

California Standards Practice for Biology/ Life Sciences



Glencoe



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To the Student

Welcome to the Student Edition of *California Standards Practice for Biology/Life Sciences*.

Task Regimen

Task	At-Home Assignment	In-Class Assignment
Task 1	Using an answer key from the teacher, locate and review any questions you missed. Place a question mark beside any question you do not understand, and bring it to class for discussion.	The teacher administers the test in a realistic test-taking environment.
Task 2	For each question you missed, find the pages in the textbook that cover the material and explain what specific information was needed to answer the question correctly. If you cannot find any helpful information in the textbook, write out three questions you have about the test question.	Work in a group to discuss any confusing questions and content areas. Then work through the confusing questions together.
Task 3	For every incorrect question, go through each answer choice and explain why it is correct or incorrect. Include any tips or hints you noticed that helped you eliminate choices. Place a question mark beside any question you do not understand, and bring it to class for discussion.	Your teacher will lead a discussion for each question. Share your ideas and observations with the class. Keep notes of the discussion to help you review.
Task 4	Your teacher will provide you with a list of questions to practice. For each question, make observations and write down all of the information given in the test in the form of a graphic, a passage, or otherwise. Write the information directly on the test.	Work in a group to discuss each question. Make sure to note the location in the textbook where helpful information was found.

Test-Taking Tips: Student

Before the Test

- Be sure to get plenty of sleep the week before the test. A healthy amount of sleep is eight to nine hours every night.
- On the night before the test, try to do something relaxing but stimulating, such as playing a board game, exercising, or reading an enjoyable book. Cramming the night before the test can often hamper your memory and make you tired.
- On the morning of the test, eat a healthy breakfast with fresh foods that are high in protein and carbohydrates.
- On the morning of the test, clear your mind of any outside distractions so that you will be better able to focus on the test. If breaks are given during the test, use that time to relax and clear your mind.

During the Test

- Listen to and read all directions.
- Be sure you understand the question before reading the answer choices. Then, make sure to read and consider **every** answer choice.
- Remember to carefully consider all the information presented in the test's graphics.
- If the test is timed, be sure to pace yourself.
- Always choose an answer. By eliminating as many incorrect choices as possible, you will have a good chance of guessing correctly and obtaining more points.

California Standards for Biology/Life Sciences

Cell Biology

1. **The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:**
 - a. Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
 - b. Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.
 - c. Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
 - d. Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
 - e. Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.
 - f. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
 - g. Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.
 - h. Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.
 - i.* Students know how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.
 - j.* Students know how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.

Genetics

2. **Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:**
 - a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
 - b. Students know only certain cells in a multicellular organism undergo meiosis.
 - c. Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.
 - d. Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).
 - e. Students know why approximately half of an individual's DNA sequence comes from each parent.
 - f. Students know the role of chromosomes in determining an individual's sex.
 - g. Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.

California Standards for Biology/Life Sciences *continued*

Genetics *continued*

3. **A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:**
 - a. Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).
 - b. Students know the genetic basis for Mendel’s laws of segregation and independent assortment.
 - c.* Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.
 - d.* Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.

4. **Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:**
 - a. Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
 - b. Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
 - c. Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
 - d. Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
 - e. Students know proteins can differ from one another in the number and sequence of amino acids.
 - f.* Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.

5. **The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:**
 - a. Students know the general structures and functions of DNA, RNA, and protein.
 - b. Students know how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.
 - c. Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.
 - d.* Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.
 - e.* Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.

California Standards for Biology/Life Sciences *continued*

Ecology

6. **Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:**
- Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
 - Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
 - Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
 - Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
 - Students know a vital part of an ecosystem is the stability of its producers and decomposers.
 - Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
 - * Students know how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.

Evolution

7. **The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:**
- Students know why natural selection acts on the phenotype rather than the genotype of an organism.
 - Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
 - Students know new mutations are constantly being generated in a gene pool.
 - Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.
 - * Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.
 - * Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.

California Standards for Biology/Life Sciences *continued*

Evolution *continued*

- 8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:**
- Students know how natural selection determines the differential survival of groups of organisms.
 - Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
 - Students know the effects of genetic drift on the diversity of organisms in a population.
 - Students know reproductive or geographic isolation affects speciation.
 - Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
 - * Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.
 - * Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

Physiology

- 9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:**
- Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
 - Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
 - Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
 - Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
 - Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.
 - * Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
 - * Students know the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
 - * Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{2+} , and ATP.
 - * Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

California Standards for Biology/Life Sciences *continued*

Physiology *continued*

- 10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:**
- a. Students know the role of the skin in providing nonspecific defenses against infection.
 - b. Students know the role of antibodies in the body's response to infection.
 - c. Students know how vaccination protects an individual from infectious diseases.
 - d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
 - e. Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.
 - f.* Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

Name _____

Student Recording Chart

Directions: Circle each question from the Diagnostic Test that you answered *incorrectly*. If there are one or two circles marked for an indicator, write **Yes** in the **Need Practice?** box. Then complete the practice pages for that indicator.

Indicator	1. a.	1. b.	1. c.	1. d.	1. e.	1. f.	1. g.	1. h.	1. i.	1. j.
Test Questions	4	52	65	27	33	55	3	58	46	1
Need Practice?										
Practice Pages	8	8	9	9	10	10	11	11	12	12

Indicator	2. a.	2. b.	2. c.	2. d.	2. e.	2. f.	2. g.
Test Questions	51	29	41	56	7	36	42
Need Practice?							
Practice Pages	13	13	14	14	15	15	16

Indicator	3. a.	3. b.	3. c.	3. d.
Test Questions	64	53	18	48
Need Practice?				
Practice Pages	17	17	18	18

Indicator	4. a.	4. b.	4. c.	4. d.	4. e.	4. f.
Test Questions	22	44	66	25	17	60
Need Practice?						
Practice Pages	19	20	20	21	21	22

Name _____

Student Recording Chart *continued*

Indicator	5. a.	5. b.	5. c.	5. d.	5. e.
Test Questions	47	5	62	19	30
Need Practice?					
Practice Pages	23	23	24	25	25

Indicator	6. a.	6. b.	6. c.	6. d.	6. e.	6. f.	6. g.
Test Questions	40	45	38	12	32	61	6
Need Practice?							
Practice Pages	26	26	27	27	28	28	29

Indicator	7. a.	7. b.	7. c.	7. d.	7. e.	7. f.
Test Questions	63	39	9	2	57	16
Need Practice?						
Practice Pages	30	30	31	31	32	32

Indicator	8. a.	8. b.	8. c.	8. d.	8. e.	8. f.	8. g.
Test Questions	21	24	20	13	11	23	35
Need Practice?							
Practice Pages	33	33	34	34	35	35	36

Name _____

Student Recording Chart *continued*

Indicator	9. a.	9. b.	9. c.	9. d.	9. e.	9. f.	9. g.	9. h.	9. i.
Test Questions	49	34	15	37	28	10	59	14	54
Need Practice?									
Practice Pages	37	37	38	38	39	39	40	40	41

Indicator	10. a.	10. b.	10. c.	10. d.	10. e.	10. f.
Test Questions	67	50	31	8	43	26
Need Practice?						
Practice Pages	42	42	43	43	44	44

Diagnostic Test



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

- Eukaryotic cells are given shape and internal organization by their **1. j.**
 - cytoskeleton.
 - chromatids.
 - hylakoids.
 - Golgi bodies.
- Variation within a species increases the likelihood that **7. d.**
 - at least some members of a species will survive under changed environmental conditions.
 - none of the members of a species will survive under changed environmental conditions.
 - all members of a species will survive under changed environmental conditions.
 - changed environmental conditions are irrelevant to survival of a species.
- Plants utilize chlorophyll containing chloroplasts and mitochondria. What is the purpose of mitochondria when a cell already has chloroplasts? **1. g.**
 - to store vitamins
 - to turn sugars into energy
 - to help plants store water
 - to fight off infection and disease
- Which statement about the cell membrane is not true? **1. a.**
 - It helps give the cell its shape.
 - It is found only in animal cells.
 - It provides some protection for the cell.
 - It helps maintain homeostasis.
- Which is NOT correct base pairing? **5. b**
 - A-G
 - C-G
 - A-T
 - A-U
- While New World monkeys have prehensile tails that they use to move from tree to tree, orangutans do not. Predict an adaptation that orangutans might have made to facilitate their arboreal lifestyle. **6. g.**
 - increased brain-to-body ratio
 - opposable thumbs
 - long, muscled forelimbs
 - binocular vision
- After DNA testing, a student determines that 10,000 blue butterflies and three green butterflies belong to the same species. What can she conclude? **2. e.**
 - The butterfly species is blue.
 - The butterfly species can be green.
 - The green butterflies are a subspecies of the blue butterflies.
 - The green butterflies are a different species.
- Which statement correctly describes the effectiveness of the human immune system's antigens and the effectiveness of antibiotics? **10. d.**
 - Antigens can defend against viral or bacterial infections, while antibiotics can be used to treat only viral infections.
 - Antigens can defend against viral or bacterial infections, while antibiotics can be used to treat only bacterial infections.
 - Antigens can defend against only viral infections, while antibiotics can be used to treat bacterial or viral infections.
 - Antigens cannot defend against bacterial infections, while antibiotics can be used to treat bacterial or viral infections.
- To be inherited by future generations, a gene mutation would have to occur in **7. c.**
 - brain cells.
 - liver cells.
 - sex cells.
 - skin cells.



Diagnostic Test *(continued)*

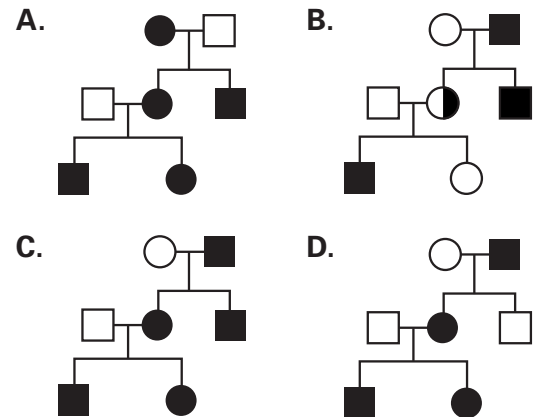


10. Physicians are able to filter the blood of patients with poorly functioning kidneys by using special machines. This process is called **9. f.**
- A. analysis.
 - B. excretion.
 - C. dialysis.
 - D. filtration.
11. Fossil evidence can reveal all of these except **8. e.**
- A. biological diversity.
 - B. episodic speciation.
 - C. mass extinction.
 - D. natural selection.
12. In the carbon cycle, atoms are usually returned to the atmosphere in the form of **6. d.**
- A. simple sugars.
 - B. carbon monoxide.
 - C. methane.
 - D. carbon dioxide.
13. Speciation is affected by **8. d.**
- A. reproductive or geographic isolation.
 - B. homologous structures.
 - C. genetic mutation.
 - D. genetic drift.
14. Two mountain climbers notice that as they climb and the temperature drops, they are able to see their breath when they exhale. They are able to see their breath is because it contains **9. h.**
- A. oxygen vapor.
 - B. water vapor.
 - C. nitrogen vapor.
 - D. carbon dioxide.
15. One similarity between the endocrine system and the nervous system is that they are both control systems. One difference is that the endocrine system **9. c.**
- A. does not react as quickly as the nervous system.
 - B. is made up of many neurons.
 - C. reacts more quickly than the nervous system.
 - D. does not release hormones into the blood.

16. The frequency of genotypes in a population and the given frequency of phenotypes can be determined by **7. f.**
- A. the Hardy-Weinberg equation.
 - B. the Price equation.
 - C. Muller's ratchet.
 - D. Ewen's sampling formula.

17. Proteins can differ from one another in the number and **4. e.**
- A. sequence of amino acids.
 - B. size of amino acids.
 - C. length of DNA sequence.
 - D. variety of base pairs.

18. The pedigree below shows how geneticists depict the inheritance of a trait through a family. Which shows the most likely inheritance of a sex-linked recessive trait? **3. c.**



19. Which is NOT an example of DNA technology that might be used to construct recombinant DNA molecules? **5. d.**
- A. restriction digestion by endonucleases
 - B. gel electrophoresis
 - C. ligation
 - D. transcription
20. In a population, genetic drift increases **8. c.**
- A. survival.
 - B. food sources.
 - C. phenotypes.
 - D. diversity.

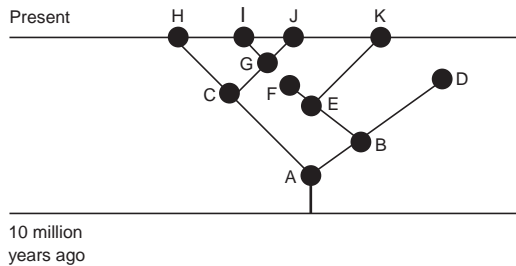


Diagnostic Test *(continued)*



21. Natural selection determines the **8. a.**
A. relationship of organisms to the biosphere.
B. differential survival of groups of organisms.
C. survival of hereditary anomalies.
D. frequency of an allele in the population.
22. Which lists the stages of protein production in the correct order? **4. a.**
A. DNA, translation, transcription
B. translation, transcription, DNA
C. transcription, DNA, translation
D. DNA, transcription, translation

23. The diagram below is called a cladogram. It shows the evolutionary history of species A through K. What information cannot be inferred from the diagram? **8. f.**



- A. ancestry
B. classification
C. anatomy
D. natural selection
24. A great diversity of species **8. b**
A. increases the chance that all organisms will survive major changes in the environment.
B. decreases the chance that some organisms will survive major changes in the environment.
C. decreases the chance that no organisms will survive major changes in the environment.
D. increases the chance that no organisms will survive major changes in the environment.
25. Specialization of cells in multicellular organisms is usually due to **4. d.**
A. different patterns of gene expression.
B. differences in the genes themselves.
C. differences in base pairs.
D. differences in mRNA.

26. Phagocytes, B-lymphocytes, and T-lymphocytes are all part of which system? **10. f.**
A. immune system
B. nervous system
C. endocrine system
D. digestive system
27. The flow of information from the transcription of RNA in the nucleus to translation of proteins on ribosomes is the basis of **1. d.**
A. protein synthesis.
B. gene transfer.
C. DNA synthesis.
D. gene mutation.
28. The chemical processes that go on in the human stomach, liver, and lungs help keep humans alive. All of those processes are part of **9. e.**
A. inorganic compounds.
B. the digestive system.
C. diffusion.
D. metabolism.
29. Which cells in a multicellular organism undergo meiosis? **2. b.**
A. sex cells
B. sperm
C. oocytes
D. prokaryotes
30. When exogenous DNA is inserted into bacterial cells, the result is **5. e.**
A. a new genetic makeup.
B. new DNA products.
C. a new organism.
D. a mutant.
31. An abiotic factor affecting the behavior and survival of organisms, such as birds and insects, in a community is the **6. e.**
A. number of secondary consumers.
B. number of daylight hours.
C. number of herbivores.
D. appearance of harmful bacteria.



Diagnostic Test *(continued)*



32. Vesicles formed in Golgi bodies contain **1. e.**
- A. mitochondria.
 - B. proteins.
 - C. ribosomes.
 - D. chromatin.

33. After vaccination, what is the first step in the process of developing immunity? **10. c.**
- A. Mature T cells destroy infected cells.
 - B. Fever and inflammation at the inoculation site “burn off” pathogens.
 - C. B cells encounter antigens on the surface of the pathogen and initiate manufacture of antibodies.
 - D. Complement complexes form holes in the bacterium’s plasma membrane, allowing water to enter and burst the cell.

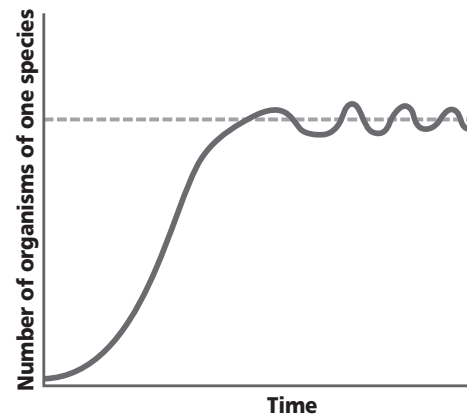
34. Which carry impulses from the skin to the central nervous system? **9. b.**
- A. sensory neurons
 - B. motor neurons
 - C. interneurons
 - D. synapses

35. A paleontologist discovers a layer of sedimentary rock filled with fossils of known and unknown species. She collects some of the fossils of the unknown species for further analysis. Which would improve her analysis? **8. g.**
- A. radioactive dating the unknown fossils with those from known species
 - B. digging deeper to the next sedimentary layer
 - C. studying the region’s geographic isolation
 - D. collecting all of the unknown fossils

36. In humans, sex is determined by which chromosome pair? **2. f.**
- A. 22
 - B. 23
 - C. 44
 - D. 46

37. The role of a neuron is to **9. d.**
- A. transmit electrochemical impulses.
 - B. complete an axon potential.
 - C. transmit motor impulses.
 - D. complete vertebrae to brain transmission.

38. A new species of mouse is introduced to an environment. As the mice reproduce and the population grows, food resources decrease and predation by hawks increases. Eventually, the number of mice levels off so that the rate of birth equals the rate of death. This nearly constant number of organisms, represented by the dotted line in the diagram below, is called **6. c.**



- A. carrying capacity.
- B. exponential growth.
- C. linear growth.
- D. competition.

39. Why do recessive lethal alleles, like the one that causes Tay-Sachs disease, persist in a population without killing it off? **7. b.**
- A. because natural selection works only on recessive phenotypes
 - B. because natural selection works only on dominant genotypes
 - C. because natural selection works on genotypes, not phenotypes
 - D. because natural selection works on phenotypes, not genotypes
40. A student is building a terrestrial biome model that represents the greatest biodiversity on Earth. The model will be of a **6. a.**
- A. taiga.
 - B. temperate forest.
 - C. tropical rain forest.
 - D. tundra.



Diagnostic Test *(continued)*



41. Random chromosome segregation explains the probability that a particular allele will be a **2. c.**
- A. gamete.
 - B. zygote.
 - C. eukaryotic cell.
 - D. homologous chromosome.

42. In the Punnett square, R and r represent **2. g.**

	R	R
r	Rr	Rr
r	Rr	Rr

- A. alleles.
 - B. hybrids.
 - C. environmental factors.
 - D. gametes.
43. How does HIV help other pathogens infect a person's body? **10. e.**
- A. It uses up the antibodies that the immune system produces for other antigens.
 - B. It attacks key cells of the immune system itself.
 - C. It overloads the immune system by reproducing very quickly.
 - D. It combines with other pathogens to create new diseases.
44. Genetic coding rules help predict the sequence of amino acids from a sequence of **4. b.**
- A. codons in RNA.
 - B. bases in nucleic acid.
 - C. chromosomes in a eukaryote.
 - D. mutations in a gene.
45. Some plants and animals have adaptations that enable them to survive in a desert ecosystem. Most of these adaptations are a response to which abiotic factor? **6. b.**
- A. number of consumers
 - B. number of producers
 - C. amount of rainfall
 - D. temperature range

46. Protons move into the intermembrane space **1. i.**
- A. with their accompanying electrons.
 - B. by eliminating ATP synthase.
 - C. and create a chemiosmotic gradient.
 - D. at any point along the intermembrane wall.

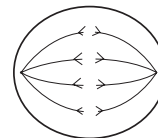
47. Which of these statements is true? **5. a.**
- A. DNA codes for RNA.
 - B. Proteins code for RNA.
 - C. RNA codes for DNA.
 - D. Proteins code for DNA.

48. Genes that cross over during meiosis with relatively high frequency **3. d.**
- A. are probably relatively distant from each other.
 - B. are probably relatively close to each other.
 - C. have locations that are difficult to predict.
 - D. lead to decreased genetic variability in gametes.

49. Which of these substances is NOT transported by the circulatory system to and from cells of the other major systems of the body? **9. a.**
- A. urea
 - B. water
 - C. ATP
 - D. NH_4

50. Antibodies are produced by cells **10. b.**
- A. so that they will bind to antigens.
 - B. in the presence of normal human proteins.
 - C. and then attack the cells that produce them.
 - D. called macrophages.

51. A student is looking at a drawing of the stage of meiosis when the egg is arrested prior to puberty. The drawing represents **2. a.**



- A. prophase I.
- B. metaphase I.
- C. anaphase I.
- D. telophase I.



Diagnostic Test *(continued)*



52. In a particular chemical reaction, substance A is converted into substance B. Which is probably the hypothesis for this experiment?
1. b.

Rate of Creation of A and B				
A (mol)	Rate of Creation of B when A is alone (mol/min)	Temperature (°C)	Rate of Creation of B when A is in the Presence of X (mol/min)	Amount of X Present
3	2.1	37	10.4	
5	2.9	37	14.6	
10	4.4	37	22.4	
30	8.0	37	33.8	

- A.** Substance X catalyzes the conversion of A to B.
B. Substance B can convert into substance X.
C. An increase in temperature decelerates most chemical reactions.
D. Large amounts of substance A cannot be affected by substance X.
53. The tall allele, *T*, is dominant to the short allele, *t*, in Mendel's pea plants. You examine a pea plant that exhibits a phenotype of tallness. After evaluating this data, you determine that its genotype **3. b.**
A. is *Tt*.
B. is *TT*.
C. is *tt*.
D. cannot be determined by the information given.
54. If blood contains too little or too much glucose, the endocrine system will respond by increasing or decreasing the glucose level. The endocrine system is a type of **9. i.**
A. positive feedback system.
B. equilibrium feedback system.
C. negative feedback system.
D. neutral feedback system.

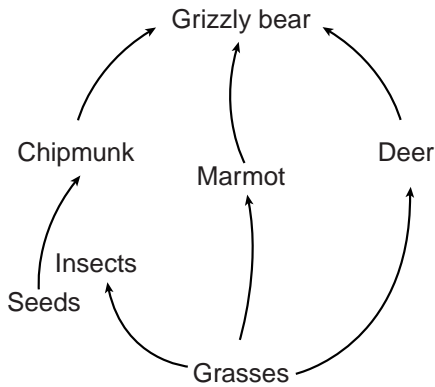
55. Chlorophyll is contained in a plant's **1. f.**
A. viruses.
B. roots.
C. chloroplasts.
D. mitochondria.
56. All are types of asexual reproduction except **2. d.**
A. budding.
B. fertilization.
C. regeneration.
D. fission.
57. Which is NOT one of the conditions for Hardy-Weinberg equilibrium in a large population? **7. e.**
A. There is a variable frequency of alleles and of genotypes over time.
B. Mating occurs randomly, without the influence of natural selection.
C. There is no migration of genes from neighboring populations.
D. Mating in a large population takes place without the occurrence of mutations.
58. Macromolecules such as polysaccharides, nucleic acids, proteins, and lipids in cells and organisms are synthesized from **1. h.**
A. a small collection of simple precursors.
B. a large group of micromolecules.
C. chromatin.
D. carbohydrates.
59. All of these muscles are examples of smooth muscle except **9. g.**
A. large intestines.
B. blood vessels.
C. bladder.
D. biceps.
60. Proteins that have different amino-acid sequences typically have different shapes and **4. f.**
A. chemical properties.
B. sizes.
C. energy levels.
D. abilities to act as enzymes.



Diagnostic Test *(continued)*

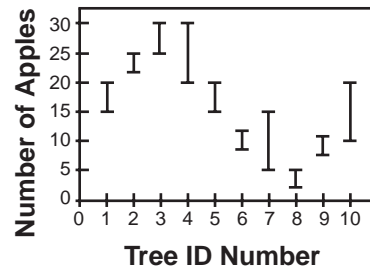


61. The model of a food web is shown below. Which is true about biomass at the trophic levels shown? **6. f.**



- A. Grizzly bears have the highest biomass.
 B. Grasses have the lowest biomass.
 C. Deer have a higher biomass than grizzly bears.
 D. Seeds have a lower biomass than chipmunks.
62. A corn plant that has been bred to have extra growth hormone is an example of **5. c.**
- A. genetic engineering.
 B. gene mutation.
 C. unethical bioengineering.
 D. Mendelian genetics.
63. Which statement best explains how natural selection occurs? **7. a.**
- A. Natural selection occurs when adaptations help an organism reproduce and survive.
 B. Natural selection occurs when organisms are geographically isolated.
 C. Natural selection occurs when an organism's offspring grow vestigial structures.
 D. Natural selection occurs when characteristics from the parent organisms are inherited.

64. Diego wants to grow apple trees. He knows that if a particular tree produces many apples every year, its offspring will probably also produce many apples. He has recorded the number of apples harvested from ten trees every year for several years. According to his data, which tree is most likely to produce fewer than 12 apples in any given year? **3. a.**



- A. Tree 7
 B. Tree 8
 C. Tree 9
 D. Tree 10
65. A chemical that harms only prokaryotic cells would affect **1. c.**
- A. fungi.
 B. plants.
 C. animals.
 D. bacteria.
66. Under which heading in a table of contents would the most information about mutations be found? **4. c.**
- A. plant reproduction
 B. genes and heredity
 C. classification of animals
 D. photosynthesis
67. All of these help your body defend itself against pathogens and might prevent disease except **10. a.**
- A. skin.
 B. cilia.
 C. enzymes.
 D. red blood cells.



Standards Practice

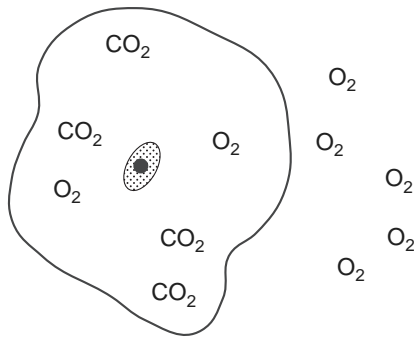
Cell Biology



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

1. a. Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.

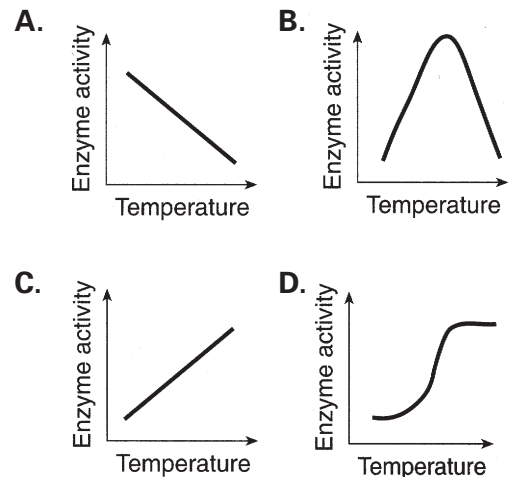
- The plasma membrane of a living plant cell
 - is composed of proteins and lipids only.
 - selectively regulates the passage of substances into and out of a cell.
 - has the same permeability to all substances found inside or outside a cell.
 - is a double protein layer with floating lipid molecules.
- The diagram below represents a cell in water. Formulas of molecules that can move freely across the cell membrane are shown. Some molecules are inside the cell, and others are in the water outside the cell. Based on the distribution of these molecules, what will most likely happen after a period of time?



- The concentration of O_2 will increase inside the cell.
 - The concentration of CO_2 will remain the same inside the cell.
 - The concentration of O_2 will remain the same outside the cell.
 - The concentration of CO_2 will decrease outside the cell.
- The job of a cell's plasma membrane is to
 - function as a flexible boundary between the cell and the environment.
 - maintain contact with similar cells in tissues.
 - keep glucose and amino acids in the bloodstream and none in the cell.
 - regulate water levels.

1. b. Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.

- Which organelle builds proteins?
 - lysosome
 - ribosome
 - nucleus
 - vacuole
- Which is a protein that changes the rate of chemical reactions?
 - chlorophyll
 - reactant
 - enzyme
 - chloroplast
- Enzymes have an optimum temperature at which they work best. Temperatures above and below this optimum will decrease enzyme activity. Which graph illustrates the effect of temperature on enzyme activity?



- During which phase of meiosis do homologous chromosomes align as tetrads in the middle of the spindle?
 - prophase I
 - prophase II
 - metaphase I
 - metaphase II

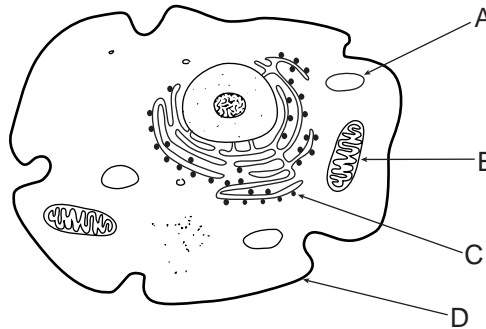
Standards Practice

Cell Biology



- 1. c.** Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
8. Which statement describing the cells in a body system is correct?
- A. Each cell in the system is identical to the other cells in the system, and each cell works independently of the other cells.
 - B. Some cells in the system might be different from the other cells in the system, but all cells are coordinated and work together.
 - C. Each cell in the system is different from the other cells in the system, and each cell works independently of the other cells.
 - D. All cells in the system are identical to each other and work together.
9. What is the name for the outer coat of proteins that surrounds the viral core of nucleic acids?
- A. capsule
 - B. envelope
 - C. membrane
 - D. capsid
10. In which virus do tail fibers enable the attachment of the virus to the host cell?
- A. adenovirus
 - B. poliovirus
 - C. bacteriophage T4
 - D. all of the above
11. While looking at virally infected cells under a microscope, you notice that as time progresses, cells seem to be bursting and dying. Which infectious cycle is the virus undergoing?
- A. latency cycle
 - B. lytic cycle
 - C. lysogenic cycle
 - D. binary fission

- 1. d.** Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
12. Which letter in the diagram below indicates the structure that is most closely associated with protein building?



- A. A
 - B. B
 - C. C
 - D. D
13. There are 64 different mRNA codons in the genetic code. How many possible codons would there be if a codon consisted of only two nucleotides?
- A. 64
 - B. 32
 - C. 16
 - D. 8
14. In most organisms, the start of translation is signaled by an AUG codon. What is the first amino acid in most proteins?
- A. proline
 - B. leucine
 - C. isoleucine
 - D. methionine
15. What is the complementary mRNA sequence to the DNA sequence A-T-T-G-C-A?
- A. T-A-A-C-G-T
 - B. U-A-A-C-G-T
 - C. U-A-A-C-G-U
 - D. T-A-A-G-C-U

Standards Practice

Cell Biology



1. e. Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.

16. Which statement is not true about ribosomes?
- A. Ribosomes build proteins by following the directions of the DNA.
 - B. Ribosomes are made in the cytoplasm of the cell.
 - C. Ribosomes attach to the endoplasmic reticulum when they are in the cytoplasm.
 - D. Ribosomes are not bound by a membrane.
17. An environmental toxin interferes with certain cellular functions. When affected cells are examined, it is observed that proteins that are normally found on the plasma membrane are instead found in the cytoplasm. Other proteins are located improperly as well. Which structure is most likely affected by the toxin?
- A. lysosome
 - B. mitochondrion
 - C. cell wall
 - D. Golgi apparatus
18. The endoplasmic reticulum is found only in the
- A. eukaryotic cell.
 - B. ribosomes.
 - C. prokaryotic cell.
 - D. nuclear envelope.
19. After proteins are made, they are transferred from the endoplasmic reticulum to the
- A. Golgi apparatus.
 - B. lysosomes.
 - C. mitochondria.
 - D. chloroplasts.

1. f. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.

20. Chlorophyll is the primary pigment in plant chloroplasts. It absorbs all wavelengths of light except
- A. green.
 - B. red.
 - C. yellow.
 - D. green, red, and yellow.
21. Where do the light-independent reactions of photosynthesis take place?
- A. stroma
 - B. thylakoid membrane
 - C. mitochondria
 - D. cell wall
22. In an investigation, three seeds of the same species were allowed to germinate and grow in three different locations. Each seedling was grown in the same amount and type of soil, and each received the same amount of water during a six-day period. At the end of the investigation, the height of each seedling and the color of its leaves were recorded. The results are shown in the data table. Which hypothesis was most likely being tested in this investigation?

Location	Height (cm)	Leaf Color
Sunny windowsill	7	green
Indirect sunlight	9	green
Closed closet	11	whitish yellow

- A. A plant grown in the dark will not be green.
- B. The type of soil in which a plant is grown influences how tall it will be.
- C. Plants need water to grow.
- D. Plants grown in red light are taller than plants grown in green light.

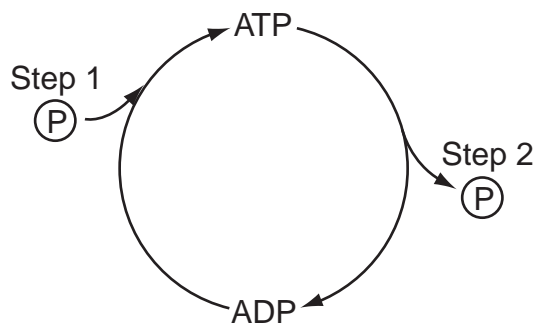
Standards Practice

Cell Biology



1. g. Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.

23. Every unicellular organism is able to survive because it carries out
- A. metabolic activities.
 - B. autotrophic nutrition.
 - C. heterotrophic nutrition.
 - D. sexual reproduction.
24. During glycolysis, a molecule of glucose is broken down into two molecules of
- A. PGAL.
 - B. pyruvic acid.
 - C. NADP⁺.
 - D. acetyl-CoA.
25. The diagram below represents part of the process of cellular respiration. Energy is released and made available for metabolic activities at



- A. Step 1 only.
 - B. Step 2 only.
 - C. both Step 1 and Step 2.
 - D. neither Step 1 nor Step 2.
26. The chemical energy generated by chloroplasts is stored in the bonds of sugar molecules until they are broken down by
- A. mitochondria.
 - B. ATP molecules.
 - C. microtubules.
 - D. lysosomes.

1. h. Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.

27. The simplest type of carbohydrate is called a
- A. monosaccharide.
 - B. polysaccharide.
 - C. disaccharide.
 - D. sugar.
28. The largest carbohydrate is composed of
- A. simple starches.
 - B. polymers of many monosaccharide units.
 - C. branched chains of lipid units.
 - D. polymers of many polysaccharide units.
29. Lipids are large biomolecules that form from
- A. carbon units.
 - B. carbon, hydrogen, and oxygen.
 - C. fats.
 - D. polymers of different monosaccharides.
30. The basic building blocks of proteins are
- A. bases.
 - B. sugars.
 - C. amino acids.
 - D. nitrogen polymers.
31. The covalent bond between two amino acids is a(n)
- A. polar molecule.
 - B. amino group.
 - C. hydrogen bond.
 - D. peptide bond.

Standards Practice

Cell Biology

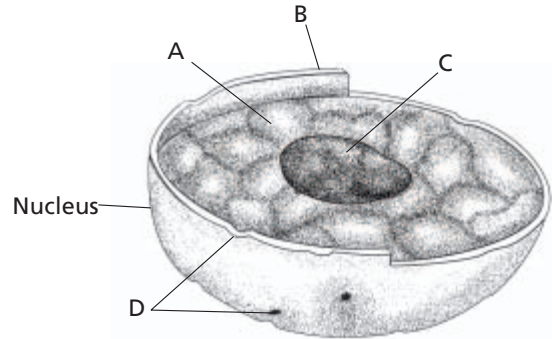


1. i. Students know how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.

32. Which are waste products of cellular respiration?
- A. carbon dioxide and water
 - B. carbon dioxide and ATP
 - C. water and oxygen
 - D. ATP and oxygen
33. In which cell organelle is the process of cellular respiration concluded?
- A. chloroplast
 - B. endoplasmic reticulum
 - C. mitochondrion
 - D. nucleus
34. Which statement best describes the process of cellular respiration?
- A. Cellular respiration circulates nutrients to cells.
 - B. Cellular respiration uses carbon dioxide and water to synthesize glucose.
 - C. Cellular respiration splits water molecules.
 - D. Cellular respiration converts chemical energy into a usable form.
35. How many molecules of ATP are produced through glycolysis?
- A. 2
 - B. 4
 - C. 36
 - D. 38
36. Which two organ systems provide materials required for the human body to produce ATP?
- A. reproductive and excretory
 - B. digestive and respiratory
 - C. respiratory and immune
 - D. digestive and reproductive

1. j. Students know how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.

37. What part of the nucleus is labeled C?



- A. chromatin
 - B. nuclear envelope
 - C. nucleolus
 - D. cytoplasm
38. Cells of which type of organism have cell walls?
- A. plant
 - B. human
 - C. bacterium
 - D. fungus
39. The cytoskeleton is a network of tiny rods and filaments called
- A. microtubules.
 - B. inner folds.
 - C. spindles.
 - D. vacuoles.
40. The cytoskeleton can be rearranged. This allows the cell to
- A. move.
 - B. change shape.
 - C. be selectively permeable.
 - D. be supported and anchored.

Standards Practice

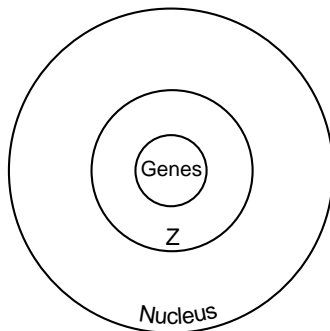
Genetics: Meiosis and Fertilization



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

2. a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.

1. The diagram below represents the organization of genetic information within a cell nucleus. The circle labeled Z most likely represents



- A. amino acids.
B. chromosomes.
C. vacuoles.
D. molecular bases.
2. Which statement best explains the significance of meiosis in the process of evolution within a species?
- A. The gametes produced by meiosis ensure the continuation of any particular species by asexual reproduction.
B. Equal numbers of eggs and sperm are produced by meiosis.
C. Meiosis produces eggs and sperm that are alike.
D. Meiosis provides for variation in the gametes produced by an organism.
3. For a human zygote to become an embryo, it must undergo
- A. meiosis.
B. mitotic divisions.
C. regeneration.
D. disjunction.

2. b. Students know only certain cells in a multicellular organism undergo meiosis.

4. During which stage of cell division does the number of chromosomes decrease from diploid ($2n$) to haploid (n)?
- A. prophase I
B. meiosis I
C. meiosis II
D. mitosis
5. Changes in the genetic code of a human can be transmitted to offspring if the changes occur in
- A. cancer cells.
B. gametes.
C. cell membranes.
D. evolution.
6. Which statement is true of both meiosis and mitosis?
- A. Both are involved in asexual reproduction.
B. Both occur only in reproductive cells.
C. The number of chromosomes is reduced by half.
D. DNA replication occurs before the division of the nucleus.
7. Which statement is true of meiosis?
- A. Only gametes undergo meiosis.
B. All cells undergo meiosis.
C. Meiosis reduces the number of chromosomes by 25 percent.
D. DNA replication occurs only in cells undergoing meiosis.
8. Meiosis is a process restricted to
- A. sex cells.
B. body cells.
C. animal cells.
D. prokaryotes.

Standards Practice

Genetics: Meiosis and Fertilization



2. c. Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.

9. Crossing over can occur
 - A. at any location on a chromosome.
 - B. only during metaphase.
 - C. in a tetrad on the spindle.
 - D. when the DNA coils.
10. The kind of cell division that allows offspring to have the same number of chromosomes as their parents is called
 - A. meiosis.
 - B. nondisjunction.
 - C. mitosis.
 - D. polyploidy.
11. Meiosis consists of
 - A. two separate divisions.
 - B. four diploid cells.
 - C. four separate divisions.
 - D. two haploid cells.
12. Random chromosome segregation explains the probability that a particular allele will be in a(n)
 - A. body cell.
 - B. embryo.
 - C. somatic cell.
 - D. gamete.
13. Which diagram best represents part of the process of sperm formation in an organism that has a normal chromosome number of eight?

A.

B.

C.

D.

2. d. Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).

14. New inheritable characteristics would be least likely to result from
 - A. mutations that occur in muscle cells and skin cells.
 - B. mutations that occur in male gametes.
 - C. mutations that occur in female gametes.
 - D. the sorting and recombination of existing genes during meiosis and fertilization.
15. The chromosome content of a skin cell is about to form two new cells, as represented in the diagram below. Which diagram best represents the chromosomes that would be found in the two new skin cells produced as a result of this process?

 - A.
 - B.
 - C.
 - D.

Standards Practice

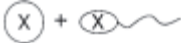
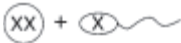


Genetics: Meiosis and Fertilization



2. e. Students know why approximately half of an individual's DNA sequence comes from each parent.

17. Which statement provides the best evidence that the environment interacts with genes in the development and expression of inherited traits?
- A. Organisms produced asexually are genetically identical.
 - B. People who have cancer can pass the defective gene to their offspring.
 - C. Mutations happen randomly and can be harmful or helpful to organisms.
 - D. Identical twins who were not raised together have different heights and weights.
18. During which phase of mitosis are sister chromatids pulled to opposite sides of the cell?
- A. prophase
 - B. metaphase
 - C. anaphase
 - D. telophase
19. Approximately half of an individual's DNA sequence comes from each parent during
- A. mitosis.
 - B. prophase I.
 - C. meiosis.
 - D. prophase II.
20. Each parent gives one allele for each
- A. nucleotide.
 - B. tetrad.
 - C. chromosome.
 - D. trait.

2. f. Students know the role of chromosomes in determining an individual's sex.

21. An individual's sex is determined by his or her
- A. chromosomes.
 - B. gametes.
 - C. DNA.
 - D. chromosome segregation.
22. Which diagram illustrates fertilization that would most likely lead to the development of a normal human female?
- A. 
 - B. 
 - C. 
 - D. 
23. Which does NOT play a role in determining an individual's sex?
- A. gametes
 - B. chromosomes
 - C. meiosis
 - D. somatic cells
24. All genes on a chromosome that determine sex are linked and inherited
- A. separately following division.
 - B. randomly.
 - C. according to sex.
 - D. together.
25. In humans, sex is determined by which chromosome pair?
- A. 22
 - B. 23
 - C. 44
 - D. 46

Standards Practice

Genetics: Meiosis and Fertilization



2. g. Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.

26. You perform a monohybrid cross between two true-breeding strains of organisms with genotypes AA and aa . What do you expect the ratio of genotypes to be in the F_1 generation?
- 3:1
 - 9:3:3:1
 - 1:2:1
 - 2:2
27. Which was concluded by Mendel as a result of his genetic research?
- Genes for different traits are inherited together in pairs.
 - Polyploidy can be beneficial in agriculture.
 - Genes for different traits are inherited independently of one another.
 - Meiosis occurs in two steps—meiosis I and meiosis II.
28. Pairs of chromosomes having genes for the same traits are said to be
- homologous.
 - analogous.
 - homozygous.
 - dominant.

29. A researcher crosses the F_1 generation of two snapdragon plants. According to this information, what is the ratio of their offspring (F_2)?

	R	r										
R	RR	Rr	<table border="1"> <thead> <tr> <th>Genotype</th> <th>Phenotype</th> </tr> </thead> <tbody> <tr> <td>RR</td> <td>red</td> </tr> <tr> <td>Rr</td> <td>pink</td> </tr> <tr> <td>rr</td> <td>white</td> </tr> </tbody> </table>	Genotype	Phenotype	RR	red	Rr	pink	rr	white	
Genotype	Phenotype											
RR	red											
Rr	pink											
rr	white											
r	Rr	rr										

- 0 red; 4 pink; 0 white
- 1 red; 2 pink; 1 white
- 3 red; 0 pink; 1 white
- 4 red; 0 pink; 0 white

Standards Practice

Genetics: Mendel's Laws



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

3. a. Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).

1. After performing a monohybrid cross, it is important to analyze the results with a Punnett square. Each box of a Punnett square represents
 - A. a possible phenotype.
 - B. a possible genotype.
 - C. one individual.
 - D. two possible genotypes.
2. A man carrying the allele for Huntington's disease marries a woman who is homozygous recessive for the allele. The probability that their offspring will develop Huntington's disease is
 - A. 25 percent.
 - B. 50 percent.
 - C. 75 percent.
 - D. none of the above.
3. An individual has type AB blood. His father has type A blood, and his mother has type B blood. The individual's phenotype is an example of
 - A. simple recessive heredity.
 - B. simple dominant heredity.
 - C. incomplete dominance.
 - D. codominance.
4. Which condition is not mediated by X-linked inheritance?
 - A. hemophilia
 - B. sickle-cell disease
 - C. retinitis pigmentosa
 - D. color blindness

3. b. Students know the genetic basis for Mendel's laws of segregation and independent assortment.

5. Many traits, such as stem length, are controlled by multiple genes. This is called
 - A. simple dominant inheritance.
 - B. monogenic inheritance.
 - C. polygenic inheritance.
 - D. codominance.
6. A couple has a child who, with respect to a specific trait, resembles neither parent. Which is NOT a possible mechanism for this trait?
 - A. simple recessive heredity
 - B. codominance
 - C. incomplete dominance
 - D. simple dominant heredity
7. In order to determine the genotype of an organism, researchers can perform a test cross between the unknown organism and an organism that is
 - A. homozygous dominant.
 - B. heterozygous.
 - C. homozygous recessive.
 - D. all of the above.
8. You perform a test cross and conclude that the unknown genotype is homozygous dominant. What phenotype ratio (dominant to recessive) will the offspring of the test cross show?
 - A. 1:0
 - B. 1:1
 - C. 0:1
 - D. 2:1

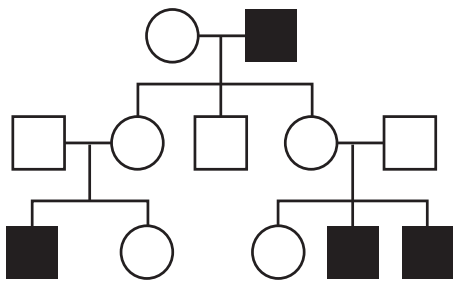
Standards Practice

Genetics: Mendel's Laws



3. c. Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.

9. You and your colleagues are constructing a pedigree for a patient with cystic fibrosis. The individual's brother has also been diagnosed with cystic fibrosis. How would this brother be represented in the pedigree?
 - A. shaded circle
 - B. shaded square
 - C. open circle
 - D. open square
10. A pedigree differs from a cladogram in that pedigrees indicate
 - A. proposed ancestry.
 - B. phylogeny of a species.
 - C. direct ancestry from two parents.
 - D. number of derived traits.
11. A pedigree uses which to study a trait?
 - A. records of phenotypes
 - B. DNA evidence
 - C. records of genotypes
 - D. several generations represented on a family tree
12. What can you conclude about the trait followed in the pedigree below?



- A. It is incompletely dominant in every other generation.
- B. It is coded for a sex-linked gene.
- C. It affects only females.
- D. The trait shows polygenic inheritance.

3. d. Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.

13. When creating a linkage map, you must analyze the frequency of recombination in the genome. What would a very low frequency of crossover indicate about two genes?
 - A. They are on the same chromosome but very far apart.
 - B. They are on the same chromosome and are very close together.
 - C. They are on different chromosomes.
 - D. It cannot be determined from the information given.
14. The frequency of recombination in a gene can be analyzed on a
 - A. cladogram.
 - B. chromosome map.
 - C. pedigree.
 - D. karyotype.
15. The data on frequency of recombination at meiosis can be used to interpret genetic maps of chromosomes and to
 - A. determine the sex of offspring.
 - B. build a chromosome pedigree.
 - C. predict nondisjunction.
 - D. estimate genetic distances between loci.
16. Which is likely to happen to genes whose loci are far apart?
 - A. They will cross over.
 - B. They will separate prematurely.
 - C. They will avoid crossing over.
 - D. They will have a shorter distance between loci.

Standards Practice

Genetics: Molecular Biology



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

4. a. Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.

- Use the table below to answer this question. A codon consists of the bases uracil, cytosine, and guanine in that order. Which amino acid is represented by this order?

First Base in Codon	Second Base in Codon				Third Base in Codon
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	methionine (start)	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	A
	valine	alanine	glutamate	glycine	C
	valine	alanine	glutamate	glycine	G

- cysteine
- phenylalanine
- serine
- tryptophan

- Which correctly sequences the main steps involved in protein synthesis?
 - Free RNA nucleotides form mRNA; mRNA attaches to a ribosome; tRNA molecules pair with mRNA codons as mRNA slides along the ribosome; amino acids are joined by an enzyme.
 - Free RNA nucleotides form tRNA; mRNA attaches to a ribosome; tRNA molecules pair with mRNA codons as mRNA slides along the ribosome; amino acids are joined by a hormone.
 - Free RNA nucleotides form tRNA; tRNA attaches to a ribosome; tRNA molecules pair with mRNA codons as mRNA slides along the ribosome; amino acids are joined by an enzyme.
 - Free RNA nucleotides form tRNA; mRNA attaches to a ribosome; tRNA molecules pair with mRNA codons as tRNA slides along the Golgi apparatus; nucleotides are joined by an enzyme.

- Which best describes the role of RNA molecules that form in the nucleus?
 - RNA molecules are messengers that carry the code from the DNA to the ribosomes.
 - RNA molecules are responsible for the genetic code.
 - RNA molecules attach to ribosomes.
 - RNA molecules determine how an organism looks and acts.
- When mRNA is transcribed from DNA, both introns and exons are
 - copied.
 - doubled.
 - deleted.
 - over.

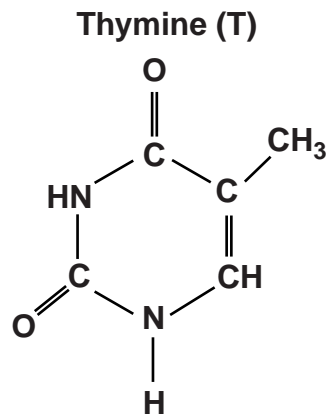
Standards Practice

Genetics: Molecular Biology



4. b. Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.

5. Which nitrogen base sequence does NOT code for alanine?
- A. GCU
 - B. GCC
 - C. GCA
 - D. GUG
6. What is the second nitrogen base in the codon that represents the amino acid methionine?
- A. uracil
 - B. adenine
 - C. guanine
 - D. cytosine
7. Which base is the complementary strand of the base shown below?



- A. adenine
 - B. guanine
 - C. cytosine
 - D. uracil
8. Genes involved in the production of abnormal red blood cells have an abnormal sequence of
- A. ATP.
 - B. amino acids.
 - C. sugars.
 - D. bases.

4. c. Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in the encoded protein.

9. Mutations can be considered one of the raw materials of evolution because they
- A. contribute to new variations in organisms.
 - B. are usually well-adapted to the environment in which they appear.
 - C. are usually beneficial to the organism in which they appear.
 - D. are usually harmful and cause species of organisms to become extinct.
10. A characteristic of mutations is that they usually
- A. are caused only by events in mitosis.
 - B. do not occur randomly.
 - C. result in different genetic sequences.
 - D. occur to meet the needs of a species.
11. Exposure to cosmic rays, X-rays, ultraviolet rays, and radiation from radioactive substances might promote
- A. the production of similar organisms.
 - B. diversity among organisms.
 - C. an increase in the population size.
 - D. a change from sexual to asexual reproduction.
12. Why can the deletion due to a mutation of a single nitrogen base in DNA be harmful to an organism?
- A. Deletion causes chromosomes to join backward or to join to the wrong chromosome.
 - B. Nearly every amino acid in the protein will change after the deletion of a base.
 - C. Deletion causes a gamete to have an extra chromosome.
 - D. Such a mutation causes one chromosome to break off and join to another.

Standards Practice

Genetics: Molecular Biology

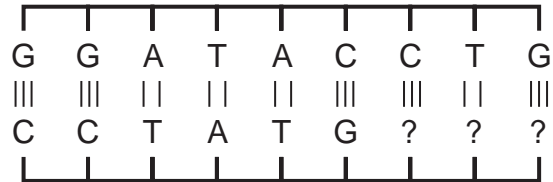


4. d. Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.

- 13.** Which statement is true?
- The nitrogen bases that make up the DNA nucleotides of plants are much different from the bases found in animals.
 - The more closely related two organisms are, the more alike the order of their DNA.
 - Changes in genes do not affect any of the traits of an individual.
 - A given sequence of bases can result in a number of different amino acids.
- 14.** A purebred animal with brown fur is crossed with a purebred animal with tan fur. The offspring has both tan and brown fur. What type of inheritance pattern is involved?
- incomplete dominance
 - polygenic inheritance
 - codominance
 - simple inheritance
- 15.** A plant species is observed to have red, yellow, white, pink, or purple flowers. What type of inheritance is shown by this plant?
- incomplete dominance
 - polygenic inheritance
 - codominance
 - simple inheritance
- 16.** A plant shows incomplete dominance. First generation offspring of a cross between plants with white flowers and plants with purple flowers will produce flowers with which color?
- white
 - light blue
 - light purple
 - dark purple

4. e. Students know proteins can differ from one another in the number and sequence of amino acids.

- 17.** The diagram shows a portion of a DNA molecule. The letters in the diagram represent the four bases: adenine (A), thymine (T), guanine (G), and cytosine (C). Which sequence of bases do the question marks represent?



- C-A-C
 - G-C-A
 - G-A-C
 - T-C-A
- 18.** Which codon does NOT code for leucine?
- CUU
 - CUG
 - UUA
 - CCA
- 19.** If a strand of DNA had bases in the order ATCCGTC, what would be the order of the bases in the complementary strand of DNA?
- ATCCGTC
 - TAGGCAG
 - GAGGCAT
 - GCTTACT
- 20.** The DNA message depends on the order of the
- nitrogen bases.
 - acids.
 - sugars.
 - genes.

Standards Practice

Genetics: Molecular Biology



- 4. f.** Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.

Use the graphic below to answer questions 21 and 22.



- 21.** What kind of molecule is shown above?
- A.** replicated DNA
 - B.** messenger RNA
 - C.** transfer RNA
 - D.** transfer DNA

- 22.** Which nitrogen base sequence will complement the anticodon shown?

- A.** AUG
- B.** GUA
- C.** TCG
- D.** AUT

- 23.** Proteins that have different amino acid sequences typically have different shapes and chemical properties because they

- A.** perform different functions in the body.
- B.** are made from different genes.
- C.** have more or fewer amino acids.
- D.** came from single- or double-stranded RNA.

Standards Practice

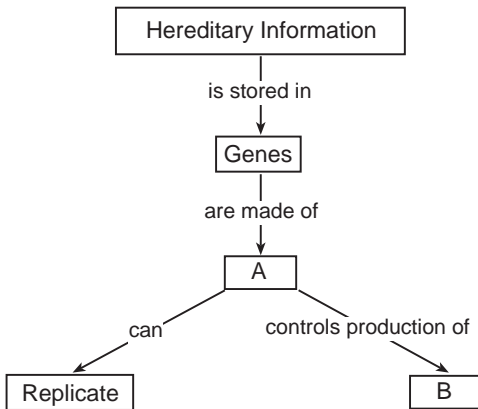
Genetics: Biotechnology



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

5. a. Students know the general structures and functions of DNA, RNA, and protein.

- A molecule of DNA is composed of
 - receptor enzymes.
 - ATP and enzymes.
 - amino acids and proteins.
 - paired bases (A,T, G, C).
- The presence of DNA is important for the cellular metabolic activities because DNA
 - directs the production of enzymes.
 - is a structural component of cell membranes.
 - directly increases the solubility of nutrients.
 - is the major component of cytoplasm.
- In the diagram below, which molecules are represented by box B?



- bases
 - proteins
 - amino acids
 - simple sugars
- Which statement best describes the relationship among cells, DNA, and protein?
 - Cells contain DNA.
 - DNA is composed of protein.
 - Proteins produce cells.
 - Cells are linked together by proteins.

5. b. Students know how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.

- The nucleotide sequence A-T-T-A-C-G would base-pair with which of the following?
 - T-A-A-T-G-C
 - T-A-C-T-G-C
 - T-U-A-T-G-C
 - T-A-T-T-G-C
- In DNA, cytosine forms three hydrogen bonds with
 - guanine.
 - adenine.
 - thymine.
 - uracil.
- In semiconservative replication, each strand of DNA serves as a
 - pattern.
 - template.
 - new strand.
 - enzyme.
- What is the function of mRNA?
 - form ribosomes
 - transport amino acids
 - carry RNA polymerase
 - direct protein synthesis
- When all the DNA of all the chromosomes in a cell have copied, how many copies are there of the organism's genetic information?
 - one
 - two
 - four
 - six

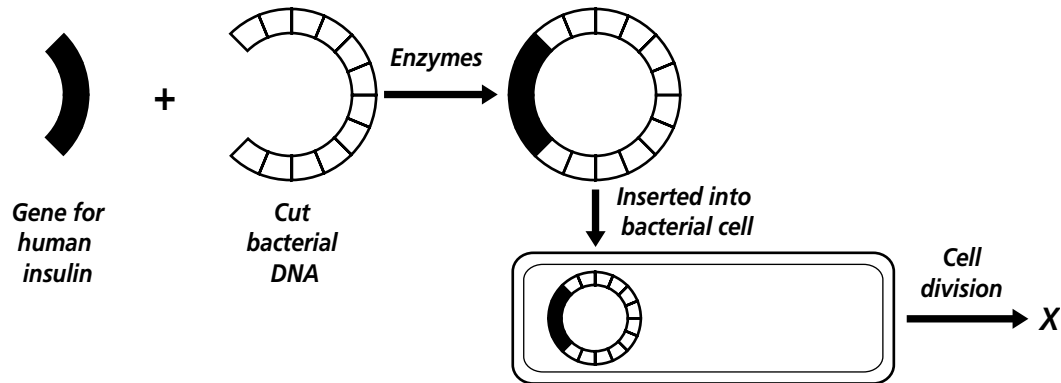
Standards Practice

Genetics: Biotechnology



5. c. Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

10. The diagram below illustrates some key steps of a biotechnological procedure. The letter X most likely represents



- A. human cells able to resist antibiotics.
- B. human cells unable to synthesize antibodies.
- C. bacterial cells able to synthesize insulin.
- D. bacterial cells unable to synthesize insulin.

11. Which process is a common practice that has been used by farmers for hundreds of years to develop new plant and animal varieties?

- A. cloning
- B. genetic engineering
- C. cutting DNA and removing segments
- D. selective breeding for desirable traits

12. The nucleus is removed from a body cell of one organism and is placed in an egg cell that has had its nucleus removed. This process, which results in the production of organisms that are genetically alike, is known as

- A. cloning.
- B. fertilization.
- C. biological adaptation.
- D. DNA production.

Standards Practice

Genetics: Biotechnology

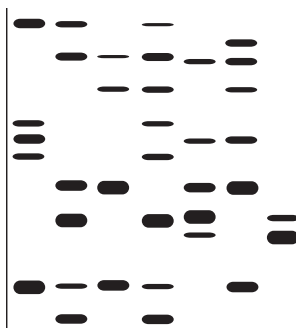


5. d. Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.

13. Restriction enzymes are used to
- maintain homeostasis.
 - transfer DNA fragments to plasmids.
 - cleave DNA strands at specific nucleotide sequences.
 - inhibit catalyzing reactions within cells.
14. A DNA fragment has been cleaved as shown in the model below. After this operation, each single strand is left with



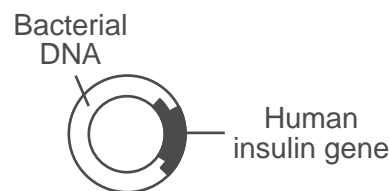
- sticky ends.
 - blunt ends.
 - spliced genes.
 - non-palindromic sequences.
15. The model below represents the outcome from a step used in the recombinant DNA process. What is the step called?



- DNA sequencing
 - gel electrophoresis
 - cloning genes
 - splicing genes
16. Indicate the missing step in the sequence below.
- cleave DNA → ? → insertion vector
- use restriction enzymes
 - produce human hormones
 - clone gene
 - splice gene into plasmid

5. e. Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.

17. The insertion of a human DNA fragment into a bacterial cell might make it possible for
- the bacterial cell to produce human protein.
 - the cloning of the human that donated the fragment.
 - humans to become immune to an infection by this type of bacteria.
 - the cloning of this type of bacteria.
18. Dolly is a sheep developed from an egg cell of her mother that had its nucleus replaced by a nucleus from a body cell of her mother. As a result of this technique, Dolly is
- no longer able to reproduce.
 - genetically identical to her mother.
 - able to have a longer life span.
 - unable to mate.
19. One variety of strawberry is resistant to a damaging fungus, but it produces small fruit. Another strawberry variety produces large fruit, but it is not resistant to the same fungus. The two desirable qualities can be combined in a new variety of strawberry plant by
- cloning.
 - asexual reproduction.
 - direct harvesting.
 - selective breeding.
20. A product of genetic engineering technology is represented below. Which substance was needed to join the insulin gene to the bacterial DNA as shown?



- specific carbohydrate
- specific enzyme
- hormones
- antibodies

Standards Practice

Ecology



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

- 6. a.** Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
1. One explanation for the variety of organisms present on Earth today is that over time
 - A. the environment has remained unchanged, causing rapid evolution.
 - B. each environment has changed to support a certain variety of organism.
 - C. new species have adapted to fill available niches in the environment.
 - D. evolution has caused the appearance of organisms that are similar to each other.
 2. Which statement is not a cause of extinction?
 - A. Members of an extinct species had plentiful food.
 - B. Members of an extinct species were able to conceal their presence by camouflage.
 - C. Members of an extinct species lacked adaptations necessary for survival.
 - D. Members of an extinct species were able to escape from predators.
 3. Some organizations are buying up sections of forest land. Once purchased, forests within the sections will never be cut down. The most obvious goal of protecting these sections of forest is to
 - A. cause extinction.
 - B. prevent overpopulation of trees.
 - C. maintain diversity of the environment.
 - D. farm.
 4. The rapid destruction of tropical rain forests might be harmful because
 - A. energy cycling in the environment will stop.
 - B. secondary succession will not occur.
 - C. removing trees will prevent scientists from studying ecological succession.
 - D. removing trees will limit the construction of factories.

- 6. b.** Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
5. Both deer and trees react to changes in their surroundings, helping them to maintain a constant internal environment. This describes
 - A. predation.
 - B. homeostasis.
 - C. antibiotic resistance.
 - D. autotrophic nutrition.
 6. Cattail plants in northeastern freshwater swamps are replacing loosestrife plants. The two species have very similar environmental requirements. This illustrates
 - A. variations within a species.
 - B. dynamic equilibrium.
 - C. random recombination.
 - D. competition between species.
 7. One biotic factor that limits the carrying capacity of any habitat is the
 - A. availability of water.
 - B. level of atmospheric oxygen.
 - C. activity of decomposers.
 - D. amount of soil erosion.
 8. In most states, automobiles must be inspected every year to make sure that the exhaust fumes they emit do not contain high levels of pollutants such as carbon monoxide. This process is one way that humans attempt to
 - A. control the water cycle.
 - B. maintain the carbon cycle.
 - C. control energy flow in ecosystems.
 - D. maintain the quality of the atmosphere.
 9. The importation of organisms such as the Japanese beetle to areas where they have no natural enemies best illustrates
 - A. the use of abiotic factors to reduce pests.
 - B. the selection of species to mate with each other to produce a new variety.
 - C. human attempts to protect extinct species.
 - D. a human activity that disrupts existing ecosystems.

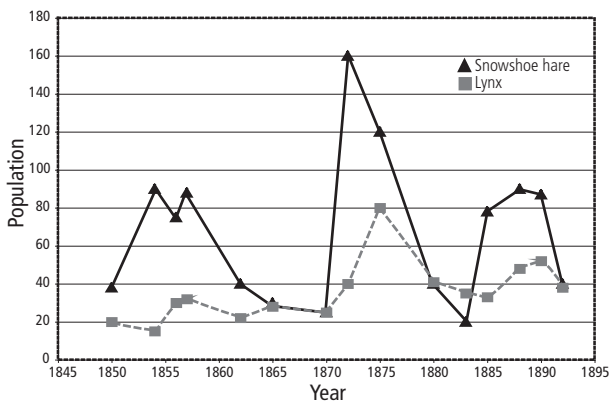
Standards Practice

Ecology



6. c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.

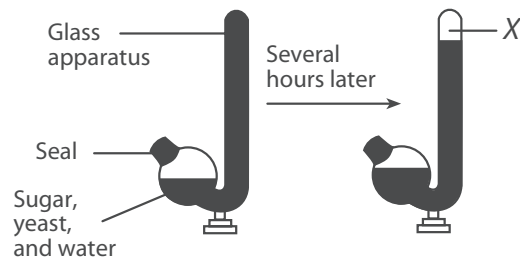
10. A greater stability of the biosphere would most likely result from
 - A. decreased finite resources.
 - B. decreased consumer population.
 - C. increased biodiversity.
 - D. increased deforestation.
11. Which factor is primarily responsible for the destruction of the greatest number of habitats?
 - A. human population growth
 - B. decreased use of renewable resources
 - C. spread of predatory insects
 - D. epidemic diseases
12. Which factor could be the cause of the other three in an animal species?
 - A. inability of a species to adapt to change
 - B. lack of genetic variability in the species
 - C. extinction of the species
 - D. decrease in the survival rate of the species
13. The graph below shows changes in population numbers over time. What is the best way to describe the relationship between these two populations?



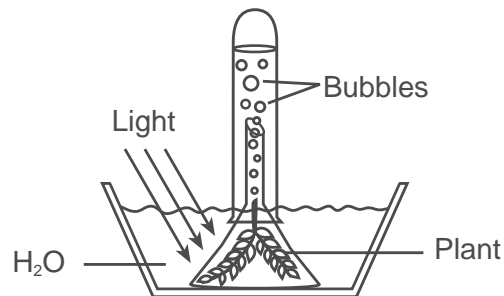
- A. symbiotic
- B. predator-prey
- C. invasive
- D. endangered

6. d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.

14. The results of an investigation are shown below. Substance X resulted from a metabolic process that produces ATP in yeast. What is substance X?



- A. oxygen released by protein synthesis
 - B. glucose that was produced in photosynthesis
 - C. starch that was produced during digestion
 - D. carbon dioxide released by respiration
15. Two methods of nitrogen fixation are
 - A. decomposition and respiration.
 - B. lightning and bacteria.
 - C. condensation and evaporation.
 - D. animal metabolism and excretion.
 16. The green aquatic plant represented in the diagram below was exposed to light for several hours. Which gas would most likely be found in the greatest amount in the bubbles?



- A. oxygen
- B. nitrogen
- C. ozone
- D. carbon dioxide

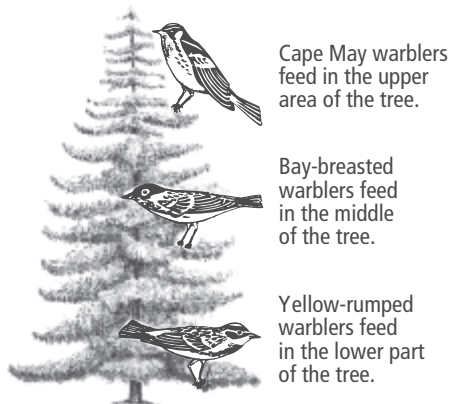
Standards Practice

Ecology



6. e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.

17. Water from nearby rivers or lakes is used to cool down the reactors in nuclear power plants. The release of this heated water back into the river or lake would most likely result in a(n)
- A. increase in sewage content.
 - B. change in the number of mutations in plants in the water.
 - C. change in the biodiversity of the habitat.
 - D. decrease in the amount of sunlight necessary for photosynthesis in the water.
18. Lichens and mosses are the first organisms to grow in an area. Over time, grasses and shrubs will grow where these organisms have been. The grasses and shrubs are able to grow in the area because the lichens and mosses
- A. synthesize needed food.
 - B. are at the beginning of the food chain.
 - C. make the environment suitable for complex plants.
 - D. provide enzymes for plant growth.
19. The ecological niches of three bird species are shown below. What is the advantage of each bird species having a different niche?



- A. More energy is available the higher a bird feeds.
- B. More abiotic resources are available for each bird.
- C. Fewer predators are present.
- D. There is less competition for food.

6. f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.

20. Which organism would be at the base of an energy pyramid?
- A. autotroph
 - B. carnivore
 - C. omnivore
 - D. heterotroph
21. An ecological pyramid shows
- A. the flow of energy in an ecosystem.
 - B. the rate of natural selection.
 - C. a food chain.
 - D. predators v. prey.
22. In a desert community food web, which would be at the highest trophic level?
- A. mouse
 - B. raven
 - C. red spotted toad
 - D. rattlesnake
23. An energy pyramid represents the following organisms: grass, bird, grasshopper, and fox. Energy from which organism is consumed by all the others?
- A. grass
 - B. bird
 - C. grasshopper
 - D. fox
24. The total weight of living matter at each trophic level of an energy pyramid is called
- A. kilojoules of energy.
 - B. bioweight.
 - C. biomass.
 - D. food mass.
25. When a particular white moth lands on a white birch tree, its color has a high adaptive value. If the birch trees become covered with black soot, the white color of this particular moth
- A. retains its adaptive value.
 - B. increases its adaptive value.
 - C. changes to a more adaptive black color.
 - D. decreases its adaptive value.

Standards Practice

Ecology



6. 8. Students know how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.

- 26.** The characteristics of a developing fetus are most influenced by
- A.** gene combinations.
 - B.** hormones from the father.
 - C.** white blood cells in the placenta.
 - D.** milk production by the mother.
- 27.** Which statement below represents the accommodation of an individual organism to its environment?
- A.** Some deep sea fish use bioluminescence as a nightlight.
 - B.** Some sheep, when moved to a cold climate, grow thicker wool coats.
 - C.** Sloths live in the canopies of rain forests.
 - D.** Manatees can hold their breath under water for 20 min while resting.
- 28.** According to Darwin, adaptations take place over
- A.** many generations.
 - B.** two generations.
 - C.** millions of years.
 - D.** a punctuated period of time.
- 29.** Which factor contributed most to the extinction of many species?
- A.** inability to evolve
 - B.** lethal mutation
 - C.** changes in the environment
 - D.** changes in migration patterns

Standards Practice

Evolution: Population Genetics



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

7. a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.

1. During warm summer temperatures, the arctic fox produces enzymes that cause its fur to become reddish brown. During winter, these enzymes do not function. As a result, the fox has a white coat that blends into the snowy background. This change in fur color shows that
 - A. the genes of a fox are made of unstable DNA.
 - B. mutations can be caused by temperature extremes.
 - C. random alteration of DNA can occur on certain chromosomes.
 - D. the expression of the fox's phenotype is affected by temperature.
2. When the antibiotic penicillin was first introduced, it was immediately effective in combating staphylococcus bacterial infections. After several years, there were outbreaks of staphylococcal infections that did not respond to treatment with penicillin. The best explanation for this situation is that
 - A. members of the original population of bacteria that were penicillin resistant survived and reproduced, creating a more resistant population.
 - B. the bacteria that survived exposure to penicillin learned to avoid it.
 - C. the bacteria that caused the new outbreaks were from populations that had never been exposed to penicillin.
 - D. during each generation, modifications to the DNA increased the bacteria's resistance to penicillin and this ability was passed on to their descendants.
3. In an organism, natural selection acts on the
 - A. phenotype.
 - B. chromosomes.
 - C. genotype.
 - D. karyotype.

7. b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.

4. Which is most likely to occur among people with the genetic disorder cystic fibrosis?
 - A. impaired circulation
 - B. frequent lung infections
 - C. blindness
 - D. obesity
5. What is nondisjunction?
 - A. failure of genes to be passed to future generations
 - B. a mutation caused by environmental factors
 - C. failure of chromosomes to separate properly
 - D. a duplication of genes on a chromosome
6. Both parents carry a single defective gene. What are the chances that their child will inherit the recessive disorder caused by the gene?
 - A. 2 percent
 - B. 25 percent
 - C. 50 percent
 - D. 100 percent
7. What are the chances that an offspring will be a carrier of a defective gene if both parents are carriers?
 - A. 2 percent
 - B. 25 percent
 - C. 50 percent
 - D. 100 percent
8. Which characteristics of a population would most likely indicate the lowest potential for evolutionary change in that population?
 - A. sexual reproduction and few mutations
 - B. sexual reproduction and many mutations
 - C. asexual reproduction and few mutations
 - D. asexual reproduction and many mutations

Standards Practice

Evolution: Population Genetics

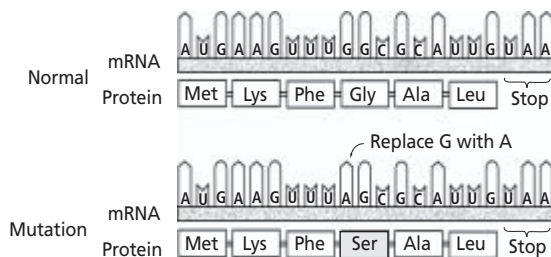


7. c. Students know new mutations are constantly being generated in a gene pool.

9. Which can disrupt genetic equilibrium?

- A. mutation
- B. migration
- C. genetic drift
- D. all of the above

10. What kind of genetic mutation is shown in the figure below?



- A. chromosomal inversion
- B. point mutation
- C. deletion
- D. chromosomal translocation

11. What kind of mutation is shown in the figure below?



- A. deletion
- B. translocation
- C. insertion
- D. inversion

7. d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

12. According to the theory of natural selection, some individuals are more likely than others to survive and reproduce because they

- A. pass on to their offspring new characteristics they have acquired during their lifetimes.
- B. are better adapted to exist in their environment than are others.
- C. do not pass on to their offspring new characteristics they have acquired during their lifetimes.
- D. tend to produce fewer offspring than do others in the same environment.

13. In order for evolution to occur, what must happen in a population?

- A. genetic drift
- B. geographic isolation
- C. natural selection
- D. reproductive isolation

14. What type of natural selection favors average individuals in a population?

- A. disruptive selection
- B. stabilizing selection
- C. directional selection
- D. bias

15. What factor within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions?

- A. variation
- B. disjunction
- C. polyploidy
- D. migration

16. In a population, natural selection is a mechanism for

- A. growth.
- B. change.
- C. increased genetic diversity.
- D. biological stability.

Standards Practice

Evolution: Population Genetics



7. e. Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.

17. The Hardy-Weinberg principle states that the frequency of the alleles for a trait in a stable population will
- A. change often.
 - B. seldom change.
 - C. change occasionally.
 - D. never change.
18. The Hardy-Weinberg principle statement is expressed in the equation
- A. $p + q = 1$.
 - B. $p - q = 1$.
 - C. $p \div q = 1$.
 - D. $p + q = 2.1$.
19. In the Hardy-Weinberg equation, p is the frequency for one allele and q is
- A. unrelated.
 - B. the frequency for all other alleles in the population.
 - C. the summation of the other alleles.
 - D. the frequency for the other allele.
20. The sum of the frequencies of the alleles is always stated as
- A. 1.
 - B. 2.
 - C. 1.5.
 - D. 3.
21. The equation can be used to determine the frequency of
- A. phenotypes in a population.
 - B. genotypes in a population.
 - C. alleles in a population.
 - D. mutations in a population.

7. f. Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.

22. The genotypes in a population tend to remain the same over time. This is explained by what principle?
- A. Hardy-Weinberg
 - B. nondisjunction
 - C. punctuated equilibrium
 - D. disruptive adaption
23. The Hardy-Weinberg equation is used to determine the frequency of
- A. recessive alleles in a population.
 - B. hybrid alleles in a population.
 - C. dominant alleles in a population.
 - D. masked alleles in a population.
24. The Hardy-Weinberg equation is used to determine the amount of
- A. equilibrium in a population.
 - B. natural selection in a population.
 - C. predation in a population.
 - D. gradualism in a population.
25. In the Hardy-Weinberg equation, the sum of the frequencies of the alleles always equals
- A. 10 percent.
 - B. 25 percent.
 - C. 50 percent.
 - D. 100 percent.
26. Based on the table below, use the Hardy-Weinberg equation $p^2 + 2pq + q^2 = 1$ to determine the frequency of the short (tt) genotype in the population.

Pea Plants (population: 100)		
TT	Tt	tt
36	48	16

- A. 0.16
- B. 0.36
- C. 0.48
- D. 1.0

Standards Practice

Evolution: Speciation



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

8. a. Students know how natural selection determines the differential survival of groups of organisms.

1. Scientists have cited the dramatic, worldwide climate change that followed an asteroid impact as the primary cause for the mass extinction of most dinosaur species. Which concept supports our understanding of why all animal life was not made extinct?
 - A. Natural selection ceases to play a role during major changes in the environment.
 - B. Isolated species have a better chance of surviving major changes in the environment.
 - C. Warm-blooded species have a better chance of surviving major changes in the environment.
 - D. Diversity of species increases the chance that some organisms will survive major changes in the environment.
2. Flower color in primrose plants is controlled by an individual gene. The sudden appearance of one white flowering primrose in a plant breeder's field of red primrose plants is most likely due to
 - A. a change in the amount of glucose produced during photosynthesis.
 - B. the use of a new fertilizer on the field.
 - C. rapid mitotic divisions within the seeds.
 - D. a random change in the structure of DNA during meiosis.
3. Over time, natural selection caused a change in moth populations. Which most likely occurred as the result of natural selection?
 - A. All the moths became light-colored.
 - B. The dark moths increased in number until they were the majority.
 - C. The birds stopped eating the moths.
 - D. The moths became extinct.
4. The most important factor in determining the differential survival of groups of organisms is
 - A. natural selection.
 - B. migration.
 - C. predation.
 - D. gradualism.

8. b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.

5. In a specific environment, individuals with certain variations are likely to
 - A. survive.
 - B. reproduce.
 - C. pass on their genes to future generations.
 - D. survive, reproduce, and pass on their genes to future generations.
6. There are many patterns of evolution in nature. These patterns support what idea?
 - A. Natural selection is an essential mechanism for evolution.
 - B. Graduated equilibrium is an essential mechanism for evolution.
 - C. Speciation is an essential mechanism for evolution.
 - D. Gradualism is an essential mechanism for evolution.
7. One reason that a population might survive to reproduce is the
 - A. great diversity in nature.
 - B. lack of predation.
 - C. genetic drift.
 - D. adaptive radiation of a certain population.
8. Major changes in the environment can be survived by species if
 - A. few organisms need food.
 - B. great biodiversity exists.
 - C. there is very little biodiversity.
 - D. there is little competition.
9. Living things are
 - A. interdependent.
 - B. independent.
 - C. not adapted to live in communities.
 - D. not very complex.
10. If one species is lost, other species
 - A. will definitely be affected.
 - B. will not notice.
 - C. might be affected.
 - D. will compensate and be unchanged.

Standards Practice

Evolution: Speciation



8. c. Students know the effects of genetic drift on the diversity of organisms in a population.

11. A factor that disrupts a population's genetic equilibrium is
 - A. genetic drift.
 - B. punctuated equilibrium.
 - C. speciation.
 - D. adaptive radiation.
12. The alteration of allelic frequencies is called
 - A. divergent evolution.
 - B. genetic drift.
 - C. convergent evolution.
 - D. adaptive radiation.
13. Genetic drift can greatly affect what kind of population?
 - A. migratory
 - B. large
 - C. dying
 - D. small
14. Genetic drift has been observed in human populations such as the
 - A. people in Los Angeles.
 - B. people in Nova Scotia.
 - C. people in Europe.
 - D. Amish.
15. Genetic equilibrium is disrupted when
 - A. a population is isolated.
 - B. there is a period of starvation.
 - C. there is very little interbreeding.
 - D. organisms move into and out of a population.

8. d. Students know reproductive or geographic isolation affects speciation.

16. The evolution of a new species is called
 - A. divergent evolution.
 - B. punctuated equilibrium.
 - C. speciation.
 - D. adaptive radiation.
17. Speciation happens when
 - A. members of similar populations no longer interbreed to produce fertile offspring.
 - B. members of different populations no longer interbreed to produce fertile offspring.
 - C. members of similar populations interbreed and produce fertile offspring.
 - D. none of the above
18. Speciation can happen in which situation?
 - A. migration
 - B. heavy predation
 - C. drought
 - D. physical isolation
19. The idea that species originate through gradual change adaptations is called
 - A. gradualism.
 - B. polyploidy.
 - C. reproductive isolation.
 - D. disrupted genetic drift.
20. The theory that speciation occurs quickly is called
 - A. convergent evolution.
 - B. gradualism.
 - C. interbreeding.
 - D. punctuated equilibrium.

Standards Practice

Evolution: Speciation



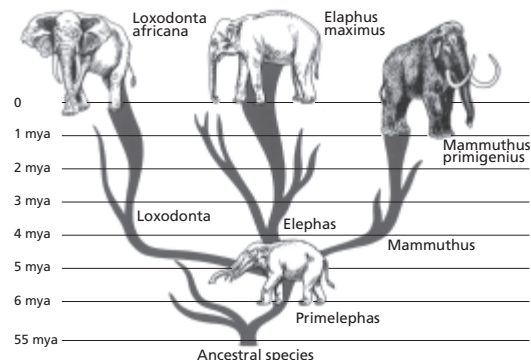
8. e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.

21. When minerals in rocks fill a space left by a decayed organism, which type of fossil is formed?
 - A. trace
 - B. cast
 - C. petrified
 - D. amber-preserved
22. When particles are compressed and hardened, which type of rock is formed?
 - A. sedimentary
 - B. metamorphic
 - C. igneous
 - D. none of the above
23. The oldest fossils on Earth are fossils of
 - A. algae.
 - B. mammals' limbs.
 - C. shells.
 - D. bacteria.
24. Most fossils are found in
 - A. chitin.
 - B. sedimentary rocks.
 - C. amber.
 - D. mud.
25. The fossil record is
 - A. complete.
 - B. not complete.
 - C. seldom helpful in following evolutionary paths.
 - D. simple rather than complex.

8. f. Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.

Use the diagram below to answer questions 26–28.

26. During the past 55 million years, elephants have developed



- A. larger ears and smaller bodies.
 - B. longer trunks and shorter legs.
 - C. larger bodies and longer trunks.
 - D. longer tusks and larger ears.
27. The common ancestor of the modern elephant is
 - A. *Loxodonta africana*.
 - B. *Mammuthus primigenius*.
 - C. *Elaphus maximus*.
 - D. *Primelephas*.
28. Which is true of the evolutionary pattern shown in elephants?
 - A. It results in extinction of all of the descendants.
 - B. It occurs relatively rapidly and causes a rapid evolution of the gene pool.
 - C. It results in polyploid individuals that cannot reproduce.
 - D. It proceeds at a very slow rate.
29. Which cannot be used to create a cladogram?
 - A. comparative embryology
 - B. DNA sequencing comparisons
 - C. protein sequence comparisons
 - D. family trees

Standards Practice

Evolution: Speciation



8. g. Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

- 30.** The process of determining a fossil's age using chemical half-lives is
- A.** isotopic dating.
 - B.** relative dating.
 - C.** radiometric dating.
 - D.** none of the above
- 31.** In order to determine the age of fossils that are less than 50,000 years old, scientists would most likely analyze the level of which of the following isotopes?
- A.** argon-40
 - B.** carbon-14
 - C.** potassium-40
 - D.** none of the above
- 32.** Fossils provide evidence of
- A.** evolution.
 - B.** DNA.
 - C.** homologous structures.
 - D.** adaptations.
- 33.** Fossil evidence can be used to determine all of the following except
- A.** mass extinction.
 - B.** speciation.
 - C.** biological diversity.
 - D.** food webs.
- 34.** Scientists can estimate how long ago various groups of organisms diverged evolutionarily from one another by using
- A.** the fossil record.
 - B.** DNA evidence.
 - C.** migration patterns.
 - D.** genetic equilibrium.

Standards Practice

Physiology: Homeostasis



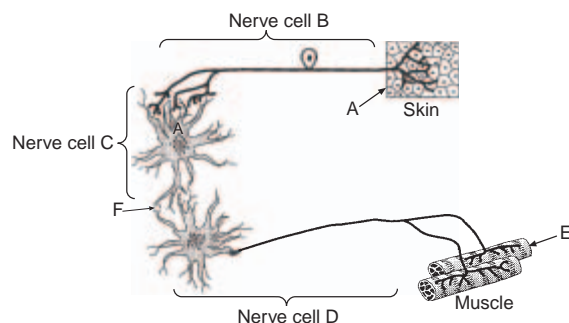
Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

9. a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.

1. What results from iron deficiency anemia?
 - A. Too few red blood cells are produced by the bone marrow, resulting in a lack of oxygen to the body's cells.
 - B. Too many red blood cells are produced by the bone marrow, causing the blood to be too viscous.
 - C. Blood-forming tissues are damaged and cannot produce adequate numbers of red blood cells.
 - D. Less hemoglobin is manufactured, so there is less oxygen available to the body's cells.
2. All substances below are filtered by the kidneys. Which is not reabsorbed?
 - A. H_2O
 - B. K^+
 - C. Na^+
 - D. NH_3
3. Which statement accurately compares cells in the human circulatory system to cells in the human nervous system?
 - A. Cells in the circulatory system carry out the same life function for the organism as cells in the nervous system.
 - B. Cells in the circulatory system are identical in structure to cells in the nervous system.
 - C. Cells in the nervous system are different in structure from cells in the circulatory system, and they carry out different specialized functions.
 - D. Cells in the nervous system act independently, but cells in the circulatory system function together.
4. In the human body, the blood with the greatest concentration of oxygen is found in the
 - A. left atrium of the heart.
 - B. cerebrum.
 - C. kidneys.
 - D. right ventricle of the heart.

9. b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.

5. An example of a reaction to a stimulus is
 - A. a boy smelling a flower.
 - B. eyes blinking due to smoke in the air.
 - C. a person tapping on a friend's shoulder.
 - D. a loud clap of thunder following lightning.
6. To communicate between cells, many multicellular animals use
 - A. nerve signals and respiratory gases.
 - B. respiratory gases and hormones.
 - C. bones and muscles.
 - D. nerve signals and hormones.
7. Communication between cells is affected if there is decreased ability to produce
 - A. digestive enzymes and gametes.
 - B. antibodies and chloroplasts.
 - C. hormones and nerve impulses.
 - D. antibiotics and guard cells.
8. In the diagram below, if a stimulus is received by the cells at A, the cells at E will most likely use energy obtained from a reaction between



- A. fats and enzymes.
- B. ATP and pathogens.
- C. glucose and oxygen.
- D. water and carbon dioxide.

Standards Practice

Physiology: Homeostasis



9. c. Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.

9. Which statement describes a feedback mechanism involving the human pancreas?
 - A. The production of estrogen stimulates formation of gametes for sexual reproduction.
 - B. The level of oxygen in the blood is related to heart rate.
 - C. The level of glucose in the blood is affected by the amount of insulin in the blood.
 - D. The production of urine allows for excretion of cell wastes.
10. Organic substances needed in small quantities to maintain growth and metabolism are called
 - A. proteins.
 - B. vitamins.
 - C. minerals.
 - D. fats.
11. What kind of hormones bind to receptors in the cytoplasm of cells?
 - A. amino acid hormones
 - B. steroid hormones
 - C. both A and B
 - D. neither A nor B
12. Which hormone does the adrenal gland produce?
 - A. aldosterone
 - B. adrenaline
 - C. glucocorticoids
 - D. all of the above
13. The hormone that stimulates the release of calcium from bone tissue is called
 - A. thyroid hormone.
 - B. calcitonin.
 - C. parathyroid hormone.
 - D. human growth hormone.

9. d. Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.

14. Which carries impulses from the skin to the central nervous system?
 - A. sensory neuron
 - B. motor neuron
 - C. interneuron
 - D. synapse
15. The presence of a stimulus causes which action in a neuron?
 - A. sodium passes out of the cell
 - B. potassium passes out of the cell
 - C. sodium passes into the cell
 - D. repolarization
16. An impulse moves fastest in an
 - A. unmyelinated dendrite.
 - B. myelinated dendrite.
 - C. unmyelinated axon.
 - D. myelinated axon.
17. Neurons require a large amount of energy to function. Which organelles might be numerous in a brain cell?
 - A. Golgi bodies
 - B. plasma membranes
 - C. vacuoles
 - D. mitochondria
18. The cell that consists of a dendrite, an axon, and a cell body is a
 - A. nephron.
 - B. somatic cell.
 - C. platelet.
 - D. neuron.

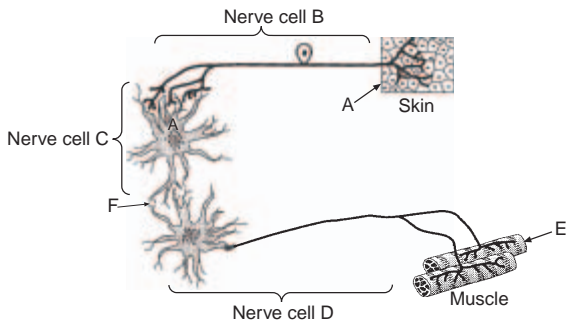
Standards Practice

Physiology: Homeostasis



9. e. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.

19. In region F, there is a space between nerve cells C and D. Cell D is usually stimulated to respond by

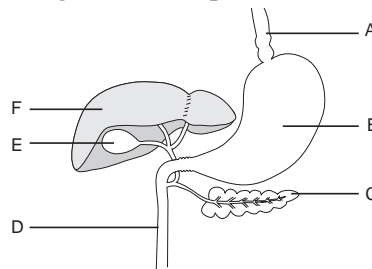


- A. a chemical produced by cell C moving to cell D.
 - B. the movement of a virus from cell C to cell D.
 - C. the flow of blood out of cell C to cell D.
 - D. the movement of material through a blood vessel that forms between cell C and cell D.
20. Neurotransmitters are used to transmit signals across a(n)
- A. axon.
 - B. cell body.
 - C. dendrite.
 - D. synaptic space.
21. Morphine is an opiate used in controlling pain. It acts on
- A. the central nervous system.
 - B. the peripheral nervous system.
 - C. receptors at the site of pain.
 - D. both A and B.
22. The neurons found within the brain and spinal cord are
- A. interneurons.
 - B. sensory neurons.
 - C. motor neurons.
 - D. gray neurons.

9. f. Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.

23. The main function of the digestive system is to
- A. rid the body of cellular waste materials.
 - B. process organic molecules so they can enter cells.
 - C. break down glucose to release energy.
 - D. change amino acids into proteins.
24. Which structures secrete chemicals utilized for digestion within the small intestine?
- A. liver and pancreas
 - B. glomerulus and villi
 - C. esophagus and alveoli
 - D. gallbladder and pharynx

25. In the diagram below, peristalsis occurs in



- A. A and D.
 - B. C and F.
 - C. C and E.
 - D. E and F.
26. Which is involved in mechanical digestion?
- A. amylase
 - B. teeth
 - C. pepsin
 - D. saliva
27. Amylase is used to break down
- A. lipids.
 - B. starches.
 - C. proteins.
 - D. vitamins.
28. Where is excess bile stored?
- A. liver
 - B. pancreas
 - C. gallbladder
 - D. stomach

Standards Practice

Physiology: Homeostasis



9. g. Students know the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.

29. The functional unit of the human kidney is known as the
- A. renal pelvis.
 - B. medulla.
 - C. nephron.
 - D. urinary bladder.
30. Which structure forms urine from water, urea, and salts?
- A. alveolus
 - B. nephron
 - C. sweat gland
 - D. liver
31. Which structure removes carbon dioxide and water from the blood?
- A. nephron
 - B. sweat gland
 - C. liver
 - D. alveolus
32. As a result of osmotic pressure, water, glucose, and waste products are filtered into which part of the nephron?
- A. urethra
 - B. distal tube
 - C. Bowman's capsule
 - D. ureter

9. h. Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2} , and ATP.

33. The formation of lactic acid in human muscle cells is most closely associated with
- A. muscle fatigue.
 - B. protein synthesis.
 - C. an increase in alcohol consumption.
 - D. an increase in glucose production.
34. Which two structures are directly involved in locomotion in humans?
- A. visceral muscle and fibrous tendons
 - B. smooth muscle and ligaments
 - C. skeletal muscle and bones
 - D. cardiac muscle and immovable joints
35. Which type of tissue interacts with hairs on the skin to respond to cold and fright?
- A. epithelial
 - B. connective
 - C. muscle
 - D. nervous
36. The connective tissue that connects muscle to bone is called
- A. bursa.
 - B. ligament.
 - C. tendon.
 - D. bone spur.
37. Which type of muscle is consciously controlled?
- A. smooth
 - B. skeletal
 - C. cardiac
 - D. all of the above
38. Muscle cells in athletes often have more mitochondria than muscle cells in nonathletes. Based on this observation, it can be inferred that the muscle cells in athletes
- A. have a smaller demand for protein.
 - B. reproduce less frequently.
 - C. have more DNA.
 - D. have a greater demand for energy.

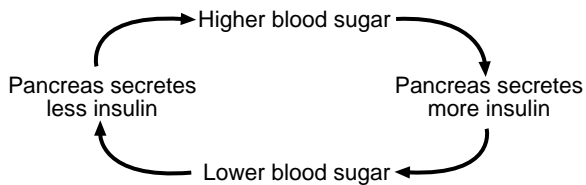
Standards Practice

Physiology: Homeostasis



9. i. Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.

- 39.** In multicellular organisms, cells must be able to communicate with each other. Structures that enable most cells to communicate with each other are known as
- A.** pathogenic agents.
 - B.** chloroplasts.
 - C.** antibiotics.
 - D.** receptor molecules.
- 40.** The diagram below shows the interaction between blood glucose levels and pancreatic activity. This process is an example of



- A.** a feedback mechanism maintaining homeostasis.
- B.** an immune system responding to prevent disease.
- C.** the digestion of sugar by insulin.
- D.** the hormonal regulation of gamete production.

- 41.** A characteristic of hormones and enzymes that allows them to work effectively with other organic molecules is their
- A.** concentration of carbon and hydrogen atoms.
 - B.** small size.
 - C.** specific shape.
 - D.** high-energy bonds.
- 42.** Which system is responsible for transporting hormones from endocrine glands to various body tissues?
- A.** circulatory
 - B.** digestive
 - C.** excretory
 - D.** nervous

Standards Practice

Physiology: Infection and Immunity



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

10. a. Students know the role of the skin in providing nonspecific defenses against infection.

1. Microbes that enter the body and cause disease are characterized as
 - A. pathogenic.
 - B. commensal.
 - C. symbiotic.
 - D. dependent.
2. What is the primary function of an organism's integumentary system?
 - A. protection
 - B. pigment
 - C. sweat
 - D. movement
3. Which system would best protect you from getting a cold?
 - A. digestive
 - B. respiratory
 - C. excretory
 - D. integumentary
4. The skin helps protect your body by producing
 - A. essential vitamins.
 - B. sweat.
 - C. chemicals that protect you from the Sun.
 - D. the hormone fibrin.

10. b. Students know the role of antibodies in the body's response to infection.

5. Which statement best describes an immune response?
 - A. It always produces antibiotics.
 - B. It usually involves the recognition and destruction of pathogens.
 - C. It stimulates asexual reproduction and resistance in pathogens.
 - D. It releases red blood cells that destroy parasites.
6. When people who are allergic to pollen come in contact with it, their eyes begin to water and itch due to the release of
 - A. antigens from red blood cells.
 - B. enzymes from platelets.
 - C. histamines from body cells.
 - D. hormones from the pituitary gland.
7. Certain microbes, foreign tissues, and some cancerous cells can cause immune responses in the human body because all three contain
 - A. antigens.
 - B. enzymes.
 - C. fats.
 - D. cytoplasm.
8. A characteristic shared by all enzymes, hormones, and antibodies is that their function is determined by the
 - A. shape of their molecules.
 - B. DNA they contain.
 - C. inorganic molecules they contain.
 - D. organelles present in their structure.
9. Which activity is NOT a response of human white blood cells to pathogens?
 - A. engulfing and destroying bacteria
 - B. producing antibodies
 - C. identifying invaders for destruction
 - D. removing carbon dioxide

Standards Practice

Physiology: Infection and Immunity



10. c. Students know how vaccination protects an individual from infectious diseases.

10. Which statement describes the best procedure to determine if a vaccine for a disease in a certain bird species is effective?
- A. Vaccinate 100 birds, and expose all 100 to the disease.
 - B. Vaccinate 100 birds, and expose only 50 of them to the disease.
 - C. Vaccinate only 50 birds, and expose all 100 to the disease.
 - D. Vaccinate only 50 birds, and expose only the vaccinated birds to the disease.
11. What did Edward Jenner inject into an individual to induce active immunity in that individual?
- A. antibodies to a smallpox virus
 - B. small amounts of smallpox virus
 - C. antibodies to cowpox virus
 - D. small amounts of cowpox virus
12. The use of a vaccine to stimulate the immune system to act against a specific pathogen is valuable in maintaining homeostasis because
- A. once the body produces chemicals to combat one type of virus, it can more easily make antibodies.
 - B. the body can digest the weakened microbes and use them as food.
 - C. the body will be able to fight invasions by the same type of microbe in the future.
 - D. the more the immune system is challenged, the better it performs.
13. Vaccination against a specific pathogen confers
- A. acquired active immunity.
 - B. acquired passive immunity.
 - C. artificial active immunity.
 - D. artificial passive immunity.
14. A lymphocyte produced in the bone marrow and processed in the thymus is called a
- A. B cell.
 - B. T cell.
 - C. pathogen.
 - D. white blood cell.

10. d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.

15. Disease can be
- A. inherited.
 - B. caused by toxic materials.
 - C. the result of poor nutrition.
 - D. a result of all of the above.
16. The uncontrolled division of certain body cells, which then invade the surrounding tissues and interfere with the normal functioning of the body, is known as
- A. cancer.
 - B. regeneration.
 - C. diffusion.
 - D. oogenesis.
17. Which disease can be proven to be caused by a pathogen using Koch postulates?
- A. syphilis
 - B. AIDS
 - C. anthrax
 - D. Lyme disease
18. *Staphylococcus aureus*, a bacterium that infects humans, is present in many hospital rooms. Many health-care workers also carry this bacterium. How would you ensure that the bacterium would not infect your patients?
- A. wear a face mask and sterile gloves
 - B. clean rooms with germicides
 - C. monitor waste disposal
 - D. all of the above
19. Substances produced by some bacteria can have severe effects on humans. What are these substances called?
- A. venoms
 - B. toxins
 - C. histamines
 - D. antigens

Standards Practice

Physiology: Infection and Immunity



10. e. Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.

20. People with AIDS are unable to fight multiple infections because the virus that causes AIDS

- A.** weakens their immune systems.
- B.** produces antibodies in their blood.
- C.** attacks muscle tissue.
- D.** kills pathogens.

21. Which disease damages the human immune system, leaving the body open to certain infectious agents?

- A.** influenza
- B.** AIDS
- C.** chicken pox
- D.** pneumonia

22. A cell infected with a virus produces a chemical that diffuses to surrounding cells, resulting in the production of antiviral proteins. What is this chemical called?

- A.** histamine
- B.** pus
- C.** interferon
- D.** basophil

23. The HIV virus can be described as two copies of RNA wrapped in

- A.** nucleotides.
- B.** viruses.
- C.** proteins.
- D.** cancerous cells.

10. f. Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

24. In some individuals, the immune system attacks substances such as grass pollen that are usually harmless, resulting in a(n)

- A.** allergic reaction.
- B.** form of cancer.
- C.** insulin imbalance.
- D.** mutation.

25. Which phrase does NOT describe a way the human body responds to fight disease?

- A.** destruction of infectious agents by white blood cells
- B.** production of antibodies by white blood cells
- C.** increased production of white blood cells
- D.** production of pathogens by white blood cells

26. Which symptom is associated with the release of histamines?

- A.** redness
- B.** pain
- C.** swelling
- D.** all of the above

27. What are the body's antibody-producing cells called?

- A.** helper T cells
- B.** B cells
- C.** cytotoxic T cells
- D.** invaders

28. Which activity is not a function of white blood cells in response to an invasion by bacteria?

- A.** engulfing the bacteria
- B.** producing antibodies
- C.** preparing for future invasions
- D.** speeding transmissions of nerve impulses

Sample Test



Read each question, and choose the best answer. Then, on your answer sheet, mark the answer choice that you think is best.

1. What is the primary function of nephrons in the kidneys? **9. g.**
 - A. to remove wastes from blood
 - B. to remove water from cells
 - C. to add carbon dioxide to cells
 - D. to add salt to blood
2. Either copy of a gene can end up in a **2. e.**
 - A. particular zygote.
 - B. particular gamete.
 - C. dihybrid cross.
 - D. diploid germ cell.
3. Which are molecules that lymphocytes recognize as foreign and that elicit an immune response? **10. f.**
 - A. interleukins
 - B. antibodies
 - C. antigens
 - D. histamines
4. What is the primary function of endonucleases in constructing recombinant DNA molecules? **5. d.**
 - A. separate DNA fragments of different lengths
 - B. join DNA fragments from different sources
 - C. identify and extract desired DNA fragments
 - D. stain DNA fragments for analysis
5. Which carries the coded instructions for an amino-acid sequence to the ribosomes? **4. a.**
 - A. DNA
 - B. rRNA
 - C. mRNA
 - D. tRNA
6. Chromosomes are produced in what part of a eukaryotic cell? **1. j.**
 - A. cell wall
 - B. nucleus
 - C. ribosome
 - D. vacuole
7. Genetic engineering of plants can produce crops with new and beneficial **5. e.**
 - A. traits.
 - B. genotypes.
 - C. marketing values.
 - D. nutrition.
8. If an allele is recessive and lethal in homozygotes before they reproduce, **7. b.**
 - A. the allele will be dominant over time.
 - B. the allele will be removed from the population by natural selection.
 - C. the allele will remain in the population at a low frequency.
 - D. the allele will remain in the population with increasing frequency.
9. Which is a prokaryotic cell that causes disease when it is ingested in contaminated food or water? **10. d.**
 - A. virus
 - B. bacterium
 - C. fungus
 - D. prion
10. Which is a product of electron transport? **1. i.**
 - A. ATP
 - B. glucose
 - C. water
 - D. carbon dioxide
11. If both parents are heterozygous for two particular genes, how many phenotypes are possible? **2. d.**
 - A. two
 - B. six
 - C. four
 - D. eight
12. Second generation offspring from a cross between two homozygotes are the **3. a.**
 - A. F₁ generation.
 - B. F₂ generation.
 - C. hybrid generation.
 - D. parental generation.



Sample Test *(continued)*



13. Most HIV infections are transmitted through
10. e.

- A. water.
- B. air.
- C. blood.
- D. hand washing.

14. How often are new mutations generated in a gene pool? **7. c.**

- A. constantly
- B. occasionally
- C. rarely
- D. never

15. Except for stop codons, a codon calls for a specific **4. b.**

- A. protein.
- B. polypeptide.
- C. amino acid.
- D. carbohydrate.

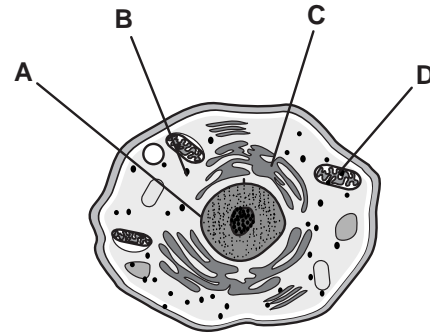
16. Which is NOT a reason that scientists are unlikely to observe Hardy-Weinberg equilibrium in nature? **7. e.**

- A. Environmental changes rarely exert influence on natural selection.
- B. Mating in large populations does not usually occur randomly.
- C. Genes usually flow between neighboring populations.
- D. Mutations in large populations are difficult to prevent.

17. Look at the following four descriptions of changes in gene frequency between a larger population and a smaller, related population. Which of these is an example of natural selection at work? **8. c.**

- A. bottleneck effect
- B. founder effect
- C. adaptive change
- D. genetic drift

18. Which organelle in the diagram below is known as the cell's powerhouse? **1. g.**



- A. A
- B. B
- C. C
- D. D

19. During ovulation, the amounts of a luteinizing hormone and estrogen in the body increase. The presence of one hormone stimulates the release of the other hormone. Which kind of feedback is this? **9. i.**

- A. negative feedback
- B. neutral feedback
- C. positive feedback
- D. not an example of feedback

20. The DNA message depends on the order of the **1. d.**

- A. nitrogenous bases.
- B. acids.
- C. sugars.
- D. genes.

21. Homeostasis is maintained by **9. c.**

- A. negative controls.
- B. feedback loops.
- C. metastasis.
- D. positive controls.

22. DNA replication is **5. b.**

- A. nonconservative.
- B. conservative.
- C. semiconservative.
- D. random.

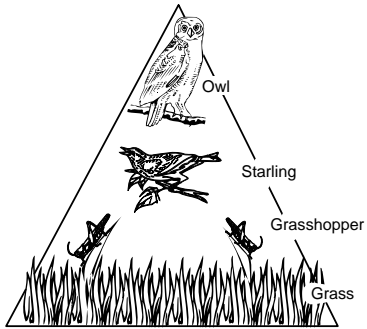


Sample Test *(continued)*



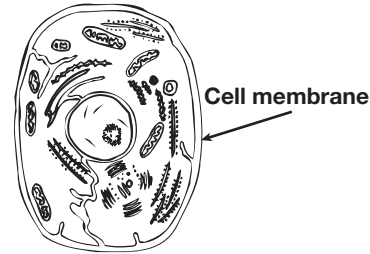
23. Which statement is true? **2. b.**
- A. In both mitosis and meiosis, the chromosomes separate once.
 - B. In both mitosis and meiosis, the chromosomes separate twice.
 - C. In mitosis the chromosomes separate once, while in meiosis the chromosomes separate twice.
 - D. In meiosis the chromosomes separate once, while in mitosis the chromosomes separate twice.

24. Based on the food pyramid below, which organism has the least amount of energy available to it? **6. f.**



- A. grass
 - B. grasshopper
 - C. starling
 - D. owl
25. Changes in an ecosystem result from all of the following except **6. b.**
- A. climate.
 - B. human activity.
 - C. introduction of nonnative species.
 - D. stability in population size.
26. Which statement accurately describes the role of a particular organelle? **1. e.**
- A. The Golgi apparatus synthesizes and stores proteins.
 - B. Smooth ER produces and stores lipids.
 - C. Mitochondria digest used proteins inside the cell and resynthesize them.
 - D. Lysosomes sort lipids for delivery to other destinations.

27. What is the purpose of the cell membrane? **1. a.**



- A. to form a boundary to allow wastes in and out of the cell
 - B. to separate organelles
 - C. to link multicellular organisms
 - D. to provide a pathway for nutrients to move within the cell
28. Fossils are most useful to scientists as evidence for studying **8. e.**
- A. the direct causes of mass extinctions.
 - B. speciation.
 - C. microevolution.
 - D. the organic material of ancient life-forms.
29. Natural selection is sometimes called survival of the fittest. Which most accurately describes an organism's fitness? **8. a.**
- A. strength
 - B. rate of mutation
 - C. fertility of its offspring
 - D. amount of food it can obtain
30. If the genotypes of the parents are known, it is possible to determine the likelihood of an offspring inheriting certain **2. g.**
- A. chromosome pairs.
 - B. particular genetic crosses.
 - C. homozygous recessive traits.
 - D. phenotypes.
31. Proteins that catalyze biochemical reactions without altering the reaction equilibrium are called **1. b.**
- A. hormones.
 - B. vitamins.
 - C. enzymes.
 - D. chromatin.

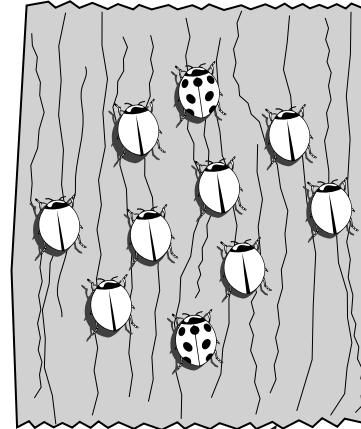


Sample Test *(continued)*



32. When DNA replicates, each new DNA molecule has **2. a.**
A. two new strands.
B. one original strand and one new strand.
C. two original strands.
D. one new strand.
33. Which organizes groups of organisms in order of increasing complexity? **1. c.**
A. eukaryotes, prokaryotes, viruses
B. viruses, prokaryotes, eukaryotes
C. viruses, eukaryotes, prokaryotes
D. prokaryotes, viruses, eukaryotes
34. Which statement best fits the principle of segregation? **3. b.**
A. Units of heredity are transmitted to offspring.
B. Two genes of a pair separate from each other during meiosis.
C. Members of a population become separated.
D. A segregating pair of genes separates.
35. Which carry impulses from the skin to the central nervous system? **9. b.**
A. sensory neurons
B. motor neurons
C. interneurons
D. synapses
36. Usable energy is captured from sunlight by **1. f.**
A. chloroplasts.
B. chromatin.
C. Golgi bodies.
D. mitochondria.
37. Deviations from the Hardy-Weinberg equation can cause what in a gene pool? **7. f.**
A. stability
B. variation
C. bottleneck
D. drift

38. If the bark on all the trees of the type shown below became spotted over a period of years, what effect would this most likely have on the beetle population? **6. g.**

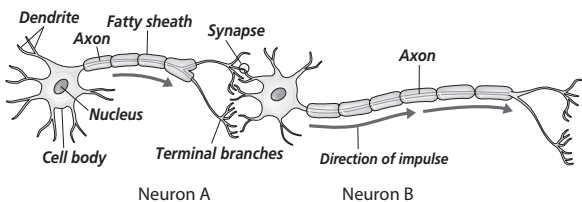


- A. Most beetles would be spotted.
B. Most beetles would be plain.
C. The plain beetles would become spotted.
D. The spotted beetles would become plain.
39. Imagine that you have just touched a warm burner. Which type of neuron would relay a message to your brain? **9. e.**
A. sensory neuron
B. motor neuron
C. interneuron
D. glial cell
40. Alleles are **3. d.**
A. alternate forms of a gene.
B. different molecular forms of a chromosome.
C. always homozygous.
D. always heterozygous.
41. Fluctuations in population size in an ecosystem are determined by the relative rates of all of the following except **6. c.**
A. birth.
B. immigration and emigration.
C. death.
D. overfeeding.

Sample Test *(continued)*



42. What is nitrogen fixation? **6. d.**
- A. the principle that describes why nitrogen stays at a fixed level in the atmosphere
 - B. a process in which plants produce N_2 to balance their chlorophyll production
 - C. the cycle in which nitrogen passes from organic to inorganic materials
 - D. a process in which bacterial enzymes produce ammonia from N_2
43. Assuming that the reading frame begins after the start signal AUG, how many amino acids are coded for in this mRNA sequence: AUGUUACACCGUCAC? **4. d.**
- A. three
 - B. four
 - C. six
 - D. seven
44. Strips of land that allow the organisms of a population to migrate from one area to another are called **6. a.**
- A. habitat corridors.
 - B. habitat fragments.
 - C. ecosystem bridges.
 - D. environmental pathways.
45. The picture below shows two neurons. A nerve impulse moves from neuron A to neuron B because of **9. d.**



- A. the release of various carbohydrates into the synapse.
- B. the release of chemicals called neurotransmitters.
- C. the dendrites that are connected.
- D. neuron A hitting against neuron B.

46. Natural selection acts on **7. a.**
- A. genotypes, regardless of how they are expressed physically.
 - B. phenotypes, whether they are the result of dominant or recessive genes.
 - C. dominant alleles, increasing the likelihood of their inheritance over time.
 - D. recessive alleles, which soon disappear from the population.
47. Which digestive aid is secreted to break down fat molecules? **9. f.**
- A. gastric enzymes
 - B. lipase enzymes
 - C. amylase enzymes
 - D. protease enzymes
48. One form of protection against disease given to small children and adolescents is **10. c.**
- A. vaccination.
 - B. immunity.
 - C. antibodies.
 - D. T cells.
49. What do chromosomes determine? **2. f.**
- A. sex of the offspring
 - B. probability
 - C. codominance
 - D. end result of a dihybrid cross
50. One application of DNA fingerprinting is used to correct genetic disorders. This is called **5. c.**
- A. the Human Genome Project.
 - B. cloning.
 - C. chromosomal mutation.
 - D. gene therapy.
51. To be inherited by future generations, a gene mutation would have to occur in **4. c.**
- A. brain cells.
 - B. liver cells.
 - C. sex cells.
 - D. skin cells.



Sample Test *(continued)*



52. A heterozygote has **3. c.**
A. only one of the various forms of a gene.
B. a pair of identical alleles.
C. a pair of contrasting alleles.
D. a haploid condition.
53. The most vital part of an ecosystem is found in the stability of its **6. e.**
A. producers and decomposers.
B. predators and prey.
C. abiotic factors.
D. biotic factors.
54. Nucleotide bases are read how many at a time? **4. e.**
A. two
B. six
C. three
D. seven
55. What purpose do molecular clocks serve? **8. g.**
A. They allow scientists to estimate the relative chronology of evolutionary relationships.
B. They tell us exactly how long DNA has existed on Earth.
C. They ensure that individual molecules are absorbed into cells at a regular rate.
D. They maintain a constant rate of chemical reactions during photosynthesis.
56. Rules of probability apply to the inheritance of traits coded by **2. c.**
A. a single gene.
B. two separate genes.
C. the sperm and the egg.
D. matching base pairs.
57. Carbohydrates, nucleic acids, proteins, and lipids come from smaller molecules called **1. h.**
A. simple precursors.
B. hormones.
C. complex precursors.
D. DNA.
58. An antibody is used by the immune system to identify foreign matter. An antibody is a(n) **10. b.**
A. steroid.
B. lipid.
C. enzyme.
D. protein.
59. Tissues, organs, and organ systems work together to maintain **9. a.**
A. a stable environment.
B. low blood pressure.
C. positive feedback.
D. communication.
60. The evolution of a new species is called **8. d.**
A. random development.
B. genetic drift.
C. speciation.
D. bottleneck.
61. A diagram depicting the pattern of shared characteristics between organisms is called a **8. f.**
A. DNA fingerprint.
B. family tree.
C. cladogram.
D. molecular clock.
62. Proteins having different amino-acid sequences have different **4. f.**
A. shapes and chemical properties.
B. densities and mass.
C. molecular makeup.
D. abilities to synthesize.
63. In muscle cells, a protein that plays a significant role in contraction is **9. h.**
A. actin.
B. chromatin.
C. cilia.
D. fibrin.

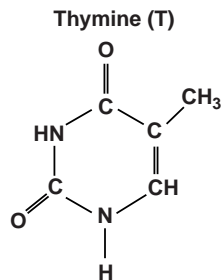


Sample Test *(continued)*



64. Variation within a species increases the likelihood that at least some members of a species will **7. d.**
- A. die.
 - B. become predators.
 - C. survive.
 - D. mate.

65. Which base is the complementary strand of the base shown below? **5. a.**



- A. adenine
- B. guanine
- C. cytosine
- D. uracil

66. A huge diversity of species allows organisms to survive major changes in **8. b.**
- A. the gene pool.
 - B. the population's phenotype.
 - C. sexual selection.
 - D. the environment.

67. The first line of defense against disease in the human body is **10. a.**
- A. the skin.
 - B. the cilia in the breathing passages.
 - C. enzymes.
 - D. stomach acid.

