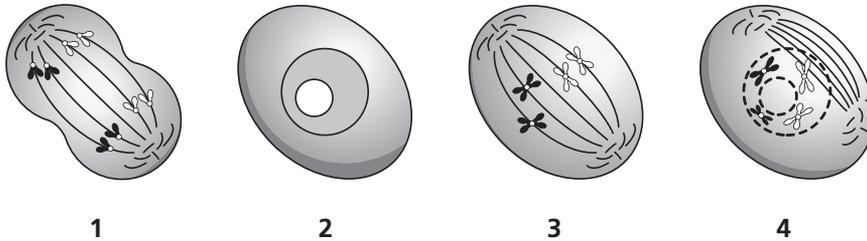


PRACTICE TEST A**DIRECTIONS**

Read each question carefully. Determine the best answer to the question from the answer choices provided. Then fill in the answer on your answer sheet.

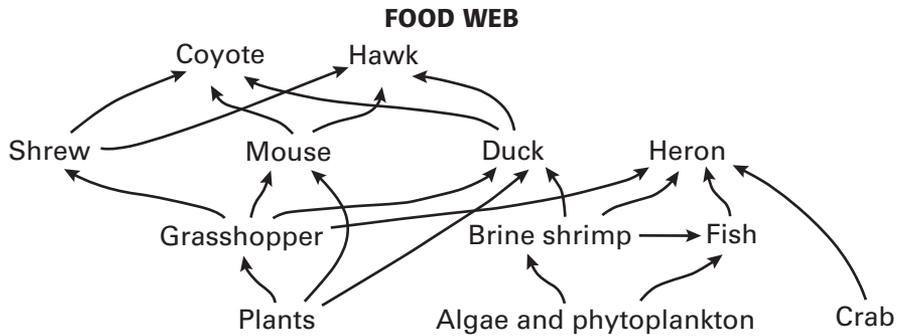
- 1 The diagram below shows four stages of a cell undergoing mitosis.



Which of the following is the correct sequence of stages as they occur in the cell cycle?

- A 1, 3, 4, 2
B 2, 1, 3, 4
C 2, 4, 3, 1
D 4, 3, 2, 1
- 2 Forest fires can destroy all the established plants living in an area. However, new growth can spring from the decaying organic matter left behind. What is the gradual, sequential regrowth of a community of species after a forest fire?
- F Adaptation
G Pioneer succession
H Primary succession
J Secondary succession
- 3 Which feedback mechanism maintains the equilibrium of your body temperature when your surroundings are very hot?
- A The brain sends a message to the skin. The muscles in the skin contract, or shiver. Shivers cool the body.
B The muscles in the skin contract, which sends a message to the brain that you feel hot. The brain sends a message to the skin's receptors.
C Heat receptors in the skin send a message to the brain. The brain sends the skin a response telling the skin to start sweating. Sweat cools the body.
D The skin starts sweating. The sweat sends a message to the brain. The brain sends a response to the skin to stop sweating, which cools the body.

- 4 A disease wipes out a population of ducks in the ecosystem represented by the food web below.

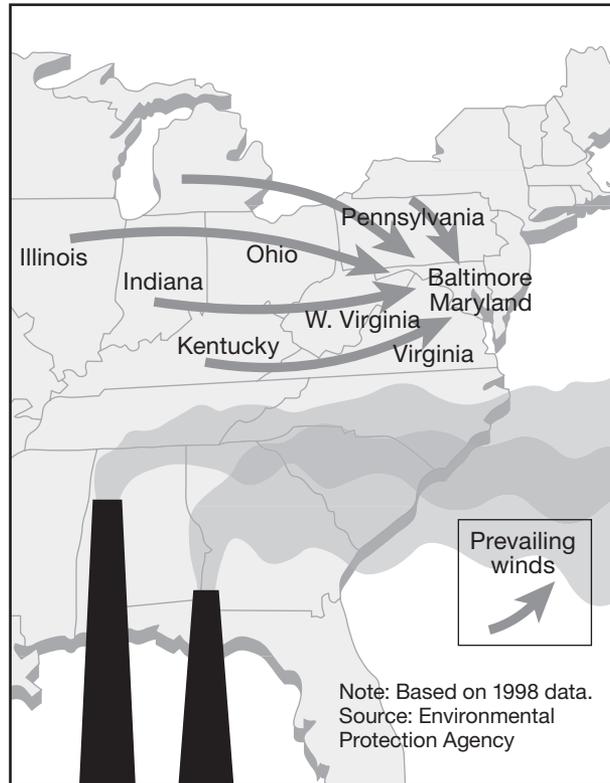


How will this most likely affect the ecosystem?

- F The population of brine shrimp will increase.
- G The population of coyotes will increase.
- H The population of grasshoppers will decrease.
- J The population of crab will decrease.

5 A Maryland environmental agency designed the promotional poster shown below.

Movement of Air Pollution



Which statement is the best caption for the poster?

- A Baltimore is the new windy city.
- B Reducing Maryland's Air Pollution: The Answer Is Blowing in the Wind
- C What happens in the Midwest stays in the Midwest.
- D Clean air is here to stay.

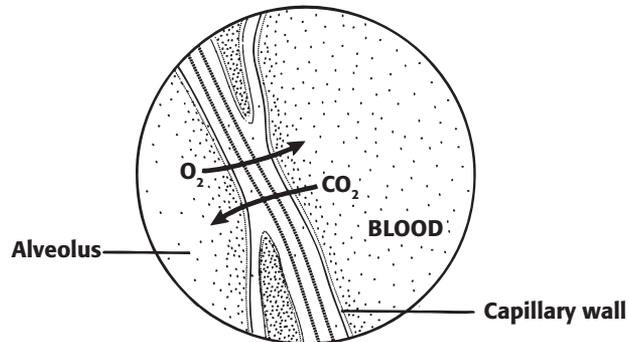
- 6 Water movement into and out of cells is important to all living things. A single-celled organism has organelles called contractile vacuoles to move water from inside to outside the cell. The data presented in the table above were obtained in an experiment in which an organism was placed in water with different salt concentrations.

Salt concentration outside the cell	Rate of contractile vacuole contractions per minute
Very high	2
High	8
Medium	15
Low	22
Very low	30

The rate at which the contractile vacuole contracted to pump out excess water was recorded. How could you explain the observed relationship between the rate of contractile vacuole contractions and the salt concentration?

- F** When the salt concentration outside the cell is very high, water moves inside the cell, and the contractile vacuole has to contract more rapidly.
- G** When the salt concentration outside the cell is very low, water moves outside the cell, but it has no impact on the contractile vacuole contractions.
- H** When the salt concentration outside the cell is very high, water moves outside the cell, and the contractile vacuole does not need to contract as rapidly.
- J** When the salt concentration outside the cell is very low, water moves outside the cell, and the contractile vacuole does not need to contract as rapidly.
- 7 Which of the following cell structures can be observed in both plant cells and bacterial cells?
- A Chloroplast
 - B Nucleus
 - C Vesicles
 - D Cell wall

- 8 The diagram below shows the exchange of oxygen and carbon dioxide through a capillary wall.



This diagram shows the exchange of gases between which two body systems?

- F Circulatory and digestive
 - G Circulatory and respiratory
 - H Endocrine and circulatory
 - J None of the above
- 9 The inflammatory response is one of the immune system's nonspecific responses to infection. How does the inflammatory response act as a defense against infection?
- A The high body temperature kills the disease-causing bacteria.
 - B Oil and sweat on the surface of the skin inhibit bacterial growth.
 - C Body heat destroys cellular proteins needed by the invaders to reproduce.
 - D Release of histamine increases blood flow, which brings white blood cells.
- 10 Which type of evidence provides the best support for the hypothesis that the ancestors of tetrapods evolved legs before tetrapods were first seen on land?
- F DNA sequencing
 - G Fetal development
 - H Fossil record
 - J Skeletal morphology

- 11 Miller and Urey exposed hydrogen gas, water vapor, ammonia, and methane gases to sparks in a reacting chamber. What was produced, giving support to certain hypotheses about how life began on Earth?
- A Primitive plants
 - B Organic compounds
 - C Single-celled organisms
 - D Membrane-bound organelles

- 12 In humans, having freckles (F) is dominant to not having freckles (f). Having dimples (D) is also dominant to not having dimples (d). Which statement is true of the offspring whose parents are both heterozygous for both traits ($FfDd$)?
- F An offspring with freckles will not have dimples.
 - G An offspring with freckles will always have dimples.
 - H All of the offspring will have freckles and dimples.
 - J An offspring who does not have freckles may or may not have dimples.

- 13 The Punnett square below shows a cross between two rabbits.

		<i>B</i>	<i>b</i>
<i>B</i>	1	2	
<i>b</i>	3	4	

Bb* × *Bb

Black fur (B) is dominant to brown fur (b). If individuals from box 1 and box 4 were crossed, what would be the genotypes of the offspring?

- A All Bb
- B Bb and bb
- C BB and bb
- D BB and Bb

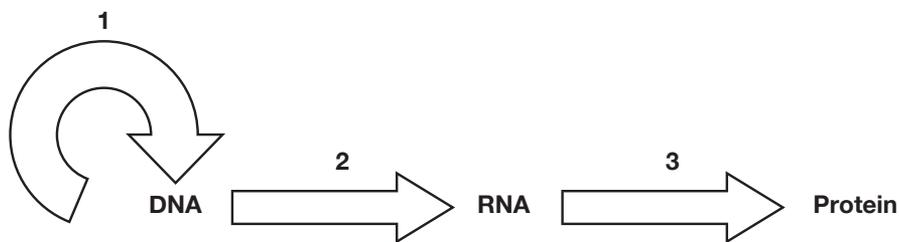
14 Changes in DNA organization over the course of the cell cycle help the cell carry out its functions. What is the difference between the terms *chromosome*, *chromatin*, and *chromatid*?

- F Chromatid is a long, uncoiled strand of DNA; a chromatin is one of two sister structures produced during DNA replication; when the sister chromatins separate, each is considered a chromosome.
- G Chromatin is a long, uncoiled strand of DNA; a chromatid is an “X-shaped” structure that contains two strands of identical DNA; a chromosome is one half of a duplicated chromatid.
- H Chromatid is a long, strand of DNA and proteins; a chromosome is an “X-shaped” structure produced during DNA replication; when the chromosome separates, each half is considered a chromatin.
- J Chromatin is a loose combination of DNA and proteins; a chromosome is a long, condensed strand of DNA and associated proteins; a chromatid is one half of a duplicated chromosome.

15 How could a change in the DNA sequence of a single gene affect an organism?

- A DNA could change into RNA.
- B The function of a protein encoded by the gene could change.
- C The organism would likely no longer be able to produce offspring.
- D The gene could code for carbohydrates instead of proteins.

16 The diagram below shows the processes that occur during gene expression.

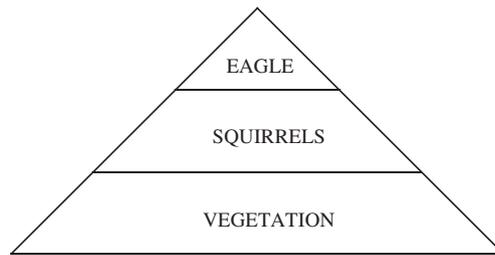


Which of the following is represented at number 2?

- F Translation
- G Replication
- H Transcription
- J Protein synthesis

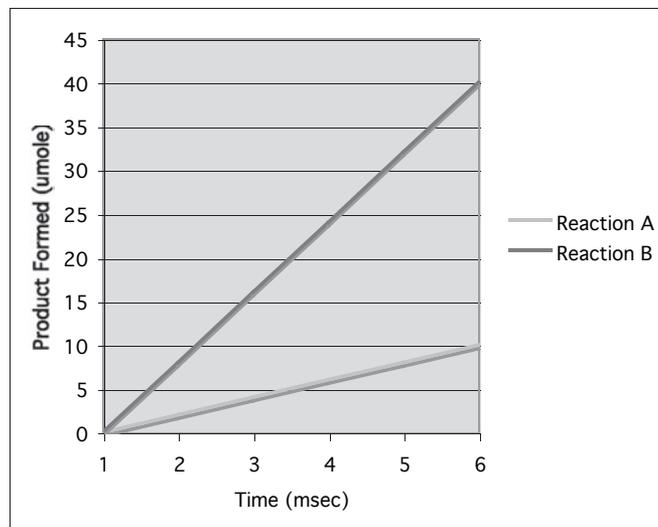
- 17** A silkworm farmer's entire population of silkworm larvae was infected with a deadly strain of bacteria. He treats the silkworms with an antibiotic spray that kills 99% of the bacteria. A month later, the silkworm farm is once again infected with the bacteria. The farmer treats the larvae with the antibiotic spray once more. This time only 50% of the bacteria are killed. Which statement best describes why the antibiotic is not as effective the second time?
- A** The bacteria that survived reproduced, passing on their genes for antibiotic resistance to the next generation.
 - B** The bacteria developed a gene that helped them be resistant to repeated treatments of antibiotics.
 - C** A symbiotic relationship between the silkworm and the bacteria evolved, making the bacteria less susceptible to the antibiotics.
 - D** The antibiotic was less effective the second time because the bacterial population already had developed the antibodies for the antibiotic.
- 18** A crop of wheat has been genetically engineered to be resistant to infection by fungal pathogens. Which of the following might occur as a result of gene flow?
- F** Drug-resistant bacteria may evolve.
 - G** There would be no movement of alleles from the genetically engineered crop of wheat to other nearby wheat crops.
 - H** The genetically engineered wheat may eventually lose its fungal pathogen resistance as it wears off.
 - J** The wheat crops in nearby fields may become resistant to infection by fungal pathogens.

- 19** Many of the proteins in the human body are enzymes that catalyze chemical reactions. What is the relationship between enzymes and activation energy?
- A** When an enzyme catalyzes a reaction, it increases the activation energy of the reaction.
 - B** When an enzyme catalyzes a reaction, it increases the activation energy of the product.
 - C** When an enzyme catalyzes a reaction, it decreases the activation energy of the reaction.
 - D** When an enzyme catalyzes a reaction, it does not affect the activation energy of the reaction.
- 20** Increased crop production in the U.S. can have negative effects on nearby ecosystems. Since crop biomass is removed from farmland, there are fewer plants to take up nitrogen. Much of the excess nitrogen and other nutrients from fertilizers, along with runoff from animal waste, are released into streams, rivers, and lakes. How do these environmental changes most likely affect aquatic ecosystems?
- F** They can affect only those organisms at lower trophic levels who directly take in the excess nutrients.
 - G** They can cause nutrient depletion so that photosynthetic organisms do not receive the nutrients they need to produce food.
 - H** The excess nitrogen and other nutrients leads to greater biodiversity.
 - J** They can increase eutrophication, which leads to oxygen depletion and the suffocation of aquatic species.



- 21 Which of the following is the correct flow of energy in the energy pyramid shown above?
- A The eagle gets energy from eating plants.
 - B The vegetation gets energy from the squirrels.
 - C The squirrels get energy from eating the eagle.
 - D The eagle gets energy from eating the squirrels.
- 22 One contribution to the buildup of greenhouse gases in the atmosphere is from humans' use of fossil fuels. Fossil fuels result from the gradual transformation of layers of organic matter in sediment into natural gas, coal, and petroleum. When fossil fuels are burned, they release a gas that can be used by plants for photosynthesis. High levels of this gas in the atmosphere are typically associated with warmer periods on Earth. What greenhouse gas is released when fossil fuels are burned and also plays a major role in photosynthesis?
- F CO_2
 - G O_2
 - H N_2
 - J O_3
- 23 The chemical equations that summarize photosynthesis and cellular respiration involve many of the same substances because these two processes are interrelated. Which two substances are the products of one of these processes and the reactants of the other process?
- A Oxygen and water
 - B Oxygen and glucose
 - C Carbon dioxide and water
 - D Carbon dioxide and glucose

- 24 A botanist notices that one of his house plants has drooping leaves. Which description best explains what happens when he waters the plant?
- F The sudden movement of water by osmosis into the plant cells causes the cells to swell and burst.
 - G The environment changes from hypotonic to hypertonic, the central vacuole swells, and the leaves stop drooping.
 - H The environment changes from isotonic to hypertonic, mitochondria in the plant cells take up the additional water, and the leaves stop drooping.
 - J The environment changes from isotonic to hypotonic, water moves into cells by osmosis, vesicles in the plant cells swell, and the leaves stop drooping.
- 25 The graph below shows the reaction rates of two different reactions.



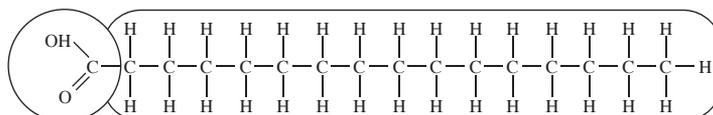
Which of the following statements could explain the difference in the two reactions?

- A Reaction A is catalyzed by an enzyme.
- B Reaction B is catalyzed by an enzyme.
- C Reaction A occurs at a faster rate than Reaction B.
- D Reaction A and reaction B have the same reaction rate.

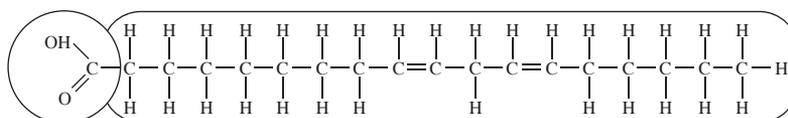
- 26 In 1998, forest fires swept through the forests of Yellowstone National Park. After the fires, biologists observed that new lodgepole pine seedlings began to sprout in the burned areas. The lodgepole pine cones are sealed with a resin that requires great heat to break open and release seeds. What inference could you make from this observation?

F Lodgepole pine seeds sprout easily.
 G Lodgepole pine is adapted to frequent forest fires.
 H Lodgepole pine will grow where other plants cannot.
 J Not all lodgepole pine seeds are contained in a cone.

- 27 The diagram below shows the structural formulas for palmitic acid and linoleic acid.



Palmitic acid



Linoleic acid

Based on the structures of the two fatty acids, which statement is true?

A Palmitic acid is polyunsaturated.
 B Linoleic acid is polyunsaturated.
 C Palmitic acid is monounsaturated.
 D Linoleic acid is monounsaturated.

- 28** Which is an example of evidence that has led biologists to accept modern evolutionary theory?
- F** Comparing the sequence of DNA of different species
 - G** Comparing different literary accounts of the origin of life on Earth
 - H** Comparing the anatomies of domesticated species
 - J** Comparing only the fossil evidence in particular geographic areas
- 29** Today, biologists classify sponges as animals rather than plants. What evidence supports today's classification?
- A** Sponges have asymmetry.
 - B** Sponges do not have a backbone.
 - C** Sponges cannot make their own food.
 - D** Sponges do not have tissues or organs.
- 30** Darwin speculated that natural selection is the mechanism that drives evolution, resulting in population changes that eventually can lead to new species. Which of the following is an example of natural selection within a population?
- F** A male peacock grows longer feathers in brighter colors in order to attract more females than other males do.
 - G** A giraffe continuously stretches its neck in order to reach food in the upper branches of a tree, resulting in a longer neck over time.
 - H** A grasshopper develops an appetite for a new food source after its current food source has been destroyed by herbicides and insecticides.
 - J** A small number of grapevines are resistant to an insect infestation, allowing them to survive and reproduce.

- 31** Sexual reproduction increases genetic variation in a population. Which is a way that meiosis and fertilization lead to genetic variation?
- A** Alleles are recombined when gametes from different parents join together.
 - B** Mutations are usually repaired by cellular machinery before genes are expressed.
 - C** DNA is replicated when a fertilized egg becomes a growing embryo through mitosis.
 - D** Parents that are homozygous for the same trait will have offspring that are also homozygous for that trait.

- 32** The base sequences below show two different sequences of the same gene.

Wild Type: TTGACTCGGTATAC

Mutant: TTGACTCGTATAC

What type of mutation is illustrated?

- F** Deletion
- G** Insertion
- H** Inversion
- J** Substitution

- 33 Modern scientists have observed that genetic changes happen over time in all natural populations. Therefore, by comparing amino acid sequences, scientists can determine how similar one species is to another. The table below compares amino acids in a number of species.

Hemoglobin Comparison	
Animal with hemoglobin	Amino acids that differ from human hemoglobin
Gorilla	1
Rhesus monkey	8
Mouse	27
Chicken	45
Frog	67
Lamprey	125

Based on the information in the table, which animal is most closely related to humans?

- A Chicken
 - B Gorilla
 - C Lamprey
 - D Rhesus monkey
- 34 Speciation is the formation of new species as a result of evolution by natural selection. What most likely effect on speciation could separation of populations have?
- F One half of the species will go extinct if the population is separated.
 - G The separated populations will always evolve into at least two different species.
 - H If the environments differ enough, the separated populations may evolve differently.
 - J By separating, the populations will no longer be able to interbreed and will die off.

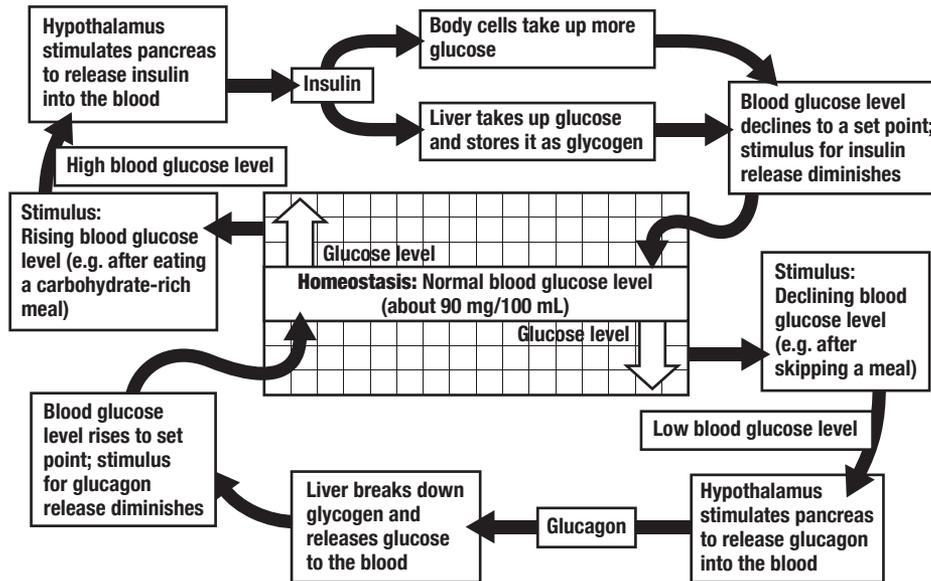
- 35** Which of the following mutations would most likely improve the chances that an organism would survive and reproduce?
- A** A stronger scent that makes an animal easier to find
 - B** A weaker scent that makes a flower less attractive to bees
 - C** Weaker eyesight that makes an animal less likely to find prey
 - D** Stronger leg muscles that allow an animal to jump away from danger
- 36** A genetic engineer is cultivating stem cells from a mouse embryo. The stem cells, like all cells, have a complete copy of the organism's DNA. What element of gene expression in the stem cells would the engineer control in order to ensure the cells grow into muscle cells?
- F** Repressor proteins that enable RNA polymerase to transcribe the genes for muscle proteins
 - G** Transcription factors that bind to sections of the DNA that express genes for muscle cells
 - H** The processing of messenger RNA, such that only introns coding for muscle cell proteins will be included in the final nucleotide sequence
 - J** The *lac* operon, which will turn certain genes on and off in the stem cells
- 37** James Watson and Francis Crick built a model showing that the structure of DNA is like a twisted ladder called a double helix. How is the double helix structure related to the function of DNA?
- A** The double helix shows that one strand of the DNA ladder is inherited from each parent.
 - B** The double helix structure allows DNA to be separated into two identical strands during mitosis.
 - C** The double helix structure of DNA is a random occurrence, and DNA could just as easily be a straight, single-strand molecule.
 - D** The pattern of complimentary bases on each side of the DNA ladder ensures that exact copies of the DNA are made during replication.

- 38** Antibiotic resistance occurs when antibiotics no longer work against disease-causing bacteria, as seen in methicillin-resistant *Staphylococcus aureus*, or MRSA. In what way can a single person most contribute to the production and spread of antibiotic-resistant bacteria?
- F** By carrying and introducing bacteria to new environments
 - G** By combining prescribed and over-the-counter medications
 - H** By washing his or her hands and drinking pasteurized beverages
 - J** By not completing a full course of prescribed medication
- 39** The Miller-Urey theory proposed how early organic molecules appeared on Earth. A weakness of the theory was that it required the presence of methane and ammonia in early Earth's atmosphere, which scientists today speculate were not in fact present. What was a second weakness in the Miller-Urey theory?
- A** Chemical reactants would have been diluted in the mixture of other compounds present in the early atmosphere and not concentrated enough for reactions to occur.
 - B** Solar radiation, volcanic eruptions, and lightning would not have provided sufficient energy to activate the reactions.
 - C** The source of the methane and ammonia could not be identified.
 - D** The ancient atmosphere provided a strongly oxidizing environment.
- 40** Proteins are used to enable movement, provide structure and support, and carry out important chemical reactions inside the body. What is needed in order for the human body to synthesize proteins?
- F** A diet rich in amino acids
 - G** Sufficient sunlight and water
 - H** 1,200 calories of nutrients per day
 - J** Minerals and fats in sufficient amounts

- 41 Mistletoe grows on trees. It sends its roots into the tree and uses the nutrients that could otherwise be used by the tree. If mistletoe benefits from the relationship and the tree is harmed, what kind of relationship exists between the two organisms?
- A Commensalism
 - B Mutualism
 - C Parasitism
 - D Predation
- 42 How can a few cells found at a crime scene be used to identify a criminal?
- F The DNA from the cells can be copied, and then a unique DNA profile can be made.
 - G The DNA from the cells can be compared to known physical characteristics.
 - H The DNA from the cells can be compared to DNA profiles in a database.
 - J The DNA can be used to reconstruct tissue, and then the tissue can be used to identify the criminal.
- 43 *Penicillium notatum* is an organism that is eukaryotic and heterotrophic, has a cell wall made from chitin, and can be either unicellular or multicellular. To which kingdom does *P. notatum* belong?
- A Bacteria
 - B Fungi
 - C Plantae
 - D Protista
- 44 Although viruses enter living cells and can cause diseases such as chicken pox and hepatitis A and B, the viruses themselves are not living. Which of the following characteristics do viruses share with organisms?
- F Growth
 - G Homeostasis
 - H Metabolism
 - J Reproduction

- 45** Which of the following correctly represents the two plant vascular tissues, the types of material they carry, and their direction of flow?
- A** Xylem—water and inorganic nutrients flow in one direction; phloem—water and organic nutrients flow in any direction
 - B** Xylem—water and organic nutrients flow in one direction; phloem—water and inorganic nutrients flow in any direction
 - C** Xylem—water and inorganic nutrients flow in any direction; phloem—water and organic nutrients flow in one direction
 - D** Xylem—water and organic nutrients flow in any direction; phloem—water and inorganic nutrients flow in one direction

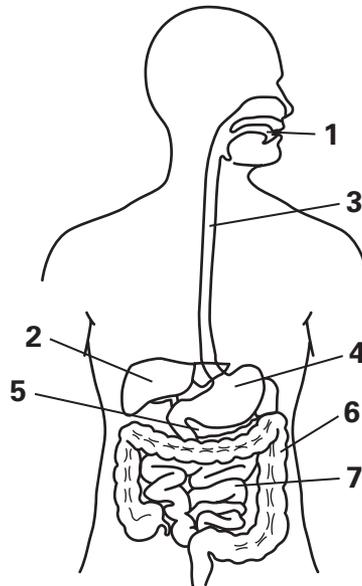
- 46 When a person eats food, the digestive, nervous, and endocrine systems work together to regulate nutrient absorption in the body by releasing and restricting the hormones insulin and glucagon. The feedback mechanism of the two hormones is shown in the illustration below.



A scientist tests how the other systems react when there is a change in one system. She treats mice with a chemical that blocks the release of insulin by the pancreas and then feeds them a diet high in carbohydrates. What would be a logical hypothesis for her experiment?

- F Insulin will build up in the mice's blood and they may develop diabetes.
 - G The mice's blood glucose levels will increase to levels high above normal.
 - H Blood glucose levels will decrease until the mice's next meal.
 - J The liver will breakdown glycogen, releasing glucose into the blood.
- 47 Which of the following is not an adaptation that helps birds of prey catch and eat other animals?
- A Two types of feathers
 - B Sharp claws on their feet
 - C Very good vision
 - D A sharp, curved beak

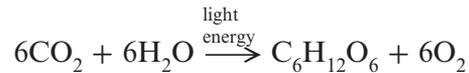
- 48 Bile, produced by the liver and stored in the gallbladder, is released when food is ingested to aid in the process of lipid digestion.



Into which organ of the digestive system is bile released to digest fat?

- F Organ 1
 - G Organ 2
 - H Organ 4
 - J Organ 7
- 49 If the sequence of bases on a strand of DNA is AGGACGCTTGCA, what is the sequence of bases on the corresponding strand?
- A TCCTGCGAACGT
 - B TAACTATCCATC
 - C TAATGAGCCAGT
 - D TTTGATACCTAG

- 50 A student found the equation below in a textbook about cells.



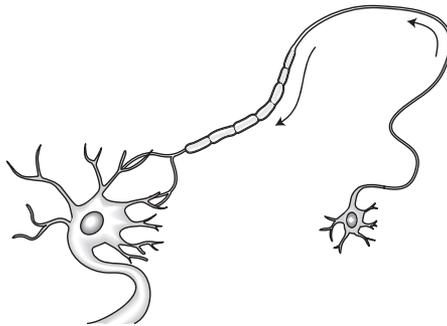
What process is described by this equation?

- F Cellular respiration
 - G Fermentation
 - H Glycolysis
 - J Photosynthesis
- 51 Termites use the cellulose in wood as the main energy source in their diet. However, termites do not produce the enzymes necessary to break down the sugars in cellulose. Bacteria living in termites' digestive system break down cellulose for the termites. Both the termites and the bacteria benefit from this relationship. What is this type of relationship called?
- A Commensalism
 - B Mutualism
 - C Parasitism
 - D Predation
- 52 Which of the following events could lead to primary succession?
- F A volcanic eruption that forms a new island
 - G A natural fire killing all of the trees in a forest
 - H A farmer abandoning a field that used to grow crops
 - J A flood drowning all of the land plants and animals in a field

53 In the laboratory, students pressed hulled, raw sunflower seeds between two pieces of paper cut from a brown lunch bag. Oily dark spots appeared on the paper. The test confirmed the presence of which biological macromolecule in the sunflower seeds?

- A Carbohydrate
- B Lipid
- C Nucleic acid
- D Protein

54 Students look at the cell shown below using a microscope.



What is the function of the cell?

- F To absorb nutrients
- G To transport oxygen
- H To transmit signals
- J To contract and expand