



Passage VII

Prose Fiction: This passage is adapted from Nathaniel Hawthorne's *The House of the Seven Gables*.

It still lacked a half hour of sunrise when Miss Hepzibah—we will say awoke, it being doubtful whether the poor old lady had so much as closed her eyes during the brief night of midsummer—but, at all events, arose from her solitary pillow, and began the adornment of her person. She was alone in the old house—quite a house by itself, indeed—with locks, bolts, and oaken bars on all the intervening doors. Inaudible, consequently, were poor Miss Hepzibah's gusty sighs, inaudible the creaking joints of her stiffened knees, as she knelt down by the bedside. And inaudible too, by mortal ear, that almost agony of prayer—now whispered, now a groan, now a struggling silence—wherewith she sought the Divine assistance through the day! Evidently this is to be the day of more than ordinary trial to Miss Hepzibah, who for above a quarter of a century gone by has dwelt in strict seclusion, taking no part in the business of life, and just as little in its intercourse and pleasures.

Here comes Miss Hepzibah. Forth she steps into the dusky, time-darkened passage a tall figure, clad in black silk, with a long and shrunken waist, feeling her way towards the stair like a nearsighted person, which in truth she is.

Her scowl—as the world persisted in calling it—her scowl had done Miss Hepzibah every ill office, in establishing her character as an ill-tempered old maid; nor does it appear improbable that, by often gazing at herself in a dim looking glass, and perpetually encountering her own frown within its ghostly sphere, she had been led to interpret the expression almost unjustly as the world did. But her heart never frowned.

60. According to the passage, Miss Hepzibah is all of the following EXCEPT:

- F. elderly.
- G. reclusive.
- H. religious.
- J. vain.

61. The author's portrait of Miss Hepzibah is:

- A. critical and disparaging.
- B. loving and intimate.
- C. sarcastic and mocking.
- D. interested and sympathetic.

62. It can be inferred that Miss Hepzibah views the day's coming events with:

- F. apprehension.
- G. confidence.
- H. eagerness.
- J. boredom.

63. Which of the following correctly describes the scene as set by the passage?

- I. The season is summer.
- II. The weather is threatening.
- III. The time is morning.

- A. I only
- B. III only
- C. I and II only
- D. I and III only

64. In the last paragraph, the author implies that Miss Hepzibah is:

- F. old and wicked.
- G. affable and outgoing.
- H. good-hearted but misunderstood.
- J. sincere but blasphemous.

Passage VIII

Social Science: This passage discusses the contest over the vice presidency in the 1792 election.

In 1792, there was no contest for the presidency. George Washington received the unanimous vote of the electors, Federalist and Republican alike. But the struggle over the vice presidency hinted at the rekindling of old divisions and antagonisms sparked by Alexander Hamilton's system. Southern planters who in 1789 had been ready, in fact eager, to cooperate with the monied men of the North, parted with them when they realized that the policies designed to benefit Northern merchants and bankers brought no profit to them as landed aristocrats. Even more, they saw themselves paying for a system that contributed to another section's prosperity. Although in 1792 they were willing to continue with Washington, they were not as willing to go along with Vice President John Adams, who represented the commerce, shipbuilding, fisheries, and banking institutions of New England and the North. If the Federalists were to have the first office, then the followers of Jefferson—who had already come to call themselves Republicans in contradistinction to the unpopular term anti-Federalist, insisted that they were to command the second office.

Appealing to the shopkeepers, artisans, laboring men, and farmers of the North based on their sympathy with the French Revolution, and to the Southern planters with their agrarian bias, the Republicans waged a gallant but losing campaign for the second office. However, the campaign served notice to the overconfident Federalists that when the Republicans became better organized nationally, they would have to be more seriously considered. This did not take long. In 1793, England went so far as to declare war with republican France over the guillotining of Louis XVI, and in 1794, John Jay's treaty terminating the United States' difficulties with Britain seemed to suggest a sympathetic policy toward monarchical and conservative England, instead of republican, liberty-loving France. The treaty intensified party spirit and gave the Republicans a sense of mission that legitimized their existence. The contest was now between the Republican "lovers of liberty" and the Monocrats.

Social Science

65. Which of the following titles best describes the content of the passage?
- A. The Origins of Jefferson's Republican Party
 - B. Jefferson's Defeat in the 1792 Election
 - C. The Legacy of Hamilton's Political System
 - D. Political Differences Between the Rich and the Poor
66. According to the passage, all of the following are true of the Republicans EXCEPT:
- F. they opposed the monied interests of the North.
 - G. they were led by Thomas Jefferson.
 - H. they disapproved of the French Revolution.
 - J. they and the Federalists supported the same candidate for president in 1792.
67. It can be inferred from the passage that the term *Monocrats* (line 45) was:
- A. used by John Jay in his treaty to refer to France's King Louis XVI.
 - B. invented by the Federalists to refer to the aristocratic landowners of the South.
 - C. coined by the Republicans to disparage the Federalists' support of England.
 - D. employed by Republicans to describe their leader, Thomas Jefferson.
68. The passage implies that Thomas Jefferson was unsuccessful in his 1792 bid for the vice presidency because the Republican Party:
- F. did not have a presidential candidate.
 - G. was not as well organized as the Federalists.
 - H. refused to support John Adams.
 - J. appealed to workers in the North.
69. The tone of the passage can best be described as:
- A. enthusiastic and impassioned.
 - B. scholarly and neutral.
 - C. opinionated and dogmatic.
 - D. argumentative and categorical.

Passage IX

Social Science: This passage is adapted from a policy article about attempts to change the healthcare system.

5 Considerable advances have been made in healthcare services since World War II. These include better access to healthcare (particularly for the poor and minorities), improvements in physical plants and facilities, and increased numbers of physicians and other health personnel. All have played a part in the recent improvement in life expectancy. But there is mounting criticism of the large remaining gaps in access, unbridled cost inflation, the further fragmentation of service, excessive indulgence in wasteful high-technology “gadgeteering,” and breakdowns in doctor-patient relationships. In recent years, proposed panaceas and new programs, small and large, have proliferated at a feverish pace, and disappointments have multiplied at almost the same rate. This has led to an increased pessimism—“everything has been tried and nothing works”—that sometimes borders on cynicism or even nihilism.

20 It is true that the automatic “pass through” of rapidly spiraling costs to government and insurance carriers produced for a time a sense of unlimited resources and allowed a mood to develop whereby every practitioner and institution could “do his own thing” without undue concern for the “Medical Commons.” The practice of full-cost reimbursement encouraged capital investment, and now the industry is overcapitalized. Many cities have hundreds of excess hospital beds; hospitals have proliferated a superabundance of high-technology equipment; and structural ostentation and luxury were the order of the day. In any given day, one-fourth of all community beds are vacant; expensive equipment is underused or, worse, used unnecessarily. Capital investment brings rapidly rising operating costs.

40 Yet, in part, this pessimism derives from expecting too much of healthcare. Care is often a painful experience accompanied by fear and unwelcome results; although there is room for improvement, it will always retain some unpleasantness and frustration. Moreover, the capacities of medical science are limited. Humpty Dumpty cannot always be put back together again. 45 Too many physicians are reluctant to admit their limitations to patients; too many patients and

families are unwilling to accept such realities. Nor is it true that everything has been tried and nothing works, as shown by the prepaid group practice plans at the Kaiser Foundation and Puget Sound. However, typically such undertakings have been drowned by a veritable flood of public and private moneys that have supported and encouraged the continuation of conventional practices and subsidized their shortcomings on a massive, almost unrestricted scale. Except for the most idealistic and dedicated, there were no incentives to seek change or to practice self-restraint or frugality. In this atmosphere, it is not fair to condemn as failures all attempted experiments; it may be more accurate to say that many never had a fair trial.

70. In line 15, the word *feverish* most nearly means:

- F. diseased.
- G. rapid.
- H. controlled.
- J. timed.

71. According to the author, the pessimism mentioned in line 37 is partly attributable to the fact that:

- A. there has been little real improvement in healthcare services.
- B. expectations about healthcare services are sometimes unrealistic.
- C. large segments of the population find it impossible to get access to healthcare services.
- D. advances in technology have made healthcare service unaffordable.

72. The author cites the prepaid plans (lines 49–50) as:

- F. counterexamples to the claim that nothing has worked.
- G. examples of healthcare plans that were overfunded.
- H. evidence that healthcare services are fragmented.
- J. proof of the theory that no plan has been successful.

73. It can be inferred that the sentence "Humpty Dumpty cannot always be put back together again" (lines 43-44) means that:
- A. the cost of healthcare services will not decline.
 - B. some people should not become doctors.
 - C. medical care is not really essential to good health.
 - D. medical science cannot cure every ill.
74. With which of the following descriptions of the system for the delivery of healthcare services would the author most likely agree?
- F. It is biased in favor of doctors and against patients.
 - G. It is highly fragmented and completely ineffective.
 - H. It has not embraced new technology rapidly enough.
 - J. It is generally effective but can be improved.
75. Which of the following best describes the logical structure of the selection?
- A. The third paragraph is intended as a refutation of the first and second paragraphs.
 - B. The second and third paragraphs are intended as a refutation of the first paragraph.
 - C. The second and third paragraphs explain and put into perspective the points made in the first paragraph.
 - D. The first paragraph describes a problem, and the second and third paragraphs present two horns of a dilemma.
76. The author's primary concern is to:
- F. criticize physicians and healthcare administrators for investing in technologically advanced equipment.
 - G. examine some problems affecting delivery of healthcare services and assess the severity of those problems.
 - H. defend the medical community from charges that healthcare has not improved since World War II.
 - J. analyze the reasons for the healthcare industry's inability to provide quality care to all segments of the population.

Passage X

Humanities: This passage is adapted from an article that discusses literary genre.

When we speak casually, we call *Nineteen Eighty-Four* a novel, but to be more exact we should call it a political fable. This requirement is not refuted by the fact that the book is preoccupied with an individual, Winston Smith, who suffers from a varicose ulcer, or by the fact that it takes account of other individuals, including Julia, Mr. Charrington, Mrs. Parsons, Syme, and O'Brien. The figures claim our attention, but they exist mainly in their relation to the political system that determines them. It would indeed be possible to think of them as figures in a novel, though in that case they would have to be imagined in a far more diverse set of relations. They would no longer inhabit or sustain a fable, because a fable is a narrative relieved of much contingent detail so that it may stand forth in an unusual degree of clarity and simplicity. A fable is a structure of types, each of them deliberately simplified lest a sense of difference and heterogeneity reduce the force of the typical. Let us say, then, that *Nineteen Eighty-Four* is a political fable, projected into a near future and incorporating historical references mainly to document a canceled past.

Since a fable is predicated upon a typology, it must be written from a certain distance. The author cannot afford the sense of familiarity that is induced by detail and differentiation. A fable, in this respect, asks to be compared to a caricature, not to a photograph. It follows that in a political fable there is bound to be some tension between a political sense dealing in the multiplicity of social and personal life, and a fable sense committed to simplicity of form and feature. If the political sense were to prevail, the narrative would be drawn away from fable into the novel, at some cost to its simplicity. If the sense of fable were to prevail, the fabulist would station himself at such a distance from any imaginary conditions in the case that his narrative would appear unmediated, free or bereft of conditions. The risk would be considerable: a reader might feel that the fabulist has lost interest in the variety of human life and fallen back upon an unconditioned sense of its types, that he has become less interested in lives than in a particular idea of life. The risk is greater still if the fabulist projects his narrative into the future: The reader cannot question by appealing to life conditions

already known. He is asked to believe that the future is another country and that "they just do things differently there."

In a powerful fable, the reader's feeling is likely to be mostly fear: He is afraid that the fabulist's vision of any life that could arise may be accurate. The fabulist's feeling may be more various. A fable such as *Nineteen Eighty-Four* might arise from disgust, despair, or world-weariness induced by evidence that nothing, despite one's best efforts, has changed and that it is too late now to hope for the change one wants.

Humanities

77. In line 15, the word *contingent* most nearly means:
- dependent.
 - essential.
 - boring.
 - unnecessary.
78. In drawing an analogy between a fable and a caricature (lines 28–30), the author would most likely regard which of the following pairs of ideas as also analogous?
- The subject of a caricature and the topic of a fable
 - The subject of a caricature and the main character in *Nineteen Eighty-Four*
 - The subject of a fable and the artist who draws the caricature
 - The artist who draws the caricature and a novelist
79. Which of the following would be the most appropriate title for the passage?
- A Critical Study of the Use of Characters in *Nineteen Eighty-Four*
 - Nineteen Eighty-Four*: Political Fable Rather Than Novel
 - Nineteen Eighty-Four*: Reflections on the Relationship of the Individual to Society
 - The Use of Typology in the Literature of Political Fables

- 80.** According to the passage, which of the following are characteristics of a political fable?
- F. It is widely popular at its time of development.
 - G. The reader is unlikely to experience fear as his reaction to the political situation described.
 - H. Its time frame must treat events that occur at some point in the future.
 - J. Its characters are defined primarily by their relationship to the social order.
- 81.** The author mentions that Winston Smith suffers from a varicose ulcer to:
- A. demonstrate that a political fable must emphasize type over detail.
 - B. show that Winston Smith has some characteristics that distinguish him as an individual.
 - C. argue that Winston Smith is no more important than any other character in *Nineteen Eighty-Four*.
 - D. illustrate one of the features of the political situation described in *Nineteen Eighty-Four*.
- 82.** The tension that the author mentions in line 31 refers to the:
- F. necessity of striking a balance between the need to describe a political situation in simple terms and the need to make the description realistic.
 - G. reaction the reader feels because he is drawn to the characters of the fable as individuals but repulsed by the political situation.
 - H. delicate task faced by a literary critic who must interpret the text of a work while attempting to describe accurately the intentions of the author.
 - J. danger that too realistic a description of a key character will make the reader feel that the fable is actually a description of his own situation.
- 83.** The author's attitude toward *Nineteen Eighty-Four* can best be described as:
- A. condescending.
 - B. laudatory.
 - C. disparaging.
 - D. scholarly.
- 84.** The author uses the phrase "another country" (line 50) to describe a political fable in which:
- F. political events described in a fable occur in a place other than the country of national origin of the author.
 - G. a lack of detail makes it difficult for a reader to see the connection between his own situation and the one described in the book.
 - H. too many minor characters create the impression of complete disorganization, leading the reader to believe he is in a foreign country.
 - J. the author has allowed his personal political convictions to infect his description of the political situation.
- 85.** The author's primary concern is to:
- A. define and clarify a concept.
 - B. point out a logical inconsistency.
 - C. trace the connection between a cause and an effect.
 - D. illustrate a general statement with examples.

Passage XI

Humanities: This passage is adapted from the speech "Is it a Crime for a Citizen of the United States to Vote?" by Susan B. Anthony.

Friends and fellow citizens: I stand before you tonight under indictment for the alleged crime of having voted at the last presidential election without having a lawful right to vote. It shall be my work this evening to prove to you that in thus voting, I not only committed no crime, but, instead, simply exercised *my citizen's rights*, guaranteed to me and all United States citizens by the National Constitution, beyond the power of any State to deny. The preamble of the Federal Constitution says: "We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America."

It was we, the people, not we, the white male citizens; but we, the whole people, who formed the Union. And we formed it, not to give the blessings of liberty, but to secure them; not to the half of ourselves and the half of our posterity but to the whole people—women as well as men. And it is a downright mockery to talk to women of their enjoyment of the blessings of liberty while they are denied the use of the only means of securing them provided by this democratic-republican government—the ballot.

For any State to make sex a qualification that must ever result in the disfranchisement of one entire half of the people is a violation of the supreme law of the land. By it the blessings of liberty are forever withheld from women and their female posterity. To them this government has no just powers derived from the consent of the governed. To them this government is not a democracy. It is not a republic. It is a hateful oligarchy of sex. An oligarchy of learning, where the educated govern the ignorant, might be endured; but this oligarchy of sex, which makes father, brothers, husband, sons, the oligarchs or rulers over the mother and sisters, the wife and daughters of every household—which ordains all men sovereigns, all women subjects, carries dissension, discord and rebellion into every home of the nation.

Webster's Dictionary defines a citizen as a person in the United States, entitled to vote and hold office.

The only question left to be settled now is, Are women persons? And I hardly believe any of our opponents will have the hardihood to say we are not. Being persons, then, women are citizens; and no State has a right to make any law, or to enforce any old law, that shall abridge their privileges or immunities. Hence, every discrimination against women in the constitutions and laws of the several States is today null and void.

86. The nineteenth-century feminist leader Susan B. Anthony fought long and hard to guarantee women the right to vote. In this speech, she talks as if she were a:

- F. defendant on trial.
- G. chairperson of a committee.
- H. legislator arguing for a new law.
- J. judge ruling at a trial.

87. Anthony broadens her appeal to her audience by showing how her case could affect all:

- A. existing laws.
- B. United States citizens.
- C. women.
- D. uneducated persons.

88. Anthony quotes the preamble to the Constitution (lines 10–17) in order to:

- F. impress the audience with her intelligence.
- G. utilize a common legalistic trick.
- H. point out which part of the preamble needs to be changed.
- J. add force to her argument.

89. According to Anthony, who formed the Union?

- A. Only one-half of the people
- B. The whole people
- C. White male citizens only
- D. White female citizens

90. When Anthony says that the blessings of liberty are forever withheld from women and their female posterity, she means that:

- F. all classes of women are discriminated against.
- G. women of the past have been victimized.
- H. female children of the poor will be the only ones affected.
- J. women of the present and the future will suffer.

91. Anthony argues that a government that denies women the right to vote is not a democracy because its powers do not come from:

- A. the Constitution of the United States.
- B. the rights of the states.
- C. the consent of the governed.
- D. the vote of the majority.

92. According to this speech, an "oligarchy of sex" would cause:

- F. women to rebel against the government.
- G. men to desert their families.
- H. problems to develop in every home.
- J. the educated to rule the ignorant.

93. In this speech, a citizen is defined as a person who has the right to vote and also the right to:

- A. acquire wealth.
- B. speak publicly.
- C. hold office.
- D. pay taxes.

94. Anthony argues that state laws that discriminate against women are:

- F. being changed.
- G. null and void.
- H. helpful to the rich.
- J. supported by the Constitution.

Passage XII

Humanities: This passage is adapted from an essay by Oliver Goldsmith that appeared in *The Citizen of the World*.

Were we to estimate the learning of the English by the number of books that are every day published among them, perhaps no country, not even China itself, could equal them in this particular. I have reckoned not less than twenty-three new books published in one day, which, upon computation, makes eight thousand three hundred and ninety-five in one year. Most of these are not confined to one single science, but embrace the whole circle. History, politics, poetry, mathematics, metaphysics, and the philosophy of nature are all comprised in a manual not larger than that in which our children are taught the letters. If then, we suppose the learned of England to read but an eighth part of the works which daily come from the press (and surely none can pretend to learning upon less easy terms), at this rate every scholar will read a thousand books in one year. From such a calculation, you may conjecture what an amazing fund of literature a man must be possessed of, who thus reads three new books every day, not one of which but contains all the good things that ever were said or written.

And yet I know not how it happens, but the English are not, in reality, so learned as would seem from this calculation. We meet but few who know all arts and sciences to perfection; whether it is that the generality are incapable of such extensive knowledge, or that the authors of those books are not adequate instructors. In China, the Emperor himself takes cognizance of all the doctors in the kingdom who profess authorship. In England, every man may be an author that can write; for they have by law a liberty, not only of saying what they please, but also of being as dull as they please.

Yesterday, I testified my surprise, to the man in black, where writers could be found in sufficient number to throw off the books I daily saw crowding from the press. I at first imagined that their learned seminaries might take this method of instructing the world. But, to obviate this objection, my companion assured me that the doctors of colleges never wrote, and that some of them had actually forgotten their reading. "But if you desire," continued he, "to see a collection of authors, I fancy I can introduce you to a club, which assembles every

Saturday at seven...." I accepted his invitation; we walked together, and entered the house some time before the usual hour for the company assembling.

50 My friend took this opportunity of letting me into the characters of the principal members of the club....

"The first person," said he, "of our society is Doctor Nonentity, a metaphysician. Most people 55 think him a profound scholar, but, as he seldom speaks, I cannot be positive in that particular; he generally spreads himself before the fire, sucks his pipe, talks little, drinks much, and is reckoned very good company. I'm told he writes indexes to 60 perfection: he makes essays on the origin of evil, philosophical inquiries upon any subject, and draws up an answer to any book upon 24 hours' warning...."

95. Goldsmith's disdainful attitude toward English authors is best explicated in:

- A. lines 1-4.
- B. lines 13-18.
- C. lines 32-35.
- D. lines 44-47.

96. Goldsmith believes that:

- F. we can tell how knowledgeable English authors are by counting the number of books they publish.
- G. the number of books published in England is not up to standards set in China.
- H. the number of books published in England says nothing about English scholarship.
- J. every English scholar reads a thousand books a year.

97. Goldsmith calculates the number of books published in England to:

- A. impress his readers with English erudition.
- B. make the point that anyone can be an author.
- C. make a defense for his argument that England is better than China.
- D. make a comparison with publication quotas in other lands.

98. The tone of the second paragraph may best be described as:
- F. self-satisfied.
 - G. awestruck.
 - H. affectionate.
 - J. sardonic.
99. Goldsmith first assumes that English writers come from:
- A. foreign lands.
 - B. seminaries.
 - C. China.
 - D. clubs.
100. The word *obviate* (line 41) means:
- F. clarify.
 - G. obscure.
 - H. turn.
 - J. negate.
101. Goldsmith's opinion of the first member of the club is illuminated by which of the following?
- I. His conversation with the character
 - II. The given name for the character
 - III. His friend's description of the character
- A. I only
 - B. II only
 - C. I and III only
 - D. II and III only
102. One of Goldsmith's major objections to English authors is to their:
- F. deficiency in language skills.
 - G. inclination to drink.
 - H. tendency to write about everything at once.
 - J. inability to retain information.

Passage XIII

Humanities: This passage discusses the impact of Southwestern environment and culture on twentieth-century artists.

Georgia O'Keeffe, whose death at age 98 closed one of the most fertile chapters of American artistic creativity, flourished as a maverick in her life and work. While other painters spent a season or two in the country trying to come to terms with the scenes and settings of the Southwest, O'Keeffe stayed a lifetime. When the canvases of other artists working in the region faded from view, and then were neglected in the chronicle of American visual history, her stylized images, skeletal, floral, and geological motifs made an indelible impression on countless eyes.

Between 1900 and 1945, the region now called New Mexico both fascinated and perplexed two generations of American artists—luminaries such as Stuart Davis, Marsden Hartley, and John Sloan, whose reputations were built largely on depictions of gritty, modern life in Eastern urban centers. Despite successes, many of these artists wearied of the industrial world of the East. The vast expanse of the American West offered a promise for inspiration. It was an ancient yet new world to their eyes—an enchanted land far removed from urban conventions.

For these artists, life and art, so separate in New York and Paris, seemed inextricably bound in Southwestern cultures. Painters of every persuasion were convinced that sampling this mysterious phenomenon would strengthen and enrich their own work. Most were touched by what D.H. Lawrence called the "spirit of the place." Besides the scenic possibilities bathed in clear golden light, the rich traditions of New Mexico's Native American and Latino people—their dress, crafts, adobe pueblos, plaza life, rituals, and simple dignity—became frequent subjects of the artists who traveled to Taos and Santa Fe.

Some of the artists were traditionalists—local color realists; some were modernists—like O'Keeffe, avant-garde painters of the abstract. Their varied talents coupled with the attractions of the land gave New Mexico's art centers a status unrivaled among other American summer colonies and contributed to their heyday in the early twentieth century.

103. This passage deals primarily with:

- A. the life of Georgia O'Keeffe.
- B. the major trends of American modern art.
- C. the mystery and spirit of the Southwest.
- D. artists in the American Southwest.

104. The author implies that the Southwest attracted artists for all of the following reasons EXCEPT:

- F. the quality of life was different from that of large urban centers.
- G. the inhabitants and culture provided interesting subject matter.
- H. New Mexico was the only state to support young, avant-garde painters.
- J. the region offered unusual geological features and landscapes.

105. The author implies that most of the artists who painted in the Southwest:

- A. originally studied in Paris.
- B. lived there only temporarily.
- C. painted only landscapes.
- D. received considerable recognition.

106. The author mentions which of the following facts about Georgia O'Keeffe?

- I. She resided permanently in the Southwest.
- II. She enjoyed considerable and lasting fame.
- III. She created modern, abstract paintings.

- F. I only
- G. II only
- H. I and III only
- J. I, II, and III

107. Stuart Davis, Marsden Hartley, and John Sloan were painters who painted mainly in:

- A. Paris.
- B. New Mexico.
- C. cities in the Eastern United States.
- D. Rome.

Passage XIV

Natural Science: This passage discusses the development of basic inheritance theories and the role of DNA in genetic mutation processes.

In 1866, Gregor Mendel published the results of his studies on the breeding of different races of pea plants. Through his experiments, Mendel discovered a pattern of inheritance and subsequently developed the concept of a “unit of inheritance.”

Mendel started with a pure stock of pea plants that had recognizably different characteristics. He artificially cross-pollinated the different races of plants and noted the characteristics of the different offspring over several generations. Mendel concluded that a pair of discrete “factors” governed each trait and that they segregated upon the formation of the gametes. This pair of factors is now known as the maternally and paternally derived alleles on homologous chromosomes that first come together at fertilization and later segregate during meiosis.

Subsequent studies have shown that new genes could appear as mutations of existing genes and that crossing over and recombination could redistribute maternal and paternal characteristics. Genes can occur in a linear sequence, and groups of genes that segregate together are called “linkage groups.” The chromosome is the carrier of the linear array of genes and the physical basis of the linkage groups.

It was originally thought that proteins were the genetic carrier. In contrast to nucleic acids, proteins were known to mediate complex reactions and to be composed of a variety of different building blocks. There are approximately 20 different amino acids in a protein, but only 4 different nucleotides in a nucleic acid molecule. It was not until 1944 that Avery et al. noted that deoxyribonucleic acid (DNA) was the genetic carrier, not protein. Avery and his co-workers conducted experiments on the transformation in pneumococcus. Two strains of the bacteria had been isolated: one produced colonies having a smooth (S) appearance and was able to cause pneumonia in a suitable host; the other grew into rough (R) colonies because of a defect in its capsule and was non-virulent. When a cell-free extract of the S bacteria was added to the medium in which the R strain was growing, a few of the R

bacteria grew into smooth colonies and were virulent. They had become transformed. From the time of transformation, the progeny of that cell continued to have the properties of the S strain. The transformation was a stable genetic change. Avery and his co-workers purified the contents of cells in detergent after their disruption and found that among the contents of the cells, only the purified DNA was capable of causing the transformation. As a result of these and future experiments, it was determined that in order for transformation to occur, DNA fragments entered the recipient cell intact and substituted in the bacterial chromosome for the original DNA, which was eliminated. This process resulted in the creation of a genetically different microorganism.

DNA is a very long, fibrous molecule with a backbone composed of alternate sugar and phosphate groups joined by 3'-5'-phosphodiester linkages. Attached to each sugar is one of four possible nitrogenous bases. There are two types of bases: the pyrimidines, cytosine (C) and thymine (T); and the purines, adenine (A) and guanine (G). The amount of purine equals the amount of pyrimidine, and, more specifically, the amount of adenine equals the amount of thymine, and the amount of guanine equals the amount of cytosine.

In 1953, Watson and Crick proposed that DNA was made of two chains of nucleotides coiled around a common axis, with the sugar-phosphate backbone on the outside and the bases pointing in toward the axis, and that the two chains were held together by hydrogen bonds. The hydrogen bonds occur between each base of one chain and an associated base on the other chain. Based on the 20-angstrom width of the fiber, a pyrimidine from one chain is always paired with a purine from the other chain. Adenine is the only purine capable of bonding to thymine and guanine is the only purine capable of bonding to cytosine.

Watson and Crick proposed that the information in DNA was coded for by the linear sequence of the base pairs. They theorized that a mutation could be accounted for by a chance mistake in the formation of the sequence during duplication. Another major aspect of the Watson and Crick model was the proposed complementarity between hydrogen-bonded nucleotides. For example, adenine is complementary to thymine, AGC is complementary to TCG, and one chain is complementary to the other. If the base sequence of

100 one chain is known, then the base sequence of the complementary chain can be derived. The concept of complementarity of nucleic acids in DNA and RNA chains is the basis of most research in which these classes of molecules are involved.

Natural Science

108. Mendel conducted his studies using the method known as:

- F. cloning.
- G. genetic mapping.
- H. cross-pollination.
- J. transformation.

109. Mendel's findings were important because they indicated which of the following?

- I. DNA fragments can replace original DNA.
 - II. Specific units, handed down from one generation to the next, govern traits in organisms.
 - III. Proteins are composed of approximately 20 different amino acids.
- A. I only
 - B. II only
 - C. I and III only
 - D. I, II, and III

110. Contrary to earlier beliefs, Avery et al. discovered that:

- F. there are only four nucleotides in DNA.
- G. pneumonia can be passed from host to host.
- H. genes can mutate.
- J. DNA, not protein, carries genetic information.

111. If you witnessed R strain pneumococcus infected with S extract and saw a few R strain pneumococcus transformed to S strain, you would expect:

- A. the remaining R strain pneumococcus to transform later.
- B. only the new S strain cells to survive.
- C. offspring of those transformed cells to be S strain as well.
- D. a few S strain pneumococcus to transform to R strain.

112. The author uses the word *non-virulent* (line 43) to mean:

- F. harmless.
- G. toxic.
- H. bacterial.
- J. sweet.

113. In contrast to the paragraphs before, the fifth paragraph is intended primarily to:

- A. give historical genetic research information.
- B. describe the results of Mendel's experiments.
- C. speculate on the future of genetic research.
- D. provide a definition for an essential element in genetic research.

114. A chain of DNA with the pattern CAG would bond with a chain with the pattern:

- F. GAC.
- G. TGA.
- H. GTC.
- J. Cannot be determined from the given information

115. Which of the following is (are) classified as a purine?

- I. Cytosine
- II. Guanine
- III. Thymine

- A. I only
- B. II only
- C. III only
- D. I and II only

116. Which of the following was Watson and Crick's contribution to the study of genetics?

- I. Information about the transfer of genes across membranes
- II. The notion that pairs of genes could work together
- III. A suggestion about the structure of DNA

- F. I only
- G. II only
- H. III only
- J. I, II, and III

117. The concept of complementarity in DNA is apparently important because:

- A. it contradicts the notion that proteins are the basis for genetic transformation.
- B. hydrogen bonds connect the nucleotides.
- C. if maternally and paternally derived alleles were not complementary, life could not exist.
- D. if you know one chain's sequence, you can determine that of the other.

Passage XV

Natural Science: This passage is adapted from a science magazine article about galaxies.

Galaxies come in a variety of sizes and shapes: majestic spirals, ruddy disks, elliptically shaped dwarfs and giants, and a menagerie of other, more bizarre forms. Most currently, popular theories suggest that conditions prior to birth—mass of the protogalactic cloud, its size, its rotation—determine whether a galaxy will be large or small, spiral or elliptical; but about 10 percent of all galaxies are members of rich clusters of thousands of galaxies. The gravitational forces of fields of nearby galaxies constantly distort galaxies in the crowded central region of rich clusters. In addition, rich clusters of galaxies are pervaded by a tenuous gas with a temperature of up to 100 million degrees. Galaxies are blasted and scoured by a hot wind created by their motion through the gas. In crowded conditions such as these, environment becomes a more important determinant of the size and shape of a galaxy than heredity. In fact, if our galaxy had happened to form well within the core of a cluster such as Virgo, the Sun would probably never have formed, because the Sun, a second- or third-generation star located in the disk of the galaxy, was formed from leftover gas five billion years or so after the initial period of star formation. By that time, in a rich cluster, the galaxy may well have already been stripped of its gas.

As a galaxy moves through the core of a rich cluster, it is not only scoured by hot gas; it encounters other galaxies as well. If the collision is one-on-one at moderate to high speeds of galaxies of approximately the same size, both galaxies will emerge relatively intact, if a little distorted and ragged about the edges. If, however, a galaxy coasts by a much larger one in a slow, grazing collision, the smaller one can be completely disrupted and assimilated by the larger.

Under the right conditions, these cosmic cannibals can consume 50 to 100 galaxies. The accumulative effect of these collisions is to produce a dynamic friction on the large galaxy, slowing it down. As a result, it gradually spirals in toward the center of the cluster. Eventually, the gravitational forces that bind the stars to the infalling galaxy are overwhelmed by the combined gravity of the galaxies in the core of the cluster—just as the ocean is pulled away from the shore at ebb tide by the

Moon, the stars are pulled away from their infalling parent galaxy. If there is a large galaxy at the center of the cluster, it may ultimately capture these stars. With the passage of time, many galaxies will be torn asunder in the depths of this gravitational maelstrom and be swallowed up in the ever-expanding envelope of the central cannibal galaxy.

Galactic cannibalism also explains why there are few if any bright galaxies in these clusters other than the central supergiant galaxy. That is because the bright galaxies, which are the most massive, experience the greatest dynamical friction. They are the first to go down to the gravitational well and be swallowed up by the central galaxies.

Over the course of several billion years, 50 or so galaxies may be swallowed up, leaving only the central supergiant and the 51st, the 52nd, etc., brightest galaxies. Given time, all the massive galaxies in the cluster will be absorbed, leaving a sparse cluster of a supergiant galaxy surrounded by clouds of small, dim galaxies.

118. In line 3, the word *menagerie* most nearly means:

- F. odd mixture.
- G. open environment.
- H. uniform collection.
- J. flat area.

119. It can be inferred from the passage that the physical features of a galaxy that does not belong to a rich cluster are determined primarily by the:

- A. size and rotation of the protogalactic cloud.
- B. intensity of light emanating from the galaxy.
- C. temperature of the interstellar gas.
- D. age of the protogalactic cloud.

120. The author implies that the currently accepted theories on galaxy formation are:

- F. completely incorrect and misguided.
- G. naive and out-of-date.
- H. speculative and unsupported by observation.
- J. substantially correct but in need of modification.

121. According to the passage, a cluster with a central, supergiant galaxy will:

- A. contain no intermediately bright galaxies.
- B. have 50–100 galaxies of all sizes and intensities.
- C. consist solely of third- and fourth-generation stars.
- D. produce only spiral and disk-shaped galaxies.

122. According to the passage, the outcome of a collision between galaxies depends on:

- F. the relative velocities of the galaxies.
- G. the relative ages of the galaxies.
- H. the relative sizes of the galaxies.
- J. the relative velocities and sizes of the galaxies.

123. According to the passage, as a galaxy falls inward toward the center of a cluster, it:

- A. collides with the central core and emerges relatively intact.
- B. absorbs superheated gases from the interstellar medium.
- C. is broken apart by the gravitational forces of the core.
- D. is transformed by collisions into a large, spiral galaxy.

124. The passage provides information that will answer which of the following questions?

- F. What is the age of our sun?
- G. What proportion of all galaxies are found in clusters?
- H. Approximately how many galaxies would be found in a rich cluster?
- J. What type of galaxy is ours?

125. The tone of the passage can best be described as:

- A. light-hearted and amused.
- B. objective but concerned.
- C. detached and unconcerned.
- D. cautious but sincere.

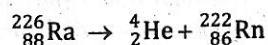
Passage XVI

Natural Science: This passage reviews the basic physical chemistry of atoms and radioactive decay.

An atom consists of a nucleus (containing protons and neutrons) surrounded by electrons. Each proton has a positive charge of +1, and each electron has a negative charge of -1. A neutron has no charge. The number of protons in their nuclei determines the identities of the different elements. For example, hydrogen atoms have only one proton, while oxygen atoms have eight protons. The total number of protons in the nucleus is the "atomic number" of that element. The total number of protons and neutrons in the nucleus is the "atomic mass" of the atom. Different atoms of the same element may contain a different number of neutrons, and so have different atomic masses. (But they will have the same number of protons and the same atomic number.) Atoms of the same element with different atomic masses are called isotopes of that element.

Certain elements are radioactive—they emit various types of radiation from their atomic nuclei. Two common types of radiation are alpha particles and beta particles. An alpha particle, which is the equivalent of a helium nucleus, consists of two protons and two neutrons. It is written ${}^4_2\text{He}$ (the superscript 4 is the mass number of the particle, and the subscript 2 is its atomic number). A beta particle is an electron traveling at high speed. It is written ${}^0_{-1}\text{e}$. Both types of radiation are emitted at a very high speed and can easily penetrate other substances.

When atoms of a substance emit radiation, they are said to undergo radioactive decay. The result is a different element with a different atomic number and a different mass number. For example, when a radium atom emits an alpha particle, it decays into an atom of radon. This reaction is shown in the following equation:



Note that the equation is balanced. That is, the atomic number of the original atom on the left side of the equation equals the sum of the atomic numbers of the products on the right side of the equation. Similarly, the mass number of the original

atom equals the sum of the mass numbers of the products. Every nuclear reaction balances in this same manner.

Some types of nuclear radiation take place very slowly; other types are very rapid. The rate of radiation is measured in half-lives. A half-life is the time required for one-half the amount of a given radioactive substance to decay.

126. As radium emits alpha particles, the mass of radium will:

- F. increase.
- G. decrease.
- H. stay the same.
- J. either increase or decrease, depending on the conditions.

127. In nuclear chemistry notation, two isotopes, or forms, of cobalt are written ${}^{59}_{27}\text{Co}$ and ${}^{60}_{27}\text{Co}$. The difference between the two isotopes is:

- A. an alpha particle.
- B. a beta particle.
- C. a proton.
- D. a neutron.

128. An alpha particle has:

- F. no electric charge.
- G. a positive electric charge.
- H. a negative electric charge.
- J. a variable electric charge.

129. A beta particle has:

- A. no electric charge.
- B. a positive electric charge.
- C. a negative electric charge.
- D. a variable electric charge.

130. When an atom emits a beta particle, the atomic mass number will:

- F. increase.
- G. decrease.
- H. stay the same.
- J. either increase or decrease, depending on the conditions.