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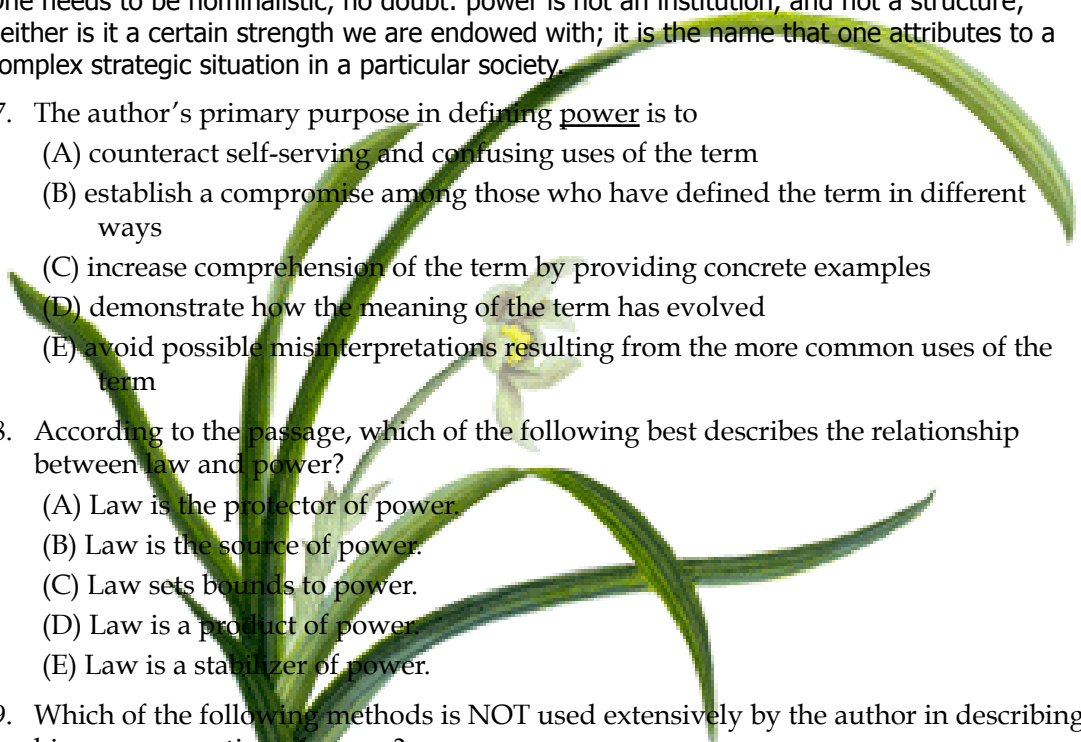
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It seems to me that power must be understood as the multiplicity of force relations that are immanent in the social sphere; as the process that, through ceaseless struggle and confrontation, transforms, strengthens, or reverses them; as the support that these force relations find in one another, or on the contrary, th

e disjunctions and contradictions that isolate them from one another; and lastly, as the strategies in which they take effect, whose general design or institutional crystallization is embodied in the state apparatus, in the formulation of the law, in the various social hegemonies.

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

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

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

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

Of course, it would be as dangerous to overreact to history by concluding that the majority must now be wrong about expansion as it would be to reenact the response that greeted the suggestion that the continents had drifted. The cases are not precisely analogous. There were ser

ious problems with the pre-drift world view that a drift theory could help to resolve, whereas Earth expansion appears to offer no comparable advantages. If, however, physicists could show that the Earth's gravitational force has decreased with time, expansion would have to be reconsidered and accommodated.

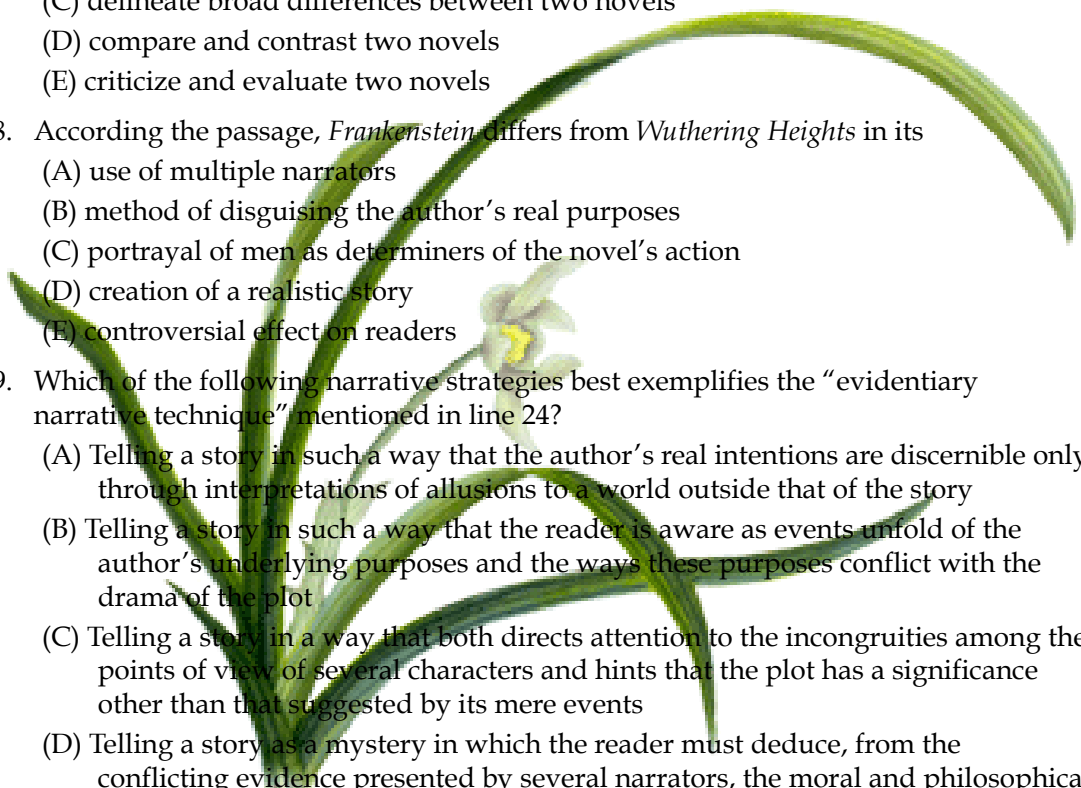
24. The passage indicates that one reason why the expansion hypothesis has attracted little support is that it will not
- (A) overcome deficiencies in current geologic hypotheses
 - (B) clarify theories concerning the Earth's gravitational forces
 - (C) complement the theory of continental drift
 - (D)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

No. 3-1

SECTION A

Notable as important nineteenth-century novels by women, Mary Shelley's *Frankenstein* and Emily Brontë's

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

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

20. According to the passage, the plots of *Wuthering Heights* and *Frankenstein* are notable for their elements of
- (A) drama and secrecy
 - (B) heroism and tension
 - (C) realism and ambition
 - (D) mystery and irony
 - (E) morality and metaphysics

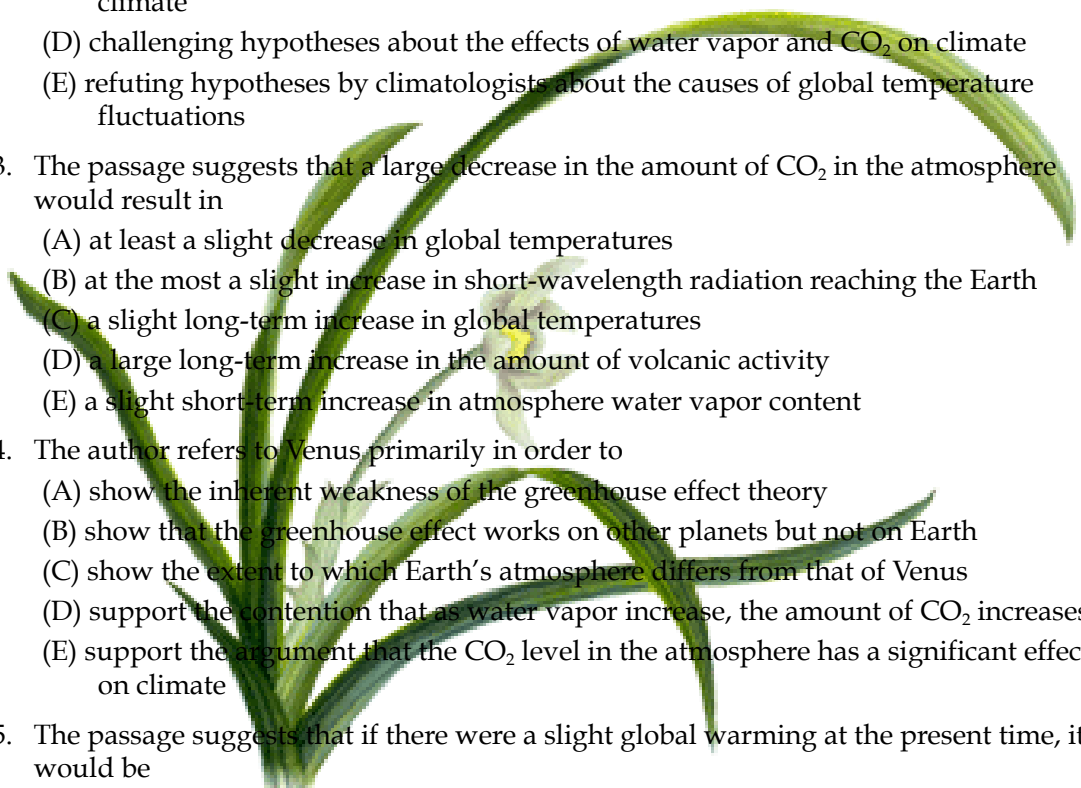
Climatic conditions are delicately adjusted to the composition of the Earth's atmosphere. If there were a change in the atmosphere—for example, in the relative proportions of atmospheric gases—the climate would probably change also. A slight increase in water vapor, for instance, would increase the heat-retaining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

The level of carbon dioxide, CO₂, in the atmosphere has an important effect on climatic change. Most of the Earth's incoming energy is short-wavelength radiation, which tends to pass through atmospheric CO₂ easily. The Earth, however, reradiates much of the received energy as long-wavelength radiation, which CO₂ absorbs and then remits toward the Earth. This phenomenon, known as the greenhouse effect, can result in an increase in the surface temperature of a planet. An extreme example of the effect is shown by Venus, a planet covered by heavy clouds composed mostly of CO₂, whose surface temperatures have been measured at 430°C. If the CO₂ content of the atmosphere is reduced, the temperature falls. According to one respectable theory, if the atmospheric CO₂ concentration were halved, the Earth would become completely covered with ice. Another equally respectable theory, however, states that a halving of the CO₂ concentration would lead only to a reduction in global temperatures of 3°C.

If, because of an increase in forest fires or volcanic activity, the CO₂ content of the atmosphere increased, a warmer climate would be produced. Plant growth, which relies on both the warmth and the availability of CO₂ would probably increase. As a consequence, plants would use more and more CO₂. Eventually CO₂ levels would diminish and the climate, in turn, would become cooler. With reduced temperatures many plants would die; CO₂ would thereby be returned to the atmosphere and gradually the temperature would rise again. Thus, if this process occurred, there might be a long-term oscillation in the amount of CO₂ present in the atmosphere, with regular temperature increases and decreases of a set magnitude.

Some climatologists argue that the burning of fossil fuels has raised the level of CO₂ in the atmosphere and has caused a global temperature increase of at least 1°C. But a supposed global temperature rise of 1°C may in reality be only several regional temperature increases, restricted to areas where there are many meteorological stations and caused simply by shifts in the pattern of atmospheric circulation. Other areas, for example the Southern Hemisphere oceanic zone, may be experiencing an equivalent temperature decrease that is unrecognized because of the shortage of meteorological recording stations.

21. The passage supplies information for answering which of the following questions?

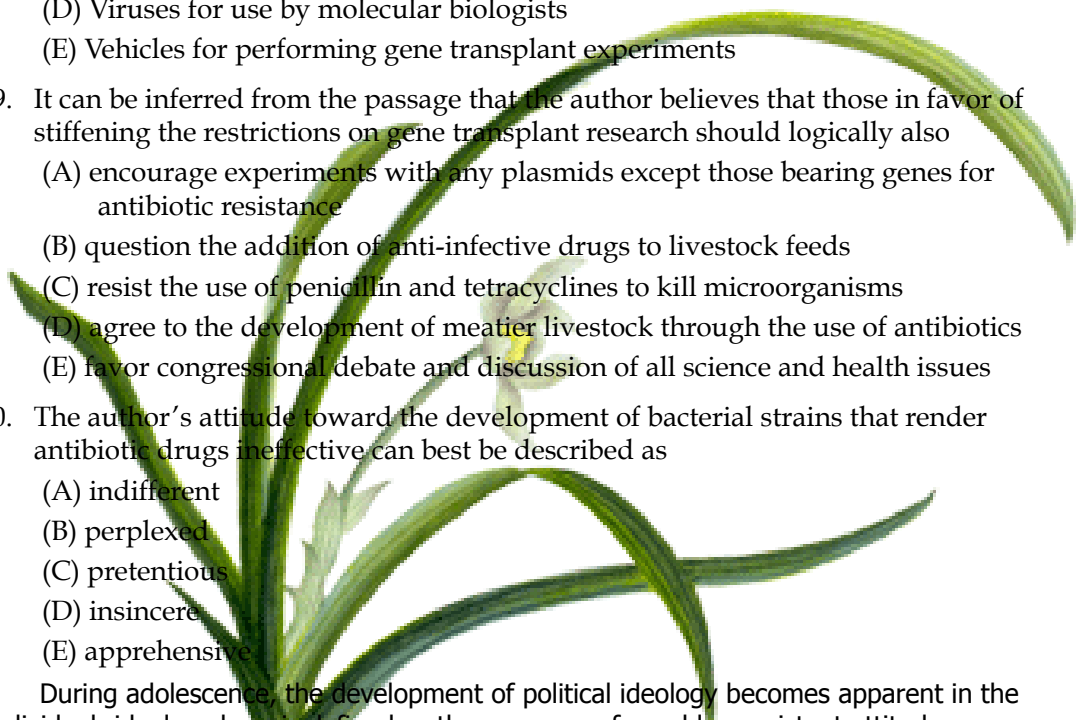
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- (A) Why are projections of the effects of changes in water vapor levels on the climate so inaccurate?
- (B) What are the steps in the process that takes place as CO₂ absorbs long-wavelength radiation?
- (C) How might our understanding of the greenhouse effect be improved if the burning of fossil fuels were decreased?
- (D) What might cause a series of regular increases and decreases in the amount of CO₂ in the atmosphere?
- (E) Why are there fewer meteorological recording stations in the Southern Hemisphere oceanic zone than elsewhere?
22. The author is primarily concerned with
- (A) explaining the effects that the burning of fossil fuels might have on climate
- (B) illustrating the effects of CO₂ on atmospheric radiation
- (C) discussing effects that changes in the CO₂ level in the atmosphere might have on climate
- (D) challenging hypotheses about the effects of water vapor and CO₂ on climate
- (E) refuting hypotheses by climatologists about the causes of global temperature fluctuations
23. The passage suggests that a large decrease in the amount of CO₂ in the atmosphere would result in
- (A) at least a slight decrease in global temperatures
- (B) at the most a slight increase in short-wavelength radiation reaching the Earth
- (C) a slight long-term increase in global temperatures
- (D) a large long-term increase in the amount of volcanic activity
- (E) a slight short-term increase in atmosphere water vapor content
24. The author refers to Venus primarily in order to
- (A) show the inherent weakness of the greenhouse effect theory
- (B) show that the greenhouse effect works on other planets but not on Earth
- (C) show the extent to which Earth's atmosphere differs from that of Venus
- (D) support the contention that as water vapor increase, the amount of CO₂ increases
- (E) support the argument that the CO₂ level in the atmosphere has a significant effect on climate
25. The passage suggests that if there were a slight global warming at the present time, it would be
- (A) easy to measure the exact increase in temperature because of the abundance of temperature recording stations throughout the world
- (B) difficult to measure the increase of CO₂ in the atmosphere because of local variations in amounts

- (C) easy to demonstrate the effects of the warming on the water vapor in the atmosphere
- (D) difficult to prove that the warming was caused by the burning of fossil fuels
- (E) easy to prove that the warming was caused by an increase of cloud cover
26. The discussion of climate in the passage suggests which of the following conclusion?
- I. Climate is not perfectly stable, and slight regional temperature variations can be considered a normal feature of the environment.
- II. We are unable at present to measure global temperature changes precisely.
- III. The most important cause of regional climatic fluctuations is the change in CO₂ levels in the atmosphere.
- (A) I only
- (B) III only
- (C) I and II only
- (D) II and III only
- (E) I, II, and III
27. All of the following can be found in the author's discussion of climate EXCEPT
- (A) a statement about the effects of increased volcanic activity on the Earth's temperatures
- (B) an indication of the effect of an increase in water vapor in the atmosphere
- (C) a contrast between two theories about the effects of a lowering of CO₂ levels in the atmosphere
- (D) a generalization about the efficiency of meteorological recording stations
- (E) a hypothesis about the relationship between atmospheric gases and changes in climate

SECTION B

The Food and Drug Administration has recently proposed severe restrictions on the use of antibiotics to promote the health and growth of meat animals. Medications added to feeds kill many microorganisms but also encourage the appearance of bacterial strains that are resistant to anti-infective drugs. Already, for example, penicillin and the tetracyclines are not as effective therapeutically as they once were. The drug resistance is chiefly conferred by tiny circlets of genes, called plasmids, which can be exchanged between different strains and even different species of bacteria. Plasmids are also one of the two kinds of vehicles (the other being viruses) that molecular biologists depend on when performing gene transplant experiments. Even present guidelines forbid the laboratory use of plasmids bearing genes for resistance to antibiotics. Yet, while congressional debate rages over whether or not to toughen these restrictions on scientists in their laboratories, little congressional attention has been focused on an ill-advised agricultural practice that produces known deleterious effects.

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

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

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

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

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

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

21. The author's primary purpose in the passage is to
- (A) clarify the kinds of understanding an adolescent must have in order to develop a political ideology
 - (B) dispute the theory that a political ideology can be acquired during adolescence
 - (C) explain why adolescents are generally uninterested in political arguments
 - (D) suggest various means of encouraging adolescents to develop personal political ideologies
 - (E) explain why an adolescent's political ideology usually appears more sophisticated than it actually is
22. According to the author, which of the following contributes to the development of political ideology during adolescence?
- (A) Conscious recognition by the adolescent of his or her own naiveté
 - (B) Thorough comprehension of the concept of ordination
 - (C) Evaluation by the adolescent of the general principles encompassing his or her specific political ideas

- (D) Intuitive understanding of relationships among various components of society
(E) Rejection of abstract reasoning in favor of involvement with pragmatic situations
23. The author uses the term “common ground of understanding” (line 27) to refer to
(A) familiar legislation regarding political activity
(B) the experiences that all adolescents share
(C) a society’s general sense of its own political activity
(D) a society’s willingness to resolve political tensions
(E) the assumption that the state controls social institutions
24. The passage suggests that, during early adolescence, a child would find which of the following most difficult to understand?
(A) A book chronicling the ways in which the presidential inauguration ceremony has changed over the years
(B) An essay in which an incident in British history is used to explain the system of monarchic succession
(C) A summary of the respective responsibilities of the legislative, executive, and judicial branches of government
(D) A debate in which the participants argue, respectively, that the federal government should or should not support private schools
(E) An article detailing the specific religious groups that founded American colonies and the guiding principles of each one
25. It can be inferred from the passage that the author would be most likely to agree with which of the following statements about schools?
(A) They should present political information according to carefully planned, schematic arrangements.
(B) They themselves constitute part of a general sociopolitical system that adolescents are learning to understand.
(C) If they were to introduce political subject matter in the primary grades, students would understand current political realities at an earlier age.
(D) They are ineffectual to the degree that they disregard adolescents’ political naiveté.
(E) Because they are subsidiary to government their contribution to the political understanding of adolescent must be limited.
26. Which of the following best summarizes the author’s evaluation of the accumulation of political knowledge by adolescents?
(A) It is unquestionably necessary, but its significance can easily be overestimated.
(B) It is important, but not as important as is the ability to appear knowledgeable.
(C) It delays the necessity of considering underlying principles.
(D) It is primarily relevant to an understanding of limited, local concerns, such as county politics.

- (E) It is primarily dependent on information gleaned from high school courses such as civics.
27. Which of the following statements best describes the organization of the author's discussion of the role of political knowledge in the formation of political ideology during adolescence?
- (A) He acknowledges its importance, but then modifies his initial assertion of that importance.
- (B) He consistently resists the idea that it is important, using a series of examples to support his stand.
- (C) He wavers in evaluating it and finally uses analogies to explain why he is indecisive.
- (D) He begins by questioning conventional ideas about its importance, but finally concedes that they are correct.
- (E) He carefully refrains from making an initial judgment about it, but later confirms its critical role.

No. 8-2

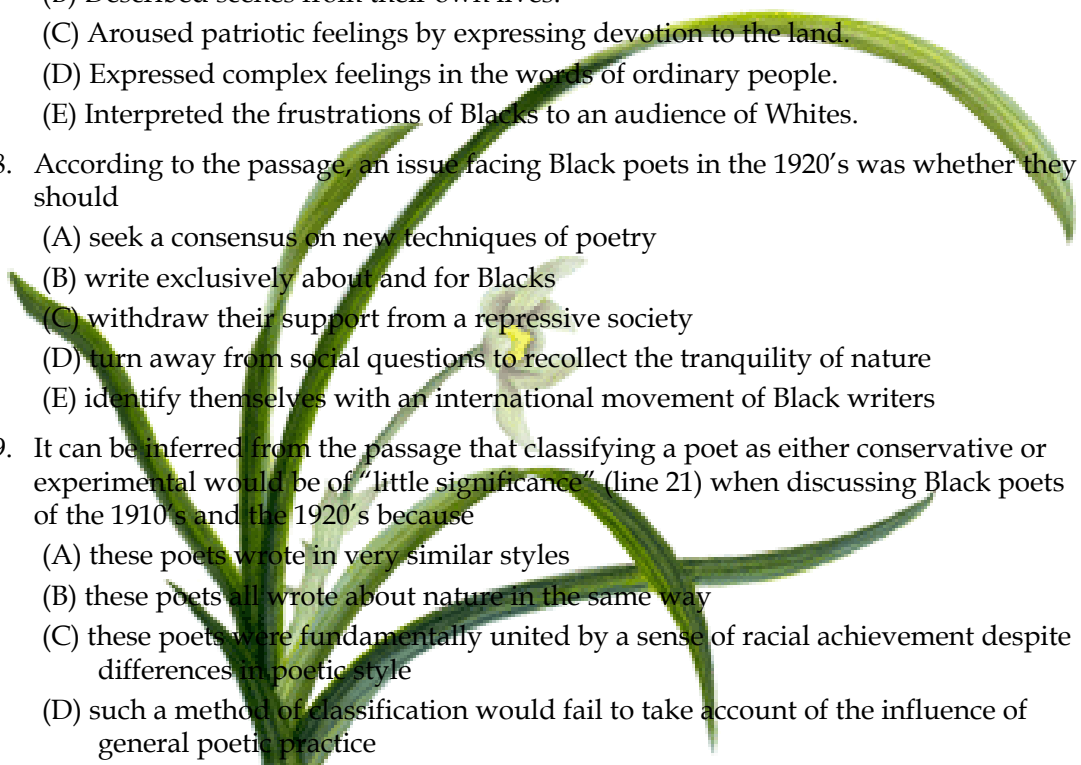
SECTION A

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

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

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

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

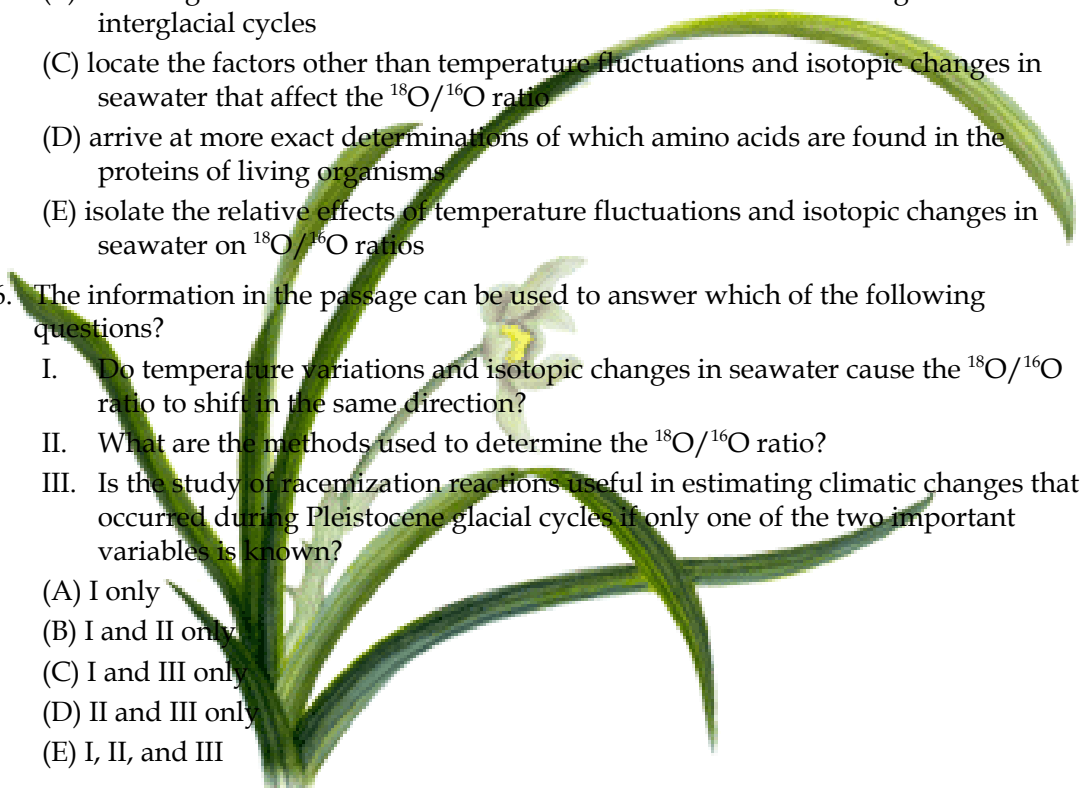
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17. According to the passage, most turn-of-the-century Black poets generally did which of the following?
 - (A) Wrote in ways that did not challenge accepted literary practice.
 - (B) Described scenes from their own lives.
 - (C) Aroused patriotic feelings by expressing devotion to the land.
 - (D) Expressed complex feelings in the words of ordinary people.
 - (E) Interpreted the frustrations of Blacks to an audience of Whites.
 18. According to the passage, an issue facing Black poets in the 1920's was whether they should
 - (A) seek a consensus on new techniques of poetry
 - (B) write exclusively about and for Blacks
 - (C) withdraw their support from a repressive society
 - (D) turn away from social questions to recollect the tranquility of nature
 - (E) identify themselves with an international movement of Black writers
 19. It can be inferred from the passage that classifying a poet as either conservative or experimental would be of "little significance" (line 21) when discussing Black poets of the 1910's and the 1920's because
 - (A) these poets wrote in very similar styles
 - (B) these poets all wrote about nature in the same way
 - (C) these poets were fundamentally united by a sense of racial achievement despite differences in poetic style
 - (D) such a method of classification would fail to take account of the influence of general poetic practice
 - (E) such a method of classification would be relevant only in a discussion of poets separated in time by more than three decades
 20. The author quotes Sterling Brown in lines 53-56 in order to
 - (A) present an interpretation of some black poets that contradicts the author's own assertion about their acceptance of various poetic styles

- (B) introduce a distinction between Black poets who used dialect and White poets who did not
- (C) disprove James Weldon Johnson's claim that race is what "the Negro poet knows best"
- (D) suggest what were the effects of some Black poets' decision not to write only about racial subjects
- (E) prove that Black poets at the turn of the century wrote less conventionally than did their White counterparts
21. It can be inferred from the passage that the author finds the work of the majority of the Black poets at the turn of the century to be
- (A) unexciting
- (B) calming
- (C) confusing
- (D) delightful
- (E) inspiring
22. The author would be most likely to agree that poets tend to produce better poems when they
- (A) express a love of nature
- (B) declaim noble emotions
- (C) avoid technical questions about style
- (D) emulate the best work of their predecessors
- (E) write from personal experience
23. Which of the following best describes the attitude of the author toward classification as a technique in literary history?
- (A) Enthusiastic
- (B) Indifferent
- (C) Wary
- (D) Derisive
- (E) Defensive

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

Fortunately, recent studies indicate that the racemization reaction of amino acids can be used to determine more accurately temperatures that occurred during Pleistocene glacial cycles. Only L-amino acids are usually found in the proteins of living organisms, but over long periods of geological time these acids undergo racemization, producing D-a

mino acids, which are not found in proteins. This reaction depends on both time and temperature; thus, if one variable is known, the reaction can be used to calculate the other.

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

- (B) determine temperatures that occurred during Pleistocene glacial cycles only by examining fossil remains
- (C) measure changes in temperatures that occurred during Pleistocene glacial cycles with only questionable accuracy
- (D) only partially identify factors tending to lower Pleistocene temperatures
- (E) accurately determine temperatures only for land masses affected by glaciation

SECTION B

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

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

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

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

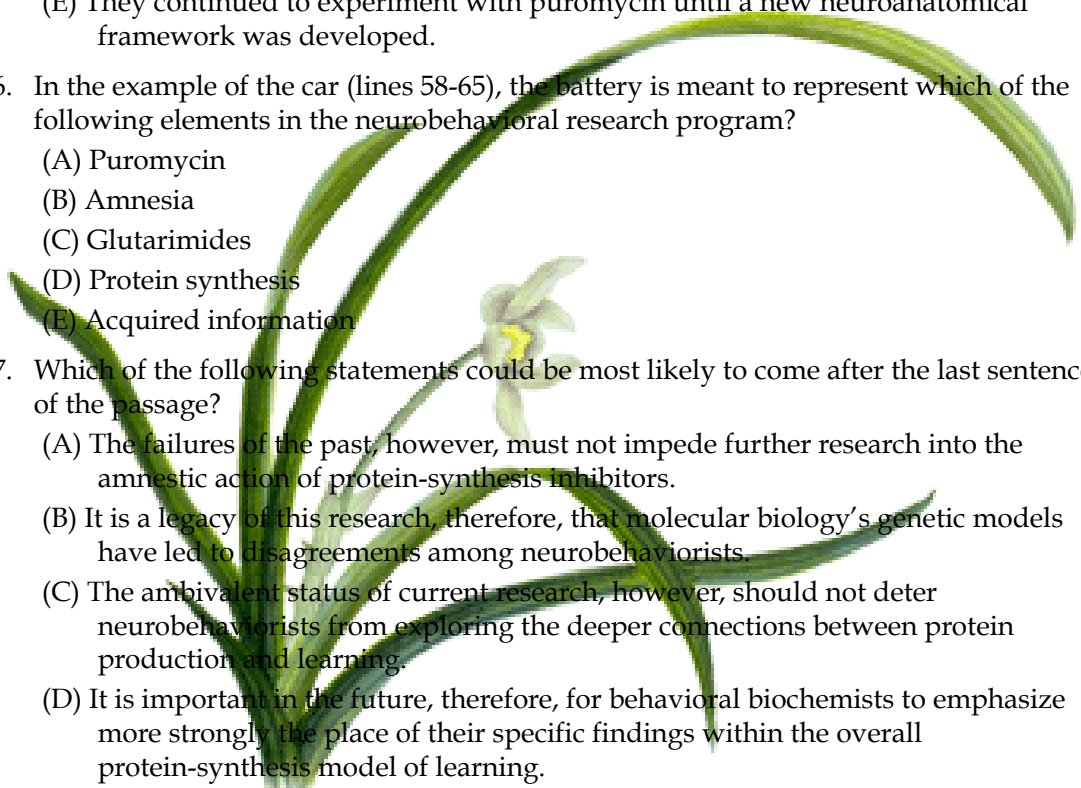
The first step toward establishing a connection between protein synthesis and learning seemed to be block memory (cause amnesia) by interrupting the production of protein. We were fortunate in finding a nonlethal dosage of puromycin that could, it first appeared, thoroughly inhibit brain protein synthesis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

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

So, puromycin turned out to be a disappointment. It came to be regarded as a poor agent for amnesia studies, although, of course, it was poor only in the context of our original paradigm of protein-synthesis inhibition. In our frustration, our initial response was simply to change drugs rather than our conceptual orientati

on. After many such disappointments, however, it now appears unlikely that we will make a firm connection between protein synthesis and learning merely by pursuing the approaches of the past. Our experience with drugs has shown that all the amnestic agents often interfere with memory in ways that seem unrelated to their inhibition of protein synthesis. More importantly, the notion that the interruption or intensification of protein production in the brain can be related in cause-and-effect fashion to learning now seems simplistic and unproductive. Remove the battery from a car and the car will not go. Drive the car a long distance at high speed and the battery will become more highly charged. Neither of these facts proves that the battery powers the car; only a knowledge of the overall automotive system will reveal its mechanism of the locomotion and the role of the battery within that system.

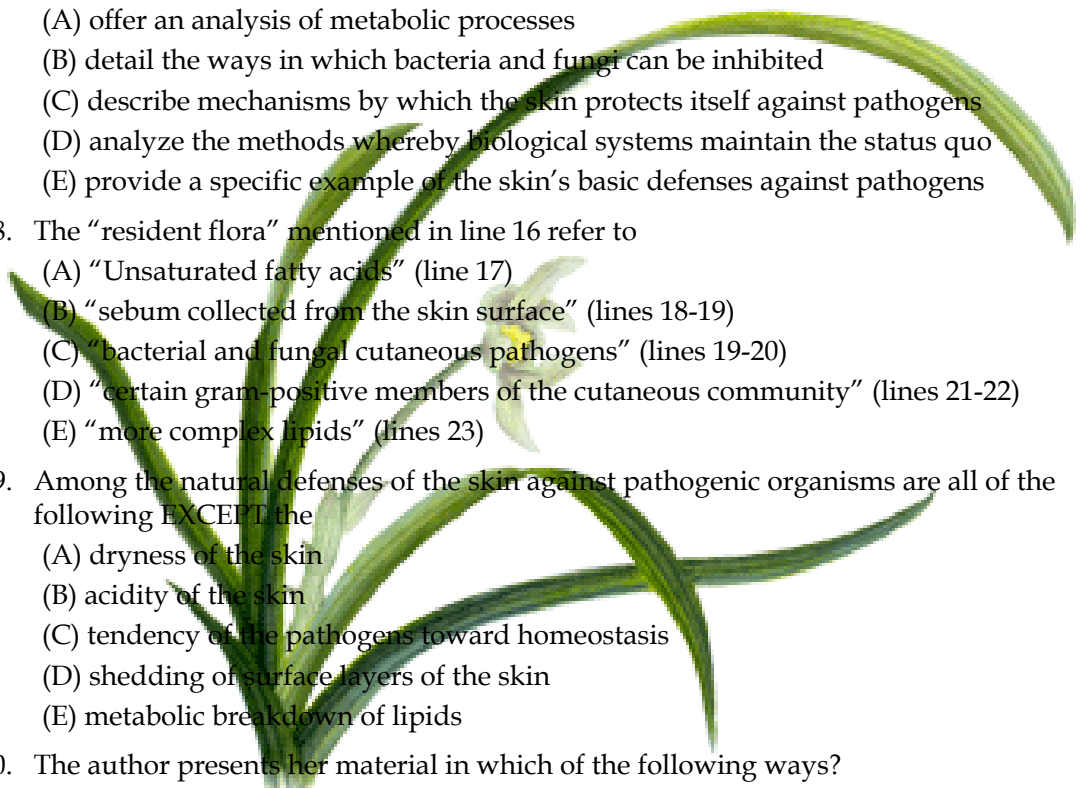
21. This passage was most likely excerpted from
- (A) a diary kept by a practicing neurobehavioral researcher
 - (B) a newspaper article on recent advances in the biochemistry of learning
 - (C) a technical article on experimental techniques in the field of molecular biology
 - (D) an article summarizing a series of scientific investigations in neurobehavioral research
 - (E) a book review in a leading journal devoted to genetic research
22. The primary purpose of the passage is to show that extensive experimentation has
- (A) demonstrated the importance of amino-acid fragmentation in the induction of amnesia
 - (B) cast doubt on the value of puromycin in the neurobehavioral investigation of learning
 - (C) revealed the importance of amnesia in the neurobehavioral study of learning
 - (D) not yet demonstrated the applicability of molecular biology to neurobehavioral research
 - (E) not supported the hypothesis that learning is directly dependent on protein synthesis
23. According to the passage, neurobehaviorists initially based their belief that protein synthesis was related to learning on which of the following?
- (A) Traditional theories about learning
 - (B) New techniques in protein synthesis
 - (C) Previous discoveries in molecular biology
 - (D) Specific research into learning and amnesia
 - (E) Historic experiments on the effects of puromycin
24. The passage mentions all of the following as effects of puromycin EXCEPT:
- (A) brain seizures
 - (B) memory loss

- 
- (C) inhibition of protein synthesis
(D) destruction of genetic information
(E) fragmentation of amino-acid chains
25. It can be inferred from the passage that, after puromycin was perceived to be a disappointment, researchers did which of the following?
- (A) They ceased to experiment with puromycin and shifted to other promising protein-synthesis inhibitors.
(B) They ceased to experiment with puromycin, and reexamined through experiments the relationship between genetic information and acquired information.
(C) They continued to experiment with puromycin, but applied their results to other facets of memory research.
(D) They continued to experiment with puromycin, but also tried other protein-synthesis inhibitors.
(E) They continued to experiment with puromycin until a new neuroanatomical framework was developed.
26. In the example of the car (lines 58-65), the battery is meant to represent which of the following elements in the neurobehavioral research program?
- (A) Puromycin
(B) Amnesia
(C) Glutarimides
(D) Protein synthesis
(E) Acquired information
27. Which of the following statements could be most likely to come after the last sentence of the passage?
- (A) The failures of the past, however, must not impede further research into the amnestic action of protein-synthesis inhibitors.
(B) It is a legacy of this research, therefore, that molecular biology's genetic models have led to disagreements among neurobehaviorists.
(C) The ambivalent status of current research, however, should not deter neurobehaviorists from exploring the deeper connections between protein production and learning.
(D) It is important in the future, therefore, for behavioral biochemists to emphasize more strongly the place of their specific findings within the overall protein-synthesis model of learning.
(E) It is important in the future, therefore, for behavioral biochemists to focus on the several components of the total learning system.

SECTION A

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

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

- 
17. The primary purpose of the passage is to
- (A) offer an analysis of metabolic processes
 - (B) detail the ways in which bacteria and fungi can be inhibited
 - (C) describe mechanisms by which the skin protects itself against pathogens
 - (D) analyze the methods whereby biological systems maintain the status quo
 - (E) provide a specific example of the skin's basic defenses against pathogens
18. The "resident flora" mentioned in line 16 refer to
- (A) "Unsaturated fatty acids" (line 17)
 - (B) "sebum collected from the skin surface" (lines 18-19)
 - (C) "bacterial and fungal cutaneous pathogens" (lines 19-20)
 - (D) "certain gram-positive members of the cutaneous community" (lines 21-22)
 - (E) "more complex lipids" (lines 23)
19. Among the natural defenses of the skin against pathogenic organisms are all of the following EXCEPT the
- (A) dryness of the skin
 - (B) acidity of the skin
 - (C) tendency of the pathogens toward homeostasis
 - (D) shedding of surface layers of the skin
 - (E) metabolic breakdown of lipids
20. The author presents her material in which of the following ways?
- (A) Stating a problem and then supplying a solution
 - (B) Presenting a phenomenon and then analyzing reason for it
 - (C) Providing information and then drawing a conclusion from it

- (D) Making a general statement and then arguing by analogy
- (E) Making an inference and then developing it by illustration

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

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

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

21. Which of the following best characterizes the author's attitude toward Tolstoi?
- (A) She deprecates the cynicism of his later works.
 - (B) She finds his theatricality artificial.
 - (C) She admires his wholehearted sincerity.
 - (D) She thinks his inconsistency disturbing.
 - (E) She respects his devotion to orthodoxy.

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

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

SECTION B

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

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

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

17. The passage suggests that factors contributing to the variation in the amount of ozone above different areas of the Earth's surface include which of the following?
- I. Some of the ozone found at higher latitudes was produced elsewhere.
 - II. There is usually a smaller amount of naturally occurring nitrogen oxide over high latitudes.
 - III. The rate of ozone production over the poles is less than that over the tropics.
- (A) II only
(B) III only
(C) I and II only
(D) I and III only
(E) I, II, and III
18. Which of the following best states the central idea of the passage?
- (A) Naturally occurring nitrogen oxides, as well as those introduced by humans, threaten to deplete the layer of ozone in the stratosphere.
(B) A delicate but reasonably constant balance exists between the natural processes that produce and those that destroy ozone in the stratosphere.
(C) There is little hope that the increased concentrations of ground-level ozone observed in recent years can offset any future depletion of stratospheric ozone.
(D) Meteorologically induced changes in the concentration of ozone in the stratosphere tend to cancel themselves out over a period of time.
(E) Solar radiation not only produces and destroys ozone but also poses a hazard to human life.
19. The processes that determine the amount of ozone in a given portion of the stratosphere most resemble which of the following?
- (A) Automobile emissions and seasonal fog that create a layer of smog over a city
(B) Planting and harvesting activities that produce a crop whose size is always about the same
(C) Withdrawals and deposits made in a bank account whose average balance remains about the same
(D) Assets and liabilities that determine the net worth of a corporation
(E) High grades and low grades made by a student whose average remains about the same from term to term
20. According to the passage, which of the following has the LEAST effect on the amount of ozone at a given location in the upper atmosphere?
- (A) Latitude
(B) Weather

- (C) Season
(D) Ground-level ozone
(E) Solar activity
21. The author provides information that answers which of the following questions?
- I. What is the average thickness of the stratospheric ozone layer?
 - II. Why does increased exposure to ultraviolet radiation damage many living organisms?
 - III. What is the role of oxygen in the production of stratospheric zone?
- (A) I only
(B) II only
(C) III only
(D) I and II
(E) II and III
22. In explaining what determines the amount of ozone in the stratosphere, the author describes natural processes that form
- (A) an interactive relationship
 - (B) a reductive system
 - (C) a linear progression
 - (D) a set of randomly occurring phenomena
 - (E) a set of sporadically recurring events

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

23. The primary purpose of the passage is to
- (A) propose and defend a theory about the consequences of a certain historical event
 - (B) present historical facts and offer a broader interpretation of those facts than has been offered in the past
 - (C) describe the socioeconomic effects of a widely held attitude during a particular historical period
 - (D) demonstrate the superiority of using an economic approach to historical analysis
 - (E) call attention to the influence of the textile industry on society during a particular historical period

24. It can be inferred from the passage that the author views the system of paying all workers equally on time rates as
- (A) unfair and not rational
 - (B) undesirable but unavoidable
 - (C) efficient and profitable
 - (D) advantageous to most women workers
 - (E) evidence of a trend toward a more modern wage system
25. The passage implies which of the following about women spinners in medieval Europe?
- (A) Most of them worked independently for wealthy sponsors.
 - (B) They were not typical of medieval women entrepreneurs.
 - (C) Some of them were paid for their work after it was done, according to its value.
 - (D) They would have been able to contribute substantial amounts to their families incomes were it not for the prohibition against advancing money to them.
 - (E) They were inevitably disadvantaged in the marketplace because they were obliged to obtain money for their supplies from usurers.
26. The passage implies that feelings of hopelessness among medieval workers
- (A) resulted primarily from the lack of a rational system of differential rewards
 - (B) disappeared completely once medieval textile workers were able to break the cycle of poverty
 - (C) were more prevalent among female workers than among male workers
 - (D) came into being in part because of women's limited earning capacity
 - (E) were particularly common among textile workers in Italy and France
27. The author suggests that historians have done which of the following?
- (A) Failed to give adequate consideration to the economic contribution of women during the medieval period.
 - (B) Overestimated the degree of hopelessness experienced by medieval workers trapped in the poverty cycle.
 - (C) Ignored the fact that by 1300 many women spinners were working independently rather than for merchant entrepreneurs.
 - (D) Regard the economic status of women in Italy and France as representative of women's status throughout medieval Europe.
 - (E) Overlooked part of the significance of a prohibition governing one aspect of yarn production in medieval Europe.

SECTION A

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

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

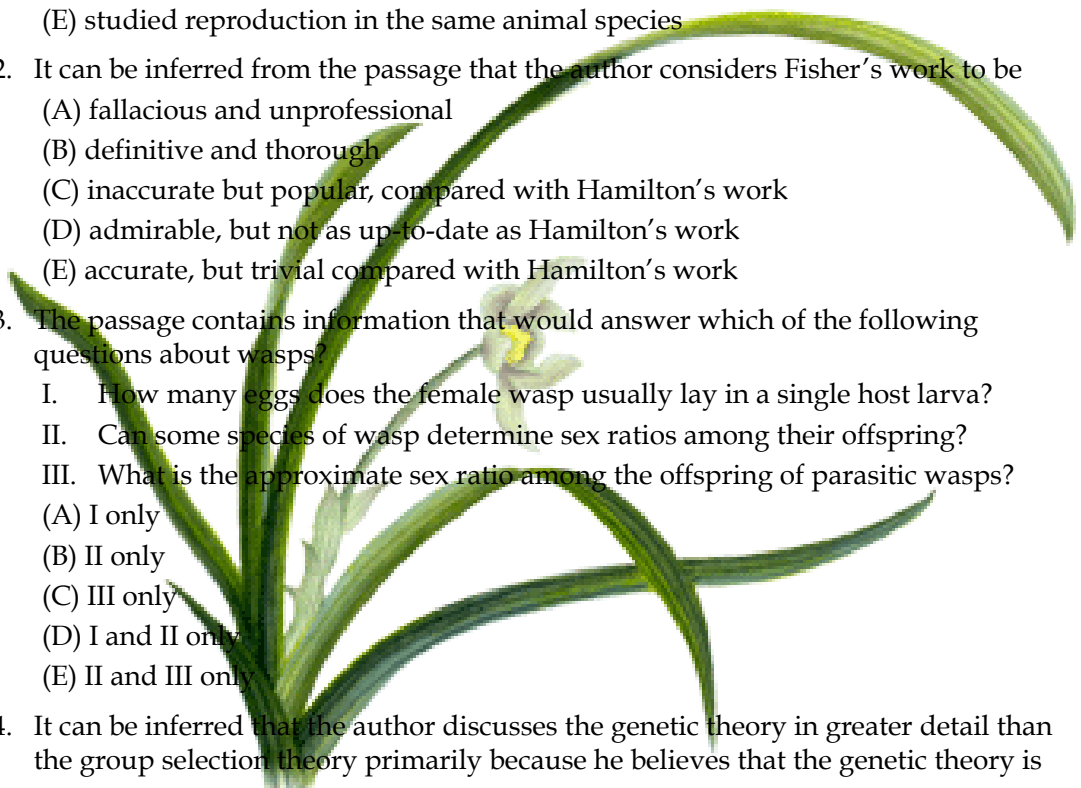
17. Which of the following best states the central idea of the passage?
- (A) The War of Independence produced among many Black Americans a heightened consciousness of the inequities in American society.
 - (B) The War of Independence strengthened the bonds of slavery of many Black Americans while intensifying their desire to be free.
 - (C) The War of Independence exposed to many Americans the contradiction of slavery in a country seeking its freedom and resulted in efforts to resolve that contradiction.
 - (D) The War of Independence provoked strong criticisms by many Americans of the institution of slavery, but produced little substantive action against it.
 - (E) The War of Independence renewed the efforts of many American groups toward achieving Black emancipation.
18. The passage contains information that would support which of the following statements about the colonies before the War of Independence?
- (A) They contained organized antislavery societies.
 - (B) They allowed individuals to own slaves.
 - (C) They prohibited religious groups from political action.
 - (D) They were inconsistent in their legal definitions of slave status.
 - (E) They encouraged abolitionist societies to expand their influence.
19. According to the passage, the War of Independence was embarrassing to some Americans for which of the following reasons?
- I. It involved a struggle for many of the same liberties that Americans were denying to others.
 - II. It involved a struggle for independence from the very nation that had founded the colonies.
 - III. It involved a struggle based on inconsistencies in the participants' conceptions of freedom.

- (A) I only
 - (B) II only
 - (C) I and II only
 - (D) I and III only
 - (E) I, II, and III
20. Which of the following statements regarding American society in the years immediately following the War of Independence is best supported by the passage?
- (A) The unexpected successes of the antislavery societies led to their gradual demise in the Eastern states.
 - (B) Some of the newly independent American states had begun to make progress toward abolishing slavery.
 - (C) Americans like Abigail Adams became disillusioned with the slow progress of emancipation and gradually abandoned the cause.
 - (D) Emancipated slaves gradually were accepted in the Eastern states as equal members of American society.
 - (E) The abolition of slavery in many Eastern states was the result of close cooperation between religious groups and free Blacks.

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

Since Fisher's time, it has been realized that genes can sometimes influence the chromosome or gamete in which they find themselves so that the gamete will be more likely to participate in fertilization. If such a gene occurs on a sex-determining (X or Y) chromosome, then highly aberrant sex ratios can occur. But more immediately relevant to **game theory** are the sex ratios in certain parasitic wasp species that have a large excess of females. In these species, fertilized eggs develop into females and unfertilized eggs into males. A female stores

sperm and can determine the sex of each egg she lays by fertilizing it or leaving it unfertilized. By Fisher's argument, it should still pay a female to produce equal numbers of sons and daughters. Hamilton, noting that the eggs develop within their host—the larva of another insect—and that the newly emerged adult wasps mate immediately and disperse, offered a remarkably cogent analysis. Since only one female usually lays eggs in a given larva, it would pay her to produce one male only, because this one male could fertilize all his sisters on emergence. Like Fisher, Hamilton looked for an evolutionarily stable strategy, but he went a step further in *recognizing* that he was looking for a strategy.

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

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

SECTION B

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

In his novels these various impulses were sacrificed to each other inevitably and often. Inevitably, because Hardy did not care in the way that novelists such as Flaubert or James cared, and therefore took paths of least resistance. Thus, one impulse often surrendered to a fresher one and, unfortunately, instead of exacting a compromise, simply disappeared. A desire to throw over reality a light that never was might give

way abruptly to the desire **on the part of** what we might consider a novelist-scientist to record exactly and concretely the structure and texture of a flower. In this instance, the new impulse was at least an energetic one, and thus its indulgence did not result in a relaxed style. But on other occasions Hardy abandoned a perilous, risky, and highly energizing impulse in favor of what was for him the fatally relaxing impulse to classify and schematize abstractly. When a relaxing impulse was indulged, the style—that sure index of an author’s literary worth—was certain to become verbose. Hardy’s weakness derived from his apparent inability to control the comings and goings of these divergent impulses and from his unwillingness to cultivate and sustain the energetic and risky ones. He submitted to first one and then another, and the spirit blew where it **listed**; hence the unevenness of any one of his novels. His most controlled novel, *Under the Greenwood Tree*, prominently exhibits two different but reconcilable impulses—a desire to be a realist-historian and a desire to be a psychologist of love—but the slight interlocking of plot are not enough to bind the two completely together. Thus even this book splits into two distinct parts.

17. Which of the following is the most appropriate title for the passage, based on its content?
- (A) *Under the Greenwood Tree*: Hardy’s Ambiguous Triumph
 - (B) The Real and the Strange: The Novelist’s Shifting Realms
 - (C) Energy *Versus* Repose: The Role of Ordinary People in Hardy’s Fiction
 - (D) Hardy’s Novelistic Impulses: The Problem of Control
 - (E) Divergent Impulses: The Issue of Unity in the Novel
18. The passage suggests that the author would be most likely to agree with which of the following statements about literary realism?
- (A) Literary realism is most concerned with the exploration of the internal lives of ordinary human beings.
 - (B) The term “literary realism” is susceptible to more than a single definition.
 - (C) Literary realism and an interest in psychology are likely to be at odds in a novelist’s work.
 - (D) “Literary realism” is the term most often used by critics in describing the method of Hardy’s novels.
 - (E) A propensity toward literary realism is a less interesting novelistic impulse than is an interest in the occult and the strange.
19. The author of the passage considers a writer’s style to be
- (A) a reliable means by which to measure the writer’s literary merit
 - (B) most apparent in those parts of the writer’s work that are not realistic
 - (C) problematic when the writer attempts to follow perilous or risky impulses
 - (D) shaped primarily by the writer’s desire to classify and schematize
 - (E) the most accurate index of the writer’s literary reputation

20. Which of the following words could best be substituted for “relaxed” (line 37) without substantially changing the author’s meaning?
- (A) informal
 - (B) confined
 - (C) risky
 - (D) wordy
 - (E) metaphoric
21. The passage supplies information to suggest that its author would be most likely to agree with which of the following statements about the novelists Flaubert and James?
- (A) They indulged more impulses in their novels than did Hardy in his novels.
 - (B) They have elicited a greater degree of favorable response from most literary critics than has Hardy.
 - (C) In the writing of their novels, they often took pains to effect a compromise among their various novelistic impulses.
 - (D) Regarding novelistic construction, they cared more about the opinions of other novelists than about the opinions of ordinary readers.
 - (E) They wrote novels in which the impulse toward realism and the impulse away from realism were evident in equal measure.
22. Which of the following statements best describes the organization of lines 27 to 41 of the passage (“Thus...abstractly”)?
- (A) The author makes a disapproving observation and then presents two cases, one of which leads to a qualification of his disapproval and the other of which does not.
 - (B) The author draws a conclusion from a previous statement, explains his conclusion in detail, and then gives a series of examples that have the effect of resolving an inconsistency.
 - (C) The author concedes a point and then makes a counterargument, using an extended comparison and contrast that qualifies his original concession.
 - (D) The author makes a judgment, points out an exception to his judgment, and then contradicts his original assertion.
 - (E) The author summarizes and explains an argument and then advances a brief history of opposing arguments.
23. Which of the following statements about the use of comedy in Hardy’s novels is best supported by the passage?
- (A) Hardy’s use of comedy in his novels tended to weaken his literary style.
 - (B) Hardy’s use of comedy in his novels was inspired by his natural sympathy.
 - (C) Comedy appeared less frequently in Hardy’s novels than did tragedy.
 - (D) Comedy played an important role in Hardy’s novels though that comedy was usually in the form of farce.

(E) Comedy played a secondary role in Hardy's more controlled novels only.

24. The author implies which of the following about *Under the Greenwood Tree* in relation to Hardy's other novels?

(A) It is Hardy's most thorough investigation of the psychology of love.
(B) Although it is his most controlled novel, it does not exhibit any harsh or risky impulses.
(C) It, more than his other novels, reveals Hardy as a realist interested in the history of ordinary human beings.
(D) In it Hardy's novelistic impulses are managed somewhat better than in his other novels.
(E) Its plot, like the plots of all of Hardy's other novels, splits into two distinct parts.

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

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

25. The author's primary purpose in the passage is to

(A) describe the formation and nature of singularities
(B) explain why large numbers of stars become singularities
(C) compare the characteristics of singularities with those of stars
(D) explain what happens during the stages of a singularity's formation
(E) imply that singularities could be more easily studied if observers could get closer to them

26. The passage suggests which of the following about the Sun?

I. The Sun could evolve to a stage of collapse that is less dense than a singularity.
II. In the Sun, the inward force of gravity is balanced by the generation of heat.
III. The Sun emits more observable light than does a white dwarf or a neutron star.
(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III

27. Which of the following sentences would most probably follow the last sentence of the passage?
- (A) Thus, a physicist interested in studying phenomena near singularities would necessarily hope to find a singularity with a measurable gravitational field.
 - (B) Accordingly, physicists to date have been unable to observe directly any singularity.
 - (C) It is specifically this startling phenomenon that has allowed us to codify the scant information currently available about singularities.
 - (D) Moreover, the existence of this extraordinary phenomenon is implied in the extensive reports of several physicists.
 - (E) Although unanticipated, phenomena such as these are consistent with the structure of a singularity.

No. 4-2

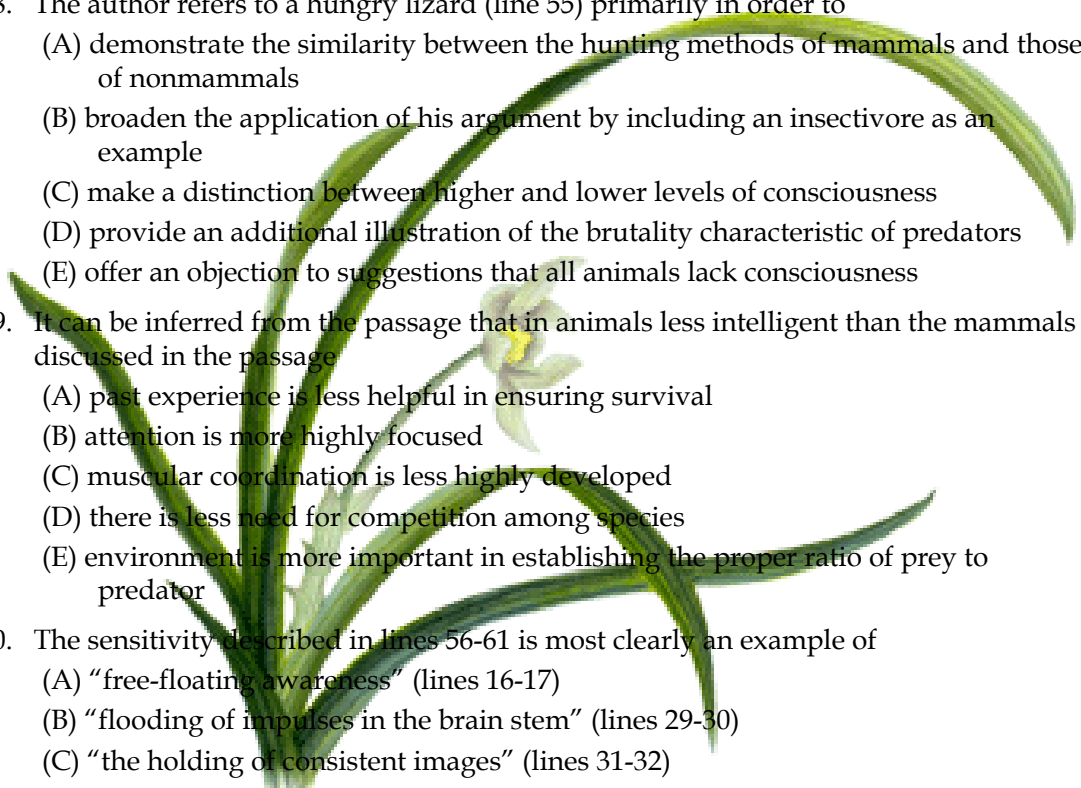
SECTION A

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

The kind of intelligence favored by the interplay of increasingly smarter catchers and increasingly keener escapers is defined by attention—that aspect of mind carrying consciousness forward from one moment to the next. It ranges from a passive, free-floating awareness to a highly focused, active fixation. The range through these states is mediated by the arousal system, a network of tracts converging from sensory systems to integrating centers in the brain stem. From the more relaxed to the more vigorous levels, sensitivity to novelty is increased. The organism is more awake, more vigilant; this increased vigilance results in the apprehension of ever more subtle signals as the organism becomes more sensitive to its surroundings. The processes of arousal and concentration give attention its direction. Arousal is at first general, with a flooding of impulses in the brain stem; then gradually the activation is channeled. Thus begins concentration, the holding of consistent images. One meaning of intelligence is the way in which these images and other alertly searched information are used in the context of previous experience. Consciousness links past attention to the present and permits the integration of details with perceived ends and purposes.

The elements of intelligence and consciousness come together marvelously to produce different styles in predator and prey. Herbivores and carnivores develop different kinds of attention related to escaping or chasing. Although in both kinds of animal, arousal stimulates the production of adrenaline and norepinephrine by the adrenal glands, the effect in herbivores is primarily fear, whereas in carnivores the effect is primarily aggression. For both, arousal attunes the animal to what is ahead. Perhaps it does not experience forethought as we know it, but the animal does experience something like it. The predator is searchingly aggressive, innerdirected, tuned by the nervous system and the adrenal hormones, but aware

in a sense closer to human consciousness than, say, a hungry lizard's instinctive snap at a passing beetle. Using past events as a framework, the large mammal predator is working out a relationship between movement and food, sensitive to possibilities in cold trails and distant sounds—and yesterday's unforgotten lessons. The herbivore prey is of a different mind. Its mood of wariness rather than searching and its attitude of general expectancy instead of anticipating are silk-thin veils of tranquility over an explosive endocrine system.

17. The author is primarily concerned with
- (A) disproving the view that herbivores are less intelligent than carnivores
 - (B) describing a relationship between animals' intelligence and their ecological roles
 - (C) establishing a direct link between early large mammals and their modern counterparts
 - (D) analyzing the ecological basis for the dominance of some carnivores over other carnivores
 - (E) demonstrating the importance of hormones in mental activity
18. The author refers to a hungry lizard (line 55) primarily in order to
- (A) demonstrate the similarity between the hunting methods of mammals and those of nonmammals
 - (B) broaden the application of his argument by including an insectivore as an example
 - (C) make a distinction between higher and lower levels of consciousness
 - (D) provide an additional illustration of the brutality characteristic of predators
 - (E) offer an objection to suggestions that all animals lack consciousness
19. It can be inferred from the passage that in animals less intelligent than the mammals discussed in the passage
- (A) past experience is less helpful in ensuring survival
 - (B) attention is more highly focused
 - (C) muscular coordination is less highly developed
 - (D) there is less need for competition among species
 - (E) environment is more important in establishing the proper ratio of prey to predator
20. The sensitivity described in lines 56-61 is most clearly an example of
- (A) "free-floating awareness" (lines 16-17)
 - (B) "flooding of impulses in the brain stem" (lines 29-30)
 - (C) "the holding of consistent images" (lines 31-32)
 - (D) "integration of details with perceived ends and purposes" (lines 37-38)
 - (E) "silk-thin veils of tranquility" (line 64)
- 

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

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

Pessen does present a **quantity of** examples, together with some refreshingly intelligible statistics, to establish the existence of an inordinately wealthy class. Though active in commerce or the professions, most of the wealthy were not self-made, but had inherited family fortunes. In no sense mercurial, these great fortunes survived the financial panics that destroyed lesser ones. Indeed, in several cities the wealthiest one percent constantly increased its share until by 1850 it owned half of the community's wealth. Although these observation

s are true, Pessen overestimates their importance by concluding from them that the undoubted progress toward inequality in the late eighteenth century continued in the Jacksonian period and that the United States was a class-ridden, plutocratic society even before industrialization.

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

SECTION B

"I want to criticize the social system, and to show it at work, at its most intense." Virginia Woolf's provocative statement about her intentions in writing *Mrs. Dalloway* has regularly been ignored by the critics, since it highlights an aspect of her literary interests very different from the traditional picture of the "poetic" novelist concerned with examining states of reverie and vision and with following the intricate pathways of individual consciousness. But Virginia Woolf was a realistic as well as a poetic novelist, a satirist and social critic as well as a visionary: literary critics' cavalier

er dismissal of Woolf's social vision will not withstand scrutiny.

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

Woolf's focus on society has not been generally recognized because of her intense antipathy to propaganda in art. The pictures of reformers in her novels are usually satiric or sharply critical. Even when Woolf is fundamentally sympathetic to their causes, she portrays people anxious to reform their society and possessed of a message or program as arrogant or dishonest, unaware of how their political ideas serve their own psychological needs. (Her *Writer's Diary* notes: "the only honest people are the artists," whereas "these social reformers and philanthropists...harbor...discreditable desires under the disguise of loving their kind...") Woolf detested what she called "preaching" in fiction, too, and criticized novelist D. H. Lawrence (among others) for working by this method.

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

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

17. Which of the following would be the most appropriate title for the passage?
- (A) Poetry and Satire as Influences on the Novels of Virginia Woolf
 - (B) Virginia Woolf: Critic and Commentator on the Twentieth-Century Novel
 - (C) Trends in Contemporary Reform Movements as a Key to Understanding Virginia Woolf's Novels
 - (D) Society as Allegory for the Individual in the Novels of Virginia Woolf
 - (E) Virginia Woolf's Novels: Critical Reflections on the Individual and on Society
18. In the first paragraph of the passage, the author's attitude toward the literary critics mentioned can best be described as
- (A) disparaging
 - (B) ironic
 - (C) facetious
 - (D) skeptical but **resigned**

- (E) disappointed but hopeful
19. It can be inferred from the passage that Woolf chose Chaucer as a literary model because she believed that
- (A) Chaucer was the first English author to focus on society as a whole as well as on individual characters
 - (B) Chaucer was an honest and forthright author, whereas novelists like D. H. Lawrence did not sincerely wish to change society
 - (C) Chaucer was more concerned with understanding his society than with calling its accepted mores into question
 - (D) Chaucer's writing was greatly, if subtly, effective in influencing the moral attitudes of his readers
 - (E) her own novels would be more widely read if, like Chaucer, she did not overtly and vehemently criticize contemporary society
20. It can be inferred from the passage that the most probable reason Woolf realistically described the social setting in the majority of her novels was that she
- (A) was aware that contemporary literary critics considered the novel to be the most realistic of literary genres
 - (B) was interested in the effect of a person's social milieu on his or her character and actions
 - (C) needed to be as attentive to detail as possible in her novels in order to support the arguments she advanced in them
 - (D) wanted to show that a painstaking fidelity in the representation of reality did not in any way hamper the artist
 - (E) wished to prevent critics from charging that her novels were written in an ambiguous and inexact style
21. Which of the following phrases best expresses the sense of the word "contemplative" as it is used in lines 43-44 of the passage?
- (A) Gradually elucidating the rational structures underlying accepted mores
 - (B) Reflecting on issues in society without prejudice or emotional commitment
 - (C) Avoiding the aggressive assertion of the author's perspective to the exclusion of the reader's judgment
 - (D) Conveying a broad view of society as a whole rather than focusing on an isolated individual consciousness
 - (E) Appreciating the world as the artist sees it rather than judging it in moral terms
22. The author implies that a major element of the satirist's art is the satirist's
- (A) consistent adherence to a position of lofty disdain when viewing the foibles of humanity
 - (B) insistence on the helplessness of individuals against the social forces that seek to determine an individual's fate

- (C) cynical disbelief that visionaries can either enlighten or improve their societies
- (D) fundamental assumption that some ambiguity must remain in a work of art in order for it to reflect society and social mores accurately
- (E) refusal to indulge in polemic when presenting social mores to readers for their scrutiny

23. The passage supplies information for answering which of the following questions?

- (A) Have literary critics ignored the social criticism inherent in the works of Chekhov and Chaucer?
- (B) Does the author believe that Woolf is solely an introspective and visionary novelist?
- (C) What are the social causes with which Woolf shows herself to be sympathetic in her writings?
- (D) Was D. H. Lawrence as concerned as Woolf was with creating realistic settings for his novels?
- (E) Does Woolf attribute more power to social environment or to historical forces as shapers of a person's life?

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

24. The primary purpose of the passage is to

- (A) criticize scientists who believe that the deuterium-tritium fusion reaction can be made feasible as an energy source
- (B) admonish scientists who have failed to correctly calculate the amount of lithium available for use in nuclear fusion reactors
- (C) defend the continued short-term use of fossil fuels as a major energy source
- (D) caution against uncritical embrace of nuclear fusion power as a major energy source
- (E) correct the misconception that nuclear fusion power is entirely free of radioactivity

25. It can be inferred from the passage that the author believes which of the following about the current state of public awareness concerning nuclear fusion power?

- (A) The public has been deliberately misinformed about the advantages and disadvantages of nuclear fusion power.

- (B) The public is unaware of the principal advantage of nuclear fusion over nuclear fission as an energy source.
 - (C) The public's awareness of the scientific facts concerning nuclear fusion power is somewhat distorted and incomplete.
 - (D) The public is not interested in increasing its awareness of the advantages and disadvantages of nuclear fusion power.
 - (E) The public is aware of the disadvantages of nuclear fusion power but not of its advantages.
26. The passage provides information that would answer which of the following questions?
- (A) What is likely to be the principal source of deuterium for nuclear fusion power?
 - (B) How much incidental radiation is produced in the deuterium tritium fusion reaction?
 - (C) Why are scientists exploring the deuterium-tritium fusion reaction with such zeal?
 - (D) Why must the tritium for nuclear fusion be synthesized from lithium?
 - (E) Why does the deuterium-tritium reaction yield both alpha particles and neutrons?
27. Which of the following statements concerning nuclear scientists is most directly suggested in the passage?
- (A) Nuclear scientists are not themselves aware of all of the facts surrounding the deuterium-tritium fusion reaction.
 - (B) Nuclear scientists exploring the deuterium-tritium reaction have overlooked key facts in their eagerness to prove nuclear fusion practical.
 - (C) Nuclear scientists may have overestimated the amount of lithium actually available in the Earth's crust.
 - (D) Nuclear scientists have not been entirely dispassionate in their investigation of the deuterium-tritium reaction.
 - (E) Nuclear scientists have insufficiently investigated the lithium-to-tritium reaction in nuclear fusion.

No. 4-3

SECTION A

Great comic art is never otherworldly, it does not seek to mystify us, and it does not deny ambiguity by branding as evil whatever differs from good. Great comic artists assume that truth may bear all lights, and thus they seek to accentuate contradictions in social action, not gloss over or transcend them by appeals to extrasocial symbols of divine ends, cosmic purpose, or laws of nature. The moment of transcendence in great comic art is a social moment, born out of the conviction that we are human, even though we try to be gods. The comic community to which artists address themselves is a community of reasoning

, loving, joyful, compassionate beings, who are willing to assume the human risks of acting rationally. Without invoking gods or demons, great comic art arouses courage in reason, courage which grows out of trust in what human beings can do as humans.

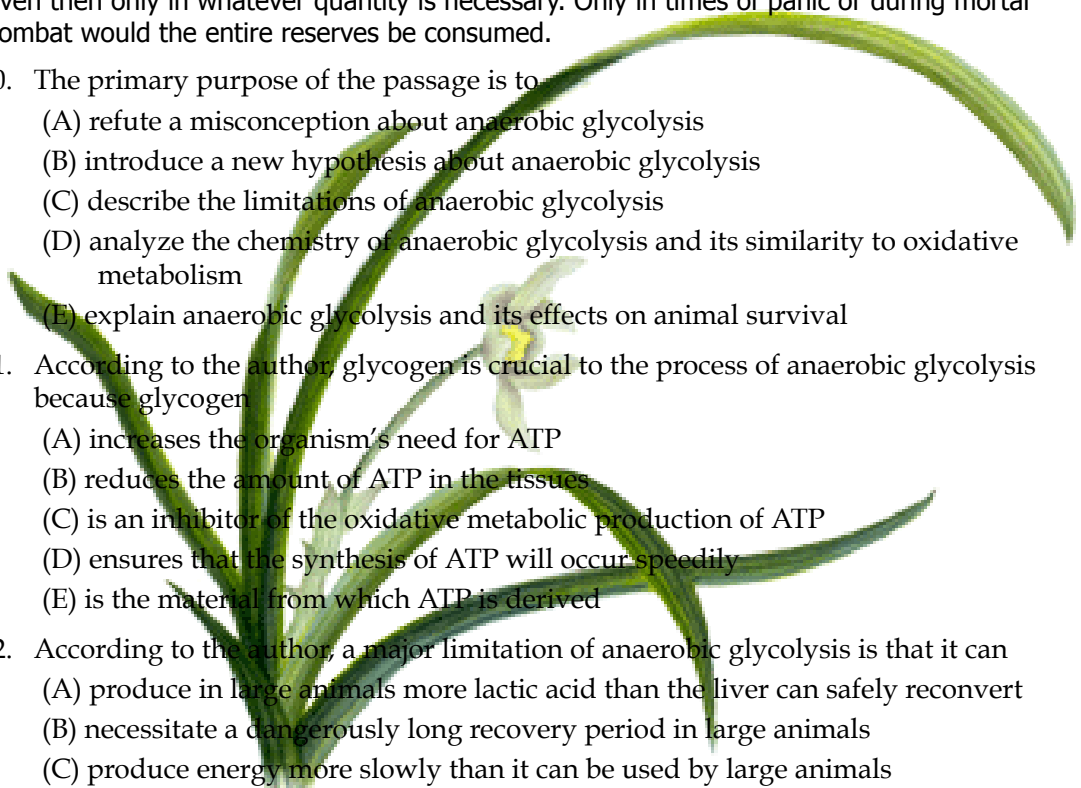
17. The passage suggests that great comic art can be characterized as optimistic about the ability of humans to
- (A) rid themselves of pride
 - (B) transcend the human condition
 - (C) differentiate clearly between good and evil
 - (D) avoid social conflicts
 - (E) act rationally
18. It can be inferred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

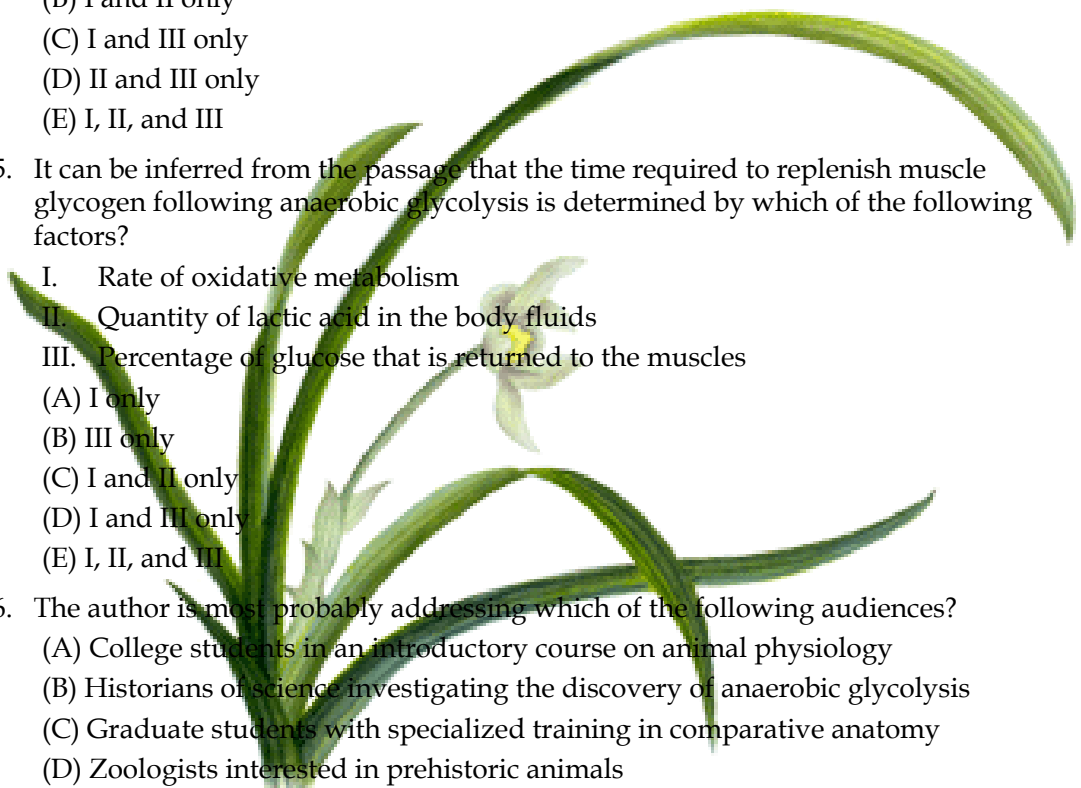
It has long been known that the rate of oxidative metabolism (the process that uses oxygen to convert food into energy) in any animal has a profound effect on its living patterns. The high metabolic rate of small animals, for example, gives them sustained power and activity per unit of weight, but **at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

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

id, the dinosaur would have been able to generate almost instantaneously, via anaerobic glycolysis, the energy of 3,000 humans at maximum oxidative metabolic energy production. This explains how many large species have managed to compete with their more active neighbors: the compensation for a low oxidative metabolic rate is glycolysis.

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

- 
20. The primary purpose of the passage is to
- (A) refute a misconception about anaerobic glycolysis
 - (B) introduce a new hypothesis about anaerobic glycolysis
 - (C) describe the limitations of anaerobic glycolysis
 - (D) analyze the chemistry of anaerobic glycolysis and its similarity to oxidative metabolism
 - (E) explain anaerobic glycolysis and its effects on animal survival
21. According to the author, glycogen is crucial to the process of anaerobic glycolysis because glycogen
- (A) increases the organism's need for ATP
 - (B) reduces the amount of ATP in the tissues
 - (C) is an inhibitor of the oxidative metabolic production of ATP
 - (D) ensures that the synthesis of ATP will occur speedily
 - (E) is the material from which ATP is derived
22. According to the author, a major limitation of anaerobic glycolysis is that it can
- (A) produce in large animals more lactic acid than the liver can safely reconvert
 - (B) necessitate a dangerously long recovery period in large animals
 - (C) produce energy more slowly than it can be used by large animals
 - (D) consume all of the available glycogen regardless of need
 - (E) reduce significantly the rate at which energy is produced by oxidative metabolism

23. The passage suggests that the total anaerobic energy reserves of a vertebrate are proportional to the vertebrate's size because
- (A) larger vertebrates conserve more energy than smaller vertebrates
 - (B) larger vertebrates use less oxygen per unit weight than smaller vertebrates
 - (C) the ability of a vertebrate to consume food is a function of its size
 - (D) the amount of muscle tissue in a vertebrate is directly related to its size
 - (E) the size of a vertebrate is proportional to the quantity of energy it can utilize
24. The author suggests that, on the basis of energy production, a 100-ton dinosaur would have been markedly vulnerable to which of the following?
- I. Repeated attacks by a single smaller, more active adversary
 - II. Sustained attack by numerous smaller, more active adversaries
 - III. An attack by an individual adversary of similar size
- (A) II only
 - (B) I and II only
 - (C) I and III only
 - (D) II and III only
 - (E) I, II, and III
25. It can be inferred from the passage that the time required to replenish muscle glycogen following anaerobic glycolysis is determined by which of the following factors?
- I. Rate of oxidative metabolism
 - II. Quantity of lactic acid in the body fluids
 - III. Percentage of glucose that is returned to the muscles
- (A) I only
 - (B) III only
 - (C) I and II only
 - (D) I and III only
 - (E) I, II, and III
26. The author is most probably addressing which of the following audiences?
- (A) College students in an introductory course on animal physiology
 - (B) Historians of science investigating the discovery of anaerobic glycolysis
 - (C) Graduate students with specialized training in comparative anatomy
 - (D) Zoologists interested in prehistoric animals
 - (E) Biochemists doing research on oxidative metabolism
27. Which of the following best states the central idea of the passage?
- (A) The disadvantage of a low oxidative metabolic rate in large animals can be offset by their ability to convert substantial amounts of glycogen into energy.
- 

- (B) The most significant problem facing animals that have used anaerobic glycolysis for energy is the resynthesis of its by-product, glucose, into glycogen.
- (C) The benefits to animals of anaerobic glycolysis are offset by the profound costs that must be paid.
- (D) The major factor ensuring that a large animal will triumph over a smaller animal is the large animal's ability to produce energy via anaerobic glycolysis.
- (E) The great differences that exist in metabolic rates between species of small animals and species of large animals can have important effects on the patterns of their activities.

SECTION B

The dark regions in the starry night sky are not pockets in the universe that are devoid of stars as had long been thought. Rather, they are dark because of interstellar dust that hides the stars behind it. Although its visual effect is so pronounced, dust is only a minor constituent of the material, extremely low in density that lies between the stars. Dust accounts for about one percent of the total mass of interstellar matter. The rest is hydrogen and helium gas, with small amounts of other elements. The interstellar material, rather like terrestrial clouds, comes in all shapes and sizes. The average density of interstellar material in the vicinity of our Sun is 1,000 to 10,000 times less than the best terrestrial laboratory vacuum. It is only because of the enormous interstellar distances that so little material per unit of volume becomes so significant. Optical astronomy is most directly affected, for although interstellar gas is perfectly transparent, the dust is not.

17. According to the passage, which of the following is a direct perceptual consequence of interstellar dust?
- (A) Some stars are rendered invisible to observers on Earth.
 - (B) Many visible stars are made to seem brighter than they really are.
 - (C) The presence of hydrogen and helium gas is revealed.
 - (D) The night sky appears dusty at all times to observers on Earth.
 - (E) The dust is conspicuously visible against a background of bright stars.
18. It can be inferred from the passage that the density of interstellar material is
- (A) higher where distances between the stars are shorter
 - (B) equal to that of interstellar dust
 - (C) unusually low in the vicinity of our Sun
 - (D) independent of the incidence of gaseous components
 - (E) not homogeneous throughout interstellar space
19. It can be inferred from the passage that it is because space is so vast that
- (A) little of the interstellar material in it seems substantial
 - (B) normal units of volume seem futile for measurements of density

- (C) stars can be far enough from Earth to be obscured even by very sparsely distributed matter
- (D) interstellar gases can, for all practical purposes, be regarded as transparent
- (E) optical astronomy would be of little use even if no interstellar dust existed

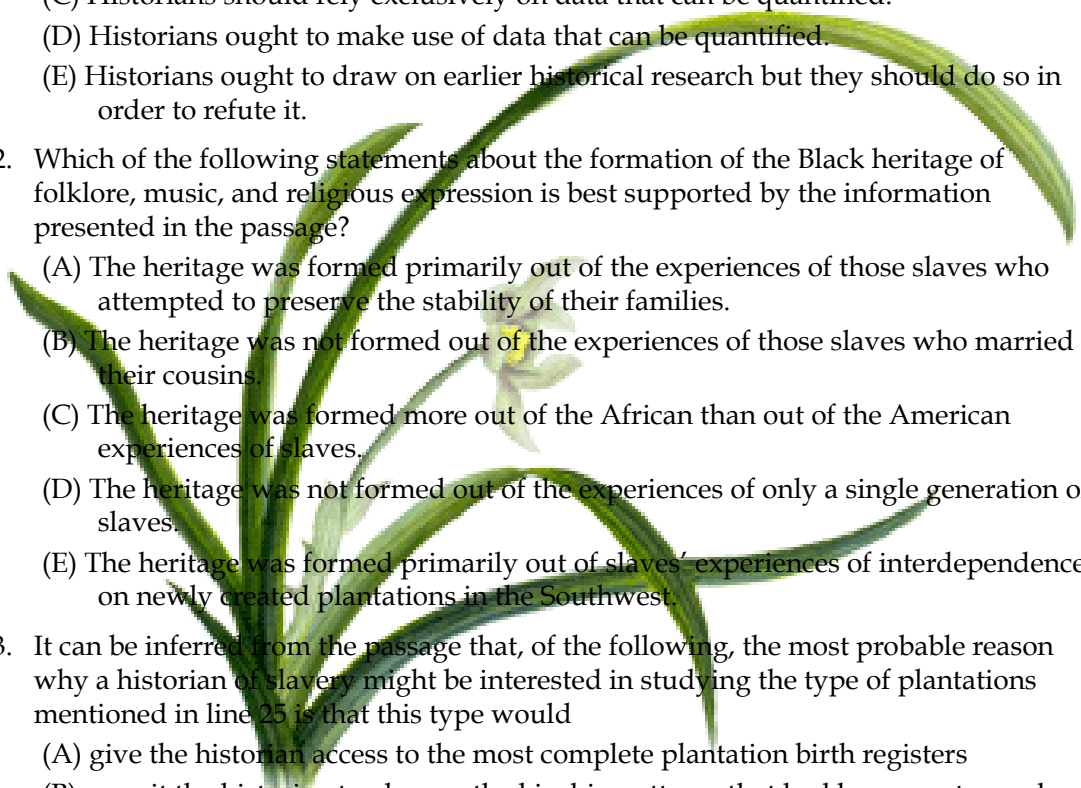
In his 2016 study of slavery in the United States, Herbert Gutman, like Fogel, Engerman, and Genovese, has rightly stressed the slaves' achievements. But unlike these historians, Gutman gives plantation owners little credit for these achievements. Rather, Gutman argues that one must look to the Black family and the slaves' extended kinship system to understand how crucial achievements, such as the maintenance of a cultural heritage and the development of a communal consciousness, were possible. His findings compel attention.

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

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

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

20. According to the passage, Fogel, Engerman, Genovese, and Gutman have all done which of the following?

- 
- I. Discounted the influence of plantation owners on slaves' achievements.
 - II. Emphasized the achievements of slaves.
 - III. Pointed out the prevalence of the two-parent household among slaves.
 - IV. Showed the connection between stable monogamy and slaves' cultural heritage.
- (A) I and II only
(B) I and IV only
(C) II and III only
(D) I, III, and IV only
(E) II, III, and IV only
21. With which of the following statements regarding the resources that historians ought to use would the author of the passage be most likely to agree?
- (A) Historians ought to make use of written rather than oral accounts.
(B) Historians should rely primarily on birth registers.
(C) Historians should rely exclusively on data that can be quantified.
(D) Historians ought to make use of data that can be quantified.
(E) Historians ought to draw on earlier historical research but they should do so in order to refute it.
22. Which of the following statements about the formation of the Black heritage of folklore, music, and religious expression is best supported by the information presented in the passage?
- (A) The heritage was formed primarily out of the experiences of those slaves who attempted to preserve the stability of their families.
(B) The heritage was not formed out of the experiences of those slaves who married their cousins.
(C) The heritage was formed more out of the African than out of the American experiences of slaves.
(D) The heritage was not formed out of the experiences of only a single generation of slaves.
(E) The heritage was formed primarily out of slaves' experiences of interdependence on newly created plantations in the Southwest.
23. It can be inferred from the passage that, of the following, the most probable reason why a historian of slavery might be interested in studying the type of plantations mentioned in line 25 is that this type would
- (A) give the historian access to the most complete plantation birth registers
(B) permit the historian to observe the kinship patterns that had been most popular among West African tribes
(C) provide the historian with evidence concerning the preference of freed slaves for stable monogamy

- (D) furnish the historian with the opportunity to discover the kind of marital commitment that slaves themselves chose to have
 - (E) allow the historian to examine the influence of slaves' preferences on the actions of plantation owners
24. According to the passage, all of the following are true of the West African rules governing marriage mentioned in lines 46-50 EXCEPT:
- (A) The rules were derived from rules governing fictive kinship arrangements.
 - (B) The rules forbade marriages between close kin.
 - (C) The rules are mentioned in Herbert Gutman's study.
 - (D) The rules were not uniform in all respects from one West African tribe to another.
 - (E) The rules have been considered to be a possible source of slaves' marriage preferences.
25. Which of the following statements concerning the marriage practices of plantation owners during the period of Black slavery in the United States can most logically be inferred from the information in the passage?
- (A) These practices began to alter sometime around the mid-eighteenth century.
 - (B) These practices varied markedly from one region of the country to another.
 - (C) Plantation owners usually based their choice of marriage partners on economic considerations.
 - (D) Plantation owners often married earlier than slaves.
 - (E) Plantation owners often married their cousins.
26. Which of the following best describes the organization of the passage?
- (A) The author compares and contrasts the work of several historians and then discusses areas for possible new research.
 - (B) The author presents his thesis, draws on the work of several historians for evidence to support his thesis, and concludes by reiterating his thesis.
 - (C) The author describes some features of a historical study and then uses those features to put forth his own argument.
 - (D) The author summarizes a historical study, examines two main arguments from the study, and then shows how the arguments are potentially in conflict with one another.
 - (E) The author presents the general argument of a historical study, describes the study in more detail, and concludes with a brief judgments of the study's value.
27. Which of the following is the most appropriate title for the passage, based on its content?
- (A) The Influence of Herbert Gutman on Historians of Slavery in the United States
 - (B) Gutman's Explanation of How Slaves Could Maintain a Cultural Heritage and Develop a Communal Consciousness
 - (C) Slavery in the United States: New Controversy About an Old Subject

- (D) The Black Heritage of Folklore, Music, and Religious Expression: Its Growing Influence
- (E) The Black Family and Extended Kinship Structure: How They Were Important for the Freed Slave

No. 5-1

SECTION A

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

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

- (B) tolerated
- (C) ignored
- (D) forbidden
- (E) nonexistent

20. According to the passage, the Marxist sociologist's chain of reasoning required him to assert that prejudice toward Oriental people in California was
- (A) directed primarily against the Chinese
 - (B) similar in origin to prejudice against the Jews
 - (C) understood by Oriental people as ethnic competition
 - (D) provoked by workers
 - (E) nonracial in character

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

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

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

- ve impulses.
21. The author suggests that, by 1950, attempts to correlate mental experience with brain processes would probably have been viewed with
- (A) indignation
 - (B) impatience
 - (C) pessimism
 - (D) indifference
 - (E) defiance
22. The author mentions “common currency” in line 26 primarily in order to emphasize the
- (A) lack of differentiation among nerve impulses in human beings
 - (B) similarity of the sensations that all human beings experience
 - (C) similarities in the views of scientists who have studied the human nervous system
 - (D) continuous passage of nerve impulses through the nervous system
 - (E) recurrent questioning by scientists of an accepted explanation about the nervous system
23. The description in lines 32-38 of an experiment in which electric stimuli were applied to different sensory fields of the cerebral cortex tends to support the theory that
- (A) the simple presence of different cortical areas cannot account for the diversity of mental experience
 - (B) variation in spatiotemporal patterning of nerve impulses correlates with variation in subjective experience
 - (C) nerve impulses are essentially homogeneous and are relatively unaffected as they travel through the nervous system
 - (D) the mental experiences produced by sensory nerve impulses are determined by the cortical area activated
 - (E) variation in neuron types affects the quality of nerve impulses
24. According to the passage, some evidence exists that the area of the cortex activated by a sensory stimulus determines which of the following?
- I. The nature of the nerve impulse
 - II. The modality of the sensory experience
 - III. Qualitative differences within a modality
- (A) II only
 - (B) III only
 - (C) I and II only

- (D) II and III only
(E) I, II and III
25. The passage can most accurately be described as a discussion concerning historical views of the
- (A) anatomy of the brain
 - (B) manner in which nerve impulses are conducted
 - (C) significance of different cortical areas in mental experience
 - (D) mechanics of sense perception
 - (E) physiological correlates of mental experience
26. Which of the following best summarizes the author's opinion of the suggestion that different areas of the brain determine perceptions produced by sensory nerve impulses?
- (A) It is a plausible explanation, but it has not been completely proved.
 - (B) It is the best explanation of brain processes currently available.
 - (C) It is disproved by the fact that the various areas of the brain are physiologically very similar.
 - (D) There is some evidence to support it, but it fails to explain the diversity of mental experience.
 - (E) There is experimental evidence that confirms its correctness.
27. It can be inferred from the passage that which of the following exhibit the LEAST qualitative variation?
- (A) Nerve cells
 - (B) Nerve impulses
 - (C) Cortical areas
 - (D) Spatial patterns of nerve impulses
 - (E) Temporal patterns of nerve impulses

SECTION 8

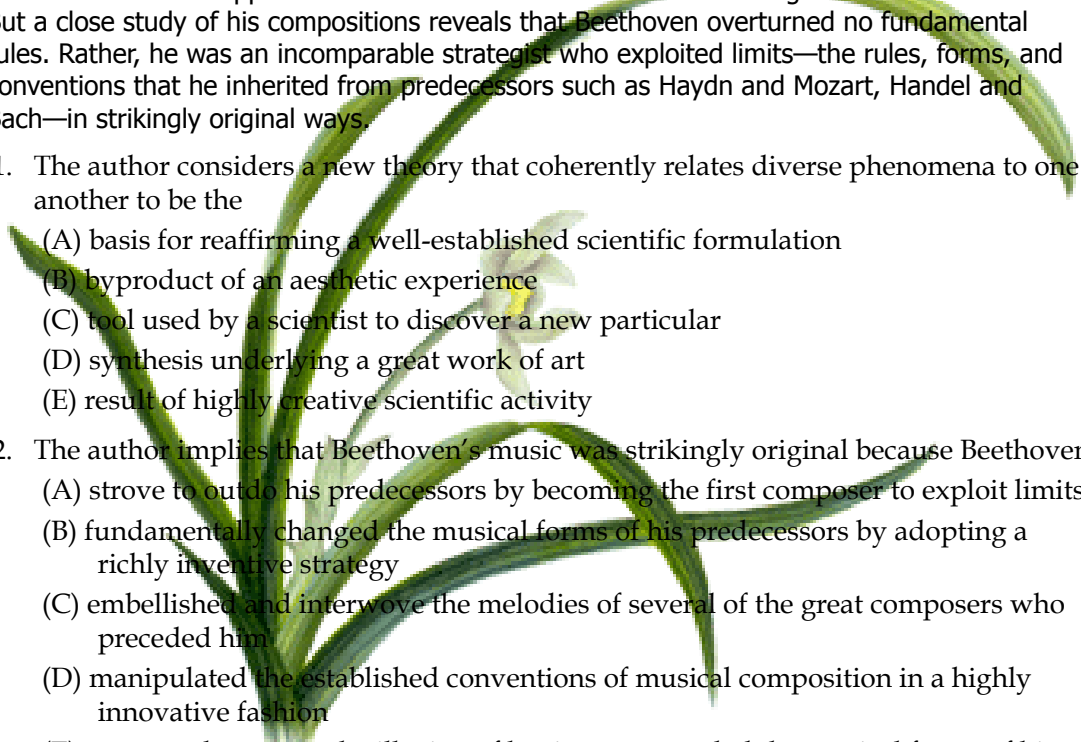
The transfer of heat and water vapor from the ocean to the air above it depends on disequilibrium at the interface of the water and the air. Within about a millimeter of the water, air temperature is close to that of the **surface water**, and the air is nearly saturated with water vapor. But the differences,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

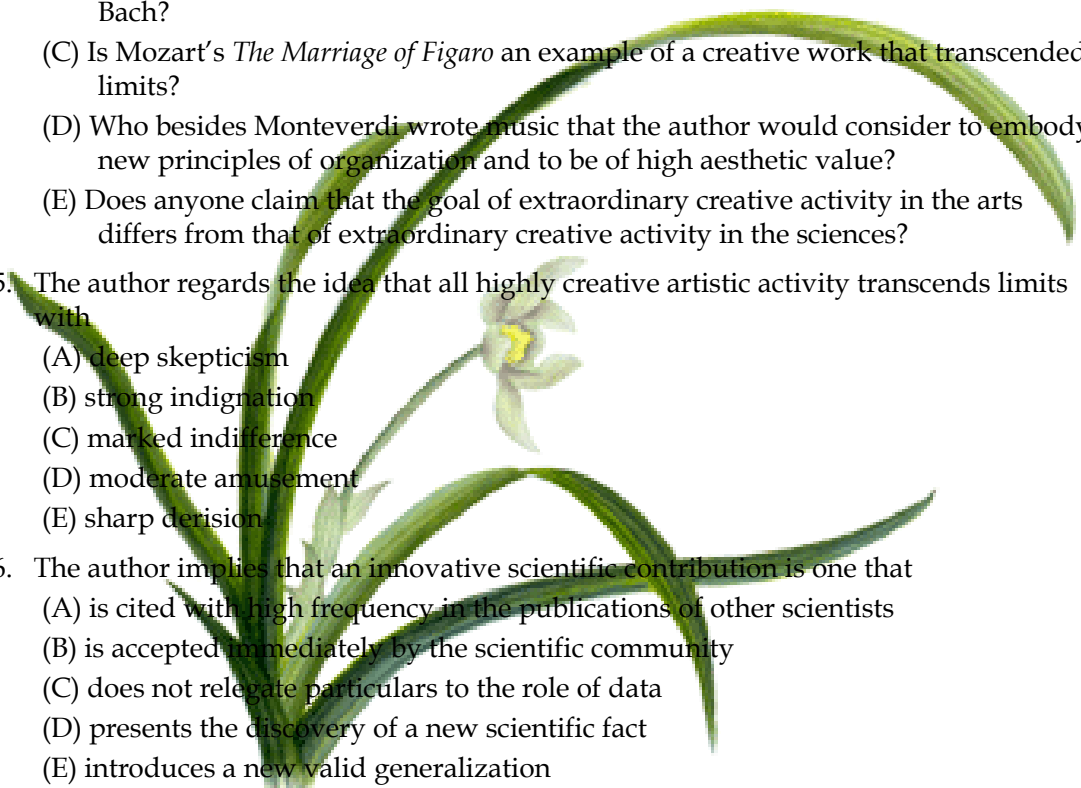
17. The primary purpose of the passage is to
- (A) resolve a controversy
 - (B) describe a phenomenon
 - (C) outline a theory
 - (D) confirm research findings
 - (E) classify various observations
18. According to the passage, wind over the ocean generally does which of the following?
- I. Causes relatively cool, dry air to come into proximity with the ocean surface.
 - II. Maintains a steady rate of heat and moisture transfer between the ocean and the air.
 - III. Causes frequent changes in the temperature of the water at the ocean's surface.
- (A) I only
 - (B) II only
 - (C) I and II only
 - (D) II and III only
 - (E) I, II, and III
19. It can be inferred from the passage that the author regards current knowledge about heat and moisture transfer from the ocean to air as
- (A) revolutionary
 - (B) inconsequential
 - (C) outdated
 - (D) derivative
 - (E) incomplete
20. The passage suggests that if on a certain day the wind were to decrease until there was no wind at all which of the following would occur?
- (A) The air closest to the ocean surface would become saturated with water vapor.
 - (B) The air closest to the ocean surface would be warmer than the water.
 - (C) The amount of moisture in the air closest to the ocean surface would decrease.
 - (D) The rate of heat and moisture transfer would increase.
 - (E) The air closest to the ocean would be at the same temperature as air higher up.

Extraordinary creative activity has been characterized as revolutionary, flying in the face of what is established and producing not what is acceptable but what will become accepted. According to this formulation, highly creative activity transcends the limits of an existing form and establishes a new principle of organization. However, the idea that extraordinary creativity transcends established limits is misleading when it is applied to the arts, even though it may be valid for the sciences. Differences between highly creative art and highly creative science arise in part from a difference in their goals. For the sciences, a new theory is the goal and end result of the creative act. Innovative science produces new propositions in terms of which diverse phenomena can be related to one another in more coherent ways. Such phenomena as a brilliant diamond or a nesting bird are relegated to the role of data, serving as the m

eans for formulating or testing a new theory. The goal of highly creative art is very different: the phenomenon itself becomes the direct product of the creative act. Shakespeare's *Hamlet* is not a tract about the behavior of indecisive princes or the uses of political power; nor is Picasso's painting *Guernica* primarily a propositional statement about the Spanish Civil War or the evils of fascism. What highly creative artistic activity produces is not a new generalization that transcends established limits, but rather an aesthetic particular. Aesthetic particulars produced by the highly creative artist extend or exploit, in an innovative way, the limits of an existing form, rather than transcend that form.

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

- 
21. The author considers a new theory that coherently relates diverse phenomena to one another to be the
- (A) basis for reaffirming a well-established scientific formulation
 - (B) byproduct of an aesthetic experience
 - (C) tool used by a scientist to discover a new particular
 - (D) synthesis underlying a great work of art
 - (E) result of highly creative scientific activity
22. The author implies that Beethoven's music was strikingly original because Beethoven
- (A) strove to outdo his predecessors by becoming the first composer to exploit limits
 - (B) fundamentally changed the musical forms of his predecessors by adopting a richly inventive strategy
 - (C) embellished and interwove the melodies of several of the great composers who preceded him
 - (D) manipulated the established conventions of musical composition in a highly innovative fashion
 - (E) attempted to create the illusion of having transcended the musical forms of his predecessors

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

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

No. 5-2

SECTION A

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

17. The author is primarily concerned with
- (A) explaining how the brain receives images
 - (B) synthesizing hypotheses of visual recognition
 - (C) examining the evidence supporting the serial recognition hypothesis
 - (D) discussing visual recognition and some hypotheses proposed to explain it
 - (E) reporting on recent experiments dealing with memory systems and their relationship to neural activity
18. According to the passage, Gestalt psychologists make which of the following suppositions about visual recognition?
- I. A retinal image is in exactly the same forms as its internal representation.
 - II. An object is recognized as a whole without any need for analysis into component parts.
 - III. The matching of an object with its internal representation occurs in only one step.
- (A) II only
 - (B) III only

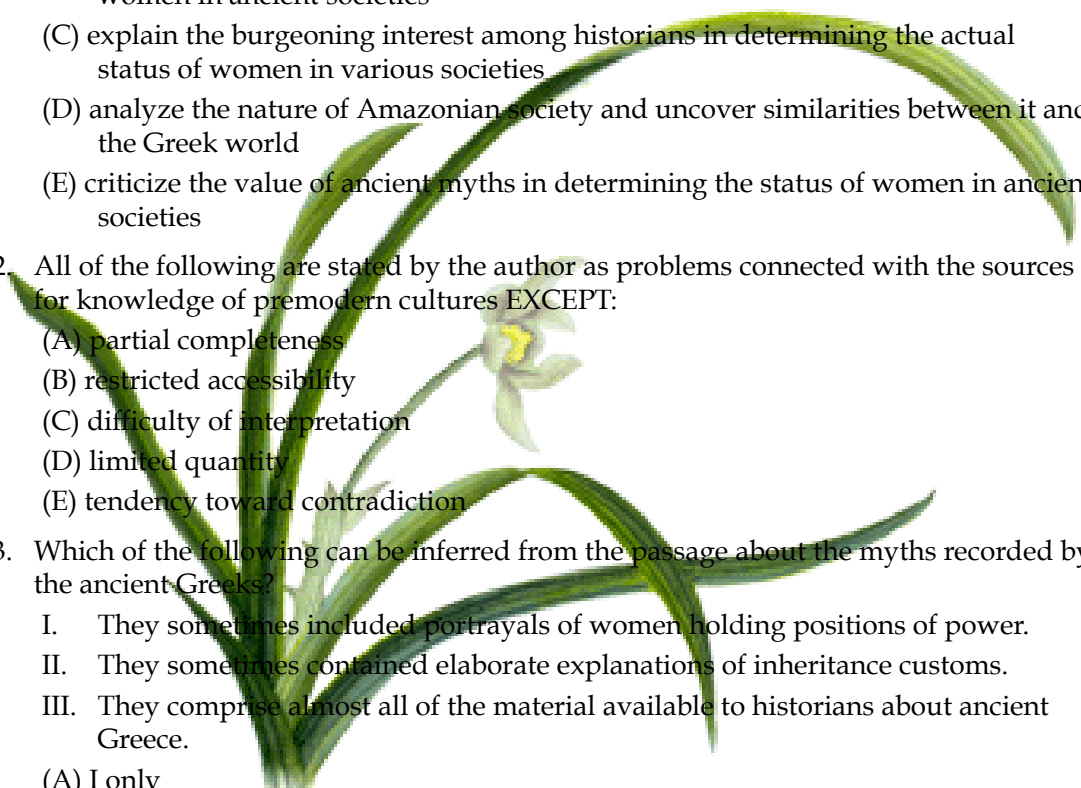
- (C) I and III only
 - (D) II and III only
 - (E) I, II, and III
19. It can be inferred from the passage that the matching process in visual recognition is
- (A) not a neural activity
 - (B) not possible when an object is viewed for the very first time
 - (C) not possible if a feature of a familiar object is changed in some way
 - (D) only possible when a retinal image is received in the brain as a unitary whole
 - (E) now fully understood as a combination of the serial and parallel processes
20. It terms of its tone and form, the passage can best be characterized as
- (A) a biased exposition
 - (B) a speculative study
 - (C) a dispassionate presentation
 - (D) an indignant denial
 - (E) a dogmatic explanation

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

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

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

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

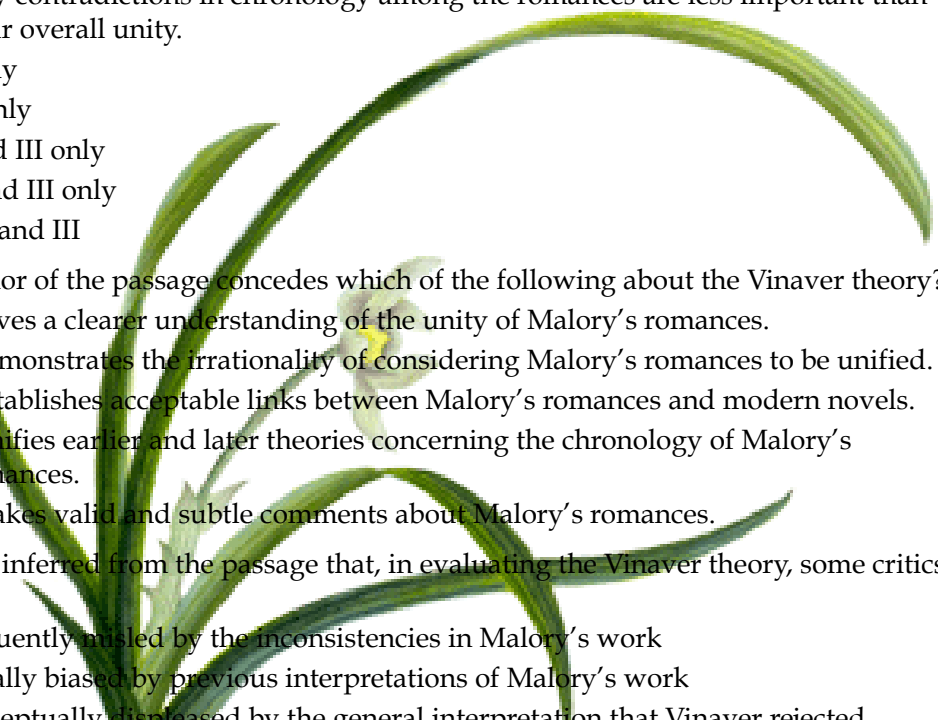
21. The primary purpose of the passage is to
- (A) compare competing new approaches to understanding the role of women in ancient societies
 - (B) investigate the ramifications of Bachofen's theory about the dominance of women in ancient societies
 - (C) explain the burgeoning interest among historians in determining the actual status of women in various societies
 - (D) analyze the nature of Amazonian society and uncover similarities between it and the Greek world
 - (E) criticize the value of ancient myths in determining the status of women in ancient societies
22. All of the following are stated by the author as problems connected with the sources for knowledge of premodern cultures EXCEPT:
- (A) partial completeness
 - (B) restricted accessibility
 - (C) difficulty of interpretation
 - (D) limited quantity
 - (E) tendency toward contradiction
23. Which of the following can be inferred from the passage about the myths recorded by the ancient Greeks?
- I. They sometimes included portrayals of women holding positions of power.
 - II. They sometimes contained elaborate explanations of inheritance customs.
 - III. They comprise almost all of the material available to historians about ancient Greece.
- (A) I only
 - (B) III only
 - (C) I and III only
 - (D) II and III only
- 

- (E) I, II, and III
24. Which of the following is presented in the passage as evidence supporting the author's view of the ancient Greeks' descriptions of the Amazons?
- (A) The requirement that Sauromatae women kill in battle before marrying
 - (B) The failure of historians to verify that women were ever governors of ancient societies
 - (C) The classing of Amazons with giants and centaurs
 - (D) The well-established unreliability of Herodotus as a source of information about ancient societies
 - (E) The recent discovery of ancient societies with matrilineal customs
25. It can be inferred from the passage that the probable reactions of many males in ancient Greece to the idea of a society ruled by women could best be characterized as
- (A) confused and dismayed
 - (B) wary and hostile
 - (C) cynical and disinterested
 - (D) curious but fearful
 - (E) excited but anxious
26. The author suggests that the main reason for the persisting influence of Bachofen's work is that
- (A) feminists have shown little interest in ancient societies
 - (B) Bachofen's knowledge of Amazonian culture is unparalleled
 - (C) reliable information about the ancient world is difficult to acquire
 - (D) ancient societies show the best evidence of women in positions of power
 - (E) historians have been primarily interested in the modern period
27. The author's attitude toward Bachofen's treatise is best described as one of
- (A) qualified approval
 - (B) profound ambivalence
 - (C) studied neutrality
 - (D) pointed disagreement
 - (E) unmitigated hostility

SECTION B

Initially the Vinaver theory that Malory's eight romances, once thought to be fundamentally unified, were in fact eight independent works produced both a sense of relief and an unpleasant shock. Vinaver's theory comfortably explained away the apparent contradictions of chronology and made each romance independently satisfying. It was, however, disagreeable to find that what had been thought of as one book was now eight books. Part of this response was the natural reaction to the disturbance of set ideas. Nevertheless, even now, after lengthy consideration of the theory's refined but legitimate observations, one cannot avoid the conclusion that the eight romances are only one work. It is not quite a matter of disagreeing with the theory of independence

, but of rejecting its implications: that the romances may be taken in any or no particular order, that they have no cumulative effect, and that they are as separate as the works of a modern novelist.

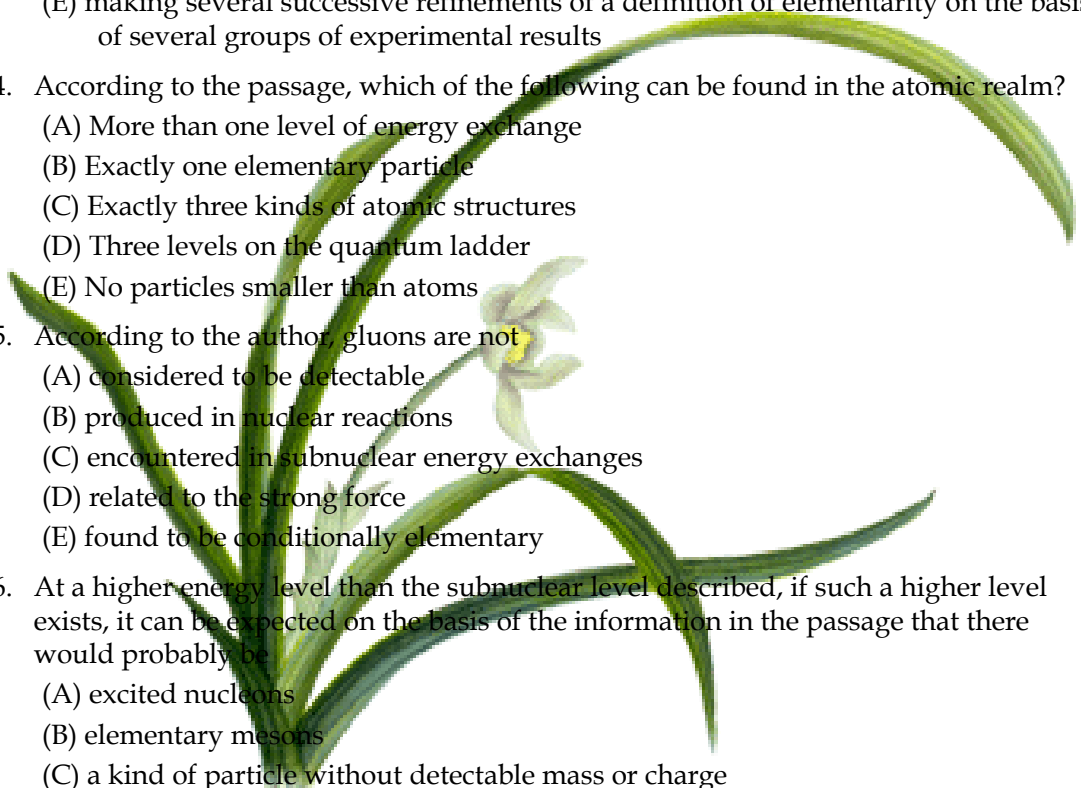
17. The primary purpose of the passage is to
- (A) discuss the validity of a hypothesis
 - (B) summarize a system of general principles
 - (C) propose guidelines for future argument
 - (D) stipulate conditions for acceptance of an interpretation
 - (E) deny accusations about an apparent contradiction
18. It can be inferred from the passage that the author believes which of the following about Malory's works?
- I. There are meaningful links between and among the romances.
 - II. The subtleties of the romances are obscured when they are taken as one work.
 - III. Any contradictions in chronology among the romances are less important than their overall unity.
- (A) I only
 - (B) III only
 - (C) I and III only
 - (D) II and III only
 - (E) I, II, and III
19. The author of the passage concedes which of the following about the Vinaver theory?
- (A) It gives a clearer understanding of the unity of Malory's romances.
 - (B) It demonstrates the irrationality of considering Malory's romances to be unified.
 - (C) It establishes acceptable links between Malory's romances and modern novels.
 - (D) It unifies earlier and later theories concerning the chronology of Malory's romances.
 - (E) It makes valid and subtle comments about Malory's romances.
20. It can be inferred from the passage that, in evaluating the Vinaver theory, some critics were
- (A) frequently misled by the inconsistencies in Malory's work
 - (B) initially biased by previous interpretations of Malory's work
 - (C) conceptually displeased by the general interpretation that Vinaver rejected
 - (D) generally in agreement with Vinaver's comparisons between Malory and modern novelists
 - (E) originally skeptical about Vinaver's early conclusions with respect to modern novels
- 

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

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

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

21. The primary topic of the passage is which of the following?
- (A) The interaction of the realms on the quantum ladder
 - (B) Atomic structures found on Earth, on other planets, and on the surfaces of stars
 - (C) Levels of energy that are released in nuclear reactions on Earth and in stars
 - (D) Particles and processes found in the atomic, nuclear, and subnuclear realms
 - (E) New types of particles occurring in the atomic realm
22. According to the passage, radioactivity that occurs naturally on Earth is the result of
- (A) the production of particles that have no detectable mass or electric charge
 - (B) high energy exchanges on the nuclear level that occurred in an ancient explosion in a star

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

27. The passage speaks of particles as having conditional elementarity if they
- (A) remain unchanged at given level of energy exchange
 - (B) cannot be decomposed into smaller constituents
 - (C) are mathematically simpler than some other set of particles
 - (D) release energy at a low level in collisions
 - (E) belong to the nuclear level on the quantum ladder

No. 5-3

SECTION A

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

17. The passage suggests that which of the following would most likely have occurred if linear perspective and anatomy had not come to influence artistic endeavor?
- (A) The craftsmanship that shaped Gothic architecture would have continued to dominate artists' outlooks.
 - (B) Some other technical elements would have been adopted to discipline artistic inspiration.
 - (C) Intellectual control over artistic inspiration would not have influenced painting as it did architecture.
 - (D) The role of intuitive inspiration would not have remained fundamental to theories of artistic creation.
 - (E) The assumptions of aesthetic philosophers before Croce would have been invalidated.
18. The passage supplies information for answering which of the following questions?
- (A) Does Romantic art exhibit the triumph of intuition over intellect?
 - (B) Did an emphasis on linear perspective and anatomy dominate Romantic art?
 - (C) Are the intellectual and intuitive faculties harmoniously balanced in post-Romantic art?
 - (D) Are the effects of the rational control of artistic inspiration evident in the great works

of pre-Romantic eras?

(E) Was the artistic craftsmanship displayed in Gothic cathedrals also an element in paintings of this period?

19. The passage implies that which of the following was a traditional assumption of aesthetic philosophers?
- (A) Intellectual elements in art exert a necessary control over artistic inspiration.
 - (B) Architecture has never again reached the artistic greatness of the Gothic cathedrals.
 - (C) Aesthetic philosophy is determined by the technical necessities of art.
 - (D) Artistic craftsmanship is more important in architectural art than in pictorial art.
 - (E) Paintings lacked the intellectual element before the invention of linear perspective and anatomy.
20. The author mentions "linear perspective and anatomy" in the last sentence in order to do which of the following?
- (A) Expand his argument to include painting as well as architecture
 - (B) Indicate his disagreement with Croce's theory of the origins of art
 - (C) Support his point that rational order of some kind has often seemed to discipline artistic inspiration
 - (D) Explain the rational elements in Gothic painting that corresponded to craftsmanship in Gothic architecture
 - (E) Show the increasing sophistication of artists after the Gothic period

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

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

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

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

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

21. The author discusses computing machines in the first paragraph primarily in order to do which of the following?
- (A) Indicate the dangers inherent in relying to a great extent on machines
 - (B) Illustrate his views about the approach of mathematicians to problem solving
 - (C) Compare the work of mathematicians with that of computer programmers
 - (D) Provide one definition of intelligence
 - (E) Emphasize the importance of computers in modern technological society
22. According to the passage, scientists are skeptical toward their equations because scientists
- (A) work to explain real, rather than theoretical or simplified, situations
 - (B) know that well-defined problems are often the most difficult to solve
 - (C) are unable to express their data in terms of multiple variables
 - (D) are unwilling to relax the axioms they have developed
 - (E) are unable to accept mathematical explanations of natural phenomena
23. It can be inferred from the passage that scientists make which of the following assumptions about scientific arguments?
- (A) The literal truth of the arguments can be made clear only in a mathematical context.
 - (B) The arguments necessarily ignore the central question of scientific investigation.
 - (C) The arguments probably will be convincing only to other scientists.
 - (D) The conclusions of the arguments do not necessarily follow from their premises.
 - (E) The premises on which the arguments are based may change.
24. According to the passage, mathematicians present a danger to scientists for which of the following reasons?

- (A) Mathematicians may provide theories that are incompatible with those already developed by scientists.
 - (B) Mathematicians may define situation in a way that is incomprehensible to scientists.
 - (C) Mathematicians may convince scientists that theoretical assumptions are facts.
 - (D) Scientists may come to believe that axiomatic statements are untrue.
 - (E) Scientists may begin to provide arguments that are convincing but imprecise.
25. The author suggests that the approach of physicists to solving scientific problems is which of the following?
- (A) Practical for scientific purposes
 - (B) Detrimental to scientific progress
 - (C) Unimportant in most situations
 - (D) Expedient, but of little long-term value
 - (E) Effective, but rarely recognized as such
26. The author suggests that a mathematician asked to solve a problem in an ill-defined situation would first attempt to do which of the following?
- (A) Identify an analogous situation
 - (B) Simplify and define the situation
 - (C) Vary the underlying assumptions of a description of the situation
 - (D) Determine what use would be made of the solution provided
 - (E) Evaluate the theoretical assumptions that might explain the situation
27. The author implies that scientists develop a healthy skepticism because they are aware that
- (A) mathematicians are better able to solve problems than are scientists
 - (B) changes in axiomatic propositions will inevitably undermine scientific arguments
 - (C) well-defined situations are necessary for the design of reliable experiments
 - (D) mathematical solutions can rarely be applied to real problems
 - (E) some factors in most situations must remain unknown

SECTION B

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

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

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

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

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

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

- (E) An association of moral reformers
23. To an assertion that Bluestockings were feminists, the author would most probably respond with which of the following?
- (A) Admitted uncertainty
 - (B) Qualified disagreement
 - (C) Unquestioning approval
 - (D) Complete indifference
 - (E) Strong disparagement
24. Which of the following titles best describes the content of the passage?
- (A) Eighteenth-Century Egalitarianism
 - (B) Feminists of the Eighteenth Century
 - (C) Eighteenth-Century Precursors of Feminism
 - (D) Intellectual Life in the Eighteenth Century
 - (E) Female Education Reform in the Eighteenth Century

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

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

- (B) Unqualified enthusiasm
 - (C) Objective indifference
 - (D) Resignation
 - (E) Dissatisfaction
27. In discussing insect and vertebrate societies, the author suggests which of the following?
- (A) A distinguishing characteristic of most insect and vertebrate societies is a well-marked division of labor.
 - (B) The caste structure of insect societies is similar to that of vertebrate societies.
 - (C) Most insect and vertebrate societies form cooperative groups in order to occupy territory.
 - (D) The means of communication among members of insect societies is similar to that among members of vertebrate societies.
 - (E) There are significant structural differences between insect and vertebrate societies.

No. 6-1

SECTION A

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

17. The main idea of the passage is that
- (A) migration over land requires a simpler explanation than migration over water does
 - (B) the means by which animals migrate over water are complex and only partly understood
 - (C) the ability of migrant animals to keep track of time is related to their magnetic sense
 - (D) knowledge of geographic location is essential to migrants with little or no compass sense

- (E) explanations of how animals migrate tend to replace, rather than build on, one another
18. It can be inferred from the passage that if the flock of birds described in lines 8-12 were navigating by compass sense alone, they would, after the storm, fly
- (A) east
 - (B) north
 - (C) northwest
 - (D) south
 - (E) southeast
19. In maintaining that migrating animals would need “a fantastic map sense” (line 17) to determine their geographic position by celestial navigation, the author intends to express
- (A) admiration for the ability of the migrants
 - (B) skepticism about celestial navigation as an explanation
 - (C) certainly that the phenomenon of migration will remain mysterious
 - (D) interest in a new method of accounting for over-water migration
 - (E) surprise that animals apparently navigate in much the same way that human beings do
20. Of the following descriptions of migrating animals, which most strongly suggests that the animals are depending on magnetic cues to orient themselves?
- (A) Pigeons can properly readjust their course even when flying long distances through exceedingly dense fogs.
 - (B) Bison are able to reach their destination by passing through a landscape that has been partially altered by a recent fire.
 - (C) Elephants are able to find grounds that some members of the herd have never seen before.
 - (D) Swallows are able to return to a given spot at the same time every year.
 - (E) Monarch butterflies coming from different parts of North America are able to arrive at the same location each winter.

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

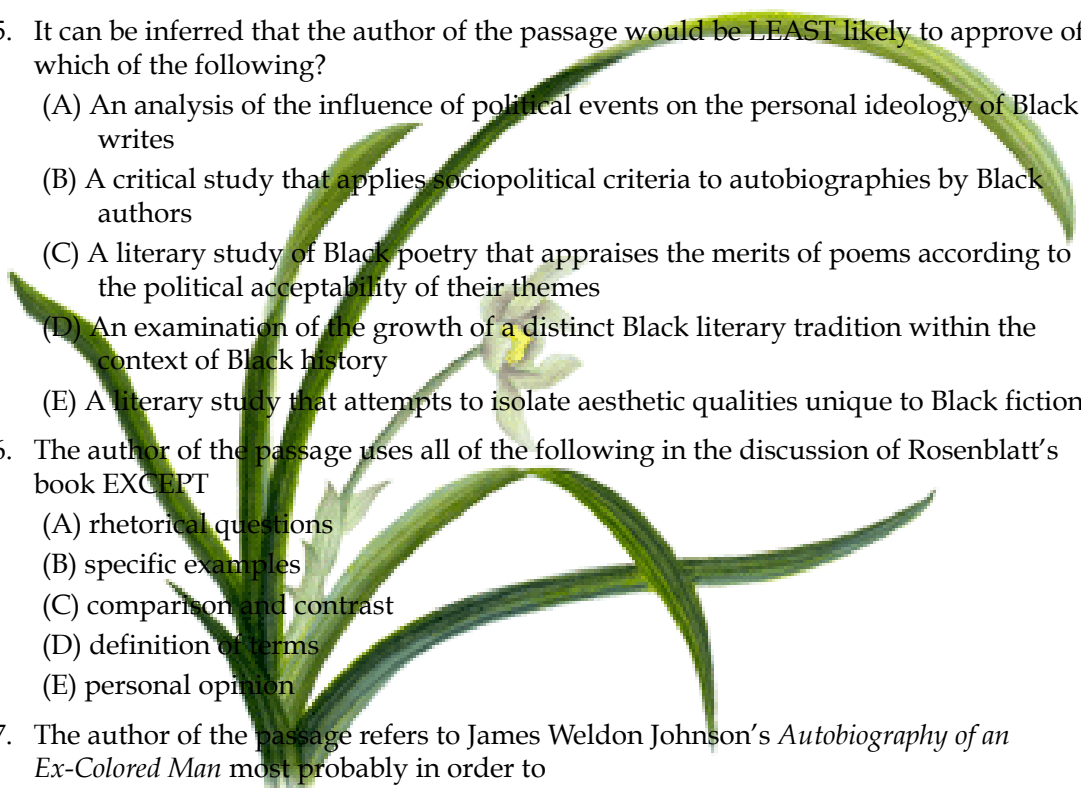
Although fiction assuredly springs from political circumstances, its authors react to those circumstances in ways other than ideological, and talking about novels and stories primarily as instruments of ideology circumvents much of the fictional enterprise. Rosenblatt's literary analysis discloses affinities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

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

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

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

21. The author of the passage objects to criticism of Black fiction like that by Addison Gayle because it
- (A) emphasizes purely literary aspects of such fiction
 - (B) misinterprets the ideological content of such fiction
 - (C) misunderstands the notions of Black identity contained in such fiction
 - (D) substitutes political for literary criteria in evaluating such fiction
 - (E) ignores the interplay between Black history and Black identity displayed in such fiction
22. The author of the passage is primarily concerned with
- (A) evaluating the soundness of a work of criticism
 - (B) comparing various critical approaches to a subject
 - (C) discussing the limitations of a particular kind of criticism
 - (D) summarizing the major points made in a work of criticism
 - (E) explaining the theoretical background of a certain kind of criticism
23. The author of the passage believes that *Black Fiction* would have been improved had Rosenblatt

- 
- (A) evaluated more carefully the ideological and historical aspects of Black fiction
- (B) attempted to be more objective in his approach to novels and stories by Black authors
- (C) explored in greater detail the recurrent thematic concerns of Black fiction throughout its history
- (D) established a basis for placing Black fiction within its own unique literary tradition
- (E) assessed the relative literary merit of the novels he analyzes thematically
24. The author's discussion of *Black Fiction* can be best described as
- (A) pedantic and contentious
- (B) critical but admiring
- (C) ironic and deprecating
- (D) argumentative but unfocused
- (E) stilted and insincere
25. It can be inferred that the author of the passage would be LEAST likely to approve of which of the following?
- (A) An analysis of the influence of political events on the personal ideology of Black writers
- (B) A critical study that applies sociopolitical criteria to autobiographies by Black authors
- (C) A literary study of Black poetry that appraises the merits of poems according to the political acceptability of their themes
- (D) An examination of the growth of a distinct Black literary tradition within the context of Black history
- (E) A literary study that attempts to isolate aesthetic qualities unique to Black fiction
26. The author of the passage uses all of the following in the discussion of Rosenblatt's book EXCEPT
- (A) rhetorical questions
- (B) specific examples
- (C) comparison and contrast
- (D) definition of terms
- (E) personal opinion
27. The author of the passage refers to James Weldon Johnson's *Autobiography of an Ex-Colored Man* most probably in order to
- (A) point out affinities between Rosenblatt's method of thematic analysis and earlier criticism
- (B) clarify the point about expressionistic style made earlier in the passage

- (C) qualify the assessment of Rosenblatt's book made in the first paragraph of the passage
- (D) illustrate the affinities among Black novels disclosed by Rosenblatt's literary analysis
- (E) give a specific example of one of the accomplishments of Rosenblatt's work

SECTION 8

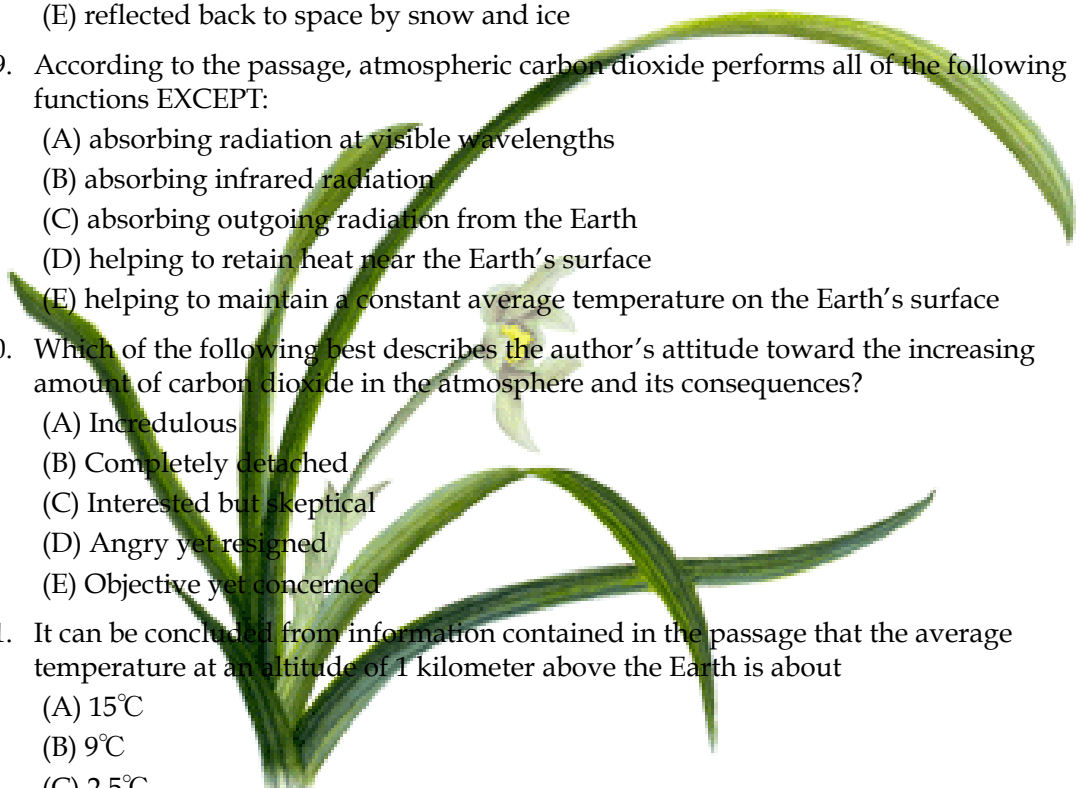
The molecules of carbon dioxide in the Earth's atmosphere affect the heat balance of the Earth by acting as a one-way screen. Although these molecules allow radiation at visible wavelengths, where most of the energy of sunlight is concentrated, to pass through, they absorb some of the longer-wavelength,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

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

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

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

17. The primary purpose of the passage is to

- 
- (A) warn of the dangers of continued burning of fossil fuels
(B) discuss the significance of increasing the amount of carbon dioxide in the atmosphere
(C) explain how a constant temperature is maintained on the Earth's surface
(D) describe the ways in which various atmospheric and climatic conditions contribute to the Earth's weather
(E) demonstrate the usefulness of mathematical models in predicting long-range climatic change
18. According to the passage, the greatest part of the solar energy that reaches the Earth is
- (A) concentrated in the infrared spectrum
(B) concentrated at visible wavelengths
(C) absorbed by carbon dioxide molecules
(D) absorbed by atmospheric water vapor
(E) reflected back to space by snow and ice
19. According to the passage, atmospheric carbon dioxide performs all of the following functions EXCEPT:
- (A) absorbing radiation at visible wavelengths
(B) absorbing infrared radiation
(C) absorbing outgoing radiation from the Earth
(D) helping to retain heat near the Earth's surface
(E) helping to maintain a constant average temperature on the Earth's surface
20. Which of the following best describes the author's attitude toward the increasing amount of carbon dioxide in the atmosphere and its consequences?
- (A) Incredulous
(B) Completely detached
(C) Interested but skeptical
(D) Angry yet resigned
(E) Objective yet concerned
21. It can be concluded from information contained in the passage that the average temperature at an altitude of 1 kilometer above the Earth is about
- (A) 15°C
(B) 9°C
(C) 2.5°C
(D) -12°C
(E) -18°C
22. It can be inferred from the passage that the construction of the mathematical model mentioned in the passage involved the formulation of which of the following?

- (A) An assumption that the amount of carbon dioxide added to the atmosphere would in reality steadily increase
- (B) An assumption that human activities are the only agencies by which carbon dioxide is added to the atmosphere
- (C) Assumptions about the social and political consequences of any curtailment of the use of fossil fuels
- (D) Assumptions about the physical conditions that are likely to prevail during the period for which the model was made
- (E) Assumptions about the differential behavior of carbon dioxide molecules at the various levels of temperature calculated in the model

23. According to the passage, which of the following is true of the last hundred years?

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

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

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

24. The primary purpose of the passage is to present

- (A) a position on the foundations of human behavior and on what those foundations imply
- (B) a theory outlining the parallel development of human morphology and of human behavior
- (C) a diagnostic test for separating biologically determined behavior patterns from culture-specific detail
- (D) a practical method for resisting the pressures of biologically determined drives
- (E) an overview of those human emotions and motives that impose constraints on human behavior

25. The author implies that control to any extent over the “frailties” that constrain our behavior is thought to presuppose
- (A) that those frailties are recognized as currently beneficial and adaptive
 - (B) that there is little or no overlay of cultural detail that masks their true nature
 - (C) that there are cultures in which those frailties do not “come naturally” and from which such control can be learned
 - (D) a full understanding of why those frailties evolved and of how they function now
 - (E) a thorough grasp of the principle that cultural detail in human behavior can differ arbitrarily from society to society
26. Which of the following most probably provides an appropriate analogy from human morphology for the “details” versus “constraints” distinction made in the passage in relation to human behavior?
- (A) The ability of most people to see all the colors of the visible spectrum as against most people’s inability to name any but the primary colors
 - (B) The ability of even the least fortunate people to show compassion as against people’s inability to mask their feelings completely
 - (C) The ability of some people to dive to great depths as against most people’s inability to swim long distances
 - (D) The psychological profile of those people who are able to delay gratification as against people’s inability to control their lives completely
 - (E) The greater lung capacity of mountain peoples that helps them live in oxygen-poor air as against people’s inability to fly without special apparatus
27. It can be inferred that in his discussion of maladaptive frailties the author assumes that
- (A) evolution does not favor the emergence of adaptive characteristics over the emergence of maladaptive ones
 - (B) any structure or behavior not positively adaptive is regarded as transitory in evolutionary theory
 - (C) maladaptive characteristics, once fixed, make the emergence of other maladaptive characteristics more likely
 - (D) the designation of a characteristic as being maladaptive must always remain highly tentative
 - (E) changes in the total human environment can outpace evolutionary change

No. 6-2

SECTION A

Whether the languages of the ancient American peoples were used for expressing abstract universal concepts can be clearly answered in the case of Nahuatl. Nahu

atl, like Greek and German, is a language that allows the formation of extensive compounds. By the combination of radicals or semantic elements, single compound words can express complex conceptual relations, often of an abstract universal character.

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

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

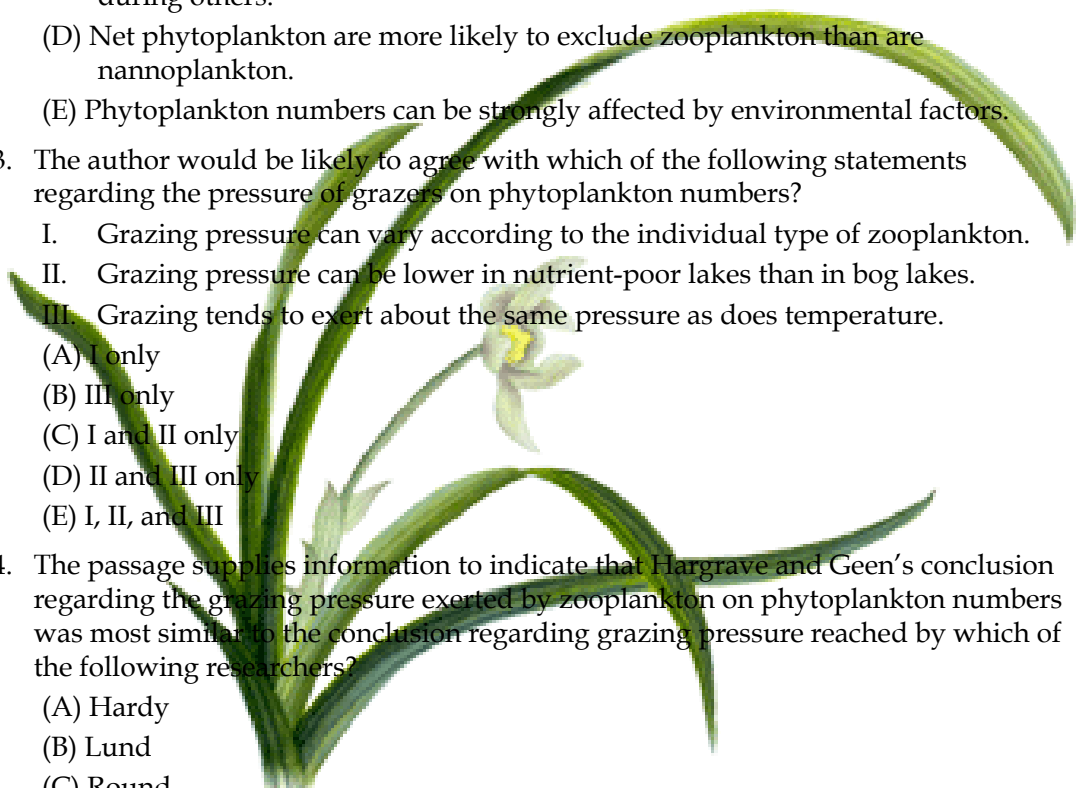
Many theories have been formulated to explain the role of grazers such as zooplankton in controlling the amount of planktonic algae (phytoplankton) in lakes. The first theories of such grazer control were merely based on observations of negative correlations between algal and zooplankton numbers. A low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

f algal defenses against grazing.

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

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

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

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

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

SECTION B

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

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

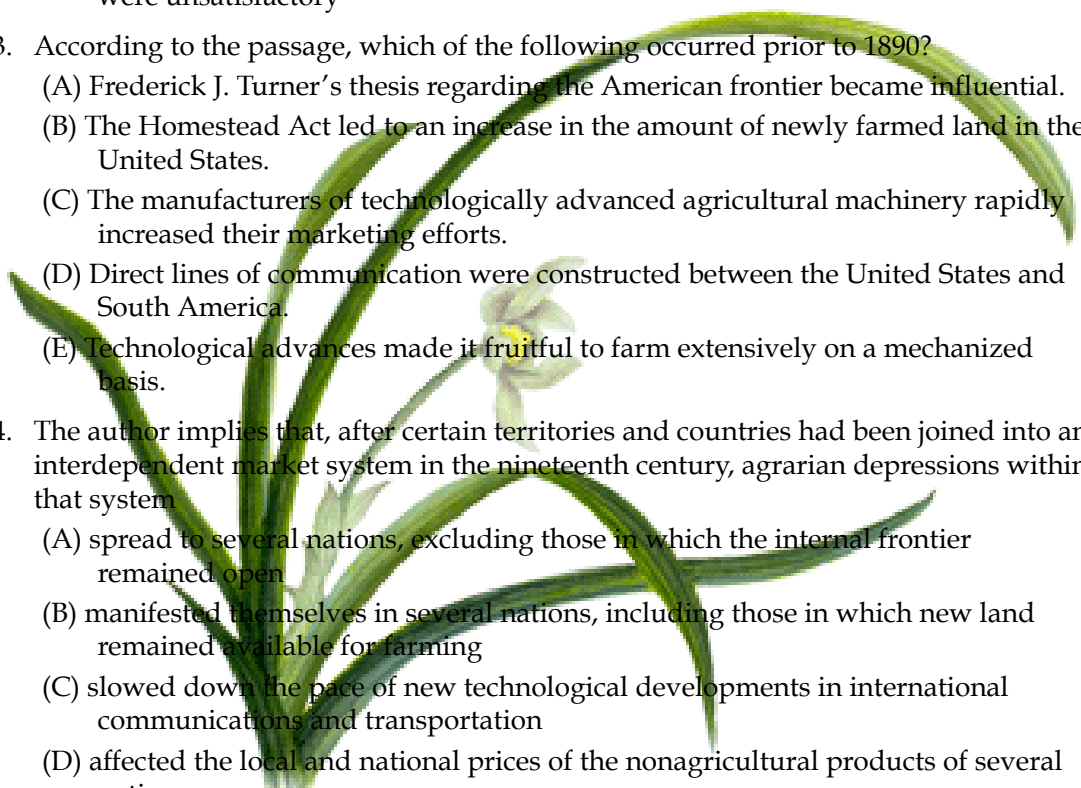
17. The author’s primary purpose is most probably to
- (A) present a hypothesis
 - (B) refute an argument
 - (C) correct a misconception
 - (D) predict an occurrence
 - (E) describe an enigma
18. It can be inferred that which of the following is most likely to be the subject of study by a geohydrologist?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

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

relatively barren lands.

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

20. The author is primarily concerned with
- (A) showing that a certain interpretation is better supported by the evidence than is an alternative explanation
 - (B) developing an alternative interpretation by using sources of evidence that formerly had been unavailable
 - (C) questioning the accuracy of the evidence that most scholars have used to counter the author's own interpretation
 - (D) reviewing the evidence that formerly had been thought to obscure a valid interpretation
 - (E) presenting evidence in support of a controversial version of an earlier interpretation
21. According to the author, changes in the conditions of international trade resulted in an
- (A) underestimation of the amount of new land that was being farmed in the United States
 - (B) underutilization of relatively small but rich plots of land
 - (C) overexpansion of the world transportation network for shipping agricultural products

- (D) extension of agrarian depressions beyond national boundaries
- (E) emphasis on the importance of market forces in determining the prices of agricultural products
22. The author implies that the change in the state of the American farmer's morale during the latter part of the nineteenth century was traceable to the American farmer's increasing perception that the
- (A) costs of cultivating the land were prohibitive within the United States
- (B) development of the first transcontinental railroad in the United States occurred at the expense of the American farmer
- (C) American farming system was about to run out of the new farmland that was required for its expansion
- (D) prices of American agricultural products were deteriorating especially rapidly on domestic markets
- (E) proceeds from the sales of American agricultural products on foreign markets were unsatisfactory
23. According to the passage, which of the following occurred prior to 1890?
- (A) Frederick J. Turner's thesis regarding the American frontier became influential.
- (B) The Homestead Act led to an increase in the amount of newly farmed land in the United States.
- (C) The manufacturers of technologically advanced agricultural machinery rapidly increased their marketing efforts.
- (D) Direct lines of communication were constructed between the United States and South America.
- (E) Technological advances made it fruitful to farm extensively on a mechanized basis.
24. The author implies that, after certain territories and countries had been joined into an interdependent market system in the nineteenth century, agrarian depressions within that system
- (A) spread to several nations, excluding those in which the internal frontier remained open
- (B) manifested themselves in several nations, including those in which new land remained available for farming
- (C) slowed down the pace of new technological developments in international communications and transportation
- (D) affected the local and national prices of the nonagricultural products of several nations
- (E) encouraged several nations to sell more of their agricultural products on foreign markets
25. The author provides information concerning newly farmed lands in the United States (lines 11-27) as evidence in direct support of which of the following?
- 

- (A) A proposal by Frederick J. Turner that was later disputed by John D. Hicks
 - (B) An elaboration by John D. Hicks of a thesis that formerly had been questioned by Frederick J. Turner
 - (C) The established view that was disputed by those scholars who adopted the thesis of Frederick J. Turner
 - (D) The thesis that important changes occurred in the nature of international trade during the second half of the nineteenth century
 - (E) The view that the American frontier did not become closed during the nineteenth century or soon thereafter
26. The author implies that the cause of the agrarian discontent was
- (A) masked by the vagueness of the official records on newly settled farms
 - (B) overshadowed by disputes on the reliability of the existing historical evidence
 - (C) misidentified as a result of influential but erroneous theorizing
 - (D) overlooked because of a preoccupation with market conditions
 - (E) undetected because visible indications of the cause occurred so gradually and sporadically
27. The author's argument implies that, compared to the yearly price changes that actually occurred on foreign agricultural markets during the 1880's, American farmers would have most preferred yearly price changes that were
- (A) much smaller and in the same direction
 - (B) much smaller but in the opposite direction
 - (C) slightly smaller and in the same direction
 - (D) similar in size but in the opposite direction
 - (E) slightly greater and in the same direction

No. 6-3

SECTION A

The use of heat pumps has been held back largely by skepticism about advertisers' claims that heat pumps can provide as many as two units of thermal energy for each unit of electrical energy used, thus apparently contradicting the principle of **energy conservation**.

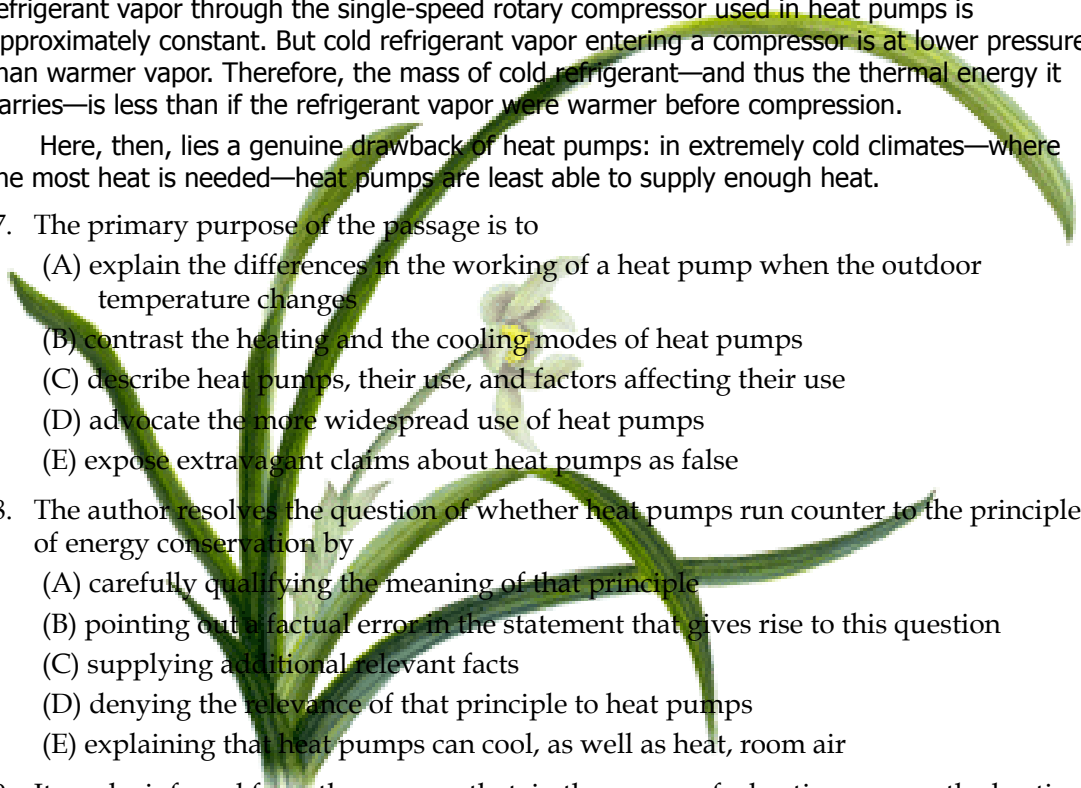
Heat pumps circulate a fluid refrigerant that cycles alternatively from its liquid phase to its vapor phase in a **closed loop**. The refrigerant, starting as a low-temperature, low-pressure vapor, enters a compressor driven by an electric motor. The refrigerant leaves the compressor as a hot, dense vapor and flows through a heat exchanger called the condenser, which transfers heat from the refrigerant to a body of air. Now the refrigerant, as a high-pressure, cooled liquid, confronts a flow restriction which causes the pressure to drop. As the pressure falls, the refrigerant expands and partially vaporizes, becoming chilled. I

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

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

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

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

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17. The primary purpose of the passage is to
- (A) explain the differences in the working of a heat pump when the outdoor temperature changes
 - (B) contrast the heating and the cooling modes of heat pumps
 - (C) describe heat pumps, their use, and factors affecting their use
 - (D) advocate the more widespread use of heat pumps
 - (E) expose extravagant claims about heat pumps as false
18. The author resolves the question of whether heat pumps run counter to the principle of energy conservation by
- (A) carefully qualifying the meaning of that principle
 - (B) pointing out a factual error in the statement that gives rise to this question
 - (C) supplying additional relevant facts
 - (D) denying the relevance of that principle to heat pumps
 - (E) explaining that heat pumps can cool, as well as heat, room air
19. It can be inferred from the passage that, in the course of a heating season, the heating capacity of a heat pump is greatest when
- (A) heating is least essential
 - (B) electricity rates are lowest

- (C) its compressor runs the fastest
(D) outdoor temperatures hold steady
(E) the heating demand surges
20. If the author's assessment of the use of heat pumps (lines 1-6) is correct, which of the following best expresses the lesson that advertisers should learn from this case?
- (A) Do not make exaggerated claims about the products you are trying to promote.
(B) Focus your advertising campaign on vague analogies and veiled implications instead of on facts.
(C) Do not use facts in your advertising that will strain the prospective client's ability to believe.
(D) Do not assume in your advertising that the prospective clients know even the most elementary scientific principles.
(E) Concentrate your advertising firmly on financially relevant issues such as price discounts and efficiency of operation.
21. The passage suggests that heat pumps would be used more widely if
- (A) they could also be used as air conditioners
(B) they could be moved around to supply heat where it is most needed
(C) their heat output could be thermostatically controlled
(D) models with truly superior cooling capacity were advertised more effectively
(E) people appreciated the role of the evaporator in the energy equation
22. According to the passage, the role of the flow restriction (lines 16-17) in a heat pump is to
- (A) measure accurately the flow rate of the refrigerant mass at that point
(B) compress and heat the refrigerant vapor
(C) bring about the evaporation and cooling of refrigerant
(D) exchange heat between the refrigerant and the air at that point
(E) reverse the direction of refrigerant flow when needed
23. The author regards the notion that heat pumps have a genuine drawback as a
- (A) cause for regret
(B) sign of premature defeatism
(C) welcome challenge
(D) case of sloppy thinking
(E) focus for an educational campaign

All of Francoise Duparc's surviving paintings blend portraiture and genre. Her subjects appear to be acquaintances whom she has asked to pose; she has captured both their self-consciousness and the spontaneity of their everyday activities, the depiction of which characterizes genre painting. But genre painting, especially when it portrayed members of the humblest classes, was never popular in eighteenth-century France. The Le Nain brothers and Georges de La Tour, who also chose such themes, were largely ignored. Their present high standing is due to a different, more d

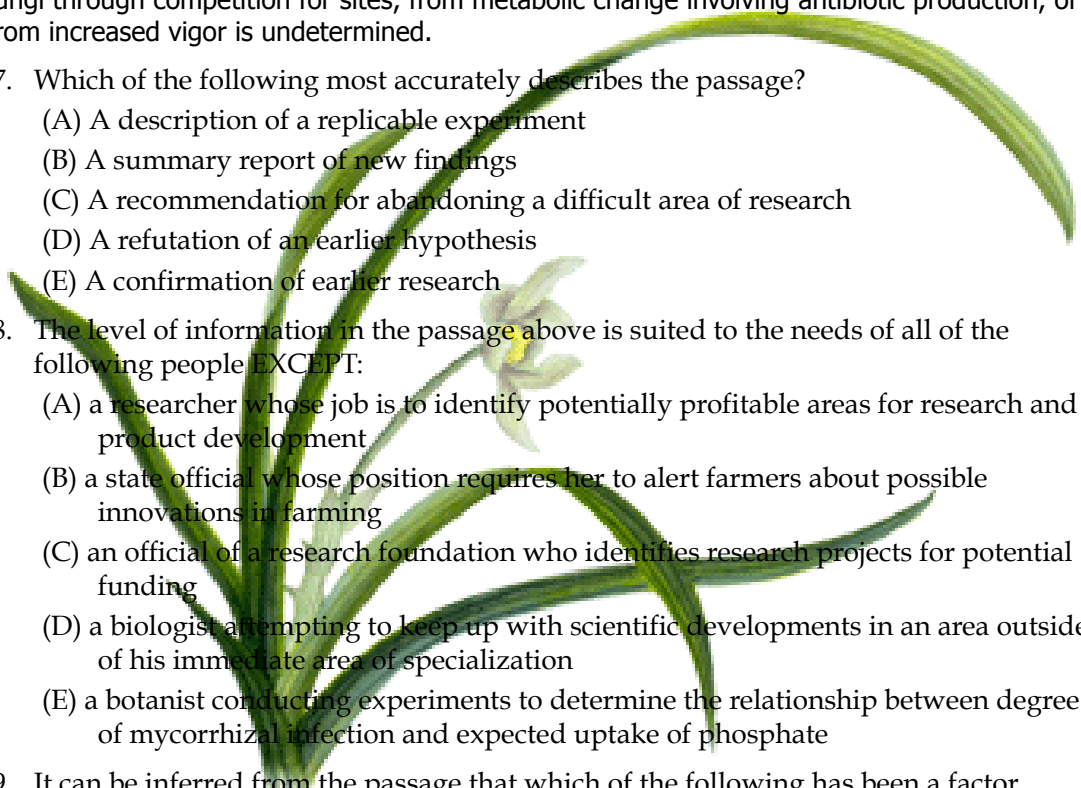
emocratic political climate and to different aesthetic values: we no longer require artists to provide ideal images of humanity for our moral edification but rather regard such idealization as a falsification of the truth. Duparc gives no improving message and discreetly refrains from judging her subjects. In brief, her works neither elevate nor instruct. This restraint largely explains her lack of popular success during her lifetime, even if her talent did not go completely unrecognized by her eighteenth-century French contemporaries.

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

- (D) In order to be highly regarded, an artist cannot be solely identified with one particular kind of painting.
- (E) Spontaneity is the most valuable quality a portrait painter can have.

SECTION B

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

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- 17. Which of the following most accurately describes the passage?
 - (A) A description of a replicable experiment
 - (B) A summary report of new findings
 - (C) A recommendation for abandoning a difficult area of research
 - (D) A refutation of an earlier hypothesis
 - (E) A confirmation of earlier research
 - 18. The level of information in the passage above is suited to the needs of all of the following people EXCEPT:
 - (A) a researcher whose job is to identify potentially profitable areas for research and product development
 - (B) a state official whose position requires her to alert farmers about possible innovations in farming
 - (C) an official of a research foundation who identifies research projects for potential funding
 - (D) a biologist attempting to keep up with scientific developments in an area outside of his immediate area of specialization
 - (E) a botanist conducting experiments to determine the relationship between degree of mycorrhizal infection and expected uptake of phosphate
 - 19. It can be inferred from the passage that which of the following has been a factor influencing the extent to which research on mycorrhizal fungi has progressed?

- (A) Lack of funding for such research
 - (B) Lack of immediate application of such research
 - (C) Lack of a method for identifying mycorrhizal fungi
 - (D) Difficulties surrounding laboratory production of specimens for study
 - (E) Difficulties ensuing from the high cost and scarcity of superphosphate fertilizers
20. The passage suggests which of the following about the increased resistance to harmful root fungi that some plants infected with mycorrhizal fungi seem to exhibit?
- (A) There are at least three hypotheses that might account for the increase.
 - (B) An explanation lies in the fact that mycorrhizal fungi increase more rapidly in number than harmful root fungi do.
 - (C) The plants that show increased resistance also exhibit improved nitrogen fixation.
 - (D) Such increases may be independent of mycorrhizal infection.
 - (E) It is unlikely that a satisfactory explanation can be found to account for the increase.

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

One way out of this dilemma was to turn to the records of legal courts, for here the voices of the nonelite can most often be heard, as witnesses, plaintiffs, and defendants. These documents have acted as "a point of entry into the mental world of the poor." Historians such as Le Roy Ladurie have used the documents to extract case histories, which have illuminated the attitudes of different social groups (these attitudes include, but are not confined to, attitudes toward crime and the law) and have revealed how the authorities administered justice. It has been societies that have had a developed police system and practiced Roman law, with its written depositions, whose court records have yielded the most data to historians. In Anglo-Saxon countries hardly any of these benefits obtain, but it has still been possible to glean information from the study of legal documents.

The extraction of case histories is not, however, the only use to which court records may be put. Historians who study preindustrial Europe have used the records to establish a series of categories of crime and to quantify indictments that were issued over a given number of years. This use of the records does yield some information about the nonelite, but this information gives us little insight into the mental lives of the nonelite. We also know that the number of indictments in preindustrial Europe bears little relation to the number of actual criminal acts, and we strongly suspect that the relationship has varied widely over time. In addition, aggregate population estimates

are very shaky, which makes it difficult for historians to compare rates of crime per thousand in one decade of the preindustrial period with rates in another decade. Given these inadequacies, it is clear why the case history use of court records is to be preferred.

21. The author suggests that, before the early 1950's, most historians who studied preindustrial Europe did which of the following?
- (A) Failed to make distinctions among members of the preindustrial European political and social elite.
 - (B) Used investigatory methods that were almost exclusively statistical in nature.
 - (C) Inaccurately estimated the influence of the preindustrial European political and social elite.
 - (D) Confined their work to a narrow range of the preindustrial European population.
 - (E) Tended to rely heavily on birth, marriage, and death records.
22. According to the passage, the case histories extracted by historians have
- (A) scarcely illuminated the attitudes of the political and social elite
 - (B) indicated the manner in which those in power apportioned justice
 - (C) focused almost entirely on the thoughts and feelings of different social groups toward crime and the law
 - (D) been considered the first kind of historical writing that utilized the records of legal courts
 - (E) been based for the most part on the trial testimony of police and other legal authorities
23. It can be inferred from the passage that much of the early work by historians on the European nonelite of the preindustrial period might have been more illuminating if these historians had
- (A) used different methods of statistical analysis to investigate the nonelite
 - (B) been more successful in identifying the attitudes of civil authorities, especially those who administered justice, toward the nonelite
 - (C) been able to draw on more accounts, written by contemporaries of the nonelite, that described what this nonelite thought
 - (D) relied more heavily on the personal records left by members of the European political and social elite who lived during the period in question
 - (E) been more willing to base their research on the birth, marriage, and death records of the nonelite
24. The author mentions Le Roy Ladurie (line 26) in order to
- (A) give an example of a historian who has made one kind of use of court records
 - (B) cite a historian who has based case histories on the birth, marriage, and death records of the nonelite

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

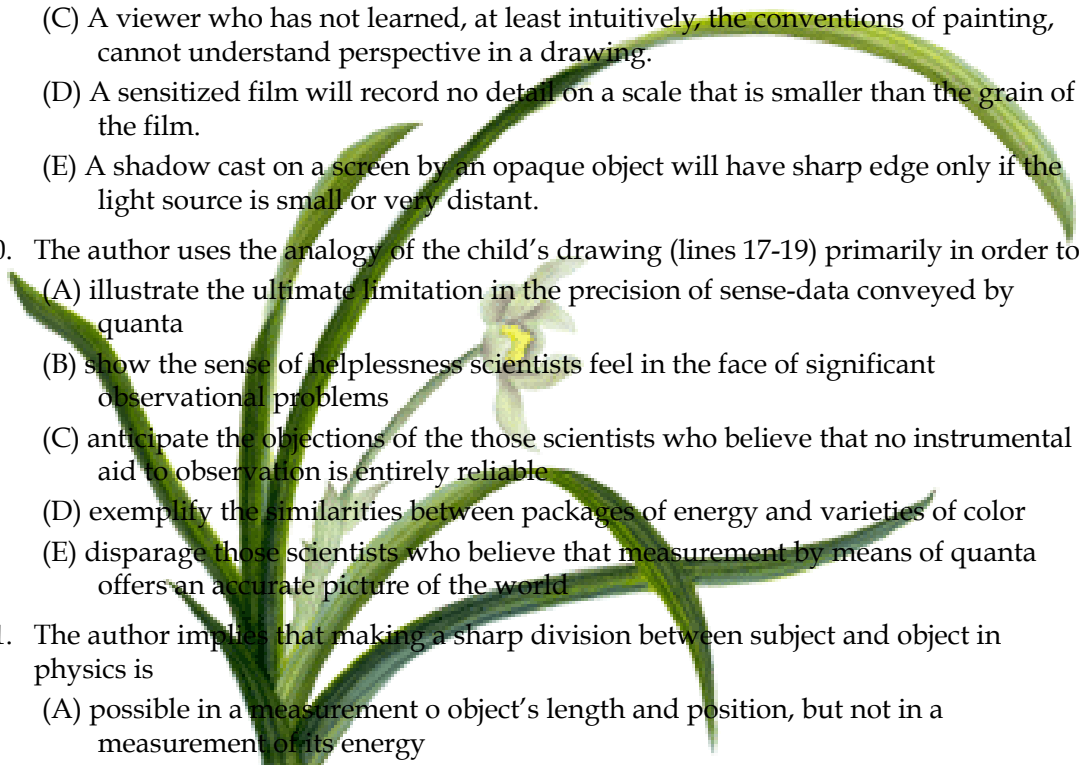
SECTION A

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

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

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

17. The primary purpose of the passage is to
- (A) discuss a problem that hinders precise perception of the world
 - (B) point out the inadequacies of accepted units of measurement
 - (C) criticize attempts to distinguish between perceiving subjects and perceived objects
 - (D) compare and contrast rival scientific hypotheses about how the world should be measured and observed
 - (E) suggest the limited function of sensory observation

18. According to the passage, quanta with an extremely long wavelength cannot be used to give complete information about the physical world because they
- (A) exist independently of sense-data
 - (B) are graduated only in inches
 - (C) have an insignificant amount of energy
 - (D) cannot, with present-day instruments, be isolated from quanta of shorter wavelength
 - (E) provide an insufficiently precise means of measuring length and position
19. Which of the following describes a situation most analogous to the situation discussed in lines 9-13?
- (A) A mathematician can only solve problems the solution of which can be deduced from known axiom.
 - (B) An animal can respond to no command that is more complicated syntactically than any it has previously received.
 - (C) A viewer who has not learned, at least intuitively, the conventions of painting, cannot understand perspective in a drawing.
 - (D) A sensitized film will record no detail on a scale that is smaller than the grain of the film.
 - (E) A shadow cast on a screen by an opaque object will have sharp edge only if the light source is small or very distant.
20. The author uses the analogy of the child's drawing (lines 17-19) primarily in order to
- (A) illustrate the ultimate limitation in the precision of sense-data conveyed by quanta
 - (B) show the sense of helplessness scientists feel in the face of significant observational problems
 - (C) anticipate the objections of those scientists who believe that no instrumental aid to observation is entirely reliable
 - (D) exemplify the similarities between packages of energy and varieties of color
 - (E) disparage those scientists who believe that measurement by means of quanta offers an accurate picture of the world
21. The author implies that making a sharp division between subject and object in physics is
- (A) possible in a measurement of object's length and position, but not in a measurement of its energy
 - (B) still theoretically possible in the small-scale world of atoms and electrons
 - (C) possible in the case of observations involving the passage of a complete quantum
 - (D) no longer an entirely accurate way to describe observation of the universe
 - (E) a goal at which scientists still aim
- 

22. The author's use of the phrase "in a sense" (line 34) implies which of the following?
- (A) Quanta of extremely long wavelength are essentially graduated in inches.
 - (B) quanta of one-inch wavelength are not precisely analogous to yardsticks graduated in inches.
 - (C) Quanta of extremely long wavelength, in at least one respect, resemble quanta of shorter wavelength.
 - (D) quanta of one-inch wavelength and quanta of extremely long wavelength do not differ only in their wavelengths.
 - (E) quanta of one-inch wavelength must be measured by different standards than quanta of extremely long wavelength.
23. According to the passage, the quantum theory can be distinguished from previous theories of physics by its
- (A) insistence on scrupulously precise mathematical formulations
 - (B) understanding of the inherent interrelationship of perceiver and perceived
 - (C) recognition of the need for sophisticated instruments of measurement
 - (D) emphasis on small-scale rather than on large-scale phenomena
 - (E) regard for philosophical issues as well as for strictly scientific ones

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

24. The primary purpose of the passage is to
- (A) argue that Olsen's understanding of class and gender is her greatest gift as a writer
 - (B) acknowledge Olsen's importance as the leading spokesperson for a radical literary heritage
 - (C) point out a literary heritage to which Olsen's work is related
 - (D) urge literary critics to investigate the origins of a literary heritage
 - (E) suggest that Olsen's work has been placed in a literary heritage to which it does not belong
25. According to the author, which of the following is true of the heritage mentioned in the passage?
- (A) It emphasizes gender as the determinate influence on people's lives.

- (B) It has been the most important influence on Olsen's work.
 - (C) It includes political traditions that span three decades of the twentieth century.
 - (D) It explains the eloquence but not the subject matter of Olsen's work.
 - (E) It reflects primarily the development of socialist political thought in the early twentieth century.
26. In the sentence "I do not ... influence on it" (lines 10-14), the author does which of the following?
- (A) Broadens an existing classification.
 - (B) Contradicts the passage's central thesis.
 - (C) Qualifies a commonly accepted point of view.
 - (D) Presents conflicting explanations for a phenomenon.
 - (E) Denies possible interpretations of an earlier assertion.
27. According to the author, Olsen's work has been
- (A) rightly acknowledged for its contribution to political thought
 - (B) thought to represent the beginning of new literary tradition
 - (C) a needed impetus for social change
 - (D) most clearly influenced by feminism
 - (E) deservedly admired by readers

SECTION B

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

17. According to the passage, the major problem currently facing scientists in the field of biomaterials is
- (A) assessing and regulating the bonding between host tissue and implants
 - (B) controlling the transfer of potentially toxic materials across the interface of tissue and implant
 - (C) discovering new materials from which to construct implant devices

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

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

Both Jewish law and canon law are more uniform than Islamic law. Though historically there is a discernible break between Jewish law of the sovereign state of ancient Israel and of the Diaspora (the dispersion of Jewish people after the conquest of Israel), the spirit of the legal matter in later parts of the Old Testament is very close to that of the Talmud, one of the primary codifications of Jewish law in the Diaspora. Islam, on the other hand, represented a radical breakaway from the Arab paganism that preceded it; Islamic law is the result of an examination, from a religious angle, of legal subject matter that was far from uniform, comprising as it did the various components of the laws of pre-Islamic Arabia and numerous legal elements taken over from the non-Arab peoples of the conquered territories. All this was unified by being subjected to the same kind of religious scrutiny, the impact of which varied greatly, being almost nonexistent in some fields, and in others originating novel institutions. This central duality of legal subject matter and religious norm is additional to the variety of legal, ethical, and ritual rules that is typical of sacred law.

In its relation to the secular state, Islamic law differed from both Jewish and canon law. Jewish law was buttressed by the cohesion of the community, reinforced by pressure from outside; its rules are the direct expression of this feeling of cohesion, tending toward the accommodation

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

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

- (B) suffered irreparably from the lack of firm institutional backing
(C) frequently been at odds with the legal activity of government institutions
(D) remained unaffected by the political forces operating alongside it
(E) benefited from the fact that it never experienced a direct confrontation with the state
24. Which of the following most accurately describes the organization of the passage?
(A) A universal principle is advanced and then discussed in relation to a particular historical phenomenon.
(B) A methodological innovation is suggested and then examples of its efficacy are provided.
(C) A traditional interpretation is questioned and then modified to include new data.
(D) A general opinion is expressed and then supportive illustrations are advanced.
(E) A controversial viewpoint is presented and then both supportive evidence and contradictory evidence are cited.
25. The passage implies that the relationship of Islamic, Jewish, and canon law is correctly described by which of the following statements?
I. Because each constitutes an example of sacred law, they necessarily share some features.
II. They each developed in reaction to the interference of secular political institutions.
III. The differences among them result partly from their differing emphasis on purely ethical rules.
(A) I only
(B) III only
(C) I and II only
(D) II and III only
(E) I, II, and III
26. The passage suggests that canon law differs from Islamic law in that only canon law
(A) contains prescriptions that nonsacred legal systems might regard as properly legal
(B) concerns itself with the duties of a person in regard to the community as a whole
(C) was affected by the tension of the conflict between religion and state
(D) developed in a political environment that did not challenge its fundamental existence
(E) played a role in the direct confrontation between institutions vying for power
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