

Form 65C

(June 2007)

FORMCODE ACTC65

ACT Assessment

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In response to your recent request for test information release materials, this booklet contains the test questions and conversion tables used in determining your ACT scores. Enclosed with this booklet is a report listing your answers to the ACT Assessment tests and the answer key.

If you wish to order a photocopy of your answer document—including, if you took the Writing Test, a copy of your written essay—please use the order form on the inside back cover of this booklet.

We hope that you will find this information helpful.



ENGLISH TEST

45 Minutes—75 Questions

DIRECTIONS: In the five passages that follow, certain words and phrases are underlined and numbered. In the right-hand column, you will find alternatives for the underlined part. In most cases, you are to choose the one that best expresses the idea, makes the statement appropriate for standard written English, or is worded most consistently with the style and tone of the passage as a whole. If you think the original version is best, choose "NO CHANGE." In some cases, you will find in the right-hand column a question about the underlined part. You are to choose the best answer to the question.

You will also find questions about a section of the passage, or about the passage as a whole. These questions do not refer to an underlined portion of the passage, but rather are identified by a number or numbers in a box.

For each question, choose the alternative you consider best and fill in the corresponding oval on your answer document. Read each passage through once before you begin to answer the questions that accompany it. For many of the questions, you must read several sentences beyond the question to determine the answer. Be sure that you have read far enough ahead each time you choose an alternative.

PASSAGE I

The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 14 will ask you to choose where Paragraph 3 should most logically be placed.

Picturing the Past

[1]

Before I left home to attend college, my grandmother gave me a bag filled with old photographic negatives. Having enrolled in a photography class for my first semester, I had offered to preserve some of our family's memories before the film deteriorated or got lost. My grandmother patted my hand and said, "Good luck,
Angela."

[2]

[1] I soon came to love the silence of the photo darkroom, illuminated only by its dim, red safelight.
2

1. A. NO CHANGE
B. memories. Before the film was
C. memories. Before the film had
D. memories. Before the film
2. Given that all the choices are true, which one provides a detail that best leads into the description that follows in this paragraph?
F. NO CHANGE
G. located in the Art Building on the south campus.
H. which was open for use by photography students.
J. occasionally shared with others from the class.

[2] Something about that isolation, and darkness seemed mysterious. [3] I took a negative from the collection and enclosed it in the glass of the enlarger. [4] An enlarger is a magnifying device used in printing photographs. [5] I exposed the paper with a flash of light through the negative and then placed the paper in a developing solution. [6] Soon, the faces' of my mother's

family began to appear on the paper. [6]

[3]

Early in the semester, I opened the bag of battered negatives and began to examine them. "I don't know," I told my grandmother doubtfully over the phone, "but I'll see what I can do." Some of the negatives were not much larger than postage stamps, while others were as large as greeting cards. Holding them up to the light, I could scarcely make out traces of faint figures. Many of the negatives were bent and faded, and some were speckled with age spots.

[4]

In one shot, my young grandparents toted crates filled with ripe fruit, and my mother sat on a branch, peering down at the camera. They floated before me, not like ancestral ghosts but physical and alive.

Yet, all my mother's stories came to mind.

3. A. NO CHANGE
B. isolation, and, darkness
C. isolation and darkness
D. isolation and darkness,
4. Which of the following alternatives to the underlined portion would NOT be acceptable?
F. collection and then enclosed
G. collection; then I enclosed
H. collection that enclosed
J. collection, enclosing
5. A. NO CHANGE
B. faces of my mother's
C. faces' of my mothers
D. faces of my mothers
6. Which of the following sentences in this paragraph is LEAST relevant to the purpose of describing the narrator's actions and, therefore, could be deleted?
F. Sentence 3
G. Sentence 4
H. Sentence 5
J. Sentence 6
7. A. NO CHANGE
B. had began
C. begun
D. begin
8. F. NO CHANGE
G. branch, which peered
H. branch that peered
J. branch peering
9. A. NO CHANGE
B. Instead, all
C. Besides, all
D. All

I recalled her description of the long hard hours,
 spent working in the migrant camps and the

peach and apricot fuzz that prickled it's

skin. [12]

[5]

In the darkroom that first semester of college,
far from home, I studied these scenes from the lives of my
 relatives. Whenever I felt discouraged, those photographs
 would reassure me. Though the distance in time and space
 between us was great, I knew that as long as I had those
 photographs, my family could never be far away.

Questions 14 and 15 ask about the preceding passage as a whole.

14. For the sake of the logic and coherence of this essay, Paragraph 3 should be placed:
- F. where it is now.
 - G. before Paragraph 1.
 - H. before Paragraph 2.
 - J. before Paragraph 5.

15. Suppose the writer's goal had been to write a brief essay on how to develop photographs in a darkroom. Would this essay successfully accomplish that goal?
- A. Yes, because it explains how developing photographs from negatives can preserve the past.
 - B. Yes, because it focuses on a particular group of photographic negatives.
 - C. No, because it fails to describe the photographs that the narrator took for the class.
 - D. No, because it focuses instead on the personal significance of a set of photographs.

PASSAGE II

Serving in the Peace Corps

After much too long a flight, we landed.

Being that I fully stretched my legs for the first
 time in twelve hours, I poked my head out the
 bulkhead door and exclaimed, "This place is hot."

10. F. NO CHANGE
 G. long, hard hours,
 H. long, hard, hours
 J. long, hard hours
11. A. NO CHANGE
 B. there
 C. her
 D. its
12. Which of the following true statements, if added at the beginning of this paragraph, would most effectively introduce readers to the information presented in the paragraph?
- F. The photos, taken around 1945, showed my relatives working in the California orchards.
 - G. Developing photographs is a difficult process, especially when the negatives are old or damaged.
 - H. As World War II came to a close, around 1945, my grandparents worked as migrant laborers.
 - J. Many people have immigrated to the United States over the years to work as migrant farm laborers.
13. Given that all the choices are true, which one provides information that is most relevant at this point in the essay?
- A. NO CHANGE
 - B. which ended in early December,
 - C. having completed high school,
 - D. a midsize state school,

I had arrived in Safi, Morocco, a seaport on the Atlantic coast in northwestern Africa. ¹⁷ The

hot, dry wind, blowing off the desert seemed to

¹⁸

melt right through me. I suddenly wished I could duck ¹⁹ back inside the air-conditioned 747 and head back home.

That was how my Peace Corps experience began.

A local welcoming committee greeted me, and we shared bowls of sweetened goat's milk and plates of fresh dates. I gratefully accepted their hospitality and satisfied my hunger.

Eventually, when I completed my Peace Corps

²⁰

service, and realized that I had also satisfied my
²¹ hunger for new experiences. But I'd accomplished
much more than that. I had become more adaptable,
more perceptive, more self-reliant—in short, more
grown up. I'd not only helped people in Morocco but
also learned Arabic, developed lifelong friendships,
celebrated Islamic holidays, and come to understand and
appreciate a culture different from my own. I had known
²²

I would be teaching English to teenagers whom were
²³ studying to become everything from shipbuilders to

17. If the writer were to delete the phrase "a seaport on the Atlantic coast in northwestern Africa" from the preceding sentence, the paragraph would primarily lose:
- details that more fully describe the setting.
 - information that explains the narrator's reason for being there.
 - a comparison of this location with the narrator's home.
 - nothing at all, since these geographic details are irrelevant to the paragraph.
18. F. NO CHANGE
 G. hot, dry, wind
 H. hot, dry wind
 J. hot dry wind,
19. A. NO CHANGE
 B. simmer
 C. blast
 D. ignite
20. Given that all the choices are true, which one provides the best transition by providing specific information?
- NO CHANGE
 - After some time had passed,
 - Two years later,
 - Subsequently,
21. A. NO CHANGE
 B. service, and I
 C. service and
 D. service, I
22. F. NO CHANGE
 G. differently from
 H. differently than
 J. different then
23. A. NO CHANGE
 B. whom are
 C. who were
 D. who have

chemical engineers. Never imagining that the work would lead to moments of self-discovery. I never dreamed

I'd miss my home in the United States as much as I did.

25

Perhaps the most important thing I learned is that for all the ways in which people all over the world are different, there are just as many ways in which they are alike. This knowledge reassures and inspires me. When I remember that human beings share many of the same

hopes, and fears, dreams and disappointments, then I can

27

help my relationships. 28 Perhaps this is a small thing, but no less significant than mastering a new skill or suddenly understanding a concept. After all, it's not

what we know that makes us smart but how one chooses to use that knowledge.

29

24. F. NO CHANGE
 G. Having never imagined
 H. Never to imagine
 J. I never imagined
25. Given that all the choices are true, which one concludes this paragraph with a point most consistent with other points made in this paragraph?
- A. NO CHANGE
 B. I'd end up learning much more than I could possibly teach.
 C. that living in Morocco could be such a fun experience.
 D. the time would pass so slowly in the beginning and so quickly at the end.
26. F. NO CHANGE
 G. myself when
 H. me, when
 J. me when
27. A. NO CHANGE
 B. hopes, and fears, dreams,
 C. hopes and fears, dreams
 D. hopes and fears dreams
28. The writer is considering revising the phrase "help my relationships" in the preceding sentence to read: more easily form new relationships and fortify old ones.
 Should the writer make this revision or keep the phrase as it is?
 F. Make the revision, because it adds details that clarify the point being made in this sentence.
 G. Make the revision, because it emphasizes how important and difficult it is to form relationships.
 H. Keep the phrase as it is, because it's specific, whereas the proposed revision is ambiguous.
 J. Keep the phrase as it is, because it's shorter and more concise than the proposed revision.
29. A. NO CHANGE
 B. we choose
 C. we chose
 D. I chose
- Question 30 asks about the preceding passage as a whole.
30. Suppose the writer's goal had been to describe the personal benefits of his Peace Corps experience. Does this essay successfully accomplish that goal?
- F. Yes, because it promotes the Peace Corps and invites readers to join the Peace Corps.
 G. Yes, because it describes what the narrator gained as a result of serving in the Peace Corps.
 H. No, because it focuses instead on the specific benefits of living in Morocco.
 J. No, because it fails to provide enough information on what the narrator did in the Peace Corps.

PASSAGE III

The following paragraphs may or may not be in the most logical order. Each paragraph is numbered in brackets, and question 45 will ask you to choose where Paragraph 4 should most logically be placed.

Highway Flowers

[1]

Wildflowers thrive in stunning stretches of color along the highways across the United States. In California, poppies spread in dazzling carpets of orange. ³¹ In

www.crackab.com
Virginia, pink cosmos accent the landscape, occasionally,
³²

these scenic expanses come about with no help from

humans. Often, for example, they are the lovely
³³
outcome of federal, state, and local programs to

restore and preserve the lasting character of the
³⁴
natural beauty of the national landscape.

[2]

The individuals who are passionate about these programs point out that native plants along a roadway do more than beautify the area. ³⁵ Properly selected vegetation absorbs rainwater runoff that might otherwise

31. At this point, the writer is considering adding the following true statement:

In Iowa, purple coneflowers sway in summer breezes.

Should the writer make this addition here?

- A. Yes, because it helps establish that the essay is set in the Midwest in the summer.
- B. Yes, because it helps reinforce the main point of this paragraph.
- C. No, because its focus on a state is not appropriate in a paragraph about a national issue.
- D. No, because it does not make it clear whether coneflowers grow in every state.

32. F. NO CHANGE

- G. landscape occasionally
- H. landscape occasionally,
- J. landscape. Occasionally,

33. A. NO CHANGE

- B. however,
- C. in the meantime,
- D. once in a while,

34. F. NO CHANGE

- G. and preserve
- H. the character of the preservation of
- J. in a characteristic fashion the preservation of

35. The writer is considering deleting the phrase "who are passionate about these programs" from the preceding sentence. Should the phrase be kept or deleted?

- A. Kept, because it indicates the paragraph's focus on the people who founded federal wildflower programs.
- B. Kept, because it clarifies the term *individuals* and contributes to the logic of the paragraph.
- C. Deleted, because the first paragraph of the essay has already established that people are passionate about wildflowers.
- D. Deleted, because it draws attention away from the wildflowers and places it on people.

GO ON TO THE NEXT PAGE.

create hazardous conditions on the highways. The plants also provide habitat for songbirds, butterflies, and other wildlife. ³⁶ Furthermore, highway maintenance costs and

pollution decreases in areas planted with native flowers

³⁷

and grasses, which require little, if any, mowing or
³⁸ chemical treatment.

[3]

Texas was one of the early leaders in this movement, ³⁹ established a wildflower program in the 1930s, thanks to the initiative of Gibb Gilchrist, the state's highway engineer at the time. Thirty years later, another Texan strengthened roadway beautification programs at a national level.

⁴⁰

[4]

As a child, Claudia Taylor became deeply attached to the wild beauty of her surroundings. As an adult, she devoted herself to protecting and restoring habitat that she saw rapidly disappearing. In the 1960s, she moved into the White House with her husband, President Lyndon Johnson, by then widely known as "Lady Bird" Johnson, ⁴¹ this crusader took a stand for native plants and the wildlife that depend on them. She strongly believed if humans were to benefit immeasurably from beauty in

⁴²

36. The writer is considering deleting the phrase "for songbirds, butterflies, and other wildlife" from the preceding sentence (and placing a period after the word *habitat*). Should the phrase be kept or deleted?
- F. Kept, because it clarifies the claim made in the first part of the sentence.
 - G. Kept, because it strengthens the paragraph's focus on songbirds and butterflies.
 - H. Deleted, because the essay is mainly about wildflowers, not birds or butterflies.
 - J. Deleted, because the information fails to specify which species of songbirds or butterflies populate the habitat.
37. A. NO CHANGE
B. pollution decrease
C. pollution has decreased
D. also decreasing pollution
38. F. NO CHANGE
G. little, if any
H. little if any,
J. little; if any
39. A. NO CHANGE
B. Texas, where
C. In Texas,
D. Texas,
40. Given that all the choices are true, which one best clarifies the distinction between the actions of the two Texans mentioned in this paragraph?
- F. NO CHANGE
 - G. involving wildflowers.
 - H. at a different level.
 - J. several decades after Gilchrist.
41. A. NO CHANGE
B. Johnson. By
C. Johnson by
D. Johnson by,
42. F. NO CHANGE
G. because if humans
H. that if humans
J. that humans

their environment. By working for the passage of the Highway Beautification Act in 1963, she helped create a national legacy to endure for others. That legacy blooms

43

from coast to coast, from sea to shining sea.

44

43. A. NO CHANGE
B. legacy for the benefit of those who come in the future.
C. project of the type that can appropriately be called a legacy.
D. legacy.

44. Given that all the choices are true, which one concludes the paragraph with a colorful image that relates to the main topic of the essay?

- F. NO CHANGE
G. thanks to the hard work of so many people over the years who have lent their efforts to an important national cause.
H. starting with the bluebells of spring and lasting through the sunflowers of autumn.
J. throughout many times of the year for the benefit of one and all.

Question 45 asks about the preceding passage as a whole.

45. For the sake of the logic and coherence of this essay, Paragraph 4 should be placed:

- A. where it is now.
B. before Paragraph 1.
C. before Paragraph 2.
D. before Paragraph 3.

PASSAGE IV

Expanding the Chorus of Voices

In 2002, Minnesota writer and

editor, Mai Neng Moua, created a new literary

46

tradition, with the publication of the first-ever anthology,
47
of Hmong American writers. This collection, *Bamboo*

Among the Oaks, features the fiction, nonfiction,
48
poetry, and drama of twenty-two Hmong Americans.

46. F. NO CHANGE
G. editor Mai Neng Moua
H. editor, Mai Neng Moua
J. editor Mai Neng Moua,

47. A. NO CHANGE
B. tradition, with the publication of the first-ever anthology
C. tradition with the publication of the first-ever anthology
D. tradition with the publication, of the first-ever anthology,

48. F. NO CHANGE
G. features:
H. featured,
J. featured:

May Lee, a writer from St. Paul, Minnesota,
 has two essays in the anthology. Most of the

featured writers are in their twenties and thirties
 and live in the Midwest. Many are first-generation
 Americans who were born in the mountain regions of
 Vietnam, Laos, and Cambodia, the traditional home
 of the Hmong.

The works in Moua's anthology records the
 challenges of adjusting to a new homeland while
 preserving the writers' ethnic traditions. The voices
 in the collection are vibrant and new, from writers who
 are grounded in Hmong culture. A common theme in
 Moua's collection is the search for identity. Specific
 topics include assimilation, group identification, and
 gender and generational conflict.

[1] Before publishing *Bamboo Among the Oaks*, Moua
 founded the first Hmong American literary journal. [2] To
 fill this gap, she decided to nurture the talent of Hmong
 American writers by creating *Paj Ntaub Voice*, a bilingual

publication in Hmong and English. [3] The idea came
 to her while she was recovering from surgery. [4] To pass
 the time, she spent many hours reading, and she discovered
 that Hmong writers were missing from Asian American
 anthologies. [5] The first issue, produced in 1994, was a
 simple collection of pages printed in black ink and stapled.

[6] Today, *Paj Ntaub Voice* is published in full color with
 standard book binding. [54]

49. A. NO CHANGE
 B. The anthology, which was published only a few years ago, is the first of its kind.
 C. *Bamboo Among the Oaks* has brought Moua significant attention from the media.
 D. DELETE the underlined portion.

50. F. NO CHANGE
 G. writers included in the group of twenty-two who are featured in this collection
 H. featured Hmong American writers being highlighted
 J. young Hmong American writers whose work collectively creates this anthology

51. A. NO CHANGE
 B. has recorded
 C. recording
 D. record

52. Which of the following alternatives to the underlined portion would be LEAST acceptable?

- F. support
 G. raise
 H. foster
 J. encourage

53. If the writer were to delete the phrase "a bilingual publication in Hmong and English" from the preceding sentence, the essay would primarily lose:

- A. a suggestion that Moua had considered publishing the *Paj Ntaub Voice* in Hmong only.
 B. a relevant description of how the writings in *Paj Ntaub Voice* are presented.
 C. a fact that reveals that *Paj Ntaub Voice* was one of the first bilingual literary journals.
 D. information that reveals why the journal is very popular in courses in Asian American studies.

54. For the sake of the logic and coherence of this paragraph, Sentence 2 should be placed:

- F. where it is now.
 G. before Sentence 1.
 H. after Sentence 3.
 J. after Sentence 4.

Moua is proud of her accomplishments
and those of other Hmong writers in the United
⁵⁵

States. ⁵⁶ Believing that many more voices need

to be heard, people in the Hmong community are urged
⁵⁷
to write, to add their voices to the literary community.

She is pleased that, within her anthology, readers
⁵⁸

nationwide are being introduced to the writing of
⁵⁹

Hmong Americans. Her hope that college courses in
⁶⁰
Asian American studies soon will include at least one
selection from *Bamboo Among the Oaks*.

55. A. NO CHANGE
B. that of
C. about
D. with
56. At this point, the writer is considering adding the following true statement:
In 1997, Moua graduated from St. Olaf College in Northfield, Minnesota.
Should the writer make this addition here?
F. Yes, because it provides information about Moua's educational background that deepens the readers' understanding of her work as an editor.
G. Yes, because it links Moua's education with her belief that more people in the Hmong community should write.
H. No, because it does not provide a direct connection between Moua's education and her accomplishments as a writer and editor.
J. No, because it is clear from the essay that Moua's experiences in college had no impact on her work as a writer and editor.
57. A. NO CHANGE
B. urging people in the Hmong community
C. people in the Hmong community whom Moua urges
D. she urges people in the Hmong community
58. F. NO CHANGE
G. throughout
H. through
J. for
59. A. NO CHANGE
B. provided with a given opportunity to become acquainted with
C. able to start to get to know and learn
D. given the chance to be exposed to Hmong American literature by means of reading
60. F. NO CHANGE
G. is that
H. being that
J. being

PASSAGE V

Learning by Building

Frank Lloyd Wright, one of the twentieth century's most creative and innovative architects basing ⁶¹ most of his designs on two theories. One is his

mentor Louis Sullivan's idea; that "form follows ⁶²

function"—this is a building's use determines its design. ⁶³

Something else underlying Wright's designs is that of ⁶⁴

organic architecture and structures should appear to be ⁶⁵ an extension of their surroundings.

Students being taught these theories and their ⁶⁶ practice, Wright founded the Frank Lloyd Wright School of Architecture in 1932. The school flourishes today, with two campuses—one in Spring Green, Wisconsin, and the other ⁶⁷ near Scottsdale, Arizona, in the Sonoran Desert.

The students learning about the art and science ⁶⁸ of architecture, and they perform the school's daily maintenance tasks such as cooking, serving, and cleaning up in the school's kitchen. Those tasks are part of the school's curriculum, although ⁶⁹ Wright believed that only a person familiar with every room's function could design a well-formed house.

61. A. NO CHANGE
B. architects. Based
C. architects, basing
D. architects, based

62. F. NO CHANGE
G. mentor, Louis Sullivan's idea,
H. mentor, Louis Sullivan's idea
J. mentor Louis Sullivan's idea

63. A. NO CHANGE
B. that is,
C. this is,
D. that is

64. F. NO CHANGE
G. Another thing
H. An idea
J. The other theory

65. A. NO CHANGE
B. architecture, which
C. architecture: that
D. architecture that

66. F. NO CHANGE
G. To teach students
H. Students learning
J. As students learn

67. Which of the following alternatives to the underlined portion would NOT be acceptable?
A. the other one
B. that one
C. another
D. one

68. F. NO CHANGE
G. learned
H. learn
J. who learn

69. A. NO CHANGE
B. since
C. while
D. furthermore



[1] The students also experiment with form and function by building their own shelters. [2] These examples of organic architecture turn out to be as distinctive as the students who design them. [3] The tan wood and rusted red steel of the residence—
which presents an interesting sight to catch the eye—
⁷⁰ mirror the colors of the surrounding desert. [4] One

student who creates a rectangular structure

⁷¹

from donated glass, wood, and steel to span a dry riverbed. [5] Some homes are inherited and modified by other students in subsequent years. [6] Other

dwellings, made of biodegradable materials, are

⁷³

left to decay. ⁷⁴

Since Wright's death in 1959, the school has continued to thrive thanks to its Fellowship members, former students of Wright's who now serve as teachers and mentors for others. These teachers and their students work, study, and build together, using Wright's guiding theories and the skills they've learned to create buildings that are both beautiful and functional.

70. Given that all the choices are true, which one would add the most effective visual detail to the description provided in the first part of the sentence?

- F. NO CHANGE
- G. an architectural structure that took the student several weeks to build—
- H. which resembles a railroad boxcar in size and shape—
- J. a piece of architecture positioned in the Arizona desert—

71. A. NO CHANGE

- B. who created
- C. creating
- D. created

72. Which of the following alternatives to the underlined portion would NOT be acceptable?

- E. out of
- G. using
- H. into
- J. with

73. A. NO CHANGE

- B. dwellings made of biodegradable materials,
- C. dwellings, made of biodegradable materials
- D. dwellings made of biodegradable materials;

74. For the sake of the logic and coherence of this paragraph, Sentence 4 should be placed:

- E. where it is now.
- G. before Sentence 1.
- H. before Sentence 2.
- J. before Sentence 3.

75. A. NO CHANGE

- B. Side by side and hand in hand, these
- C. As one group with each other, these
- D. By cooperating in harmony, these

END OF TEST 1

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

2**2****MATHEMATICS TEST****60 Minutes—60 Questions**

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. A fruit salad contains pineapples, apples, bananas, and oranges. It contains twice as many bananas as apples, 10 times as many oranges as pineapples, and the same number of apples as oranges. Jeff made this fruit salad using 1 pineapple. How many of each of the other fruits did he use?

	<u>Apples</u>	<u>Bananas</u>	<u>Oranges</u>
A.	10	20	10
B.	10	20	1
C.	10	2	10
D.	10	2	1
E.	1	2	1

2. Which of the following expressions is equivalent to $(2x + 5)(x - 3)$?

- F. $2x^2 + 11x + 15$
 G. $2x^2 + 11x - 15$
 H. $2x^2 - 11x + 15$
 J. $2x^2 + x + 15$
 K. $2x^2 - x - 15$

3. Let a function of 2 variables be defined by $f(x,y) = xy - (x - y)$. What is the value of $f(9,7)$?

- A. 16
 B. 47
 C. 61
 D. 65
 E. 79

4. What is $\frac{1}{6}$ of 24% of \$7,000?

- F. \$ 28
 G. \$ 280
 H. \$ 1,008
 J. \$ 2,800
 K. \$10,080

2**2**

DO YOUR FIGURING HERE.

5. If $4x + 4 = 16 + 2x$, then $x = ?$

- A. 2
- B. 6
- C. 10
- D. 24
- E. $\frac{10}{3}$

6. The second term of an arithmetic sequence is -11, and the third term is -38. What is the first term?

(Note: In an arithmetic sequence, consecutive terms differ by the same amount.)

- F. -27
- G. $\frac{1}{11}$
- H. 11
- J. 16
- K. 27

7. A bag contains 64 marbles, all solid colored. Each marble is either red, yellow, or green. A marble is randomly removed from the bag and then returned to the bag. The probability that this marble is red is $\frac{5}{8}$. The probability that this marble is yellow is $\frac{1}{4}$. How many green marbles are in the bag?

- A. 40
- B. 32
- C. 24
- D. 16
- E. 8

8. A small bottling company pays for the water it uses. The monthly cost is a fixed charge of \$50 plus \$4 for each 1,000 units of water used. Last month, the company used 40,000 units of water. What was the total cost of water for this company last month?

- F. \$ 66
- G. \$ 160
- H. \$ 210
- J. \$1,600
- K. \$1,650

2**2**

DO YOUR FIGURING HERE.

9. A square has the same perimeter as a regular hexagon (a 6-sided polygon with all sides congruent and all interior angles congruent). If 1 side of the square is 108 centimeters long, how many centimeters long is 1 side of the hexagon?

- A. 72
- B. 90
- C. 108
- D. 216
- E. 648

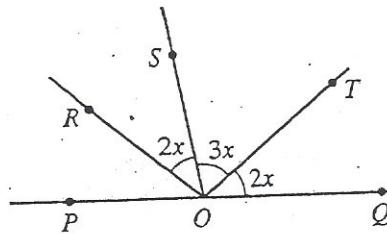
10. Two workers were hired to begin work at the same time. Worker A's contract called for a starting salary of \$20,000 with an increase of \$800 after each year of employment. Worker B's contract called for a starting salary of \$15,200 with an increase of \$2,000 after each year of employment. If x represents the number of full years of employment (that is, the number of yearly increases each worker has received), which of the following equations could be solved to determine the number of years until B's yearly salary equals A's yearly salary?

- F. $20,000 + 800x = 15,200 + 2,000x$
- G. $20,000 + 2,000x = 15,200 + 800x$
- H. $800x + 2,000x = x$
- J. $800x + 2,000x = 20,000$
- K. $800x + 2,000x = 15,200$

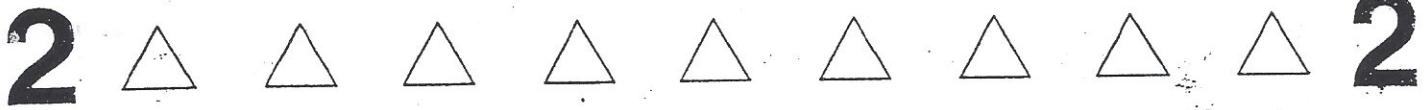
11. If $I = PRT$, then which of the following is an expression for T in terms of I , P , and R ?

- A. $\frac{PR}{I}$
- B. $\frac{I}{PR}$
- C. IPR
- D. $I - PR$
- E. $I + PR$

12. The measure of $\angle QOR$ in the figure below is 140° . The measures of 3 angles are given in terms of x , in degrees. What is the measure of $\angle QOS$?



- F. 96°
- G. 100°
- H. 120°
- J. 138°
- K. 140°



DO YOUR FIGURING HERE.

13. A Fahrenheit thermometer outside reads 57°F . The temperature is 20°F warmer indoors. What is the indoor temperature, C , in degrees Celsius?

(Note: $F = \frac{9}{5}C + 32$)

- A. 14°C
- B. 25°C
- C. 34°C
- D. 77°C
- E. 81°C

14. If $a - b = 5$ and $c = 7a - 9 - 7b$, then $c = ?$

- F. -4
- G. -2
- H. 26
- J. 35
- K. 44

15. Dena ran $2\frac{4}{5}$ miles on Monday and $3\frac{1}{3}$ miles on Tuesday. The total distance, in miles, Dena ran during those 2 days is within which of the following ranges?

- A. At least $5\frac{1}{2}$ and less than $5\frac{2}{3}$
- B. At least $5\frac{2}{3}$ and less than 6
- C. At least 6 and less than $6\frac{1}{3}$
- D. At least $6\frac{1}{3}$ and less than $6\frac{1}{2}$
- E. At least $6\frac{1}{2}$ and less than $6\frac{2}{3}$

16. A boat leaves a dock and sails directly north for 5 miles. It then turns and sails 12 miles east. How many miles is the boat from the dock?

- F. 5
- G. 11
- H. 12
- J. 13
- K. 17

17. A mathematical processor in a computer can add a number to a running total in 0.000 000 045 seconds. This processor can add 10,000,000,000 numbers to the running total in how many seconds?

- A. 0.0045
- B. 0.45
- C. 4.5
- D. 45
- E. 450

2



2

DO YOUR FIGURING HERE.

18. Tira's dog's rectangular pen is 10 feet wide by 25 feet long. Tira wants to increase the area by 200 square feet by increasing the width and length by the same amount. What will be the new dimensions (width by length), in feet?

- F. 15 by 30
 - G. 18 by 25
 - H. 20 by 45
 - J. 30 by 35
 - K. 50 by 65

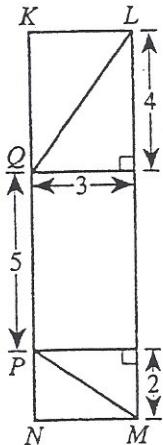
19. The lengths of the sides of a triangle are 3 consecutive odd integers. If the perimeter of the triangle is 33 inches, what is the length, in inches, of the longest side?

- A. 7
 B. 9
 C. 11
 D. 13
 E. 15

20. In the standard (x,y) coordinate plane, what is the slope of the line with equation $2y - 6x = 4$?

- | | |
|----|----|
| F. | 2 |
| G. | 3 |
| H. | 4 |
| J. | 6 |
| K. | -3 |

21. In the figure below, points K , Q , P , and N are collinear, and distances marked are in meters. The area of rectangle $KLMN$ is 33 square meters. What is the area of trapezoid $LQPM$, in square meters?

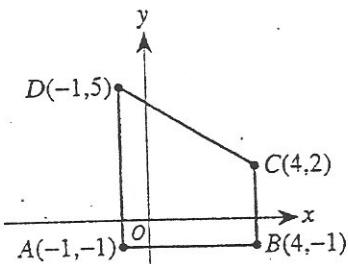


- A. 18
 B. 21
 C. 24
 D. 27
 E. 48

DO YOUR FIGURING HERE.

Use the following information to answer
questions 22–24.

Quadrilateral $ABCD$ is shown below in the standard (x,y) coordinate plane. For this quadrilateral, $AB = 5$, $BC = 3$, $CD = \sqrt{34}$, and $DA = 6$, all in coordinate units.



22. Which of the following is closest to the perimeter of quadrilateral $ABCD$, in coordinate units?

F. 14.0
G. 15.0
H. 19.8
J. 22.5
K. 26.0

23. What is the length of \overline{AC} in coordinate units?

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A. 4
B. 8
C. $\sqrt{8}$
D. $\sqrt{10}$
E. $\sqrt{34}$

24. Which of the following are the coordinates of the image of D under a 90° counterclockwise rotation about the origin?

F. $(-5, -1)$
G. $(-1, -5)$
H. $(1, -5)$
J. $(1, 5)$
K. $(5, -1)$

25. Which of the following letters of the alphabet has at least 1 reflectional symmetry and at least 1 rotational symmetry?

(Note: The angle of rotation for the rotational symmetry must be less than 360° .)

A. H
B. M
C. N
D. S
E. T

2**2**

DO YOUR FIGURING HERE.

26. What is the coefficient of x^9 in the product of the 2 polynomials below?

$$(x^5 - 2x^4 + 8x^3 + 3x^2 + x)(3x^4 + x^3 - 2x^2 + 4)$$

- F. 0
G. 1
H. 3
J. 8
K. 9

Use the following information to answer questions 27–28.

The stem-and-leaf plot below shows the number of rebounds a basketball player with the Connecticut Suns grabbed in each of 17 games.

Stem	Leaf
0	8 9
1	1 1 3 3 4 4 5 5 5 6 9
2	1 1 2 4

(Note: For example, 13 rebounds would have a stem value of 1 and a leaf value of 3.)

27. Which of the following is closest to the mean number of rebounds this player grabbed per game?

- A. 7.5
B. 15.0
C. 15.4
D. 16.0
E. 16.5

28. If a game represented in the stem-and-leaf plot is selected randomly, what is the probability that the basketball player grabbed exactly 15 rebounds in that game?

- F. $\frac{3}{17}$
G. $\frac{9}{17}$
H. $\frac{15}{17}$
J. $\frac{15}{261}$
K. $\frac{45}{261}$

DO YOUR FIGURING HERE.

29. What is the least common multiple of 3 , $5x$, $4y$, and $6xy$?

- A. $30xy$
- B. $60xy$
- C. $60x^2y$
- D. $120xy$
- E. $120x^2y$

30. The number of clients Galaxy Internet Company acquired in each calendar year can be modeled by the function $C(t) = 750t + 320$, where $t = 0$ corresponds to the 1999 calendar year. Using this model, how many clients would you expect Galaxy to acquire in the calendar year 2006?

- F. 2,990
- G. 4,070
- H. 4,820
- J. 5,570
- K. 6,320

31. A line in the standard (x,y) coordinate plane contains the points $A(-2,3)$ and $B(10,9)$. What is the midpoint of \overline{AB} ?

- A. $(4, 6)$
- B. $(6, 3)$
- C. $(6, 6)$
- D. $(8, 12)$
- E. $(12, 6)$

32. For $x^2 \neq 81$, $\frac{(x-9)^2}{x^2 - 81} = ?$

- F. $\frac{x-9}{x+9}$
- G. $\frac{1}{x-9}$
- H. $\frac{1}{x+9}$
- J. $-\frac{1}{9}$
- K. $\frac{1}{9}$

33. Issa bought 2 cases of 12-ounce cans of soda. Each case contained 24 cans. Issa could have bought the same amount of soda by buying how many 16-ounce bottles of soda?

- A. 8
- B. 18
- C. 32
- D. 36
- E. 48

2



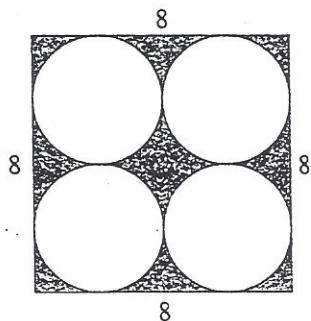
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34. When $\frac{r}{s} = 3$, $r^2 - 9s^2 = ?$

DO YOUR FIGURING HERE.

- F. 0
- G. 8
- H. 9
- J. -8
- K. -9

35. An 8-foot-square sheet of tin from which 4 identical circles are cut is shown below. Each circle is tangent to 2 other circles and tangent to 2 of the edges of the square. What is the approximate area, in square feet, of the remaining tin, as indicated by the shaded region below?



- A. 51.4
- B. 38.9
- C. 19.4
- D. 13.7
- E. 6.9

36. Which of the following lists gives the 3 largest prime numbers that are less than 60?

- F. 2, 3, and 5
- G. 3, 5, and 7
- H. 37, 47, and 59
- J. 47, 51, and 57
- K. 47, 53, and 59

37. The costs of taxi rides of different lengths, given in quarter miles, are shown in the table below.

Number of quarter miles	10	12	14	20
Cost	\$4.00	\$4.50	\$5.00	\$6.50

Each cost consists of a fixed charge and a charge per quarter mile. What is the fixed charge?

- A. \$0.40
- B. \$1.00
- C. \$1.50
- D. \$3.75
- E. \$6.50

2

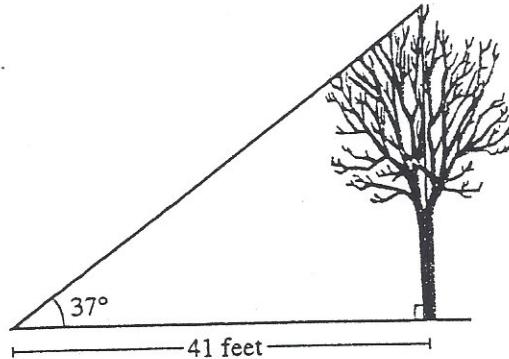


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DO YOUR FIGURING HERE.

38. At a time when the sun's rays are striking the level ground at an angle of 37° , a tree casts a shadow that is 41 feet long, as shown in the figure below. To the nearest foot, how many feet tall is the tree?

(Note: $\sin 37^\circ \approx 0.60$, $\cos 37^\circ \approx 0.80$, $\tan 37^\circ \approx 0.75$)



- F. 25
G. 31
H. 33
J. 50
K. 55
39. A circle in the standard (x,y) coordinate plane has center $(11, -9)$ and radius 8 coordinate units. Which of the following is an equation of the circle?

- A. $(x - 11)^2 + (y + 9)^2 = 8$
B. $(x + 11)^2 + (y - 9)^2 = 8$
C. $(x + 11)^2 - (y - 9)^2 = 8$
D. $(x + 11)^2 - (y - 9)^2 = 64$
E. $(x - 11)^2 + (y + 9)^2 = 64$

40. What is the largest integer value of n that satisfies the inequality $\frac{12}{15} > \frac{n}{12}$?

- F. 7
G. 8
H. 9
J. 10
K. 11

41. Given $f(x) = x^2 + x + 2$, what is $f(x + h)$?

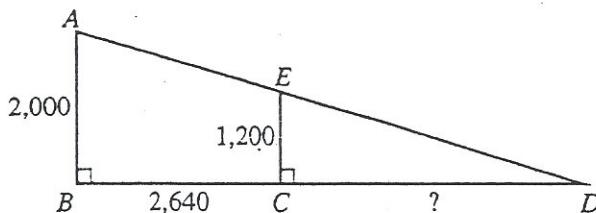
- A. $x^2 + x + h + 2$
B. $x^2 + h^2 + x + h + 2$
C. $x^2 + h^2 + x + h + 4$
D. $(x + h)^2 + x + h + 2$
E. $(x + h)^2 + x + 2h + 2$

2



2

42. In the figure below, E is on \overline{AD} and C is on \overline{BD} . The dimensions given are in meters. What is the length, in meters, of \overline{CD} ?



- F. 2,640
 G. 2,784
 H. 3,960
 J. 4,400
 K. 5,840
43. In Lewis Carroll's *Alice in Wonderland*, Alice drinks from a small bottle and shrinks to a height of 10 inches. Later, Alice eats a cake and quickly grows to a height of over 9 feet. Assume that Alice's height, h inches, t seconds after she finished eating the cake is given by $h = 10 + 6t$. To the nearest second, how many seconds after Alice finished eating the cake was she 8 feet tall?

- A. 3
 B. 5
 C. 14
 D. 16
 E. 58

44. In $\triangle XYZ$, $\overline{XY} \cong \overline{XZ}$ and the measure of $\angle Y$ is 34° . What is the measure of $\angle X$?

- F. 34°
 G. 56°
 H. 68°
 J. 73°
 K. 112°

45. A Little League baseball player has batted 120 times and has 25 hits. Starting now, if she gets a hit each time she is at bat, what is the least number of times she must be at bat to raise her batting average to at least .300?

(Note: batting average = $\frac{\text{number of hits}}{\text{number of times batted}}$)

- A. 11
 B. 16
 C. 36
 D. 61
 E. 161

DO YOUR FIGURING HERE.

2



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46. Suppose $0 < a < 1$. Which of the following has the greatest value?

F. $\frac{\pi}{a}$

G. $\frac{1}{a}$

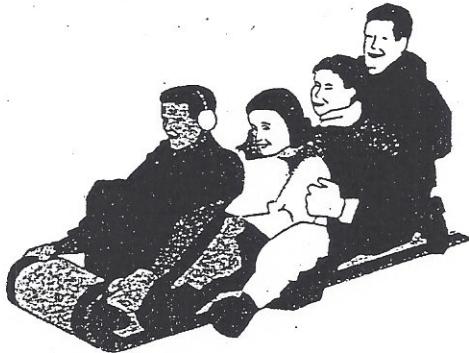
H. a^2

J. a^3

K. $\log a$

DO YOUR FIGURING HERE.

47. Casey and 3 friends are snow sledding on a 4-person toboggan like the one shown in the figure below. Each time all 4 of them go down the hill on the toboggan, they sit in a different order, from front to back. What is the maximum number of times they can go down the hill without sitting in the same order twice?



A. 256

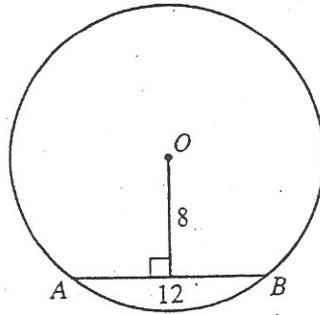
B. 64

C. 24

D. 16

E. 10

48. In the circle below, O is the center. Chord \overline{AB} is 12 inches long and is 8 inches from O . What is the area, in square inches, of the circle?



F. 36π

G. 64π

H. 80π

J. 100π

K. 208π

49. What is the x -intercept of the line that contains the points $(-3, 5)$ and $(5, 1)$ in the standard (x, y) coordinate plane?

A. $\left(-\frac{1}{2}, 0\right)$

B. $\left(0, -\frac{1}{2}\right)$

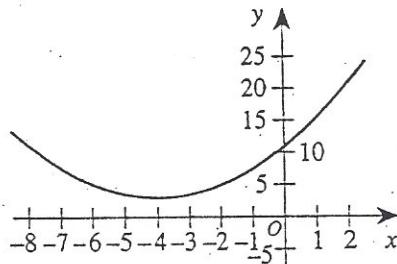
C. $(0, 7)$

D. $(7, 0)$

E. $\left(7, \frac{7}{2}\right)$

DO YOUR FIGURING HERE.

50. The graph of one of the following equations is the parabola shown in the standard (x, y) coordinate plane below. Which one?



F. $y - 3 = (x - 4)^2$

G. $y - 3 = 2(x + 4)^2$

H. $y + 3 = 2(x - 4)^2$

J. $y - 3 = \frac{1}{2}(x + 4)^2$

K. $y + 3 = \frac{1}{2}(x - 4)^2$

51. Suppose $0^\circ < x < 90^\circ$ and $\tan x = \frac{3}{7}$. What is the value of $\cos x + \sin x$?

A. $\frac{7}{\sqrt{116}}$

B. $\frac{7}{\sqrt{58}}$

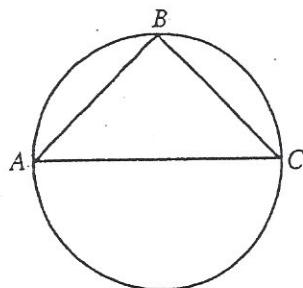
C. $\frac{10}{\sqrt{116}}$

D. $\frac{6}{7}$

E. $\frac{10}{\sqrt{58}}$

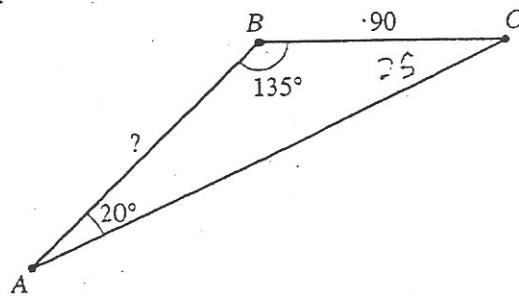
DO YOUR FIGURING HERE.

52. In the figure below, $AB = BC$, and \overline{AC} is a diameter of the circle, having a length of 4 centimeters. What is the area of $\triangle ABC$, in square centimeters?



- F. 2
- G. 4
- H. 8
- J. $\sqrt{8}$
- K. $4\sqrt{2}$

53. In $\triangle ABC$, shown below, angle measures are as marked and the length given is in meters. Which of the following is an expression for the length, in meters, of \overline{AB} ?



(Note: The law of sines states that for a triangle with sides of lengths a , b , and c opposite angles of measure α , β , and γ , respectively, $\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$.)

- A. $\frac{90 \sin 20^\circ}{\sin 135^\circ}$
- B. $\frac{90 \sin 25^\circ}{\sin 20^\circ}$
- C. $\frac{90 \sin 25^\circ}{\sin 135^\circ}$
- D. $\frac{90 \sin 135^\circ}{\sin 20^\circ}$
- E. $\frac{90 \sin 135^\circ}{\sin 25^\circ}$

2



2

DO YOUR FIGURING HERE.

54. The length of arc \widehat{AB} of a circle is equal to $\frac{1}{5}$ of the circumference of the circle. The length of the arc is 4π inches. What is the radius, in inches, of the circle?

- F. 4
G. 5
H. 8
J. 10
K. 20

55. $\begin{bmatrix} a & b \\ c & d \end{bmatrix} + \begin{bmatrix} b & c \\ d & a \end{bmatrix} + \begin{bmatrix} \frac{1}{a+b} & \frac{1}{b+c} \\ \frac{1}{c+d} & \frac{1}{d+a} \end{bmatrix} = ?$

- A. $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
 B. $\begin{bmatrix} \frac{ab}{a+b} & \frac{bc}{b+c} \\ \frac{cd}{c+d} & \frac{ad}{d+a} \end{bmatrix}$
 C. $\begin{bmatrix} 2a+2b & 2b+2c \\ 2c+2d & 2d+2a \end{bmatrix}$
 D. $\begin{bmatrix} \frac{1}{2a+2b} & \frac{1}{2b+2c} \\ \frac{1}{2c+2d} & \frac{1}{2d+2a} \end{bmatrix}$
 E. $\begin{bmatrix} a+b+\frac{1}{a+b} & b+c+\frac{1}{b+c} \\ c+d+\frac{1}{c+d} & d+a+\frac{1}{d+a} \end{bmatrix}$

56. A function is defined by $g(x) = -x^3$. Which of the following is an expression for $g(g(x))$?

- F. $-x^9$
G. $-x^3$
H. x^3
J. x^6
K. x^9

57. The function values for $h(x)$ vary directly as x for all real numbers. The graph of $y = h(x)$ in the standard (x,y) coordinate plane is:

- A. a line with a y -intercept at 0.
 B. a line with a y -intercept, but not at 0.
 C. a line with no y -intercept.
 D. a hyperbola.
 E. neither a line nor a hyperbola.

2



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DO YOUR FIGURING HERE.

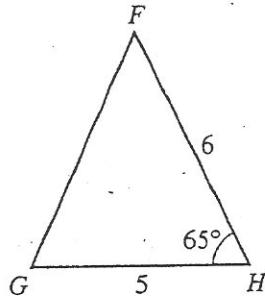
58. A data set of integers has 5 members. The median of the data set is 6. The only mode of the data set is 2. The mean of the data set is 5. Which of the following statements *must* be true about the data set?

- F. The sum of the 5 integers is 30.
- G. The sum of the 5 integers is 10.
- H. The median of the 3 largest integers is 6.
- J. The largest integer is 9.
- K. The largest integer is 8.

59. A rectangular box is to be made from a rectangular piece of sheet metal 20 inches wide and 30 inches long by cutting a square piece of equal size from each of the corners and bending up the sides so that they make a 90° angle with the base. The base of the finished box will be 200 square inches. About how many inches high will the box be?

- A. 5
- B. 10
- C. 15
- D. 20
- E. 30

60. Which of the following expressions gives the area, in square inches, of $\triangle FGH$, shown below with the given side lengths in inches?



- F. $30 \cos 65^\circ$
- G. $30 \sin 65^\circ$
- H. $15 \cos 65^\circ$
- J. $15 \sin 65^\circ$
- K. $15 \tan 65^\circ$

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.
DO NOT RETURN TO THE PREVIOUS TEST.

READING TEST

35 Minutes—40 Questions

DIRECTIONS: There are four passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

Passage I

PROSE FICTION: This passage is adapted from the novel *The Alchemist: A Fable About Following Your Dreams* by Paulo Coehlo. (©1993 by Paulo Coehlo).

Dusk was falling as Santiago arrived with his herd at an abandoned church.

He decided to spend the night there. He saw to it that all the sheep entered through the ruined gate, and 5 then laid some planks across it to prevent the flock from wandering away during the night.

He swept the floor with his jacket and lay down, using the book he had just finished reading as a pillow.

It was still dark when he awoke, and, looking up, 10 he could see the stars through the half-destroyed roof.

He arose and, taking up his staff, began to awaken the sheep that still slept. He had noticed that, as soon as he awoke, most of his animals also began to stir. It was as if some mysterious energy bound his life to that of 15 the sheep, with whom he had spent the past two years, leading them through the countryside in search of food and water. "They are so used to me that they know my schedule," he muttered. Thinking about that for a moment, he realized that it could be the other way 20 around: that it was he who had become accustomed to their schedule.

He had always believed that the sheep were able to understand what he said. So there were times when he 25 read them parts of his books that had made an impression on him, or when he would tell them of the loneliness or the happiness of a shepherd in the fields.

But for the past few days he had spoken to them about only one thing: the girl, the daughter of a merchant who lived in the village they would reach in 30 about four days. The merchant owned a dry goods shop, and he always demanded that the sheep be sheared in his presence. The boy had taken his sheep there the year before.

"I need to sell some wool," the boy told the merchant. The shop was busy, and the man asked the shepherd to wait until the afternoon. So the boy sat on the steps of the shop and took a book from his bag.

"I didn't know shepherds knew how to read," said a girl's voice behind him.

40 "Well, usually I learn more from my sheep than from books," he answered. During the two hours that they talked, she told him she was the merchant's daughter, and spoke of life in the village, where each day was like all the others. The shepherd told her of the Andalusian countryside, and related the news from the other towns where he had stopped. It was a pleasant change from talking to his sheep.

45 "How did you learn to read?" the girl asked at one point.

50 "Like everybody learns," he said. "In school."

And now it was only four days before he would be back in that same village. He was excited, and at the same time uneasy: maybe the girl had already forgotten him. Lots of shepherds passed through, selling their 55 wool.

"It doesn't matter," he said to his sheep. "I know other girls in other places."

But in his heart he knew that it did matter. And he knew that shepherds, like sailors and like traveling 60 salespeople, always found a town where there was someone who could make them forget the joys of care-free wandering.

The day was dawning, and the shepherd urged his sheep in the direction of the sun. He drank a bit, and he 65 gathered his jacket closer to his body.

The jacket had a purpose, and so did the boy. His purpose in life was to travel, and, after two years of walking the Andalusian terrain, he knew all the cities of the region. He was planning, on this visit, to explain to 70 the girl how it was that a shepherd knew how to read. His parents had wanted him to become a priest, and thereby a source of pride for a simple farm family. They worked hard just to have food and water. He had studied Latin, Spanish, and theology. But ever since he 75 had been a child, he had wanted to know the world. One afternoon, he had summoned up the courage to tell his father that he didn't want to become a priest. That he wanted to travel.

"People from all over the world have passed 80 through this village, son," said his father. "They come in search of new things, but when they leave they are basically the same people they were when they arrived. They climb the mountain to see the castle, and they

wind up thinking that the past was better than what we
85 have now."

"But I'd like to see the castles in the towns where they live," the boy explained.

"Amongst us, the only ones who travel are the shepherds," his father said.

90 "Well, then I'll be a shepherd!"

His father said no more. The next day, he gave his son three ancient Spanish coins.

"I found these one day in the fields. I wanted them to be a part of your inheritance. But use them to buy 95 your flock. Take to the fields, and someday you'll learn that our countryside is the best."

1. The first seven paragraphs (lines 1–33) establish all of the following about Santiago EXCEPT that he:
 - A. has often watched his sheep wander away during the night.
 - B. has learned to be resourceful as a shepherd.
 - C. draws comfort from talking to his sheep.
 - D. spends some of his time reading books.
2. The time sequence of the passage indicates that Santiago's conversation with the merchant's daughter takes place:

~~before he arrives at the abandoned church with his sheep.~~

 - G. before his father gives him the three ancient coins.
 - H. after he realizes it was he who had become accustomed to the sheep's schedule.
 - J. after he has sold some wool to the merchant.
3. Compared to Santiago's views about traveling, his father's views are best described as:
 - A. contrasting; the father is certain traveling is an unfulfilling pastime.
 - B. contrasting; the father thinks staying home is financially more profitable than traveling.
 - C. similar; the father thinks traveling is rewarding.
 - D. similar; the father wants to know about other cities.
4. Which of the following statements best describes the reaction of Santiago's father to Santiago's wish to travel?
 - F. He is angry at Santiago for dashing his family's hopes by abandoning the path to the priesthood and tells him to leave the village permanently.
 - G. He lectures Santiago at length about the agonizing complications that can befall a shepherd and his flock but ultimately wishes him well.
 - H. He has a brief conversation with Santiago during which he expresses his regret for not realizing sooner what his son's life goals were.
 - J. He questions the wisdom of Santiago's intentions but after a brief discussion offers him support to start his new career.

5. According to the passage, prior to Santiago's arrival, the abandoned church features all of the following EXCEPT:
 - A. a broken gate.
 - B. an old, torn book.
 - C. a dilapidated roof.
 - D. a dirty floor.
6. Which of the following statements about the start of the conversation between Santiago and the girl is supported by the passage?
 - F. Before he noticed her, she saw him reading on the steps of her father's shop and spoke to him.
 - G. When he first saw her in the merchant's shop, he wanted to start a conversation but was too shy.
 - H. He talked to the girl for the first time on his second visit to the shop, because on the first visit he had been too preoccupied with business.
 - J. The first words she spoke to him so surprised him that he was unable to reply until after she had spoken at length.
7. It is most reasonable to infer from the passage that the merchant's daughter would agree with which of the following statements about her village?
 - A. Life there is so exciting because every day different people from around the world come to visit.
 - B. It is painful to witness visitors who discover that what they had hoped to find in the village does not exist.
 - C. Life there is the same day after day, year after year, even though it is a busy place.
 - D. It is a charming place where people support each other in business and family matters.
8. As it is used in the thirteenth paragraph (lines 51–55), the statement "Lots of shepherds passed through, selling their wool" primarily supports which of the following points implied by the passage?
 - F. Santiago is excited about coming to a bustling village after a boring stretch of time in the fields.
 - G. The merchant asked Santiago to wait to conduct business because the merchant had more wool than he could sell that day.
 - H. Santiago fears that the merchant's daughter will not be as excited to see him as he is to see her.
 - J. The merchant's daughter hoped to run her father's business one day because it was so successful.
9. The passage states that Santiago sees a clear similarity between himself and:
 - A. the merchant.
 - B. sailors and traveling salespeople.
 - C. others who have left the priesthood.
 - D. his father when he was young.
10. As it is used in line 65, the word *gathered* most nearly means:
 - F. attached.
 - G. lifted.
 - H. assembled.
 - J. pulled.

Passage II

SOCIAL SCIENCE: This passage is adapted from the article "A Proverb Each Day Keeps This Scholar at Play" by Richard Wolkomir (©1992 by Smithsonian Institution).

Ever since emigrating to the United States from Germany at age 16, Wolfgang Mieder has left no proverbial stone unturned. Besides teaching about proverbs at the University of Vermont, he has published 5 more than 50 books on his favorite subject, including the massive Oxford University Press *Dictionary of American Proverbs*.

Mieder can tell you the origin of the proverb "One picture is worth a thousand words." Its structure, he 10 says, is one of the universal types: "One of something is worth vast numbers of something else." He can spin off examples, such as "One good head is better than a hundred strong hands" (English), "A friend is better than a thousand silver pieces" (Greek), "A moment is 15 worth a thousand gold pieces" (Korean), "A single penny fairly got is worth a thousand that are not" (German), and "Silence is worth a thousand pieces of silver" (Burmese).

The structure of "One picture is worth a thousand 20 words" may derive from a familiar type, but the actual proverb was dreamed up in 1921 by Fred R. Barnard of the Street Railways Advertising Company. He used it in a piece he wrote for an advertising journal, advocating pictures in advertisements.

25 "One picture" hit on something about how the mind works—at least, the American mind in the nascent media age—and became part of the national psychic genome. That is one way to look at proverbs: as bits of mental DNA passed on from generation to generation. Some persist, others mutate and evolve. Some 30 disappear. But proverbs are slippery things, and defining them precisely has eluded proverb scholars, or paroemiologists.

35 "Proverbs are crystallized bits of wisdom," says Mieder, adding that they average seven words, tend to have several levels of meaning and apply to various situations. That is why they are not necessarily true. If 40 "Absence makes the heart grow fonder," why do we say "Out of sight, out of mind"? And if "He who hesitates is lost," how come you have to "Look before you leap"? Mix and match, says Mieder. "We pick the proverb that fits the situation." He has his own favorite definition: "A proverb is a concise statement of an apparent truth that has currency."

45 Folklorists note that proverbs' meanings depend on the situations in which they are used. And many proverbs do not fit our changed society. A city youth who has never met a Rhode Island Red chicken might have trouble deciphering "Never cackle unless you lay." Nationality also can affect interpretations. The 50 Scots, for instance, tend to read "A rolling stone gathers no moss" as extolling the virtues of action as

opposed to the more sedentary life. The English, however, tend to equate it with the beautiful growth of moss on a stone in a stream, a metaphor for tradition and stability.

These examples suggest that proverbs reveal "national character." But paroemiologists following that road have hit a dead end. "I could put together a 60 bunch of proverbs that show Americans are materialistic, and I could put together another collection showing that Americans really value friendship and love," says Mieder. "If I know the 300 most common American proverbs, the ones we really use, then maybe I can say 65 something."

In fact, that is one of Mieder's projects, although aimed at a different goal than determining national character. The idea of establishing a country's "proverbial minimum" began in Russia in the 1970s, when 70 scholars identified about 300 proverbs that every Russian knows. In the former Soviet Union, people of many nationalities often found themselves struggling to learn Russian, a proverb-rich language, and mastering the proverbial minimum was vital. Now efforts are under 75 way to establish proverbial minimums for other nations, too.

Mieder is pushing the project in the United States: "I've already done statistical analyses, figuring out 80 which proverbs are particularly frequent in 20th-century U.S. writing." Mieder cautions, however, "we would have to distribute about 10,000 questionnaires around the United States to see what proverbs people actually use." Establishing a U.S. proverbial minimum will ease the path for immigrants learning English, he 85 adds.

Meanwhile, linguists are taking a whack at the world's millions of extant proverbs, trying to reduce 90 them to a small number of basic structures. On one level, they reduce proverbs to simple formulas, like "Where there's X, there's Y." But on a deeper level, where they use symbolic logic, their results are pages full of pluses, minuses, equal signs and does-not-equal signs.

11. Which of the following groups is NOT mentioned in the passage as being associated with the study of proverbs?

- A. Linguists
- B. Anthropologists
- C. Paroemiologists
- D. Folklorists

12. The main idea of the first paragraph is that Mieder:
- emigrated to the United States to study the origin of proverbs at the University of Vermont.
 - has published a few books on proverbs since coming to the United States at age 16.
 - has spent his career studying proverbs and sharing his knowledge through teaching and writing.
 - considers his massive proverb dictionary to be the most important work of his career.
13. As it is used in line 10, the word *types* most nearly means:
- situations.
 - meanings.
 - models.
 - letters.
14. Based on the passage, Mieder most likely includes the word *apparent* in his “favorite definition” of a proverb (lines 42–44) to indicate that a proverb doesn’t have to be:
- true.
 - concise.
 - meaningful.
 - popular.
15. The italicizing of the word *maybe* in line 64 primarily serves to:
- point to the general lack of scholarly research on proverbs worldwide.
 - emphasize that even knowing the most common American proverbs will not necessarily reveal the “national character.”
 - suggest that Mieder is unsure about whether he could put together a collection of proverbs about friendship and love.
 - reveal Mieder’s doubts about his ability to determine which proverbs Americans really use.
16. The passage indicates that the movement behind establishing a proverbial minimum began as an effort to:
- pinpoint when it is most appropriate to use a proverb in conversation.
 - determine the national character of a population.
 - respond to the rapid changes in a language.
 - lessen nonnative speakers’ struggle to learn a new language.
17. The passage suggests that of the following, which one poses the greatest difficulty in establishing a U.S. proverbial minimum?
- Mieder’s lack of interest in the project
 - Competing efforts underway in other nations
 - Figuring out which proverbs occur most frequently in twentieth-century U.S. writing
 - Distributing enough questionnaires around the United States to determine what proverbs people actually use
18. The author includes the information in the last paragraph primarily to:
- criticize Mieder for excluding too many proverbs from his research on the proverbial minimum.
 - emphasize the complexity of trying to reduce millions of proverbs to meaningful patterns.
 - describe how the use of surveys has assisted researchers in the advanced study of proverbs.
 - argue that the world’s millions of proverbs should be reduced to a small number of basic structures.
19. The author’s reference to proverbs as *slippery things* in line 31 most nearly means that they are:
- innumerable.
 - memorable.
 - untrue.
 - inconstant..
20. According to the passage, the Scots tend to view the proverb “a rolling stone gathers no moss” as endorsing the value of:
- sedentary living.
 - tradition and stability.
 - action.
 - growth.

Passage III

HUMANITIES: This passage is adapted from the article "The Ascent of Glass" by Jeffrey Hogrefe (©2001 by the Smithsonian Institution).

One of the most striking of the transparent glass buildings that are appearing like ghostly apparitions in cities around the world, the Rose Center for Earth and Space at the American Museum of Natural History in Manhattan marks a new age in glass architecture. Not since the early 1950s, when sleek, green-tinted glass buildings like New York City's Lever House rose amid the stone canyons of countless major cities, has glass elicited so much attention. There are so many glass buildings currently on the drawing boards or under construction, in fact, that it is hard to keep track of them all. "Glass is back," says Kenneth Frampton, professor of architecture at Columbia University and author of *Modern Architecture: A Critical History*. And now it's taking center stage.

Like the Rose Center, many of the new glass edifices are signature buildings. That is to say, the structure itself is used to communicate a message to the public about the occupants' underlying philosophies. "We wanted to build a structure that would say science," says Rose Center lead designer James Polshek. In the year since the Rose Center opened to the public, it drew crowds beyond the wildest expectations of the museum's directors. Many people go just to see the pristine glass cube, which houses the spherical aluminum Hayden Planetarium as if it were a ship in a giant glass bottle. The museum's directors were initially reluctant to give the green light to such an experimental system of glass construction because nothing like it had been used here in the United States. Although many of the icons of early glass architecture rose in U.S. cities during the years after World War II, since the energy crisis of 1973 most of the advances in glass architecture have taken place in Europe. The directors approved the design only after a trip to France to see the building's prototype, the Cité de Sciences & l'Industrie, in Paris. Completed in 1986, the museum used an innovative structural device designed by the Paris-based firm of Rice Francis Ritchie. The system suspended the glass wall in front of a series of metal trusses and braces that held the glass panels in a state of tension.

Glass has many virtues. It lets in light, and brings the outside in and the inside out. Glass is also impervious to the effects of most harsh chemicals and thus is less susceptible to damage from acid rain, which eats away at masonry buildings. Furthermore, advancements in glass production since the 1973 energy crisis have resulted in revolutionary changes in its performance.

Kenneth Frampton sees the return to glass buildings as a symbol of progress. "We do see glass coming back, and with the comeback it has to be effective environmentally," he says. "The early glass curtain wall was only slightly more efficient than no wall." The new

glass is not only spectacular to look at and through, it is also more efficient and much safer than the old glass. Stringent energy codes have led to many innovations. Glass is now being manufactured with special coatings that adjust the thermal intake for all four directions of the compass and even allow for the increased intensity of the sun at certain latitudes. For the new LVMH (Louis Vuitton Moët Hennessy) building, which opened in midtown Manhattan in 1999, more than 30 different types of glass were used in the curtain wall in order to meet New York City's energy codes and create an arresting facade of contrasting textures and colors.

Old glass buildings, too, are benefiting from the improvements in glass. Completed in 1952, Park Avenue's Lever House was one of the first glass-walled buildings in Manhattan. Construction was recently finished on a two-year renovation, undertaken because the original glass had begun to crack. The structure has now been completely reclad with a new, stronger version of the glass originally used in the building.

"Glass is being argued as a new material," notes architect Robert A. M. Stern, dean of the School of Architecture at Yale University. "It's being rediscovered after a generation of architects who rejected it."

Glass can serve as a lens, revealing and bringing into focus the interior of buildings—as in the Rose Center, and in the award-winning Hillier Group design for the power plant that supplies electricity to New York's John F. Kennedy International Airport. The inner workings of the plant are exposed to view through the building's transparent glass walls. Unlike traditional power plants, which disguise themselves as other types of buildings, the JFK design is as honest as it is bold. "The underlying point of the design was that power is beautiful," says project architect David Finci.

21. It can most reasonably be inferred from the passage that the author views the statement by Frampton in line 12 as:
- an exaggeration of the role of glass in architecture today.
 - a gross oversimplification of a complicated issue regarding glass.
 - a suggestion about glass that will hopefully be true someday.
 - an accurate comment about the use of glass in contemporary architecture.

22. Based on information in the passage, during which of the following periods were architects LEAST likely to design innovative glass buildings for construction in the United States?
- F. 1945–1955
G. 1955–1965
H. 1965–1975
J. 1975–1985
23. The passage's author indicates that compared to most other transparent glass buildings, the Rose Center is:
- A. more impressive in terms of appearance and design.
B. less impressive in terms of structural soundness.
C. more likely to be a part of ongoing research about the shortcomings of glass as a building material.
D. less likely to influence future designs of buildings in the United States.
24. The main purpose of the fourth paragraph (lines 50–66) is to make clear that the glass used to build walls today has to be:
- F. layered to create walls thick enough to insulate the building adequately.
G. made of a type of glass that has been used in several energy-efficient older buildings.
H. much more environmentally effective than the glass used in past buildings.
J. coated with a special material that allows for the increased intensity of the Sun at certain latitudes.
25. As it is used in line 86, the word *disguise* could reasonably be said to mean any of the following EXCEPT:
- A. vary.
B. mask.
C. conceal.
D. misrepresent.
26. As it is used in line 31, the word *icons* most nearly means:
- F. likenesses.
G. substitutes.
H. landmarks.
J. reflections.
27. The passage suggests that since the early 1970s, compared to architectural firms in the United States, architectural firms in Europe have been:
- A. more in favor of designing stone buildings.
B. more focused on advancing glass architecture.
C. less interested in designing signature buildings.
D. less focused on experimenting with new types of glass.
28. According to the passage, an important factor in the Rose Center directors' decision to approve a proposed experimental glass construction for the center was:
- F. the approval and support of the construction by the Paris-based firm of Rice Francis Ritchie.
G. their visit to the Cité de Sciences & l'Industrie.
H. their belief that a more traditional glass construction would be less energy efficient.
J. the public excitement over the proposed design.
29. It can most reasonably be inferred from the passage that one aspect of glass that has continued to satisfy architects and builders since the first glass buildings were constructed in the United States is the ability of glass to:
- A. withstand the damaging effects of strong winds.
B. insulate a building as well as more traditional building materials.
C. let in light and blur the distinction between the outside and the inside.
D. adjust how it performs as an insulator depending on environmental conditions.
30. It can most reasonably be inferred from Stern's comments that architects today:
- F. are reconsidering and redefining how glass is used in architecture.
G. believe that glass must be further improved before it can be considered a truly "new material."
H. are not able to keep their designs up to date with the continuing advances in glass.
J. wonder why the past generation of architects had rejected glass.

Passage IV

NATURAL SCIENCE: This passage is adapted from the article "Is There Life on Other Planets?" by Victoria Pope (©2002 by U.S. News and World Report, Inc.).

The search for life on other planets is a quest of vast intrinsic interest but of extreme difficulty in practice. Its root logic, though, is simple enough: If life was brewed on the planet Earth in a primordial soup of chemicals 4 billion to 4.5 billion years ago, why shouldn't it have happened on at least one other planet in the universe, too? Astronomers calculate that hundreds of millions of Earth-like planets must exist throughout the universe.

10 Early space exploration didn't turn up life. When NASA's Viking landers examined Mars two decades ago, they found a dry, sterile environment. Venus was a blazing inferno. It was only the images from the Galileo spacecraft that raised a slight hope of finding suitable 15 conditions for life elsewhere in our solar system: Jupiter's moon Europa appeared to have an ocean of liquid water covered with pack ice.

Scientists who are skeptical about life's having arisen elsewhere have had a strong case, given the precise conditions that seemed essential for life to develop and survive. Planets that are too small cannot retain an atmosphere at all. Those too large turn into gas balls, like Jupiter. Those that are too hot or too cold have no liquid water. And without water, the chemical process 25 of photosynthesis, which converts sunlight into chemical energy, is impossible. Without an atmosphere of oxygen, the chemical reactions that allow a cell to extract energy from other chemicals cannot normally run, either.

30 But recent findings from our own planet have led scientists to wonder if they've taken too parochial a view of life. Microbes have been discovered thriving under circumstances once thought impossible: in volcanic vents, in hot springs, in geysers. Antarctica's 35 rocks, the cold waters deep beneath the surface of its frozen lakes, and the subterranean ground water below the basalt flows of Washington State's Columbia River Basin may harbor terrestrial models for the rise of life on Mars and other planets. And some tantalizing, if still 40 highly controversial, evidence from Mars at least hints that some similar forms of life may indeed have arisen there, even if they subsequently died out. A Martian meteorite found in Antarctica contains microscopic wormlike structures, dating from at least 3.6 billion 45 years ago, that resemble fossilized bacterial forms found on Earth.

The earthly microbes that seem to defy the odds are members of a category loosely called "extremophiles." Among their hardy ranks are the thermophiles, which thrive in searing heat; the halophiles, which love salt; and the barophiles, bacteria often found in the deep sea that live under high pressure.

Evidence of life in inhospitable environments began to pile up in recent years as highly sensitive gene-sequencing techniques made it possible to identify microorganisms that wouldn't grow in petri dishes in the lab. Before these techniques were available, scientists were able to examine only about 1 percent of the real microbial population. New exploration technologies have helped, too. Deep-diving submarines found "cryptoendolithic" ("hiding within rock") organisms whose metabolism is driven by heat from a geothermal source.

Although the issue is highly contentious, some researchers argue that many of these microbes belong to a distinct and previously unrecognized branch of life. Supporters of this idea say that these one-cell throwbacks, now dubbed "archaea," are genetically different from bacteria and appear to be the oldest life forms on Earth. If that's so, it means that life did not necessarily need some warm, hospitable primordial soup to form but could have originated in a far greater range of environments—including some downright hostile ones.

One of the first Martian rocks to be analyzed by the rover from NASA's Pathfinder spacecraft appears to be andesite, a type of lava found in the Columbia Basin, an area some view as an apt geological analog to Mars. Scientists are especially on the lookout for any rocks that show signs of water deposits that could have supported life. And microbiologists are hoping to find direct traces of archaealike microbes under the surface of Mars to support the idea that Martian life could have existed on the surface and then retreated underground—just like earthly microorganisms found in the volcanic vents, salt mines, and other hard-to-take environments. Guided by what they know from our planet, researchers now have their eyes set on a costly and complex mission: drilling into the Martian permafrost, which could yield the firmest answers yet about the origins of life.

31. With regard to the possibility of finding life on other planets, information presented in the passage makes it clear that the author is:
 - A. intrigued but cynical.
 - B. frustrated but determined.
 - C. optimistic but practical.
 - D. hopeful but impatient.

32. Which of the following statements most accurately summarizes how the passage characterizes the current state of scientific knowledge about the origins of life?
 - F. New evidence is misunderstood because today's technology is inadequate.
 - G. Long-held assumptions are being challenged by new evidence.
 - H. Once-competing theories are now merging due to conclusive evidence found on other planets.
 - J. Recent findings are providing concrete support for scientists who are skeptical of the possibility of life on other planets.

33. Based on the passage, recent discoveries made on which two planets have led some scientists to broaden theories about where life could have originated?
- Jupiter and Venus
 - Venus and Mars
 - Mars and Earth
 - Earth and Jupiter
34. The main point of the second paragraph (lines 10-17) is that:
- space technology has progressed greatly in two decades.
 - images from space are difficult for scientists to interpret.
 - space exploration for finding life should be expanded beyond our solar system.
 - early exploration of other planets had offered little hope for finding life.
35. The passage indicates that if scientists can show that archaea are different from all other forms of life, it will prove that life:
- arose when bacteria first developed in a primordial soup.
 - arose when photosynthesis first occurred in microorganisms.
 - could only have emerged under one set of precise conditions.
 - could have emerged under a fairly broad range of conditions.
36. According to the passage, some early evidence of conditions suitable for life on other planets was found when:
- Galileo sent back images of Europa.
 - Viking landers examined the surface of Mars.
 - Columbia took pictures of Jupiter.
 - Pathfinder took atmospheric readings of Venus.
37. As it is used in line 31, the word *parochial* most nearly means:
- private.
 - religious.
 - narrow.
 - spiritual.
38. According to the passage, extremophiles include microbes that:
- live in very hot, salty, or highly pressurized environments.
 - have life spans twice as long as average microorganisms.
 - live in very dry, sterile environments without oxygen or liquid water.
 - have been thriving recently due to changes in Earth's atmosphere.
39. It can reasonably be inferred that as it is used in line 77, the term *geological analog* directly refers to an area on Earth where:
- fossilized microorganisms are found in rocks, as if frozen in time.
 - NASA installs and tests equipment before moving it to other planets.
 - rock and mineral layers contain bits of meteorites from other planets.
 - rock and mineral layers are similar to those on another planet.
40. According to the passage, scientists studying Mars to determine the planet's potential for supporting life are especially looking for:
- signs of water deposits.
 - traces of a geothermal heat source.
 - chemical readings showing high oxygen levels.
 - proof that the planet is between 4 and 4.5 billion years old.

END OF TEST 3

**STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.
DO NOT RETURN TO A PREVIOUS TEST.**



SCIENCE TEST

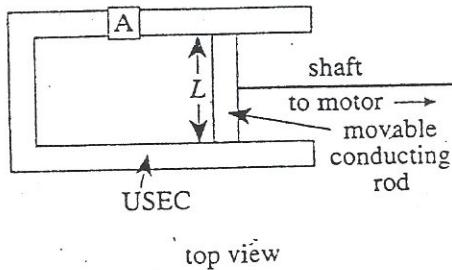
35 Minutes—40 Questions

DIRECTIONS: There are seven passages in this test. Each passage is followed by several questions. After reading a passage, choose the best answer to each question and fill in the corresponding oval on your answer document. You may refer to the passages as often as necessary.

You are NOT permitted to use a calculator on this test.

Passage 1

Some students conducted 4 studies using *slidewire generators* of various sizes. Each slidewire generator contained a U-shaped electrical conductor (USEC), a movable conducting rod of length L that connected the sides of the USEC, and an ammeter (A). All conductors were made of the same metal. Using a motor-driven shaft attached to the conducting rod, the students could move the rod either to the left or to the right at speed v (see Figure 1).



top view

Figure 1

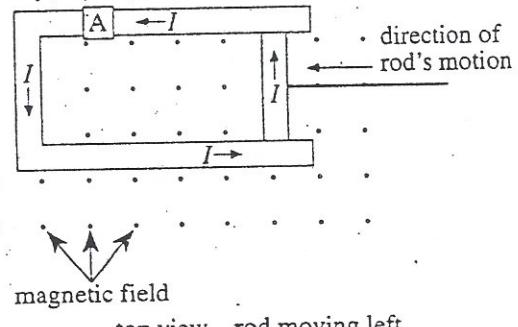
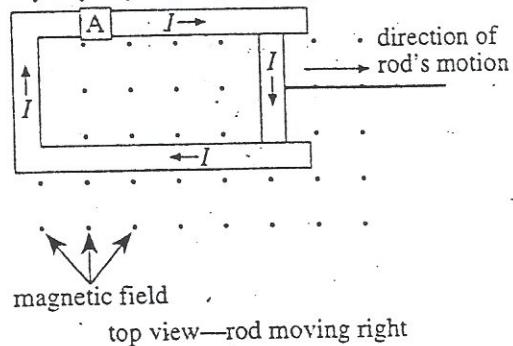


Figure 2

In each trial, the slidewire generator was placed perpendicular to a magnetic field of strength B that pointed vertically toward the ceiling. The field was constant in strength and direction. When the rod was moved, an amount of electrical current, I , was generated in the circuit made by the USEC and the conducting rod (see Figure 2).

I was positive when the current moved clockwise through the circuit and negative when the current moved counter-clockwise through the circuit.

Study 1

The students moved a rod of length $L = 0.20$ m to the right at various v and measured I in millamps (mA) for each v (see Table 1). B was the same across the 3 trials.

Table 1		
Trial	v (m/sec)	I (mA)
1	0.10	+1.6
2	0.20	+3.2
3	0.30	+4.8

Study 2

The students moved rods of various L to the right at $v = 0.20$ m/sec and found I for each rod (see Table 2). For each trial, $B = 0.40$ tesla (T).

Table 2		
Trial	L (m)	I (mA)
4	0.10	+1.6
5	0.40	+6.4
6	0.60	+9.6

Study 3

The students moved a rod of $L = 0.20$ m to the right at $v = 0.20$ m/sec in fields of various B and found I for each B (see Table 3).

Table 3		
Trial	B (T)	I (mA)
7	0.60	+4.8
8	0.80	+6.4
9	1.00	+8.0

Study 4

The students moved a rod of $L = 0.20$ m to the left at various v and found I for each v (see Table 4). In each trial, B was the same as in Study 1.

Table 4		
Trial	v (m/sec)	I (mA)
10	0.10	-1.6
11	0.20	-3.2
12	0.30	-4.8

1. In Study 1, I would most likely have equaled +8.0 mA if v had been:

- A. 0.05 m/sec.
- B. 0.25 m/sec.
- C. 0.40 m/sec.
- D. 0.50 m/sec.

2. In Study 2, as the length of the conducting rod increased, the amount of electrical current through the loop:

- E. increased only.
- G. decreased only.
- H. remained constant.
- J. varied, but with no general trend.

3. In Study 3, I would most likely have equaled +5.6 mA if B had equaled which of the following?

- A. 0.50 T
- B. 0.70 T
- C. 0.90 T
- D. 1.10 T

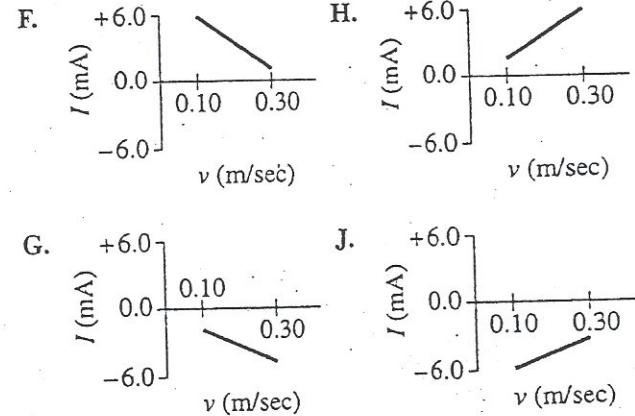
4. During each trial, an electrical current flowed through the circuit because the motion of the conducting rod in the magnetic field produced a nonzero voltage in the circuit. Assuming that the electrical resistance in the circuit was the same across Trials 2, 7, 8, and 9, during which of these trials was the voltage greatest?

- F. Trial 2
- G. Trial 7
- H. Trial 8
- J. Trial 9

5. In which of the studies, if any, did the electrical current move counterclockwise?

- A. Study 1 only
- B. Study 4 only
- C. Studies 1, 2, and 3 only
- D. None of the studies

6. The results of Study 4 are best represented by which of the following graphs?





Passage II

The order Anura includes frogs and toads. Table 1 is a key for identifying some anurans in national forests in California.

Table 1

Step	Trait	Appearance	Result
1	pupils	horizontally aligned	<i>Ascaphus truei</i>
		vertically aligned	go to Step 2
2	large parotid glands*	present	go to Step 3
		not present	go to Step 4
3	throat and chest	white without markings	<i>Bufo microscaphus</i>
		white with dark markings	<i>Bufo boreas</i>
4	toes	padded	go to Step 5
		unpadded	go to Step 6
5	black eye stripe	present	<i>Hyla regilla</i>
		not present	<i>Hyla cadaverina</i>
6	skin folds on back	present	go to Step 7
		not present	<i>Rana catesbeiana</i>
7	groin color	white	<i>Rana pipiens</i>
		red	go to Step 8
		yellow or orange	go to Step 9
8	eyes	tilt upward	<i>Rana pretiosa</i>
		look outward	<i>Rana aurora</i>
9	black spots on back, neck, and head	present	<i>Rana cascadae</i>
		not present	go to Step 10
10	light stripe across snout	present	<i>Rana boylii</i>
		not present	<i>Rana muscosa</i>

*The parotid gland is a gland found behind each eye.

Table 2 describes 4 anurans that were seen in national forests in California.

Anuran	Traits
W	<ul style="list-style-type: none"> • 8 cm in length • large parotid glands • brown back • white throat and chest with black markings • unpadded toes • vertically aligned pupils
X	<ul style="list-style-type: none"> • 9 cm in length • no large parotid glands • eyes look outward • skin folds on back • unpadded toes • vertically aligned pupils
Y	<ul style="list-style-type: none"> • 4 cm in length • brown back with black spots • eyes look outward • no large parotid glands • horizontally aligned pupils
Z	<ul style="list-style-type: none"> • 3 cm in length • black eye stripe present • unpadded toes • vertically aligned pupils • no large parotid glands • no skin folds on back

Tables 1 and 2 adapted from U.S. Department of Agriculture and Forest Service, R-5 Fish Habitat Relationship Technical Bulletin, Number 4, Monitoring Frogs and Toads in Region 5 National Forests. 1991.

7. Table 1 is used to identify animals that belong to which of the following groups?

- A. Mammals
- B. Birds
- C. Reptiles
- D. Amphibians

8. Based on the information provided, the anuran listed in Table 1 that is most closely related to *Bufo boreas* most likely has which of the following characteristics?

- F. Horizontally aligned pupils
- G. A white throat and chest
- H. Padded toes
- J. A light stripe across its snout

9. Based on Table 1, which of the following traits of Anuran X indicates it is NOT a *Hyla regilla*?

- A. No large parotid glands
- B. Eyes look outward
- C. Skin folds on back
- D. Unpadded toes

10. The results from Table 1 for Anuran Y and Anuran Z first diverge at which of the following steps?

- F. Step 1
- G. Step 2
- H. Step 3
- J. Step 4

11. According to Table 1, *Rana cascadae* and *Rana muscosa* both have which of the following traits?

- A. Padded toes
- B. Skin folds on their backs
- C. Red groin color
- D. A light stripe across their snouts



Passage III

A mercury thermometer, at an initial temperature of 20°C, was placed in 30°C water, and the temperature registered by the thermometer was recorded over time. This procedure was repeated using water samples at 40°C and 50°C (see Figure 1). Next, the same thermometer, at an initial temperature of 50°C, was placed in an air sample at 20°C, and the temperature registered by the thermometer was recorded over time. This procedure was repeated using air samples at 30°C and 40°C (see Figure 2).

(Note: Assume that the designated temperatures of the water samples and air samples did not change during the measurements.)

Key	
water temperature:	
o	50°C
△	40°C
□	30°C

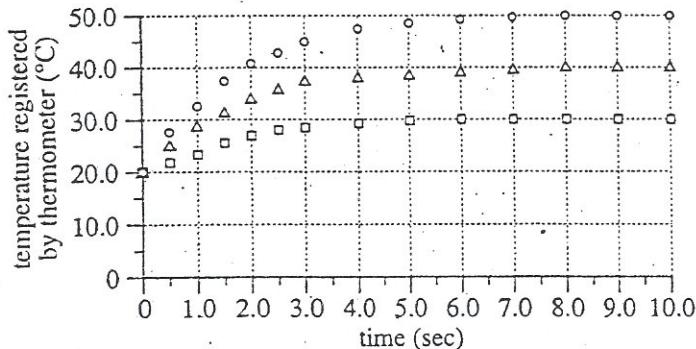


Figure 1

Key	
air temperature:	
◊	40°C
○	30°C
*	20°C

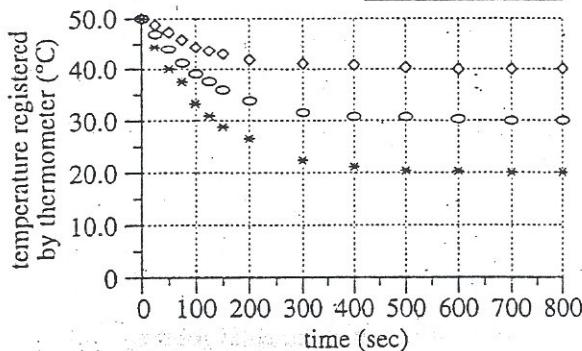


Figure 2

Figures 1 and 2 adapted from Volker Thomsen, "Response Time of a Thermometer." ©1998 by American Association of Physics Teachers.

12. Based on Figure 2, at 250 sec, the thermometer reading in the 40°C air most likely was closest to which of the following?

- F. 24°C
- G. 32°C
- H. 41°C
- J. 53°C

13. When the thermometer was in the 50°C water, in the time interval between 2 sec and 3 sec, approximately how rapidly, in °C/sec, was the temperature registered by the thermometer changing?

- A. 1°C/sec
- B. 4°C/sec
- C. 40°C/sec
- D. 45°C/sec

14. According to Figure 2, for an air temperature of 20°C, over which of the following time intervals was the thermometer reading changing most rapidly?

- F. 0–100 sec
- G. 100–200 sec
- H. 200–300 sec
- J. 300–400 sec

15. Based on Figure 2, for the thermometer placed in 30°C air, the average kinetic energy of the mercury atoms in the thermometer was greatest at which of the following times?

- A. 100 sec
- B. 300 sec
- C. 500 sec
- D. 700 sec

16. Based on Figure 2, if the thermometer, at an initial temperature of 50°C, had been placed in an air sample at 10°C, how long would it most likely have taken the thermometer reading to reach 10°C?

- F. Less than 5 sec
- G. Between 5 sec and 15 sec
- H. Between 100 sec and 300 sec
- J. Greater than 300 sec

Passage IV

Amylase is an enzyme that speeds up the breakdown of starch into smaller carbohydrates (such as maltose).

A starch solution, an amylase solution, and several *buffer solutions* (solutions that maintain a constant pH) were prepared. Two experiments were done using these solutions and the following tests:

- Iodine test: 3 drops of a brown KI_3 solution is added to a sample solution. If starch is present in the sample solution, the solution will turn from brown to black.
- Benedict's test: 1 mL of a blue solution containing $CuSO_4$ is added to a sample solution. The solution is then heated in a boiling water bath for 3 min. If maltose is present in the sample solution, the solution will turn from blue to orange.

Experiment 1

Each of 7 test tubes was filled with 5 mL of pH 7.0 buffer solution. Different amounts of starch solution and/or amylase solution were added to each tube. The solution in each tube was then diluted to 10 mL with the buffer solution (so the final pH was 7.0 in each tube). Each tube was then incubated at a constant temperature for 10 min. The iodine and Benedict's tests were then each done with 2 mL samples drawn from each tube (see Table 1).

Table 1

Tube	Starch (mL)	Amylase (mL)	Temperature ($^{\circ}C$)	Iodine test	Benedict's test
1	1	1	30	black	blue
2	1	1	35	black	orange
3	1	1	40	brown	orange
4	1	1	45	black	orange
5	1	1	50	black	blue
6	1	0	50	black	blue
7	0	1	50	brown	blue

Experiment 2

Seven test tubes were filled and tested according to the procedure used for Tube 3, except that for each tube, a different buffer solution was used (see Table 2).

Table 2

Tube	pH	Iodine test	Benedict's test
8	5.0	black	blue
9	6.0	black	blue
10	6.5	black	blue
11	7.0	brown	orange
12	7.5	brown	orange
13	8.0	black	orange
14	9.0	black	blue

17. Based on the passage, amylase in humans is most directly associated with which of the following systems?

- A. Nervous
B. Respiratory
C. Digestive
D. Circulatory

18. Suppose an additional trial had been done in Experiment 2 using a buffer solution with a pH of 7.3. What would be the most likely results of the iodine and Benedict's tests?

	Iodine test	Benedict's test
F.	brown	blue
G.	brown	orange
H.	black	blue
J.	black	orange

19. Suppose an additional trial had been performed in Experiment 2 using a buffer solution with a pH of 4.3. What would be the most likely results of the iodine and Benedict's tests?

	Iodine test	Benedict's test
A.	brown	blue
B.	brown	orange
C.	black	blue
D.	black	orange

20. According to the results of the iodine and Benedict's tests, which of Tubes 1–4 in Experiment 1 contained both starch and maltose?

- F. Tube 1 only
G. Tube 3 only
H. Tubes 2 and 4 only
J. Tubes 1, 2, 3, and 4

21. All of the experimental factors were identical for which of the following tubes?

- A. Tubes 1 and 8
B. Tubes 3 and 11
C. Tubes 5 and 6
D. Tubes 10 and 14

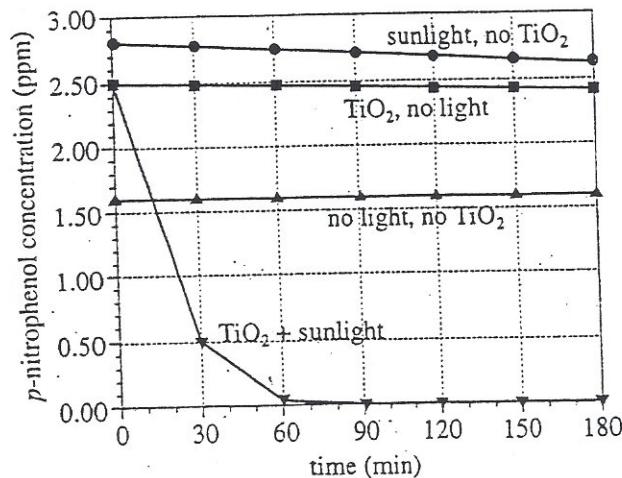
22. Which of the following best describes the relationship between the starch concentration and the maltose concentration during the incubation of Tube 3? As the starch concentration:

- F. decreased, the maltose concentration increased.
G. decreased, the maltose concentration remained constant.
H. increased, the maltose concentration decreased.
J. increased, the maltose concentration remained constant.



Passage V

Students studied the *photodecomposition* (breakdown by light) of *p*-nitrophenol (a toxic pollutant) in wastewater. They measured the concentration of *p*-nitrophenol (in parts per million, ppm) in wastewater samples during exposure to various lighting conditions. Titanium dioxide (TiO_2) and/or hydrogen peroxide (H_2O_2) were added to some samples at the start of exposure (time = 0 min). TiO_2 and H_2O_2 speed up some photodecomposition reactions. The results of 3 sets of experiments are shown in Figures 1–3.



Note: For the 2 samples exposed to sunlight, the intensity of the sunlight was the same.

Figure 1

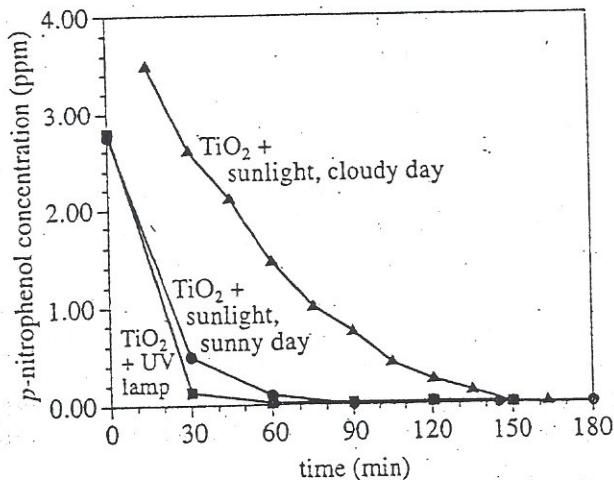
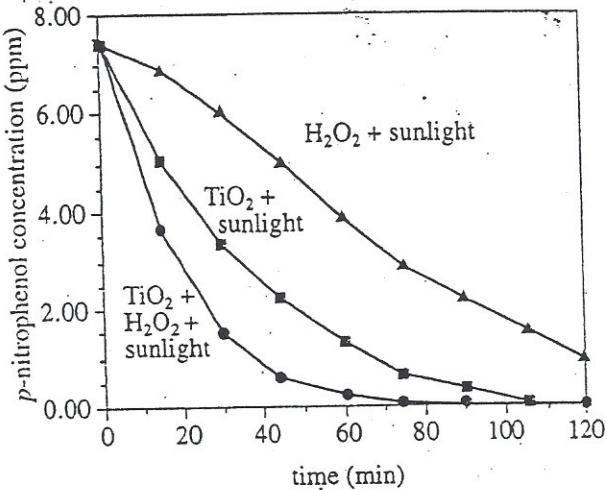


Figure 2



Note: All 3 samples were exposed to the same intensity of sunlight.

Figure 3

Figures adapted from J. A. Herrera-Melián et al., "Solar Photocatalytic Destruction of *p*-Nitrophenol: A Pedagogical Use of Lab Wastes." ©2001 by Division of Chemical Education, Inc., American Chemical Society.

23. According to Figure 1, 60 min after TiO_2 was added to the wastewater sample that was NOT exposed to sunlight, the concentration of *p*-nitrophenol was closest to which of the following?
 - A. 0.00 ppm
 - B. 0.20 ppm
 - C. 2.50 ppm
 - D. 2.70 ppm

24. According to Figure 1, for the sample that contained TiO_2 and was exposed to sunlight, the greatest amount of *p*-nitrophenol decomposed during which of the following time intervals?
 - F. From 0 min to 30 min
 - G. From 30 min to 90 min
 - H. From 90 min to 150 min
 - J. From 150 min to 180 min

25. For which of the 3 figures did all of the wastewater samples studied have the same initial *p*-nitrophenol concentration?

- A. Figure 1 only
- B. Figure 2 only
- C. Figure 3 only
- D. Figures 1, 2, and 3

26. Based on the information in the passage, which of the following best describes and explains the results shown in Figure 2? As time increased from 0 min to 180 min, the concentration of *p*-nitrophenol in the 3 samples:

- F. decreased, because the *p*-nitrophenol changed from a liquid to a gas.
- G. decreased, because the *p*-nitrophenol molecules broke down to form other substances.
- H. increased, because the *p*-nitrophenol changed from a liquid to a gas.
- J. increased, because the *p*-nitrophenol molecules broke down to form other substances.

27. A chemist claimed that adding H_2O_2 to wastewater containing *p*-nitrophenol will cause the *p*-nitrophenol to decompose in the absence of light. Do the results from any of the figures confirm her claim?

- A. Yes; according to Figure 1, the *p*-nitrophenol concentration only decreased in the sample containing H_2O_2 tested in the absence of light.
- B. Yes; according to Figure 3, the *p*-nitrophenol concentration only decreased in the sample containing H_2O_2 .
- C. No; according to Figure 1, the *p*-nitrophenol concentration only decreased in the sample containing H_2O_2 tested in the absence of light.
- D. No; according to Figures 1–3, no samples containing H_2O_2 were tested in the absence of light.



Passage VI

Water flowing over the sediment in a river channel creates *bedforms* (3-dimensional structures formed in the sediment). The processes that produce bedforms in present-day river channels produced the same types of bedforms in ancient river channels. Ancient bedforms are often found preserved in sedimentary rock layers. Figure 1 shows a longitudinal cross section of 3 types of bedforms: ripples, dunes, and flat beds.

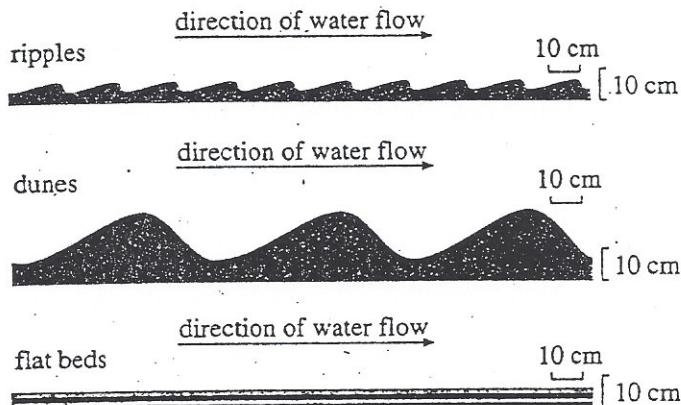


Figure 1

A geologist conducted 3 studies using an artificial river channel 15 m long, 1 m wide, and 0.6 m deep. Water velocity through the channel and water flow depth could be controlled. At the start of each study, a flat, 15 cm thick layer of sand particles of uniform diameter was placed in the bottom of the channel. Various combinations of water velocity, from 0.2 m/sec to 2.0 m/sec, and of water flow depth, from 0.1 m to 0.4 m, were tested in each of the 3 studies.

Study 1

The bottom of the channel was covered with fine sand particles, all having a diameter of 0.19 mm. Water was passed over the sediment bed. The resulting *bedform stability fields* (water velocities and water flow depths at which various types of bedforms were present) are shown in Figure 2.

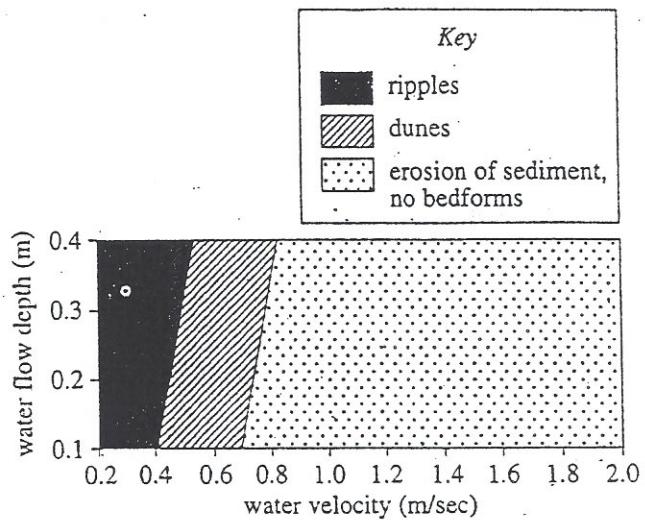


Figure 2

Study 2

Study 1 was repeated using medium sand particles, all having a diameter of 0.45 mm. The resulting bedform stability fields are shown in Figure 3.

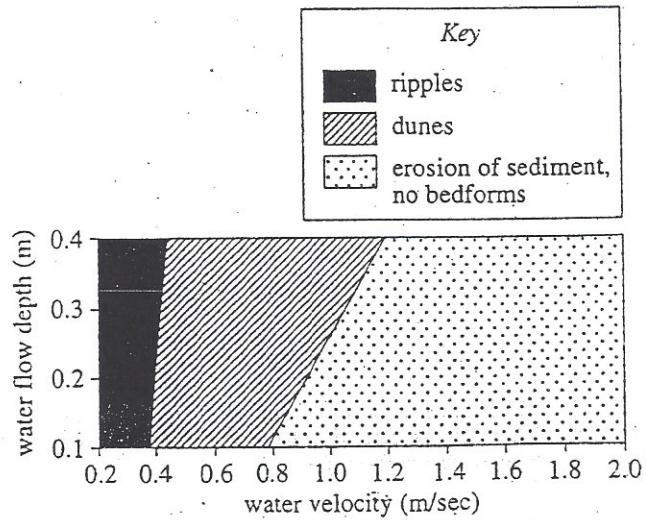


Figure 3

Study 3

Study 1 was repeated using coarse sand particles, all having a diameter of 0.93 mm. The resulting bedform stability fields are shown in Figure 4.

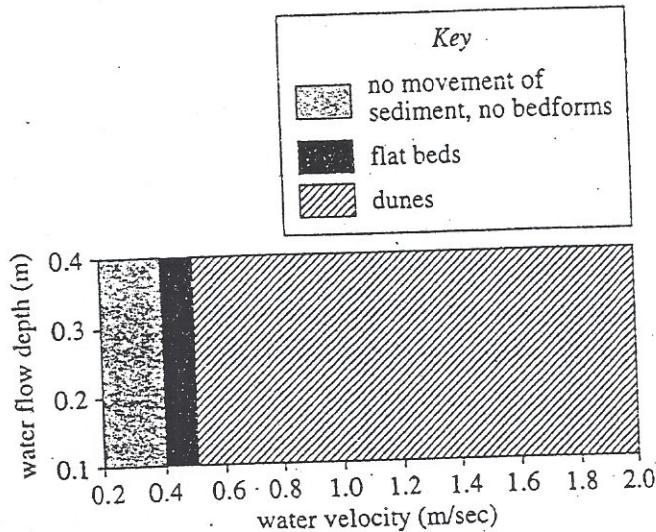


Figure 4

Figures 2-4 adapted from Gerald Middleton and John Southard, *Mechanics of Sediment Movement*. ©1984 by the Society of Economic Paleontologists and Mineralogists.

28. Which of the following factors was NOT directly controlled by the geologist during the studies?
- F. Water velocity
 - G. Water flow depth
 - H. Bedform type
 - J. Sediment particle diameter
29. Suppose Study 1 were repeated using sand particles all having a diameter of 0.30 mm. The resulting bedform stability fields would include which of the 3 types of bedforms referred to in the passage?
- A. Ripples only
 - B. Flat beds only
 - C. Ripples and dunes only
 - D. Dunes and flat beds only

30. A sedimentary rock layer containing preserved ripples was composed entirely of sediment particles with diameters between 0.4 mm and 0.5 mm. The water flow depth in the river at the time the ripples were forming was between 0.1 m and 0.4 m. Based on the information presented, the velocity of the river water was most likely:

- F. less than 0.5 m/sec.
- G. between 0.5 m/sec and 0.6 m/sec.
- H. between 0.6 m/sec and 0.7 m/sec.
- J. greater than 0.7 m/sec.

31. According to the results of Studies 1 and 2, which of the following statements comparing the maximum water velocity at which ripples were present and the maximum water velocity at which dunes were present is true?

- A. For all water flow depths, the maximum water velocity at which ripples were present was higher than the corresponding maximum water velocity at which dunes were present.
- B. For all water flow depths, the maximum water velocity at which ripples were present was lower than the corresponding maximum water velocity at which dunes were present.
- C. For only some of the water flow depths, the maximum water velocity at which ripples were present was higher than the corresponding maximum water velocity at which dunes were present.
- D. For only some of the water flow depths, the maximum water velocity at which ripples were present was lower than the corresponding maximum water velocity at which dunes were present.

32. According to the results of Study 3, for a given water velocity, as the water flow depth increased, the type of bedform present:

- F. changed from ripples to dunes.
- G. changed from dunes to flat beds.
- H. changed from flat beds to dunes.
- J. did not change.

33. Consider the average wavelength of a ripple bedform and the average wavelength of a dune bedform, as shown in Figure 1. Which, if either, is(are) greater than 10 cm?

- A. The average wavelength of a ripple bedform only
- B. The average wavelength of a dune bedform only
- C. Both the average wavelength of a ripple bedform and the average wavelength of a dune bedform
- D. Neither the average wavelength of a ripple bedform nor the average wavelength of a dune bedform

Passage VII

Vapor pressure is the pressure exerted by the vapor above a liquid in a closed container at a given temperature and at *equilibrium*. At equilibrium, the rate of evaporation equals the rate of condensation.

Two students observed that the vapor pressure of H_2O decreased when NaCl was dissolved in the H_2O . The students then offered explanations for why this decrease occurred.

Student 1

Solvent molecules are attracted to charged solute particles. This causes solvent molecules to surround solute particles, forming clusters. Additional energy is needed to break solvent molecules free from these clusters. Thus, at a given temperature, the vapor pressure of the solution is lower than that of the pure liquid. The vapor pressure decreases as the concentration of charged solute particles increases and as the magnitude of the charge on each solute particle increases. Neutral solute particles do not affect the vapor pressure of a liquid.

Student 2

Vapor pressure decreases because some of the solvent particles that have sufficient energy to escape the solution's surface collide with the solute particles and lose energy. Thus, at a given temperature, the vapor pressure of the solution is lower than that of the pure liquid. The size of the decrease in vapor pressure is directly proportional to the concentration of solute particles. A neutral solute particle decreases the vapor pressure of a liquid by the same amount as does a charged solute particle. The concentration of solute particles is the only factor that affects the vapor pressure of a liquid.

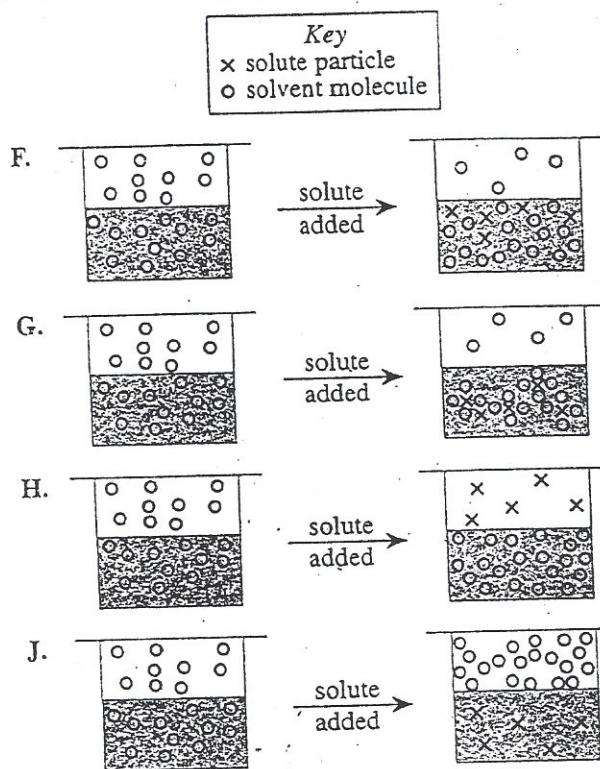
Experiment

Three 1 kg solutions were made by dissolving 1.0 mole (6×10^{23} units or molecules) of glucose, NaCl, or $CaCl_2$, respectively, in distilled H_2O . Thus, the concentration of each solution was 1.0 mole/kg. Table 1 shows the solute particle(s) resulting from each unit (or molecule) of each substance dissolved in H_2O . The students then measured the vapor pressure of distilled H_2O and of each solution at $25^\circ C$.

Table 1

Solution	Solute	Resulting solute particle(s)
1	glucose	1 particle (1 neutral glucose molecule)
2	NaCl	2 particles (1 Na^+ and 1 Cl^-)
3	$CaCl_2$	3 particles (1 Ca^{2+} and 2 Cl^-)

34. Which of the following diagrams best illustrates how Student 1 would describe the change that occurs when NaCl is dissolved in H_2O ?



35. Do the 2 students differ in their descriptions of how solvent molecules interact with solute particles in a solution?

- A. Yes; Student 1 claims solvent molecules are attracted to charged solute particles and Student 2 does not.
- B. Yes; Student 2 claims solvent molecules are attracted to charged solute particles and Student 1 does not.
- C. No; both students claim that the solvent molecules surround charged solute particles.
- D. No; neither student discusses the interactions of solvent molecules with solute particles.

36. Based on Table 1, how did the concentration of solute particles in Solution 3 compare to the concentration of solute particles in Solution 1? The concentration of solute particles in Solution 3 was:

- F. lower, because each $CaCl_2$ unit dissolves into fewer solute particles than does each glucose molecule.
- G. lower, because each $CaCl_2$ unit dissolves into more solute particles than does each glucose molecule.
- H. higher, because each $CaCl_2$ unit dissolves into fewer solute particles than does each glucose molecule.
- J. higher, because each $CaCl_2$ unit dissolves into more solute particles than does each glucose molecule.

4



4

37. Suppose an experiment showed that each Na^+ in a salt-water solution exists in a cluster with 3 H_2O molecules. This finding would support the explanation(s) of which of the students, if either?

- A. Student 1 only
- B. Student 2 only
- C. Both students
- D. Neither student

38. When table sugar is dissolved in pure H_2O at 25°C , the vapor pressure at equilibrium is lower than that of pure H_2O at 25°C . Because dissolved table sugar molecules are neutral, this observation contradicts the explanation of:

- F. Student 1, because Student 1 claims that only charged solute particles can cause the vapor pressure to decrease.
- G. Student 2, because Student 2 claims that only charged solute particles can cause the vapor pressure to decrease.
- H. Student 1, because Student 1 claims that only uncharged solute particles can cause the vapor pressure to decrease.
- J. Student 2, because Student 2 claims that only uncharged solute particles can cause the vapor pressure to decrease.

39. With which of the following statements about solutes would both students agree? Adding to a liquid a substance that dissolves:

- A. and dissociates into ions will decrease the liquid's vapor pressure.
- B. and dissociates into ions will increase the liquid's vapor pressure.
- C. but does not dissociate into ions will decrease the liquid's vapor pressure.
- D. but does not dissociate into ions will increase the liquid's vapor pressure.

40. Assume the following for the addition of a substance to a pure liquid:

$$\Delta P = \text{the decrease in vapor pressure}$$
$$C = \text{the concentration of solute particles}$$
$$k = \text{a constant}$$

Which of the following equations is most consistent with Student 2's explanation?

- F. $\Delta P = \frac{k}{C^2}$
- G. $\Delta P = k \times C^2$
- H. $\Delta P = \frac{k}{C}$
- J. $\Delta P = k \times C$

END OF TEST 4

STOP! DO NOT RETURN TO ANY OTHER TEST.

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Form 65C (June 2007)
Picturing the Past

<u>English</u>	<u>Math</u>	<u>Reading</u>	<u>Science</u>
1) A	51) D	1) A	1) D
2) F	52) G	2) F	2) F
3) C	53) B	3) A	3) B
4) H	54) J	4) J	4) J
5) B	55) A	5) B	5) B
6) G	56) H	6) F	6) G
7) A	57) D	7) C	7) D
8) F	58) H	8) H	8) G
9) D	59) A	9) B	9) D
10) J	60) G	10) J	10) F
11) C	61) D	11) B	11) B
12) F	62) J	12) H	12) H
13) A	63) B	13) C	13) B
14) H	64) J	14) F	14) F
15) D	65) C	15) B	15) A
16) J	66) G	16) J	16) J
17) A	67) B	17) D	17) C
18) H	68) H	18) G	18) G
19) C	69) B	19) D	19) C
20) H	70) H	20) H	20) H
21) D	71) D	21) D	21) B
22) F	72) H	22) J	22) F
23) C	73) A	23) A	23) C
24) J	74) J	24) H	24) F
25) B	75) A	25) A	25) C
26) F	26) H	26) H	26) G
27) C	27) C	27) B	27) D
28) F	28) F	28) G	28) H
29) B	29) B	29) C	29) C
30) G	30) J	30) F	30) F
31) B	31) A	31) C	31) B
32) J	32) F	32) G	32) J
33) B	33) D	33) C	33) C
34) G	34) F	34) J	34) G
35) B	35) D	35) D	35) A
36) F	36) K	36) F	36) J
37) B	37) C	37) C	37) A
38) F	38) G	38) F	38) F
39) D	39) E	39) D	39) A
40) F	40) H	40) F	40) J
41) B	41) D	B	
42) J	42) H	J	
43) D	43) C	O	
44) H	44) K	#	
45) A	45) B	#	
46) G	46) F	#	
47) C	47) C	#	
48) F	48) J	III	
49) D	49) D	11	
50) F	50) J	29	