, the relation of these and other phenomena, known collectively as the solar-activity cycle, to terrestrial weather and climate remains unclear. For example, the sunspot cycle and the allied magnetic-polarity cycle have been linked to periodicities discerned in records of such variables as rainfall, temperature, and winds. Invariably, however, the relation is weak, and commonly of dubious statistical significance.

Effects of solar variability over longer terms have also been sought. The absence of recorded sunspot activity in the notes kept by European observers in the late seventeenth and early eighteenth centuries has led some scholars to postulate a brief cessation of sunspot activity at that time (a period called the **Maunder minimum**). The Maunder minimum has been linked to a span of unusual cold in Europe extending from the sixteenth to the early nineteenth centuries. The reality of the Maunder minimum has yet to be established, however, especially since the records that Chinese naked-eye observers of solar activity made at that time appear to contradict it. Scientists have also sought evidence of long-term solar periodicities by examining indirect climatological data, such as fossil records of the thickness of ancient tree rings. These studies, however, failed to link unequivocally terrestrial climate and the solar-activity cycle, or even to confirm the cycle's past existence.

If consistent and reliable geological or archaeological evidence tracing the solar-activity cycle in the distant past could be found, it might also resolve an important issue in solar physics: how to model solar activity. Currently, there are two models of solar activity. The first supposes that the Sun's internal motions (caused by rotation and convection) interact with its large-scale magnetic field to produce a dynamo, a device in which mechanical energy is converted into the energy of a magnetic field. In short, the Sun's large-scale magnetic field is taken to be self-sustaining, so that the solar-activity cycle it drives would be maintained with little overall change for perhaps billions of years. The alternative explanation supposes that the Sun's large-scale magnetic field is a remnant of the field the Sun acquired when it formed, and is not sustained against decay. In this model, the solar mechanism dependent on the Sun's magnetic field runs down more quickly. Thus, the characteristics of the solar-activity cycle could be expected to change over a long period of time. Modern solar observations span too short a time to reveal whether present cyclical solar activity is a long-lived feature of the Sun, or merely a transient phenomenon.

17. The author focuses primarily on
  - (A) presenting two competing scientific theories concerning solar activity and evaluating geological evidence often cited to support them
  - (B) giving a brief overview of some recent scientific developments in solar physics and assessing their impact on future climatological research
  - (C) discussing the difficulties involved in linking terrestrial phenomena with solar activity and indicating how resolving that issue could have an impact on our understanding of **solar physics**
  - (D) pointing out the futility of a certain line of scientific inquiry into the terrestrial effects of solar activity and recommending its abandonment in favor of purely physics-oriented research
  - (E) outlining the specific reasons why a problem in solar physics has not yet been solved and faulting the overly theoretical approach of modern physicists
18. Which of the following statements about the two models of solar activity, as they are

described in lines 37-55, is accurate?

- (A) In both models cyclical solar activity is regarded as a long-lived feature of the Sun, persisting with little change over billions of years.
  - (B) In both models the solar-activity cycle is hypothesized as being dependent on the large-scale solar magnetic field.
  - (C) In one model the Sun's magnetic field is thought to play a role in causing solar activity, whereas in the other model it is not.
  - (D) In one model solar activity is presumed to be unrelated to terrestrial phenomena, whereas in the other model solar activity is thought to have observable effects on the Earth.
  - (E) In one model cycles of solar activity with periodicities longer than a few decades are considered to be impossible, whereas in the other model such cycles are predicted.
19. According to the passage, late seventeenth and early eighteenth-century Chinese records are important for which of the following reasons?
- (A) They suggest that the data on which the Maunder minimum was predicated were incorrect.
  - (B) They suggest that the Maunder minimum cannot be related to climate.
  - (C) They suggest that the Maunder minimum might be valid only for Europe.
  - (D) They establish the existence of a span of unusually cold weather worldwide at the time of the Maunder minimum.
  - (E) They establish that solar activity at the time of the Maunder minimum did not significantly vary from its present pattern.
20. The author implies which of the following about currently available geological and archaeological evidence concerning the solar-activity cycle?
- (A) It best supports the model of solar activity described in lines 37-45.
  - (B) It best supports the model of solar activity described in lines 45-52.
  - (C) It is insufficient to confirm either model of solar activity described in the third paragraph.
  - (D) It contradicts both models of solar activity as they are presented in the third paragraph.
  - (E) It disproves the theory that terrestrial weather and solar activity are linked in some way.
21. It can be inferred from the passage that the argument in favor of the model described in lines 37-45 would be strengthened if which of the following were found to be true?
- (A) Episodes of intense volcanic eruptions in the distant past occurred in cycles having very long periodicities.
  - (B) At the present time the global level of thunderstorm activity increases and decreases in cycles with periodicities of approximately 11 years.
  - (C) In the distant past cyclical climatic changes had periodicities of longer than 200 years.
  - (D) In the last century the length of the sunspot cycle has been known to vary by as much as 2 years from its average periodicity of 11 years.
  - (E) Hundreds of millions of years ago, solar-activity cycles displayed the same periodicities as do present-day solar-activity cycles.



22. It can be inferred from the passage that Chinese observations of the Sun during the late seventeenth and early eighteenth centuries
- (A) are ambiguous because most sunspots cannot be seen with the naked eye
  - (B) probably were made under the same weather conditions as those made in Europe
  - (C) are more reliable than European observations made during this period
  - (D) record some sunspot activity during this period
  - (E) have been employed by scientists seeking to argue that a change in solar activity occurred during this period
23. It can be inferred from the passage that studies attempting to use tree-ring thickness to locate possible links between solar periodicity and terrestrial climate are based on which of the following assumptions?
- (A) The solar-activity cycle existed in its present form during the time period in which the tree rings grew.
  - (B) The biological mechanisms causing tree growth are unaffected by short-term weather patterns.
  - (C) Average tree-ring thickness varies from species to species.
  - (D) Tree-ring thicknesses reflect changes in terrestrial climate.
  - (E) Both terrestrial climate and the solar-activity cycle randomly affect tree-ring thickness.

The common belief of some linguists that each language is a perfect vehicle for the thoughts of the nation speaking it is in some ways the exact counterpart of the conviction of the Manchester school of economics that supply and demand will regulate everything for the best. Just as economists were blind to the numerous cases in which the law of supply and demand left actual wants unsatisfied, so also many linguists are deaf to those instances in which the very nature of a language **calls forth** misunderstandings in everyday conversation, and in which, consequently, a word has to be modified or defined in order to present the idea intended by the speaker: "He took his stick—no, not John's, but his own." No language is perfect, and if we admit this truth, we must also admit that it is not unreasonable to investigate the relative merits of different languages or of different details in languages.

24. The primary purpose of the passage is to
- (A) analyze an interesting feature of the English language
  - (B) refute a belief held by some linguists
  - (C) show that economic theory is relevant to linguistic study
  - (D) illustrate the confusion that can result from the improper use of language
  - (E) suggest a way in which languages can be made more nearly perfect
25. The misunderstanding presented by the author in lines 13-14 is similar to which of the following?
- I. X uses the word "you" to refer to a group, but Y thinks that X is referring to one person only.
  - II. X mistakenly uses the word "anomaly" to refer to a typical example, but Y knows that "anomaly" means "exception."
  - III. X uses the word "bachelor" to mean "unmarried man," but Y mistakenly thinks that bachelor means "unmarried woman."
- (A) I only
  - (B) II only

- (C) III only
  - (D) I and II only
  - (E) II and III only
26. In presenting the argument, the author does all of the following EXCEPT:
- (A) give an example
  - (B) draw a conclusion
  - (C) make a generalization
  - (D) make a comparison
  - (E) present a paradox
27. Which of the following contributes to the misunderstanding described by the author in lines 13-14?
- (A) It is unclear whom the speaker of the sentence is addressing.
  - (B) It is unclear to whom the word “his” refers the first time it is used.
  - (C) It is unclear to whom the word “his” refers the second time it is used.
  - (D) The meaning of “took” is ambiguous.
  - (E) It is unclear to whom “He” refers.

## SECTION B

It is frequently assumed that the mechanization of work has a revolutionary effect on the lives of the people who operate the new machines and on the society into which the machines have been introduced. For example, it has been suggested that the employment of women in industry took them out of the household, their traditional sphere, and fundamentally altered their position in society. In the nineteenth century, when women began to enter factories, Jules Simon, a French politician, warned that by doing so, women would give up their femininity. Friedrich Engels, however, predicted that women would be liberated from the “social, legal, and economic subordination” of the family by technological developments that made possible the recruitment of “the whole female sex into public industry.” Observers thus differed concerning the social desirability of mechanization’s effects, but they agreed that it would transform women’s lives.

Historians, particularly those investigating the history of women, now seriously question this assumption of transforming power. They conclude that such dramatic technological innovations as the **spinning jenny**, the sewing machine, the typewriter, and the vacuum cleaner have not resulted in equally dramatic social changes in women’s economic position or in the prevailing evaluation of women’s work. The employment of young women in textile mills during the Industrial Revolution was largely an extension of an older pattern of employment of young, single women as **domestics**. It was not the change in office technology, but rather the separation of secretarial work, previously seen as an apprenticeship for beginning managers, from administrative work that in the 1880’s created a new class of “dead-end” jobs, thenceforth considered “women’s work.” The increase in the numbers of married women employed outside the home in the twentieth century had less to do with the mechanization of housework and an increase in leisure time for these women than it did with their own economic necessity and with high marriage rates that shrank the available pool of single women workers, previously, in many cases, the only women employers would hire.

Women’s work has changed considerably in the past 200 years, moving from the household to the office or the factory, and later becoming mostly white-collar instead of blue-collar work. Fundamentally, however, the conditions under which women work have changed little since before the Industrial Revolution: the segregation of occupations by gender, lower pay for women as a group, jobs that require relatively low levels of skill and offer women little opportunity for advancement all persist, while women’s household labor remains demanding. Recent historical investigation has led to a major revision of the

notion that technology is always inherently revolutionary in its effects on society. Mechanization may even have slowed any change in the traditional position of women both in the labor market and in the home.

17. Which of the following statements best summarizes the main idea of the passage?
  - (A) The effects of the mechanization of women's work have not borne out the frequently held assumption that new technology is inherently revolutionary.
  - (B) Recent studies have shown that mechanization revolutionizes a society's traditional values and the customary roles of its members.
  - (C) Mechanization has caused the nature of women's work to change since the Industrial Revolution.
  - (D) The mechanization of work creates whole new classes of jobs that did not previously exist.
  - (E) The mechanization of women's work, while extremely revolutionary in its effects, has not, on the whole, had the deleterious effects that some critics had feared.
18. The author mentions all of the following inventions as examples of dramatic technological innovations EXCEPT the
  - (A) sewing machine
  - (B) vacuum cleaner
  - (C) typewriter
  - (D) telephone
  - (E) spinning jenny
19. It can be inferred from the passage that, before the Industrial Revolution, the majority of women's work was done in which of the following settings?
  - (A) Textile mills
  - (B) Private households
  - (C) Offices
  - (D) Factories
  - (E) Small shops
20. It can be inferred from the passage that the author would consider which of the following to be an indication of a fundamental alteration in the conditions of women's work?
  - (A) Statistics showing that the majority of women now occupy white-collar positions
  - (B) Interviews with married men indicating that they are now doing some household tasks
  - (C) Surveys of the labor market documenting the recent creation of a new class of jobs in electronics in which women workers outnumber men four to one
  - (D) Census results showing that working women's wages and salaries are, on the average, as high as those of working men
  - (E) Enrollment figures from universities demonstrating that increasing numbers of young women are choosing to continue their education beyond the undergraduate level
21. The passage states that, before the twentieth century, which of the following was true of many employers?
  - (A) They did not employ women in factories.
  - (B) They tended to employ single rather than married women.

- (C) They employed women in only those jobs that were related to women's traditional household work.
  - (D) They resisted technological innovations that would radically change women's roles in the family.
  - (E) They hired women only when qualified men were not available to fill the open positions.
22. It can be inferred from the passage that the author most probably believes which of the following to be true concerning those historians who study the history of women?
- (A) Their work provides insights important to those examining social phenomena affecting the lives of both sexes.
  - (B) Their work can only be used cautiously by scholars in other disciplines.
  - (C) Because they concentrate only on the role of women in the workplace, they draw more reliable conclusions than do other historians.
  - (D) While highly interesting, their work has not had an impact on most historians' current assumptions concerning the revolutionary effect of technology in the workplace.
  - (E) They oppose the further mechanization of work, which, according to their findings, tends to perpetuate existing inequalities in society.
23. Which of the following best describes the function of the concluding sentence of the passage?
- (A) It sums up the general points concerning the mechanization of work made in the passage as a whole.
  - (B) It draws a conclusion concerning the effects of the mechanization of work which goes beyond the evidence presented in the passage as a whole.
  - (C) It restates the point concerning technology made in the sentence immediately preceding it.
  - (D) It qualifies the author's agreement with scholars who argue for a major revision in the assessment of the impact of mechanization on society.
  - (E) It suggests a compromise between two seemingly contradictory views concerning the effects of mechanization on society.

(This passage is excerpted from an article that was published in 1982.)

Warm-blooded animals have elaborate physiological controls to maintain constant body temperature (in humans, 37°C). Why then during sickness should temperature rise, apparently increasing stress on the infected organism? It has long been known that the level of serum iron in animals falls during infection. Garibaldi first suggested a relationship between fever and iron. He found that microbial synthesis of **siderophores**—substances that bind iron—in bacteria of the genus *Salmonella* declined at environmental temperatures above 37°C and stopped at 40.3°C. Thus, fever would make it more difficult for an infecting bacterium to acquire iron and thus to multiply. Cold-blooded animals were used to test this hypothesis because their body temperature can be controlled in the laboratory. Kluger reported that of iguanas infected with the potentially lethal bacterium *A. hydrophilia*, more survived at temperatures of 42°C than at 37°C, even though healthy animals prefer the lower temperature. When animals at 42°C were injected with an iron solution, however, mortality rates increased significantly. Research to determine whether similar phenomena occur in warm-blooded animals is sorely needed.

24. The passage is primarily concerned with attempts to determine
- (A) the role of siderophores in the synthesis of serum iron
  - (B) new treatments for infections that are caused by *A. hydrophilia*

- (C) the function of fever in warm-blooded animals
  - (D) the mechanisms that ensure constant body temperature
  - (E) iron utilization in cold-blooded animals
25. According to the passage, Garibaldi determined which of the following?
- (A) That serum iron is produced through microbial synthesis.
  - (B) That microbial synthesis of siderophores in warm-blooded animals is more efficient at higher temperatures.
  - (C) That only iron bound to other substances can be used by bacteria.
  - (D) That there is a relationship between the synthesis of siderophores in bacteria of the genus *Salmonella* and environmental temperature.
  - (E) That bacteria of the genus *Salmonella* require iron as a nutrient.
26. Which of the following can be inferred about warm-blooded animals solely on the basis of information in the passage?
- (A) The body temperatures of warm-blooded animals cannot be easily controlled in the laboratory.
  - (B) Warm-blooded animals require more iron in periods of stress than they do at other times.
  - (C) Warm-blooded animals are more comfortable at an environmental temperature of 37°C than they are at a temperature of 42°C.
  - (D) In warm-blooded animals, bacteria are responsible for the production of siderophores, which, in turn, make iron available to the animal.
  - (E) In warm-blooded animals, infections that lead to fever are usually traceable to bacteria.
27. If it were to be determined that “similar phenomena occur in warm-blooded animals” (lines 21-22), which of the following, assuming each is possible, is likely to be the most effective treatment for warm-blooded animals with bacterial infections?
- (A) Administering a medication that lowers the animals’ body temperature
  - (B) Injecting the animals with an iron solution
  - (C) Administering a medication that makes serum iron unavailable to bacteria
  - (D) Providing the animals with reduced-iron diets
  - (E) Keeping the animals in an environment with temperatures higher than 37°C

1991 02

## SECTION A

As Gilbert White, Darwin, and others observed long ago, all species appear to have the innate capacity to increase their numbers from generation to generation. The task for ecologists is to untangle the environmental and biological factors that hold this intrinsic capacity for population growth in check over the long run. The great variety of dynamic behaviors exhibited by different populations makes this task more difficult: some populations remain roughly constant **from year to year**; others exhibit regular cycles of abundance and scarcity; still others vary wildly, with outbreaks and crashes that are in some cases plainly correlated with the weather, and in other cases not.

To impose some order on this kaleidoscope of patterns, one school of thought proposes dividing populations into two groups. These ecologists posit that the relatively steady populations have “density-dependent” growth parameters; that is, rates of birth, death, and migration which depend strongly on

population density. The highly varying populations have “density-independent” growth parameters, with vital rates buffeted by environmental events; these rates fluctuate in a way that is wholly independent of population density.

This dichotomy has its uses, but it can cause problems if taken too literally. For one thing, no population can be driven entirely by density-independent factors all the time. No matter how severely or unpredictably birth, death and migration rates may be fluctuating around their long-term averages, if there were no density-dependent effects, the population would, in the long run, either increase or decrease without bound (barring a miracle by which gains and losses canceled exactly). Put another way, it may be that on average 99 percent of all deaths in a population arise from density-independent causes, and only one percent from factors varying with density. The factors making up the one percent may seem unimportant, and their cause may be correspondingly hard to determine. Yet, whether recognized or not, they will usually determine the long-term average population density.

In order to understand the nature of the ecologist’s investigation, we may think of the density-dependent effects on growth parameters as the “signal” ecologists are trying to isolate and interpret, one that tends to make the population increase from relatively low values or decrease from relatively high ones, while the density-independent effects act to produce “noise” in the **population dynamics**. For populations that remain relatively constant, or that oscillate around repeated cycles, the signal can be fairly easily characterized and its effects described, even though the causative biological mechanism may remain unknown. For irregularly fluctuating populations, we are likely to have too few observations to have any hope of extracting the signal from the overwhelming noise. But it now seems clear that all populations are regulated by a mixture of density-dependent and density-independent effects in varying proportions.

17. The author of the passage is primarily concerned with
- (A) discussing two categories of factors that control population growth and assessing their relative importance
  - (B) describing how growth rates in natural populations fluctuate over time and explaining why these changes occur
  - (C) proposing a hypothesis concerning population sizes and suggesting ways to test it
  - (D) posing a fundamental question about environmental factors in population growth and presenting some currently accepted answers
  - (E) refuting a commonly accepted theory about population density and offering a new alternative
18. It can be inferred from the passage that the author considers the dichotomy discussed in the second paragraph to be
- (A) applicable only to erratically fluctuating populations
  - (B) useful, but only if its limitations are recognized
  - (C) dangerously misleading in most circumstances
  - (D) a complete and sufficient way to account for observed phenomena
  - (E) conceptually valid, but too confusing to apply on a practical basis
19. Which of the following statements can be inferred from the last paragraph?
- (A) For irregularly fluctuating populations, doubling the number of observations made will probably result in the isolation of density-dependent effects.
  - (B) Density-dependent effects on population dynamics do not occur as frequently as do density-independent effects.
  - (C) At present, ecologists do not understand any of the underlying causes of the density-

dependent effects they observe in population dynamics.

- (D) Density-dependent effects on growth parameters are thought to be caused by some sort of biochemical “signaling” that ecologists hope eventually to understand.
  - (E) It is sometimes possible to infer the existence of a density-dependent factor controlling population growth without understanding its causative mechanism.
20. According to the passage, which of the following is a true statement about density-dependent factors in population growth?
- (A) They ultimately account for long-term population levels.
  - (B) They have little to do with long-term population dynamics.
  - (C) They are always more easily isolated and described than those that are density-independent.
  - (D) They include random environmental events.
  - (E) They contradict current ecological assumptions about population dynamics.
21. According to the passage, all of the following behaviors have been exhibited by different populations EXCEPT:
- (A) roughly constant population levels from year to year
  - (B) regular cycles of increases and decreases in numbers
  - (C) erratic increases in numbers correlated with the weather
  - (D) unchecked increases in numbers over many generations
  - (E) sudden declines in numbers from time to time
22. The discussion concerning population in lines 24-40 serves primarily to
- (A) demonstrate the difficulties ecologists face in studying density-dependent factors limiting population growth
  - (B) advocate more rigorous study of density-dependent factors in population growth
  - (C) prove that the death rates of any population are never entirely density-independent
  - (D) give an example of how death rates function to limit population densities in typical populations
  - (E) underline the importance of even small density-dependent factors in regulating long-term population densities
23. In the passage, the author does all of the following EXCEPT:
- (A) cite the views of other biologists
  - (B) define a basic problem that the passage addresses
  - (C) present conceptual categories used by other biologists
  - (D) describe the results of a particular study
  - (E) draw a conclusion

In *Raisin in the Sun*, Lorraine Hansberry does not reject integration or the economic and moral promise of the American dream; rather, she remains loyal to this dream while looking, realistically, at its incomplete realization. Once we recognize this dual vision, we can accept the play's ironic nuances as deliberate social commentaries by Hansberry rather than as the “unintentional” irony that Bigsby attributes to the work. Indeed a curiously persistent refusal to credit Hansberry with a capacity for intentional irony has led some critics to interpret the play's thematic conflicts as mere confusion, contradiction, or eclecticism. Isaacs, for example, cannot easily reconcile Hansberry's intense concern for

her race with her ideal of human reconciliation. But the play's complex view of Black self-esteem and human solidarity as compatible is no more "contradictory" than Du Bois' famous, well-considered ideal of ethnic self-awareness coexisting with human unity, or Fanon's emphasis on an ideal internationalism that also accommodates national identities and roles.

24. The author's primary purpose in this passage is to
- (A) explain some critics' refusal to consider *Raisin in the Sun* a deliberately ironic play
  - (B) suggest that ironic nuances ally *Raisin in the Sun* with Du Bois' and Fanon's writings
  - (C) analyze the fundamental dramatic conflicts in *Raisin in the Sun*
  - (D) justify the inclusion of contradictory elements in *Raisin in the Sun*
  - (E) affirm the thematic coherence underlying *Raisin in the Sun*
25. It can be inferred from the passage that the author believes which of the following about Hansberry's use of irony in *Raisin in the Sun*?
- (A) It derives from Hansberry's eclectic approach to dramatic structure.
  - (B) It is justified by Hansberry's loyalty to a favorable depiction of American life.
  - (C) It is influenced by the themes of works by Du Bois and Fanon.
  - (D) It is more consistent with Hansberry's concern for Black Americans than with her ideal of human reconciliation.
  - (E) It reflects Hansberry's reservations about the extent to which the American dream has been realized.
26. In which of the following does the author of the passage reinforce his criticism of responses such as Isaacs' to *Raisin in the Sun*?
- (A) The statement that Hansberry is "loyal" (line 3) to the American dream
  - (B) The description of Hansberry's concern for Black Americans as "intense" (line 13)
  - (C) The assertion that Hansberry is concerned with "human solidarity" (line 15)
  - (D) The description of Du Bois' ideal as "well-considered" (line 17)
  - (E) The description of Fanon's internationalism as "ideal" (line 19)
27. The author of the passage would probably consider which of the following judgments to be most similar to the reasoning of critics described in lines 8-12?
- (A) The world is certainly flat; therefore, the person proposing to sail around it is unquestionably foolhardy.
  - (B) Radioactivity cannot be directly perceived; therefore, a scientist could not possibly control it in a laboratory.
  - (C) The painter of this picture could not intend it to be funny, therefore, its humor must result from a lack of skill.
  - (D) Traditional social mores are beneficial to culture; therefore, anyone who deviates from them acts destructively.
  - (E) Filmmakers who produce documentaries deal exclusively with facts; therefore, a filmmaker who reinterprets particular events is misleading us.

## SECTION B

Some recent historians have argued that life in the British colonies in America from approximately 1763 to 1789 was marked by internal conflicts among colonists. Inheritors of some of the viewpoints of



early twentieth-century Progressive historians such as Beard and Becker, these recent historians have put forward arguments that deserve evaluation.

The kind of conflict most emphasized by these historians is class conflict. Yet with the Revolutionary War dominating these years, how does one distinguish class conflict within that larger conflict? Certainly not by the side a person supported. Although many of these historians have accepted the earlier assumption that Loyalists represented an upper class, new evidence indicates that Loyalists, like rebels, were drawn from all socioeconomic classes. (It is nonetheless probably true that a larger percentage of the well-to-do joined the Loyalists than joined the rebels.) Looking at the rebel side, we find little evidence for the contention that lower-class rebels were in conflict with upper-class rebels. Indeed, the war effort against Britain tended to suppress class conflicts. Where it did not, the disputing rebels of one or another class usually became Loyalists. Loyalism thus operated as a safety valve to remove socioeconomic discontent that existed among the rebels. Disputes occurred, of course, among those who remained on the rebel side, but the extraordinary social mobility of eighteenth-century American society (with the obvious exception of slaves) usually prevented such disputes from hardening along class lines. Social structure was in fact so fluid—though recent statistics suggest a narrowing of economic opportunity as the latter half of the century progressed—that to talk about social classes at all requires the use of loose economic categories such as rich, poor, and middle class, or eighteenth-century designations like “the better sort.” Despite these vague categories, one should not claim unequivocally that hostility between recognizable classes cannot be legitimately observed. Outside of New York, however, there were very few instances of openly expressed class antagonism.

Having said this, however, one must add that there is much evidence to support the further claim of recent historians that sectional conflicts were common between 1763 and 1789. The “Paxton Boys” incident and the Regulator movement are representative examples of the widespread, and justified, discontent of western settlers against colonial or state governments dominated by eastern interests. Although undertones of class conflict existed beneath such hostility, the opposition was primarily geographical. Sectional conflict—which also existed between North and South—deserves further investigation.

In summary, historians must be careful about the kind of conflict they emphasize in eighteenth-century America. Yet those who stress the achievement of a general consensus among the colonists cannot fully understand that consensus without understanding the conflicts that had to be overcome or repressed in order to reach it.

17. The author considers the contentions made by the recent historians discussed in the passage to be
  - (A) potentially verifiable
  - (B) partially justified
  - (C) logically contradictory
  - (D) ingenious but flawed
  - (E) capricious and unsupported
18. The author most likely refers to “historians such as Beard and Becker” (lines 5-6) in order to
  - (A) isolate the two historians whose work is most representative of the viewpoints of Progressive historians
  - (B) emphasize the need to find connections between recent historical writing and the work of earlier historians
  - (C) make a case for the importance of the views of the Progressive historians concerning eighteenth-century American life
  - (D) suggest that Progressive historians were the first to discover the particular internal conflicts in eighteenth-century American life mentioned in the passage

- (E) point out historians whose views of history anticipated some of the views of the recent historians mentioned in the passage
19. According to the passage, Loyalism during the American Revolutionary War served the function of
- (A) eliminating the disputes that existed among those colonists who supported the rebel cause
  - (B) drawing upper, as opposed to lower, socioeconomic classes away from the rebel cause
  - (C) tolerating the kinds of socioeconomic discontent that were not allowed to exist on the rebel side
  - (D) channeling conflict that existed within a socioeconomic class into the war effort against the rebel cause
  - (E) absorbing members of socioeconomic groups on the rebel side who felt themselves in contention with members of other socioeconomic groups
20. The passage suggests that the author would be likely to agree with which of the following statements about the social structure of eighteenth-century American society?
- I. It allowed greater economic opportunity than it did social mobility.
  - II. It permitted greater economic opportunity prior to 1750 than after 1750.
  - III. It did not contain rigidly defined socioeconomic divisions.
  - IV. It prevented economic disputes from arising among members of the society.
- (A) I and IV only
  - (B) II and III only
  - (C) III and IV only
  - (D) I, II, and III only
  - (E) I, II, III, and IV
21. It can be inferred from the passage that the author would be most likely to agree with which of the following statements regarding socioeconomic class and support for the rebel and Loyalist causes during the American Revolutionary War?
- (A) Identifying a person's socioeconomic class is the least accurate method of ascertaining which side that person supported.
  - (B) Identifying a person as a member of the rebel or of the Loyalist side does not necessarily reveal that person's particular socioeconomic class.
  - (C) Both the rebel and the Loyalist sides contained members of all socioeconomic classes, although there were fewer disputes among socioeconomic classes on the Loyalist side.
  - (D) Both the rebel and the Loyalist sides contained members of all socioeconomic classes, although the Loyalist side was made up primarily of members of the upper classes.
  - (E) Both the rebel and the Loyalist sides contained members of all socioeconomic classes, although many upper-class rebels eventually joined the Loyalists.
22. The author suggests which of the following about the representativeness of colonial or state governments in America from 1763 to 1789?
- (A) The governments inadequately represented the interests of people in western regions.
  - (B) The governments more often represented class interests than sectional interests.

- (C) The governments were less representative than they had been before 1763.
- (D) The governments were dominated by the interests of people of an upper socioeconomic class.
- (E) The governments of the northern colonies were less representative than were the governments of the southern colonies.

23. According to the passage, which of the following is a true statement about sectional conflicts in America between 1763 and 1789?

- (A) These conflicts were instigated by eastern interests against western settlers.
- (B) These conflicts were the most serious kind of conflict in America.
- (C) The conflicts eventually led to openly expressed class antagonism.
- (D) These conflicts contained an element of class hostility.
- (E) These conflicts were motivated by class conflicts.

Since 1953, many experimental attempts to synthesize the chemical constituents of life under "primitive Earth conditions" have been performed, but none of these experiments has produced anything approaching the complexity of the simplest organism. They have demonstrated, however, that a variety of the complex molecules currently making up living organisms could have been present in the early ocean and atmosphere, with only one limitation: such molecules are synthesized far less readily when oxygen-containing compounds dominate the atmosphere. Therefore some scientists postulate that the Earth's earliest atmosphere, unlike that of today, was dominated by hydrogen, methane, and ammonia.

From these studies, scientists have concluded that the surface of the primitive Earth was covered with oceans containing the molecules fundamental to life. Although, at present, scientists cannot explain how these relatively small molecules combined to produce larger, more complex molecules, some scientists have precipitously ventured hypotheses that attempt to explain the development, from larger molecules, of the earliest self-duplicating organisms.

24. According to the passage, which of the following can be inferred about the process by which the chemical constituents of life were synthesized under primitive Earth conditions?

- (A) The synthesis is unlikely to occur under current atmospheric conditions.
- (B) The synthesis is common in modern laboratories.
- (C) The synthesis occurs more readily in the atmosphere than in the ocean.
- (D) The synthesis easily produces the most complex organic molecules.
- (E) The synthesis is accelerated by the presence of oxygen-containing compounds.

25. The primary purpose of the passage is to

- (A) point out that theories about how life developed on Earth have changed little since 1953
- (B) warn of increasing levels of hydrogen, methane, and ammonia in the Earth's atmosphere
- (C) describe the development since 1953 of some scientists' understanding of how life began on Earth
- (D) demonstrate that the synthesis of life in the laboratory is too difficult for modern technology
- (E) describe how primitive atmospheric conditions produced the complex molecules of living organisms

26. It can be inferred from the passage that "some scientists" assume which of the following concerning "larger, more complex molecules" (line 20)?

- (A) The earliest atmosphere was formed primarily of these molecules.

- (B) Chemical processes involving these molecules proceeded much more slowly under primitive Earth conditions.
  - (C) The presence of these molecules would necessarily precede the existence of simple organisms.
  - (D) Experimental techniques will never be sufficiently sophisticated to produce in the laboratory simple organisms from these chemical constituents.
  - (E) Explanations could easily be developed to explain how simple molecules combined to form these more complex ones.
27. The author's reaction to the attempts that have been made to explain the development of the first self-duplication organisms can best be described as one of
- (A) enthusiasm
  - (B) expectation
  - (C) dismay
  - (D) skepticism
  - (E) antipathy

1991 04

### SECTION A

Isadora Duncan's masterly writings on the dance reveal the depth of her determination to create a lyric form of the art which was free of characterization, storytelling, and the theatrical exhibition of skills. She wished to discard the traditional methods and established vocabularies of such dance forms as ballet and to explore the internal sources of human expressiveness. She shunned bodily ornamentation and strove to use only the natural movements of her body, undistorted by acrobatic exaggeration and stimulated only by internal compulsion. In her recitals Duncan danced to the music of Beethoven, Wagner, and Gluck, among others, but, contrary to popular belief, she made no attempt to visualize or to interpret the music; rather, she simply relied on it to provide the inspiration for expressing inner feelings through movement. She did not regard this use of music as ideal, however, believing that she would someday **dispense with** music entirely. That day never came.

17. The author is primarily concerned with Duncan's
- (A) masterful lyricism as expressed in her writings on the dance
  - (B) concerted efforts to subdue the natural movements of the dance
  - (C) belated recognition that she could not actually fulfill all of her ideals for the dance
  - (D) basic standards for the dance form that she wished to create and perform
  - (E) continuous responsiveness to a popular misconception about the nature of her new art form
18. The author implies that Duncan relied on music in her recitals in order to
- (A) interpret musical works solely by means of natural body movements
  - (B) foster the illusion that music serves as an inspiration for the dance
  - (C) inspire the expression of inner feeling when she danced
  - (D) validate the public belief that music inspires the expression of feeling through movement
  - (E) counter the public belief that she made no attempt to visualize music
19. According to the passage, Duncan intended to develop an art form that would do all of the

following EXCEPT

- (A) avoid the use of standard ballet techniques
  - (B) revitalize an earlier established vocabulary
  - (C) draw on internal sources of human expressiveness
  - (D) create intended effects without the use of acrobatic exaggeration
  - (E) derive inspiration solely from inner feelings
20. It can be inferred from the passage that which of the following endeavors is LEAST compatible with Duncan's ideals for the dance?
- (A) Using music to stimulate the inspiration to dance
  - (B) Attempting to free an art form of both characterization and storytelling
  - (C) Minimizing the theatrical exhibition of skills
  - (D) Being inspired to express inner feeling through movement
  - (E) Creating a lyric art form by drawing on inner personal resources

The recent, apparently successful, prediction by mathematical models of an appearance of El Nino—the warm ocean current that periodically develops along the Pacific coast of South America—has excited researchers. Jacob Bjerknes pointed out over 20 years ago how winds might create either abnormally warm or abnormally cold water in the eastern equatorial Pacific. Nonetheless, until the development of the models no one could explain why conditions should regularly shift from one to the other, as happens in the periodic oscillations between appearances of the warm El Nino and the cold so-called anti-El Nino. The answer, at least if the current model that links the behavior of the ocean to that of the atmosphere is correct, is to be found in the ocean.

It has long been known that during an El Nino, two conditions exist: (1) unusually warm water extends along the eastern Pacific, principally along the coasts of Ecuador and Peru, and (2) winds blow from the west into the warmer air rising over the warm water in the east. These winds tend to create a **feedback mechanism** by driving the warmer surface water into a "pile" that blocks the normal **upwelling** of deeper, cold water in the east and further warms the eastern water, thus strengthening the wind still more. The contribution of the model is to show that the winds of an El Nino, which raise sea level in the east, simultaneously send a signal to the west lowering sea level. According to the model, that signal is generated as a negative Rossby wave, a wave of depressed, or negative, sea level, that moves westward parallel to the equator at 25 to 85 kilometers per day. Taking months to traverse the Pacific, Rossby waves march to the western boundary of the Pacific basin, which is modeled as a smooth wall but in reality consists of quite irregular island chains, such as the Philippines and Indonesia.

When the waves meet the western boundary, they are reflected, and the model predicts that Rossby waves will be broken into numerous coastal Kelvin waves carrying the same negative sea-level signal. These eventually shoot toward the equator, and then head eastward along the equator propelled by the rotation of the Earth at a speed of about 250 kilometers per day. When enough Kelvin waves of sufficient amplitude arrive from the western Pacific, their negative sea-level signal overcomes the feedback mechanism tending to raise the sea level, and they begin to drive the system into the opposite cold mode. This produces a gradual shift in winds, one that will eventually send positive sea-level Rossby waves westward, waves that will eventually return as cold cycle-ending positive Kelvin waves, beginning another warming cycle.

21. The primary function of the passage as a whole is to
- (A) introduce a new explanation of a physical phenomenon
  - (B) explain the difference between two related physical phenomena
  - (C) illustrate the limitations of applying mathematics to complicated physical phenomena
  - (D) indicate the direction that research into a particular physical phenomenon should take

- (E) clarify the differences between an old explanation of a physical phenomenon and a new model of it
22. Which of the following best describes the organization of the first paragraph?
- (A) A theory is presented and criticized.
  - (B) A model is described and evaluated.
  - (C) A result is reported and its importance explained.
  - (D) A phenomenon is noted and its significance debated.
  - (E) A hypothesis is introduced and contrary evidence presented.
23. According to the passage, which of the following features is characteristic of an El Nino?
- (A) Cold coastal water near Peru
  - (B) Winds blowing from the west
  - (C) Random occurrence
  - (D) Worldwide effects
  - (E) Short duration
24. According to the model presented in the passage, which of the following normally signals the disappearance of an El Nino?
- (A) The arrival in the eastern Pacific of negative sea-level Kelvin waves.
  - (B) A shift in the direction of the winds produced by the start of an anti-El Nino elsewhere in the Pacific.
  - (C) The reflection of Kelvin waves after they reach the eastern boundary of the Pacific, along Ecuador and Peru.
  - (D) An increase in the speed at which negative Rossby waves cross the Pacific.
  - (E) The creation of a reservoir of colder, deep ocean water trapped under the pile of warmer, surface ocean water.
25. It can be inferred from the passage that which of the following would result fairly immediately from the cessation of the winds of an El Nino?
- I. Negative Rossby waves would cease to be generated in the eastern Pacific.
  - II. The sea level in the eastern Pacific would fall.
  - III. The surface water in the eastern Pacific would again be cooled by being mixed with deep water.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) I and III only
  - (E) I, II, and III
26. Which of the following, if true, would most seriously undermine the validity of the model of El Nino that is presented in the passage?
- (A) During some years El Nino extends significantly farther along the coasts of Ecuador and Peru than during other years.
  - (B) During periods of unusually cool temperatures along the eastern Pacific, an El Nino is

much colder than normal.

- (C) The normal upwelling of cold water in the eastern Pacific depends much more on the local characteristics of the ocean than on atmospheric conditions.
  - (D) The variations in the time it takes Rossby waves to cross the Pacific depend on the power of the winds that the waves encounter.
  - (E) The western boundary of the Pacific basin is so irregular that it impedes most coastal Kelvin waves from heading eastward.
27. The passage best supports the conclusion that during an anti-El Nino the fastest-moving signal waves are
- (A) negative Rossby waves moving east along the equator
  - (B) positive Rossby waves moving west along the equator
  - (C) negative Kelvin waves moving west along the equator
  - (D) positive Kelvin waves moving west along the equator
  - (E) positive Kelvin waves moving east along the equator

## SECTION B

Historians have only recently begun to note the increase in demand for luxury goods and services that took place in eighteenth-century England. McKendrick has explored the Wedgwood firm's remarkable success in marketing luxury pottery; Plumb has written about the proliferation of provincial theaters, musical festivals, and children's toys and books. While the fact of this consumer revolution is hardly in doubt, three key questions remain: Who were the consumers? What were their motives? And what were the effects of the new demand for luxuries?

An answer to the first of these has been difficult to obtain. Although it has been possible to infer from the goods and services actually produced what manufacturers and servicing trades thought their customers wanted, only a study of relevant personal documents written by actual consumers will provide a precise picture of *who* wanted what. We still need to know how large this consumer market was and how far down the social scale the consumer demand for luxury goods penetrated. With regard to this last question, we might note in passing that Thompson, while rightly restoring laboring people to the stage of eighteenth-century English history, has probably exaggerated the opposition of these people to the inroads of capitalist consumerism in general; for example, laboring people in eighteenth-century England readily shifted from home-brewed beer to standardized beer produced by huge, heavily capitalized urban breweries.

To answer the question of why consumers became so eager to buy, some historians have pointed to the ability of manufacturers to advertise in a relatively uncensored press. This, however, hardly seems a sufficient answer. McKendrick favors a Veblen model of **conspicuous consumption** stimulated by competition for status. The "middling sort" bought goods and services because they wanted to follow fashions set by the rich. Again, we may wonder whether this explanation is sufficient. Do not people enjoy buying things as a form of self-gratification? **If so**, consumerism could be seen as a product of the rise of new concepts of individualism and **materialism**, but not necessarily of the frenzy for conspicuous competition.

Finally, what were the consequences of this consumer demand for luxuries? McKendrick claims that it **goes a long way** toward explaining the coming of the Industrial Revolution. But does it? What, for example, does the production of high-quality pottery and toys have to do with the development of iron manufacture or textile mills? It is perfectly possible to have the psychology and reality of a consumer society without a heavy industrial sector.

That future exploration of these key questions is undoubtedly necessary should not, however, diminish the force of the conclusion of recent studies: the insatiable demand in eighteenth-century England for frivolous as well as useful goods and services foreshadows our own world.

17. In the first paragraph, the author mentions McKendrick and Plumb most probably in order to
- (A) contrast their views on the subject of luxury consumerism in eighteenth-century England
  - (B) indicate the inadequacy of historiographical approaches to eighteenth-century English history
  - (C) give examples of historians who have helped to establish the fact of growing consumerism in eighteenth-century England
  - (D) support the contention that key questions about eighteenth-century consumerism remain to be answered
  - (E) compare one historian's interest in luxury goods such as pottery to another historian's interest in luxury services such as musical festivals
18. Which of the following items, if preserved from eighteenth-century England, would provide an example of the kind of documents mentioned in lines 16-17?
- (A) A written agreement between a supplier of raw materials and a supplier of luxury goods
  - (B) A diary that mentions luxury goods and services purchased by its author
  - (C) A theater ticket stamped with the date and name of a particular play
  - (D) A payroll record from a company that produced luxury goods such as pottery
  - (E) A newspaper advertisement describing luxury goods and services available at a seaside resort
19. According to the passage, Thompson attributes to laboring people in eighteenth-century England which of the following attitudes toward capitalist consumerism?
- (A) Enthusiasm
  - (B) Curiosity
  - (C) Ambivalence
  - (D) Stubbornness
  - (E) Hostility
20. In the third paragraph, the author is primarily concerned with
- (A) contrasting two theses and offering a compromise
  - (B) questioning two explanations and proposing a possible alternative to them
  - (C) paraphrasing the work of two historians and questioning their assumptions
  - (D) examining two theories and endorsing one over the other
  - (E) raising several questions but implying that they cannot be answered
21. According to the passage, a Veblen model of conspicuous consumption has been used to
- (A) investigate the extent of the demand for luxury goods among social classes in eighteenth-century England
  - (B) classify the kinds of luxury goods desired by eighteenth-century consumers
  - (C) explain the motivation of eighteenth-century consumers to buy luxury goods
  - (D) establish the extent to which the tastes of rich consumers were shaped by the middle classes in eighteenth-century England
  - (E) compare luxury consumerism in eighteenth-century England with such consumerism in the twentieth century



22. According to the passage, eighteenth-century England and the contemporary world of the passage's readers are
- (A) dissimilar in the extent to which luxury consumerism could be said to be widespread among the social classes
  - (B) dissimilar in their definitions of luxury goods and services
  - (C) dissimilar in the extent to which luxury goods could be said to be a stimulant of industrial development
  - (D) similar in their strong demand for a variety of goods and services
  - (E) similar in the extent to which a middle class could be identified as imitating the habits of a wealthier class
23. It can be inferred from the passage that the author would most probably agree with which of the following statements about the relationship between the Industrial Revolution and the demand for luxury goods and services in eighteenth-century England?
- (A) The growing demand for luxury goods and services was a major factor in the coming of the Industrial Revolution.
  - (B) The Industrial Revolution exploited the already existing demand for luxury goods and services.
  - (C) Although the demand for luxury goods may have helped bring about the Industrial Revolution, the demand for luxury services did not.
  - (D) There is no reason to believe that the Industrial Revolution was directly driven by a growing demand for luxury goods and services.
  - (E) The increasing demand for luxury goods and services was a cultural phenomenon that has been conclusively demonstrated to have been separate from the coming of the Industrial Revolution.

Researchers are finding that in many ways an individual bacterium is more analogous to a component cell of a multicellular organism than it is to a free-living, autonomous organism. *Anabaena*, a freshwater bacteria, is a case in point. Among photosynthetic bacteria, *Anabaena* is unusual: it is capable of both photosynthesis and nitrogen fixation. Within a single cell, these two biochemical processes are incompatible: oxygen produced during photosynthesis, inactivates the **nitrogenase** required for nitrogen fixation. In *Anabaena* communities, however, these processes can coexist. When fixed nitrogen compounds are abundant, *Anabaena* is strictly photosynthetic and its cells are all alike. When nitrogen levels are low, however, specialized cells called **heterocysts** are produced which lack chlorophyll (necessary for photosynthesis) but which can fix nitrogen by converting nitrogen gas into a usable form. Submicroscopic channels develop which connect the heterocyst cells with the photosynthetic ones and which are used for transferring cellular products between the two kinds of *Anabaena* cells.

24. According to the passage, which of the following statements is true of bacteria that engage in photosynthesis?
- (A) They eventually become two autonomous cells.
  - (B) They cannot normally also engage in nitrogen fixation.
  - (C) Oxygen normally inactivates them.
  - (D) Cellular products are constantly transferred between such bacteria.
  - (E) They normally lack chlorophyll.
25. It can be inferred from the passage that cell differentiation within *Anabaena* is regulated by the

- (A) amount of oxygen *Anabaena* cells produce
  - (B) season of the year
  - (C) amount of fixed nitrogen compounds available
  - (D) number of microscopic channels uniting *Anabaena* cells
  - (E) amount of chlorophyll in *Anabaena* cells
26. The passage supports which of the following inferences about heterocysts?
- (A) Heterocysts do not produce oxygen.
  - (B) Nitrogen gas inactivates heterocysts.
  - (C) Chlorophyll increases the productivity of heterocysts.
  - (D) Heterocysts allow nitrogen fixation and photosynthesis to occur in the same cell.
  - (E) Heterocysts are more important for *Anabaena*'s functioning than are photosynthetic cells.
27. The author uses the example of *Anabaena* to illustrate the
- (A) uniqueness of bacteria among unicellular organisms
  - (B) inadequacy of an existing view of bacteria
  - (C) ability of unicellular organisms to engage in photosynthesis
  - (D) variability of a freshwater bacteria
  - (E) difficulty of investigating even the simplest unicellular organisms

1991 10

## SECTION A

Aided by the recent ability to analyze samples of air trapped in glaciers, scientists now have a clearer idea of the relationship between atmospheric composition and global temperature change over the past 160,000 years. In particular, determination of atmospheric composition during periods of glacial expansion and retreat (cooling and warming) is possible using data from the 2,000 meter Vostok ice core drilled in Antarctica. The technique involved is similar to that used in analyzing cores of marine sediments, where the ratio of the two common isotopes of oxygen,  $^{18}\text{O}$  and  $^{16}\text{O}$ , accurately reflects past temperature changes. Isotopic analysis of oxygen in the Vostok core suggests mean global temperature fluctuations of up to 10 degrees centigrade over the past 160,000 years.

Data from the Vostok core also indicate that the amount of carbon dioxide has fluctuated with temperature over the same period: the higher the temperature, the higher the concentration of carbon dioxide and the lower the temperature, the lower the concentration. Although change in carbon dioxide content closely follows change in temperature during periods of deglaciation, it apparently lags behind temperature during periods of cooling. The correlation of carbon dioxide with temperature, of course, does not establish whether changes in atmospheric composition caused the warming and cooling trends or were caused by their.

The correlation between carbon dioxide and temperature throughout the Vostok record is consistent and predictable. The absolute temperature changes, however, are from 5 to 14 times greater than would be expected on the basis of carbon dioxide's own ability to absorb infrared radiation, or radiant heat. This reaction suggests that, quite aside from changes in heat-trapping gases, commonly known as greenhouse gases, certain positive feedbacks are also amplifying the temperature change. Such feedbacks might involve ice on land and sea, clouds, or water vapor, which also absorb radiant heat.

Other data from the Vostok core show that methane gas also correlates closely with temperature and carbon dioxide. The methane concentration nearly doubled, for example, between the peak of the penultimate glacial period and the following interglacial period. Within the present interglacial period it has more than doubled in just the past 300 years and is rising rapidly. Although the concentration of

atmospheric methane is more than two orders of magnitude lower than that of carbon dioxide, it cannot be ignored: the radiative properties of methane make it 20 times more effective, molecule for molecule, than carbon dioxide in absorbing radiant heat. On the basis of a simulation model that climatological researchers have developed, methane appears to have been about 25 percent as important as carbon dioxide in the warming that took place during the most recent glacial retreat 8,000 to 10,000 years ago.

17. The primary purpose of the passage is to
  - (A) interpret data
  - (B) explain research methodology
  - (C) evaluate a conclusion
  - (D) suggest a new technique
  - (E) attack a theory
18. According to the passage, which of the following statements about methane is true?
  - (A) Methane is found in marine sediments.
  - (B) Methane is more effective than carbon dioxide in absorbing radiant heat.
  - (C) The Earth's atmosphere now contains more than twice as much methane as it does carbon dioxide.
  - (D) The higher the concentration of carbon dioxide in the Earth's atmosphere, the lower the concentration of methane.
  - (E) Most of the global warming that has occurred during the past 10 years has been associated with increased methane concentration.
19. According to the passage, which of the following statements best describes the relationship between carbon dioxide and global temperature?
  - (A) Carbon dioxide levels change immediately in response to changes in temperature.
  - (B) Carbon dioxide levels correlate with global temperature during cooling periods only.
  - (C) Once carbon dioxide levels increase, they remain high regardless of changes in global temperature.
  - (D) Carbon dioxide levels increase more quickly than global temperature does.
  - (E) During cooling periods, carbon dioxide levels initially remain high and then decline.
20. The author mentions "certain positive feedbacks" (lines 35-36) in order to indicate that
  - (A) increased concentration of carbon dioxide in the Earth's atmosphere is responsible for global temperature increase
  - (B) some climate simulation models have produced useful information
  - (C) greenhouse gases alone do not account for global temperature increase
  - (D) variables that benefit life are causing global temperature to increase
  - (E) beneficial substances that are not heat-trapping gases and that contribute to global temperature increase have been found in the Vostok ice core
21. It can be inferred from the passage that a long-term decrease in the concentration of carbon dioxide in the Earth's atmosphere would
  - (A) increase methane concentration in the Earth's atmosphere
  - (B) accompany a period of glaciation
  - (C) encourage the formation of more oxygen isotopes in the Earth's atmosphere

- (D) promote the formation of more water in the Earth's global environment
  - (E) increase the amount of infrared radiation absorbed by the Earth's atmosphere
22. The passage suggests that when the methane concentration in the Earth's atmosphere decreases, which of the following also happens?
- (A) Glaciers melt faster.
  - (B) The concentration of carbon dioxide increases.
  - (C) The mean global temperature decreases.
  - (D) Carbon dioxide absorbs more radiant heat.
  - (E) More clouds form in the Earth's atmosphere.
23. In the fourth paragraph, the author is primarily concerned with
- (A) restating the main idea of the passage
  - (B) using research findings to develop a simulation model
  - (C) outlining the direction of future research
  - (D) providing an additional example of a phenomenon
  - (E) introducing a conflicting hypothesis

In *The Women of Mexico City, 1796-1857*, Sylvia Marina Arrom argues that the status of women in Mexico City improved during the nineteenth century. According to Arrom, households headed by females and instances of women working outside the home were much more common than scholars have estimated; efforts by the Mexican government to encourage female education resulted in increased female literacy; and influential male writers wrote *pieces* advocating education, employment, and increased family responsibilities for women, while deploring women's political and marital inequality. Mention of the fact that the civil codes of 1870 and 1884 significantly advanced women's rights would have further strengthened Arrom's argument.

Arrom does not discuss whether women's improved status counteracted the effects on women of instability in the Mexican economy during the nineteenth century. However, this is not so much a weakness in her work as it is the inevitable result of scholars' neglect of this period. Indeed, such gaps in Mexican history are precisely what make Arrom's pioneering study an important addition to Latin American women's history.

24. The passage is primarily concerned with doing which of the following?
- (A) Reviewing a historical study of the status of women in Mexico City during the nineteenth century
  - (B) Analyzing the effects of economic instability on the status of women in Mexico during the nineteenth century
  - (C) Advancing a thesis explaining why women's status in Mexico City improved during the nineteenth century
  - (D) Rejecting the thesis that the status of women in Mexico City during the nineteenth century actually improved
  - (E) Praising an author for a pioneering attempt to bridge significant gaps in Mexico's economic history prior to 1790
25. According to the author of the passage, Arrom's study can be characterized as "an important addition to Latin American women's history" (lines 21-22) because it
- (A) offers a radical thesis concerning the status of women's civil rights in Mexican society during the nineteenth century

- (B) relies on a new method of historical analysis that has not previously been applied to Latin American history
  - (C) focuses only on the status of women in Mexican society
  - (D) addresses a period in Mexican history that scholars have to some extent neglected
  - (E) is the first study to recognize the role of the Mexican government in encouraging women's education
26. It can be inferred from the passage that Arrom would agree with which of the following assertions?
- (A) Efforts by the Mexican government to encourage education for women during the nineteenth century were hampered by the economic instability of that period.
  - (B) The most significant advances in the rights of Mexican women during the nineteenth century occurred prior to 1857.
  - (C) Improvements in the status of women in Mexico City during the nineteenth century were accompanied by similar improvements in the status of women in other large Latin American cities.
  - (D) Scholars have in the past accorded the most significance to nineteenth-century Mexican literature that supported the status quo in women's political and marital rights.
  - (E) Scholars have in the past underestimated the number of households headed by females in Mexico City.
27. Which of the following best describes the author's attitude toward Arrom's work?
- (A) Uncritical approval
  - (B) Enthusiasm tempered by minor reservations
  - (C) Praise for her thesis, despite skepticism regarding the sources of her evidence
  - (D) Reluctant acceptance, despite lingering doubts regarding the accuracy of her thesis
  - (E) Rejection, despite admiration for her attempt to break new ground in a hitherto neglected field

## SECTION B

Present-day philosophers usually envision their discipline as an endeavor that has been, since antiquity, distinct from and superior to any particular intellectual discipline, such as theology or science. Such philosophical concerns as the mind-body problem or, more generally, the nature of human knowledge, they believe, are basic human questions whose tentative philosophical solutions have served as the necessary foundations on which all other intellectual speculation has rested.

The basis for this view, however, lies in a serious misinterpretation of the past, a projection of modern concerns onto past events. The idea of an autonomous discipline called "philosophy," distinct from and sitting in judgment on such pursuits as theology and science turns out, on close examination, to be of quite recent origin. When, in the seventeenth century, Descartes and Hobbes rejected medieval philosophy, they did not think of themselves, as modern philosophers do, as proposing a new and better philosophy, but rather as furthering "the warfare between science and theology." They were fighting, albeit discreetly, to open the intellectual world to the new science and to liberate intellectual life from ecclesiastical philosophy and envisioned their work as contributing to the growth, not of philosophy, but of research in mathematics and physics. This link between philosophical interests and scientific practice persisted until the nineteenth century, when decline in ecclesiastical power over scholarship and changes in the nature of science provoked the final separation of philosophy from both.

The demarcation of philosophy from science was facilitated by the development in the early

nineteenth century of a new notion, that philosophy's core interest should be epistemology, the general explanation of what it means to know something. Modern philosophers now trace that notion back at least to Descartes and Spinoza, but it was not explicitly articulated until the late eighteenth century, by Kant, and did not become built into the structure of academic institutions and the standard self-descriptions of philosophy professors until the late nineteenth century. Without the idea of epistemology, the survival of philosophy in an age of modern science is hard to imagine. Metaphysics, philosophy's traditional core—considered as the most general description of how the heavens and the earth are put together—had been rendered almost completely meaningless by the spectacular progress of physics. Kant, however, by focusing philosophy on the problem of knowledge, managed to replace metaphysics with epistemology, and thus to transform the notion of philosophy as “queen of sciences” into the new notion of philosophy as a separate, foundational discipline. Philosophy became “primary” no longer in the sense of “highest” but in the sense of “underlying”. After Kant, philosophers were able to reinterpret seventeenth- and eighteenth-century thinkers as attempting to discover “How is our knowledge possible?” and to project this question back even on the ancients.

17. Which of the following best expresses the author's main point?
- (A) Philosophy's overriding interest in basic human questions is a legacy primarily of the work of Kant.
  - (B) Philosophy was deeply involved in the seventeenth-century warfare between science and religion.
  - (C) The set of problems of primary importance to philosophers has remained relatively constant since antiquity.
  - (D) The status of philosophy as an independent intellectual pursuit is a relatively recent development.
  - (E) The role of philosophy in guiding intellectual speculation has gradually been usurped by science.
18. According to the passage, present-day philosophers believe that the mind-body problem is an issue that
- (A) has implications primarily for philosophers
  - (B) may be affected by recent advances in science
  - (C) has shaped recent work in epistemology
  - (D) has little relevance to present-day philosophy
  - (E) has served as a basis for intellectual speculation since antiquity
19. According to the author, philosophy became distinct from science and theology during the
- (A) ancient period
  - (B) medieval period
  - (C) seventeenth century
  - (D) nineteenth century
  - (E) twentieth century
20. The author suggests that Descartes' support for the new science of the seventeenth century can be characterized as
- (A) pragmatic and hypocritical
  - (B) cautious and inconsistent
  - (C) daring and opportunistic

- (D) intense but fleeting  
(E) strong but prudent
21. The author of the passage implies which of the following in discussing the development of philosophy during the nineteenth century?
- (A) Nineteenth-century philosophy took science as its model for understanding the bases of knowledge.  
(B) The role of academic institutions in shaping metaphysical philosophy grew enormously during the nineteenth century.  
(C) Nineteenth-century philosophers carried out a program of investigation explicitly laid out by Descartes and Spinoza.  
(D) Kant had an overwhelming impact on the direction of nineteenth-century philosophy.  
(E) Nineteenth-century philosophy made major advances in understanding the nature of knowledge.
22. With which of the following statements concerning the writing of history would the author of the passage be most likely to agree?
- (A) History should not emphasize the role played by ideas over the role played by individuals.  
(B) History should not be distorted by attributing present-day consciousness to historical figures.  
(C) History should not be focused primarily on those past events most relevant to the present.  
(D) History should be concerned with describing those aspects of the past that differ most from those of the present.  
(E) History should be examined for the lessons it can provide in understanding current problems.
23. The primary function of the passage as a whole is to
- (A) compare two competing models  
(B) analyze a difficult theory  
(C) present new evidence for a theory  
(D) correct an erroneous belief by describing its origins  
(E) resolve a long-standing theoretical controversy

Biologists have long maintained that two groups of **pinnipeds**, sea lions and walruses, are descended from a terrestrial bearlike animal, whereas the remaining group, seals, shares an ancestor with weasels. But the recent discovery of detailed similarities in the skeletal structure of the flippers in all three groups undermines the attempt to **explain away** superficial resemblance as due to **convergent evolution**—the independent development of similarities between unrelated groups in response to similar environmental pressures. Flippers may indeed be a necessary response to aquatic life; turtles, whales, and **dugongs** also have them. But the common detailed design found among the pinnipeds probably indicates a common ancestor. Moreover, walruses and seals drive themselves through the water with thrusts of their hind flippers, but sea lions use their front flippers. If anatomical similarity in the flippers resulted from similar environmental pressures, as posited by the convergent evolution theory, one would expect walruses and seals, but not seals and sea lions, to have similar flippers.

24. According to the passage, it has been recently discovered that

- (A) there are detailed skeletal similarities in the flippers of pinnipeds
  - (B) sea lions, seals, and walruses are all pinnipeds
  - (C) pinnipeds are descended from animals that once lived on land
  - (D) animals without common ancestors sometimes evolve in similar ways
  - (E) animals that have flippers do not all use them in the same way
25. The author implies that which of the following was part of the long-standing view concerning pinnipeds?
- (A) Pinnipeds are all descended from a terrestrial bearlike animal.
  - (B) Pinnipeds share a common ancestor with turtles, whales, and dugongs.
  - (C) Similarities among pinnipeds are due to their all having had to adapt to aquatic life.
  - (D) There are detailed similarities in the skeletal structure of the flippers in all pinnipeds.
  - (E) Convergent evolution cannot account for the similarities among pinnipeds.
26. The author implies which of the following about the fact that turtles, whales, and dugongs all have flippers?
- (A) It can be explained by the hypothesis that turtles, whales, and dugongs are very closely related.
  - (B) It can be explained by the idea of convergent evolution.
  - (C) It suggests that turtles, whales, and dugongs evolved in separate parts of the world.
  - (D) It undermines the view that turtles, whales, and dugongs are all descended from terrestrial ancestors.
  - (E) It is the primary difference between turtles, whales, and dugongs, on the one hand, and pinnipeds, on the other.
27. In presenting the argument in the passage, the author does which of the following?
- (A) Contends that key terms in an opposing view have been improperly used.
  - (B) Contends that opponents have purposely obscured important evidence.
  - (C) Shows that two theories thought to be in conflict are actually complementary.
  - (D) Shows that advocates of a theory have not always stated their view in the same manner.
  - (E) Shows that an implication of a theory is contradicted by the facts.

1992 02

### SECTION A

The more that is discovered about the intricate organization of the nervous system, the more it seems remarkable that genes can successfully specify the development of that system. Human genes contain too little information even to specify which hemisphere of the brain each of a human's  $10^{11}$  neurons should occupy, let alone the hundreds of connections that each neuron makes. For such reasons, we can assume that there must be an important random factor in neural development, and in particular, that errors must and do occur in the development of all normal brains.

The most vivid expression of such errors occurs in genetically identical (isogenic) organisms. Even when reared under the same conditions, isogenic organisms are rarely exact copies of one another, and their differences have revealed much about the random variations that **result from** an organism's limited supply of genetic information. In isogenic *Daphniae*, for example, even though the position, size, and branching pattern of each optic neuron are remarkably constant, there is some variability in connectivity, and the number of synapses varies greatly. This variability is probably the result of random scatter



beyond the resolution of genetic control and is best termed "imprecision," since its converse, the degree of clustering about a mean, is conventionally, called "precision."

Imprecision should be distinguished from developmental mistakes: wrongly migrated neurons, incorrect connections, and the like. To use a computer analogy, minor rounding-off errors occur universally and are analogous to imprecision, but occasionally a binary digit is incorrectly transmitted, perhaps ruining a calculation, and this incorrect transmission is analogous to a developmental mistake. Thus, imprecision is a form of inaccuracy inherent within the limits of design, but mistakes are forms of gross fallibility.

Both imprecision and gross fallibility can plausibly be blamed on the insufficiency of genetic information, since either could be reduced by adding more information. It is universally accepted among information theorists that codes and languages can be made mistake-resistant by incorporating redundancy. However, since the amount of space available in any information system is limited, increased redundancy results in decreased precision. For example,  $\pi$  when written incorrectly in English, "three point oen four two," can be understood correctly even though a typographical error has occurred. More precision could be gained, however, if those 24 spaces were filled with **Arabic numerals**; then  $\pi$  could be expressed to 23 **significant digits**, although any error would significantly change the meaning. There exists a **trade-off**, the more precisely a system is specified, using a given limited amount of information, the greater the danger of gross mistakes. The overall scheme by which genetic information is **rationed out** in organisms, therefore, must involve a compromise between two conflicting priorities: precision and the avoidance of gross mistakes.

17. Which of the following best expresses the main idea of the passage?
- (A) Although studies of isogenic organisms have shown that all organisms are subject to developmental variations, there is still scientific debate over the exact causes of these variations.
  - (B) Because of limitations on the amount of information contained in the genes of organisms, developing nervous systems are subject to two basic kinds of error, the likelihood of one of which is reduced only when the likelihood of the other is increased.
  - (C) The complexity of an organism's genetic information means that much of the unusual variation that occurs among organisms can best be explained as the result of developmental mistakes.
  - (D) New findings about the nature of the genetic control of neural development support the work of some scientists who argue that the computer is an extremely useful model for understanding the nervous system.
  - (E) The major discovery made by scientists studying the genetic control of neural development is that both imprecision and gross developmental error can be traced to specific types of mutations in specific genes.
18. According to the passage, one of the reasons it has been assumed that there is an important random element in human neural development is that
- (A) genes cannot specify certain types of developmental processes as well as they can others
  - (B) the intricacy of the nervous system allows small developmental errors to occur without harmful effects
  - (C) the amount of information contained in the genes is less than the amount necessary to specify the location of the neurons
  - (D) the number of neurons in the human brain varies greatly from individual to individual
  - (E) it is theoretically impossible for an organism to protect itself completely from gross developmental mistakes

19. The author suggests which of the following about the findings of information theorists?
- (A) Their findings provocatively challenge the standard explanation of redundancy in genes.
  - (B) Their findings provide useful insights into understanding the rationing of genetic information.
  - (C) Their findings help to explain why imprecision can occur in neural development but not why gross mistakes can occur.
  - (D) Their findings suggest that genes may be able to specify neural development more accurately than had previously been thought.
  - (E) Their findings support the work of those who use computer operations as models for understanding genetic control.
20. According to the passage, of the following aspects of the optic neurons of isogenic *Daphniae*, which varies the most?
- (A) Size
  - (B) Connectivity
  - (C) Position
  - (D) Branching pattern
  - (E) Number of synapses
21. Which of the following best describes the organization of the first paragraph?
- (A) A specific case is presented, its details are analyzed, and a conclusion is drawn from it.
  - (B) A discovery is announced, its most significant application is discussed, and possibilities for the future are suggested.
  - (C) A generalization is made, specific situations in which it is applicable are noted, and problems with it are suggested.
  - (D) An observation is made, specifics are provided to support it, and a generalization is derived.
  - (E) A hypothesis is presented, its implications are clarified, and applications of it are discussed.
22. The author uses all of the following to clarify the distinction between imprecision and gross mistake in neural development EXCEPT
- (A) classification of borderline phenomena
  - (B) a description of the relationship between the phenomena denoted by each term
  - (C) specific examples of the phenomena denoted by each term
  - (D) an explanation of at least one of the key terms involved
  - (E) analogies to other types of phenomena
23. Which of the following can be inferred from the passage about the genetic information of *Daphniae*?
- I. There is probably some degree of redundancy in the information controlling neural development.
  - II. Most of the information for neural development stored in the genes is used to specify the positions of the optic neurons.
  - III. There is sufficient information to preclude the occurrence of gross mistakes during

neural development.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) II and III only

In a recent study, David Cressy examines two central questions concerning English immigration to New England in the 1630's: what kinds of people immigrated and why? Using contemporary literary evidence, shipping lists, and customs records, Cressy finds that most adult immigrants were skilled in farming or crafts, were literate, and were organized in families. Each of these characteristics sharply distinguishes the 21,000 people who left for New England in the 1630's from most of the approximately 377,000 English people who had immigrated to America by 1700.

With respect to their reasons for immigrating, Cressy does not deny the frequently noted fact that some of the immigrants of the 1630's, most notably the organizers and clergy, advanced religious explanations for departure, but he finds that such explanations usually assumed primacy only **in retrospect**. When he moves beyond the principal actors, he finds that religious explanations were less frequently offered and he concludes that most people immigrated because they were recruited by promises of material improvement.

24. In the passage, the author is primarily concerned with
- (A) summarizing the findings of an investigation
  - (B) analyzing a method of argument
  - (C) evaluating a point of view
  - (D) hypothesizing about a set of circumstances
  - (E) establishing categories
25. According to the passage, Cressy would agree with which of the following statements about the organizers among the English immigrants to New England in the 1630's?
- I. Most of them were clergy.
  - II. Some of them offered a religious explanation for their immigration.
  - III. They did not offer any reasons for their immigration until some time after they had immigrated.
  - IV. They were more likely than the average immigrant to be motivated by material considerations.
- (A) I only
  - (B) II only
  - (C) II and III only
  - (D) I, III, and IV only
  - (E) II, III, and IV only
26. According to the passage, Cressy has made which of the following claims about what motivated English immigrants to go to New England in the 1630's?
- (A) They were motivated by religious considerations alone.
  - (B) They were motivated by economic considerations alone.
  - (C) They were motivated by religious and economic considerations equally.

- (D) They were motivated more often by economic than by religious considerations.
  - (E) They were motivated more often by religious than by economic considerations.
27. The passage suggests that the majority of those English people who had immigrated to America by the late seventeenth century were
- (A) clergy
  - (B) young children
  - (C) organized in families
  - (D) skilled in crafts
  - (E) illiterate

## SECTION B

Is the literary critic like the poet, responding creatively, intuitively, subjectively to the written word as the poet responds to human experience? Or is the critic more like a scientist, following a series of demonstrable, verifiable steps, using an objective method of analysis?

For the woman who is a practitioner of feminist literary criticism, the subjectivity versus objectivity, or critic-as-artist-or-scientist, debate has special significance; for her, the question is not only academic, but political as well, and her definition will court special risks whichever side of the issue it favors. If she defines feminist criticism as objective and scientific—a valid, verifiable, intellectual method that anyone, whether man or woman, can perform—the definition not only precludes the critic-as-artist approach, but may also impede accomplishment of the utilitarian political objectives of those who seek to change the academic establishment and its thinking, especially about sex roles. If she defines feminist criticism as creative and intuitive, privileged as art, then her work becomes vulnerable to the prejudices of stereotypic ideas about the ways in which women think, and will be dismissed by much of the academic establishment. Because of these prejudices, women who use an intuitive approach in their criticism may find themselves charged with inability to be analytical, to be objective, or to think critically. Whereas men may be free to claim the role of critic-as-artist, women run different professional risks when they choose intuition and private experience as critical method and defense.

These questions are political in the sense that the debate over them will inevitably be less an exploration of abstract matters in a spirit of disinterested inquiry than an academic power struggle in which the careers and professional fortunes of many women scholars—only now entering the academic profession in substantial numbers—will be at stake, and with them the chances for a distinctive contribution to humanistic understanding, a contribution that might be an important influence against sexism in our society.

As long as the academic establishment continues to regard objective analysis as “masculine” and an intuitive approach as “feminine,” the theoretician must steer a delicate philosophical course between the two. If she wishes to construct a theory of feminist criticism, she would be well advised to place it within the framework of a general theory of the critical process that is neither purely objective nor purely intuitive. Her theory is then more likely to be compared and contrasted with other theories of criticism with some degree of dispassionate distance.

17. Which of the following titles best summarizes the content of the passage?
- (A) How Theories of Literary Criticism Can Best Be Used
  - (B) Problems Confronting Women Who Are Feminist Literary Critics
  - (C) A Historical overview of Feminist literary Criticism
  - (D) A New Theory of Literary Criticism
  - (E) Literary Criticism: Art or Science?
18. It can be inferred that the author believes which of the following about women who are

literary critics?

- I. They can make a unique contribution to society.
- II. They must develop a new theory of the critical process.
- III. Their criticisms of literature should be entirely objective.

- (A) I only
- (B) II only
- (C) I and III only
- (D) II and III only
- (E) I, II, and III

19. The author specifically mentions all of the following as difficulties that particularly affect women who are theoreticians of feminist literary criticism EXCEPT the
- (A) tendency of a predominantly male academic establishment to form preconceptions about women
  - (B) limitations that are imposed when criticism is defined as objective and scientific
  - (C) likelihood that the work of a woman theoretician who claims the privilege of art will be viewed with prejudice by some academics
  - (D) inescapability of power struggles between women in the academic profession and the academic establishment
  - (E) tendency of members of the academic establishment to treat all forms of feminist literary theory with hostility
20. According to the author, the debate mentioned in the passage has special significance for the woman who is a theoretician of feminist literary criticism for which of the following reasons?
- (A) There are large numbers of capable women working within the academic establishment.
  - (B) There are a few powerful feminist critics who have been recognized by the academic establishment.
  - (C) Like other critics, most women who are literary critics define criticism as either scientific or artistic.
  - (D) Women who are literary critics face professional risks different from those faced by men who are literary critics.
  - (E) Women who are literary critics are more likely to participate in the debate than are men who are literary critics.
21. Which of the following is presented by the author **in support of** the suggestion that there is stereotypic thinking among members of the academic establishment?
- (A) A distinctively feminist contribution to humanistic understanding could work against the influence of sexism among members of the academic establishment.
  - (B) Women who define criticism as artistic may be seen by the academic establishment as being incapable of critical thinking.
  - (C) The debate over the role of the literary critic is often seen as a political one.
  - (D) Women scholars are only now entering academia in substantial numbers.
  - (E) The woman who is a critic is forced to construct a theory of literary criticism.

22. Which of the following is most likely to be one of the “utilitarian political objectives” mentioned by the author in line 16?
- (A) To forge a new theory of literary criticism
  - (B) To pursue truth in a disinterested manner
  - (C) To demonstrate that women are interested in literary criticism that can be viewed either subjectively or objectively
  - (D) To convince the academic establishment to revise the ways in which it assesses women scholars’ professional qualities
  - (E) To dissuade women who are literary critics from taking a subjective approach to literary criticism
23. It can be inferred that the author would define as “political” (line 30) questions that
- (A) are contested largely through contentions over power
  - (B) are primarily academic in nature and open to abstract analysis
  - (C) are not in themselves important
  - (D) cannot be resolved without extensive debate
  - (E) will be debated by both men and women

[This passage was excerpted from an article published in 1979.]

Quantum mechanics is a highly successful theory: it supplies methods for accurately calculating the results of diverse experiments, especially with minute particles. The predictions of quantum mechanics, however, give only the probability of an event, not a deterministic statement of whether or not the event will occur. Because of this probabilism, Einstein remained strongly dissatisfied with the theory throughout his life, though he did not maintain that quantum mechanics is wrong. Rather, he held that it is incomplete: in quantum mechanics the motion of a particle must be described in terms of probabilities, he argued, only because some parameters that determine the motion have not been specified. If these hypothetical “hidden parameters” were known, a fully deterministic trajectory could be defined. Significantly, this hidden-parameter quantum theory leads to experimental predictions different from those of traditional quantum mechanics. Einstein’s ideas have been tested by experiments performed since his death, and as most of these experiments support traditional quantum mechanics, Einstein’s approach is almost certainly erroneous.

24. The author regards the idea that traditional quantum mechanics is incomplete with
- (A) approval
  - (B) surprise
  - (C) indifference
  - (D) apprehension
  - (E) skepticism
25. It can be inferred from the passage that the author’s conclusion that Einstein’s approach is “erroneous” (line 22) might have to be modified because
- (A) it is theoretically possible to generate plausible theories with hidden parameters within them
  - (B) some experimental tests of Einstein’s theory do not disconfirm the hidden-parameter theory of quantum mechanics
  - (C) it is possible for a theory to have hidden parameters and yet be probabilistic
  - (D) traditional quantum mechanics has not yet been used to analyze all of the phenomena to

which it could be applied

- (E) there are too many possible hidden parameters to develop meaningful tests of hidden-parameter theories
26. According to the passage, Einstein posed objections to the
- (A) existence of hidden parameters in quantum theory
  - (B) probabilistic nature of quantum mechanics
  - (C) idea that quantum mechanics is incomplete
  - (D) results of experiments testing quantum theory
  - (E) importance accorded quantum mechanics in physics
27. The passage suggests that which of the following would have resulted if the experiments mentioned in lines 18-20 had not supported the predictions of traditional quantum mechanics?
- (A) Einstein, had he been alive, would have revised his approach to quantum mechanics.
  - (B) Hidden-parameter theories would have been considered inaccurate descriptions of real-world phenomena.
  - (C) A deterministic description of the motion of a particle might still be considered possible.
  - (D) Quantum mechanics would have ceased to attract the attention of physicists.
  - (E) Einstein, had he been alive, would have abandoned attempts to specify the hidden parameters that describe motion.

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## SECTION A

The 1960's witnessed two profound social movements: the civil rights movement and the movement protesting the war in Vietnam. Although they overlapped in time, they were largely distinct. For a brief moment in 1967, however, it appeared that the two movements might unite under the leadership of Martin Luther King, Jr.

King's role in the antiwar movement appears to require little explanation, since he was the foremost advocate of nonviolence of his time. But King's stance on the Vietnam War cannot be explained in terms of pacifism alone. After all, he was something of a latecomer to the antiwar movement, even though by 1965 he was convinced that the role of the United States in the war was indefensible. Why then the two years that passed before he translated his private misgivings into public dissent? Perhaps he believed that he could not criticize American foreign policy without endangering the support for civil rights that he had won from the federal government.

17. According to the passage, the delay referred to in lines 12-15 is perhaps attributable to which of the following?
- (A) King's ambivalence concerning the role of the United States in the war in Vietnam
  - (B) King's attempts to consolidate support for his leadership within the civil rights movement
  - (C) King's desire to keep the leadership of the civil rights movement distinct from that of the antiwar movement
  - (D) King's desire to draw support for the civil rights movement from the leadership of the antiwar movement
  - (E) King's reluctance to jeopardize federal support for the civil rights movement



18. The author supports the claim that “King’s stance on the Vietnam War cannot be explained in terms of pacifism alone” (lines 10-12) by implying which of the following?
- (A) There is little evidence that King was ever a student of pacifist doctrine.
  - (B) King, despite pacifist sympathies, was not convinced that the policy of the federal government in Vietnam was wrong.
  - (C) King’s belief in nonviolence was formulated in terms of domestic policy rather than in terms of international issues.
  - (D) Had King’s actions been based on pacifism alone, he would have joined the antiwar movement earlier than he actually did.
  - (E) Opponents of United States foreign policy within the federal government convinced King of their need for support.
19. Which of the following can be inferred from the passage about the movement opposing the war in Vietnam?
- (A) It preceded the civil rights movement.
  - (B) It began in 1965.
  - (C) It was supported by many who otherwise opposed public dissent.
  - (D) It drew support from most civil rights leaders.
  - (E) It was well underway by 1967.
20. Which of the following best describes the passage?
- (A) It discusses an apparent inconsistency and suggests a reason for it.
  - (B) It outlines a sequence of historical events.
  - (C) It shows why a commonly held view is inaccurate.
  - (D) It evaluates an explanation and finally accepts that explanation.
  - (E) It contrasts two views of an issue.

What causes a helix in nature to appear with either a dextral (“right-handed,” or clockwise) twist or a sinistral (“left-handed,” or counterclockwise) twist is one of the most intriguing puzzles in the science of form. Most spiral-shaped snail species are predominantly dextral. But **at one time**, handedness (twist direction of the shell) was equally distributed within some snail species that have become predominantly dextral or, in a few species, predominantly sinistral. What mechanisms, control handedness and keep left-handedness rare?

It would seem unlikely that evolution should **discriminate against** sinistral snails if sinistral and dextral snails are exact mirror images, for any disadvantage that a sinistral twist in itself could confer on its possessor is almost inconceivable. But left- and right-handed snails are not actually true mirror images of one another. Their shapes are noticeably different. Sinistral rarity might, then, be a consequence of possible disadvantages conferred by these other concomitant structural features. In addition, perhaps left- and right-handed snails cannot mate with each other, having incompatible twist directions. Presumably an individual of the rarer form would have relative difficulty in finding a mate of the same hand, thus keeping the rare form rare or creating geographically separated right-and left-handed populations.

But this evolutionary mechanism combining dissymmetry, anatomy, and chance does not provide an adequate explanation of why right-handedness should have become predominant. It does not explain, for example, why the infrequent unions between snails of opposing hands produce fewer offspring of the rarer than the commoner form in species where each parent contributes equally to handedness. Nor does it explain why, in a species where one parent determines handedness, a brood is not exclusively right- or left-handed when the offspring would have the same genetic predisposition. In the European pond snail



*Lymnaea peregra*, a predominantly dextral species whose handedness is maternally determined, a brood might be expected to be exclusively right or left-handed—and this often occurs. However, some broods possess a few snails of the opposing hand, and in predominantly sinistral broods, the incidence of dextrality is surprisingly high.

Here, the evolutionary theory must defer to a theory based on an explicit developmental mechanism that can favor either right or left-handedness. In the case of *Lymnaea peregra*, studies indicate that a dextral gene is expressed during egg formation; i.e., before egg fertilization, the gene produces a protein, found in the cytoplasm of the egg, that controls the pattern of cell division and thus handedness. In experiments, an injection of cytoplasm from dextral eggs changes the pattern of sinistral eggs, but an injection from sinistral eggs does not influence dextral eggs. One explanation for the differing effects is that all *Lymnaea peregra* eggs begin left-handed but most switch to being right-handed. Thus, the path to a solution to the puzzle of handedness in all snails appears to be as twisted as the helix itself.

21. Which of the following would serve as an example of “concomitant structural features” (line 19) that might disadvantage a snail of the rarer form?
  - (A) A shell and body that are an exact mirror image of a snail of the commoner form
  - (B) A smaller population of the snails of the rarer form
  - (C) A chip or fracture in the shell caused by an object falling on it
  - (D) A pattern on the shell that better camouflages it
  - (E) A smaller shell opening that restricts mobility and ingestion relative to that of a snail of the commoner form
22. The second paragraph of the passage is primarily concerned with offering possible reasons why
  - (A) it is unlikely that evolutionary mechanisms could discriminate against sinistral snails
  - (B) sinistrality is relatively uncommon among snail species
  - (C) dextral and sinistral populations of a snail species tend to intermingle
  - (D) a theory based on a developmental mechanism inadequately accounts for the predominance of dextrality across snail species
  - (E) dextral snails breed more readily than sinistral snails, even within predominantly sinistral populations
23. In describing the “evolutionary mechanism” (line 27), the author mentions which of the following?
  - (A) The favorable conditions for nurturing new offspring
  - (B) The variable environmental conditions that affect survival of adult snails
  - (C) The availability of potential mates for breeding
  - (D) The structural identity of offspring to parents of the same hand
  - (E) The frequency of unions between snails of different species
24. According to the passage, which of the following is true of *Lymnaea peregra*?
  - (A) Handedness within the species was at one time equally distributed between left and right.
  - (B) Under laboratory conditions, dextral eggs from *Lymnaea peregra* can be artificially induced to develop into sinistral snails.
  - (C) Broods of *Lymnaea peregra* are, without variation, exclusively sinistral or dextral.
  - (D) Handedness in *Lymnaea peregra* offspring is determined by only one of the parents.

- (E) Geographic factors have played a larger role than has genetics in the evolution of the species.
25. The passage implies that in *Lymnaea peregra*, there will generally be
- (A) more offspring of the nondominant hand in broods where handedness is determined after, rather than before, fertilization
  - (B) a sinistral gene that produces a protein in the cytoplasm of the egg cell
  - (C) fewer sinistral offspring in dextral broods than dextral offspring in sinistral broods
  - (D) equal numbers of exclusively left-and right-handed broods
  - (E) an increasing occurrence of left-handedness in successive broods
26. It can be inferred from the passage that a predominantly sinistral snail species might stay predominantly sinistral for each of the following reasons EXCEPT for
- (A) a developmental mechanism that affects the cell-division pattern of snails
  - (B) structural features that advantage dextral snails of the species
  - (C) a relatively small number of snails of the same hand for dextral snails of the species to mate with
  - (D) anatomical incompatibility that prevents mating between snails of opposing hands within the species
  - (E) geographic separation of sinistral and dextral populations
27. Which of the following accurately describes the relationship between the evolutionary and developmental theories discussed in the passage?
- (A) Although the two theories reach the same conclusion, each is based on different assumptions.
  - (B) They present contradictory explanations of the same phenomenon.
  - (C) The second theory accounts for certain phenomena that the first cannot explain.
  - (D) The second theory demonstrates why the first is valid only for very unusual, special cases.
  - (E) They are identical and interchangeable in that the second theory merely restates the first in less technical terms.

## SECTION B

Recently some scientists have concluded that meteorites found on Earth and long believed to have a Martian origin might actually have been blasted free of Mars's gravity by the impact on Mars of other meteorites. This conclusion has led to another question: whether meteorite impacts on Earth have similarly driven rocks from this planet to Mars.

According to astronomer S. A. Phinney, kicking a rock hard enough to free it from Earth's gravity would require a meteorite capable of making a crater more than 60 miles across. Moreover, even if Earth rocks were freed by meteorite impact, Mars's orbit is much larger than Earth's, so Phinney estimates that the probability of these rocks hitting Mars is about one-tenth as great as that of Mars's rocks hitting Earth. To demonstrate this estimate, Phinney used a computer to calculate where 1,000 hypothetical particles would go if ejected from Earth in random directions. He found that 17 of the 1,000 particles would hit Mars.

17. The passage is primarily concerned with
- (A) presenting an argument to support a particular hypothesis

- (B) suggesting an answer to a theoretical question
  - (C) questioning the assumptions of a research project
  - (D) criticizing experimental results
  - (E) explaining the origin of certain scientific data
18. According to the passage, which of the following events may have initiated the process that led to the presence on Earth of meteorites from Mars?
- (A) A meteorite struck the Earth with tremendous velocity.
  - (B) A meteorite collided with Mars.
  - (C) Approximately 1,000 rocks were ejected from Mars.
  - (D) The orbits of Earth and Mars brought the planets to their closest points.
  - (E) Rocks from a meteorite impact broke free of Earth's gravity.
19. The passage suggests that which of the following is true concerning the probability that a rock, if ejected from Mars, will hit the Earth?
- (A) The probability is increased when particles are ejected from Mars in random directions.
  - (B) The probability is increased by the presence of large craters on the surface of Mars.
  - (C) The probability is decreased when Mars's orbit brings the planet close to Earth.
  - (D) The probability is greater than the probability that a rock from Earth will hit Mars.
  - (E) The probability is less than the probability that a rock from Earth will escape Earth's gravity.
20. Which of the following, if true, would cast most doubt on Phinney's estimate of the probability of Earth rocks hitting Mars?
- (A) Rather than going in random directions, about 25 percent of all particles ejected from Earth go in the same direction into space.
  - (B) Approximately 100 meteorites large enough to make a noticeable crater hit the Earth each year.
  - (C) No rocks of Earth origin have been detected on Mars.
  - (D) The velocity of rocks escaping from Earth's gravity is lower than the velocity of meteorites hitting the Earth.
  - (E) No craters more than 60 miles across have been found on Mars.

A "scientistic" view of language was dominant among philosophers and linguists who affected to develop a scientific analysis of human thought and behavior in the early part of this century. Under the force of this view, it was perhaps inevitable that the art of rhetoric should pass from the status of being regarded as of questionable worth (because although it might be both a source of pleasure and a means to urge people to right action, it might also be a means to distort truth and a source of misguided action) to the status of being wholly condemned. If people are regarded only as machines guided by logic, as they were by these "scientistic" thinkers, rhetoric is likely to be held in low regard; for the most obvious truth about rhetoric is that it speaks to the whole person. It presents its arguments first to the person as a rational being, because persuasive discourse, if honestly conceived, always has a basis in reasoning. Logical argument is the plot, *as it were*, of any speech or essay that is respectfully intended to persuade people. Yet it is a characterizing feature of rhetoric that it goes beyond this and appeals to the parts of our nature that are involved in feeling, desiring, acting, and suffering. It recalls relevant instances of the emotional reactions of people to circumstances—real or fictional—that are similar to our own circumstances. Such is the purpose of both historical accounts and fables in persuasive discourse: they indicate literally or symbolically how people may react emotionally, with hope or fear, to particular

circumstances. A speech attempting to persuade people can achieve little unless it takes into account the aspect of their being related to such hopes and fears.

Rhetoric, then, is addressed to human beings living at particular times and in particular places. From the point of view of rhetoric, we are not merely logical thinking machines, creatures abstracted from time and space. The study of rhetoric should therefore be considered the most humanistic of the humanities, since rhetoric is not directed only to our rational selves. It takes into account what the "scientistic" view **leaves out**. If it is a weakness to harbor feelings, then rhetoric may be thought of as dealing in weakness. But those who reject the idea of rhetoric because they believe it deals in lies and who at the same time hope to move people to action, must either be liars themselves or be very naive; pure logic has never been a motivating force unless it has been subordinated to human purposes, feelings, and desires, and thereby ceased to be pure logic.

21. According to the passage, to reject rhetoric and still hope to persuade people is
  - (A) an aim of most speakers and writers
  - (B) an indication either of dishonesty or of credulity
  - (C) a way of displaying distrust of the audience's motives
  - (D) a characteristic of most humanistic discourse
  - (E) a way of avoiding excessively abstract reasoning
22. It can be inferred from the passage that in the late nineteenth century rhetoric was regarded as
  - (A) the only necessary element of persuasive discourse
  - (B) a dubious art in at least two ways
  - (C) an outmoded and tedious amplification of logic
  - (D) an open offense to the rational mind
  - (E) the most important of the humanistic studies
23. The passage suggests that the disparagement of rhetoric by some people can be traced to their
  - (A) reaction against science
  - (B) lack of training in logic
  - (C) desire to persuade people as completely as possible
  - (D) misunderstanding of the use of the term "scientistic"
  - (E) view of human motivation
24. The passage suggests that a speech that attempts to persuade people to act is likely to fail if it does NOT
  - (A) distort the truth a little to make it more acceptable to the audience
  - (B) appeal to the self-interest as well as the humanitarianism of the audience
  - (C) address listeners' emotions as well as their intellects
  - (D) concede the logic of other points of view
  - (E) show how an immediately desirable action is consistent with timeless principles
25. The passage suggests that to consider people as "thinking machines" (line 37) is to consider them as
  - (A) beings separated from a historical context
  - (B) replaceable parts of a larger social machine

- (C) more complex than other animals
  - (D) liars rather than honest people
  - (E) infallible in their reasoning
26. Which of the following persuasive devices is NOT used in the passage?
- (A) A sample of an actual speech delivered by an orator
  - (B) The contrast of different points of view
  - (C) The repetition of key ideas and expressions
  - (D) An analogy that seeks to explain logical argument
  - (E) Evaluative or judgmental words
27. Which of the following best states the author's main point about logical argument?
- (A) It is a sterile, abstract discipline, of little use in real life.
  - (B) It is an essential element of persuasive discourse, but only one such element.
  - (C) It is an important means of persuading people to act against their desires.
  - (D) It is the lowest order of discourse because it is the least imaginative.
  - (E) It is essential to persuasive discourse because it deals with universal truths.

1992 10

### SECTION A

Hank Morgan, the hero of Mark Twain's *A Connecticut Yankee in King Arthur's Court*, is a nineteenth-century master mechanic who mysteriously awakening in sixth-century Britain, launches what he hopes will be a peaceful revolution to transform Arthurian Britain into an industrialized modern democracy. The novel, written as a **spoof** of Thomas Malory's *Morte d'Arthur*, a popular collection of fifteenth-century legends about sixth-century Britain, has been made into three upbeat movies and two musical comedies. None of these translations to screen and stage, however, dramatize the anarchy **at the conclusion of** *A Connecticut Yankee*, which ends with the violent overthrow of Morgan's three-year-old progressive order and his return to the nineteenth century, where he apparently commits suicide after being labeled a lunatic for his incoherent babblings about drawbridges and battlements. The American public, although enjoying Twain's humor, evidently rejected his cynicism about technological advancement and change through peaceful revolution as antithetical to the United States doctrine of progress.

17. According to the passage, which of the following is a true statement about the reception of *A Connecticut Yankee in King Arthur's Court* by the American public?
- (A) The public had too strong a belief in the doctrine of progress to accept the cynicism demonstrated at the conclusion of Twain's novel.
  - (B) Twain's novel received little public recognition until the work was adapted for motion pictures and plays.
  - (C) Although the public enjoyed Twain's humor, his use of both sixth-century and nineteenth-century characters confused many people.
  - (D) The public has continued to enjoy Twain's story, but the last part of the novel seems too violent to American minds.
  - (E) Because of the cynicism at the end of the book, the public rejected Twain's work in favor of the work of Thomas Malory.
18. The author uses the examples of "three upbeat movies and two musical comedies" (lines 9-10) primarily in order to demonstrate that

- (A) well-written novels like *A Connecticut Yankee in King Arthur's Court*, regardless of their tone or theme, can be translated to the stage and screen
  - (B) the American public has traditionally been more interested in watching plays and movies than in reading novels like *A Connecticut Yankee in King Arthur's Court*
  - (C) Twain's overall message in *A Connecticut Yankee in King Arthur's Court* is one that had a profound impact on the American public
  - (D) Twain's *A Connecticut Yankee in King Arthur's Court* has been a more popular version of the Arthurian legends than has Malory's *Morte d'Arthur*
  - (E) *A Connecticut Yankee in King Arthur's Court* has been accepted as an enjoyable and humorous tale in versions that have omitted the anarchy at the novel's conclusion
19. The author of the passage characterizes Thomas Malory's *Morte d'Arthur* as which of the following?
- (A) The best-known and most authoritative collection of Arthurian tales written in the English language
  - (B) A collection of legends that have been used as the basis for three movies and two musical comedies
  - (C) A historical account of King Arthur, the sixth-century king of Britain
  - (D) A collection of legends about sixth-century Britain that have existed since at least the fifteenth century
  - (E) The novel about the life of King Arthur that inspired Twain's cynicism about nineteenth-century notions of progress
20. It can be inferred from the passage that Mark Twain would most probably have believed in which of the following statements about societal change?
- (A) Revolutions, in order to be successful in changing society, have to be carried out without violence.
  - (B) Technological advancements are limited in their ability to change society and will likely bring liabilities along with any potential benefits.
  - (C) The belief in the unmitigated benefits of societal change is antithetical to the American doctrine of progress.
  - (D) The political system of sixth-century Britain was more conducive to societal change than was the political system of nineteenth-century America.
  - (E) Technological advances and peaceful revolutions, although sometimes accompanied by unintended violence and resistance to societal change, eventually lead to a more progressive order.

The intensive work of materials scientists and solid-state physicists has given rise to a class of solids known as amorphous metallic alloys, or glassy metals. There is a growing interest among theoretical and applied researchers alike in the structural properties of these materials.

When a molten metal or metallic alloy is cooled to a solid, a crystalline structure is formed that depends on the particular alloy composition. In contrast, molten nonmetallic glass-forming materials, when cooled, do not assume a crystalline structure, but instead retain a structure somewhat like that of the liquid—an amorphous structure. At room temperature, the natural long-term tendency for both types of materials is to assume the crystalline structure. The difference between the two is in the kinetics or rate of formation of the crystalline structure, which is controlled by factors such as the nature of the chemical bonding and the ease with which atoms move relative to each other. Thus, in metals, the



kinetics favors rapid formation of a crystalline structure, whereas in nonmetallic glasses the rate of formation is so slow that almost any cooling rate is sufficient to result in an amorphous structure. For glassy metals to be formed, the molten metal must be cooled extremely rapidly so that crystallization is suppressed.

The structure of glassy metals is thought to be similar to that of liquid metals. One of the first attempts to model the structure of a liquid was that by the late J. D. Bernal of the University of London, who packed hard spheres into a rubber vessel in such a way as to obtain the maximum possible density. The resulting dense, random-packed structure was the basis for many attempts to model the structure of glassy metals. Calculations of the density of alloys based on Bernal-type models of the alloys metal component agreed fairly well with the experimentally determined values from measurements on alloys consisting of a noble metal together with a metalloid, such as alloys of palladium and silicon, or alloys consisting of iron, phosphorus, and carbon, although small discrepancies remained. One difference between real alloys and the hard spheres used in Bernal models is that the components of an alloy have different sizes, so that models based on two sizes of spheres are more appropriate for a binary alloy, for example. The smaller metalloid atoms of the alloy might fit into holes in the dense, random-packed structure of the larger metal atoms.

One of the most promising properties of glassy metals is their high strength combined with high malleability. In usual crystalline materials, one finds an inverse relation between the two properties, whereas for many practical applications simultaneous presence of both properties is desirable. One residual obstacle to practical applications that is likely to be overcome is the fact that glassy metals will crystallize at relatively low temperatures when heated slightly.

21. The author is primarily concerned with discussing
  - (A) crystalline solids and their behavior at different temperatures
  - (B) molten materials and the kinetics of the formation of their crystalline structure
  - (C) glassy metals and their structural characteristics
  - (D) metallic alloys and problems in determining their density
  - (E) amorphous materials and their practical utilization
22. The author implies that the rate at which the molten materials discussed in the passage are cooled is a determinant of the
  - (A) chemical composition of the resulting solids
  - (B) strength of the chemical bonds that are formed
  - (C) kinetics of the materials' crystalline structure
  - (D) structure the materials assume
  - (E) stability of the materials' crystalline structure
23. The author's speculation about the appropriateness of models using spheres of two sizes for binary alloys would be strongly supported if models using spheres of two sizes yielded
  - (A) values for density identical to values yielded by one-sphere models using the smaller spheres only
  - (B) values for density agreeing nearly perfectly with experimentally determined values
  - (C) values for density agreeing nearly perfectly with values yielded by models using spheres of three sizes
  - (D) significantly different values for density depending on the size ratio between the two kinds of spheres used
  - (E) the same values for density as the values for appropriately chosen models that use only medium-sized spheres

24. The author's attitude toward the prospects for the economic utilization of glassy metals is one of
- (A) disinterest
  - (B) impatience
  - (C) optimism
  - (D) apprehension
  - (E) skepticism
25. According to the passage, which of the following determines the crystalline structure of a metallic alloy?
- (A) At what rate the molten alloy is cooled
  - (B) How rapid the rate of formation of the crystalline phase is
  - (C) How the different-sized atoms fit into a dense, random-packed structure
  - (D) What the alloy consists of and in what ratios
  - (E) At what temperature the molten alloy becomes solid
26. Which of the following best describes the relationship between the structure of liquid metals and the structure of glassy metals, as it is presented in the passage?
- (A) The latter is an illustrative example of the former.
  - (B) The latter is a large-scale version of the former.
  - (C) The former is a structural elaboration of the latter.
  - (D) The former provides an instructive contrast to the latter.
  - (E) The former is a fair approximation of the latter.
27. It can be inferred from the passage that, theoretically, molten nonmetallic glasses assume a crystalline structure rather than an amorphous structure only if they are cooled
- (A) very evenly, regardless of the rate
  - (B) rapidly, followed by gentle heating
  - (C) extremely slowly
  - (D) to room temperature
  - (E) to extremely low temperatures

## SECTION B

In a perfectly free and open market economy, the type of employer—government or private—should have little or no impact on the earnings differentials between women and men. However, if there is discrimination against one sex, it is unlikely that the degree of discrimination by government and private employers will be the same. Differences in the degree of discrimination would result in earnings differentials associated with the type of employer. Given the nature of government and private employers, it seems most likely that discrimination by private employers would be greater. Thus, one would expect that, if women are being discriminated against, government employment would have a positive effect on women's earnings as compared with their earnings from private employment. The results of a study by Fuchs support this assumption. Fuchs's results suggest that the earnings of women in an industry composed entirely of government employers would be 14.6 percent greater than the earnings of women in an industry composed exclusively of private employees, other things being equal.

In addition, both Fuchs and Sanborn have suggested that the effect of discrimination by consumers on the earnings of self-employed women may be greater than the effect of either government or private



employer discrimination on the earnings of women employees. To test this hypothesis, Brown selected a large sample of White male and female workers from the 1970 Census and divided them into three categories: private employees, government employees, and self-employed. (Black workers were excluded from the sample to avoid picking up earnings differentials that were the result of racial disparities.) Brown's research design controlled for education, labor-force participation, mobility, motivation, and age in order to eliminate these factors as explanations of the study's results. Brown's results suggest that men and women are not treated the same by employers and consumers. For men, self-employment is the highest earnings category, with private employment next, and government lowest. For women, this order is reversed.

One can infer from Brown's results that consumers discriminate against self-employed women. In addition, self-employed women may have more difficulty than men in getting good employees and may encounter discrimination from suppliers and from financial institutions.

Brown's results are clearly consistent with Fuch's argument that discrimination by consumers has a greater impact on the earnings of women than does discrimination by either government or private employers. Also, the fact that women do better working for government than for private employers implies that private employers are discriminating against women. The results do not prove that government does not discriminate against women. They do, however, demonstrate that if government is discriminating against women, its discrimination is not having as much effect on women's earnings as is discrimination in the private sector.

17. The passage mentions all of the following as difficulties that self-employed women may encounter EXCEPT:
  - (A) discrimination from suppliers
  - (B) discrimination from consumers
  - (C) discrimination from financial institutions
  - (D) problems in obtaining good employees
  - (E) problems in obtaining government assistance
18. The author would be most likely to agree with which of the following conclusions about discrimination against women by private employers and by government employers?
  - (A) Both private employers and government employers discriminate, with equal effects on women's earnings.
  - (B) Both private employers and government employers discriminate, but the discrimination by private employers has a greater effect on women's earnings.
  - (C) Both private employers and government employers discriminate, but the discrimination by government employers has a greater effect on women's earnings.
  - (D) Private employers discriminate; it is possible that government employers discriminate.
  - (E) Private employers discriminate; government employers do not discriminate.
19. A study of the practices of financial institutions that revealed no discrimination against self-employed women would tend to contradict which of the following?
  - (A) Some tentative results of Fuchs's study
  - (B) Some explicit results of Brown's study
  - (C) A suggestion made by the author
  - (D) Fuchs's hypothesis
  - (E) Sanborn's hypothesis
20. According to Brown's study, women's earnings categories occur in which of the following

orders, from highest earnings to lowest earnings?

- (A) Government employment, self-employment, private employment
- (B) Government employment, private employment, self-employment
- (C) Private employment, self-employment, government employment
- (D) Private employment, government employment, self-employment
- (E) Self-employment, private employment, government employment

21. The passage explicitly answers which of the following questions?
- (A) Why were Black workers excluded from the sample used in Brown's study?
  - (B) Why do private employers illuminate more against women than do government employers?
  - (C) Why do self-employed women have more difficulty than men in hiring high-quality employees?
  - (D) Why do suppliers discriminate against self-employed women?
  - (E) Are Black women and Black men treated similarly by employers and consumers?
22. It can be inferred from the passage that the statements in the last paragraph are most probably which of the following?
- (A) Brown's elaboration of his research results
  - (B) Brown's tentative inference from his data
  - (C) Brown's conclusions, based on common-sense reasoning
  - (D) The author's conclusions, based on Fuchs's and Brown's results
  - (E) The author's criticisms of Fuchs's argument, based on Brown's results
23. Which of the following titles best describes the content of the passage as a whole?
- (A) The Necessity for Earnings Differentials in a Free Market Economy
  - (B) Why Discrimination Against Employed Women by Government Employers and Private Employers Differs from Discrimination Against Self-Employed Women by Consumers
  - (C) How Discrimination Affects Women's Choice of Type of Employment
  - (D) The Relative Effect of Private Employer Discrimination on Men's Earnings as Compared to Women's Earnings
  - (E) The Relative Effect of Discrimination by Government Employers, Private Employers, and Consumers on Women's Earnings

The success of fluoride in combating dental decay is well established and, **without a doubt**, socially beneficial. However, fluoride's toxic properties have been known for a century. In humans excessive intake (for adults, over 4 milligrams per day) over many years can lead to skeletal fluorosis, a well-defined skeletal disorder, and in some plant species, fluoride is more toxic than ozone, sulfur dioxide, or pesticides.

Some important questions remain. For example, the precise lower limit at which the fluoride content of bone becomes toxic is still undetermined. And while fluoride intake from water and air can be evaluated relatively easily, it is much harder to estimate how much a given population ingests from foodstuffs because of the wide variations in individual eating habits and in fluoride concentrations in foodstuffs. These difficulties suggest that we should by wary of indiscriminately using fluoride, even in the form of fluoride-containing dental products.

24. In the passage, the author is primarily concerned with

- (A) analyzing and categorizing
  - (B) comparing and contrasting
  - (C) synthesizing and predicting
  - (D) describing and cautioning
  - (E) summarizing and reinterpreting
25. The passage suggests that it would be easier to calculate fluoride intake from food if
- (A) adequate diets were available for most people.
  - (B) individual eating habits were more uniform
  - (C) the fluoride content of food was more varied
  - (D) more people were aware of the fluoride content of food
  - (E) methods for measuring the fluoride content of food were more generally agreed on
26. One function of the second paragraph of the passage is to
- (A) raise doubts about fluoride's toxicity
  - (B) introduce the issue of fluoride's toxicity
  - (C) differentiate a toxic from a nontoxic amount of fluoride
  - (D) indicate that necessary knowledge of fluoride remains incomplete
  - (E) discuss the foodstuffs that are most likely to contain significant concentrations of fluoride
27. The passage suggests which of the following about the effect of fluoride on humans?
- (A) The effect is more easily measured than is the effect of exposure to pesticides.
  - (B) The effect of fluoride intake from water and air is relatively difficult to monitor.
  - (C) In general the effect is not likely to be as harmful as the effect of exposure to sulfur dioxide.
  - (D) An intake of 4 milligrams over a long period of time usually leads to a skeletal disorder in humans.
  - (E) An intake of slightly more than 4 milligrams for only a few months is not likely to be life-threatening.

1993 02

### SECTION A

It is now established that the Milky Way is far more extended and of much greater mass than was hitherto thought. However, all that is visible of the constituents of the Milky Way's corona (outer edge), where much of the galaxy's mass must be located, is a tiny fraction of the corona's mass. Thus, most of the Milky Way's outlying matter must be dark.

Why? Three facts are salient. First, dwarf galaxies and globular clusters, into which most of the stars of the Milky Way's corona are probably bound, consist mainly of old stars. Second, old stars are not highly luminous. Third, no one has detected in the corona the clouds of gaseous matter such as hydrogen and carbon monoxide that are characteristic of the bright parts of a galaxy. At present, therefore, the best explanation—though still quite tentative—for the darkness of the corona is that the corona is composed mainly of old, burned-out stars.

17. The passage as a whole is primarily concerned with
- (A) analyzing a current debate

- (B) criticizing a well-established theory  
(C) showing how new facts support a previously dismissed hypothesis  
(D) stating a conclusion and adducing evidence that may justify it  
(E) contrasting two types of phenomena and showing how they are related
18. According to the passage, a bright part of a galaxy typically includes  
(A) dwarf galaxies and clusters of stars  
(B) a balanced mixture of old and new stars  
(C) a large portion of the galaxy's mass  
(D) part of the corona of the galaxy  
(E) gases such as hydrogen and carbon monoxide
19. It can be inferred from the passage that, compared with what they now think, until fairly recently astronomers believed that the Milky Way  
(A) was much darker  
(B) was much smaller  
(C) was moving much more slowly  
(D) had a much larger corona  
(E) had much less gaseous matter
20. The passage presents which of the following as incontrovertible?  
I. The low luminosity of old stars  
II. The absence of clouds of gaseous matter from the corona of the Milky Way  
III. The predominance of globular clusters and dwarf galaxies in the corona of the Milky Way  
(A) I only  
(B) III only  
(C) I and II only  
(D) II and III only  
(E) I, II, and III

One of the principal themes of Walzer's critique of liberal capitalism is that it is insufficiently egalitarian. Walzer's case against the economic inequality generated by capitalism and in favor of "a radical redistribution of wealth" is presented in a widely cited essay entitled "In Defense of Equality."

The most striking feature of Walzer's critique is that, **far from** rejecting the principle of reward according to merit, Walzer insists on its validity. People who excel should receive the superior benefits appropriate to their excellence. But people exhibit a great variety of qualities—"intelligence, physical strength, agility and grace, artistic creativity, mechanical skill, leadership, endurance, memory, psychological insight, the capacity for hard work—even moral strength, sensitivity, the ability to express compassion." Each deserves its proper recompense, and hence a proper distribution of material goods should reflect human differences as measured on all these different scales. Yet, under capitalism, the ability to make money ("the **green thumb** of bourgeois society") enables its possessor to acquire almost "every other sort of social good," such as the respect and esteem of others.

The centerpiece of Walzer's argument is the invocation of a quotation from Pascal's *Pensees*, which concludes: "Tyranny is the wish to obtain by one means what can only be had by another." Pascal believes that we owe different **duties** to different qualities. So we might say that infatuation is the proper response to charm, and awe the proper response to strength. In this light, Walzer characterizes

capitalism as the tyranny of money (or of the ability to make it). And Walzer advocates as the means of eliminating this tyranny and of restoring genuine equality “the abolition of the power of money outside its sphere.” What Walzer envisions is a society in which wealth is no longer convertible into social goods with which it has no intrinsic connection.

Walzer’s argument is a puzzling one. After all, why should those qualities unrelated to the production of material goods be rewarded with material goods? Is it not tyrannical, in Pascal’s sense, to insist that those who excel in “sensitivity” or “the ability to express compassion” merit equal wealth with those who excel in qualities (such as “the capacity for hard work”) essential in producing wealth? Yet Walzer’s argument, however deficient, does point to one of the most serious weaknesses of capitalism—namely, that it brings to predominant positions in a society people who, no matter how legitimately they have earned their material rewards, often lack those other qualities that evoke affection or admiration. Some even argue plausibly that this weakness may be irremediable: in any society that, like a capitalist society, seeks to become ever wealthier in material terms disproportionate rewards are bound to flow to the people who are instrumental in producing the increase in its wealth.

21. The primary purpose of the passage is to
  - (A) argue that Walzer’s critique of liberal capitalism is the cornerstone of Walzer’s thinking
  - (B) identify and to deprecate the origins of the intellectual tradition championed by Walzer
  - (C) present more clearly than does the essay “In Defense of Equality” the distinctive features of Walzer’s politico-economic theories
  - (D) demonstrate that Walzer’s critique of liberal capitalism is neither original nor persuasive
  - (E) outline and to examine critically Walzer’s position on economic equality
22. The author mentions all of the following as issues addressed by Walzer EXCEPT:
  - (A) proper recompense for individual excellence
  - (B) proper interpretation of “economic equality”
  - (C) proper level of a society’s wealth
  - (D) grounds for calling capitalism “the tyranny of money”
  - (E) exchangeability of money for social goods
23. The argumentation in the passage turns importantly on the question of what should be the proper relation between
  - (A) “liberal capitalism” (line 2) and “bourgeois society” (lines 20-21)
  - (B) “reward” (line 8) and “recompense” (line 17)
  - (C) “sensitivity” (line 15) and “the ability to express compassion” (lines 15-16)
  - (D) “distribution of material goods” (lines 17-18) and “redistribution of wealth” (lines 4-5)
  - (E) “social goods” (line 37) and “material goods” (line 41)
24. The passage provides sufficient information to answer which of the following questions?
  - (A) What weight in relation to other qualities should a quality like sensitivity have, according to Walzer, in determining the proper distribution of goods?
  - (B) Which quality does Walzer deem too highly valued under liberal capitalism?
  - (C) Which are the social goods that are, according to Walzer, outside the reach of the power of money?
  - (D) What practical steps does Walzer suggest be taken to relieve the economic inequality generated by capitalism?
  - (E) What deficiencies in Walzer’s own argument does Walzer acknowledge?

25. The author implies that Walzer's interpretation of the principle of reward according to merit is distinctive for its
- (A) insistence on maximizing everyone's rewards
  - (B) emphasis on equality
  - (C) proven validity
  - (D) broad conception of what constitutes merit
  - (E) broad conception of what constitutes a reward
26. The author's interpretation of the principle that "we owe different duties to different qualities" (lines 28-29) suggests that which of the following would most probably be the duty paired with the quality of veracity?
- (A) Dignity
  - (B) Trust
  - (C) Affection
  - (D) Obedience
  - (E) Integrity
27. The author implies that sensitivity is not a quality that
- (A) is essential in producing wealth
  - (B) wealthy people lack
  - (C) can be sensibly measured on a scale
  - (D) characterizes tyrannical people
  - (E) is owed a duty in Pascal's sense

## SECTION B

The outpouring of contemporary American Indian literature in the last two decades, often called the Native American Renaissance, represents for many the first opportunity to experience Native American poetry. The appreciation of traditional oral American Indian literature has been limited, hampered by poor translations and by the difficulty, even in the rare culturally sensitive and aesthetically satisfying translation, of completely conveying the original's verse structure, tone, and syntax.

By writing in English and experimenting with European literary forms, contemporary American Indian writers have broadened their potential audience, while clearly retaining many essential characteristics of their ancestral oral traditions. For example, Pulitzer-prizewinning author N. Scott Momaday's poetry often treats art and mortality in a manner that recalls British romantic poetry, while his poetic response to the power of natural forces recalls Cherokee oral literature. In the same way, his novels, an art form European in origin, display an eloquence that echoes the oratorical grandeur of the great nineteenth-century American Indian chiefs.

17. According to the passage, Momaday's poetry shares which of the following with British romantic poetry?
- (A) Verse structure
  - (B) Oratorical techniques
  - (C) Manner of treating certain themes
  - (D) Use of certain syntactical constructions
  - (E) Patterns of rhythm and rhyme
18. Which of the following is most likely one of the reasons that the author mentions the work

of N. Scott Momaday?

- (A) To illustrate how the author believes that members of the Native American Renaissance have broadened their potential audience
  - (B) To emphasize the similarities between Momaday's writings and their European literary models
  - (C) To demonstrate the contemporary appeal of traditional Native American oral literature
  - (D) To suggest that contemporary American Indian writers have sacrificed traditional values for popular literary success
  - (E) To imply the continuing popularity of translations of oral American Indian literature
19. Which of the following can be inferred from the passage about written translations of oral Native American poetry?
- (A) They were less widely read than are the works of contemporary Native American poets writing in English.
  - (B) They were often made by writers who were intimately familiar with both English and Native American languages.
  - (C) They often gave their readers aesthetic satisfaction, despite their inaccuracies.
  - (D) They usually lacked complex verse structure.
  - (E) They were overly dependent on European literary models.
20. The passage suggests which of the following about American Indian poets before the Native American Renaissance?
- (A) Art and mortality were rarely the subjects of their poetry.
  - (B) Their oratorical grandeur reached its peak in the nineteenth century.
  - (C) They occasionally translated their own poetry.
  - (D) They seldom wrote poetry in English.
  - (E) They emphasized structure, tone, and syntax rather than literary form.

Recent findings suggest that visual signals are fed into at least three separate processing systems in the brain, each with its own distinct function. One system appears to process information about shape perception; a second, information about color; a third, information about movement, location, and spatial organization. An understanding of the functions and capabilities of these three systems can shed light on how artists manipulate materials to create surprising visual effects.

It is possible to summarize the functions of the three subsystems of the visual system as follows. The parvo system carries highly detailed information about stationary objects and about borders that are formed by contrasting colors. It does not, however, carry information about specific colors. Because much of the information about the shape of objects can be represented by their borders, we suspect that this system is important in shape perception. The blob system processes information about colors, but not about movement, shape discrimination, or depth. The magno system carries information about movement and depth. It is good at detecting motion but poor at scrutinizing stationary images. In addition it appears to be colorblind; it is unable to perceive borders that are visible only on the basis of color contrast.

Cells in the parvo system can distinguish between two colors at any relative brightness of the two. Cells in the color-blind magno system, on the other hand, are analogous to a black-and-white photograph in the way they function: they signal information about the brightness of surfaces but not about their colors. For any pair of colors there is a particular brightness ratio at which two colors, for example red and green, will appear as the same shade of gray in a black-and-white photograph, hence any border between them will vanish. Similarly at some relative red-to-green brightness level, the red and green will

appear identical to the magno system. The red and green are then called equiluminant. A border between two equiluminant colors has color contrast but no **luminance contrast**.

Many artists have seemed to be empirically aware of these underlying principles and have used them to maximize particular effects. Some of the peculiar effects of **Op Art**, for example, probably arise from color combinations that are strong activators of the parvo system but are weak stimuli for the magno system. An object that is equiluminant with its background looks vibrant and unstable. The reason is that the parvo system can signal the object's shape but the magno system cannot see its borders and therefore cannot signal either the movement or the position of the object. Hence it seems to jump around, drift, or vibrate on the canvas.

21. The passage is primarily concerned with
  - (A) describing subsystems of the visual system and showing their relevance to art
  - (B) comparing three theories on how the visual system analyzes images in a work of art
  - (C) explaining how artists use color contrasts to create particular visual effects
  - (D) explaining how the visual system distinguishes among different colors
  - (E) describing functions of the first three phases of the visual system
22. Which of the following would create visual effects most similar to those discussed in lines 43-48?
  - (A) A watercolor in which colors are applied imprecisely to outlined shapes
  - (B) A painting in which different shades of the same color are used to obscure the boundaries between objects
  - (C) A black-and-white sketch in which shading is used to convey a sense of depth
  - (D) An advertisement in which key words are at the same level of brightness as a background of contrasting color
  - (E) A design in which two different shades of gray are juxtaposed to heighten the contrast between them
23. The passage provides information about which of the following?
  - (A) Why the same system can process information about movement and location
  - (B) Why the parvo system is considered to be responsible for shape perception
  - (C) Why the blob system can process information about colors but not movement
  - (D) The mechanism that enables the blob system to distinguish between stationary objects
  - (E) The mechanism that enables the magno system to carry information about shape discrimination
24. According to the passage, which of the following is true of the visual system?
  - (A) It processes visual signals in three consecutive stages.
  - (B) It processes visual signals through separate processing systems in the brain.
  - (C) It consists of only three separate systems.
  - (D) It consists of a single hierarchical system rather than a multipartite system.
  - (E) It consists of separate system with high overlap in processing functions.
25. The author mentions a "black-and-white photograph" (line 29) most probably in order to explain
  - (A) how the parvo system distinguishes between different shapes and colors



- (B) how the magno system uses luminosity to identify borders between objects
  - (C) the mechanism that makes the magno system color-blind
  - (D) why the magno system is capable of perceiving moving images
  - (E) the brightness ratio at which colors become indistinguishable to the parvo system
26. The author uses all of the following in the discussion in the third paragraph EXCEPT:
- (A) an example
  - (B) definition of terms
  - (C) contrast
  - (D) a rhetorical question
  - (E) analogy
27. The passage suggests which of the following about the magno system?
- (A) It perceives borders on the basis of luminance contrast.
  - (B) It perceives shapes on the basis of color contrast.
  - (C) It is better at perceiving stationary objects than it is at detecting movement.
  - (D) It can detect motion but it cannot signal the position of an object.
  - (E) It is better at processing information about movement than it is at processing information about depth.

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### SECTION A

Although, recent years have seen substantial reductions in noxious pollutants from individual motor vehicles, the number of such vehicles has been steadily increasing consequently, more than 100 cities in the United States still have levels of carbon monoxide, **particulate matter**, and ozone (generated by photochemical reactions with **hydrocarbons** from vehicle exhaust) that exceed legally established limits. There is a growing realization that the only effective way to achieve further reductions in vehicle emissions—**short of** a massive shift **away from** the private automobile—is to replace conventional diesel fuel and gasoline with cleaner-burning fuels such as compressed natural gas, **liquefied petroleum gas**, ethanol, or methanol.

All of these alternatives are carbon-based fuels whose molecules are smaller and simpler than those of gasoline. These molecules burn more cleanly than gasoline, in part because they have fewer, if any, carbon-carbon bonds, and the hydrocarbons they do emit are less likely to generate ozone. The combustion of larger molecules, which have multiple carbon-carbon bonds, involves a more complex series of reactions. These reactions increase the probability of incomplete combustion and are more likely to release uncombusted and photochemically active hydrocarbon compounds into the atmosphere. On the other hand, alternative fuels do have drawbacks. Compressed natural gas would require that vehicles have a set of heavy fuel tanks—a serious liability in terms of performance and fuel efficiency—and liquefied petroleum gas faces fundamental limits on supply.

Ethanol and methanol, on the other hand, have important advantages over other carbon-based alternative fuels: they have a higher **energy content** per volume and would require minimal changes in the existing network for distributing motor fuel. Ethanol is commonly used as a gasoline supplement, but it is currently about twice as expensive as methanol, the low cost of which is one of its attractive features. Methanol's most attractive feature, however, is that it can reduce by about 90 percent the vehicle emissions that form ozone, the most serious urban air pollutant.

Like any alternative fuel, methanol has its critics. Yet much of the criticism is based on the use of "gasoline clone" vehicles that do not incorporate even the simplest design improvements that are made

possible with the use of methanol. It is true, for example, that a given volume of methanol provides only about one-half of the energy that gasoline and diesel fuel do; other things being equal, the fuel tank would have to be somewhat larger and heavier. However, since methanol-fueled vehicles could be designed to be much more efficient than "gasoline clone" vehicles fueled with methanol, they would need comparatively less fuel. Vehicles incorporating only the simplest of the engine improvements that methanol makes feasible would still contribute to an immediate lessening of urban air pollution.

17. The author of the passage is primarily concerned with
  - (A) countering a flawed argument that dismisses a possible solution to a problem
  - (B) reconciling contradictory points of view about the nature of a problem
  - (C) identifying the strengths of possible solutions to a problem
  - (D) discussing a problem and arguing in favor of one solution to it
  - (E) outlining a plan of action to solve a problem and discussing the obstacles blocking that plan
18. According to the passage, incomplete combustion is more likely to occur with gasoline than with an alternative fuel because
  - (A) the combustion of gasoline releases photochemically active hydrocarbons
  - (B) the combustion of gasoline involves an intricate series of reactions
  - (C) gasoline molecules have a simple molecular structure
  - (D) gasoline is composed of small molecules.
  - (E) gasoline is a carbon-based fuel
19. The passage suggests which of the following about air pollution?
  - (A) Further attempts to reduce emissions from gasoline-fueled vehicles will not help lower urban air-pollution levels.
  - (B) Attempts to reduce the pollutants that an individual gasoline-fueled vehicle emits have been largely unsuccessful.
  - (C) Few serious attempts have been made to reduce the amount of pollutants emitted by gasoline-fueled vehicles.
  - (D) Pollutants emitted by gasoline-fueled vehicles are not the most critical source of urban air pollution.
  - (E) Reductions in pollutants emitted by individual vehicles have been offset by increases in pollution from sources other than gasoline-fueled vehicles.
20. which of the following most closely parallels the situation described in the first sentence of the passage?
  - (A) Although a town reduces its public services in order to avoid a tax increase, the town's tax rate exceeds that of other towns in the surrounding area.
  - (B) Although a state passes strict laws to limit the type of toxic material that can be disposed of in public landfills, illegal dumping continues to increase.
  - (C) Although a town's citizens reduce their individual use of water, the town's water supplies continue to dwindle because of a steady increase in the total population of the town.
  - (D) Although a country attempts to increase the sale of domestic goods by adding a tax to the price of imported goods, the sale of imported goods within the country continues to

increase.

- (E) Although a country reduces the speed limit on its national highways, the number of fatalities caused by automobile accidents continues to increase.
21. The author describes which of the following as the most appealing feature of methanol?
- (A) It is substantially less expensive than ethanol.
  - (B) It could be provided to consumers through the existing motor fuel distribution system.
  - (C) It has a higher energy content than other alternative fuels.
  - (D) Its use would make design improvements in individual vehicles feasible.
  - (E) Its use would substantially reduce ozone levels.
22. It can be inferred from the passage that a vehicle specifically designed to use methanol for fuel would
- (A) be somewhat lighter in total body weight than a conventional vehicle fueled with gasoline
  - (B) be more expensive to operate than a conventional vehicle fueled with gasoline
  - (C) have a larger and more powerful engine than a conventional vehicle fueled with gasoline
  - (D) have a larger and heavier fuel tank than a “gasoline clone” vehicle fueled with methanol
  - (E) average more miles per gallon than a “gasoline clone” vehicle fueled with methanol
23. It can be inferred that the author of the passage most likely regards the criticism of methanol in the last paragraph as
- (A) flawed because of the assumptions on which it is based
  - (B) inapplicable because of an inconsistency in the critics’ arguments
  - (C) misguided because of its exclusively technological focus
  - (D) inaccurate because it ignores consumers’ concerns
  - (E) invalid because it reflects the personal bias of the critics

Paule Marshall’s *Brown Girl, Brownstones* (1959) was a landmark in the depiction of female characters in Black American literature. Marshall avoided the oppressed and tragic heroine in conflict with White society that had been typical of the protest novels of the early twentieth century. Like her immediate predecessors, Zora Neale Hurston and Gwendolyn Brooks, she focused her novel on an ordinary Black woman’s search for identity within the context of a Black community. But Marshall extended the analysis of Black female characters begun by Hurston and Brooks by depicting her heroine’s development in terms of the relationship between her Barbadian American parents, and by exploring how male and female roles were defined by their immigrant culture, which in turn was influenced by the materialism of White America. By placing characters within a wider cultural context, Marshall attacked racial and sexual stereotypes and paved the way for explorations of race, class, and gender in the novels of the 1970’s.

24. The passage is primarily concerned with
- (A) comparing the works of three Black American authors
  - (B) describing common themes in Black American literature
  - (C) discussing an important work in Black American literature
  - (D) providing insights about Black American literature in the early twentieth century
  - (E) providing historical information about the writing of Black American novels in the second half the twentieth century

25. According to the passage, Hurston, Brooks, and Marshall are alike in that they
- (A) did not examine the effects of White culture on their characters' lives
  - (B) were heavily influenced by the protest novels of the early twentieth century
  - (C) used Black communities as the settings for their novels
  - (D) wrote primarily about the difficulties their characters encountered in White culture
  - (E) wrote exclusively about female characters and the experiences of women
26. The author's description of the way in which Marshall depicts her heroine's development is most probably intended to
- (A) continue the discussion of similarities in the works of Brooks, Hurston, and Marshall
  - (B) describe the specific racial and sexual stereotypes that Marshall attacked
  - (C) contrast the characters in Marshall's novels with those in later works
  - (D) show how Marshall extends the portrayal of character initiated by her predecessors
  - (E) compare themes in Marshall's early work with themes in her later novels
27. It can be inferred that the author of the passage would describe *Brown Girl, Brownstones* as being
- (A) completely different from novels written before 1959
  - (B) highly influenced by novels written in the early twentieth century
  - (C) similar to the protest novels that preceded it
  - (D) important in the late 1950's but dated today
  - (E) an important influence on novels written in the 1970's

## SECTION B

Many philosophers disagree over the definition of morality, but most disputants **fall into** one of two categories: egocentrics, who define morality as the pursuit of self-fulfillment, and sociocentrics, who define morality as an individual's obligations to society. Where does the truth lie? Fortunately, the stem of the word "morality" provides some clues. The word "mores" originally referred to the customs of preliterate cultures. Mores, which embodied each culture's ideal principles for governing every citizen, were developed in the belief that the foundation of a community lies in the cultivation of individual powers to be placed in service to the community. These mores were concerned with such skills as food-gathering and warfare as well as an individual's relationships with others. Thus, I **submit**, "morality" must be concerned with what is honored by the community **at large**. However, self-fulfillment is important to morality because unfulfilled citizens, no matter how virtuous, cannot perform the duties morality assigns them.

17. The primary purpose of this passage is to
- (A) summarize an argument
  - (B) resolve a dispute
  - (C) trace a word's origin
  - (D) prove a hypothesis
  - (E) initiate a debate
18. According to the passage, mores in preliterate cultures concerned such skills as warfare and food-gathering because these skills were
- (A) characteristic of an individual's self-fulfillment

- (B) examples of a culture's traditions
  - (C) manifestations of an individual's ideals
  - (D) demonstrations of an individual's contributions to the community
  - (E) examples of a community's governing principles
19. It can be inferred from the passage that the author would be most likely to agree with which of the following statements regarding sociocentrics and egocentrics?
- (A) The position of the sociocentrics is stronger than that of the egocentrics.
  - (B) The positions of the egocentrics and sociocentrics are of equal merit.
  - (C) There is no merit in the position of the egocentrics.
  - (D) Neither position contributes very much to an understanding of the definition of morality.
  - (E) The dispute between the egocentrics and sociocentrics is based on trivial issues.
20. With which of the following statements regarding the relationship between the individual and morality would the author be most likely to agree?
- (A) Failure in social obligations is the price of success in individual endeavors.
  - (B) The unfulfilled citizen cannot fulfill his moral obligations to the community.
  - (C) Morality is unconcerned with conflicts among citizens.
  - (D) The unfulfilled citizen is without virtue.
  - (E) Wealth harms a citizen's moral standing in the community.

(This passage was written in 1975.)

The complications frequently accompanying diabetes, such as impairment of vision and of kidney function, are now thought to result from the lack of continuous control of blood glucose concentrations. The healthy pancreas, in response to increases in blood glucose concentration, releases small quantities of insulin throughout the day and thereby maintains the concentration within physiological limits (normoglycemia). But the diabetic generally receives only one large dose daily. The diabetic's blood glucose concentration can thus fluctuate greatly during the interval between doses, and it has been suggested that the complications result from the periods of high concentrations of blood glucose (hyperglycemia). Many investigators thus believe that restoration of normoglycemia might halt the progression of such complications and perhaps even reverse them.

There are three primary techniques that have been investigated for restoration of normoglycemia. They are: transplantation of whole, healthy pancreases; transplantation of islets of Langerhans, that portion of the pancreas that actually secretes insulin; and implantation of artificial pancreases. There has, in fact, been a great deal of success in the development of these techniques and each seems, on the whole, promising. Nonetheless, it will undoubtedly be many years before any one of them is accepted as a treatment for diabetes.

To many people, the obvious approach would seem to be simply to transplant pancreases from cadavers in the same manner that kidneys and other organs are routinely transplanted. That was the rationale in 1966 when the first recorded pancreas transplant was performed. Between 1966 and 1975, there were forty-six pancreas transplants in forty-five other patients in the United States and five other countries. But only one of these patients is still alive with a functioning graft, and surgeons have found that the procedure is not as simple as they once thought.

The surviving patient has required no insulin since the operation. Another patient survived 638 days without requiring insulin. And one patient survived a transplantation for more than a year, but died when he chose not to take the immunosuppressive drugs. These results, though meager, suggest that the procedure has the potential for success.

The rest of the patients, however, either rejected the transplant or died within a short period. There does not appear to be any technical problem with the procedure. Rather, most of the patients were

already so severely debilitated by the complications of diabetes that they could not withstand the surgery and the immunosuppressive regimen required to prevent rejection. More than half of the patients, furthermore, also required a kidney transplant. Most investigators now agree that the simultaneous transplantation of both organs is too great a shock to the patient and greatly increases the total risk.

21. Which of the following best states one of the main conclusions of the passage?
- (A) Although the techniques for pancreas transplants appear to be theoretically correct, there are problems that must be solved before the operation can be used as a treatment for diabetes.
  - (B) Although the techniques for pancreas transplants are still being developed, the experimental results show that the operation will be a successful treatment for diabetes in the near future.
  - (C) Although pancreas transplants are reliable, many diabetics are reluctant to undergo the operation because of the side effects of immunosuppressive drugs.
  - (D) Although pancreas transplants alone are not generally successful, the operation can be used in conjunction with other procedures to treat diabetes.
  - (E) Although pancreas transplants have not been successful in treating diabetes, research indicates that other procedures may soon be developed.
22. According to the passage, widely spaced doses of insulin can cause.
- (A) reversal of normal kidney function
  - (B) delay in the onset of diabetes
  - (C) radical changes in the concentration of blood glucose
  - (D) restoration of normoglycemia
  - (E) marked variations in the islets of Langerhans
23. According to the passage, a periodic high concentration of blood glucose in diabetics is a possible cause of
- (A) deterioration of the pancreas
  - (B) damage to the eyes and kidneys
  - (C) rejection of transplanted organs
  - (D) inadequate secretion of insulin
  - (E) increased production of blood cells
24. It can be inferred from the passage that one of the important contributing causes of the failure of most pancreas transplants has been the
- (A) reluctance of patients to cooperate with physicians
  - (B) imperfect techniques used in the operations
  - (C) scarcity of immunosuppressive drugs
  - (D) unavailability of healthy pancreases
  - (E) weakened condition of the patients
25. The author provides information that would answer which of the following questions?
- I. What is hyperglycemia?
  - II. What is one cause of hyperglycemia?
  - III. What are some of the organs that can be adversely affected by hyperglycemia?

- (A) I only
  - (B) II only
  - (C) I and III only
  - (D) II and III only
  - (E) I, II, and III
26. On the basis of the information in the passage, which of the following can be inferred about the islets of Langerhans?
- I. They are important for the normal control of blood glucose concentration.
  - II. They can be transplanted independently of other pancreatic cells.
  - III. They regulate immunosuppressive reactions.
- (A) I only
  - (B) III only
  - (C) I and II only
  - (D) I and III only
  - (E) I, II, and III
27. The passage suggests that the author considers the data concerning the success of pancreas transplants to be
- (A) invalid
  - (B) indirect
  - (C) inaccurate
  - (D) insufficient
  - (E) inappropriate

## SECTION C

In February 1848 the people of Paris rose in revolt against the constitutional monarchy of Louis-Philippe. Despite the existence of excellent narrative accounts, the February Days, as this revolt is called, have been largely ignored by social historians of the past two decades. For each of the three other major insurrections in nineteenth-century Paris—July 1830, June 1848, and May 1871—there exists at least a sketch of participants' backgrounds and an analysis, more or less rigorous, of the reasons for the occurrence of the uprisings. Only in the case of the February Revolution do we lack a useful description of participants that might characterize it in the light of what social history has taught us about the process of revolutionary mobilization.

Two reasons for this relative neglect seem obvious. First, the insurrection of February has been overshadowed by that of June. The February Revolution overthrew a regime, to be sure, but met with so little resistance that it failed to generate any real sense of historical drama. Its successor, on the other hand, appeared to pit key socioeconomic groups in a life-or-death struggle and was widely seen by contemporary observers as marking a historical departure. Through their interpretations, which exert a continuing influence on our understanding of the revolutionary process, the impact of the events of June has been magnified, while, as an unintended consequence, the significance of the February insurrection has been diminished. Second, like other "successful" insurrections, the events of February failed to generate the most desirable kinds of historical records. Although the June insurrection of 1848 and the Paris Commune of 1871 would be considered watersheds of nineteenth-century French history by any standard, they also present the social historian with a signal advantage: these failed insurrections created a mass of invaluable documentation as a by-product of authorities' efforts to search out and punish the rebels.

Quite different is the outcome of successful insurrections like those of July 1830 and February 1848. Experiences are retold, but participants typically resume their daily routines without ever recording their activities. Those who played salient roles may become the objects of highly embellished verbal accounts or in rare cases, of celebratory articles in contemporary periodicals. And it is true that the publicly acknowledged leaders of an uprising frequently write memoirs. However, such documents are likely to be highly unreliable, unrepresentative, and unsystematically preserved, especially when compared to the detailed judicial dossiers prepared for everyone arrested following a failed insurrection. As a consequence, it may prove difficult or impossible to establish for a successful revolution a comprehensive and trustworthy picture of those who participated, or to answer even the most basic questions one might pose concerning the social origins of the insurgents.

17. According to the passage, “a useful description of participants” (lines 11-12) exists for which of the following insurrections of nineteenth-century France?
  - I. The July Insurrection of 1830
  - II. The February Revolution of 1848
  - III. The June insurrection of 1848
  - IV. The May insurrection of 1871

(A) I and III only  
(B) II and IV only  
(C) I, II, and III only  
(D) I, III, and IV only  
(E) II, III, and IV only
18. It can be inferred from the passage that support for the objectives of the February Revolution was

(A) negligible  
(B) misguided  
(C) fanatical  
(D) spontaneous  
(E) widespread
19. Which of the following, best describes the organization of the second paragraph?

(A) The thesis of the passage is stated and supporting evidence systematically presented.  
(B) Two views regarding the thesis presented in the first paragraph are compared and contrasted.  
(C) Evidence refuting the thesis presented in the first paragraph is systematically presented.  
(D) The thesis presented in the first paragraph is systematically supported.  
(E) The thesis presented in the first paragraph is further defined and a conclusion drawn.
20. It can be inferred from the passage that the author considers which of the following essential for understanding a revolutionary mobilization?

(A) A comprehensive theory of revolution that can be applied to the major insurrections of the nineteenth century  
(B) Awareness of the events necessary for a revolution to be successful  
(C) Access to narratives and memoirs written by eyewitnesses of a given revolution  
(D) The historical perspective provided by the passage of a considerable amount of time



- (E) Knowledge of the socioeconomic backgrounds of a revolution's participants
21. Which of the following can be inferred about the "detailed judicial dossiers" referred to in line 49?
- (A) Information contained in the dossiers sheds light on the social origins of a revolution's participants.
  - (B) The dossiers closely resemble the narratives written by the revolution's leaders in their personal memoirs.
  - (C) The information that such dossiers contain is untrustworthy and unrepresentative of a revolution's participants.
  - (D) Social historians prefer to avoid such dossiers whenever possible because they are excessively detailed.
  - (E) The February Revolution of 1848 produced more of these dossiers than did the June insurrection.
22. Which of the following is the most logical objection to the claim made in lines 38-39?
- (A) The February Revolution of 1848 is much less significant than the July insurrection of 1830.
  - (B) The backgrounds and motivations of participants in the July insurrection of 1830 have been identified, however cursorily.
  - (C) Even less is known about the July insurrection of 1830 than about the February Revolution of 1848.
  - (D) Historical records made during the July insurrection of 1830 are less reliable than those made during the May insurrection of 1871.
  - (E) The importance of the July insurrection of 1830 has been magnified at the expense of the significance of the February Revolution of 1848.
23. With which of the following statements regarding revolution would the author most likely agree?
- (A) Revolutionary mobilization requires a great deal of planning by people representing disaffected groups.
  - (B) The objectives of the February Revolution were more radical than those of the June insurrection.
  - (C) The process of revolutionary mobilization varies greatly from one revolution to the next.
  - (D) Revolutions vary greatly in the usefulness of the historical records that they produce.
  - (E) As knowledge of the February Revolution increases, chances are good that its importance will eventually eclipse that of the June insurrection.

One advantage of breeding African bees with other bee types (Africanization) may be resistance to the parasitic mite *Varroa jacobsoni*, a major threat to modern beekeeping. In parts of Europe, this mite is devastating honeybees and killing many colonies despite preventive measures by beekeepers. But in Brazil *Varroa jacobsoni* has been present in Africanized bees since 1972 without the loss of a single colony, even though beekeepers there undertook no preventive measures. The mites lay eggs within the brood cells of immature bees, and developing mites feed on the hemolymph (blood) of bee pupae. But fewer mites reproduce in Africanized bees than in European bees. Some researchers point out that this resistance may be related to the Africanized worker bee's shorter development period, which prevents some mites from reaching maturity. Recently the mite has become a serious problem in colonies of European bees in North America. Africanization of these bees may be the best safeguard against this

parasite.

24. The passage suggests that which of the following was true of the honeybee colonies described in line 4-6?
- (A) Their life expectancy, when free of disease, was shorter than that of European bee colonies in North America.
  - (B) They were not Africanized.
  - (C) Their life cycle did not accommodate the feeding habits of *Varroa jacobsoni*.
  - (D) They responded well to measures to control *Varroa jacobsoni*.
  - (E) They were managed using methods that were more modern than those employed in Brazil.
25. The author cites all of the following as evidence that Africanized bees' resistance to *Varroa jacobsoni* is superior to that of European bees EXCEPT:
- (A) Fewer *Varroa jacobsoni* mites reproduce in Africanized bees.
  - (B) *Varroa jacobsoni* is killing many bee colonies in Europe.
  - (C) Beekeepers in Brazil have not used preventive measures to protect their colonies.
  - (D) Brazilian bee colonies have endured *Varroa jacobsoni* since 1972.
  - (E) At least some European bee colonies have been saved by preventive measures.
26. According to the passage, research suggests that one possible reason the Africanized bees in Brazil have successfully resisted *Varroa jacobsoni* is that
- (A) the life cycle of the Africanized bee may limit the *Varroa jacobsoni* mite's opportunity to reach full development
  - (B) the Africanized bees may have had an opportunity to develop a chemical resistance to *Varroa jacobsoni*
  - (C) the location of bee colonies in Brazil may provide a natural deterrent to *Varroa jacobsoni*
  - (D) *Varroa jacobsoni* may be relatively new to Brazil and may not have had time to become widespread
  - (E) beekeepers may have developed effective control techniques for *Varroa jacobsoni*
27. The author's argument regarding the resistance of Africanized bees to *Varroa jacobsoni* would be most weakened if which of the following were true?
- (A) The bees in Brazil were resistant before being Africanized.
  - (B) The number of bee colonies in North American increased dramatically whereas the number in Brazil remained unchanged.
  - (C) Mites found in European bees reproduce at a faster rate than mites of identical species found in the bees in Brazil.
  - (D) Africanized bees retain many of the characteristics of European bees.
  - (E) Bee colonies in Europe continue to produce greater quantities of honey than do those in Brazil.

National character is not formally considered by social scientists in discussing economic and social development today. They believe that people differ and that these differences should be taken into account somehow, but they have as yet discovered no way to include such variables in their formal models of economic and social development. The difficulty lies in the nature of the data that supposedly define different national characters. Anthropologists and others are on much firmer ground when they attempt to describe the cultural norms for a small homogeneous tribe or village than when they undertake the formidable task of discovering the norms that exist in a complex modern nation-state composed of many disparate groups. The situation is further complicated by the nature of judgments about character, since such judgments are overly dependent on impressions and since, furthermore, impressions are usually stated in qualitative terms, it is impossible to make a reliable comparison between the national characters of two countries.

17. The author's main point in the passage is that national character
  - (A) is too elusive to merit attention by anthropologists and other social scientists
  - (B) is of greater interest to social scientists today than it has been in the past
  - (C) is still too difficult to describe with the precision required by many social scientists
  - (D) has become increasingly irrelevant because of the complexity of modern life
  - (E) can be described more accurately by anthropologists than by other social scientists
18. Given the information in the passage, which of the following is NOT true of modern nation-states?
  - (A) They are complex.
  - (B) They are heterogeneous.
  - (C) They are of interest to social scientists.
  - (D) They lack cultural norms.
  - (E) They differ from one another in terms of national character.
19. It can be inferred from the passage that the social scientists mentioned in lines 1-7 would agree with which of the following statements?
  - I. It is extremely difficult to create models that account for both economic and social development.
  - II. Models of economic and social development would be improved by the inclusion of adequate descriptions of national character.
  - III. It is important to supplement formal models of economic and social development with qualitative impressions of national character.
  - (A) I only
  - (B) II only
  - (C) III only
  - (D) I and III only
  - (E) II and III only
20. Which of the following best describes the organization of the passage?
  - (A) A problem is presented and reasons for its existence are supplied.
  - (B) A controversial view is presented and evidence for its validity is supplied.
  - (C) A hypothesis is presented and possible means of verifying it are suggested.
  - (D) A recent development is described and then analyzed.

(E) A dispute is summarized and one side defended.

One of the simplest and best known kinds of crystal is the ionic salt, of which a typical example is sodium chloride or ordinary table salt. The fundamental components of an ionic salt are ions: atoms or molecules that have become electrically charged by gaining or losing one or more electrons. In forming sodium chloride, for example, sodium atoms give up an electron (thereby becoming positively charged) and chlorine atoms gain an electron (thereby becoming negatively charged). The ions are attracted to one another by their opposite charges, and they stack together compactly, like tightly packed spheres.

Recently, scientists at Michigan State University created a new kind of crystal called an electride. In electrides, the anions (negative ions) are completely replaced by electrons, which are trapped in naturally formed cavities within a framework of regularly stacked cations (positive ions). Electrides are the first examples of ionic salts in which all these anionic sites are occupied solely by electrons.

Unlike other types of anions, anionic electrons do not behave as if they were simple charged spheres. In particular, because of their low mass and their tendency to interact with one another over great distances, they cannot be "pinned down" to any one location. Instead, they wander close to and among the atoms lining the cavity and interact with electrons in nearby cavities, perhaps changing places with them.

The properties of an electride depend largely on the distance between the cavities that hold trapped electrons. When the trapped electrons are far apart, they do not interact strongly, and so behave somewhat like an array of isolated negative charges. When they are closer together, they begin to display properties associated with large ensembles of identical particles. When they are still closer, the ensemble properties dominate and the electrons "delocalize": they are no longer tightly bound within individual cavities but are more or less free to pass through the spaces within the frame-work of positive ions.

By synthesizing electrides from a variety of materials, one can vary the geometry of the anionic cavities and their relation to the surrounding cations. The resulting properties may make it possible for electrides to become a basis for economically useful new materials and devices. For instance, because the electrons in some electrides are very weakly bound, these crystals could be effective as photosensitive detectors, in which an impinging photon liberates an electron, resulting in a small electric current. The same weak binding could also make electrides useful in solar-energy converters and as cathodes in batteries. One obstacle is the tendency of electrides to decompose through reaction with air and water. Researchers are seeking ways to increase their stability.

21. The passage is primarily concerned with discussing
  - (A) a way to isolate electrons
  - (B) the characteristics of a new kind of crystal
  - (C) the structure of an ionic salt
  - (D) commercial uses for electrides
  - (E) the properties of ions
22. In the first paragraph, the author is primarily concerned with
  - (A) introducing a variant on the standard atomic theory
  - (B) describing how chlorine atoms can become negatively charged
  - (C) describing some early research at Michigan State University
  - (D) presenting the identifying properties of an electride
  - (E) providing background for the technical discussion to follow
23. It can be inferred from the passage that the differences between the behavior of anionic electrons and normal anions result from which of the following features of electrons, as compared to normal anions?
  - I. The much lower mass of electrons

- II. The much greater tendency of electrons to interact with one another over large distances
  - III. The much greater likelihood of electrons to remain trapped in naturally formed anionic cavities
- (A) I only  
(B) II only  
(C) I and II only  
(D) I and III only  
(E) II and III only
24. According to the passage, the defining characteristic of an electride is which of the following?
- (A) Its positive ions are of particularly low mass.  
(B) Its ions possess identical electrical charges.  
(C) It contains a framework of regularly stacked ions.  
(D) Its ions demonstrate strong mutual attraction.  
(E) Its negative ions consist solely of electrons.
25. It can be inferred from the passage that anions behaving as “simple charged spheres” (line 22) could be expected to
- (A) readily lose electrons and become positively charged  
(B) move freely in and out of their cavities  
(C) respond to photons by liberating electrons  
(D) stack with other anions to create a regular framework  
(E) remain fixed relative to their cations
26. It can be inferred from the passage that an electride behaves most like a normal ionic crystal when the electride has which of the following features?
- (A) The anionic cavities are widely separated.  
(B) All of the trapped electrons are able to delocalize.  
(C) The trapped electrons are liberated by impinging photons.  
(D) The ions are tightly packed together.  
(E) Most of the cations have lost their electrical charge.
27. With which of the following statements regarding electrides would the author most likely agree?
- (A) They have proven themselves to be of great commercial value.  
(B) Their future commercial value is promising but uncertain.  
(C) They are interesting but of no practical value.  
(D) They have commercial value mainly in solar-energy applications.  
(E) Their principal importance will lie in scientific research.

## SECTION B

Typically the queen honeybee is mother to all the bees in a hive; after mating with several male drones from other colonies, she lays fertilized eggs that develop into all-female worker bees and lays

unfertilized eggs that become all-male drones. When a queen dies, workers often lay unfertilized eggs that hatch into drones. Yet workers rarely reproduce while a queen reigns.

According to **natural selection** theory, a worker would enhance her fitness—or ability to propagate her genes—by hatching her own eggs in addition to or in place of the queen's. But a typical worker's fitness would be diminished if other workers' sons, who have less genetic material in common with the worker, supplanted the queen's sons (the worker's brothers). Researchers, testing the hypothesis that workers usually somehow block each other's attempts to reproduce, put unfertilized eggs laid by workers and by the queen into a hive. Other workers quickly devoured the workers' eggs while leaving the queen's eggs alone.

17. The author refers to the experiment described in lines 16-19 in order to
  - (A) explain how worker bees are prevented from mating with drones
  - (B) explain how worker bees hatch and nurture the queen's young
  - (C) demonstrate the universality of natural selection
  - (D) show that worker bees are capable of thwarting each other's attempts to reproduce
  - (E) provide a model of daily life in a typical honeybee hive
18. The inner workings in a honeybee hive that regulate reproduction, as they are described in the passage, are most similar to which of the following types of human societies?
  - (A) A totalitarian society in which citizens' "policing" of each other's actions helps to maintain the status quo.
  - (B) A pacifist state in which the individuals are strongly opposed to the use of violence or aggression to settle disputes.
  - (C) A democratic society in which the voice of the majority rules.
  - (D) A parliamentary society in which a few members, organized as a cabinet wield executive power.
  - (E) An anarchic state in which order and stable social structures are lacking.
19. The passage best supports which of the following inferences about the fitness of honeybees?
  - (A) Reproduction diminishes any individual honeybee's fitness.
  - (B) An individual worker's fitness can be maintained without the individual herself reproducing.
  - (C) A hierarchy of stronger and weaker individuals among the worker bees determines which individuals will reproduce when a queen dies.
  - (D) While a queen reigns, the fitness of the worker bees is increased and that of the drones is diminished.
  - (E) Fitness encourages worker bees to hatch honeybee eggs without regard for the relatedness of the young to the "parent."
20. The passage suggests which of the following about the eggs laid by worker bees?
  - (A) One of the eggs hatches into the next queen.
  - (B) The eggs are invariably destroyed by other worker bees.
  - (C) Each worker tries to hide her eggs from the other worker bees.
  - (D) The eggs hatch only if the worker has mated with a drone from another hive.
  - (E) The eggs are less likely to be harmed by other workers if the queen is dead.

In the fields of Delano, California, in 1965, Luis Valdez started the Teatro Campesino (Farmworker's

Theater), and with it initiated the renaissance of Mexican American theater. The Teatro Campesino had an avowedly political purpose: to rally *campesinos* (farmworkers) in support of the farm workers' strike then being organized by Cesar Chavez. Valdez' dramatic presentations, called *actos*, spoke to a *campesino* audience and addressed topics and themes directly related to the strike. Valdez' early *actos* were composed of a series of scenes about the strike experience acted by *campesino* volunteers. His later *actos* were presented by a newly constituted professional company, still called the Teatro Campesino, and addressed such themes as the impact of the Vietnam War on Mexican Americans and the dangers of assimilation, themes relevant to urban Mexican Americans as well as to *campesinos*. All Valdez' *actos* contained elements of song and dance, relied little on stage effects or props, and featured the use of masks. These dramatic elements, along with an intensely social or political purpose and the use of a mixture of Spanish, English, and Mexican American dialects in the dialogues, which realistically capture the flavor of Mexican American conversation, are still characteristic both of the *acto* and of most other forms of Mexican American theater today.

Innovative as it is, the *acto* owes much to the theater traditions of other periods and regions. Like early Spanish American religious dramas, secular folk dramas, and the Mexican *carpas* of a somewhat later period, *actos* are usually performed outdoors by traveling groups of players or by local theater groups. The improvised comic satire of the *actos* is often attributed to Valdez' study of the Italian *commedia dell'arte* of the sixteenth century, although some critics see it as a direct reflection of the comic and improvisational qualities of the more contemporary and local *carpas* of Mexican theater. The Italian influence is likely, whatever Valdez' immediate source: the Mexican *carpas* themselves are said to have originated from the theater pieces of a sixteenth-century Spanish writer inspired by encounters with Italian *commedia dell'arte* troupes on tour in Spain. The English-language theater has provided elements as well: Valdez himself has acknowledged his debt to the agitprop socialist theater that appeared in the United States during the 1920's and 1930's. In particular, his *actos* contain the same assortment of semiallegorical characters and the same blend of music, chorus, and dialogue found in some of the agitprop pieces, as well as the same fierce spirit of social and political critique. Finally, many of Valdez' later theater pieces freely incorporate characters, plots and symbols drawn from the indigenous myths and rituals of the pre-Hispanic peoples of Latin America. In fact, no other art form illustrates more clearly the depth and complexity of the Mexican American heritage itself than does the *acto* of Luis Valdez and the Teatro Campesino.

21. According to the passage, the original impetus behind the establishment of the Teatro Campesino was which of the following?
  - (A) To help urban Mexican Americans understand the problems confronting striking *campesinos* in California
  - (B) To promote an attitude of pride in the depth and richness of the Mexican American heritage among striking *campesinos*
  - (C) To provide striking *campesinos* an opportunity to use their creative talents to express their political opinions
  - (D) To allow its founder to express his personal support of the *campesinos*' strike effort
  - (E) To mobilize *campesinos* to support the farm workers' strike in California
22. The author cites all of the following as probable influences on Valdez' development of the *acto* EXCEPT the
  - (A) theater of sixteenth-century Italy
  - (B) *carpas* of Mexico
  - (C) drama of classical Greece
  - (D) English-language theater of the United States
  - (E) myths and rituals of pre-Hispanic America

23. The passage suggests that which of the following was true of the later *actos* of the Teatro Campesino?
- (A) They were more politically effective than were earlier *actos*.
  - (B) They were presented primarily outdoors, whereas earlier *actos* were presented inside theaters.
  - (C) They used a greater mixture of dialects than did the earlier *actos*.
  - (D) They addressed a broader audience than did the earlier *actos*.
  - (E) They differed from earlier *actos* in that they contained fewer improvisational elements.
24. Which of the following best describes the author's evaluation of the views of the critics cited in lines 36-39?
- (A) Their views, if correct, do not preclude the existence of an Italian influence on the *acto*.
  - (B) Their views are unlikely to be correct, given the differences existing between Mexican and Mexican American theater.
  - (C) Their views concerning the Mexican *carpas* are essentially correct, but they lack familiarity with the *acto*.
  - (D) Their views are probably more correct than the views of those who have attributed the comic and improvisational elements of the *acto* to earlier sources.
  - (E) Their views betray a lack of familiarity with the *commedia dell'arte*.
25. The passage suggests that which of the following explains the characteristic use of a mixture of Spanish, English, and Mexican American dialects in the works of Mexican American playwrights?
- (A) Mexican American playwrights wish to include in their works elements drawn from the traditions and history of pre-Hispanic America.
  - (B) Mexican American playwrights try to guarantee that their works are fully understood by the broadest possible audience, including those who may speak only one language.
  - (C) Such a linguistic mix faithfully reflects the linguistic diversity of Mexican American culture, and is easily understood by most Mexican Americans.
  - (D) Many Mexican American playwrights are quite familiar with both the Spanish-language and the English-language theater traditions.
  - (E) Many different languages are still spoken within the confines of the United States, although English is still the most common first language of its citizens.
26. According to the passage, which of the following elements characteristic of the *acto* are also found in some agitprop theater pieces?
- (A) The use of masks
  - (B) Comic improvisation
  - (C) An outdoor setting
  - (D) Minimal use of complex stage effects or props
  - (E) An assortment of semiallegorical characters
27. Which of the following, if true, most strengthens the author's argument concerning the debt of the *acto* to the theater traditions of other periods and regions?
- (A) Many popular forms of theater rely heavily on improvisation.



- (B) Plays resembling the *acto* in structure were written in the 1970's by West African playwrights who are interested in dramatizing the richness of their own cultures.
- (C) The use of masks has, **at one time or another**, been characteristic of the theater traditions of almost all cultures, even those most isolated from outside influences.
- (D) During a strike, it is common for union members to present musical skits dramatizing the values of solidarity and resistance.
- (E) Before 1965 Luis Valdez had attended many performances of traditional Mexican theater groups touring the western United States.

1994 02

### SECTION A

Analyzing the physics of dance can add fundamentally to a dancer's skill. Although dancers seldom see themselves totally in physical terms—as body mass moving through space under the influence of well-known forces and obeying physical laws—neither can they afford to ignore the physics of movement. For example, no matter how much a dancer wishes to leap off the floor and then start turning, the law of conservation of angular momentum absolutely prevents such a movement.

Some movements involving primarily vertical or horizontal motions of the body as a whole, in which rotations can be ignored, can be studied using simple equations of linear motion in three dimensions. However, rotational motions require more complex approaches that involve analyses of the way the body's mass is distributed, the axes of rotation involved in different types of movement, and the sources of the forces that produce the rotational movement.

17. The primary purpose of the passage is to
  - (A) initiate a debate over two approaches to analyzing a field of study
  - (B) describe how one field of knowledge can be applied to another field
  - (C) point out the contradictions between two distinct theories
  - (D) define and elaborate on an accepted scientific principle
  - (E) discuss the application of a new theory within a new setting
18. The author mentions all of the following as contributing to an understanding of the physics of dance EXCEPT:
  - (A) the law of conservation of angular momentum
  - (B) analyses of the way in which the body's mass is distributed
  - (C) equations of linear motion in three dimensions
  - (D) analyses of the sources that produce rotational motions
  - (E) the technical terms for movements such as leaps and turns
19. The author implies that dancers can become more skilled by doing which of the following?
  - (A) Ignoring rotational movements
  - (B) Understanding the forces that permit various movements
  - (C) Solving simple linear equations
  - (D) Learning the technical terms utilized by choreographers
  - (E) Circumventing the law of conservation of angular momentum
20. Analysis of which of the following would require the kind of complex approach described in lines 14-19?

- (A) A long leap across space
- (B) A short jump upward with a return to the same place
- (C) A sustained and controlled turn in place
- (D) Short, rapid steps forward and then backward without turning
- (E) Quick sidesteps in a diagonal line

Human relations have commanded people's attention from early times. The ways of people have been recorded in innumerable myths, folktales, novels, poems, plays, and popular or philosophical essays. Although the full significance of a human relationship may not be directly evident, the complexity of feelings and actions that can be understood at a glance is surprisingly great. For this reason psychology holds a unique position among the sciences. "Intuitive" knowledge may be remarkably penetrating and can significantly help us understand human behavior; whereas in the physical sciences such commonsense knowledge is relatively primitive. If we erased all knowledge of scientific physics from our modern world, not only would we not have cars and television sets, we might even find that the ordinary person was unable to cope with the fundamental mechanical problems of pulleys and levers. On the other hand if we removed all knowledge of scientific psychology from our world, problems in interpersonal relations might easily be coped with and solved much as before. We would still "know" how to avoid doing something asked of us and how to get someone to agree with us; we would still "know" when someone was angry and when someone was pleased. One could even offer sensible explanations for the "whys" of much of the self's behavior and feelings. In other words, the ordinary person has a great and profound understanding of the self and of other people which, though unformulated or only vaguely conceived, enables one to interact with others in more or less adaptive ways. Kohler, in referring to the lack of great discoveries in psychology as compared with physics, accounts for this by saying that "people were acquainted with practically all territories of mental life a long time before the founding of scientific psychology."

Paradoxically, with all this natural, intuitive, commonsense capacity to grasp human relations, the science of human relations has been one of the last to develop. Different explanations of this paradox have been suggested. One is that science would destroy the vain and pleasing illusions people have about themselves; but we might ask why people have always loved to read pessimistic, debunking writings, from *Ecclesiastes* to Freud. It has also been proposed that just because we know so much about people intuitively, there has been less incentive for studying them scientifically; why should one develop a theory, carry out systematic observations, or make predictions about the obvious? In any case, the field of human relations, with its vast literary documentation but meager scientific treatment, is in great contrast to the field of physics in which there are relatively few nonscientific books.

21. According to the passage, it has been suggested that the science of human relations was slow to develop because
  - (A) intuitive knowledge of human relations is derived from philosophy
  - (B) early scientists were more interested in the physical world
  - (C) scientific studies of human relations appear to investigate the obvious
  - (D) the scientific method is difficult to apply to the study of human relations
  - (E) people generally seem to be more attracted to literary than to scientific writings about human relations
22. The author's statement that "Psychology holds a unique position among the sciences" (lines 8-9) is supported by which of the following claims in the passage?
  - (A) The full meaning of a human relationship may not be obvious.
  - (B) Commonsense understanding of human relations can be incisive.
  - (C) Intuitive knowledge in the physical sciences is relatively advanced.

- (D) Subjective bias is difficult to control in psychological research.  
(E) Psychological facts are too imprecise to lead to great discoveries.
23. According to the passage, an understanding of the self can be  
(A) highly biased due to unconscious factors  
(B) profound even when vaguely conceived  
(C) improved by specialized training  
(D) irrelevant for understanding human relations  
(E) more reliable than knowledge about other people
24. It can be inferred that the author would most likely agree with which of the following statements regarding people who lived before the advent of scientific psychology?  
(A) Their understanding of human relations was quite limited.  
(B) They were uninterested in acquiring knowledge of the physical world.  
(C) They misunderstood others more frequently than do people today.  
(D) Their intuitions about human relations were reasonably sophisticated.  
(E) They were more likely to hold pleasing illusions about themselves than are people today.
25. The author implies that attempts to treat human relations scientifically have thus far been relatively  
(A) unilluminating  
(B) paradoxical  
(C) pessimistic  
(D) encouraging  
(E) uninterpretable
26. The author refers to people who are attracted to “pessimistic, debunking writings” (line 44) in order to support which of the following ideas?  
(A) Interesting books about human relations are typically pessimistic.  
(B) People tend to ignore scientific explanations of human relations.  
(C) People rarely hold pleasing illusions about themselves.  
(D) A scientific approach human relations would undermine the pleasing illusions people hold of themselves.  
(E) It is doubtful that the science of human relations developed slowly because of a desire to maintain pleasing illusions.
27. It can be inferred that the author assumes that commonsense knowledge of human relations is  
(A) equally well developed among all adults within a given society  
(B) considerably more accurate in some societies than in others  
(C) biased insofar as it is based on myths and folktales  
(D) typically unrelated to an individual’s interactions with other people  
(E) usually sufficiently accurate to facilitate interactions with others

## SECTION B

Although a historical lack of access to formal Spanish-language education initially limited the opportunities of some Chicanos to hone their skills as writers of Spanish, their bilingual culture clearly fostered an exuberant and compelling oral tradition. It has thus generally been by way of the emphasis on oral literary creativity that these Chicano writers, whose English-language works are sometimes uninspired, developed the powerful and arresting language that characterized their Spanish-language works. This Spanish-English difference is not surprising. When writing in Spanish, these authors stayed close to the spoken traditions of their communities where publication, support, and instructive response would come quickly in local or regional newspapers. Works in English, however, often required the elimination of nuance or colloquialism, the adoption of a formal tone, and the adjustment of themes or ideas to satisfy the different demands of national publications.

17. The passage is primarily concerned with doing which of the following?
  - (A) Debating the historical value of a literary movement
  - (B) Describing and accounting for a difference in literary styles
  - (C) Explaining a publishing decision and evaluating its results
  - (D) Analyzing the expectations of a particular group of readers
  - (E) Classifying several kinds of literary production
18. According to the author, the Chicano oral experience contributed directly to which of the following characteristics in the work of some Chicano writers?
  - (A) A sensitivity to and adeptness in using the spoken language
  - (B) A tendency to appear in national rather than regional publications
  - (C) A style reflecting the influence of Spanish language education
  - (D) A reliance on a rather formal style
  - (E) A capacity to appeal to a broad range of audiences
19. Which of the following best describes the function of the last two sentences of the passage (lines 11-19)?
  - (A) They expand on an advantage mentioned in the first sentence of the passage (lines 1-5).
  - (B) They outline the consequences of a limitation discussed in the first sentence of the passage (lines 1-5).
  - (C) They provide explicit examples drawn from the oral and the written works mentioned in the second sentence of the passage (lines 5-10).
  - (D) They explain the causes of a phenomenon mentioned in the third sentence of the passage (lines 10-11).
  - (E) They limit the applicability of a generalization made in the third sentence of the passage (lines 10-11).
20. The passage suggests that which of the following was probably characteristic of the “national publications” mentioned in line 19?
  - (A) They primarily presented scholarly material of little interest to a general audience.
  - (B) They sometimes published articles treating controversial themes.
  - (C) They encouraged authors to feature local issues in articles in order to increase circulation.
  - (D) They included a significant number of articles by minority authors.
  - (E) They took a stylistically formal approach to material of interest to a general audience.

The two claws of the mature American lobster are decidedly different from each other. The crusher claw is short and stout; the cutter claw is long and slender. Such bilateral asymmetry, in which the right side of the body is, in all other respects, a mirror image of the left side, is not unlike handedness in humans. But where the majority of humans are right-handed, in lobsters the crusher claw appears with equal probability on either the right or left side of the body.

Bilateral asymmetry of the claws comes about gradually. In the juvenile fourth and fifth stages of development, the paired claws are symmetrical and cutterlike. Asymmetry begins to appear in the juvenile sixth stage of development, and the paired claws further diverge toward well-defined cutter and crusher claws during succeeding stages. An intriguing aspect of this development was discovered by Victor Emmel. He found that if one of the paired claws is removed during the fourth or fifth stage, the intact claw invariably becomes a crusher, while the regenerated claw becomes a cutter. Removal of a claw during a later juvenile stage or during adulthood, when asymmetry is present, does not alter the asymmetry; the intact and the regenerate claws retain their original structures.

These observations indicate that the conditions that trigger differentiation must operate in a random manner when the paired claws are intact but in a nonrandom manner when one of the claws is lost. One possible explanation is that differential use of the claws determines their asymmetry. Perhaps the claw that is used more becomes the crusher. This would explain why, when one of the claws is missing during the fourth or fifth stage, the intact claw always becomes a crusher. With two intact claws, initial use of one claw might prompt the animal to use it more than the other throughout the juvenile fourth and fifth stages, causing it to become a crusher.

To test this hypothesis, researchers raised lobsters in the juvenile fourth and fifth stages of development in a laboratory environment in which the lobsters could manipulate oyster chips. (Not coincidentally, at this stage of development lobsters typically change from a habitat where they drift passively, to the ocean floor where they have the opportunity to be more active by burrowing in the substrate.) Under these conditions, the lobsters developed asymmetric claws, half with crusher claws on the left, and half with crusher claws on the right. In contrast, when juvenile lobsters were reared in a smooth tank without the oyster chips, the majority developed two cutter claws. This unusual configuration of symmetrical cutter claws did not change when the lobsters were subsequently placed in a manipulatable environment or when they lost and regenerated one or both claws.

21. The passage is primarily concerned with
  - (A) drawing an analogy between asymmetry in lobsters and handedness in humans
  - (B) developing a method for predicting whether crusher claws in lobsters will appear on the left or right side
  - (C) explaining differences between lobsters' crusher claws and cutter claws
  - (D) discussing a possible explanation for the way bilateral asymmetry is determined in lobsters
  - (E) summarizing the stages of development of the lobster
22. Each of the following statements about the development of a lobster's crusher claw is supported by information in the passage EXCEPT:
  - (A) It can be stopped on one side and begun on the other after the juvenile sixth stage.
  - (B) It occurs gradually over a number of stages.
  - (C) It is initially apparent in the juvenile sixth stage.
  - (D) It can occur even when a prospective crusher claw is removed in the juvenile sixth stage.
  - (E) It is less likely in the absence of a manipulatable environment.
23. Which of the following experimental results, if observed, would most clearly contradict the findings of Victor Emmel?

- (A) A left cutterlike claw is removed in the fifth stage and a crusher claw develops on the right side.
  - (B) A left cutterlike claw is removed in the fourth stage and a crusher claw develops on the left side.
  - (C) A left cutterlike claw is removed in the sixth stage and a crusher claw develops on the right side.
  - (D) Both cutterlike claws are removed in the fifth stage and a crusher claw develops on the left side.
  - (E) Both cutterlike claws are removed in the fourth stage and a crusher claw develops on the right side.
24. It can be inferred that of the two laboratory environments mentioned in the passage, the one with oyster chips was designed to
- (A) prove that the presence of oyster chips was not necessary for the development of a crusher claw
  - (B) prove that the relative length of time that the lobsters were exposed to the oyster-chip environment had little impact on the development of a crusher claw
  - (C) eliminate the environment as a possible influence in the development of a crusher claw
  - (D) control on which side the crusher claw develops
  - (E) simulate the conditions that lobsters encounter in their natural environment
25. It can be inferred from the passage that one difference between lobsters in the earlier stages of development and those in the juvenile fourth and fifth stages is that lobsters in the early stages are
- (A) likely to be less active
  - (B) likely to be less symmetrical
  - (C) more likely to lose a claw
  - (D) more likely to replace a crusher claw with a cutter claw
  - (E) more likely to regenerate a lost claw
26. Which of the following conditions does the passage suggest is a possible cause for the failure of a lobster to develop a crusher claw?
- (A) The loss of a claw during the third or earlier stage of development
  - (B) The loss of a claw during the fourth or fifth stage of development
  - (C) The loss of a claw during the sixth stage of development
  - (D) Development in an environment devoid of material that can be manipulated
  - (E) Development in an environment that changes frequently throughout the stages of development
27. The author regards the idea that differentiation is triggered randomly when paired claws remain intact as
- (A) irrefutable considering the authoritative nature of Emmel's observations
  - (B) likely in view of present evidence
  - (C) contradictory to conventional thinking on lobster-claw differentiation
  - (D) purely speculative because it is based on scattered research and experimentation

(E) unlikely because of apparent inconsistencies with theories on handedness in humans

1994 04

## SECTION A

Defenders of special protective labor legislation for women often maintain that eliminating such laws would destroy the fruits of a century-long struggle for the protection of women workers. Even a brief examination of the historic practice of courts and employers would show that the fruit of such laws has been bitter: they are, **in practice**, more of a curse than a blessing.

Sex-defined protective laws have often been based on stereotypical assumptions concerning women's needs and abilities, and employers have frequently used them as legal excuses for discriminating against women. After the Second World War, for example, businesses and government sought to persuade women to vacate jobs in factories, thus making room in the labor force for returning veterans. The revival or passage of state laws limiting the daily or weekly work hours of women conveniently accomplished this. Employers had only to declare that overtime hours were a necessary condition of employment or promotion in their factory, and women could be quite legally fired, refused jobs, or kept at low wage levels, all **in the name of** "protecting" their health. By validating such laws when they are challenged by lawsuits, the courts have colluded over the years in establishing different, less advantageous employment terms for women than for men, thus reducing women's competitiveness on the job market. At the same time, even the most well-intentioned lawmakers, courts, and employers have often been blind to the real needs of women. The lawmakers and the courts continue to permit employers to offer employee health insurance plans that cover all known human medical disabilities except those relating to pregnancy and childbirth.

Finally, labor laws protecting only special groups are often ineffective at protecting the workers who are actually in the workplace. Some chemicals, for example, pose reproductive risks for women of childbearing years; manufacturers using the chemicals comply with laws protecting women against these hazards by refusing to hire them. Thus the sex-defined legislation protects the hypothetical female worker, but has no effect whatever on the safety of any actual employee. The health risks to male employees in such industries cannot be negligible, since chemicals toxic enough to cause birth defects in fetuses or sterility in women are presumably harmful to the human metabolism. Protective laws aimed at changing production materials or techniques in order to reduce such hazards would benefit all employees without discriminating against any.

In sum, protective labor laws for women are discriminatory and do not meet their intended purpose. Legislators should recognize that women are in the work force to stay, and that their needs—good health care, a decent wage, and a safe workplace—are the needs of all workers. Laws that ignore these facts violate women's rights for equal protection in employment.

17. According to the author, which of the following resulted from the passage or revival of state laws limiting the work hours of women workers?
  - (A) Women workers were compelled to leave their jobs in factories.
  - (B) Many employers had difficulty in providing jobs for returning veterans.
  - (C) Many employers found it hard to attract women workers.
  - (D) The health of most women factory workers improved.
  - (E) Employment practices that addressed the real needs of women workers became common.
18. The author places the word "protecting" in quotation marks in line 21 most likely in order to suggest that
  - (A) she is quoting the actual wording of the laws in question
  - (B) the protective nature of the laws in question should not be overlooked
  - (C) protecting the health of workers is important to those who support protective labor laws



- (D) the laws in question were really used to the detriment of women workers, despite being overtly protective in intent
  - (E) the health of workers is not in need of protection, even in jobs where many hours of overtime work are required
19. The passage suggests that which of the following is a shortcoming of protective labor laws that single out a particular group of workers for protection?
- (A) Such laws are often too weak to be effective at protecting the group in question.
  - (B) Such laws are usually drafted by legislators who, do not have the best interests of workers at heart.
  - (C) Such laws exert no pressure on employers to eliminate hazards in the workplace.
  - (D) Compliance with such laws is often costly for employers and provokes lawsuits by employees claiming discrimination.
  - (E) Employer compliance with such laws results in increased tension among workers on the job, because such laws unfairly privilege one group of employees over another.
20. According to the first paragraph of the passage, the author considers which of the following to be most helpful in determining the value of special protective labor legislation for women?
- (A) A comparative study of patterns of work-related illnesses in states that had such laws and in states that did not
  - (B) An estimate of how many women workers are in favor of such laws
  - (C) An analysis of the cost to employers of complying with such laws
  - (D) A consideration of what intentions the advocates of such laws really had concerning women workers
  - (E) An examination of the actual effects that such laws have had in the past on women workers
21. The main point of the passage is that special protective labor laws for women workers are
- (A) unnecessary because most workers are well protected by existing labor laws
  - (B) harmful to the economic interests of women workers while offering them little or no actual protection
  - (C) not worth preserving even though they do represent a hard-won legacy of the labor movement
  - (D) controversial because male workers receive less protection than they require
  - (E) inadequate in that they often do not prevent employers from exposing women workers to many health hazards
22. The author implies that which of the following is characteristic of many employee health insurance plans?
- (A) They cover all the common medical conditions affecting men, but only some of those affecting women.
  - (B) They lack the special provisions for women workers that proposed special labor laws for women would provide.
  - (C) They pay the medical costs associated with pregnancy and childbirth only for the



spouses of male employees, not for female employees.

(D) They meet minimum legal requirements, but do not adequately safeguard the health of either male or female employees.

(E) They have recently been improved as a result of the passage of new labor laws, but continue to exclude coverage of certain uncommon medical conditions affecting women.

23. According to the passage, special labor laws protecting women workers tend generally to have which of the following effects?

(A) They tend to modify the stereotypes employees often hold concerning women.

(B) They increase the advantage to employers of hiring men instead of women, making it less likely that women will be hired.

(C) They decrease the likelihood that employers will offer more protection to women workers than that which is absolutely required by law.

(D) They increase the tendency of employers to deny health insurance and disability plans to women workers.

(E) They have little impact of any kind on women workers, since typically very few women are employed in those classes of jobs covered by the laws.

While it is true that living organisms are profoundly affected by their environment, it is equally important to remember that many organisms are also capable of altering their habitat significantly, sometimes limiting their own growth. The influence of the biological component of an ecosystem is often greater in fresh waters than in marine or terrestrial systems, because of the small size of many freshwater bodies. Many of the important effects of organisms are related to their physiology, especially growth and respiration. By their growth many species can deplete essential nutrients within the system, thus limiting their own growth or that of other species. Lund has demonstrated that in Lake Windermere the alga *Asterionella* is unable to grow in conditions that it itself has created. Once a year, in the spring, this plant starts to grow rapidly in the lake, using up so much silica from the water that by late spring there is no longer enough to maintain its own growth. The population decreases dramatically as a result.

24. Which of the following is an example of the type of organism described in lines 2-5?

(A) A kind of ant that feeds on the sweet juice exuded by the twigs of a species of thorn tree that grows in dry areas.

(B) A kind of fish that, after growing to maturity in the ocean, returns to fresh water.

(C) A kind of flower that has markings distinctly perceptible in ultraviolet light to the species of bee that pollinates the flower.

(D) A kind of tree with seeds that germinate readily only in a sunny spot and then develop into mature trees that shade the area below them.

(E) A kind of butterfly, itself nonpoisonous, with the same markings as a kind of butterfly that birds refuse to eat because it is poisonous.

25. It can be inferred from the passage that which of the followings is true about *Asterionella* plants in Lake Windermere?

(A) They are not present except in early spring.

(B) They contribute silica to the waters as they grow.

(C) They are food for other organisms.

(D) They form a silica-rich layer on the lake bottom.

- (E) Their growth peaks in the spring.
26. The passage indicates that organisms frequently have the strongest effects on their environment in
- (A) oceans, since oceans contain the largest organisms living on Earth
  - (B) oceans, since oceans provide habitats for many different kinds of species
  - (C) freshwater bodies, since such effects become pronounced in relatively small spaces
  - (D) freshwater lakes, since nutrients in freshwater lakes are present only in small amounts
  - (E) land areas, since there exist major influences of climate on the kinds of small organisms supported in land areas
27. The primary topic of the passage is the way in which
- (A) organisms are affected by the amount of nutrients available
  - (B) organisms can change their own surroundings
  - (C) elements of freshwater habitats impede the growth of small organisms
  - (D) the reproduction of organisms is controlled by factors in the environment
  - (E) plant matter in a given locale can increase up to a limit

## SECTION B

It is their sensitive response to human circumstance that accounts for the persistence of certain universal ideas. Rabbi Meir, a second-century scholar, admonished his disciples to look not at the pitcher but at its contents because, he stated, "Many a new pitcher has been found to be full of old wine." This was his way of emphasizing the importance of the distinction between form and idea, and of stressing that the integrity of an idea is more important than the form of its expression.

Creative ideas not only produce their own instruments of survival as time and circumstances demand, but permit the substitution of new forms for old under the pressure of changed circumstances. For example democracy, as an idea, originated in ancient Greece and was carried from there to Western Europe and the Americas. But it did not retain the ancient Greek form: it passed through several reforming processes and exists today in many countries. Democratic governments differ in form because democracy is in principle dynamic and has therefore responded to local needs.

17. The author is primarily concerned with
- (A) illustrating the importance of a historical figure
  - (B) discussing an important characteristic of human ideas
  - (C) describing the history of the growth of democracy
  - (D) contrasting ancient and modern views of the importance of creative ideas
  - (E) evaluating the contribution of ancient Greece to modern government
18. According to the passage, democracy is an example of
- (A) a human circumstance that has molded creative ideas
  - (B) an instrument of survival that has altered its original form
  - (C) an attribute of a creative idea that has allowed that idea to persist
  - (D) a creative idea that has persisted because of its adaptability
  - (E) a reforming process that has culminated in the creation of modern governments
19. The "new pitcher" mentioned in line 6 is the equivalent of which of the following elements in the author's discussion of democracy (lines 15-22)?

- (A) Ancient Greece
- (B) The idea of democracy
- (C) A modern democratic government
- (D) A dynamic principle
- (E) The Greek form of democracy

20. It can be inferred from the passage that the author would disagree most with which of the following assertions?

- (A) Changing circumstances sometimes give rise to original ideas.
- (B) Creative ideas have universal applications.
- (C) Changing human needs influence universal ideas.
- (D) Democratic institutions are appropriate in the modern world.
- (E) An idea must be expressed in a traditional way.

Before 1965 many scientists pictured the circulation of the ocean's water mass as consisting of large, slow-moving currents, such as the **Gulf Stream**. That view, based on 100 years of observations made around the globe, produced only a rough approximation of the true circulation. But in the 1950's and the 1960's, researchers began to employ newly developed techniques and equipment, including subsurface floats that move with ocean currents and emit identification signals, and ocean-current meters that record data for months at fixed locations in the ocean. These instruments disclosed an unexpected level of variability in the deep ocean. Rather than being characterized by smooth, large-scale currents that change seasonally (if at all), the seas are dominated by what oceanographers call mesoscale fields: fluctuating, energetic flows whose velocity can reach ten times the mean velocity of the major currents.

Mesoscale phenomena—the oceanic analogue of weather systems—often extend to distances of 100 kilometers and persist for 100 days (weather systems generally extend about 1,000 kilometers and last 3 to 5 days in any given area). More than 90 percent of the kinetic energy of the entire ocean may be accounted for by mesoscale variability rather than by large-scale currents. Mesoscale phenomena may, in fact, play a significant role in oceanic mixing, air-sea interactions, and occasional—but far-reaching—climatic events such as El Nino, the atmospheric-oceanic disturbance in the equatorial Pacific that affects global weather patterns.

Unfortunately, it is not feasible to use conventional techniques to measure mesoscale fields. To measure them properly, monitoring equipment would have to be laid out on a grid at intervals of at most 50 kilometers, with sensors at each grid point lowered deep in the ocean and kept there for many months. Because using these techniques would be prohibitively expensive and time-consuming, it was proposed in 1979 that **tomography** be adapted to measuring the physical properties of the ocean. In medical tomography x-rays map the human body's density variations (and hence internal organs); the information from the x-rays, transmitted through the body along many different paths, is recombined to form three-dimensional images of the body's interior. It is primarily this multiplicative increase in data obtained from the **multipath transmission** of signals that accounts for oceanographers' attraction to tomography: it allows the measurement of vast areas with relatively few instruments. Researchers reasoned that low-frequency sound waves, because they are so well described mathematically and because even small perturbations in emitted sound waves can be detected, could be transmitted through the ocean over many different paths and that the properties of the ocean's interior—its temperature, salinity, density, and speed of currents—could be deduced on the basis of how the ocean altered the signals. Their initial trials were highly successful, and ocean acoustic tomography was born.

21. According to the passage, scientists are able to use ocean acoustic tomography to deduce the properties of the ocean's interior in part because

- (A) low-frequency sound waves are well described mathematically
- (B) mesoscale phenomena are so large as to be easily detectable

- (C) information from sound waves can be recombined more easily than information from x-rays
  - (D) tomography is better suited to measuring mesoscale phenomena than to measuring small-scale systems
  - (E) density variations in the ocean are mathematically predictable
22. The passage suggests that medical tomography operates on the principle that
- (A) x-rays are superior to sound waves for producing three-dimensional images
  - (B) sound waves are altered as they pass through regions of varying density
  - (C) images of the body's interior can be produced by analyzing a single x-ray transmission through the body
  - (D) the varying densities within the human body allow x-rays to map the internal organs
  - (E) information from x-rays and sound waves can be combined to produce a highly detailed image of the body's interior
23. Which of the following is most similar to medical tomography as it is described in the passage?
- (A) The use of ocean-current meters to determine the direction and velocity of the ocean's mesoscale fields
  - (B) The use of earthquake shockwave data collected at several different locations and combined to create a three-dimensional image of the Earth's interior
  - (C) The use of a grid-point sensory system to map global weather patterns
  - (D) The use of subsurface floats to map large-scale circulation in the ocean
  - (E) The use of computer technology to halt the progress of a particular disease within the human body's internal organs
24. The author mentions El Nino (line 27) primarily in order to emphasize which of the following points?
- (A) The brief duration of weather patterns
  - (B) The variability of mesoscale phenomena
  - (C) The difficulty of measuring the ocean's large-scale currents
  - (D) The effectiveness of low-frequency sound waves in mapping the ocean
  - (E) The possible impact of mesoscale fields on weather conditions
25. Which of the following best describes the organization of the third paragraph of the passage?
- (A) A theory is proposed, considered, and then attended.
  - (B) Opposing views are presented, elaborated, and then reconciled.
  - (C) A problem is described, then a solution is discussed and its effectiveness is affirmed.
  - (D) An argument is advanced, then refuted, and an alternative is suggested.
  - (E) A hypothesis is presented, qualified, and then reaffirmed.
26. The passage suggests that which of the following would be true if the ocean's circulation consisted primarily of large, slow-moving currents?
- (A) The influence of mesoscale fields on global weather patterns would remain the same.
  - (B) Large-scale currents would exhibit more variability than is actually observed.

- (C) The majority of the ocean's kinetic energy would be derived from mesoscale fields.
  - (D) Atmospheric-oceanic disturbances such as El Nino would occur more often.
  - (E) Conventional measuring techniques would be a feasible method of studying the physical properties of the ocean.
27. Which of the following, if presented as the first sentence of a succeeding paragraph, would most logically continue the discussion presented in the passage?
- (A) Timekeeping in medical tomography must be precise because the changes in travel time caused by density fluctuations are slight.
  - (B) To understand how ocean acoustic tomography works, it is necessary to know how sound travels in the ocean.
  - (C) Ships are another possibility, but they would need to stop every 50 kilometers to lower measuring instruments.
  - (D) These variations amount to only about 2 to 3 percent of the average speed of sound in water, which is about 1,500 meters per second.
  - (E) The device used in medical tomography emits a specially coded signal, easily distinguishable from background noise.

1994 10

## SECTION A

The Fourteenth Amendment to the United States Constitution, ratified in 1868, prohibits state governments from denying citizens the "equal protection of the laws." Although precisely what the framers of the amendment meant by this equal protection clause remains unclear, all interpreters agree that the framers' immediate objective was to provide a constitutional warrant for the Civil Rights Act of 1866, which guaranteed the citizenship of all persons born in the United States and subject to United States jurisdiction. This declaration, which was echoed in the text of the Fourteenth Amendment, was designed primarily to counter the Supreme Court's ruling in *Dred Scott v. Sandford* that Black people in the United States could be denied citizenship. The act was vetoed by President Andrew Johnson, who argued that the Thirteenth Amendment, which abolished slavery, did not provide Congress with the authority to extend citizenship and equal protection to the freed slaves. Although Congress promptly overrode Johnson's veto, supporters of the act sought to ensure its constitutional foundations with the passage of the Fourteenth Amendment.

The broad language of the amendment strongly suggests that its framers were proposing to write into the Constitution not a laundry list of specific civil rights but a principle of equal citizenship that forbids organized society from treating any individual as a member of an inferior class. Yet for the first eight decades of the amendment's existence, the Supreme Court's interpretation of the amendment betrayed this ideal of equality. In the *Civil Rights Cases* of 1883, for example, the Court invented the "state action" limitation, which asserts that "private" decisions by owners of public accommodations and other commercial businesses to segregate their facilities are insulated from the reach of the Fourteenth Amendment's guarantee of equal protection under the law.

After the Second World War, a judicial climate more hospitable to equal protection claims culminated in the Supreme Court's ruling in *Brown v. Board of Education* that racially segregated schools violated the equal protection clause of the Fourteenth Amendment. Two doctrines embraced by the Supreme Court during this period extended the amendment's reach. First, the Court required especially strict scrutiny of legislation that employed a "suspect classification," meaning discrimination against a group on grounds that could be construed as racial. This doctrine has broadened the application of the Fourteenth Amendment to other, nonracial forms of discrimination, for while some justices have refused to find any legislative classification other than race to be constitutionally disfavored, most have been receptive to

arguments that at least some nonracial discriminations, sexual discrimination in particular, are “suspect” and deserve this heightened scrutiny by the courts. Second, the Court relaxed the state action limitation on the Fourteenth Amendment, bringing new forms of private conduct within the amendment’s reach.

17. Which of the following best describes the main idea of the passage?
- (A) By presenting a list of specific rights, framers of the Fourteenth Amendment were attempting to provide a constitutional basis for broad judicial protection of the principle of equal citizenship.
  - (B) Only after the Supreme Court adopted the suspect classification approach to reviewing potentially discriminatory legislation was the applicability of the Fourteenth Amendment extended to include sexual discrimination.
  - (C) Not until after the Second World War did the Supreme Court begin to interpret the Fourteenth Amendment in a manner consistent with the principle of equal citizenship that it expresses.
  - (D) Interpreters of the Fourteenth Amendment have yet to reach consensus with regard to what its framers meant by the equal protection clause.
  - (E) Although the reluctance of judges to extend the reach of the Fourteenth Amendment to nonracial discrimination has betrayed the principle of equal citizenship, the Supreme Court’s use of the state action limitation to insulate private activity from the amendment’s reach has been more harmful.
18. The passage suggests that the principal effect of the state action limitation was to
- (A) allow some discriminatory practices to continue unimpeded by the Fourteenth Amendment
  - (B) influence the Supreme Court’s ruling in *Brown v. Board of Education*
  - (C) provide expanded guidelines describing prohibited actions
  - (D) prohibit states from enacting laws that violated the intent of the Civil Rights Act of 1866
  - (E) shift to state governments the responsibility for enforcement of laws prohibiting discriminatory practices
19. The author’s position regarding the intent of the framers of the Fourteenth Amendment would be most seriously undermined if which of the following were true?
- (A) The framers had anticipated state action limitations as they are described in the passage.
  - (B) The framers had merely sought to prevent discriminatory acts by federal officials.
  - (C) The framers were concerned that the Civil Rights Act of 1866 would be overturned by the Supreme Court.
  - (D) The framers were aware that the phrase “equal protection of the laws” had broad implications.
  - (E) The framers believed that racial as well as non-racial forms of discrimination were unacceptable.
20. According to the passage, the original proponents of the Fourteenth Amendment were primarily concerned with
- (A) detailing the rights afforded by the principle of equal citizenship
  - (B) providing support in the Constitution for equal protection for all citizens of the United States

- (C) closing a loophole that could be used to deny individuals the right to sue for enforcement of their civil rights
  - (D) asserting that the civil rights protected by the Constitution included nonracial discrimination as well as racial discrimination
  - (E) granting state governments broader discretion in interpreting the Civil Rights Act of 1866
21. The author implies that the Fourteenth Amendment might not have been enacted if
- (A) Congress' authority with regard to legislating civil rights had not been challenged
  - (B) the framers had anticipated the Supreme Court's ruling in *Brown v. Board of Education*
  - (C) the framers had believed that it would be used in deciding cases of discrimination involving non-racial groups
  - (D) most state governments had been willing to protect citizens' civil rights
  - (E) its essential elements had not been implicit in the Thirteenth Amendment
22. According to the passage, which of the following most accurately indicates the sequence of the events listed below?
- I. Civil Rights Act of 1866
  - II. Dred Scott v. Sandford
  - III. Fourteenth Amendment
  - IV. Veto by President Johnson
- (A) I, II, III, IV
  - (B) I, IV, II, III
  - (C) I, IV, III, II
  - (D) II, I, IV, III
  - (E) III, II, I, IV
23. Which of the following can be inferred about the second of the two doctrines referred to in lines 39-41 of the passage?
- (A) It caused some justices to rule that all types of discrimination are prohibited by the Constitution.
  - (B) It shifted the focus of the Supreme Court from racial to nonracial discrimination.
  - (C) It narrowed the concern of the Supreme Court to legislation that employed a suspect classification.
  - (D) It caused legislators who were writing new legislation to reject language that could be construed as permitting racial discrimination.
  - (E) It made it more difficult for commercial businesses to practice racial discrimination.

The Earth's magnetic field is generated as the molten iron of the Earth's outer core revolves around its solid inner core. When surges in the molten iron occur, magnetic tempests are created. At the Earth's surface, these tempests can be detected by changes in the strength of the Earth's magnetic field. For reasons not fully understood, the field itself reverses periodically every million years or so. During the past million years, for instance, the magnetic north pole has migrated between the Antarctic and the Arctic.

Clearly, geophysicists who seek to explain and forecast changes in the field must understand what happens in the outer core. Unlike meteorologists, however, they cannot rely on observations made in

their own lifetimes. Whereas atmospheric storms arise in a matter of hours and last for days, magnetic tempests develop over decades and persist for centuries. Fortunately scientists have been recording changes in the Earth's magnetic field for more than 300 years.

24. In the passage, the author is primarily concerned with
- (A) analyzing a complicated scientific phenomenon and its impact on the Earth's surface features
  - (B) describing a natural phenomenon and the challenges its study presents to researchers
  - (C) discussing a scientific field of research and the gaps in researchers' methodological approaches to it
  - (D) comparing two distinct fields of physical science and the different research methods employed in each
  - (E) proposing an explanation for a geophysical phenomenon and an experiment that could help confirm that explanation
25. The passage suggests which of the following about surges in the Earth's outer core?
- (A) They occur cyclically every few decades.
  - (B) They can be predicted by changes in the Earth's inner core.
  - (C) They are detected through indirect means.
  - (D) They are linked to disturbances in the Earth's atmosphere.
  - (E) They last for periods of about 1 million years.
26. It can be inferred from the passage that geophysicists seeking to explain magnetic tempests ought to conduct research on the Earth's outer core because the Earth's outer core
- (A) is more fully understood than the Earth's magnetic field
  - (B) is more easily observed than the Earth's magnetic field
  - (C) has been the subject of extensive scientific observation for 300 years
  - (D) is involved in generating the Earth's magnetic field
  - (E) reflects changes in the inner core caused by magnetic tempests
27. In the second paragraph, the author is primarily concerned with
- (A) stating a limitation that helps determine a research methodology
  - (B) making a comparative analysis of two different research methodologies
  - (C) assessing the amount of empirical data in the field of physical science
  - (D) suggesting an optimistic way of viewing a widely feared phenomenon
  - (E) describing a fundamental issue and discussing its future impact on society

## SECTION B

The defoliation of millions of acres of trees by massive infestations of **gypsy moth** caterpillars is a recurring phenomenon in the northeastern United States. In studying these outbreaks, scientists have discovered that affected trees fight back by releasing toxic chemicals, mainly phenols, into their foliage. These noxious substances limit caterpillars' growth and reduce the number of eggs that female moths lay. Phenols also make the eggs smaller, which reduces the growth of the following year's caterpillars. Because the number of eggs a female moth produces is directly related to her size, and because her size is determined entirely by her feeding success as a caterpillar, the trees' defensive mechanism has an impact on moth fecundity.

The gypsy moth is also subject to attack by the nucleopolyhedrosis virus, or **wilt disease**, a



particularly important killer of the caterpillars in outbreak years. Caterpillars contract wilt disease when they eat a leaf to which the virus, encased in a protein globule, has become attached. Once ingested by a caterpillar, the protein globule dissolves, releasing thousands of viruses, or virions, that after about two weeks multiply enough to fill the entire body cavity. When the caterpillar dies, the virions are released to the outside, encased in a new protein globule synthesized from the caterpillar's tissues and ready to be picked up by other caterpillars.

Knowing that phenols, including tannins, often act by associating with and altering the activity of proteins, researchers focused on the effects on caterpillars of ingesting the virus and leaves together. They found that on tannin-rich oak leaves, the virus is considerably less effective at killing caterpillars than when it is on aspen leaves, which are lower in phenols. In general, the more concentrated the phenols in tree leaves, the less deadly the virus. Thus, while highly concentrated phenols in tree leaves reduce the caterpillar population by limiting the size of caterpillars and, consequently, the size of the female's egg cluster, these same chemicals also help caterpillars survive by disabling the wilt virus. Forest stands of red oaks, with their tannin-rich foliage, may even provide caterpillars with safe havens from disease. In stands dominated by trees such as aspen, however, incipient gypsy moth outbreaks are quickly suppressed by viral epidemics.

Further research has shown that caterpillars become virtually immune to the wilt virus as the trees on which they feed respond to increasing defoliation. The trees' own defenses raise the threshold of caterpillar vulnerability to the disease, allowing populations to grow denser without becoming more susceptible to infection. For these reasons, the benefits to the caterpillars of ingesting phenols appear to outweigh the costs. Given the presence of the virus, the trees' defensive tactic apparently has **backfired**.

17. Which of the following statements best expresses the main point of the passage?
- (A) Recurring outbreaks of infestation by gypsy moth caterpillars have had a devastating impact on trees in the northeastern United States.
  - (B) A mechanism used by trees to combat the threat from gypsy moth caterpillars has actually made some trees more vulnerable to that threat.
  - (C) Although deadly to gypsy moth caterpillars, wilt disease has failed to significantly affect the population density of the caterpillars.
  - (D) The tree species with the highest levels of phenols in their foliage are the most successful in defending themselves against gypsy moth caterpillars.
  - (E) In their efforts to develop new methods for controlling gypsy moth caterpillars, researchers have focused on the effects of phenols in tree leaves on the insects' growth and reproduction.
18. In lines 12-14, the phrase "the trees' defensive mechanism has an impact on moth fecundity" refers to which of the following phenomena?
- (A) Female moths that ingest phenols are more susceptible to wilt virus, which causes them to lay smaller eggs.
  - (B) Highly concentrated phenols in tree leaves limit caterpillars' food supply, thereby reducing the gypsy moth population.
  - (C) Phenols attack the protein globule that protects moth egg clusters, making them vulnerable to wilt virus and lowering their survival rate.
  - (D) Phenols in oak leaves drive gypsy moths into forest stands dominated by aspens, where they succumb to viral epidemics.
  - (E) The consumption of phenols by caterpillars results in undersized female gypsy moths, which tend to produce small egg clusters.
19. It can be inferred from the passage that wilt disease virions depend for their survival on

- (A) protein synthesized from the tissues of a host caterpillar
  - (B) aspen leaves with high concentrations of phenols
  - (C) tannin-rich oak leaves
  - (D) nutrients that they synthesize from gypsy moth egg clusters
  - (E) a rising threshold of caterpillar vulnerability to wilt disease
20. Which of the following, if true, would most clearly demonstrate the operation of the trees' defensive mechanism as it is described in the first paragraph of the passage?
- (A) Caterpillars feeding on red oaks that were more than 50 percent defoliated grew to be only two-thirds the size of those feeding on trees with relatively intact foliage.
  - (B) Oak leaves in areas unaffected by gypsy moths were found to have higher levels of tannin on average than aspen leaves in areas infested with gypsy moths.
  - (C) The survival rate of gypsy moth caterpillars exposed to the wilt virus was 40 percent higher for those that fed on aspen leaves than for those that ate oak leaves.
  - (D) Female gypsy moths produced an average of 25 percent fewer eggs in areas where the wilt virus flourished than did moths in areas that were free of the virus.
  - (E) Gypsy moth egg clusters deposited on oak trees were found to have relatively large individual eggs compared to those deposited on aspen trees.
21. Which of the following best describes the function of the third paragraph of the passage?
- (A) It resolves a contradiction between the ideas presented in the first and second paragraphs.
  - (B) It introduces research data to support the theory outlined in the second paragraph.
  - (C) It draws a conclusion from conflicting evidence presented in the first two paragraphs.
  - (D) It shows how phenomena described in the first and second paragraphs act in combination.
  - (E) It elaborates on the thesis introduced in the first paragraph after a digression in the second paragraph.
22. It can be inferred from the passage that gypsy moth caterpillars become immune to the wilt virus as a result of
- (A) consuming a wide range of nutrients from a variety of leaf types
  - (B) feeding on leaves that contain high levels of phenols
  - (C) producing fewer offspring, which favors the survival of the hardiest individuals
  - (D) ingesting the virus together with leaves that do not contain tannin
  - (E) growing population density, which outstrips the ability of the virus to multiply and spread
23. Which of the following statements about gypsy moth caterpillars is supported by information presented in the passage?
- (A) Wilt disease is more likely to strike small gypsy moth caterpillars than large ones.
  - (B) The concentration of phenols in tree leaves increases as the gypsy moth caterpillar population dies off.
  - (C) Female gypsy moth caterpillars stop growing after they ingest leaves containing phenols.
  - (D) Differing concentrations of phenols in leaves have differing effects on the ability of the

wilt virus to kill gypsy moth caterpillars.

- (E) The longer a gypsy moth population is exposed to wilt disease, the greater the likelihood that the gypsy moth caterpillars will become immune to the virus.

The sweep of narrative in A. N. Wilson's biography of C. S. Lewis is impressive and there is much that is acute and well argued. But much in this work is careless and unworthy of its author. Wilson, a novelist and an accomplished biographer, has failed to do what any writer on such a subject as Lewis ought to do, namely work out a coherent view of how the various literary works by the subject are to be described and commented on. Decisions have to be made on what to look at in detail and what to pass by with just a mention. Wilson has not thought this problem out. For instance, *Till We Have Faces*, Lewis' treatment of the Eros and Psyche story and one of his best-executed and most moving works, is merely mentioned by Wilson, though it illuminates Lewis' spiritual development, whereas Lewis' minor work *Pilgrim's Regress* is looked at in considerable detail.

24. The author of the passage implies that Wilson's examination of *Pilgrim's Regress*
- (A) is not as coherent as his treatment of *Till We Have Faces*
  - (B) would have been more appropriate in a separate treatise because of the scope of *Pilgrim's Regress*
  - (C) demonstrates how Wilson's narrow focus ignores the general themes of Lewis' works
  - (D) was more extensive than warranted because of the relative unimportance of *Pilgrim's Regress*
  - (E) was disproportionately long relative to the amount of effort Lewis devoted to writing *Pilgrim's Regress*
25. The author of the passage would be most likely to agree with which of the following statements regarding *Till We Have Faces*?
- (A) It is an improvement over the Eros and Psyche story on which it is based.
  - (B) It illustrated Lewis' attempt to involve his readers emotionally in the story of Eros and Psyche.
  - (C) It was more highly regarded by Wilson than by Lewis himself.
  - (D) It is one of the outstanding literary achievements of Lewis' career.
  - (E) It is probably one of the most popular of Lewis' works.
26. Which of the following best describes the organization of the passage?
- (A) An evaluation is made, and aspects of the evaluation are expanded on with supporting evidence.
  - (B) A theory is proposed, and supporting examples are provided.
  - (C) A position is examined, analyzed, and rejected.
  - (D) A contradiction is described, then the points of contention are evaluated and reconciled.
  - (E) Opposing views are presented and evaluated, then modifications are advocated.
27. Which of the following best describes the content of the passage?
- (A) A critique of A. N. Wilson as a biographer
  - (B) An evaluation of the significance of several works by C. S. Lewis
  - (C) An appraisal of a biography by A. N. Wilson
  - (D) A ranking of the elements necessary for a well-structured biography
  - (E) A proposal for evaluating the literary merits of the works of C. S. Lewis

## SECTION A

Influenced by the view of some twentieth-century feminists that women's position within the family is one of the central factors determining women's social position, some historians have underestimated the significance of the woman suffrage movement. These historians contend that nineteenth-century suffragist was less radical and, hence, less important than, for example, the moral reform movement or domestic feminism—two nineteenth-century movements in which women struggled for more power and autonomy within the family. True, by emphasizing these struggles, such historians have broadened the conventional view of nineteenth-century feminism, but they do a historical disservice to suffragism. Nineteenth-century feminists and anti-feminist alike perceived the suffragists' demand for enfranchisement as the most radical element in women's protest, in part because suffragists were demanding power that was not based on the institution of the family, women's traditional sphere. When evaluating nineteenth-century feminism as a social force, contemporary historians should consider the perceptions of actual participants in the historical events.

17. The author asserts that the historians discussed in the passage have
  - (A) influenced feminist theorists who concentrate on the family
  - (B) honored the perceptions of the women who participated in the women suffrage movement
  - (C) treated feminism as a social force rather than as an intellectual tradition
  - (D) paid little attention to feminist movements
  - (E) expanded the conventional view of nineteenth-century feminism
18. The author of the passage asserts that some twentieth-century feminists have influenced some historians view of the
  - (A) significance of the woman suffrage movement
  - (B) importance to society of the family as an institution
  - (C) degree to which feminism changed nineteenth-century society
  - (D) philosophical traditions on which contemporary feminism is based
  - (E) public response to domestic feminism in the nineteenth century
19. The author of the passage suggests that which of the following was true of nineteenth-century feminists?
  - (A) Those who participated in the moral reform movement were motivated primarily by a desire to reconcile their private lives with their public positions.
  - (B) Those who advocated domestic feminism, although less visible than the suffragists, were in some ways the more radical of the two groups.
  - (C) Those who participated in the woman suffrage movement sought social roles for women that were not defined by women's familial roles.
  - (D) Those who advocated domestic feminism regarded the gaining of more autonomy within the family as a step toward more participation in public life.
  - (E) Those who participated in the nineteenth-century moral reform movement stood midway between the positions of domestic feminism and suffragism.
20. The author implies that which of the following is true of the historians discussed in the passage?

- (A) They argue that nineteenth-century feminism was not as significant a social force as twentieth-century feminism has been.
- (B) They rely too greatly on the perceptions of the actual participants in the events they study.
- (C) Their assessment of the relative success of nineteenth-century domestic feminism does not adequately take into account the effects of antifeminist rhetoric.
- (D) Their assessment of the significance of nineteenth-century suffragism differs considerably from that of nineteenth-century feminists.
- (E) They devote too much attention to nineteenth-century suffragism at the expense of more radical movements that emerged shortly after the turn of the century.

Many objects in daily use have clearly been influenced by science, but their form and function, their dimensions and appearance, were determined by technologists, artisans, designers, inventors, and engineers—using non-scientific modes of thought. Many features and qualities of the objects that a technologist thinks about cannot be reduced to unambiguous verbal descriptions; they are dealt with in the mind by a visual, nonverbal process. In the development of Western technology, it has been non-verbal thinking, by and large, that has fixed the outlines and filled in the details of our material surroundings. Pyramids, cathedrals, and rockets exist not because of geometry or thermodynamics, but because they were first a picture in the minds of those who built them.

The creative shaping process of a technologist's mind can be seen in nearly every artifact that exists. For example, in designing a **diesel engine**, a technologist might impress individual ways of nonverbal thinking on the machine by continually using an intuitive sense of rightness and fitness. What would be the shape of the **combustion chamber**? Where should the valves be placed? Should it have a long or short piston? Such questions have a range of answers that are supplied by experience, by physical requirements, by limitations of available space, and not least by a sense of form. Some decisions, such as wall thickness and pin diameter, may depend on scientific calculations, but the nonscientific component of design remains primary.

Design courses, then, should be an essential element in engineering curricula. Nonverbal thinking, a central mechanism in engineering design, involves perceptions, the **stock-in-trade** of the artist, not the scientist. Because perceptive processes are not assumed to entail "hard thinking," nonverbal thought is sometimes seen as a primitive stage in the development of cognitive processes and inferior to verbal or mathematical thought. But it is paradoxical that when the staff of the *Historic American Engineering Record* wished to have drawings made of machines and isometric views of industrial processes for its historical record of American engineering, the only college students with the requisite abilities were not engineering students, but rather students attending architectural schools.

If courses in design, which in a strongly analytical engineering curriculum provide the background required for practical problem-solving, are not provided, we can expect to encounter silly but costly errors occurring in advanced engineering systems. For example, early models of high-speed railroad cars loaded with sophisticated controls were unable to operate in a snowstorm because a fan sucked snow into the electrical system. Absurd random failures that plague automatic control systems are not merely trivial aberrations; they are a reflection of the chaos that results when design is assumed to be primarily a problem in mathematics.

21. In the passage, the author is primarily concerned with
- (A) identifying the kinds of thinking that are used by technologists
  - (B) stressing the importance of nonverbal thinking in engineering design
  - (C) proposing a new role for nonscientific thinking in the development of technology
  - (D) contrasting the goals of engineers with those of technologists
  - (E) criticizing engineering schools for emphasizing science in engineering curricula

22. It can be inferred that the author thinks engineering curricula are
- (A) strengthened when they include courses in design
  - (B) weakened by the substitution of physical science courses for courses designed to develop mathematical skills
  - (C) strong because nonverbal thinking is still emphasized by most of the courses
  - (D) strong despite the errors that graduates of such curricula have made in the development of automatic control systems
  - (E) strong despite the absence of nonscientific modes of thinking
23. Which of the following statements best illustrates the main point of lines 1-28 of the passage?
- (A) When a machine like a rotary engine malfunctions, it is the technologist who is best equipped to repair it.
  - (B) Each component of an automobile—for example, the engine or the fuel tank—has a shape that has been scientifically determined to be best suited to that component's function.
  - (C) A telephone is a complex instrument designed by technologists using only nonverbal thought.
  - (D) The designer of a new refrigerator should consider the designs of other refrigerators before deciding on its final form.
  - (E) The distinctive features of a suspension bridge reflect its designer's conceptualization as well as the physical requirements of its site.
24. Which of the following statements would best serve as an introduction to the passage?
- (A) The assumption that the knowledge incorporated in technological developments must be derived from science ignores the many non-scientific decisions made by technologists.
  - (B) Analytical thought is no longer a vital component in the success of technological development.
  - (C) As knowledge of technology has increased, the tendency has been to lose sight of the important role played by scientific thought in making decisions about form, arrangement, and texture.
  - (D) A movement in engineering colleges toward a technician's degree reflects a demand for graduates who have the nonverbal reasoning ability that was once common among engineers.
  - (E) A technologist thinking about a machine, reasoning through the successive steps in a dynamic process, can actually turn the machine over mentally.
25. The author calls the predicament faced by the *Historic American Engineering Record* "paradoxical" (lines 36-37) most probably because
- (A) the publication needed drawings that its own staff could not make
  - (B) architectural schools offered but did not require engineering design courses for their students
  - (C) college students were qualified to make the drawings while practicing engineers were not
  - (D) the drawings needed were so complicated that even students in architectural schools had

difficulty making them

- (E) engineering students were not trained to make the type of drawings needed to record the development of their own discipline
26. According to the passage, random failures in automatic control systems are “not merely trivial aberrations” (lines 53) because
- (A) automatic control systems are designed by engineers who have little practical experience in the field
  - (B) the failures are characteristic of systems designed by engineers relying too heavily on concepts in mathematics
  - (C) the failures occur too often to be taken lightly
  - (D) designers of automatic control systems have too little training in the analysis of mechanical difficulties
  - (E) designers of automatic control systems need more help from scientists who have a better understanding of the analytical problems to be solved before such systems can work efficiently
27. The author uses the example of the early models of high-speed railroad cars primarily to
- (A) weaken the argument that modern engineering systems have major defects because of an absence of design courses in engineering curricula
  - (B) support the thesis that the number of errors in modern engineering systems is likely to increase
  - (C) illustrate the idea that courses in design are the most effective means for reducing the cost of designing engineering systems
  - (D) support the contention that a lack of attention to the nonscientific aspects of design results in poor conceptualization by engineers
  - (E) weaken the proposition that mathematics is a necessary part of the study of design

## SECTION B

One explanation for the tendency of animals to be more vigilant in smaller groups than in larger ones assumes that the vigilant behavior—looking up, for example—is aimed at predators. If individuals on the edge of a group are more vigilant because they are at greater risk of being captured, then individuals on average would have to be more vigilant in smaller groups, because the animals on the periphery of a group form a greater proportion of the whole group as the size of the group diminishes.

However, a different explanation is necessary in cases where the vigilant behavior is not directed at predators. J. Krebs has discovered that great blue herons look up more often when in smaller flocks than when in larger ones, solely as a consequence of poor feeding conditions. Krebs hypothesizes that the herons in smaller flocks are watching for herons that they might follow to better feeding pools, which usually attract larger numbers of the birds.

17. It can be inferred from the passage that in species in which vigilant behavior is directed at predators, the tendency of the animals to be more vigilant in smaller groups than in larger ones would most likely be minimized if which of the following were true?
- (A) The vigilance of animals on the periphery of a group always exceeded that of animals located in its interior, even when predators were not in the area.
  - (B) The risk of capture for individuals in a group was the same, whether they were located in the interior of the group or on its periphery.

- (C) Animals on the periphery of a group tended to be less capable of defending themselves from attack by predators than animals located in the interior of the group.
  - (D) Animals on the periphery of a group tended to bear marks that were more distinctive to predators than animals located in the interior of the group.
  - (E) Animals on the periphery of a group tended to have shorter life spans than animals located in the interior of the group.
18. Which of the following best describes the relationship of the second paragraph to the first?
- (A) The second paragraph relies on different evidence in drawing a conclusion similar to that expressed in the first paragraph.
  - (B) The second paragraph provides further elaboration on why an assertion made at the end of the first paragraph proves to be true in most cases.
  - (C) The second paragraph provides additional information in support of a hypothesis stated in the first paragraph.
  - (D) The second paragraph provides an example of a case in which the assumption described in the first paragraph is unwarranted.
  - (E) The second paragraph describes a phenomenon that has the same cause as the phenomenon described in the first paragraph.
19. It can be inferred from the passage that the author of the passage would be most likely to agree with which of the following assertions about vigilant behavior?
- (A) The larger the group of animals, the higher the probability that individuals in the interior of the group will exhibit vigilant behavior.
  - (B) Vigilant behavior exhibited by individuals in small groups is more effective at warding off predators than the same behavior exhibited by individuals in larger groups.
  - (C) Vigilant behavior is easier to analyze in species that are preyed upon by many different predators than in species that are preyed upon by relatively few of them.
  - (D) The term “vigilant,” when used in reference to the behavior of animals, does not refer exclusively to behavior aimed at avoiding predators.
  - (E) The term “vigilant,” when used in reference to the behavior of animals, usually refers to behavior exhibited by large groups of animals.
20. The passage provides information in support of which of the following assertions?
- (A) The avoidance of predators is more important to an animal’s survival than is the quest for food.
  - (B) Vigilant behavior aimed at predators is seldom more beneficial to groups of animals than to individual animals.
  - (C) Different species of animals often develop different strategies for dealing with predators.
  - (D) The size of a group of animals does not necessarily reflect its success in finding food.
  - (E) Similar behavior in different species of animals does not necessarily serve the same purpose.

The earliest controversies about the relationship between photography and art centered on whether photography’s fidelity to appearances and dependence on a machine allowed it to be a fine art as distinct from merely a practical art. Throughout the nineteenth century, the defense of photography was identical with the struggle to establish it as a fine art. Against the charge that photography was a soulless, mechanical copying of reality, photographers asserted that it was instead a privileged way of seeing, a



revolt against commonplace vision, and no less worthy an art than painting.

Ironically, now that photography is securely established as a fine art, many photographers find it pretentious or irrelevant to label it as such. Serious photographers variously claim to be finding, recording, impartially observing, witnessing events, exploring themselves—anything but making works of art. In the nineteenth century, photography's association with the real world placed it in an ambivalent relation to art; late in the twentieth century, an ambivalent relation exists because of the Modernist heritage in art. That important photographers are no longer willing to debate whether photography is or is not a fine art, except to proclaim that their own work is not involved with art, shows the extent to which they simply take for granted the concept of art imposed by the triumph of Modernism: the better the art, the more subversive it is of the traditional aims of art.

Photographers' disclaimers of any interest in making art tell us more about the harried status of the contemporary notion of art than about whether photography is or is not art. For example, those photographers who suppose that, by taking pictures, they are getting away from the pretensions of art as exemplified by painting remind us of those Abstract Expressionist painters who imagined they were getting away from the intellectual austerity of classical Modernist painting by concentrating on the physical act of painting. Much of photography's prestige today derives from the convergence of its aims with those of recent art, particularly with the dismissal of abstract art implicit in the phenomenon of Pop painting during the 1960's. Appreciating photographs is a relief to sensibilities tired of the mental exertions demanded by abstract art. Classical Modernist painting—that is, abstract art as developed in different ways by Picasso, Kandinsky, and Matisse—presupposes highly developed skills of looking and a familiarity with other paintings and the history of art. Photography, like Pop painting, reassures viewers that art is not hard; photography seems to be more about its subjects than about art.

Photography, however, has developed all the anxieties and self-consciousness of a classic Modernist art. Many professionals privately have begun to worry that the promotion of photography as an activity subversive of the traditional pretensions of art has gone so far that the public will forget that photography is a distinctive and exalted activity—in short, an art.

21. In the passage, the author is primarily concerned with
  - (A) defining the Modernist attitude toward art
  - (B) explaining how photography emerged as a fine art after the controversies of the nineteenth century
  - (C) explaining the attitudes of serious contemporary photographers toward photography as art and placing those attitudes in their historical context
  - (D) defining the various approaches that serious contemporary photographers take toward their art and assessing the value of each of those approaches
  - (E) identifying the ways that recent movements in painting and sculpture have influenced the techniques employed by serious photographers
22. Which of the following adjectives best describes “the concept of art imposed by the triumph of Modernism” as the author represents it in lines 25-27?
  - (A) Objective
  - (B) Mechanical
  - (C) Superficial
  - (D) Dramatic
  - (E) Paradoxical
23. The author introduces Abstract Expressionist painters (lines 34) in order to
  - (A) provide an example of artists who, like serious contemporary photographers, disavowed traditionally accepted aims of modern art

- (B) call attention to artists whose works often bear a physical resemblance to the works of serious contemporary photographers
  - (C) set forth an analogy between the Abstract Expressionist painters and classical Modernist painters
  - (D) provide a contrast to Pop artists and others who created works that exemplify the Modernist heritage in art
  - (E) provide an explanation of why serious photography, like other contemporary visual forms, is not and should not pretend to be an art
24. According to the author, the nineteenth-century defenders of photography mentioned in the passage stressed that photography was
- (A) a means of making people familiar with remote locales and unfamiliar things
  - (B) a technologically advanced activity
  - (C) a device for observing the world impartially
  - (D) an art comparable to painting
  - (E) an art that would eventually replace the traditional arts
25. According to the passage, which of the following best explains the reaction of serious contemporary photographers to the question of whether photography is an art?
- (A) The photographers' belief that their reliance on an impersonal machine to produce their art requires the surrender of the authority of their personal vision
  - (B) The photographers' fear that serious photography may not be accepted as an art by the contemporary art public
  - (C) The influence of Abstract Expressionist painting and Pop Art on the subject matter of the modern photograph
  - (D) The photographers' belief that the best art is subversive of art as it has previously been defined
  - (E) The notorious difficulty of defining art in its relation to realistic representation
26. According to the passage, certain serious contemporary photographers expressly make which of the following claims about their photographs?
- (A) Their photographs could be created by almost anyone who had a camera and the time to devote to the activity.
  - (B) Their photographs are not examples of art but are examples of the photographers' impartial observation of the world.
  - (C) Their photographs are important because of their subjects but not because of the responses they evoke in viewers.
  - (D) Their photographs exhibit the same ageless principles of form and shading that have been used in painting.
  - (E) Their photographs represent a conscious glorification of the mechanical aspects of twentieth-century life.
27. It can be inferred from the passage that the author most probably considers serious contemporary photography to be a
- (A) contemporary art that is struggling to be accepted as fine art

- (B) craft requiring sensitivity but by no means an art
- (C) mechanical copying of reality
- (D) modern art that displays the Modernist tendency to try to subvert the prevailing aims of art
- (E) modern art that displays the tendency of all Modernist art to become increasingly formal and abstract

1995 10

## SECTION A

It is possible for students to obtain advanced degrees in English while knowing little or nothing about traditional scholarly methods. The consequences of this neglect of traditional scholarship are particularly unfortunate for the study of women writers. If the canon—the list of authors whose works are most widely taught—is ever to include more women, scholars must be well trained in historical scholarship and textual editing. Scholars who do not know how to read early manuscripts, locate rare books, establish a sequence of editions, and so on are bereft of crucial tools for revising the canon.

To address such concerns, an experimental version of the traditional scholarly methods course was designed to raise students' consciousness about the usefulness of traditional learning for any modern critic or theorist. To minimize the artificial aspects of the conventional course, the usual procedure of assigning a large number of small problems drawn from the entire range of historical periods was abandoned, though this procedure has the obvious advantage of at least superficially familiarizing students with a wide range of reference sources. Instead students were engaged in a collective effort to do original work on a neglected eighteenth-century writer, Elizabeth Griffith, to give them an authentic experience of literary scholarship and to inspire them to take responsibility for the quality of their own work.

Griffith's work presented a number of advantages for this particular pedagogical purpose. First, the body of extant **scholarship** on Griffith was so tiny that it could all be read in a day; thus students spent little time and effort mastering the literature and had a clear field for their own discoveries. Griffith's play *The Platonic Wife* exists in three versions, enough to provide illustrations of editorial issues but not too many for beginning students to manage. In addition, because Griffith was successful in the eighteenth century, as her continued productivity and favorable reviews demonstrate, her exclusion from the canon and virtual disappearance from literary history also helped raise issues concerning the current canon.

The range of Griffith's work meant that each student could become the world's leading authority on a particular Griffith text. For example, a student studying Griffith's *Wife in the Right* obtained a first edition of the play and studied it for some weeks. This student was suitably shocked and outraged to find its title transformed into *A Wife in the Night* in Watt's *Bibliotheca Britannica*. Such experiences, inevitable and common in working on a writer to whom so little attention has been paid, serve to vaccinate the student—I hope for a lifetime—against credulous use of reference sources.

17. The author of the passage is primarily concerned with
  - (A) revealing a commonly ignored deficiency
  - (B) proposing a return to traditional terminology
  - (C) describing an attempt to correct a shortcoming
  - (D) assessing the success of a new pedagogical approach
  - (E) predicting a change in a traditional teaching strategy
18. It can be inferred that the author of the passage expects that the experience of the student mentioned as having studied *Wife in the Right* would have which of the following effects?
  - (A) It would lead the student to disregard information found in the *Bibliotheca Britannica*.

- (B) It would teach the student to question the accuracy of certain kinds of information sources when studying neglected authors.
  - (C) It would teach the student to avoid the use of reference sources in studying neglected authors.
  - (D) It would help the student to understand the importance of first editions in establishing the authorship of plays.
  - (E) It would enhance the student's appreciation of the works of authors not included in the canon.
19. The author of the passage suggests that which of the following is a disadvantage of the strategy employed in the experimental scholarly methods course?
- (A) Students were not given an opportunity to study women writers outside the canon.
  - (B) Students' original work would not be appreciated by recognized scholars.
  - (C) Little scholarly work has been done on the work of Elizabeth Griffith.
  - (D) Most of the students in the course had had little opportunity to study eighteenth-century literature.
  - (E) Students were not given an opportunity to encounter certain sources of information that could prove useful in their future studies.
20. Which of the following best states the "particular pedagogical purpose" mentioned in line 28?
- (A) To assist scholars in revising the canon of authors
  - (B) To minimize the trivial aspects of the traditional scholarly methods course
  - (C) To provide students with information about Griffith's work
  - (D) To encourage scholarly rigor in students' own research
  - (E) To reestablish Griffith's reputation as an author
21. Which of the following best describes the function of the last paragraph in relation to the passage as a whole?
- (A) It summarizes the benefits that students can derive from the experimental scholarly methods course.
  - (B) It provides additional reasons why Griffith's work raises issues having to do with the canon of authors.
  - (C) It provides an illustration of the immediate nature of the experiences students can derive from the experimental scholarly methods course.
  - (D) It contrasts the experience of a student in the experimental scholarly methods course with the experience of a student in the traditional course.
  - (E) It provides information that emphasizes the suitability of Griffith's work for inclusion in the canon of authors.
22. It can be inferred that which of the following is most likely to be among the "issues" mentioned in line 38?
- (A) Why has the work of Griffith, a woman writer who was popular in her own century, been excluded from the canon?
  - (B) In what ways did Griffith's work reflect the political climate of the eighteenth century?

- (C) How was Griffith's work received by literary critics during the eighteenth century?
- (D) How did the error in the title of Griffith's play come to be made?
- (E) How did critical reception of Griffith's work affect the quantity and quality of that work?

23. It can be inferred that the author of the passage considers traditional scholarly methods courses to be

- (A) irrelevant to the work of most students
- (B) inconsequential because of their narrow focus
- (C) unconcerned about the accuracy of reference sources
- (D) too superficial to establish important facts about authors
- (E) too wide-ranging to approximate genuine scholarly activity

Experiments show that insects can function as pollinators of **cycads**, rare, palmlike tropical plants. Furthermore, cycads removed from their native habitats—and therefore from insects native to those habitats—are usually infertile. Nevertheless, anecdotal reports of wind pollination in cycads cannot be ignored. The structure of cycads male cones is quite consistent with the wind dispersal of pollen, clouds of which are released from some of the larger cones. The male cone of *Cycas circinalis*, for example, sheds almost 100 cubic centimeters of pollen, most of which is probably dispersed by wind. Still, many male cycad **cones** are comparatively small and thus produce far less pollen. Furthermore, the structure of most female cycad cones seems inconsistent with direct pollination by wind. Only in the **Cycas** genus are the females' **ovules** accessible to airborne pollen, since only in this genus are the ovules surrounded by a loose aggregation of **megasporophylls** rather than by a tight cone.

24. According to the passage, the size of a male cycad cone directly influences which of the following?

- (A) The arrangement of the male cone's structural elements
- (B) The mechanism by which pollen is released from the male cone
- (C) The degree to which the ovules of female cycads are accessible to airborne pollen
- (D) The male cone's attractiveness to potential insect pollinators
- (E) The amount of pollen produced by the male cone

25. The passage suggests that which of the following is true of the structure of cycad cones?

- (A) The structure of cycad cones provides conclusive evidence in favor of one particular explanation of cycad pollination.
- (B) The structure of cycad cones provides evidence concerning what triggers the first step in the pollination process.
- (C) An irresolvable discrepancy exists between what the structure of most male cycad cones suggests about cycad pollination and what the structure of most female cones suggests about that process.
- (D) The structure of male cycad cones rules out a possible mechanism for cycad pollination that is suggested by the structure of most female cycad cones.
- (E) The structure of male cycad cones is consistent with a certain means of cycad pollination, but that means is inconsistent with the structure of most female cycad cones.

26. The evidence in favor of insect pollination of cycads presented in lines 2-4 would be more convincing if which of the following were also true?

- (A) Only a small variety of cycad species can be successfully transplanted.
  - (B) Cycads can sometimes be pollinated by means other than wind or insects.
  - (C) Insects indigenous to regions to which cycads are transplanted sometimes feed on cycads.
  - (D) Winds in the areas to which cycads are usually transplanted are similar to winds in cycads' native habitats.
  - (E) The transplantation of cycads from one region to another usually involves the accidental removal and introduction of insects as well.
27. The passage suggests that which of the following is true of scientific investigations of cycad pollination?
- (A) They have not yet produced any systematic evidence of wind pollination in cycads.
  - (B) They have so far confirmed anecdotal reports concerning the wind pollination of cycads.
  - (C) They have, until recently, produced little evidence in favor of insect pollination in cycads.
  - (D) They have primarily been carried out using cycads transplanted from their native habitats.
  - (E) They have usually concentrated on describing the physical characteristics of the cycad reproductive system.

## SECTION B

(This passage is adapted from an article published in 1981.)

The term "remote sensing" refers to the techniques of measurement and interpretation of phenomena from a distance. Prior to the mid-1960's the interpretation of film images was the primary means for remote sensing of the Earth's geologic features. With the development of the optomechanical scanner, scientists began to construct digital multispectral images using data beyond the sensitivity range of visible light photography. These images are constructed by mechanically aligning pictorial representations of such phenomena as the reflection of light waves outside the visible spectrum, the refraction of radio waves, and the daily changes in temperature in areas on the Earth's surface. Digital multispectral imaging has now become the basic tool in geologic remote sensing from satellites.

The advantage of digital over photographic imaging is evident: the resulting numerical data are precisely known, and digital data are not subject to the vagaries of difficult-to-control chemical processing. With digital processing, it is possible to combine a large number of spectral images. The acquisition of the first multispectral digital data set from the multispectral scanner (MSS) aboard the satellite *Landsat* in 1972 consequently attracted the attention of the entire geologic community. *Landsat* MSS data are now being applied to a variety of geologic problems that are difficult to solve by conventional methods alone. These include specific problems in mineral and energy resource exploration and the charting of glaciers and shallow seas.

A more fundamental application of remote sensing is to augment conventional methods for geologic mapping of large areas. Regional maps present compositional, structural, and chronological information for reconstructing geologic evolution. Such reconstructions have important practical applications because the conditions under which rock units and other structural features are formed influence the occurrence of ore and petroleum deposits and affect the thickness and integrity of the geologic media in which the deposits are found.

Geologic maps incorporate a large, varied body of specific field and laboratory measurements, but the maps must be interpretative because field measurements are always limited by rock exposure, accessibility and labor resources. With remote-sensing techniques it is possible to obtain much geologic information more efficiently than it can be obtained on the ground. These techniques also facilitate

overall interpretation. Since detailed geologic mapping is generally conducted in small areas, the continuity of regional features that have intermittent and variable expressions is often not recognized, but in the comprehensive views of Landsat images these continuities are apparent. However, some critical information cannot be obtained through remote sensing, and several characteristics of the Landsat MSS impose limitations on the acquisition of diagnostic data. Some of these limitations can be overcome by designing satellite systems specifically for geologic purposes; but, to be most effective, remote-sensing data must still be combined with data from field surveys and laboratory tests, the techniques of the earlier twentieth century.

17. By using the word “interpretative” in line 40, the author is indicating which of the following?
  - (A) Some maps are based more on data from aerial photography than on data from field operations.
  - (B) Some maps are based almost exclusively on laboratory measurements.
  - (C) Some maps are based on incomplete data from field observations.
  - (D) Some maps show only large geologic features.
  - (E) Some maps can be three-dimensional.
18. With which of the following statements about geologic mapping would the author be most likely to agree?
  - (A) Geologic mapping is basically an art and not a science.
  - (B) Geologic mapping has not changed significantly since the early 1960’s.
  - (C) Geologic mapping will have limited practical applications until remote-sensing systems are perfected.
  - (D) A developmental milestone in geologic mapping was reached in 1972.
  - (E) Without the present variety of remote-sensing techniques, geologic mapping could not be done.
19. According to the passage, measurements of which of the following can be provided by the optomechanical scanner but not by visible-light photography?
  - (A) The amount of visible light reflected from oceans
  - (B) The density of foliage in remote areas on the Earth’s surface
  - (C) Daily temperature changes of areas on the Earth’s surface
  - (D) The degree of radioactivity emitted by exposed rocks on the Earth’s surface
  - (E) Atmospheric conditions over large landmasses
20. It can be inferred from the passage that a major disadvantage of photographic imaging in geologic mapping is that such photography
  - (A) cannot be used at night
  - (B) cannot focus on the details of a geologic area
  - (C) must be chemically processed
  - (D) is always enhanced by digital reconstruction
  - (E) cannot reflect changes over extended periods of time
21. It can be inferred from the passage that Landsat images differ from conventional geologic maps in that Landsat images
  - (A) reveal the exact size of petroleum deposits and ore deposits

- (B) indicate the continuity of features that might not otherwise be interpreted as continuous
  - (C) predict the movements of glaciers
  - (D) provide highly accurate data about the occurrence of mineral deposits
  - (E) reveal the integrity of the media in which petroleum deposits and ore deposits are found
22. The passage provides information about each of the following topics EXCEPT:
- (A) the principal method of geologic remote sensing prior to the mid-1960's
  - (B) some of the phenomena measured by digital multi-spectral images in remote sensing
  - (C) some of the practical uses of regional geologic maps
  - (D) the kinds of problems that are difficult to solve solely through conventional methods of geologic mapping
  - (E) the specific limitations of the Landsat multi-spectral scanner
23. The passage suggests which of the following about the "conventional methods" mentioned in line 29?
- (A) They consist primarily of field surveys and laboratory measurements.
  - (B) They are not useful in providing information necessary for reconstructing geologic evolution.
  - (C) They have rarely been used by geologists since 1972.
  - (D) They are used primarily to gather compositional information about geologic features.
  - (E) They are limited primarily because of difficulties involved in interpreting film images.

Although the development of new infrastructure (such public facilities as power plants, schools, and bridges) is usually determined by governmental planning, sometimes this development can be planned more flexibly and realistically by private investors who anticipate profit from the collection of user fees. Such profits can contribute to the financing of more infrastructure if demand proves great enough, **whereas** the reluctance of developers to invest in such projects can signal that additional infrastructure is not needed. During the economic boom of the 1980's, for example, the state of Virginia authorized private developers to build a \$300 million **toll road**. These developers obtained the needed right-of-way from property owners, but by 1993 they still had not raised the necessary financing. The unwillingness of investors to finance this project does not negate the viability of privately financed roads; rather, it illustrates a virtue of private financing. If a road appears unlikely to attract enough future traffic to pay for the road, then it should not be built.

24. The primary purpose of the passage is to
- (A) build a case for increasing the development of new infrastructure
  - (B) advocate an alternative to government financing of infrastructure
  - (C) explain the failure of a privately financed venture
  - (D) suggest the types of infrastructure most appropriate for private financing
  - (E) argue against government restrictions on developing new infrastructure
25. The passage implies that the "governmental planning" mentioned in line 3 may lead to which of the following problems?
- (A) Improper use of profits derived from user fees
  - (B) Unduly slow development of necessary new infrastructure
  - (C) Unrealistic decisions about developing new infrastructure
  - (D) Incorrect predictions about profits to be gained from user fees



- (E) Obstruction of private financing for the development of new infrastructure
26. According to the passage, which of the following is true of the toll road mentioned in line 12?
- (A) After it was built, it attracted too little traffic to pay for its construction.
  - (B) It was partially financed by the state of Virginia.
  - (C) Its development was authorized during an economic boom.
  - (D) Its construction was controversial among local residents.
  - (E) Its developers were discouraged by governmental restrictions on acquiring the necessary land.
27. The passage suggests that which of the following would occur if a privately financed bridge that proved to be profitable failed after a number of years to meet the demands of traffic?
- (A) Private developers who financed the bridge would rely on governmental authorities to develop new infrastructure.
  - (B) User fees would be increased so that usage would become more costly.
  - (C) Governmental authorities would be reluctant to rely on private contractors to develop a new bridge.
  - (D) The success of the project would be jeopardized by public dissatisfaction with the project's adequacy.
  - (E) Profits generated by user fees would be used to help finance the construction of new infrastructure to alleviate the traffic problem.

1996 04

## SECTION A

As people age, their cells become less efficient and less able to replace damaged components. At the same time their tissues stiffen. For example, the lungs and the heart muscle expand less successfully, the blood vessels become increasingly rigid, and the ligaments and tendons tighten.

Few investigators would attribute such diverse effects to a single cause. Nevertheless, researchers have discovered that a process long known to discolor and toughen foods may also contribute to age-related impairment of both cells and tissues. That process is nonenzymatic glycosylation, whereby glucose becomes attached to proteins without the aid of enzymes. When enzymes attach glucose to proteins (enzymatic glycosylation), they do so at a specific site on a specific protein molecule for a specific purpose. In contrast, the nonenzymatic process adds glucose haphazardly to any of several sites along any available peptide chain within a protein molecule.

This nonenzymatic glycosylation of certain proteins has been understood by food chemists for decades, although few biologists recognized until recently that the same steps could take place in the body. Nonenzymatic glycosylation begins when an aldehyde group (CHO) of glucose and an amino group (NH<sub>2</sub>) of a protein are attracted to each other. The molecules combine, forming what is called a Schiff base within the protein. This combination is unstable and quickly rearranges itself into a stabler, but still reversible, substance known as an Amadori product.

If a given protein persists in the body for months or years, some of its Amadori products slowly dehydrate and rearrange themselves yet again, into new glucose-derived structures. These can combine with various kinds of molecules to form irreversible structures named advanced glycosylation end products (AGE's). Most AGE's are yellowish brown and fluorescent and have specific spectrographic properties. More important for the body, many are also able to cross-link adjacent proteins, particularly ones that give structure to tissues and organs. Although no one has yet satisfactorily described the origin of all such bridges between proteins, many investigators agree that extensive cross-linking of proteins

probably contributes to the stiffening and loss of elasticity characteristic of aging tissues.

In an attempt to link this process with the development of cataracts (the browning and clouding of the lens of the eye as people age), researchers studied the effect of glucose on solutions of purified crystallin, the major protein in the lens of the eye. Glucose-free solutions remained clear, but solutions with glucose caused the proteins to form clusters, suggesting that the molecules had become cross-linked. The clusters diffracted light, making the solution opaque. The researchers also discovered that the pigmented cross-links in human cataracts have the brownish color and fluorescence characteristic of AGE's. These data suggest that nonenzymatic glycosylation of lens crystallins may contribute to cataract formation.

17. With which of the following statements concerning the stiffening of aging tissues would the author most likely agree?
  - (A) It is caused to a large degree by an increased rate of cell multiplication.
  - (B) It paradoxically both helps and hinders the longevity of proteins in the human body.
  - (C) It can be counteracted in part by increased ingestion of glucose-free foods.
  - (D) It is exacerbated by increased enzymatic glycosylation.
  - (E) It probably involves the nonenzymatic glycosylation of proteins.
18. According to the passage, which of the following statements is true of the process that discolors and toughens foods?
  - (A) It takes place more slowly than glycosylation in the human body.
  - (B) It requires a higher ratio of glucose to protein than glycosylation requires in the human body.
  - (C) It does not require the aid of enzymes to attach glucose to protein.
  - (D) It proceeds more quickly when the food proteins have a molecular structure similar to that of crystallin proteins.
  - (E) Its effectiveness depends heavily on the amount of environmental moisture.
19. According to the passage, which of the following is characteristic of enzymatic glycosylation of proteins?
  - (A) AGE's are formed after a period of months or years.
  - (B) Proteins affected by the process are made unstable.
  - (C) Glucose attachment impairs and stiffens tissues.
  - (D) Glucose is attached to proteins for specific purposes.
  - (E) Amino groups combine with aldehyde groups to form Schiff bases.
20. According to the passage, which of the following statements is true of Amadori products in proteins?
  - (A) They are more plentiful in a dehydrated environment.
  - (B) They are created through enzymatic glycosylation.
  - (C) They are composed entirely of glucose molecules.
  - (D) They are derived from Schiff bases.
  - (E) They are derived from AGE's.
21. Which of the following best describes the function of the third paragraph of the passage (lines 19-29)?
  - (A) It offers evidence that contradicts the findings described in the first two paragraphs.

- (B) It presents a specific example of the process discussed in the first two paragraphs.
  - (C) It explains a problem that the researchers mentioned in the second paragraph have yet to solve.
  - (D) It evaluates the research discoveries described in the previous paragraph.
  - (E) It begins a detailed description of the process introduced in the previous two paragraphs.
22. The passage suggests that which of the following would be LEAST important in determining whether nonenzymatic glycosylation is likely to have taken place in the proteins of a particular tissue?
- (A) The likelihood that the tissue has been exposed to free glucose
  - (B) The color and spectrographic properties of structures within the tissue
  - (C) The amount of time that the proteins in the tissue have persisted in the body
  - (D) The number of amino groups within the proteins in the tissue
  - (E) The degree of elasticity that the tissue exhibits
23. If the hypothesis stated in lines 56-58 is true, it can be inferred that the crystallin proteins in the lenses of people with cataracts
- (A) have increased elasticity
  - (B) do not respond to enzymatic glycosylation
  - (C) are more susceptible to stiffening than are other proteins
  - (D) are at least several months old
  - (E) respond more acutely than other proteins to changes in moisture levels

Writing of the Iroquois nation, Smith has argued that through the chiefs' council, tribal chiefs traditionally maintained complete control over the political affairs of both the Iroquois tribal league and the individual tribes belonging to the league, whereas the sole jurisdiction over religious affairs resided with the shamans. According to Smith, this division was maintained until the late nineteenth century, when the dissolution of the chiefs' council and the consequent diminishment of the chiefs' political power fostered their increasing involvement in religious affairs.

However, Smith fails to recognize that this division of power between the tribal chiefs and shamans was not actually rooted in Iroquois tradition; rather, it resulted from the Iroquois' resettlement on reservations early in the nineteenth century. Prior to resettlement, the chiefs' council controlled only the broad policy of the tribal league; individual tribes had institutions—most important, the longhouse—to govern their own affairs. In the longhouse, the tribe's chief influenced both political and religious affairs.

24. The primary purpose of the passage is to
- (A) question the published conclusions of a scholar concerning the history of the Iroquois nation
  - (B) establish the relationship between an earlier scholar's work and new anthropological research
  - (C) summarize scholarly controversy concerning an incident from Iroquois history
  - (D) trace two generations of scholarly opinion concerning Iroquois social institutions
  - (E) differentiate between Iroquois political practices and Iroquois religious practices
25. It can be inferred that the author of the passage regards Smith's argument as
- (A) provocative and potentially useful, but flawed by poor organization
  - (B) eloquently presented, but needlessly inflammatory

- (C) accurate in some of its particulars, but inaccurate with regard to an important point
  - (D) historically sound, but overly detailed and redundant
  - (E) persuasive in its time, but now largely outdated
26. The author of the passage implies that which of the following occurred after the Iroquois were resettled on reservations early in the nineteenth century?
- (A) Chiefs became more involved in their tribes' religious affairs.
  - (B) The authority of the chiefs' council over the affairs of individual tribes increased.
  - (C) The political influence of the Iroquois shamans was diminished.
  - (D) Individual tribes coalesced into the Iroquois tribal league.
  - (E) The longhouse became a political rather than a religious institution.
27. Which of the following best expresses an opinion presented by the author of the passage?
- (A) Smith has overstated the importance of the political role played by Iroquois tribal chiefs in the nineteenth century.
  - (B) Smith has overlooked the fact that the Iroquois rarely allowed their shamans to exercise political authority.
  - (C) Smith has failed to explain why the chiefs' council was dissolved late in the nineteenth century.
  - (D) Smith has failed to acknowledge the role prior to the nineteenth century of the Iroquois tribal chiefs in religious affairs.
  - (E) Smith has failed to recognize that the very structure of Iroquois social institutions reflects religious beliefs.

## SECTION B

*Mary Barton*, particularly in its early chapters, is a moving response to the suffering of the industrial worker in the England of the 1840's. What is most impressive about the book is the intense and painstaking effort made by the author, Elizabeth Gaskell, to convey the experience of everyday life in working-class homes. Her method is partly documentary in nature: the novel includes such features as a carefully annotated reproduction of dialect, the exact details of food prices in an account of a **tea party**, an itemized description of the furniture of the Bartons' living room, and a **transcription** (again annotated) of the ballad "The Oldham Weaver." The interest of this record is considerable, even though the method has a slightly distancing effect.

As a member of the middle class, Gaskell could hardly help approaching working-class life as an outside observer and a reporter, and the reader of the novel is always conscious of this fact. But there is genuine imaginative re-creation in her accounts of the walk in Green Heys Fields, of tea at the Bartons' house, and of John Barton and his friend's discovery of the starving family in the cellar in the chapter "Poverty and Death." Indeed, for a similarly convincing re-creation of such families' emotions and responses (which are more crucial than the material details on which the mere reporter is apt to concentrate), the English novel had to wait 60 years for the early writing of D. H. Lawrence. If Gaskell never quite conveys the sense of full participation that would completely authenticate this aspect of *Mary Barton*, she still brings to these scenes an intuitive recognition of feelings that has its own sufficient conviction.

The chapter "Old Alice's History" brilliantly dramatizes the situation of that early generation of workers brought from the villages and the countryside to the urban industrial centers. The account of Job Legh, the weaver and naturalist who is devoted to the study of biology, vividly embodies one kind of response to an urban industrial environment: an affinity for living things that hardens, by its very contrast

with its environment, into a kind of crankiness. The early chapters—about factory workers walking out in spring into Green Heys Fields; about Alice Wilson, remembering in her cellar the twig-gathering for brooms in the native village that she will never again see; about Job Legh, intent on his impaled insects—capture the characteristic responses of a generation to the new and crushing experience of industrialism. The other early chapters eloquently portray the development of the instinctive cooperation with each other that was already becoming an important tradition among workers.

17. Which of the following best describes the author's attitude toward Gaskell's use of the method of documentary record in *Mary Barton*?
  - (A) Uncritical enthusiasm
  - (B) Unresolved ambivalence
  - (C) Qualified approval
  - (D) Resigned acceptance
  - (E) Mild irritation
18. According to the passage, *Mary Barton* and the early novels of D. H. Lawrence share which of the following?
  - (A) Depiction of the feelings of working-class families
  - (B) Documentary objectivity about working-class circumstances
  - (C) Richly detailed description of working-class adjustment to urban life
  - (D) Imaginatively structured plots about working-class characters
  - (E) Experimental prose style based on working-class dialect
19. Which of the following is most closely analogous to Job Legh in *Mary Barton*, as that character is described in the passage?
  - (A) An entomologist who collected butterflies as a child
  - (B) A small-town attorney whose hobby is nature photography
  - (C) A young man who leaves his family's dairy farm to start his own business
  - (D) A city dweller who raises exotic plants on the roof of his apartment building
  - (E) A union organizer who works in a textile mill under dangerous conditions
20. It can be inferred from examples given in the last paragraph of the passage that which of the following was part of "the new and crushing experience of industrialism" (lines 46-47) for many members of the English working class in the nineteenth century?
  - (A) Extortionate food prices
  - (B) Geographical displacement
  - (C) Hazardous working conditions
  - (D) Alienation from fellow workers
  - (E) Dissolution of family ties
21. It can be inferred that the author of the passage believes that *Mary Barton* might have been an even better novel if Gaskell had
  - (A) concentrated on the emotions of a single character
  - (B) made no attempt to re-create experiences of which she had no firsthand knowledge
  - (C) made no attempt to reproduce working-class dialects
  - (D) grown up in an industrial city

- (E) managed to transcend her position as an outsider
22. Which of the following phrases could best be substituted for the phrase “this aspect of *Mary Barton*” in line 29 without changing the meaning of the passage as a whole?
- (A) the material details in an urban working-class environment
- (B) the influence of *Mary Barton* on Lawrence’s early work
- (C) the place of *Mary Barton* in the development of the English novel
- (D) the extent of the poverty and physical suffering among England’s industrial workers in the 1840’s
- (E) the portrayal of the particular feelings and responses of working-class characters
23. The author of the passage describes *Mary Barton* as each of the following EXCEPT:
- (A) insightful
- (B) meticulous
- (C) vivid
- (D) poignant
- (E) lyrical

As of the late 1980’s, neither theorists nor large-scale computer climate models could accurately predict whether cloud systems would help or hurt a warming globe. Some studies suggested that a four percent increase in stratocumulus clouds over the ocean could compensate for a doubling in atmospheric carbon dioxide, preventing a potentially disastrous planetwide temperature increase. On the other hand, an increase in cirrus clouds could increase global warming.

That clouds represented the weakest element in climate models was illustrated by a study of fourteen such models. Comparing climate forecasts for a world with double the current amount of carbon dioxide, researchers found that the models agreed quite well if clouds were not included. But when clouds were incorporated, a wide range of forecasts was produced. With such discrepancies plaguing the models, scientists could not easily predict how quickly the world’s climate would change, nor could they tell which regions would face dustier droughts or deadlier monsoons.

24. The author of the passage is primarily concerned with
- (A) confirming a theory
- (B) supporting a statement
- (C) presenting new information
- (D) predicting future discoveries
- (E) reconciling discrepant findings
25. It can be inferred that one reason the fourteen models described in the passage failed to agree was that
- (A) they failed to incorporate the most up-to-date information about the effect of clouds on climate
- (B) they were based on faulty information about factors other than clouds that affect climate
- (C) they were based on different assumptions about the overall effects of clouds on climate
- (D) their originators disagreed about the kinds of forecasts the models should provide
- (E) their originators disagreed about the factors other than clouds that should be included in the models
26. It can be inferred that the primary purpose of the models included in the study discussed in

the second paragraph of the passage was to

- (A) predict future changes in the world's climate
- (B) predict the effects of cloud systems on the world's climate
- (C) find a way to prevent a disastrous planetwide temperature increase
- (D) assess the percentage of the Earth's surface covered by cloud systems
- (E) estimate by how much the amount of carbon dioxide in the Earth's atmosphere will increase

27. The information in the passage suggests that scientists would have to answer which of the following questions in order to predict the effect of clouds on the warming of the globe?

- (A) What kinds of cloud systems will form over the Earth?
- (B) How can cloud systems be encouraged to form over the ocean?
- (C) What are the causes of the projected planetwide temperature increase?
- (D) What proportion of cloud systems are currently composed of cirrus of clouds?
- (E) What proportion of the clouds in the atmosphere form over land masses?

1996 04

### SECTION A

For many years, Benjamin Quarles' seminal account of the participation of African Americans in the American Revolution has remained the standard work in the field. According to Quarles, the outcome of this conflict was mixed for African American slaves who enlisted in Britain's fight against its rebellious American colonies **in return for** the promise of freedom: the British treacherously resold many into slavery in the **West Indies**, while others obtained freedom in Canada and Africa. Building on Quarles' analysis of the latter group, Sylvia Frey studied the former slaves who emigrated to British colonies in Canada. According to Frey, these refugees—the most successful of the African American Revolutionary War participants—viewed themselves as the ideological heirs of the American Revolution. Frey sees this inheritances reflected in their demands for the same rights that the American revolutionaries had demanded from the British: land ownership, limits to arbitrary authority and burdensome taxes, and freedom of religion.

17. According to the passage, which of the following is true about the African American Revolutionary War participants who settled in Canada after the American Revolution?
- (A) Although they were politically unaligned with either side, they identified more with British ideology than with American ideology.
  - (B) While they were not immediately betrayed by the British, they ultimately suffered the same fate as did African American Revolutionary War participants who were resold into slavery in the West Indies.
  - (C) They settled in Canada rather than in Africa because of the greater religious freedom available in Canada.
  - (D) They were more politically active than were African American Revolutionary War participants who settled in Africa.
  - (E) They were more successful than were African American Revolutionary War participants who settled Africa.
18. Which of the following is most analogous to the relationship between the African American Revolutionary War participants who settled in Canada after the American Revolution and the



American revolutionaries, as that relationship is described in the passage?

- (A) A brilliant pupil of a great musician rebels against the teacher, but adopts the teacher's musical style after the teacher's unexpected death.
  - (B) Two warring rulers finally make peace after a lifetime of strife when they realize that they have been duped by a common enemy.
  - (C) A child who has sided with a domineering parent against a defiant sibling later makes demands of the parent similar to those once made by the sibling.
  - (D) A writer spends much of her life popularizing the work of her mentor, only to discover late in life that much of the older writer's work is plagiarized from the writings of a foreign contemporary.
  - (E) Two research scientists spend much of their careers working together toward a common goal, but later quarrel over which of them should receive credit for the training of a promising student.
19. The author of the passage suggests that which of the following is true of Benjamin Quarles' work?
- (A) It introduced a new and untried research methodology.
  - (B) It contained theories so controversial that they gave rise to an entire generation of scholarship.
  - (C) It was a pioneering work that has not yet been displaced by subsequent scholarship.
  - (D) It launched the career of a scholar who later wrote even more important works.
  - (E) At the time it appeared, its author already enjoyed a well-established reputation in the field.
20. Which of the following can be inferred from the passage concerning Britain's rule in its Canadian colonies after the American Revolution?
- (A) Humiliated by their defeat by the Americans, the British sharply curtailed civil rights in their Canadian colonies.
  - (B) The British largely ignored their Canadian colonies.
  - (C) The British encouraged the colonization of Canada by those African Americans who had served on the American side as well as by those who had served on the British side.
  - (D) Some of Britain's policies in its Canadian colonies were similar to its policies in its American colonies before the American Revolution.
  - (E) To reduce the debt incurred during the war, the British imposed even higher taxes on the Canadian colonists than they had on the American colonists.

Over the years, biologists have suggested two main pathways by which **sexual selection** may have shaped the evolution of male birdsong. In the first, male competition and intrasexual selection produce relatively short, simple songs used mainly in territorial behavior. In the second, female choice and intersexual selection produce longer, more complicated songs used mainly in mate attraction; like such visual ornamentation as the peacock's tail, elaborate vocal characteristics increase the male's chances of being chosen as a mate, and he thus enjoys more reproductive success than his less ostentatious rivals. The two pathways are not mutually exclusive, and we can expect to find examples that reflect their interaction. **Teasing** them apart has been an important challenge to evolutionary biologists.

Early research confirmed the role of intrasexual selection. In a variety of experiments in the field, males responded aggressively to recorded songs by exhibiting territorial behavior near the speakers. The breakthrough for research into intersexual selection came in the development of a new technique for



investigating female response in the laboratory. When female **cowbirds** raised in isolation in sound-proof chambers were exposed to recordings of male song, they responded by exhibiting mating behavior. By quantifying the responses, researchers were able to determine what particular features of the song were most important. In further experiments on **song sparrows**, researchers found that when exposed to a single song type repeated several times or to a repertoire of different song types, females responded more to the latter. The **beauty** of the experimental design is that it effectively rules out confounding variables; acoustic isolation assures that the female can respond only to the song structure itself.

If intersexual selection operates as theorized, males with more complicated songs should not only attract females more readily but should also enjoy greater reproductive success. At first, however, researchers doing fieldwork with song sparrows found no correlation between larger repertoires and early mating, which has been shown to be one indicator of reproductive success; further, common measures of male quality used to predict reproductive success, such as weight, size, age, and territory, also failed to correlate with song complexity.

The confirmation researchers had been seeking was finally achieved in studies involving two varieties of warblers. Unlike the song sparrow, which repeats one of its several song types in bouts before switching to another, the warbler continuously composes much longer and more variable songs without repetition. **For the first time**, researchers found a significant correlation between repertoire size and early mating, and they discovered further that repertoire size had a more significant effect than any other measure of male quality on the number of young produced. The evidence suggests that warblers use their extremely elaborate songs primarily to attract females, clearly confirming the effect of intersexual selection on the evolution of birdsong.

21. The passage is primarily concerned with
  - (A) showing that intrasexual selection has a greater effect on birdsong than does intersexual selection
  - (B) contrasting the role of song complexity in several species of birds
  - (C) describing research confirming the suspected relationship between intersexual selection and the complexity of birdsong
  - (D) demonstrating the superiority of laboratory work over field studies in evolutionary biology
  - (E) illustrating the effectiveness of a particular approach to experimental design in evolutionary biology
22. The author mentions the peacock's tail in line 8 most probably in order to
  - (A) cite an exception to the theory of the relationship between intrasexual selection and male competition
  - (B) illustrate the importance of both of the pathways that shaped the evolution of birdsong
  - (C) draw a distinction between competing theories of intersexual selection
  - (D) give an example of a feature that may have evolved through intersexual selection by female choice
  - (E) refute a commonly held assumption about the role of song in mate attraction
23. According to the passage, which of the following is specifically related to intrasexual selection?
  - (A) Female choice
  - (B) Territorial behavior
  - (C) Complex song types
  - (D) Large song repertoires

- (E) Visual ornamentation
24. Which of the following, if true, would most clearly demonstrate the interaction mentioned in lines 11-13?
- (A) Female larks respond similarly both to short, simple songs and to longer, more complicated songs.
  - (B) Male canaries use visual ornamentation as well as elaborate song repertoires for mate attraction.
  - (C) Both male and female blackbirds develop elaborate visual and vocal characteristics.
  - (D) Male jays use songs to compete among themselves and to attract females.
  - (E) Male robins with elaborate visual ornamentation have as much reproductive success as rivals with elaborate vocal characteristics.
25. The passage indicates that researchers raised female cowbirds in acoustic isolation in order to
- (A) eliminate confounding variables
  - (B) approximate field conditions
  - (C) measure reproductive success
  - (D) quantify repertoire complexity
  - (E) prevent early mating
26. According to the passage, the song sparrow is unlike the warbler in that the song sparrow
- (A) uses songs mainly in territorial behavior
  - (B) continuously composes long and complex songs
  - (C) has a much larger song repertoire
  - (D) repeats one song type before switching to another
  - (E) responds aggressively to recorded songs
27. The passage suggests that the song sparrow experiments mentioned in lines 37-43 failed to confirm the role of intersexual selection because
- (A) females were allowed to respond only to the song structure
  - (B) song sparrows are unlike other species of birds
  - (C) the experiments provided no evidence that elaborate songs increased male reproductive success
  - (D) the experiments included the songs of only a small number of different song sparrows
  - (E) the experiments duplicated some of the limitations of previous field studies

## SECTION B

An experiment conducted aboard Space Lab in 1983 was the first attempt to grow protein crystals in the low-gravity environment of space. That experiment is still cited as evidence that growing crystals in microgravity can increase crystal size: the authors reported that they grew **lysozyme** protein crystals 1,000 times larger than crystals grown in the same device on Earth. Unfortunately, the authors did not point out that their crystals were no larger than the average crystal grown using other, more standard techniques in an Earth laboratory.

No research has yet produced results that could justify the enormous costs of producing crystals **on a large scale** in space. To get an unbiased view of the usefulness of microgravity crystal growth, crystals

grown in space must be compared with the best crystals that have been grown with standard techniques on Earth. Given the great expense of conducting such experiments with proper controls, and the limited promise of experiments performed thus far, it is questionable whether further experiments in this area should even be conducted.

17. According to the passage, which of the following is true about the Space Lab experiment conducted in 1983?
  - (A) It was the first experiment to take place in the microgravity environment of space.
  - (B) It was the first experiment in which researchers in space were able to grow lysozyme protein crystals greater in size than those grown on Earth.
  - (C) Its results have been superseded by subsequent research in the field of microgravity protein crystal growth.
  - (D) Its results are still considered by some to be evidence for the advantages of microgravity protein crystal growth.
  - (E) Its results are considered by many to be invalid because nonstandard techniques were employed.
18. It can be inferred from the passage that the author would find the Space Lab experiment more impressive if which of the following were true?
  - (A) The results of the Space Lab experiment could be replicated in producing other kinds of crystals in addition to lysozyme protein.
  - (B) The device used in the experiment produced larger crystals on Earth than it did in space.
  - (C) The size of the crystals produced in the experiment exceeded the size of crystals grown in Earth laboratories using standard techniques.
  - (D) The cost of producing the crystals in space exceeded that of producing them using standard laboratory techniques.
  - (E) The standard techniques used in Earth laboratories were modified in the Space Lab experiment due to the effects of microgravity.
19. Which of the following can be inferred from the passage about the device used to grow crystals in the Space Lab experiment?
  - (A) The device is more expensive to manufacture than are the devices used in standard techniques in an Earth laboratory.
  - (B) The device has not been used to grow crystals in space since the Space Lab experiment of 1983.
  - (C) Crystals grown in the device on Earth tend to be much smaller than crystals grown in it in space.
  - (D) Crystals grown in the device in space have been exceeded in size by crystals grown in subsequent experiments in space using other devices.
  - (E) The experiments in which the device was used were conducted with proper controls.
20. The passage suggests that the author would most probably agree with which of the following assessments of the results of the Space Lab experiment?
  - (A) Although the results of the experiment are impressive, the experiment was too limited in scope to allow for definitive conclusions.
  - (B) The results of the experiment are impressive on the surface, but the report is misleading.

- (C) The results of the experiment convincingly confirm what researchers have long suspected.
- (D) Because of design flaws, the experiment did not yield any results relevant to the issue under investigation.
- (E) The results of the experiment are too contradictory to allow for easy interpretation.

In 1923 the innovative Russian filmmaker Dziga Vertov described filmmaking as a process that leads viewers toward a “fresh perception of the world.” Vertov’s description of filmmaking should apply to films on the subject of art. Yet films on art have not had a powerful and pervasive effect on the way we see.

Publications on art flourish, but these books and articles do not necessarily succeed in teaching us to see more deeply or more clearly. Much writing in art history advances the discourse in the field but is unlikely to inform the eye of one unfamiliar with its polemics. Films, however, with their capacity to present material visually and to reach a broader audience, have the potential to enhance visual literacy (the ability to identify the details that characterize a particular style) more effectively than publications can. Unfortunately, few of the hundred or so films on art that are made each year in the United States are broadcast nationally on prime-time television.

The fact that films on art are rarely seen on prime-time television may be due not only to limitations on distribution but also to the shortcomings of many such films. Some of these shortcomings can be attributed to the failure of art historians and filmmakers to collaborate closely enough when making films on art. These professionals are able, within their respective disciplines, to increase our awareness of visual forms. For close collaboration to occur, professionals in each discipline need to recognize that films on art can be both educational and entertaining, but this will require compromise on both sides.

A filmmaker who is creating a film about the work of an artist should not follow the standards set by rock videos and advertising. Filmmakers need to resist the impulse to move the camera quickly from detail to detail for fear of boring the viewer, to frame the image for the sake of drama alone, to add music for fear of silence. Filmmakers are aware that an art object demands concentration and, at the same time, are concerned that it may not be compelling enough—and so they hope to provide relief by interposing “real” scenes that bear only a tangential relationship to the subject. But a work of art needs to be explored on its own terms. On the other hand, art historians need to trust that one can indicate and analyze, not solely with words, but also by directing the viewer’s gaze. The specialized written language of art history needs to be relinquished or at least tempered for the screen. Only an effective collaboration between filmmakers and art historians can create films that will enhance viewers’ perceptions of art.

21. The passage suggests that a filmmaker desiring to enhance viewers’ perceptions of art should do which of the following?
- (A) Rely on the precise language of art history when developing scripts for films on art.
  - (B) Rely on dramatic narrative and music to set a film’s tone and style.
  - (C) Recognize that a work of art by itself can be compelling enough to hold a viewer’s attention.
  - (D) Depend more strongly on narration instead of camera movements to guide the viewer’s gaze.
  - (E) Emphasize the social and the historical contexts within which works of art have been created.
22. The author of the passage refers to Vertov in the first paragraph most probably in order to
- (A) provide an example of how films can be used to influence perceptions
  - (B) present evidence to support the argument that films have been used successfully to influence viewers’ perceptions
  - (C) introduce the notion that film can influence how viewers see

- (D) contrast a traditional view of the uses of film with a more modern view
  - (E) describe how film can change a viewer's perception of a work of art
23. Which of the following best describes the organization of the passage?
- (A) An observation about an unsatisfactory situation is offered, the reasons for the situation are discussed, and then ways to change it are suggested.
  - (B) Two opinions regarding a controversial phenomenon are contrasted, supporting evidence for each is presented, and then the two opinions are reconciled.
  - (C) Criticism of a point of view is discussed, the criticism is answered, and then the criticism is applied to another point of view.
  - (D) A point of view is described, evidence supporting the view is provided, and then a summary is presented.
  - (E) A strategy is presented, reasons for its past failure are discussed, and then a recommendation that will be abandoned is offered.
24. The passage is primarily concerned with
- (A) discussing why film's potential as a medium for presenting art to the general public has not been fully realized and how film might be made more effective in this regard
  - (B) discussing the shortcomings of films on art and the technological innovations required to increase the impact of film on visual literacy
  - (C) discussing the advantages and the disadvantages of using films rather than publications to present works of art to the general public
  - (D) presenting information to support the view that films on art must focus more on education and less on entertainment in order to increase visual literacy
  - (E) presenting information to support the view that films on art, because they reach a broader audience than many other kinds of media, have had greater success in promoting visual literacy
25. The author would most likely agree with which of the following statements about film and visual literacy?
- (A) Reading a publication about a work of art and then seeing a film about the same work is the most effective way to develop visual literacy.
  - (B) An increase in a viewer's awareness of visual forms will also lead to an increased **attention span**.
  - (C) Film has a great but not yet fully exploited capacity to increase viewers' awareness of visual forms.
  - (D) A film that focuses on the details of a work of art will hinder the development of visual literacy.
  - (E) Films on art would more effectively enhance the visual literacy of teenagers if filmmakers followed the standards set by rock videos.
26. According to the passage, art historians desiring to work with filmmakers to enhance the public's appreciation of art need to acknowledge which of the following?
- (A) The art historian's role in the creation of a film on art is likely to be a relatively minor one.
  - (B) Film provides an ideal opportunity to acquaint viewers with a wide range of issues that

- relate incidentally to a work of art.
- (C) An in-depth analysis of a work of art is not an appropriate topic for a film on art.
- (D) Although silence may be an appropriate background when viewing a work of art in a museum, it is inappropriate in a film.
- (E) Film can use nonverbal means to achieve some of the same results that a spoken or written discourse can achieve.
27. Which of the following would describe the author's most likely reaction to a claim that films on art would more successfully promote visual literacy if they followed the standards set for rock videos?
- (A) Ambivalence
- (B) Indifference
- (C) Sympathy
- (D) Interest
- (E) Disdain

1996 10

### SECTION A

This is not to deny that the Black gospel music of the early twentieth century differed in important ways from the slave spirituals. Whereas spirituals were created and disseminated in folk fashion, gospel music was composed, published, copyrighted, and sold by professionals. Nevertheless, improvisation remained central to gospel music. One has only to listen to the recorded repertoire of gospel songs to realize that Black gospel singers rarely sang a song precisely the same way twice and never according to its exact musical notation. They performed what jazz musicians call "head arrangements" proceeding from their own feelings and from the way "the spirit" moved them at the time. This improvisatory element was reflected in the manner in which gospel music was published. Black gospel composers scored the music intended for White singing groups fully, indicating the various vocal parts and the accompaniment, but the music produced for Black singers included only a vocal line and piano accompaniment.

17. Which of the following best describes "head arrangement" as the term is used in line 11?
- (A) A published version of a gospel song produced for use by Black singers
- (B) A gospel song based on a slave spiritual
- (C) A musical score shared by a gospel singer and a jazz musician
- (D) An informally written composition intended for use by a gospel singer
- (E) An improvised performance inspired by the singer's emotions
18. The author mentions "folk fashion" (line 4) most likely in order to
- (A) counter an assertion about the role of improvisation in music created by Black people
- (B) compare early gospel music with gospel music written later in the twentieth century
- (C) make a distinction between gospel music and slave spirituals
- (D) introduce a discussion about the dissemination of slave spirituals
- (E) describe a similarity between gospel music and slave spirituals
19. The passage suggests which of the following about Black gospel music and slave spirituals?
- (A) Both became widely known in the early twentieth century.

- (B) Both had an important improvisatory element.
  - (C) Both were frequently performed by jazz musicians.
  - (D) Both were published with only a vocal line and piano accompaniment.
  - (E) Both were disseminated chiefly by Black singing groups.
20. Of the following sentences, which is most likely to have immediately preceded the passage?
- (A) Few composers of gospel music drew on traditions such as the spiritual in creating their songs.
  - (B) Spirituals and Black gospel music were derived from the same musical tradition.
  - (C) The creation and singing of spirituals, practiced by Black Americans before the Civil War, continued after the war.
  - (D) Spirituals and gospel music can be clearly distinguished from one another.
  - (E) Improvisation was one of the primary characteristics of the gospel music created by Black musicians.

About a century ago, the Swedish physical scientist Arrhenius proposed a law of classical chemistry that relates chemical reaction rate to temperature. According to the Arrhenius equation, chemical reactions are increasingly unlikely to occur as temperatures approach **absolute zero**, and at absolute zero (zero degrees Kelvin, or minus 273 degrees Celsius) reactions stop. However, recent experimental evidence reveals that although the Arrhenius equation is generally accurate in describing the kind of chemical reaction that occurs at relatively high temperatures, at temperatures closer to zero a quantum-mechanical effect known as tunneling comes into play; this effect accounts for chemical reactions that are forbidden by the principles of classical chemistry. Specifically, entire molecules can “tunnel” through the barriers of repulsive forces from other molecules and chemically react even though these molecules do not have sufficient energy, according to classical chemistry, to overcome the repulsive barrier.

The rate of any chemical reaction, regardless of the temperature at which it takes place, usually depends on a very important characteristic known as its activation energy. Any molecule can be imagined to reside at the bottom of a so-called potential well of energy. A chemical reaction corresponds to the transition of a molecule from the bottom of one potential well to the bottom of another. In classical chemistry, such a transition can be accomplished only by going over the potential barrier between the wells, the height of which remains constant and is called the activation energy of the reaction. In tunneling, the reacting molecules tunnel from the bottom of one to the bottom of another well without having to rise over the barrier between the two wells. Recently researchers have developed the concept of tunneling temperature: the temperature below which tunneling transitions greatly outnumber Arrhenius transitions, and classical mechanics gives way to its quantum counterpart.

This tunneling phenomenon at very low temperatures suggested my hypothesis about a cold prehistory of life: the formation of rather complex organic molecules in the deep cold of outer space, where temperatures usually reach only a few degrees Kelvin. Cosmic rays (high-energy protons and other particles) might trigger the synthesis of simple molecules, such as interstellar formaldehyde, in dark clouds of interstellar dust. Afterward complex organic molecules would be formed, slowly but surely, by means of tunneling. After I offered my hypothesis, Hoyle and Wickramasinghe argued that molecules of interstellar formaldehyde have indeed evolved into stable polysaccharides such as cellulose and starch. Their conclusions, although strongly disputed, have generated excitement among investigators such as myself who are proposing that the galactic clouds are the places where the **prebiological** evolution of compounds necessary to life occurred.

21. The author of the passage is primarily concerned with
- (A) describing how the principles of classical chemistry were developed
  - (B) initiating a debate about the kinds of chemical reactions required for the development of life

- (C) explaining how current research in chemistry may be related to broader biological concerns
  - (D) reconciling opposing theories about chemical reactions
  - (E) clarifying inherent ambiguities in the laws of classical chemistry
22. According to the passage, classical chemical reactions and tunneling reactions are alike in which of the following ways?
- (A) In both types of reactions, reacting molecules have to rise over the barrier between the two wells.
  - (B) In both types of reactions, a transition is made from the bottom of one potential well to the bottom of another.
  - (C) In neither type of reaction does the height of the barrier between the wells remain constant.
  - (D) In neither type of reaction does the rate of a chemical reaction depend on its activation energy.
  - (E) In both types of reactions, reacting molecules are able to go through the barrier between the two wells.
23. According to the Arrhenius equation as discussed in the passage, which of the following statements about chemical reactions is true?
- (A) Chemical reactions are less likely to occur at temperatures close to absolute zero.
  - (B) In some cases the rate of a chemical reaction is related to temperature and in other cases it is not.
  - (C) Chemical reactions frequently occur at a few degrees above absolute zero, but they are very unpredictable.
  - (D) The rate of a chemical reaction depends on many other factors besides temperature.
  - (E) Chemical reaction rate and temperature are not related.
24. The author's attitude toward the theory of a cold pre-history of life can best be described as
- (A) neutral
  - (B) skeptical
  - (C) mildly positive
  - (D) very supportive
  - (E) pointedly critical
25. The author's hypothesis concerning the cold prehistory of life would be most weakened if which of the following were true?
- (A) Cosmic rays are unlikely to trigger the formation of simple molecules.
  - (B) Tunneling occurs only in a narrow band of temperatures around zero degrees Kelvin.
  - (C) The synthesis of interstellar formaldehyde can be activated by means other than cosmic rays.
  - (D) Simple molecules can be synthesized by means of tunneling.
  - (E) Classical chemical reactions do not occur at temperatures close to absolute zero.
26. Which of the following best describes the hypothesis of Hoyle and Wickramasinghe as it is



presented in the passage?

- (A) Cosmic rays can directly synthesize complex organic molecules.
  - (B) The galactic clouds are the places where prebiological evolution of compounds necessary to life occurred.
  - (C) Interstellar formaldehyde can be synthesized by tunneling.
  - (D) Molecules of interstellar formaldehyde can evolve into complex organic molecules.
  - (E) Complex organic molecules can be synthesized from stable polysaccharides such as cellulose and starch.
27. Which of the following best describes the organization of the first two paragraphs of the passage?
- (A) The author cites a basic principle of classical chemistry and then describes the research from which that principle was developed.
  - (B) The author cites an apparent contradiction to the principles of classical chemistry and then explains the process of a chemical reaction to show there is in fact no contradiction.
  - (C) The author describes the role of heat in chemical reactions and then offers a detailed explanation of its function.
  - (D) The author presents a law of classical chemistry in order to introduce a kind of chemical reaction that differs from it and then explains the essential difference between the two.
  - (E) The author presents the fundamental rules of classical chemistry in order to introduce an explanation of a specific chemical reaction.

## SECTION B

Although the hormone adrenaline is known to regulate memory storage, it does not pass from the blood into brain cells. We are faced with an apparent paradox: how can a hormone that does not act directly on the brain have such a large effect on brain function?

Recently, we tested the possibility that one of the hormone's actions outside the brain might be responsible. Since one consequence of adrenaline release in an animal is an increase in blood glucose levels, we examined the effects of glucose on memory in rats. We found that glucose injected immediately after training enhances memory tested the next day. Additional evidence was provided by negative findings: drugs called adrenergic antagonists, which block peripheral adrenaline receptors, disrupted adrenaline's ability to regulate memory but did not affect memory enhancements produced by glucose that was not stimulated by adrenaline. These results are as they should be if adrenaline affects memory modulation by increasing blood glucose levels.

17. The primary purpose of the passage is to
- (A) reconcile two opposing theories
  - (B) compare two different explanations for a phenomenon
  - (C) describe experimental research that appears to support an unpopular theory
  - (D) present evidence that may help to resolve an apparent contradiction
  - (E) describe a hypothesis that has caused a controversy
18. It can be inferred from the passage that the author would most likely describe the "additional evidence" (line 12) provided by experiments with adrenergic antagonists as
- (A) revolutionary

- (B) disappointing
- (C) incomplete
- (D) unexpected
- (E) corroborative

19. The passage provides information about which of the following topics?
- (A) The mechanism by which glucose affects memory storage
  - (B) The evidence that prompted scientist to test the effects of adrenaline on memory regulation
  - (C) The reason that the effects of glucose on memory were tested
  - (D) The ways that memory storage modifies the structure of the brain
  - (E) The kinds of training used to test memory enhancement in rats
20. The author refers to the results of the experiment using adrenergic antagonists as “negative findings” (line 13) most likely because the adrenergic antagonists
- (A) failed to disrupt adrenaline’s effect on memory
  - (B) did not affect glucose’s ability to enhance memory
  - (C) did not block adrenaline’s ability to increase blood glucose levels
  - (D) only partially affected adrenaline’s ability to enhance memory
  - (E) disrupted both adrenaline’s and glucose’s effect on memory

The age at which young children begin to make moral discriminations about harmful actions committed against themselves or others has been the focus of recent research into the moral development of children. Until recently, child psychologists supported pioneer developmentalist Jean. Piaget in his hypothesis that because of their immaturity, children under age seven do not take into account the intentions of a person committing accidental or deliberate harm, but rather simply assign punishment for transgressions on the basis of the magnitude of the negative consequences caused. According to Piaget, children under age seven occupy the first stage of moral development, which is characterized by moral absolutism (rules made by authorities must be obeyed) and imminent justice (if rules are broken, punishment will be meted out). Until young children mature, their moral judgments are based entirely on the effect rather than the cause of a transgression. However, in recent research, Keasey found that six-year-old children not only distinguish between accidental and intentional harm, but also judge intentional harm as naughtier, regardless of the amount of damage produced. Both of these findings seem to indicate that children, at an earlier age than Piaget claimed, advance into the second stage of moral development, moral autonomy, in which they accept social rules but view them as more arbitrary than do children in the first stage.

Keasey’s research raises two key questions for developmental psychologists about children under age seven: do they recognize justifications for harmful actions, and do they make distinctions between harmful acts that are preventable and those acts that have unforeseen harmful consequences? Studies indicate that justifications excusing harmful actions might include public duty, self-defense, and provocation. For example, Nesdale and Rule concluded that children were capable of considering whether or not an aggressor’s action was justified by public duty: five year olds reacted very differently to “Bonnie wrecks Ann’s pretend house” depending on whether Bonnie did it “so somebody won’t fall over it” or because Bonnie wanted “to make Ann feel bad.” Thus, a child of five begins to understand that certain harmful actions, though intentional, can be justified; the constraints of moral absolutism no longer solely guide their judgments.

Psychologists have determined that during kindergarten children learn to make subtle distinctions involving harm. Darley observed that among acts involving unintentional harm, six-year-old children just entering kindergarten could not differentiate between foreseeable, and thus preventable, harm and

unforeseeable harm for which the perpetrator cannot be blamed. Seven months later, however, Darley found that these same children could make both distinctions, thus demonstrating that they had become morally autonomous.

21. Which of the following best describes the passage as a whole?
  - (A) An outline for future research
  - (B) An expanded definition of commonly misunderstood terms
  - (C) An analysis of a dispute between two theorists
  - (D) A discussion of research findings in an ongoing inquiry
  - (E) A confirmation of an established authority's theory
22. According to the passage, Darley found that after seven months of kindergarten six year olds acquired which of the following abilities?
  - (A) Differentiating between foreseeable and unforeseeable harm
  - (B) Identifying with the perpetrator of a harmful action
  - (C) Justifying harmful actions that result from provocation
  - (D) Evaluating the magnitude of negative consequences resulting from the breaking of rules
  - (E) Recognizing the difference between moral absolutism and moral autonomy
23. According to the passage, Piaget and Keasey would not have agreed on which of the following points?
  - (A) The kinds of excuses children give for harmful acts they commit
  - (B) The age at which children begin to discriminate between intentional and unintentional harm
  - (C) The intentions children have in perpetrating harm
  - (D) The circumstances under which children punish harmful acts
  - (E) The justifications children recognize for mitigating punishment for harmful acts
24. It can be inferred that the term "public duty" (line 33) in the context of the passage means which of the following?
  - (A) The necessity to apprehend perpetrators.
  - (B) The responsibility to punish transgressors
  - (C) An obligation to prevent harm to another
  - (D) The assignment of punishment for harmful action
  - (E) A justification for punishing transgressions
25. According to the passage, Keasey's findings support which of the following conclusions about six-year-old children?
  - (A) They have the ability to make autonomous moral judgments.
  - (B) They regard moral absolutism as a threat to their moral autonomy.
  - (C) They do not understand the concept of public duty.
  - (D) They accept moral judgment made by their peers more easily than do older children.
  - (E) They make arbitrary moral judgments.
26. It can be inferred from the passage that Piaget would be likely to agree with which of the following statements about the punishment that children under seven assign to wrongdoing?

- (A) The severity of the assigned punishment is determined by the perceived magnitude of negative consequences more than by any other factor.
  - (B) The punishment is to be administered immediately following the transgression.
  - (C) The children assign punishment less arbitrarily than they do when they reach the age of moral autonomy.
  - (D) The punishment for acts of unintentional harm is less severe than it is for acts involving accidental harm.
  - (E) The more developmentally immature a child, the more severe the punishment that the child will assign.
27. According to the passage, the research of Nesdale and Rule suggests which of the following about five-year-old children?
- (A) Their reactions to intentional and accidental harm determine the severity of the punishments they assign.
  - (B) They, as perpetrators of harmful acts, disregard the feelings of the children they harm.
  - (C) They take into account the motivations of actions when judging the behavior of other children.
  - (D) They view public duty as a justification for accidental, but not intentional, harm.
  - (E) They justify any action that protects them from harm.

1997 04

### SECTION A

Geologists Harris and Gass hypothesized that the Red Sea rift developed along the line of a suture (a splice in the Earth's crust) formed during the late Proterozoic era, and that significant observable differences in the composition of the upper layers of rocks deposited on either side of the suture give clues to the different natures of the underlying igneous rocks.

Other geologists argued that neither the upper rock layer nor the underlying igneous rocks on the one side of the rift differ fundamentally from the corresponding layers on the other side. These geologists believe, therefore, that there is inadequate evidence to conclude that a suture underlies the rift.

In response, Harris and Gass asserted that the upper rock layers on the two sides of the rift had not been shown to be of similar age, structure, or geochemical content. Furthermore, they cited new evidence that the underlying igneous rocks on either side of the rift contain significantly different kinds of rare metals.

17. Part of the Harris and Gass hypothesis about the Red Sea rift would be weakened if it could be demonstrated that the composition of upper rock layers
- (A) cannot cause a suture to develop
  - (B) has no effect on where a suture will occur
  - (C) cannot provide information about the nature of underlying rocks
  - (D) is similar on the two sides of a rift unless a suture divides the two sides
  - (E) is usually different from the composition of underlying rocks
18. It can be inferred from the passage that the "Other geologists" (line 8) would be most likely to agree with which of the following statements?
- (A) Similar geological features along both sides of a possible suture imply the existence of that suture.

- (B) Sutures can be discovered only where they are not obscured by superimposed geological features.
  - (C) The composition of igneous rocks permits prediction of the likelihood of a rift developing through them.
  - (D) It is possible to date igneous rocks by carefully studying the different kinds of rare metals contained in them and by observing their similarity to the layer of rock that lies above them.
  - (E) The existence of rock layers on one side of a rift that are similar in composition to rock layers on the other side suggests that no suture exists between the two sides.
19. It can be inferred from the passage that Harris and Gass have done which of the following?
- (A) Drawn detailed diagrams of the Red Sea rift.
  - (B) Based their conclusions on the way in which sutures develop in the Earth's crust.
  - (C) Rejected other geologists' objections to their hypothesis about the Red Sea rift.
  - (D) Suggested that the presence of rare metals in rocks indicates an underlying suture.
  - (E) Asserted that rifts usually occur along the lines of sutures.
20. According to the passage, Harris and Gass have mentioned all of the following properties of rocks along the Red Sea rift EXCEPT:
- (A) age of the upper layers of rock
  - (B) structure of the upper layers of rocks
  - (C) geochemical content of the upper layers of rocks
  - (D) metallic content of the underlying igneous rocks
  - (E) age of the underlying igneous rocks

Proponents of different jazz styles have always argued that their predecessors' musical style did not include essential characteristics that define jazz as jazz. Thus, 1940's swing was belittled by beboppers of the 1950's, who were themselves attacked by free jazzers of the 1960's. The neoboppers of the 1980's and 1990's attacked almost everybody else. The titanic figure of Black saxophonist John Coltrane has complicated the arguments made by proponents of styles from bebop through neobop because in his own musical journey he drew from all those styles. His influence on all types of jazz was immeasurable. At the height of his popularity, Coltrane largely abandoned playing bebop, the style that had brought him fame, to explore the outer reaches of jazz.

Coltrane himself probably believed that the only essential characteristic of jazz was improvisation, the one constant in his journey from bebop to open-ended improvisations on modal, Indian, and African melodies. On the other hand, this dogged student and prodigious technician—who insisted on spending hours each day practicing scales from theory books—was never able to jettison completely the influence of bebop, with its fast and elaborate chains of notes and ornaments on melody.

Two stylistic characteristics shaped the way Coltrane played the tenor saxophone, he favored playing fast runs of notes built on a melody and depended on heavy, regularly accented beats. The first led Coltrane to "sheets of sound," where he raced faster and faster, pile-driving notes into each other to suggest stacked harmonies. The second meant that his sense of rhythm was almost as close to rock as to bebop.

Three recordings illustrate Coltrane's energizing explorations. Recording *Kind of Blue* with Miles Davis, Coltrane found himself outside bop, exploring modal melodies. Here he played surging, lengthy solos built largely around repeated motifs—an organizing principle unlike that of free jazz saxophone player Ornette Coleman, who modulated or altered melodies in his solos. On *Giant Steps*, Coltrane

debuted as leader, introducing his own compositions. Here the sheets of sound, downbeat accents, repetitions, and great speed are part of each solo, and the variety of the shapes of his phrases is unique. Coltrane's searching explorations produced solid achievement. *My Favorite Things* was another kind of watershed. Here Coltrane played the soprano saxophone, an instrument seldom used by jazz musicians. Musically, the results were astounding. With the soprano's piping sound, ideas that had sounded dark and brooding acquired a feeling of giddy fantasy.

When Coltrane began recording for the Impulse! label, he was still searching. His music became raucous, physical. His influence on rockers was enormous, including Jimi Hendrix, the rock guitarist, who, following Coltrane, raised the extended guitar solo using repeated motifs to a kind of rock art form.

21. The primary purpose of the passage is to
  - (A) discuss the place of Coltrane in the world of jazz and describe his musical explorations
  - (B) examine the nature of bebop and contrast it with improvisational jazz
  - (C) analyze the musical sources of Coltrane's style and their influence on his work
  - (D) acknowledge the influence of Coltrane's music on rock music and rock musicians
  - (E) discuss the arguments that divide the proponents of different jazz styles
22. The author implies that which of the following would have been an effect of Coltrane's having chosen to play the tenor rather than the soprano saxophone on *My Favorite Things*?
  - (A) The tone of the recording would have been more somber.
  - (B) The influence of bebop on the recording would have been more obvious.
  - (C) The music on the recording would have sounded less raucous and physical.
  - (D) His influence on rock music might have been less pervasive.
  - (E) The style of the recording would have been indistinguishable from that on *Kind of Blue*.
23. Which of the following best describes the organization of the fourth paragraph?
  - (A) A thesis referred to earlier in the passage is mentioned and illustrated with three specific examples.
  - (B) A thesis is stated and three examples are given each suggesting that a correction needs to be made to a thesis referred to earlier in the passage.
  - (C) A thesis referred to earlier in the passage is mentioned, and three examples are presented and ranked in order of their support of the thesis.
  - (D) A thesis is stated, three seemingly opposing examples are presented, and their underlying correspondence is explained.
  - (E) A thesis is stated, three dissimilar examples are considered, and the thesis is restated.
24. According to the passage, John Coltrane did all of the following during his career EXCEPT:
  - (A) improvise on melodies from a number of different cultures
  - (B) perform as leader as well as soloist
  - (C) spend time improving his technical skills
  - (D) experiment with the sounds of various instruments
  - (E) eliminate the influence of bebop on his own music
25. The author mentions the work of Ornette Coleman in the fourth paragraph in order to do which of the following?
  - (A) Expand the discussion by mentioning the work of a saxophone player who played in Coltrane's style.

- (B) Compare Coltrane's solos with the work of another jazz artist.
  - (C) Support the idea that rational organizing principles need to be applied to artistic work.
  - (D) Show the increasing intricacy of Coltrane's work after he abandoned bebop.
  - (E) Indicate disagreement with the way Coltrane modulated the motifs in his lengthy solos.
26. According to the passage, a major difference between Coltrane and other jazz musicians was the
- (A) degree to which Coltrane's music encompassed all of jazz
  - (B) repetition of motifs that Coltrane used in his solos
  - (C) number of his own compositions that Coltrane recorded
  - (D) indifference Coltrane maintained to musical technique
  - (E) importance Coltrane placed on rhythm in jazz
27. In terms of its tone and form, the passage can best be characterized as
- (A) dogmatic explanation
  - (B) indignant denial
  - (C) enthusiastic praise
  - (D) speculative study
  - (E) lukewarm review

## SECTION B

A special mucous coating that serves as a chemical camouflage allows clown fish to live among the deadly tentacles of the unsuspecting sea **anemone**. Utterly dependent on this unlikely host for protection from predators, clown fish have evolved in isolated communities, a pattern that has led to unusual behavioral adaptations.

The rigidly defined hierarchy of each clown-fish community is dominated by a monogamous breeding pair consisting of the largest fish, a female, and the next largest, a male, attended by a fixed number of sexually immature fish ranging in size from large to tiny. A remarkable adaptation is that the development of these juveniles is somehow arrested until the hierarchy changes; then they grow in **lockstep**, maintaining their relative sizes. While the community thus economizes on limited space and food resources, life is risky for newly spawned clown fish. On hatching, the hundreds of larvae drift off into the plankton. If, within three weeks, the defenseless larval clown fish locates a suitable anemone (either by pure chance or perhaps guided by chemicals secreted by the anemone), it may survive. However, if an anemone is fully occupied, the resident clown fish will repel any newcomer.

Though advantageous for established community members, the suspended and staggered maturation of juveniles might seem to pose a danger to the continuity of the community: there is only one successor for two breeding fish. Should one of a pair die, the remaining fish cannot swim off in search of a mate, nor is one likely to arrive. It would seem inevitable that reproduction must sometimes have to halt, **pending** the chance arrival and maturation of a larval fish of the appropriate sex.

This, however, turns out not to be the case. In experiments, vacancies have been contrived by removing an established fish from a community. Elimination of the breeding male triggers the prompt maturation of the largest juvenile. Each remaining juvenile also grows somewhat, and a minuscule newcomer drops in from the plankton. Removal of the female also triggers growth in all remaining fish and acceptance of a newcomer, but the female is replaced by the adult male. Within days, the male's behavior alters and physiological transformation is complete within a few months. Thus, whichever of the breeding pair is lost, a relatively large juvenile can fill the void, and reproduction can resume with a minimal loss of time. Furthermore, the new mate has already proved its ability to survive.

This transformation of a male into a female, or protandrous hermaphroditism, is rare among reef

fish. The more common protogynous hermaphroditism, where females change into males, does not occur among clown fish. An intriguing question for further research is whether a juvenile clown fish can turn directly into a female or whether it must function first as a male.

17. The passage is primarily concerned with
  - (A) analyzing the mutually advantageous relationship between two species
  - (B) comparing two forms of hermaphroditism among clown fish
  - (C) describing and explaining aspects of clown-fish behavior
  - (D) outlining proposed research on clown-fish reproduction
  - (E) attempting to reconcile inconsistent observations of clown-fish development
18. It can be inferred from the passage that the clown fish is able to survive in close association with the sea anemone because the
  - (A) sea anemone cannot detect the presence of the clown fish
  - (B) tentacles of the sea anemone cannot grasp the slippery clown fish
  - (C) sea anemone prefers other prey
  - (D) clown fish does not actually come within the range of the sea anemone's tentacles
  - (E) clown fish has developed tolerance to the sea anemone's poison
19. According to the passage, adult clown fish would be at a disadvantage if they were not associated with sea anemones because the clown fish would
  - (A) be incapable of sexual transformation
  - (B) be vulnerable to predators
  - (C) have no reliable source of food
  - (D) have to lay their eggs in the open
  - (E) face competition from other clown fish
20. It can be inferred from the passage that sex change would have been less necessary for the clown fish if
  - (A) the male clown fish were larger than the female
  - (B) each sea anemone were occupied by several varieties of clown fish
  - (C) many mature clown fish of both sexes occupied each sea anemone
  - (D) juvenile clown fish had a high mortality rate
  - (E) both male clown fish and female clown fish were highly territorial
21. The author mentions all of the following as characteristic of the "rigidly defined hierarchy" (line 8) of the clown-fish community EXCEPT:
  - (A) At any time only one female clown fish can be reproductively active
  - (B) The mature clown fish are monogamous
  - (C) The growth of clown fish is synchronized
  - (D) The maximum number of clown fish is fixed
  - (E) There are equal numbers of male juveniles and female juveniles
22. Which of the following statements about newly hatched clown fish can be inferred from the passage?
  - (A) They develop rapidly.



- (B) They remain close to the sea anemone occupied by their parents.
- (C) They are more sensitive to chemical signals than are adult clown fish.
- (D) They are not protected by their parents.
- (E) They are less vulnerable to predation than are adult fish.

23. Which of the following, if true, would be LEAST consistent with the author's explanation of the advantage of hermaphroditism for clown fish?

- (A) The number of individuals in a clown-fish community fluctuates significantly.
- (B) Adult clown fish frequently cannibalize their young.
- (C) The sea anemone tolerates clown fish only during a specific stage of the anemone's life cycle.
- (D) Juvenile clown fish rarely reach maturity.
- (E) Clown-fish communities are capable of efficiently recruiting solitary adult clown fish.

Comparing designs in music with visual designs raises interesting questions. We are familiar with the easy transfers of terms denoting qualities from one field to another. The basic problem can be put this way: can music sound the way a design looks? The elements of music are not the same as those of painting. They may be analogous, but to be analogous is not to be identical. Is it possible, then, for the same broad characteristics to **emerge from** different perceptual conditions?

Two facts about the relation between broad characteristics of a work and their perceptual conditions must be kept distinct. First, the global characteristics of a visual or auditory complex are determined by the discernible parts and their relationships. Thus, any notable change in the parts or their relationships produces a change in some of the global characteristics. Second, a change in the parts or their relationships may leave other global characteristics unchanged.

24. In the first paragraph, the author is primarily concerned with establishing the fact that

- (A) comparisons are not equations
- (B) auditory phenomena are not visual phenomena
- (C) frequently used comparisons are usually inaccurate
- (D) careless perceptions result from careless thought
- (E) questions concerning perception are psychological

25. In the passage, the author is primarily concerned with

- (A) distinguishing mutually exclusive categories
- (B) clarifying an apparent contradiction
- (C) supporting new ideas
- (D) analyzing a problem
- (E) comparing opinions

26. The second paragraph is primarily concerned with establishing the idea that

- (A) different global characteristics of a work result from the same discernible parts
- (B) the parts of a work of art influence the total perception of the work
- (C) visual and auditory characteristics can be combined
- (D) changes in the parts of a work remain isolated from the work as a whole
- (E) the visual complexes in a work of art influence the work's auditory complexes

27. Which of the following statements is most likely be a continuation of the passage?

- (A) The search for broad similarities thus begins by understanding and distinguishing these two facts.
- (B) The search for musical-visual analogies thus depends on the complexity of the works being compared.
- (C) The search for music and art of the highest quality thus depends on very different assumptions.
- (D) Thus music and painting exist in mutually exclusive worlds.
- (E) Thus music and painting are too complicated to be evaluated in terms of analogies.

1997 11

## SECTION A

Investigators of monkeys' social behavior have always been struck by monkeys' aggressive potential and the consequent need for social control of their aggressive behavior. Studies directed at describing aggressive behavior and the situations that elicit it, as well as the social mechanisms that control it, were therefore among the first investigations of monkeys' social behavior.

Investigators initially believed that monkeys would compete for any resource in the environment: hungry monkeys would fight over food, thirsty monkeys would fight over water, and, in general, any time more than one monkey in a group sought the same incentive simultaneously, a dispute would result and would be resolved through some form of aggression. However, the motivating force of competition for incentives began to be doubted when experiments like Southwick's on the reduction of space or the withholding of food failed to produce more than temporary increases in intragroup aggression. Indeed, food deprivation not only failed to increase aggression but in some cases actually resulted in decreased frequencies of aggression.

Studies of animals in the wild under conditions of extreme food deprivation likewise revealed that starving monkeys devoted almost all available energy to foraging, with little energy remaining for aggressive interaction. Furthermore, accumulating evidence from later studies of a variety of primate groups, for example, the study conducted by Bernstein, indicates that one of the most potent stimuli for eliciting aggression is the introduction of an intruder into an organized group. Such introductions result in far more serious aggression than that produced in any other types of experiments contrived to produce competition.

These studies of intruders suggest that adult members of the same species introduced to one another for the first time show considerable hostility because, in the absence of a social order, one must be established to control interanimal relationships. When a single new animal is introduced into an existing social organization, the newcomer meets even more serious aggression. Whereas in the first case aggression establishes a social order, in the second case resident animals mob the intruder, thereby initially excluding the new animal from the existing social unit. The simultaneous introduction of several animals lessens the effect, **if only because** the group divides its attention among the multiple targets. If, however, the several animals introduced to a group constitute their own social unit, each group may fight the opposing group as a unit; but, again, no individual is subjected to mass attack, and the very cohesion of the groups precludes prolonged individual combat. The submission of the defeated group, rather than unleashing unchecked aggression **on the part of** the victorious group, reduces both the intensity and frequency of further attack. Monkey groups therefore seem to be organized primarily to maintain their established social order rather than to engage in hostilities per se.

17. The author of the passage is primarily concerned with

- (A) advancing a new methodology for changing a monkey's social behavior
- (B) comparing the methods of several research studies on aggression among monkeys
- (C) explaining the reasons for researchers' interest in monkeys' social behavior

- (D) discussing the development of investigators' theories about aggression among monkeys
  - (E) examining the effects of competition on monkeys' social behavior
18. Which of the following best summarizes the findings reported in the passage about the effects of food deprivation on monkeys' behavior?
- (A) Food deprivation has no effect on aggression among monkeys.
  - (B) Food deprivation increases aggression among monkeys because one of the most potent stimuli for eliciting aggression is the competition for incentives.
  - (C) Food deprivation may increase long-term aggression among monkeys in a laboratory setting, but it produces only temporary increases among monkeys in the wild.
  - (D) Food deprivation may temporarily increase aggression among monkeys, but it also leads to a decrease in conflict.
  - (E) Food deprivation decreases the intensity but not the frequency of aggressive incidents among monkey.
19. According to the author, studies such as Southwick's had which of the following effects on investigators' theories about monkeys' social behavior?
- (A) They suggested that existing theories about the role of aggression among monkeys did not fully account for the monkeys' ability to maintain an established social order.
  - (B) They confirmed investigators' theories about monkeys' aggressive response to competition for food and water.
  - (C) They confirmed investigators' beliefs about the motivation for continued aggression among monkeys in the same social group.
  - (D) They disproved investigators' theory that the introduction of intruders in an organized monkey group elicits intragroup aggressive behavior.
  - (E) They cast doubt on investigators' theories that could account for observed patterns of aggression among monkeys.
20. The passage suggests that investigators of monkeys social behavior have been especially interested in aggressive behavior among monkeys because
- (A) aggression is the most common social behavior among monkeys
  - (B) successful competition for incentives determines the social order in a monkey group
  - (C) situations that elicit aggressive behavior can be studied in a laboratory
  - (D) most monkeys are potentially aggressive, yet they live in social units that could not function without control of their aggressive impulses
  - (E) most monkeys are social, yet they frequently respond to newcomers entering existing social units by attacking them
21. It can be inferred from the passage that the establishment and preservation of social order among a group of monkeys is essential in order to
- (A) keep the monkeys from straying and joining other groups
  - (B) control aggressive behavior among group members
  - (C) prevent the domination of that group by another
  - (D) protect individuals seeking to become members of that group from mass attack
  - (E) prevent aggressive competition for incentives between that group and another

22. The passage supplies information to answer which of the following questions?
- (A) How does the reduction of space affect intragroup aggression among monkeys in an experimental setting?
  - (B) Do family units within a monkey social group compete with other family units for food?
  - (C) What are the mechanisms by which the social order of an established group of monkeys controls aggression within that group?
  - (D) How do monkeys engaged in aggression with other monkeys signal submission?
  - (E) Do monkeys of different species engage in aggression with each other over food?
23. Which of the following best describes the organization of the second paragraph?
- (A) A hypothesis is explained and counter evidence is described.
  - (B) A theory is advanced and specific evidence supporting it is cited.
  - (C) Field observations are described and a conclusion about their significance is drawn.
  - (D) Two theories are explained and evidence supporting each of them is detailed.
  - (E) An explanation of a general principle is stated and specific examples of its operation are given.

Analysis of prehistoric air trapped in tiny bubbles beneath the polar ice sheets and of the composition of ice surrounding those bubbles suggests a correlation between carbon dioxide levels in the Earth's atmosphere and global temperature over the last 160,000 years. Estimates of global temperature at the time air in the bubbles was trapped rely on measuring the relative abundances of hydrogen and its heavier isotope, deuterium, in the ice surrounding the bubbles. When global temperatures are relatively low, water containing deuterium tends to condense and precipitate before reaching the poles; thus, ice deposited at the poles when the global temperature was cooler contained relatively less deuterium than ice deposited at warmer global temperatures. Estimates of global temperature based on this information, combined with analysis of the carbon dioxide content of air trapped in ice deep beneath the polar surface, suggest that during periods of postglacial warming carbon dioxide in the Earth's atmosphere increased by approximately 40 percent.

24. In the passage, the author is primarily concerned with doing which of the following?
- (A) Describing a new method of estimating decreases in global temperature that have occurred over the last 160,000 years
  - (B) Describing a method of analysis that provides information regarding the relation between the carbon dioxide content of the Earth's atmosphere and global temperature
  - (C) Presenting information that suggests that global temperature has increased over the last 160,000 years
  - (D) Describing the kinds of information that can be gleaned from a careful analysis of the contents of sheets
  - (E) Demonstrating the difficulty of arriving at a firm conclusion regarding how increases in the amount of carbon dioxide in the Earth's atmosphere affect global temperature
25. It can be inferred from the passage that during periods of postglacial warming, which of the following occurred?
- (A) The total volume of air trapped in bubbles beneath the polar ice sheets increased.
  - (B) The amount of deuterium in ice deposited at the poles increased.
  - (C) Carbon dioxide levels in the Earth atmosphere decreased.
  - (D) The amount of hydrogen in the Earth's atmosphere decreased relatively the amount of

deuterium.

- (E) The rate at which ice was deposited at the poles increased.
26. The author states that there is evidence to support which of the following assertions?
- (A) Estimates of global temperature that rely on measurements of deuterium in ice deposited at the poles are more reliable than those based on the amount of carbon dioxide contained in air bubbles beneath the polar surface.
- (B) The amount of deuterium in the Earth's atmosphere tends to increase as global temperature decreases.
- (C) Periods of postglacial warming are characterized by the presence of increased levels of carbon dioxide in the Earth's atmosphere.
- (D) Increases in global temperature over the last 160,000 years are largely the result of increases in the ratio of deuterium to hydrogen in the Earth's atmosphere.
- (E) Increases in global temperature over the last 160,000 years have been accompanied by decreases in the amount of deuterium in the ice deposited at the poles.
27. It can be inferred from the passage that the conclusion stated in the last sentence would need to be reevaluated if scientists discovered that which of the following were true?
- (A) The amount of deuterium in ice deposited on the polar surface is significantly greater than the amount of deuterium in ice located deep beneath the polar surface.
- (B) Both the air bubbles trapped deep beneath the polar surface and the ice surrounding them contain relatively low levels of deuterium.
- (C) Air bubbles trapped deep beneath the polar surface and containing relatively high levels of carbon dioxide are surrounded by ice that contained relatively low levels of deuterium.
- (D) The current level of carbon dioxide in the Earth's atmosphere exceeds the level of carbon dioxide in the prehistoric air trapped beneath the polar surface.
- (E) Increases in the level of carbon dioxide in the Earth's atmosphere are accompanied by increases in the amount of deuterium in the ice deposited at the poles.

## SECTION B

Bracken fern has been spreading from its woodland **strongholds** for centuries, but the rate of encroachment into open countryside has lately increased alarmingly throughout northern and western Britain. A tough competitor, bracken reduces the value of grazing land by crowding out other vegetation. The fern is itself poisonous to livestock, and also encourages proliferation of sheep ticks, which not only attack sheep but also transmit diseases. No less important to some people are bracken's effects on threatened habitats and on the use of uplands for recreational purposes, even though many appreciate its beauty.

Biological controls may be the only economic solution. One potentially cheap and self-sustaining method of halting the spread of bracken is to introduce natural enemies of the plant. Initially unrestrained by predators of their own, foreign predators are likely to be able to multiply rapidly and overwhelm intended targets. Because bracken occurs throughout the world, there is plenty of scope for this approach. Two candidates, both moths from the Southern Hemisphere, are now being studied.

Of course, biological control agents can safely be released only if it can be verified that they feed solely on the target weed. The screening tests have so far been fraught with difficulties. The first large shipment of moths succumbed to a disease. Growing enough bracken indoors is difficult, and the moths do not readily exploit cut stems. These are common problems with rearing insects for biological control.

Other problems can be foreseen. Policymakers need to consider many factors and opinions such as the cost of control compared to existing methods, and the impact of the clearance of bracken on the landscape, wildlife, and vegetation. In fact, scientists already have much of the information needed to assess the impact of biological control of bracken, but it is spread among many individuals, organizations, and government bodies. The potential gains for the environment are likely to outweigh the losses because few plants, insects, mammals, and birds live associated only with bracken, and many would benefit from a return of other vegetation or from a more diverse mosaic of habitats. But legal consequences of attempts at biological control present a potential minefield. For example, many rural tenants still have the right of "estovers," the right to cut bracken as bedding for livestock and uses. What would happen if they were deprived of these rights? Once a biological control agent is released, it is difficult to control its spread. What consideration is due landowners who do not want to control bracken? According to law, the release of the biological control agents must be authorized by the **secretary of state** for the environment. But Britain lacks the legal and administrative machinery to assemble evidence for and against release.

17. Which of the following best states the main idea of the passage?
  - (A) Studies suggest that biological control of bracken will not be technically feasible.
  - (B) Although biological control appears to be the best solution to bracken infestation, careful assessment of the consequences is required.
  - (C) Environmentalists are hoping that laboratory technicians will find a way to raise large numbers of moths in captivity.
  - (D) Bracken is currently the best solution to the proliferation of nonnative moth species.
  - (E) Even after researchers discover the most economical method of pest control, the government has no authority to implement a control program.
18. According to the passage, which of the following can be inferred about sheep ticks?
  - (A) They increase where bracken spreads.
  - (B) They are dangerous only to sheep.
  - (C) They are especially adapted to woodland.
  - (D) They have no natural enemies.
  - (E) They cause disease among bracken.
19. The author cites all of the following as disadvantages of bracken encroachment EXCEPT:
  - (A) Bracken is poisonous to farm animals.
  - (B) Bracken inhibits the growth of valuable vegetation.
  - (C) Bracken indirectly helps spread certain diseases.
  - (D) Bracken is aesthetically objectionable.
  - (E) Bracken disturbs habitats that some people would like to protect.
20. The final paragraph can best be described as
  - (A) a summation of arguments presented in previous paragraphs
  - (B) the elimination of competing arguments to strengthen a single remaining conclusion
  - (C) an enumeration of advantages to biological control
  - (D) an expansion of the discussion from the particular example of bracken control to the general problem of government regulation
  - (E) an overview of the variety of factors requiring further assessment
21. It can be inferred from the passage that it is advantageous to choose as the biological control

agent a predator that is foreign to the targeted environment for which of the following reasons?

- (A) Conservation groups prefer not to favor one native species over another.
  - (B) All local predators have already been overwhelmed by the target species.
  - (C) Local predators cannot be effectively screened since they already exist in the wild.
  - (D) There is little risk of an artificially introduced foreign predator multiplying out of control.
  - (E) Native predator species are generally limited by their own predators.
22. It can be inferred from the passage that the screening tests performed on the biological control agent are designed primarily to determine
- (A) its effectiveness in eliminating the target species
  - (B) the response of local residents to its introduction
  - (C) the risk it poses to species other than the target
  - (D) its resistance to the stress of shipment
  - (E) the likelihood of its survival indoors
23. As it is discussed in the passage, the place of bracken within the forest habitat can best be described as
- (A) rapidly expanding
  - (B) the subject of controversy
  - (C) well established
  - (D) circumscribed by numerous predators
  - (E) a significant nutrient source

Allen and Wolkowitz's research challenges the common claim that homework—waged labor performed at home for a company—is primarily a response to women workers' needs and preferences. By focusing on a limited geographical area in order to gather in-depth information, the authors have avoided the methodological pitfalls that have plagued earlier research on homework. Their findings disprove accepted notions about homeworkers: that they are unqualified for other jobs and that they use homework as a short-term strategy for dealing with child care.

The authors conclude that the persistence of homework cannot be explained by appeal to such notions, for, in fact, homeworkers do not differ sharply from other employed women. Most homeworkers would prefer to work outside the home but are constrained from doing so by lack of opportunity. In fact, homework is driven by employers' desires to minimize fixed costs: homeworkers receive no benefits and are paid less than regular employees.

24. The passage is primarily concerned with
- (A) advocating a controversial theory
  - (B) presenting and challenging the results of a study
  - (C) describing a problem and proposing a solution
  - (D) discussing research that opposes a widely accepted belief
  - (E) comparing several explanations for the same phenomenon
25. According to the passage, which of the following has been generally believed about homework?
- (A) The benefits of homework accrue primarily to employers rather than to homeworkers.

- (B) Homework is prevalent predominantly in rural areas.
  - (C) Homework is primarily a response to the preferences of women workers.
  - (D) Few homeworkers rely on homework for the majority of their family income.
  - (E) Most homework is seasonal and part-time rather than full-time and year-round.
26. Allen and Wolkowitz's research suggests that each of the following is true of most homeworkers EXCEPT:
- (A) They do not necessarily resort to homework as a strategy for dealing with child care.
  - (B) Their family situations are not unlike those of other employed women.
  - (C) They are as well qualified as women who work outside the home.
  - (D) They perform professional-level duties rather than manual tasks or piecework.
  - (E) They do not prefer homework to employment outside the home.
27. The passage suggests which of the following about previous research on homework?
- (A) It was conducted primarily with women who did not have extensive household responsibilities or care for small children at home.
  - (B) It was conducted with homeworkers and companies over a large geographical area.
  - (C) It indicated that women homeworkers had numerous opportunities to work outside the home.
  - (D) It indicated that homeworkers usually work for companies that are close to their homes.
  - (E) It indicated that homework was financially advantageous to large companies.

1998 04

## SECTION A

Much of the research on hallucinogenic drugs such as LSD has focused on the neurotransmitter serotonin, a chemical that when released from a presynaptic serotonin-secreting neuron causes the transmission of a nerve impulse across a synapse to an adjacent postsynaptic, or target, neuron. There are two major reasons for this emphasis. First, it was discovered **early on** that many of the major hallucinogens have a molecular structure similar to that of serotonin. In addition, animal studies of brain neurochemistry following administration of hallucinogens invariably reported changes in serotonin levels.

Early investigators correctly reasoned that the structural similarity to the serotonin molecule might imply that LSD's effects are brought about by an action on the neurotransmission of serotonin in the brain. Unfortunately, the level of technical expertise in the field of brain research was such that this hypothesis had to be tested on peripheral tissue (tissue outside the brain). Two different groups of scientists reported that LSD powerfully blocked serotonin's action. Their conclusions were quickly challenged, however. We now know that the action of a drug at one site in the body does not necessarily correspond to the drug's action at another site, especially when one site is in the brain and the other is not.

By the 1960's, technical advances permitted the direct testing of the hypothesis that LSD and related hallucinogens act by directly suppressing the activity of serotonin-secreting neurons themselves—the so-called presynaptic hypothesis. Researchers reasoned that if the hallucinogenic drugs act by suppressing the activity of serotonin-secreting neurons, then drugs administered after these neurons had been destroyed should have no effect on behavior, because the system would already be maximally suppressed. Contrary to their expectations, neuron destruction enhanced the effect of LSD and related hallucinogens on behavior. Thus, hallucinogenic drugs apparently do not act directly on serotonin-secreting neurons.

However, these and other available data do support an alternative hypothesis that LSD and related



drugs act directly at receptor sites on serotonin target neurons (the postsynaptic hypothesis). The fact that LSD elicits "serotonin syndrome"—that is, causes the same kinds of behaviors as does the administration of serotonin—in animals whose brains are depleted of serotonin indicates that LSD acts directly on serotonin receptors, rather than indirectly through the release of stores of serotonin. The enhanced effect of LSD reported after serotonin depletion could be due to a proliferation of serotonin receptor sites on serotonin target neurons. This phenomenon often follows neuron destruction or neurotransmitter depletion; the increase in the number of receptor sites appears to be a compensatory response to decreased input. Significantly, this hypothesis is supported by data from a number of different laboratories.

17. According to the passage, which of the following is one of the primary factors that led researchers studying hallucinogenic drugs to focus on serotonin?
  - (A) The suppression of the activity of serotonin-secreting neurons by the administration of hallucinogens
  - (B) The observed similarities in the chemical structures of serotonin and hallucinogens
  - (C) The effects the administration of hallucinogens has on serotonin production in the human brain
  - (D) Serotonin-induced changes in the effects of hallucinogens on behavior
  - (E) Hallucinogen-induced changes in the effects of serotonin on behavior
18. It can be inferred that researchers abandoned the presynaptic hypothesis because
  - (A) a new and more attractive hypothesis was suggested
  - (B) no research was reported that supported the hypothesis
  - (C) research results provided evidence to counter the hypothesis
  - (D) the hypothesis was supported only by studies of animals and not by studies of human beings
  - (E) the level of technical expertise in the field of brain research did not permit adequate testing of the hypothesis
19. Which of the following best expresses the main idea of the passage?
  - (A) Research has suggested that the neurotransmitter serotonin is responsible for the effects of hallucinogenic drugs on the brain and on behavior.
  - (B) Researchers have spent an inadequate amount of time developing theories concerning the way in which the effects of hallucinogenic drugs occur.
  - (C) Research results strongly suggest that hallucinogenic drugs create their effects by acting on the serotonin receptor sites located on target neurons in the brain.
  - (D) Researchers have recently made valuable discoveries concerning the effects of depleting the amount of serotonin in the brain.
  - (E) Researchers have concluded that hallucinogenic drugs suppress the activity of serotonin-secreting neurons.
20. The research described in the passage is primarily concerned with answering which of the following questions?
  - (A) How can researchers control the effects that LSD has on behavior?
  - (B) How are animals' reactions to LSD different from those of human beings?
  - (C) What triggers the effects that LSD has on human behavior?
  - (D) What technical advances would permit researchers to predict more accurately the effects

of LSD on behavior?

- (E) What relationship does the suppression of neuron activity have to the occurrence of “serotonin syndrome”?
21. Which of the following best defines “serotonin syndrome” (line 46) as the term is used in the passage?
- (A) The series of behaviors, usually associated with the administration of serotonin, that also occurs when LSD is administered to animals whose brains are depleted of serotonin
  - (B) The series of behaviors, usually associated with the administration of LSD, that also occurs when the amount of serotonin in the brain is reduced
  - (C) The maximal suppression of neuron activity that results from the destruction of serotonin-secreting neurons
  - (D) The release of stores of serotonin from serotonin-secreting neurons in the brain
  - (E) The proliferation of serotonin receptor sites that follows depletion of serotonin supplies in the brain
22. Which of the following best describes the organization of the argument that the author of the passage presents in the last two paragraphs?
- (A) Two approaches to testing a hypothesis are described, and the greater merits of one approach are indicated.
  - (B) The assumptions underlying two hypotheses are outlined, and evidence for and against each hypothesis is discussed.
  - (C) A phenomenon is described, and hypotheses concerning its occurrence are considered and rejected.
  - (D) The reasoning behind a hypothesis is summarized, evidence supporting the hypothesis is presented, and research that counters the supporting evidence is described.
  - (E) A hypothesis is discussed, evidence undermining the hypothesis is revealed, and a further hypothesis based on the undermining evidence is explained.
23. The author’s attitude toward early researchers’ reasoning concerning the implications of similarities in the structures of serotonin and LSD molecules can best be described as one of
- (A) complete agreement
  - (B) reluctant support
  - (C) subtle condescension
  - (D) irreverent dismissal
  - (E) strong opposition

When literary periods are defined on the basis of men’s writing, women’s writing must be forcibly assimilated into an irrelevant grid: a Renaissance that is not a renaissance for women, a Romantic period in which women played very little part, a modernism with which women conflict. Simultaneously, the history of women’s writing has been suppressed, leaving large, mysterious gaps in accounts of the development of various genres. Feminist criticism is beginning to correct this situation. Margaret Anne Doody, for example, suggests that during “the period between the death of Richardson and the appearance of the novels of Scott and Austen,” which has “been regarded as a dead period,” late-eighteenth-century women writers actually developed “the paradigm for women’s fiction of the nineteenth century—something hardly less than the paradigm of the nineteenth-century novel itself.” Feminist critics have also pointed out that the twentieth-century writer Virginia Woolf belonged to a tradition other than modernism and that this tradition surfaces in her work precisely where criticism has

hitherto found obscurities, evasions, implausibilities, and imperfections.

24. It can be inferred from the passage that the author views the division of literature into periods based on men's writing as an approach that
- (A) makes distinctions among literary periods ambiguous
  - (B) is appropriate for evaluating only premodern literature
  - (C) was misunderstood until the advent of feminist criticism
  - (D) provides a valuable basis from which feminist criticism has evolved
  - (E) obscures women's contributions to literature
25. The passage suggests which of the following about Virginia Woolf's work?
- I. Nonfeminist criticism of it has been flawed.
  - II. Critics have treated it as part of modernism.
  - III. It is based on the work of late-eighteenth-century women writers.
- (A) I only
  - (B) II only
  - (C) I and II only
  - (D) II and III only
  - (E) I, II and III
26. The author quotes Doody most probably in order to illustrate
- (A) a contribution that feminist criticism can make to literary criticism
  - (B) a modernist approach that conflicts with women's writing
  - (C) writing by a woman which had previously been ignored
  - (D) the hitherto overlooked significance of Scott's and Austen's novels
  - (E) a standard system of defining literary periods
27. The passage provides information that answers which of the following questions?
- (A) In what tradition do feminist critics usually place Virginia Woolf?
  - (B) What are the main themes of women's fiction of the nineteenth century?
  - (C) What events motivated the feminist reinterpretation of literary history?
  - (D) How has the period between Richardson's death and Scott's and Austen's novels traditionally been regarded by critics?
  - (E) How was the development of the nineteenth-century novel affected by women's fiction in the same century?

## SECTION B

The origin of the theory that major geologic events may occur at regular intervals can be traced back not to a study of volcanism or plate tectonics but to an investigation of marine extinctions. In the early 1980's, scientists began to look closely at the question of how these extinctions occur. Two paleontologists, Raup and Sepkoski, compiled a master list of marine species that died out during the past 268 million years and noted that there were brief periods during which many species disappeared at once. These mass extinctions occurred at surprisingly regular intervals.

Later studies revealed that extinctions of terrestrial reptiles and mammals also occurred periodically. These findings, combined with the research of Raup and Sepkoski, led scientists to hypothesize the existence of some kind of cyclically recurring force powerful enough to affect living things profoundly.

Speculation that so powerful a force might affect geologic events as well led geologists to search for evidence of periodicity in episodes of volcanism, seafloor spreading, and plate movement.

17. According to the passage, Raup and Sepkoski's research was concerned with
  - (A) learning more about the habitats of marine species
  - (B) studying plate tectonics and the occurrence of volcanism over the past 268 million years
  - (C) examining extinctions of marine species over the past 268 million years
  - (D) finding out whether a rhythmically recurring geologic force exists
  - (E) confirming previous evidence suggesting that extinction of terrestrial species occurred regularly
18. The author of the passage would most likely describe the findings of Raup and Sepkoski as
  - (A) plausible, because the findings supported the theories of previous researchers
  - (B) significant, because the findings were an impetus for subsequent research
  - (C) controversial, because the findings contradicted the theories of previous researchers
  - (D) questionable, because the authors were not working in their field of expertise
  - (E) definitive, because the findings confirmed the existence of a rhythmically recurring force
19. The author of the passage is primarily concerned with
  - (A) determining the dates of various geologic events
  - (B) defending the conclusions reached by Raup and Sepkoski
  - (C) establishing a link between the disciplines of paleontology and geology
  - (D) proving that mass extinctions of marine animals occur periodically
  - (E) explaining how a theory concerning geologic events was formulated
20. The passage suggests which of the following about the "force" mentioned in lines 16 and 18?
  - (A) It is responsible for most of the major geologic events that have occurred.
  - (B) It is responsible for most of the marine extinctions that have occurred.
  - (C) Its recurrence is unlikely to be able to be predicted by scientists.
  - (D) Its existence was not seriously considered by scientists before Raup and Sepkoski did their research.
  - (E) Its existence was confirmed by the research of Raup and Sepkoski.

A recent history of the Chicago meat-packing industry and its workers examines how the industry grew from its appearance in the 1830's through the early 1890's. Meat-packers, the author argues, had good wages, working conditions, and prospects for advancement within the packinghouses, and did not cooperate with labor agitators since labor relations were so harmonious. Because the history maintains that conditions were above standard for the era, the frequency of labor disputes, especially in the mid-1880's, is not accounted for. The work ignores the fact that the 1880's were crucial years in American labor history, and that the packinghouse workers' efforts were part of the national movement for labor reform.

In fact, other historical sources for the late nineteenth century record deteriorating housing and high disease and infant mortality rates in the industrial community, due to low wages and unhealthy working conditions. Additional data from the University of Chicago suggest that the packinghouses were dangerous places to work. The government investigation commissioned by President Theodore Roosevelt which eventually led to the adoption of the 1906 Meat Inspection Act found the packinghouses unsanitary, while social workers observed that most of the workers were poorly paid and overworked.

The history may be too optimistic because most of its data date from the 1880's **at the latest**, and the information provided from that decade is insufficiently analyzed. Conditions actually declined in the 1880's, and continued to decline after the 1880's, due to a reorganization of the packing process and a massive influx of unskilled workers. The deterioration in worker status, partly a result of the new availability of unskilled and hence cheap labor, is not discussed. Though a detailed account of work in the packing-houses is attempted, the author fails to distinguish between the wages and conditions for skilled workers and for those unskilled laborers who comprised the majority of the industry's workers from the 1880's on. While conditions for the former were arguably tolerable due to the strategic importance of skilled workers in the complicated slaughtering, cutting, and packing process (though worker complaints about the rate and conditions of work were frequent), pay and conditions for the latter were wretched.

The author's misinterpretation of the origins of the feelings the meat-packers had for their industrial neighborhood may account for the history's faulty generalizations. The pride and contentment the author remarks upon were, arguably, less the products of the industrial world of the packers—the giant yards and the intricate plants—than of the unity and vibrance of the ethnic cultures that formed a viable community on Chicago's South Side. Indeed, the strength of this community succeeded in generating a social movement that effectively confronted the problems of the industry that provided its livelihood.

21. The passage is primarily concerned with discussing
  - (A) how historians ought to explain the origins of the conditions in the Chicago meat-packing industry
  - (B) why it is difficult to determine the actual nature of the conditions in the Chicago meat-packing industry
  - (C) why a particular account of the conditions in the Chicago meat-packing industry is inaccurate
  - (D) what ought to be included in any account of the Chicago meat-packers' role in the national labor movement
  - (E) what data are most relevant for an accurate account of the relations between Chicago meat-packers and local labor agitators
22. The author of the passage mentions all of the following as describing negative conditions in the meat-packing industry EXCEPT:
  - (A) data from the University of Chicago
  - (B) a recent history of the meat-packing industry
  - (C) social workers
  - (D) historical sources for the late nineteenth century
  - (E) government records
23. The author of the passage mentions the "social movement" (line 57) generated by Chicago's South Side community primarily in order to
  - (A) inform the reader of events that occurred in the meat-packing industry after the period of time covered by the history
  - (B) suggest the history's limitations by pointing out a situation that the history failed to explain adequately
  - (C) salvage the history's point of view by suggesting that there were positive developments in the meat-packing industry due to worker unity
  - (D) introduce a new issue designed to elaborate on the good relationship between the meat-packers and Chicago's ethnic communities

- (E) suggest that the history should have focused more on the general issue of the relationship between labor movements and healthy industrial communities
24. According to the passage, the working conditions of skilled workers in the meat-packing industry during the 1880's were influenced by
- (A) the workers' determined complaints about the rate and conditions of their work
  - (B) the efforts of social workers to improve sanitation in the packinghouses
  - (C) the workers' ability to perform the industry's complex tasks
  - (D) improvements in the industry's packing process that occurred in the 1880's
  - (E) opportunities for job advancement due to the filling of less desirable positions by increasing numbers of unskilled workers
25. The author of the passage uses the second paragraph to
- (A) summarize the main point of the history discussed in the passage
  - (B) explain why the history discussed in the passage has been disparaged by critics
  - (C) evaluate the findings of recent studies that undermine the premises of the history discussed in the passage
  - (D) introduce a hypothesis that will be discussed in detail later in the passage
  - (E) present evidence that is intended to refute the argument of the history discussed in the passage
26. The tone of the author of the passage in discussing the meat-packer community on Chicago's South Side can best be described as one of
- (A) appreciation of the community's ability to cope with difficult conditions
  - (B) admiration for the community's refusal to cooperate with labor agitators
  - (C) indignation at the kinds of social conditions the community faced
  - (D) annoyance at the community's inability to abolish discrimination in the meat-packing industry
  - (E) concern that the meat-packers' feelings for their community have not been documented
27. The information in the passage suggests that the author of the history discussed in the passage made which of the following errors?
- (A) Failing to recognize the effect of the diversity of the South Side community on the meat-packers' efforts to reform the industry
  - (B) Attributing good working conditions in the meat-packing industry to the efforts of labor agitators
  - (C) Overemphasizing the importance of the availability of unskilled labor as an influence on conditions in the meat packing industry
  - (D) Interpreting the meat-packers' feelings for their community as appreciation of their industry
  - (E) Failing to observe the pride and contentment felt by the meat-packers

When we consider great painters of the past, the study of art and the study of illusion cannot always be separated. By illusion I mean those contrivances of color, line, shape, and so forth that lead us to see marks on a flat surface as depicting three-dimensional objects in space. I must emphasize that I am not making a plea, disguised or otherwise, for the exercise of illusionist tricks in painting today, although I am, in fact, rather critical of certain theories of non-representational art. But to argue over these theories would be to miss the point. That the discoveries and effects of representation that were the pride of earlier artists have become trivial today I would not deny for a moment. Yet I believe that we are in real danger of losing contact with past masters if we accept the fashionable doctrine that such matters never had anything to do with art. The very reason why the representation of nature can now be considered something commonplace should be of the greatest interest to art historians. Never before has there been an age when the visual image was so cheap in every sense of the word. We are surrounded and assailed by posters and advertisements, comics and magazine illustrations. We see aspects of reality represented on television, postage stamps, and food packages. Painting is taught in school and practiced as a pastime, and many modest amateurs have mastered tricks that would have looked like sheer magic to the fourteenth-century painter Giotto. Even the crude colored renderings on a cereal box might have made Giotto's contemporaries gasp. Perhaps there are people who conclude from this that the cereal box is superior to a Giotto; I do not. But I think that the victory and vulgarization of representational skills create a problem for both art historians and critics.

In this connection it is instructive to remember the Greek saying that to marvel is the beginning of knowledge and if we cease to marvel we may be in danger of ceasing to know. I believe we must restore our sense of wonder at the capacity to conjure up by forms, lines, shades, or colors those mysterious phantoms of visual reality we call "pictures." Even comics and advertisements, rightly viewed, provide food for thought. Just as the study of poetry remains incomplete without an awareness of the language of prose, so, I believe, the study of art will be increasingly supplemented by inquiry into the "linguistics" of the visual image. The way the language of art refers to the visible world is both so obvious and so mysterious that it is still largely unknown except to artists, who use it as we use all language—without needing to know its grammar and semantics.

17. The author of the passage explicitly disagrees with which of the following statements?
- (A) In modern society even nonartists can master techniques that great artists of the fourteenth century did not employ.
  - (B) The ability to represent a three-dimensional object on a flat surface has nothing to do with art.
  - (C) In modern society the victory of representational skills has created a problem for art critics.
  - (D) The way that artists are able to represent the visible world is an area that needs a great deal more study before it can be fully understood.
  - (E) Modern painters do not frequently make use of illusionist tricks in their work.
18. The author suggests which of the following about art historians?
- (A) They do not believe that illusionist tricks have become trivial.
  - (B) They generally spend little time studying contemporary artists.
  - (C) They have not given enough consideration to how the representation of nature has become commonplace.
  - (D) They generally tend to argue about theories rather than address substantive issues.
  - (E) They are less likely than art critics to study comics or advertisements.
19. Which of the following best states the author's attitude toward comics, as expressed in the passage?

- (A) They constitute an innovative art form.
  - (B) They can be a worthwhile subject for study.
  - (C) They are critically important to an understanding of modern art.
  - (D) Their visual structure is more complex than that of medieval art.
  - (E) They can be understood best if they are examined **in conjunction with** advertisements.
20. The author's statement regarding how artists use the language of art (lines 48-52) implies that
- (A) artists are better equipped than are art historians to provide detailed evaluations of other artists' work
  - (B) many artists have an unusually quick, intuitive understanding of language
  - (C) artists can produce works of art even if they cannot analyze their methods of doing so
  - (D) artists of the past, such as Giotto, were better educated about artistic issues than were artists of the author's time
  - (E) most artists probably consider the processes involved in their work to be closely akin to those involved in writing poetry
21. The passage asserts which of the following about commercial art?
- (A) There are many examples of commercial art whose artistic merit is equal to that of great works of art of the past.
  - (B) Commercial art is heavily influenced by whatever doctrines are fashionable in the serious art world of the time.
  - (C) The line between commercial art and great art lies primarily in how an image is used, not in the motivation for its creation.
  - (D) The level of technical skill required to produce representational imagery in commercial art and in other kinds of art cannot be compared.
  - (E) The pervasiveness of contemporary commercial art has led art historians to undervalue representational skills.
22. Which of the following can be inferred from the passage about the adherents of "certain theories of nonrepresentational art" (lines 9-10)?
- (A) They consider the use of illusion to be inappropriate in contemporary art.
  - (B) They do not agree that marks on a flat surface can ever satisfactorily convey the illusion of three-dimensional space.
  - (C) They do not discuss important works of art created in the past.
  - (D) They do not think that the representation of nature was ever the primary goal of past painters.
  - (E) They concern themselves more with types of art such as advertisements and magazine illustrations than with traditional art.
23. It can be inferred from the passage that someone who wanted to analyze the "grammar and semantics" (line 52) of the language of art would most appropriately comment on which of the following?
- (A) The relationship between the drawings in a comic strip and the accompanying text
  - (B) The amount of detail that can be included in a tiny illustration on a postage stamp



- (C) The sociological implications of the images chosen to advertise a particular product
- (D) The degree to which various colors used in different versions of the same poster would attract the attention of **passersby**
- (E) The particular juxtaposition of shapes in an illustration that makes one shape look as though it were behind another

The 1973 Endangered Species Act made into legal policy the concept that endangered species of wildlife are precious as part of a natural ecosystem. The nearly unanimous passage of this act in the United States Congress, reflecting the rising national popularity of environmentalism, masked a bitter debate. Affected industries clung to the former wildlife policy of valuing individual species according to their economic usefulness. They fought to minimize the law's impact by limiting definitions of key terms, but they lost on nearly every issue. The act defined "wildlife" as almost all kinds of animals—from large mammals to invertebrates—and plants. "Taking" wildlife was defined broadly as any action that threatened an endangered species; areas vital to a species' survival could be federally protected as "critical habitats." Though these definitions legislated strong environmentalist goals, political compromises made in the enforcement of the act were to determine just what economic interests would be **set aside** for the sake of ecological stabilization.

24. According to the passage, which of the following does the Endangered Species Act define as a "critical habitat"?
  - (A) A natural ecosystem that is threatened by imminent development
  - (B) An industrial or urban area in which wildlife species have almost ceased to live among humans
  - (C) A natural area that is crucial to the survival of a species and thus eligible for federal protection
  - (D) A wilderness area in which the "taking" of wildlife species is permitted rarely and only under strict federal regulation
  - (E) A natural environment that is protected under law because its wildlife has a high economic value
25. According to the passage, which of the following is an explanation for the degree of support that the Endangered Species Act received in Congress?
  - (A) Concern for the environment had gained increasing national popularity.
  - (B) Ecological research had created new economic opportunities dependent on the survival of certain species.
  - (C) Congress had long wanted to change the existing wildlife policy.
  - (D) The growth of industry had endangered increasing numbers of wildlife species.
  - (E) Legislators did not anticipate that the act could be effectively enforced.
26. It can be inferred from the passage that if business interests had won the debate on provisions of the 1973 Endangered Species Act, which of the following would have resulted?
  - (A) Environmentalist concepts would not have become widely popular.
  - (B) The definitions of key terms of the act would have been more restricted.
  - (C) Enforcement of the act would have been more difficult.
  - (D) The act would have had stronger support from Congressional leaders.
  - (E) The public would have boycotted the industries that had the greatest impact in defining

the act.

27. The author refers to the terms “wildlife” (line 11), “taking” (line 13), and “critical habitats” (line 16) most likely in order to
- (A) illustrate the misuse of scientific language and concepts in political processes
  - (B) emphasize the importance of selecting precise language in transforming scientific concepts into law
  - (C) represent terminology whose definition was crucial in writing environmentalist goals into law
  - (D) demonstrate the triviality of the issues debated by industries before Congress passed the Endangered Species Act
  - (E) show that broad definitions of key terms in many types of laws resulted in ambiguity and thus left room for disagreement about how the law should be enforced

## SECTION B

From the 1900's through the 1950's waitresses in the United States developed a form of unionism based on the unions' defining the skills that their occupation included and enforcing standards for the performance of those skills. This “occupational unionism” differed substantially from the “worksite unionism” prevalent among factory workers. Rather than unionizing the workforces of particular employers, waitress **locals** sought to control their occupation throughout a city. Occupational unionism operated through union hiring halls, which provided free **placement** services to employers who agreed to hire their personnel only through the union. Hiring halls offered union waitresses collective employment security, not individual job security—a basic protection offered by worksite unions. That is, when a waitress lost her job, the local did not intervene with her employer but placed her elsewhere; and when jobs were scarce, the work hours available were distributed fairly among all members rather than being assigned according to seniority.

17. The primary purpose of the passage is to
- (A) analyze a current trend in relation to the past
  - (B) discuss a particular solution to a longstanding problem
  - (C) analyze changes in the way that certain standards have been enforced
  - (D) apply a generalization to an unusual situation
  - (E) describe an approach by contrasting it with another approach
18. Which of the following statements best summarizes a distinction mentioned in the passage between waitress unions and factory workers' unions?
- (A) Waitress unions were more successful than factory workers' unions in that they were able to unionize whole cities.
  - (B) Waitress unions had an impact on only certain local areas, whereas the impact of factory workers' unions was national.
  - (C) Waitress union members held primarily part-time positions, whereas factory workers' unions placed their members in full-time jobs.
  - (D) Waitress unions emphasized the occupation of workers, whereas factory workers' unions emphasized the worksite at which workers were employed.
  - (E) Waitress unions defined the skills of their trade, whereas the skills of factory trades were determined by employers' groups.
19. According to the passage, which of the following was characteristic of the form of union that

United States waitresses developed in the first half of the twentieth century?

- (A) The union represented a wide variety of restaurant and hotel service occupations.
- (B) The union defined the skills required of waitresses and disciplined its members to meet certain standards.
- (C) The union billed employers for its members' work and distributed the earnings among all members.
- (D) The union negotiated the enforcement of occupational standards with each employer whose workforce joined the union.
- (E) The union ensured that a worker could not be laid off arbitrarily by an employer.

20. The author of the passage mentions "particular employers" (line 8) primarily in order to
- (A) suggest that occupational unions found some employers difficult to satisfy
  - (B) indicate that the occupational unions served some employers but not others
  - (C) emphasize the unique focus of occupational unionism
  - (D) accentuate the hostility of some employers toward occupational unionism
  - (E) point out a weakness of worksite unionism

In prehistoric times **brachiopods** were one of the most abundant and diverse forms of life on Earth: more than 30,000 species of this clamlike creature have been cataloged from fossil records. Today brachiopods are not as numerous, and existing species are not well studied, partly because neither the animal's fleshy inner tissue nor its shell has any commercial value. Moreover, in contrast to the greater diversity of the extinct species, the approximately 300 known surviving species are relatively uniform in appearance. Many zoologists have interpreted this as a sign that the animal has been unable to compete successfully with other marine organisms in the evolutionary struggle.

Several things, however, suggest that the conventional view needs revising. For example, the genus *Lingula* has an unbroken fossil record extending over more than half a billion years to the present. Thus, if longevity is any measure, brachiopods are the most successful organisms extant. Further, recent studies suggest that diversity among species is a less important measure of evolutionary success than is the ability to withstand environmental change, such as when a layer of clay replaces sand on the ocean bottom. The relatively greater uniformity among the existing brachiopod species may offer greater protection from environmental change and hence may reflect highly successful adaptive behavior.

The adaptive advantages of uniformity for brachiopods can be seen by considering specialization, a process that occurs as a result of prolonged colonization of a uniform substrate. Those that can survive on many surfaces are called generalists, while those that can survive on a limited range of substrates are called specialists. One specialist species, for example, has valves weighted at the base, a characteristic that assures that the organism is properly positioned for feeding in mud and similar substrates; other species secrete glue allowing them to survive on the face of underwater cliffs. The fossil record demonstrates that most brachiopod lineages have followed a trend toward increased specialization. However, during periods of environmental instability, when a particular substrate to which a specialist species has adapted is no longer available, the species quickly dies out. Generalists, on the other hand, are not dependent on a particular substrate, and are thus less vulnerable to environmental change. One study of the fossil record revealed a mass extinction of brachiopods following a change in sedimentation from **chalk** to clay. Of the 35 brachiopod species found in the chalk, only 6 survived in the clay, all of them generalists.

As long as enough generalist species are maintained, and studies of arctic and subarctic seas suggest that generalists are often dominant members of the marine communities there, it seems unlikely that the phylum is close to extinction.

21. In the passage, the author is primarily concerned with
- (A) rejecting an earlier explanation for the longevity of certain brachiopod species

- (B) reevaluating the implications of uniformity among existing brachiopod species
  - (C) describing the varieties of environmental change to which brachiopods are vulnerable
  - (D) reconciling opposing explanations for brachiopods' lack of evolutionary success
  - (E) elaborating the mechanisms responsible for the tendency among brachiopod species toward specialization
22. It can be inferred from the passage that many zoologists assume that a large diversity among species of a given class of organisms typically leads to which of the following?
- (A) Difficulty in classification
  - (B) A discontinuous fossil record
  - (C) A greater chance of survival over time
  - (D) Numerical abundance
  - (E) A longer life span
23. The second paragraph makes use of which of the following?
- (A) Specific examples
  - (B) Analogy
  - (C) Metaphor
  - (D) Quotation
  - (E) Exaggeration
24. The author suggests that the scientists holding the conventional view mentioned in lines 15-16 make which of the following errors?
- (A) They mistakenly emphasize survival rather than diversity.
  - (B) They misunderstand the causes of specialization.
  - (C) They misuse zoological terminology.
  - (D) They catalog fossilized remains improperly.
  - (E) They overlook an alternative criterion of evolutionary success.
25. It can be inferred from the passage that the decision to study an organism may sometimes be influenced by
- (A) its practical or commercial benefits to society
  - (B) the nature and prevalence of its fossilized remains
  - (C) the relative convenience of its geographical distribution
  - (D) its similarity to one or more better-known species
  - (E) the degree of its physiological complexity
26. Which of the following, if true, would most strengthen the author's claim (lines 56-57) that "it seems unlikely that the phylum is close to extinction"?
- (A) Generalist species now living in arctic water give few if any indications of a tendency towards significant future specialization.
  - (B) Zoologists have recently discovered that a common marine organism is a natural predator of brachiopods.
  - (C) It was recently discovered that certain brachiopod species are almost always concentrated near areas rich in offshore oil deposits.

- (D) The ratio of specialist to Generalist species is slowly but steadily increasing.
- (E) It is easier for a brachiopod to survive a change in sedimentation than a change in water temperature.
27. Information in the passage supports which of the following statements about brachiopods?
- I. Few brachiopods living in prehistoric times were specialists.
  - II. A tendency toward specialization, though typical, is not inevitable.
  - III. Specialist species dominate in all but arctic and subarctic waters.
- (A) I only
- (B) II only
- (C) II and III only
- (D) I and III only
- (E) I, II and III

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### SECTION A

This passage is based on an article published in 1990.

Eight times within the past million years, something in the Earth's climatic equation has changed, allowing snow in the mountains and the northern latitudes to accumulate from one season to the next instead of melting away. Each time, the enormous ice sheets resulting from this continual buildup lasted tens of thousands of years until the end of each particular glacial cycle brought a warmer climate. Scientists speculated that these glacial cycles were ultimately driven by astronomical factors: slow, cyclic changes in the **eccentricity** of the Earth's orbit and in the tilt and orientation of its spin axis. But up until around 30 years ago, the lack of an independent record of ice-age timing made the hypothesis untestable.

Then in the early 1950's Emiliani produced the first complete record of the waxings and wanings of past glaciations. It came from a seemingly odd place, the seafloor. Single-cell marine organisms called "foraminifera" house themselves in shells made from **calcium carbonate**. When the foraminifera die, sink to the bottom, and become part of seafloor sediments, the carbonate of their shells preserves certain characteristics of the seawater they inhabited. In particular, the ratio of a heavy isotope of oxygen (oxygen-18) to ordinary oxygen (oxygen-16) in the carbonate preserves the ratio of the two oxygens in water molecules.

It is now understood that the ratio of oxygen isotopes in seawater closely reflects the proportion of the world's water locked up in glaciers and ice sheets. A kind of meteorological distillation accounts for the link. Water molecules containing the heavier isotope tend to condense and fall as precipitation slightly sooner than molecules containing the lighter isotope. Hence, as water vapor evaporated from warm oceans moves away from its source, its oxygen-18 returns more quickly to the oceans than does its oxygen-16. What falls as snow on distant ice sheets and mountain glaciers is relatively depleted of oxygen-18. As the oxygen-18-poor ice builds up, the oceans become relatively enriched in the isotope. The larger the ice sheets grow, the higher the proportion of oxygen-18 becomes in seawater—and hence in the sediments.

Analyzing cores drilled from seafloor sediments, Emiliani found that the isotopic ratio rose and fell in rough accord with the Earth's astronomical cycles. Since that pioneering observation, oxygen-isotope measurements have been made on hundreds of cores. A chronology for the combined record enables scientists to show that the record contains the very same periodicities as the orbital processes. Over the past 800,000 years, the global ice volume has peaked every 100,000 years, matching the period of the orbital eccentricity variation. In addition, "wrinkles" superposed on each cycle—small decreases or surges in ice volume—have come at intervals of roughly 23,000 and 41,000 years, **in keeping with** the precession

and tilt frequencies of the Earth's spin axis.

17. Which of the following best expresses the main idea of the passage?
- (A) Marine sediments have allowed scientists to amass evidence tending to confirm that astronomical cycles drive the Earth's glacial cycles.
  - (B) The ratio between two different isotopes of oxygen in seawater correlates closely with the size of the Earth's ice sheets.
  - (C) Surprisingly, single-cell marine organisms provide a record of the Earth's ice ages.
  - (D) The Earth's astronomical cycles have recently been revealed to have an unexpectedly large impact on the Earth's climate.
  - (E) The earth has experienced eight periods of intense glaciation in the past million years, primarily as a result of substantial changes in its orbit.
18. The passage asserts that one reason that oceans become enriched in oxygen-18 as ice sheets grow is because
- (A) water molecules containing oxygen-18 condense and fall as precipitation slightly sooner than those containing oxygen-16
  - (B) the ratio of oxygen-18 to oxygen-16 in water vapor evaporated from oceans is different from that of these isotopes in seawater
  - (C) growing ice sheets tend to lose their oxygen-18 as the temperature of the oceans near them gradually decreases
  - (D) less water vapor evaporates from oceans during glacial periods and therefore less oxygen-18 is removed from the seawater
  - (E) the freezing point of seawater rich in oxygen-18 is slightly lower than that of seawater poor in oxygen-18
19. According to the passage, the large ice sheets typical of glacial cycles are most directly caused by
- (A) changes in the average temperatures in the tropics and over open oceans
  - (B) prolonged increases in the rate at which water evaporates from the oceans
  - (C) extreme seasonal variations in temperature in northern latitudes and in mountainous areas
  - (D) steadily increasing precipitation rates in northern latitudes and in mountainous areas
  - (E) the continual failure of snow to melt completely during the warmer seasons in northern latitudes and in mountainous areas
20. It can be inferred from the passage that which of the following is true of the water locked in glaciers and ice sheets today?
- (A) It is richer in oxygen-18 than frozen water was during past glacial periods.
  - (B) It is primarily located in the northern latitudes of the Earth.
  - (C) Its ratio of oxygen isotopes is the same as that prevalent in seawater during the last ice age.
  - (D) It is steadily decreasing in amount due to increased thawing during summer months.
  - (E) In comparison with seawater, it is relatively poor in oxygen-18.
21. The discussion of the oxygen-isotope ratios in paragraph three of the passage suggests that

which of the following must be assumed if the conclusions described in lines 49-58 are to be validly drawn?

- (A) The Earth's overall annual precipitation rates do not dramatically increase or decrease over time.
  - (B) The various chemicals dissolved in seawater have had the same concentrations over the past million years.
  - (C) Natural processes unrelated to ice formation do not result in the formation of large quantities of oxygen-18.
  - (D) Water molecules falling as precipitation usually fall on the open ocean rather than on continents or polar ice packs.
  - (E) Increases in global temperature do not increase the amount of water that evaporates from the oceans.
22. The passage suggests that the scientists who first constructed a coherent, continuous picture of past variations in marine-sediment isotope ratios did which of the following?
- (A) Relied primarily on the data obtained from the analysis of Emiliani's core samples.
  - (B) Combined data derived from the analysis of many different core samples.
  - (C) Matched the data obtained by geologists with that provided by astronomers.
  - (D) Evaluated the isotope-ratio data obtained in several areas in order to eliminate all but the most reliable data.
  - (E) Compared data obtained from core samples in many different marine environments with data samples derived from polar ice caps.
23. The passage suggests that the scientists mentioned in line 8 considered their reconstruction of past astronomical cycles to be
- (A) unreliable because astronomical observations have been made and recorded for only a few thousand years
  - (B) adequate enough to allow that reconstruction's use in explaining glacial cycles if a record of the latter could be found
  - (C) in need of confirmation through comparison with an independent source of information about astronomical phenomena
  - (D) incomplete and therefore unusable for the purposes of explaining the causes of ice ages
  - (E) adequate enough for scientists to support conclusively the idea that ice ages were caused by astronomical changes

Although Victor Turner's writings have proved fruitful for fields beyond anthropology, his definition of ritual is overly restrictive. Ritual, he says, is "prescribed formal behavior for occasions not **given over** to technological routine, having reference to beliefs in mystical beings or powers." "Technological routine" refers to the means by which a social group provides for its material needs. Turner's differentiating ritual from technology helps us recognize that festivals and celebrations may have little purpose other than play, but it obscures the practical aims, such as making crops grow or healing patients, of other rituals. Further, Turner's definition implies a necessary relationship between ritual and mystical beliefs. However, not all rituals are religious; some religions have no reference to mystical beings; and individuals may be required only to participate in, not necessarily believe in, a ritual. Turner's assumption that ritual behavior follows belief thus limits the usefulness of his definition in studying ritual across cultures.

24. According to the passage, which of the following does Turner exclude from his conception of ritual?



- (A) Behavior based on beliefs
  - (B) Behavior based on formal rules
  - (C) Celebrations whose purpose is play
  - (D) Routines directed toward practical ends
  - (E) Festivals honoring supernatural beings
25. The passage suggests that an assumption underlying Turner's definition of ritual is that
- (A) anthropological concepts apply to other fields
  - (B) festivals and ceremonies are related cultural phenomena
  - (C) there is a relationship between play and practical ends
  - (D) rituals refer only to belief in mystical beings or powers
  - (E) mystical beings and powers have certain common attributes across cultures
26. It can be inferred that the author of the passage believes each of the following concerning rituals EXCEPT:
- (A) Some are unrelated to religious belief.
  - (B) Some are intended to have practical consequences.
  - (C) Some have no purpose other than play.
  - (D) They sometimes involve reference to mystical beings.
  - (E) They are predominantly focused on agricultural ends.
27. Which of the following best describes the organization of the passage?
- (A) Factual data are presented and a hypothesis is proposed.
  - (B) A distinction is introduced then shown not to be a true distinction.
  - (C) A statement is quoted, and two assumptions on which it is based are clarified.
  - (D) A definition is challenged, and two reasons for the challenge are given.
  - (E) An opinion is offered and then placed within a historical framework.

## SECTION B

Benjamin Franklin established that lightning is the transfer of positive or negative electrical charge between regions of a cloud or from cloud to earth. Such transfers require that electrically neutral clouds, with uniform charge distributions, become electrified by separation of charges into distinct regions. The greater this separation is, the greater the voltage, or electrical potential of the cloud. Scientists still do not know the precise distribution of charges in thunderclouds nor how separation adequate to support the huge voltages typical of lightning bolts arises. According to one theory, the precipitation hypothesis, charge separation occurs as a result of precipitation. Larger droplets in a **thundercloud** precipitate downward past smaller suspended droplets. Collisions among droplets transfer negative charge to precipitating droplets, leaving the suspended droplets with a positive charge, thus producing a positive **dipole** in which the lower region of the thundercloud is filled with negatively charged raindrops and the upper with positively charged suspended droplets.

17. The passage is primarily concerned with discussing which of the following?
- (A) A central issue in the explanation of how lightning occurs
  - (B) Benjamin Franklin's activities as a scientist
  - (C) Research into the strength and distribution of thunderstorms
  - (D) The direction of movement of electrical charges in thunderclouds



- (E) The relation between a cloud's charge distribution and its voltage
18. The passage suggests that lightning bolts typically
- (A) produce a distribution of charges called a positive dipole in the clouds where they originate
  - (B) result in the movement of negative charges to the centers of the clouds where they originate
  - (C) result in the suspension of large, positively charged raindrops at the tops of the clouds where they originate
  - (D) originate in clouds that have large numbers of negatively charged droplets in their upper regions
  - (E) originate in clouds in which the positive and negative charges are not uniformly distributed
19. According to the passage, Benjamin Franklin contributed to the scientific study of lightning by
- (A) testing a theory proposed earlier, showing it to be false, and developing an alternative, far more successful theory of his own
  - (B) making an important discovery that is still important for scientific investigations of lightning
  - (C) introducing a hypothesis that, though recently shown to be false, proved to be a useful source of insights for scientists studying lightning
  - (D) developing a technique that has enabled scientists to measure more precisely the phenomena that affect the strength and location of lightning bolts
  - (E) predicting correctly that two factors previously thought unrelated to lightning would eventually be shown to contribute jointly to the strength and location of lightning bolts
20. Which of the following, if true, would most seriously undermine the precipitation hypothesis, as it is set forth in the passage?
- (A) Larger clouds are more likely than smaller clouds to be characterized by complete separation of positive and negative charges.
  - (B) In smaller clouds lightning more often occurs within the cloud than between the cloud and the earth.
  - (C) Large raindrops move more rapidly in small clouds than they do in large clouds.
  - (D) Clouds that are smaller than average in size rarely, if ever, produce lightning bolts.
  - (E) In clouds of all sizes negative charges concentrate in the center of the clouds when the clouds become electrically charged.

Before Laura Gilpin (1891-1979), few women in the history of photography had so devoted themselves to chronicling the landscape. Other women had photographed the land, but none can be regarded as a landscape photographer with a sustained body of work documenting the physical terrain. Anne Brigman often photographed woodlands and coastal areas, but they were generally settings for her artfully placed subjects. Dorothea Lange's landscapes were always conceived of as counterparts to her portraits of rural women.

At the same time that Gilpin's interest in landscape work distinguished her from most other women photographers, her approach to landscape photography **set** her **apart** from men photographers who, like Gilpin, documented the western United States. Western American landscape photography grew out of a

male tradition, pioneered by photographers attached to government and commercial survey teams that went west in the 1860's and 1870's. These explorer-photographers documented the West that their employers wanted to see: an exotic and majestic land shaped by awesome natural forces, unpopulated and ready for American settlement. The next generation of male photographers, represented by Ansel Adams and Eliot Porter, often worked with conservationist groups rather than government agencies or commercial companies, but they nonetheless preserved the "heroic" style and maintained the role of respectful outsider peering in with reverence at a fragile natural world.

For Gilpin, by contrast, the landscape was neither an empty vista awaiting human settlement nor a jewel-like scene resisting human intrusion, but a peopled landscape with a rich history and tradition of its own, an environment that shaped and molded the lives of its inhabitants. Her photographs of the Rio Grande, for example, consistently depict the river in terms of its significance to human culture: as a source of irrigation water, a source of food for livestock, and a provider of town sites. Also instructive is Gilpin's general avoidance of extreme close-ups of her natural subjects: for her, emblematic details could never suggest the intricacies of the interrelationship between people and nature that made the landscape a compelling subject. While it is dangerous to draw conclusions about a "feminine" way of seeing from the work of one woman, it can nonetheless be argued that Gilpin's unique approach to landscape photography was analogous to the work of many women writers who, far more than their male counterparts, described the landscape in terms of its potential to sustain human life.

Gilpin never spoke of herself as a photographer with a feminine perspective: she eschewed any discussion of gender as it related to her work and maintained little interest in interpretations that relied on the concept of a "woman's eye." Thus it is ironic that her photographic evocation of a historical landscape should so clearly present a distinctively feminine approach to landscape photography.

21. Which of the following best expresses the main idea of the passage?
- (A) Gilpin's landscape photographs more accurately documented the Southwest than did the photographs of explorers and conservationists.
  - (B) Gilpin's style of landscape photography substantially influenced the heroic style practiced by her male counterparts.
  - (C) The labeling of Gilpin's style of landscape photography as feminine ignores important ties between it and the heroic style.
  - (D) Gilpin's work exemplifies an arguably feminine style of landscape photography that contrasts with the style used by her male predecessors.
  - (E) Gilpin's style was strongly influenced by the work of women writers who described the landscape in terms of its relationship to people.
22. It can be inferred from the passage that the teams mentioned in line 19 were most interested in which of the following aspects of the land in the western United States?
- (A) Its fragility in the face of increased human intrusion
  - (B) Its role in shaping the lives of indigenous peoples
  - (C) Its potential for sustaining future settlements
  - (D) Its importance as an environment for rare plants and animals
  - (E) Its unusual vulnerability to extreme natural forces
23. The author of the passage claims that which of the following is the primary reason why Gilpin generally avoided extreme close-ups of natural subjects?
- (A) Gilpin believed that pictures of natural details could not depict the interrelationship between the land and humans.
  - (B) Gilpin considered close-up photography to be too closely associated with her

predecessors.

- (C) Gilpin believed that all of her photographs should include people in them.
  - (D) Gilpin associated close-up techniques with photography used for commercial purposes.
  - (E) Gilpin feared that pictures of small details would suggest an indifference to the fragility of the land as a whole.
24. The passage suggests that a photographer who practiced the heroic style would be most likely to emphasize which of the following in a photographic series focusing on the Rio Grande?
- (A) Indigenous people and their ancient customs relating to the river
  - (B) The exploits of navigators and explorers
  - (C) Unpopulated, pristine parts of the river and its surroundings
  - (D) Existing commercial ventures that relied heavily on the river
  - (E) The dams and other monumental engineering structures built on the river
25. It can be inferred from the passage that the first two generations of landscape photographers in the western United States had which of the following in common?
- (A) They photographed the land as an entity that had little interaction with human culture.
  - (B) They advanced the philosophy that photographers should resist alliances with political or commercial groups.
  - (C) They were convinced that the pristine condition of the land needed to be preserved by government action.
  - (D) They photographed the land as a place ready for increased settlement.
  - (E) They photographed only those locations where humans had settled.
26. Based on the description of her works in the passage, which of the following would most likely be a subject for a photograph taken by Gilpin?
- (A) A vista of a canyon still untouched by human culture
  - (B) A portrait of a visitor to the West against a desert backdrop
  - (C) A view of historic Native American dwellings carved into the side of a natural cliff
  - (D) A picture of artifacts from the West being transported to the eastern United States for retail sale
  - (E) An abstract pattern created by the shadows of clouds on the desert
27. The author of the passage mentions women writers in line 50 most likely in order to
- (A) counter a widely held criticism of her argument
  - (B) bolster her argument that Gilpin's style can be characterized as a feminine style
  - (C) suggest that Gilpin took some of her ideas for photographs from landscape descriptions by women writers
  - (D) clarify the interrelationship between human culture and the land that Gilpin was attempting to capture
  - (E) offer an analogy between photographic close-ups and literary descriptions of small details

No. 2-1

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. D | 20. E | 21. A |
| 22. C | 23. E | 24. B | 25. E | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. C | 19. D | 20. E | 21. B |
| 22. C | 23. A | 24. C | 25. E | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

No. 2-2

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. D | 20. D | 21. E |
| 22. E | 23. B | 24. C | 25. E | 26. D |
| 27. D | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. B | 19. D | 20. C | 21. B |
| 22. B | 23. E | 24. D | 25. E | 26. E |
| 27. C | 28.   | 29.   | 30.   | 31.   |

No. 2-3

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. E | 20. C | 21. A |
| 22. E | 23. D | 24. B | 25. D | 26. C |
| 27. A | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. B | 20. D | 21. B |
| 22. A | 23. C | 24. A | 25. C | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

No. 3-1

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. C | 19. C | 20. D | 21. D |
| 22. C | 23. A | 24. E | 25. D | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. B | 20. E | 21. A |
| 22. D | 23. C | 24. D | 25. B | 26. A |
| 27. A | 28.   | 29.   | 30.   | 31.   |

No. 3-2

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. B | 19. C | 20. D | 21. A |
| 22. E | 23. C | 24. D | 25. E | 26. C |

|       |  |  |  |  |
|-------|--|--|--|--|
| 27. C |  |  |  |  |
|-------|--|--|--|--|

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. E | 20. D | 21. D |
| 22. E | 23. C | 24. D | 25. A | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 3-3

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. D | 19. C | 20. B | 21. C |
| 22. B | 23. A | 24. C | 25. E | 26. A |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. C | 20. D | 21. C |
| 22. A | 23. B | 24. A | 25. C | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 4-1

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. A | 20. B | 21. C |
| 22. D | 23. B | 24. B | 25. A | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. A | 20. D | 21. C |
| 22. A | 23. C | 24. D | 25. A | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 4-2

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. A | 20. D | 21. E |
| 22. C | 23. A | 24. E | 25. D | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. A | 19. D | 20. B | 21. C |
| 22. E | 23. B | 24. D | 25. C | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 4-3

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. C | 20. E | 21. E |
| 22. B | 23. D | 24. A | 25. E | 26. A |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. E | 19. C | 20. C | 21. D |
| 22. D | 23. D | 24. A | 25. E | 26. E |

|       |     |     |     |     |
|-------|-----|-----|-----|-----|
| 27. B | 28. | 29. | 30. | 31. |
|-------|-----|-----|-----|-----|

### No. 5-1

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. E | 20. E | 21. C |
| 22. A | 23. D | 24. A | 25. E | 26. D |
| 27. B | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. A | 19. E | 20. A | 21. E |
| 22. D | 23. B | 24. D | 25. A | 26. E |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 5-2

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. D | 19. B | 20. C | 21. E |
| 22. B | 23. A | 24. C | 25. B | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. C | 19. E | 20. B | 21. D |
| 22. B | 23. C | 24. A | 25. B | 26. E |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### No. 5-3

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. A | 20. C | 21. B |
| 22. A | 23. E | 24. C | 25. A | 26. B |
| 27. E | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. B | 19. E | 20. C | 21. E |
| 22. D | 23. B | 24. C | 25. E | 26. A |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 6-1

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. A | 19. B | 20. A | 21. D |
| 22. A | 23. E | 24. B | 25. C | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. B | 19. A | 20. E | 21. B |
| 22. D | 23. D | 24. A | 25. D | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 6-2

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. C | 20. A | 21. D |
| 22. B | 23. C | 24. E | 25. C | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. C | 19. A | 20. A | 21. D |
| 22. E | 23. E | 24. B | 25. E | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 6-3

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. C | 19. A | 20. C | 21. E |
| 22. C | 23. A | 24. C | 25. A | 26. D |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. D | 20. A | 21. D |
| 22. B | 23. C | 24. A | 25. C | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 7-1

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. E | 19. D | 20. A | 21. D |
| 22. B | 23. B | 24. C | 25. C | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. C | 19. B | 20. B | 21. A |
| 22. D | 23. C | 24. D | 25. A | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 7-2

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. C | 20. A | 21. A |
| 22. C | 23. E | 24. C | 25. D | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. A | 19. B | 20. D | 21. C |
| 22. E | 23. B | 24. C | 25. D | 26. B |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 7-3

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. E | 20. D | 21. C |
| 22. D | 23. E | 24. A | 25. B | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. C | 20. B | 21. D |
| 22. D | 23. A | 24. C | 25. C | 26. B |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 8-1

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. C | 20. A | 21. B |
| 22. E | 23. A | 24. C | 25. C | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. D | 20. E | 21. C |
| 22. E | 23. B | 24. D | 25. A | 26. E |

### No. 8-2

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. D | 19. B | 20. D | 21. B |
| 22. A | 23. D | 24. D | 25. B | 26. E |
| 27. A | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. A | 20. E | 21. B |
| 22. D | 23. A | 24. A | 25. B | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 8-3

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. D | 20. A | 21. B |
| 22. E | 23. B | 24. A | 25. C | 26. D |
| 27. A | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. C | 20. C | 21. A |
| 22. B | 23. C | 24. C | 25. A | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 9-1

#### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. B | 20. B | 21. B |
| 22. A | 23. D | 24. E | 25. D | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

#### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. A | 20. D | 21. C |
| 22. D | 23. A | 24. B | 25. B | 26. B |
| 27. C | 28.   | 29.   | 30.   | 31.   |

### No. 9-2



### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. B | 19. A | 20. D | 21. A |
| 22. B | 23. E | 24. C | 25. D | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. C | 19. E | 20. B | 21. D |
| 22. E | 23. A | 24. A | 25. E | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### No. 9-3

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. E | 19. B | 20. B | 21. E |
| 22. E | 23. C | 24. E | 25. C | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. B | 20. D | 21. E |
| 22. A | 23. E | 24. C | 25. A | 26. B |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 9-4

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. D | 19. D | 20. B | 21. B |
| 22. D | 23. A | 24. E | 25. B | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. B | 19. C | 20. A | 21. E |
| 22. C | 23. B | 24. D | 25. C | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### No. 9-5

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. D | 20. E | 21. A |
| 22. D | 23. B | 24. E | 25. A | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. D | 19. E | 20. A | 21. D |
| 22. B | 23. A | 24. B | 25. A | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### No. 9-6

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. A | 20. B | 21. A |
| 22. C | 23. B | 24. C | 25. E | 26. D |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. C | 19. D | 20. A | 21. A |
| 22. D | 23. A | 24. E | 25. B | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### GRE国内题全部 RC

1990 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. C | 19. C | 20. C | 21. B |
| 22. A | 23. B | 24. C | 25. E | 26. A |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. A | 20. B | 21. D |
| 22. C | 23. C | 24. D | 25. E | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

1990 10

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. A | 20. C | 21. E |
| 22. D | 23. D | 24. B | 25. A | 26. E |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. D | 19. B | 20. D | 21. B |
| 22. A | 23. B | 24. C | 25. D | 26. A |
| 27. C | 28.   | 29.   | 30.   | 31.   |

1991 02

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. B | 19. E | 20. A | 21. D |
| 22. E | 23. D | 24. E | 25. E | 26. D |
| 27. C | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. E | 20. B | 21. B |
| 22. A | 23. D | 24. A | 25. C | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

1991 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. C | 19. B | 20. A | 21. A |
| 22. C | 23. B | 24. A | 25. E | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. E | 20. B | 21. C |
| 22. D | 23. D | 24. B | 25. C | 26. A |

|       |     |     |     |     |
|-------|-----|-----|-----|-----|
| 27. B | 28. | 29. | 30. | 31. |
|-------|-----|-----|-----|-----|

1991 10

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. B | 19. E | 20. C | 21. B |
| 22. C | 23. D | 24. A | 25. D | 26. E |
| 27. B | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. D | 20. E | 21. D |
| 22. B | 23. D | 24. A | 25. C | 26. B |
| 27. E | 28.   | 29.   | 30.   | 31.   |

1992 02

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. B | 20. E | 21. D |
| 22. A | 23. A | 24. A | 25. B | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. A | 19. E | 20. D | 21. B |
| 22. D | 23. A | 24. E | 25. B | 26. B |
| 27. C | 28.   | 29.   | 30.   | 31.   |

1992 04

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. E | 20. A | 21. E |
| 22. B | 23. C | 24. D | 25. C | 26. B |
| 27. C | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. B | 19. D | 20. A | 21. B |
| 22. B | 23. E | 24. C | 25. A | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

1992 10

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. E | 19. D | 20. B | 21. C |
| 22. D | 23. B | 24. C | 25. D | 26. E |
| 27. C | 28.   | 29.   | 30.   | 31.   |

SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. C | 20. B | 21. A |
| 22. D | 23. E | 24. D | 25. B | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

1993 02

SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. B | 20. A | 21. E |
| 22. C | 23. E | 24. B | 25. D | 26. B |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. A | 20. D | 21. A |
| 22. D | 23. B | 24. B | 25. B | 26. D |
| 27. A | 28.   | 29.   | 30.   | 31.   |

1993 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. B | 19. A | 20. C | 21. E |
| 22. E | 23. A | 24. C | 25. C | 26. D |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. A | 20. B | 21. A |
| 22. C | 23. B | 24. E | 25. E | 26. C |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION C

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. D | 20. E | 21. A |
| 22. B | 23. D | 24. B | 25. E | 26. A |
| 27. A | 28.   | 29.   | 30.   | 31.   |

1993 10

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. D | 19. B | 20. A | 21. B |
| 22. E | 23. C | 24. E | 25. E | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. A | 19. B | 20. E | 21. E |
| 22. C | 23. D | 24. A | 25. C | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

1994 02

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. B | 20. C | 21. C |
| 22. B | 23. B | 24. D | 25. A | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. A | 19. D | 20. E | 21. D |
| 22. A | 23. B | 24. E | 25. A | 26. D |
| 27. B | 28.   | 29.   | 30.   | 31.   |

1994 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. D | 19. C | 20. E | 21. B |
| 22. A | 23. B | 24. D | 25. E | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. C | 20. E | 21. A |
| 22. D | 23. B | 24. E | 25. C | 26. E |
| 27. B | 28.   | 29.   | 30.   | 31.   |

1994 10

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. B | 20. B | 21. A |
| 22. D | 23. E | 24. B | 25. C | 26. D |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. E | 19. A | 20. A | 21. D |
| 22. B | 23. D | 24. D | 25. D | 26. A |
| 27. C | 28.   | 29.   | 30.   | 31.   |

1995 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. A | 19. C | 20. D | 21. B |
| 22. A | 23. E | 24. A | 25. E | 26. B |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. D | 19. D | 20. E | 21. C |
| 22. E | 23. A | 24. D | 25. D | 26. B |
| 27. D | 28.   | 29.   | 30.   | 31.   |

1995 10

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. E | 20. D | 21. C |
| 22. A | 23. E | 24. E | 25. E | 26. D |
| 27. A | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. D | 19. C | 20. C | 21. B |
| 22. E | 23. A | 24. B | 25. C | 26. C |
| 27. E | 28.   | 29.   | 30.   | 31.   |

1996 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. C | 19. D | 20. D | 21. E |
| 22. D | 23. D | 24. A | 25. C | 26. B |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. D | 20. B | 21. E |
| 22. E | 23. E | 24. B | 25. C | 26. A |
| 27. A | 28.   | 29.   | 30.   | 31.   |

1996 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. C | 19. C | 20. D | 21. C |
| 22. D | 23. B | 24. D | 25. A | 26. D |
| 27. C | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. C | 19. C | 20. A | 21. C |
| 22. C | 23. A | 24. A | 25. C | 26. E |
| 27. E | 28.   | 29.   | 30.   | 31.   |

1996 10

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. C | 19. B | 20. B | 21. C |
| 22. B | 23. A | 24. C | 25. A | 26. D |
| 27. D | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. E | 19. C | 20. B | 21. D |
| 22. A | 23. B | 24. C | 25. A | 26. A |
| 27. C | 28.   | 29.   | 30.   | 31.   |

1997 04

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. E | 19. C | 20. E | 21. A |
| 22. A | 23. A | 24. E | 25. B | 26. A |
| 27. C | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. A | 19. B | 20. C | 21. E |
| 22. D | 23. E | 24. A | 25. D | 26. B |
| 27. A | 28.   | 29.   | 30.   | 31.   |

1997 11

### SECTION A

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. D | 18. D | 19. E | 20. D | 21. D |
| 22. A | 23. A | 24. B | 25. B | 26. C |
| 27. C | 28.   | 29.   | 30.   | 31.   |

### SECTION B

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. A | 19. D | 20. E | 21. E |
| 22. C | 23. C | 24. D | 25. C | 26. D |
| 27. B | 28.   | 29.   | 30.   | 31.   |

1998 04

**SECTION A**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. C | 20. C | 21. A |
| 22. E | 23. B | 24. E | 25. C | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

**SECTION B**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. C | 18. B | 19. E | 20. D | 21. C |
| 22. B | 23. B | 24. C | 25. E | 26. A |
| 27. D | 28.   | 29.   | 30.   | 31.   |

**1998 11****SECTION A**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. B | 18. C | 19. B | 20. A | 21. E |
| 22. A | 23. E | 24. C | 25. A | 26. B |
| 27. C | 28.   | 29.   | 30.   | 31.   |

**SECTION B**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. E | 18. D | 19. B | 20. C | 21. B |
| 22. C | 23. A | 24. E | 25. A | 26. A |
| 27. B | 28.   | 29.   | 30.   | 31.   |

**1999 04****SECTION A**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. A | 19. E | 20. E | 21. C |
| 22. B | 23. B | 24. D | 25. D | 26. E |
| 27. D | 28.   | 29.   | 30.   | 31.   |

**SECTION B**

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 17. A | 18. E | 19. B | 20. E | 21. D |
| 22. C | 23. A | 24. C | 25. A | 26. C |
| 27. B | 28.   | 29.   | 30.   | 31.   |