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Passage 1

Animal Behavior

1 By the early 1900s the field of animal behavior had split into two major branches. One branch, ethology, developed primarily in Europe. To ethologists, what is striking about animal behaviors in that they are fixed and seemingly unchangeable? For example, kittens and puppies play in characteristic but different ways. Present a kitten with a ball of yarn and invariably it draws back its head and bats the yarn with claws extended. Kittens are generally silent as they play, and their tails twitch. Puppies, by contrast, are most likely to pounce flat-footed on a ball of yarn. They bit and bark and their tails wag. Ethologists came to believe that ultimately even the most complex animal behaviors could be broken down into a series of unchangeable stimulus/response reactions. They became convinced that the details of these patterns were as distinctive of a particular group of animals as were anatomical characteristics. For well over half a century, their search for and description of innate patterns of animal behavior continued.

2 Meanwhile, mainly in North America, the study of animal behavior took a different tack, developing into comparative behavior. Of interest to comparative behaviorists was where a particular came from, that is, its evolutionary history, how the nervous system controlled it, and the extent to which it could be modified. In 1894, C. Lloyd Morgan, an early comparative behaviorist, insisted that animal behavior be explained as simply as possible without reference to emotions or motivations since these could not be observed or measured. In Morgan's research, animals were put in simple situations, presented with an easily described stimulus, and their resultant behavior described.

3 The extension to animals of behaviorism—the idea that the study of behavior should be restricted to only those elements that can be directly observed—was an important development in comparative behavior. Studies of stimulus/response and the importance of simple rewards to enforce and modify animal behavior were stressed. Not surprisingly, comparative behaviorists worked most comfortably in the laboratory. Comparative behaviorists stressed the idea that animal behavior could be modified, while their ethologist colleagues thought it was innate and unchangeable. Inevitably, the two approaches led to major disagreements.

4 To early ethologists, the major driving force in behavior was instinct, behaviors that are inherited and unchangeable. Moths move towards light because they inherit the mechanism to so respond to light. Although dogs have more options available to them, they bark at strangers for much the same reasons. The comparative behaviorists disagreed: learning and rewards are more important factors than instinct in animal behavior. Geese are not born with the ability to retrieve lost eggs when they roll out the nest, they learn to do so. If their behavior seems sometimes silly to

humans because it fails to take new conditions into account, that is because the animal's ability to learn is limited. There were too many examples of behaviors modified by experience for comparative behaviorists to put their faith in instincts.

5 The arguments came to a peak in the 1950s and became known as the nature or nurture controversy.

Consider how differently an ethologist and a comparative behaviorist would interpret the begging behavior of a hatchling bird. The first time a hatchling bird is approached by its parent, it begs for food. All baby birds of a particular species beg in exactly the same way. Obviously, said the ethologists, they inherited the ability and the tendency to beg. Baby birds did not have to learn the behavior, they were born with it—a clear example of innate, unchanging behavior. Not so, countered the comparative behaviorists. Parent birds teach their young to beg by stuffing food in their open mouths. Later experiments showed that before hatching, birds make and respond to noises of their nest mates and adults. Is it not possible that young birds could learn to beg prenatally?

6 It was hard for ethologists to accept that innate behaviors could be modified by learning. It was equally difficult for comparative behaviorists to accept that genetic factors could dominate learning experiences. The controversy raged for over a decade. Eventually, however, the distinctions between the two fields narrowed. The current view is that both natural endowments and environmental factors work together to shape behavior.

1. The word "ultimately" in the passage is closest in the meaning to

A. noticeably

B. importantly

C. some of the time

D. in the end

2. According to paragraph 1, what do ethologists think is the most notable characteristic of animal behavior?

A. Animal responses in most situations are predictable and do not vary

B. In similar situations, different animal species often behave in similar ways.

C. Even in ordinary situations, animal behavior can be unusually complex.

D. Animal behavior may sometimes include stimulus/response reactions.

3. According to paragraph 2, C. Lloyd Morgan agreed with which of the following statements about animal behavior?

A. Only those elements of animal behavior that could be observed and measured should be used to explain it.

B. Any study of animal behavior should include an explanation of emotions and motivations.

C. Emotions and motivations can be measured indirectly using simple experimental situations.

D. Experimental situations are less than ideal if researchers want to develop a comprehensive explanation of animal behavior.

4. According to paragraph 2, comparative behaviorists were interested in finding answers to all of the following questions EXCEPT

A. How has animal behavior changed over time?

B. How can emotions causing a specific behavior in one animal species help explain behavior in other animal species?

C. To what degree can animal behavior be changed?

D. How does the nervous system regulate animal behavior?

5. Paragraph 3 suggests that comparative behaviorists' conclusions concerning animal behavior were based

A. on the observation that rewards do not affect inherited animal behavior

B. on the application of stress to modify animal behavior

C. most often on the results of laboratory experiments

D. more on stimulus/response reactions than on simple rewards

6. The word "retrieve" in the passage is closest in meaning to

A. find

B. recover

C. remember

D. hatch

7. According to paragraph 4, why did comparative behaviorists believe that their view of instinct in animal behavior was correct?

A. They had observed that animals can respond to the same stimulus in different ways.

B. They had demonstrated that animals could use learned behaviors in new conditions.

C. They had acquired sufficient evidence that instincts vary from one animal to another.

D. They had shown that the behavior of many different animals had been changed by learning.

8. The word “Obviously” in the passage is closest in meaning to

A. Originally

B. Clearly

C. Similarly

D. Consequently

9. The word “countered” in the passage is closest in meaning to

A. learned

B. argued back

C. assumed

D. predicted

10. In paragraph 5, why does the author discuss the begging behavior of a hatchling bird?

A. To support the view that instinct explains animal behavior better than learning does

B. To demonstrate that ethologists are correct about the limited ability of animals to learn

C. To contrast an ethologist's explanation of a particular animal behavior with that of a comparative behaviorist

D. To question whether the discussion about the roles of nature and nurture was a valid one

11. The word "current" in the passage is closest in meaning to

A. ideal

B. basic

C. alternative

D. present

12. Look at the four squares [] that indicate where the following sentence could be added to the passage. Where would the sentence best fit?

This view is supported by the behavior of insects as well as animals.

Where would the sentence best fit?

13. Directions: Select from the seven phrases below the phrases that correctly characterize ethologists and the phrases that correctly characterize comparative behaviorists. Drag each phrase you select into the phrases will NOT be used. This question is worth 3 points.

Ethologists

Comparative Behaviorists

Answer Choices

A. Worked primarily in North America

B. Argued that animal behavior is passed on from one generation to another without change over time

C. Maintained from the start that behaviors that are inherited could be influenced by learning

D. Believed that stimulus-response reactions serve to distinguish one animal from another just as their physical features do

E. Studied stimulus-response reactions and emphasized the importance of rewards for enforcing and changing behavior

F. Conducted more experiments with birds than with any other species

G. Studied primarily how physical characteristics often determine behavior.

Passage 2

Wind pollination

1 Pollen, a powdery substance, which is produced by flowering plants and contains male reproductive cells, is usually carried from plant to plant by insects or birds, but some plants rely on the wind to carry their pollen. Wind pollination is often seen as being primitive and wasteful in costly pollen and yet it is surprisingly common, especially in higher latitudes. Wind is very good at moving pollen a long way; pollen can be blown for hundreds of kilometers, and only birds can get pollen anywhere near as far. The drawback is that wind is obviously unspecific as to where it takes the pollen. It is like trying to get a letter to a friend at the other end of the village by climbing onto the roof and throwing an armful of letters into the air and hoping that one will end up in the friend's garden. For the relatively few dominant tree species that make up temperate forests, where there are many individuals of the same species within pollen range, this is quite a safe gamble. If a number of people in the village were throwing letters off roofs, your friend would be bound to get one. By contrast, in the tropics, where each tree species has few, widely scattered individuals, the chance of wind blowing pollen to another individual is sufficiently slim that animals are a safer bet as transporters of pollen. Even tall trees in the tropics are usually not wind pollinated despite being in windy conditions. In a similar way, trees in temperate forests that are insect pollinated tend to grow as solitary, widely spread individuals.

2 Since wind-pollinated flowers have no need to attract insects or other animals, they have dispensed with bright petals, nectar, and scent. These are at best a waste and at worst an impediment to the transfer of pollen in the air. The result is insignificant-looking flowers and catkins (dense cylindrical clusters of small, petalless flowers).

3 Wind pollination does, of course, require a lot of pollen. Birch and hazel trees can produce5.5 and 4 million grains per catkin, respectively. There are various adaptations to help as much of the pollen go as far as possible. Most deciduous wind-pollinated trees (which shed their leaves every fall) produce their pollen in the spring while the branches are bare of leaves to reduce the surrounding surfaces that "compete" with the stigmas (the part of the flower that receives the pollen) for pollen. Evergreen conifers, which do not shed their leaves, have less to gain from spring flowering, and, indeed, some flower in the autumn or winter.

4 Pollen produced higher in the top branches is likely to go farther, it is windier (and gustier) and the pollen can be blown farther before hitting the ground. Moreover, dangling catkins like hazel hold the pollen in until the wind is strong enough to ben them, ensuring that pollen is only shed into the air when the wind is blowing hard. Weather is also important. Pollen is shed primarily when the air is dry to prevent too much sticking to wet surfaces or being knocked out of the air by rain. Despite these adaptations, much of the pollen fails to leave the top branches, and only between 0.5 percent and 40 percent gets more than 100 meters away from the parent. But once this far, significant quantities can go a kilometer or more. Indeed, pollen can travel many thousands of kilometers at high altitudes. Since all this pollen is floating around in the air, it is no wonder that wind-pollinated trees are a major source of allergies.

5 Once the pollen has been snatched by the wind, but not everything is left to chance. Windborne pollen is dry, rounded, smooth, and generally smaller than that of insect-pollinated plants. But size is a two-edged sword. Small grains may be blown farther but they are also more prone to be whisked past the waiting stigma because smaller particles tend to stay trapped in the fast-moving air that flows around the stigma. But stigmas create turbulence, which slows the air speed around them and may help pollen stick to them.

1. The word “drawback” in the passage is closet in meaning to

A. other side of the issue

B. objection

C. concern

D. problem

2. Which of the following can be inferred from paragraph 1 about pollen production?

A. Pollen production requires a significant investment of energy and resources on the part of the plant.

B. The capacity to produce pollen in large quantities is a recent development in the evolutionary history of plants.

C. Plants in the tropics generally produce more pollen than those in temperate zones.

D. The highest levels of pollen production are found in plants that depend on insects or birds to carry their pollen.

3. According to paragraph 1, wind-pollinated trees are most likely to be found

A. in temperate forests

B. at lower latitudes

C. in the tropics

D. surrounded by trees of many different species

4. Paragraph 1 supports which of the following as the reason animals are a safer bet than wind as pollinators when the individual trees of a species are widely separated?

A. Animals tend to carry pollen from a given flower further than the wind does.

B. Animals serve as pollinators even where there is little wind to disperse the pollen.

C. An animal that visits a flower is likely to deliberately visit other flowers of the same species and pollinate them.

D. Birds and insects fly in all directions, not just the direction the wind is blowing at a given moment.

5. In paragraph 1, the author compares pollen moved by wind with letters thrown off roofs in order to

A. explain why there are relatively few species of trees that depend on wind pollination

B. compare natural, biological processes with human social practices

C. make a point about the probability of wind-blown pollen reaching a tree of the same species

D. argue against the common assumption that the tallest trees are the most likely to employ wind pollination

6. Paragraph 2 suggests that wind-pollinated plants do not have bright petals, nectar, and scent for which TWO of the following reasons? To receive credit, you must select TWO answers.

A. They interfere with pollination by wind.

B. They are easily damaged by wind.

C. They are unnecessary.

D. They reduce the amount of pollen that can be produced.

7. The word “respectively” in the passage is closet in meaning to

A. over time

B. separately

C. in that order

D. consistently

8. According to paragraph 3, why do most deciduous wind-pollinated trees produce their pollen in the spring?

A. To avoid competing with evergreen conifers, which flower in the fall or winter

B. So that the leaves of the trees receiving the pollen will not prevent the pollen from reaching the trees’ stigmas

C. Because they do not have enough energy to produce new leaves and pollen at the same time

D. In order to take advantage of the windiest time of year

9. According to paragraph 4, which of the following is NOT an adaptation that helps ensure that pollen travels as far as possible?

A. Pollen-producing flowers and catkins are located at or near the top of the tree.

B. Trees grow at least 100 meters away from each other.

C. Dangling catkins release pollen only when the wind is blowing hard.

D. Pollen is not released during rain storms or when the air is damp.

10. The word “significant” in the passage is closet in meaning to

A. sufficient

B. considerable

C. increasing

D. small

11. The phrase “no wonder” in the passage is closet in meaning to

A. unsurprising

B. understandable

C. well-known

D. unfortunate

12. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

A. Because smaller particles tend to stay trapped in the fast-moving air, they are blown much farther than other grains.

B. Smaller particles are trapped by the stigma when fast-moving air flows past it.

C. Small particles that are whisked past the waiting stigma gain speed and are often trapped in the fast-

moving air.

D. While smallness helps pollen travel farther, it also makes it more likely to be blown past the stigma.

13. Look at the four squares [] that indicate where the following sentence could be added to the passage.

This level of volume is important to ensure that at least some of the pollen reaches a target tree, but dispersing the pollen is crucial as well.

Where would the sentence best fit? Click on a square [] to add the sentence to the passage.

14. Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some answer choices do not belong

in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage.

This question is worth 2 points.

Drag your choices to the spaces where they belong. To review the passage, click on View Text. Answer choices

A. Because there are few trees in temperate forests, it is safer to transport pollen by insects or birds.

B. Wind pollination is a safe reproductive strategy for trees in temperate forests where there are only a few dominant species and, therefore, many individuals of the same species.

C. Wind pollination requires production of large amount of pollen, which must be released at the right time and under the right conditions to extend its range.

D. Most wind-pollinated trees are deciduous because evergreen needles compete with the stigma for pollen, making wind pollination uncertain.

E. Wind-pollinated plants usually have small petalless flowers which often grow in catkins that produce a very fine-grained pollen.

F. Wind-pollinated trees must grow in regions that are only moderately windy because strong winds will blow the tiny pollen grains past the stigma.

Passage 3

Cereals and Legumes: A Partnership

1 Cereals are flowering grasses that sprout, flower, seed, and die in the space of a year, which is why gardeners refer to them as annuals. Grown for their seeds or kernels, cereals are excellent sources of energy: although they lack some amino acids, as well as calcium, vitamin A, and vitamin C, they provide starch and oil, and in some cases, considerable amounts of protein. Once ripe, the kernels are relatively easy to store, and they retain their nutrients for a long time. Even the stalks of cereals are useful as animal food, as bedding in stables and barns, and as a building material. A major drawback with cereals is that they depend on the soil for nitrogen. Without fertilization they eventually exhaust the fields they are growing in, but despite this, two cereals (wheat and barley) were the very first plants to be domesticated (grown for human use); and a third (rye) may have been cultivated, or even domesticated, at about the same time. Today, cereal crops including wheat, rice, maize, sorghum, millet, and oats provide most of the calories in the human diet.

2 Like cereals, legumes are annuals. Some legumes are grown for animal fodder. Many other legumes, however, are cultivated for their seeds, which ripen in pods. The seeds are rich in B vitamins and iron, contain on average two times the protein but less starch than cereals, and can be eaten, sometimes pods and all, while they're still green. (Snow peas and green beans are familiar examples.) Legumes are characterized by a long period of sequential ripening, during which a single plant may have ripe pods, green pods, and flowers, all at the same time, which means that a stand of legumes can be harvested again and again over several weeks. Like cereals, legumes can be dried and stored for later use (the pods open easily when dry), and again like cereals, legumes provide food for both people and animals. However, legume plants add nitrogen to the soil, so when they are grown in the same fields as cereals, they can replace much of the nitrogen the cereals have depleted.

3 Growing cereals and legumes together is good for the fields, and eating them together is good for the farmers. In order to build and maintain body tissue, people need protein or more specifically, the amino acids in protein. Some amino acids are synthesized in the adult human body, but eight essential ones cannot be and have to come from food. Although all eight are present in animal protein, plant proteins are usually missing one or two. When cereals and legumes are eaten together, they provide all eight of the essential amino acids, a fact that the ancestors of early agriculturalists undoubtedly understood at least on a practical level and their descendants took advantage of that knowledge. In Asia, rice, wheat, and barley were grown along with soybeans; in India rice was paired with hyacinth bean, black gram, and green gram; in the African savanna, pear millet and sorghum were domesticated along with cow pea and Bambara groundnut; and in the New World, maize and Phaseolus beans in Central America and maize and groundnuts in South America were the bases for agriculture.

4 Cereals and legumes are technically dry fruits (they have a hard dry layer around their seeds). Early agriculturalists also experimented with growing succulent fruits like apples, olives, grapes, and melons, but most of these were brought into domestication much later than cereals and legumes, and in most

cultures they've always been supplementary foods rather than staples. Many of them are propagated vegetatively asexually by using a plant part such as a bulb or cutting rather than sexually through seeds, so they are more complicated to grow than cereals and legumes, and this may account for their typically late addition to agricultural assemblages. It should be noted, however, that recent research in Israel suggests that figs may have been domesticated at a site near Jericho in the Jordan Valley at about the same time as the first experiments with cereals and legumes, and some archaeologists believe that in New Guinea, tubers may have been domesticated long before other crops were imported.

1. According to paragraph 1, all of the following are advantages of cereals EXCEPT:

A. They provide large amounts of energy when consumed.

B. They store easily and retain nutrients for a long time.

C. They provide considerable amounts of calcium, vitamin A, and vitamin C.

D. They have multiple uses, including as bedding or building material.

2. According to paragraph 1, a major disadvantage of cereals is that they

A. cannot be used as animal food

B. must be planted in a different field every year

C. take a long time to ripen before they can be used or stored

D. use up all of the nitrogen in a field unless fertilizer is used

3. According to paragraph 2, one way in which legumes differ from cereals is that legumes

A. are a better source of starch

B. contain far more protein

C. take much longer to ripen

D. must be dried before being stored

4. According to paragraph 2, all of the following statements about legumes are true EXCEPT:

A. Legumes have pods that help seeds ripen quickly.

B. Legumes contain a lot of iron and B vitamins.

C. Legumes return nitrogen to the soil.

D. Legume plants can be harvested many times during a growing season.

5. The word “specifically” in the passage is closest in meaning to

A. precisely

B. importantly

C. frequently

D. likely

6. The word “undoubtedly” in the passage is closest in meaning to

A. possibly

B. typically

C. certainly

D. initially

7. Paragraph 3 supports which of the following ideas about amino acids

A. Amino acids are not produced by the human body and must be obtained from food.

B. Certain amino acids that people need for building and maintaining body tissue cannot be acquired from plant proteins.

C. When legumes or cereals are consumed alone, they do not provide all of the essential amino acids.

D. Legumes are missing many more of the eight essential amino acids than cereals are.

8. In paragraph 3, why does the author discuss crops grown in Asia, India, the African savanna, and the New World

A. To show how widely the understanding of the benefits of combining legumes and cereals was applied

B. To suggest that it was most effective for the same crops to be grown year after year in many parts of the world

C. To emphasize that proteins that come from plants were recognized as valuable in many parts of the world

D. To demonstrate that a wide variety of very different cereals and legumes could be grown together

9. The word “technically” in the passage is closest in meaning to

A. more complex than

B. generally understood to be

C. often confused with

D. scientifically classified as

10. The word “supplementary” in the passage is closest in meaning to

A. valued

B. rare

C. seasonal

D. extra

11. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage. Incorrect choices change the meaning in important ways or leave out essential information.

A. Many of the cereals and legumes can be propagated asexually through offshoots, cuttings, tubers, bulbs and corns or sexually through seeds, which are less complicated to grow.

B. Fruits were typically domesticated later than cereals and legumes, possibly because they tend not to be propagated through seeds and are thus more complicated to grow.

C. Plants that are propagated sexually through seeds are generally much less complicated to grow than asexually propagated plants are.

D. In addition to being propagated asexually, rather than sexually through seeds, many fruits can be added and grown later in the season than cereals and legumes.

12. Paragraph 4 supports which of the following ideas about the figs that may have been domesticated in the Jordan Valley near Jericho

A. Their early domestication casts doubt on the idea that succulent fruits were grown much later than cereals and legumes.

B. They were a more important crop to inhabitants of the Jordan Valley than cereals and legumes were.

C. They are closely related to the plants domesticated in New Guinea before other crops were imported.

D. They are much easier to grow than any other succulent fruit.

13. Look at the four squares that indicate where the following sentence could be added to the passage.

Although they must be replanted each year, they can be grown for a variety of uses.

Where would the sentence best fit? Click on a square to add the sentence to the passage.

14. Drag your choices to the spaces where they belong. To review the passage, click on View Text. Answer Choices

A. Cereals, annual flowering grasses with usable stalks and nutritious seeds that dry and store well, were the first domesticated plants, but they must be grown with legumes to preserve soil nitrogen.

B. Legumes contain a large amount of protein and, when they are eaten with cereals, provide all the amino acids essential to humans.

C. Both the seeds and stalks of wheat and barley were eaten by early agriculturalists, who needed to take in enough nutrients and calories to work the fields.

D. Planting cereals and legumes together sped up their growing period, which meant that they could both be harvested many times over a period of several weeks to several months.

E. Cereals and legumes were typically domesticated well before succulent fruits, which are harder to cultivate, and became staples in early agricultural societies.

F. Because soil conditions in New Guinea and the Jordan Valley made it difficult to grow cereals such as wheat and barley, these regions began to cultivate figs and tubers instead.

Passage 4

Models of Egg Development

1 Several different theories have been put forward to explain how the hard-shelled eggs of land-dwelling reptiles (e.g. lizards) evolved from the soft eggs that amphibians (e.g. frogs and toads) lay in water. The Romer model of egg development is named after the late Alfred Romer, a paleontologist who also became director of the Harvard University Museum of Comparative Zoology. His specialty was early reptiles because, he felt, they were the key to understanding the great reptile diversification seen in the Late Paleozoic and Mesozoic Eras (around 230 million years ago). Romer's hypothesis was that some aquatic amphibians that is, amphibians living in water called anthracosaurs began to lay their eggs on land at about the time that they were evolving reptile-like skeletal features. Indeed, some of these early amphibians and earliest reptiles are so similar in their skeletons that the exact transition point from one to the other is still difficult to determine. Eventually, though, the transition was made, but these early reptiles remained aquatic. The advantage for laying eggs on land was primarily to avoid the aquatic larval (pre- adult) stage during which immature amphibians live exclusively in water with its inherent risk of predators and drying of ponds. However, the land has its own set of dangers, not least of which is the drying effect of the atmosphere. To cope with these problems, a series of protective membranes developed around the egg, including a hard shell. Only later did the reptiles completely abandon an aquatic lifestyle.

2 Another hypothesis was proposed by German paleontologist Rolf Kohring, whose specialty is fossil eggs.

In Kohring's model, amphibians during the Mississippian epoch (360-320 million years ago) spread into nutrient-poor or cooler water. Because of the harsher conditions, eggs were produced with larger yolks, that is, more nutrients for the embryo. With larger yolks, the eggs were bigger, and fewer of them could be produced by the female hundreds rather than thousands. To keep the larger egg intact, one or more membranes were developed, including one that surrounded and protected the egg. This outer membrane provided a place to safely store calcium ions, which are poisonous. Accumulating the calcium in a hard shell then made it possible for the egg to be laid on land (it was pre-adapted to be laid there.)

3 One other model we should consider is the anti-predator hypothesis proposed by Gary and Mary Packard to explain the evolution of the hard-shelled egg. Their model was not concerned with the development of membranes surrounding the egg but continues the story after these membranes appeared. The Packards assume that the earliest reptiles laid leathery shelled eggs on very wet ground where they could absorb water during the embryos' growth. But life on the ground is not without hazards, based on studies of modern reptiles with leathery shelled eggs. Predatory insects and microbes can be a major cause of egg mortality. To counter this loss of eggs, some of the early reptiles began secreting a thin calcareous (containing calcium carbonate) layer. This hard layer gave the embryos a better chance of surviving until hatching. And these survivors in turn would probably leave more progeny once a few of them

reached reproductive age. In time, a thicker, more resistant shell developed. However, a thicker eggshell meant that less water could be absorbed for the needs of the embryo. To compensate, larger eggs were produced, containing a great deal more albumen (egg white, a water-soluble protein). At this point, the rigid eggshell had reached the bird egg level of complexity.

4 Mary Packard presented yet another model with her colleague Roger Seymour. They note that amphibian eggs can never get very large because the gelatin coat surrounding the developing larva is not very good at transmitting oxygen. Because of this restriction, we will never see frog eggs the size of a chicken's. For Packard and Seymour, the major evolutionary breakthrough in reptile eggs was the elimination of the thick gelatin coat and replacing part of it with a fibrous membrane. This change allowed larger eggs to be developed.

1. Which of the sentences below best expresses the essential information in the highlighted sentence in the passage. Incorrect choices change the meaning in important ways or leave out essential information.

A. During the period that early amphibians changed into reptiles, their skeletons were exactly the same.

B. It is difficult to identify the time that early amphibians changed to reptiles because their skeletons look so much alike.

C. The skeletons of some early amphibians and reptiles are so similar that it is difficult to say which are amphibians and which are reptiles.

D. Early amphibians and reptiles had the same kind of skeleton at the same point in time.

2. The word “exclusively” in the passage is closest in meaning to

A. only

B. initially

C. primarily

D. temporarily

3. According to paragraph 1, aquatic amphibians laid their eggs on land in order to

A. enable young amphibians to benefit from a dry atmosphere

B. ensure the rapid development of a hard shell

C. enable young amphibians to evolve features necessary for living on land

D. protect young amphibians from the dangers associated with life in the water

4. The word “Accumulating” in the passage is closest in meaning to

A. Forcing

B. Collecting

C. Distributing

D. Isolating

5. In paragraph 2, why does the author mention the information about calcium ions

A. To explain Koherig's theory that amphibian eggs developed at least two protective outer membranes

B. To explain that the calcium in a hard shell is not poisonous when the egg is laid on land

C. To explain why, according to Kohring, a hard shell evolved

D. To explain why only the outer membrane stored calcium

6. Which of the following can be inferred from paragraph 2 about the relationship between eggs and water

temperature

A. Eggs needed adaptations to survive in cold water.

B. Eggs needed warm water to survive.

C. Smaller eggs were produced in cold water.

D. Fewer eggs were produced in warm water.

7. According to paragraph 2, all of the following are true of the eggs of amphibians during the Mississippian epoch EXCEPT:

A. They had hard shells made from calcium ions.

B. They had larger yolks than previously.

C. They had protective membranes.

D. They were produced in larger quantities than previously.

8. The word “counter” in the passage is closest in meaning to

A. escape

B. stop

C. combat

D. delay

9. According to paragraph 3, early reptiles began to develop a thin calcareous layer around the egg so that

A. the embryo could survive attacks from predatory insects and microbes

B. the embryo could absorb sufficient water during its growth

C. the surviving embryo could reach reproductive age

D. the egg could be laid on land

10. Which of the following is mentioned in paragraph 3 as a disadvantage of the hard eggshell

A. It increased the hatching period.

B. It prevented the development of large-size eggs.

C. It made it more difficult for the embryo to obtain water.

D. It made it harder for the embryo to survive until hatching.

11. The word “breakthrough” in the passage is closest in meaning to

A. effect

B. development

C. requirement

D. goal

12. Which of the following can be inferred from paragraph 4 about the fibrous membrane

A. It served the same function as the gelatin coat.

B. It was larger than the gelatin coat.

C. It allowed amphibians to produce eggs as large as those of reptiles.

D. It allowed for better transmission of oxygen.

13. Look at the four squares that indicate where the following sentence could be added to the passage.

And the relatively few that were produced had to be properly protected.

Where would the sentence best fit? Click on a square to add the sentence to the passage.

14. Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some answer choices do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

Answer Choices

A. Alfred Romer's hypothesis was that early amphibians started evolving reptilian skeletal features long before they started laying eggs on land.

B. Alfred Romer theorized that early reptiles developed protective membranes around the egg in response to the dangers to young amphibians in water and threats to the egg on land.

C. In Rolf Kohring's view, early reptiles developed protective membranes around the large eggs that were produced in harsh water conditions, making it possible for the egg to be laid on land.

D. Gary and Mary Packard claimed that reptiles developed the hard-shelled egg in order to reduce the rate at which eggs were destroyed by predatory insects and microbes.

E. Rolf Kohring argued that egg development was poor during the Mississippian epoch due to nutrient-poor waters.

F. According to Mary Packard and Roger Seymour, reptiles could not successively develop very large eggs because of the elimination of the gelatin coat.