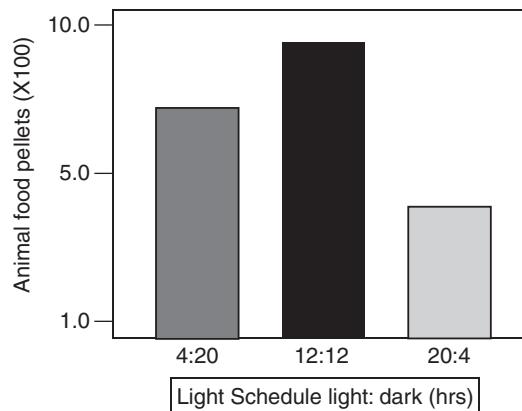


**PRACTICE TEST 2**

- 1** A scientist wants to investigate male-guppy behavior in the presence of female guppies. She puts two longtailed guppies in the same fish tank. The male guppies appear to be indifferent to each other's presence. However, when the scientist adds one female guppy to the tank, the male guppies become aggressive toward one another. Throughout the experiment, the scientist gives the fish enough food so that they do not need to compete for it. In the experiment, why does the scientist maintain the abundance of food before and during the presence of the female guppy?
- A. The scientist wants to see how the guppies react to various amounts of food.
  - B. The scientist wants to see if the female is more interested in food than the male guppies.
  - C. The scientist wants the guppies to have enough energy to display their natural behavior.
  - D. The scientist must ensure that the guppy's behavior is not affected by the need to compete for food.
- 2** It may seem obvious to people living in the modern world that disease is caused by germs or pathogens, but germ theory took centuries to be developed and accepted. Germ theory proposes that microorganisms are the cause of many diseases. This theory was highly controversial when it was first proposed, but it is now a cornerstone of modern medicine. Before germ theory, the view was that disease was spontaneously generated. This ancient view of the cause of disease was first published more than 2,000 years ago. Spontaneous generation was first questioned in 1546, when Girolamo Fracastoro proposed that diseases could be transferred from person to person through small things like seeds. Germ theory was also supported by the observations of Anton van Leeuwenhoek, who first examined pond water under a microscope and identified microorganisms. Other scientists, such as Louis Pasteur, added more evidence to the growing support for germ theory and led to innovations that changed human society, such as antibiotics. What is one reason why germ theory was controversial when it was first proposed?
- F. Most of the public had little experience with diseases.
  - G. The previous theory that disease was spontaneously generated had only recently been accepted.
  - H. The technology had not yet been developed to view microorganisms, many of which can cause disease.
  - I. The previous theory that disease was spontaneously generated had immediate and recognizable evidence.

- 3** A botanist has recently developed an enzyme called NoGro. This enzyme acts as an herbicide by preventing cell growth in the leaves of a certain species of tree that is an invasive plant species in Florida. The botanist wants to test the effects of temperature on NoGro so that NoGro can be applied to the invasive tree under optimal conditions on Florida farms. After looking into the background of the study, you discover that the botanist performing this investigation is being paid by a company that will make a lot of money if NoGro proves to be useful at eradicating the invasive tree. How might this affect your view of the research in this experiment?
- A. You should not consider this an important experiment, because it was funded by industry and not a governmental agency.
  - B. You should approach the results of the experiment with skepticism and review the experimental methods and results carefully.
  - C. You should ignore the conflict of interest between the botanist and the company because all scientific endeavors are performed without bias.
  - D. You should immediately dismiss the entire experiment because the results were definitely skewed to make NoGro look more effective than it actually is.

- 4** The graph below is from an experiment where total light exposure was adjusted for three groups of rats. Each group had 12 rats and each group was exposed to different amounts of light versus dark in a 24-hour period for three months. Food consumption was measured in each group following each 24-hour period. Food pellets are reported as means per group for three months. (Note: All rats used in the experiment were the same age and breed. All were fed the same kind of food pellets.)



What could you infer from the graph?

- F. Light schedules affect the appetites of rats.
- G. Rats eat more when they are exposed to more light.
- H. The appetites of rats are unrelated to light schedule.
- I. Rats eat more when they are exposed to higher temperatures.

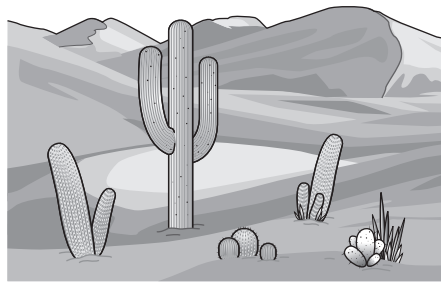
- 5 Darwin's theory of evolution was criticized fiercely during his time. Modern scientists now accept the theory while they still debate many of its details. Though a theory cannot be "proven," significant evidence can be used to support it. What kind of evidence has led biologists to accept modern evolutionary theory?
- A. comparing the sequence of DNA base pairs of different species
  - B. comparing different literary accounts of the origin of life on Earth
  - C. comparing the anatomies of purebred pets and other domesticated species
  - D. comparing Darwin's knowledge with that of modern evolutionary scientists
- 6 Every year, monarch butterflies travel thousands of miles from their summer homes in northern states and Canada to wintering spots in Mexico and southern California. In spring, they make the journey back again. However, the butterflies die before they reach their northern homes. New butterflies, hatched from eggs laid by migrating monarchs, complete the journey. A scientist wanted to know how the new butterflies found their way to their northern homes if they had never been there before. Which of the following is **not** a testable hypothesis about monarch migratory behavior?
- F. Monarchs can sense Earth's magnetic field.
  - G. Monarchs are prettier than other types of butterflies.
  - H. Monarchs follow routes that have many milkweed plants.
  - I. Monarchs can smell the remains of the last season's dead monarchs.
- 7 A theory is a set of related hypotheses that have been tested and confirmed many times by many scientists. Which of the following could cause a long-held theory to be challenged or even overturned by the scientific community?
- A. new evidence that better matches the new theory than previous evidence
  - B. a popular celebrity who disagrees with the ideas outlined in the old theory
  - C. a scientist who has strong beliefs that the old theory is wrong but little evidence
  - D. a group of scientists who believe that new theories are usually better than old theories

- 8** A newspaper headline says, “Detective Has Theory on How Computers Were Stolen from Warehouse.” Which of the following words **most accurately** reflects the use of the term *theory* in this newspaper headline?
- F. experiment                      G. fact  
H. hypothesis                      I. law
- 9** The careful observations of many scientists have resulted in the development of the cell theory. Which of the following is **not** part of this theory?
- A. All cells contain a nucleus.  
B. All cells come from existing cells.  
C. The cell is the basic unit of all living things.  
D. All organisms are made up of one or more cells.
- 10** Sodium-potassium pumps, endocytosis, and exocytosis all involve active transport. Which of the following is a characteristic of active transport?
- F. It involves facilitated diffusion.  
G. It requires energy from the cell.  
H. It relies on vesicles that often function as pumps.  
I. It moves substances with a concentration gradient.
- 11** Which could be found in a prokaryote?
- A. endoplasmic reticulum  
B. flagellum  
C. mitochondrion  
D. nucleus
- 12** Advancements in which of the following pieces of technology allowed scientists to make new discoveries about materials on an atomic level?
- F. telescope                      G. otoscope  
H. light microscope              I. electron microscope

**13** AIDS is a fatal disease caused by HIV, a virus that attacks and destroys the human immune system. Which of the following activities is a risk factor for transmitting HIV?

- A. sharing needles
- B. shaking hands or kissing
- C. being bitten by mosquitoes and ticks
- D. coming in contact with infected toilet seats

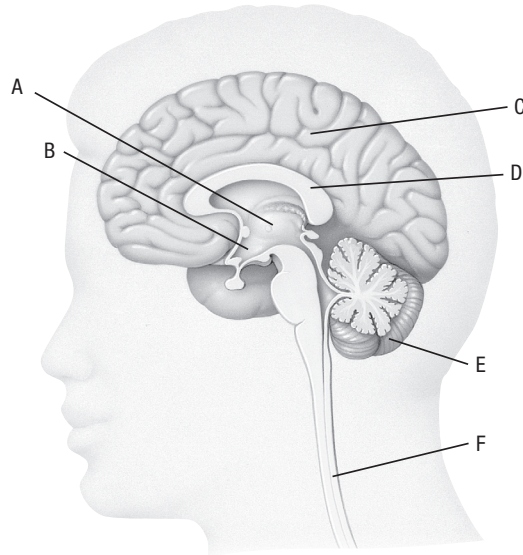
**14** Various types of cactuses, such as those shown in the picture below, thrive in Arizona's deserts even though there is little annual rainfall there.



Which adaptation listed below allows all types of cactuses to survive long periods without rain?

- F. waxy cuticle on their surface
- G. deep roots that tap underground water
- H. cessation of photosynthesis in summer
- I. ability to take water from other desert plants

- 15 The diagram below shows the major parts of the human brain.

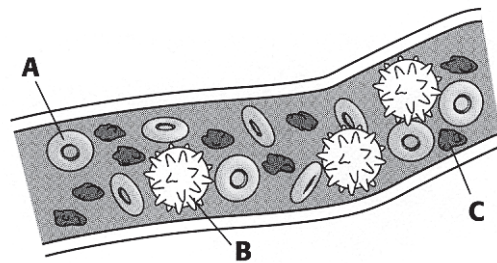


What is part *D*?

- A. cerebellum
- B. corpus collasum
- C. midbrain
- D. pons

- 16 The picture below models a blood vessel carrying different components of blood.

**Components of Human Blood**



If human blood did not contain component *C*, which function could you conclude the blood incapable of?

- F. clotting
- G. fighting disease
- H. carrying oxygen
- I. having red color

**17** In the past, smallpox, which is caused by a virus, was a common and deadly disease. Now, people no longer get smallpox. Which method eradicated the smallpox virus?

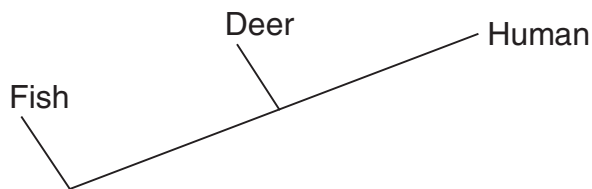
- A. vaccination
- B. cooking food thoroughly
- C. water purification programs
- D. more sanitary living conditions

**18** A species of toad living in an area is similar in form to toad fossils found in very old rock. Which hypothesis does this observation support?

- F. Toads living near the area have evolved slowly over time.
- G. Toads evolved rapidly, because there are many variations in form.
- H. This species of toad burrowed into the rock and became fossilized.
- I. The toads living today migrated to the area from a different region.

**19** A new animal was discovered in a remote area of Southeast Asia. The animal seemed to resemble a crocodile. Biologists have several ways that they can classify the mystery animal and determine its evolutionary history. One way involves identifying important characteristics of the animal and forming a hypothesis about the order in which it evolved from a common ancestor. The first step in this process is to analyze the characteristics in a data table.

ANIMAL	CHARACTERISTICS			
	Backbone	Lungs	Mammary glands	Bipedal
Fish	Yes	No	No	No
Deer	Yes	Yes	Yes	No
Human	Yes	Yes	Yes	Yes
Mystery animal	Yes	Yes	No	No



The cladogram above, based on the data in the table, could show the evolutionary relationships of these animals. Where would a biologist place the mystery animal on the cladogram?

- A. before the fish
- B. between the fish and the deer
- C. between the deer and the human
- D. after the human

- 20** Today, biologists classify sponges as animals rather than plants. What evidence supports today's classification?
- F. Sponges have asymmetry.
  - G. Sponges do not have a backbone.
  - H. Sponges cannot make their own food.
  - I. Sponges do not have tissues or organs.
- 21** Scientists used to group fungi with plants. Which of the following is a major factor that determines why fungi are not classified as part of the plant kingdom?
- A. Fungi do not have leaves.
  - B. Fungi grow close to the ground.
  - C. Fungi can reproduce either sexually or asexually.
  - D. Fungi are heterotrophs, but plants are autotrophs.
- 22** According to the primordial soup model, the first organic molecules could have formed from simpler inorganic substances in Earth's early oceans, but only if there were a source of energy to cause such chemical reactions to take place. Which are possible sources of energy that could have led to the production of these first precursors to life?
- F. lightning and cellular respiration
  - G. nuclear radiation and photosynthesis
  - H. photosynthesis and cellular respiration
  - I. solar radiation, volcanic eruptions, and lightning
- 23** Which species name meaning "wise man" describes hominid fossils associated with the first known paintings?
- A. *Homo erectus*
  - B. *Homo habilis*
  - C. *Homo neanderthalensis*
  - D. *Homo sapiens*



- 24** In a population of clover flowers, there are both white and purple varieties. The cows that graze the field where the clovers grow prefer the purple variety. Over time, the white clover flowers become much more numerous and the purple ones more scarce. This is an example of what process?
- F. evolution
  - G. reproduction
  - H. natural selection
  - I. genetic mutation
- 25** Immigration to the United States in the 1800s from Eastern Europe is an example of which type of force for genetic change?
- A. increased birth rate
  - B. genetic equilibrium
  - C. gene flow through interbreeding
  - D. increased chance of genetic mutation
- 26** Sexual reproduction increases genetic variation in a population. Which is a way that meiosis and fertilization lead to genetic variation?
- F. Alleles are recombined when gametes from different parents join together.
  - G. Mutations are usually repaired by cellular machinery before genes are expressed.
  - H. DNA is replicated when a fertilized egg becomes a growing embryo through mitosis.
  - I. Parents that are homozygous for the same trait will have offspring that are also homozygous for that trait.
- 27** A parent that is heterozygous for two different traits ( $AaBb$ ) can pass any combination of two alleles ( $AB$ ,  $Ab$ ,  $aB$ , or  $ab$ ) to its offspring. Which statement explains why this is possible?
- A. There are alternative versions of genes.
  - B. The two alleles for a single gene separate when gametes are formed.
  - C. For each inherited character, an individual has two copies of the gene.
  - D. The alleles of different genes separate independently of one another during gamete formation.

- 28 The Punnett square below shows a cross between two rabbits. Black fur ( $B$ ) is dominant to brown fur ( $b$ ).

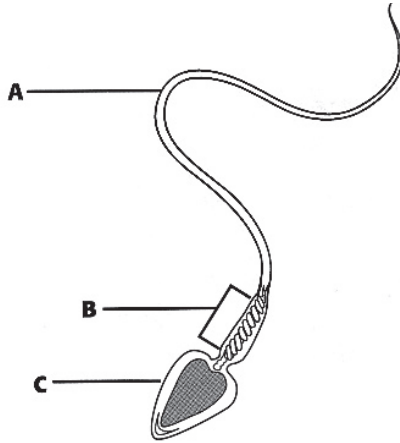
$Bb \times Bb$		$B$	$b$
$B$	1	2	
$b$	3	4	

What would be the phenotype of the offspring indicated by box 3?

- F. black
  - G. white
  - H. brown
  - I. a mixture of brown and black
- 29 During replication, a double-stranded DNA molecule opens up exposing the bases on each strand. Complementary bases line up with the bases on each of the exposed original strands, forming two new strands. The sequence of bases on one of the original strands is CGGTAGGG. What is the sequence of bases on its complementary strand of DNA?
- A. CGGTAGGG
  - B. CGGTUGGG
  - C. GCCATCCC
  - D. GCCAUCCC
- 30 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
  - I. substitution



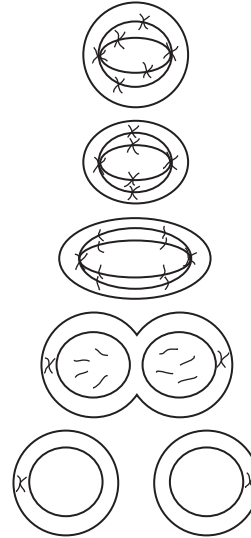
- 35** The diagram shows a sperm cell.



A sperm cell needs lots of ATP, which allows the tail to transport it into the female reproductive system. Which statement is true?

- A. The sperm's mitochondria are found in part *A*.
- B. The sperm's mitochondria are found in part *B*.
- C. The sperm's mitochondria are found in part *C*.
- D. Sperm do not contain mitochondria.

- 36** The diagram below shows the process of cell division.



Which of the following statements about the process is correct?

- F. Two cells are produced, each containing half of the DNA of the parent cell.
- G. Four cells are produced, each containing half of the DNA of the parent cell.
- H. Two cells are produced, each containing a complete set of the parent cell's DNA.
- I. Three cells are produced: one cell receives the entire DNA of the parent and the other two synthesize new DNA from spare nucleotides.

- 37 The following chart shows the number of  $2n$  chromosomes in various organisms.

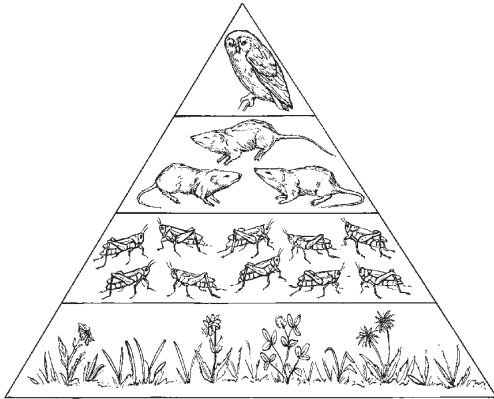
Organism	Number of $2n$ Chromosomes
Mosquito	6
Corn	20
Human	46
Dog	78

Which series lists the number of chromosomes in each gamete of a mosquito, corn, a human, and a dog?

- A. 3, 10, 23, 39
- B. 3, 15, 22, 46
- C. 6, 20, 23, 39
- D. 6, 20, 46, 78
- 38 Cells and the organisms they make up reproduce through cell division. Some organisms reproduce through mitosis, while others reproduce through meiosis and fertilization. What advantage does meiosis give to organisms that reproduce sexually?
- F. Meiosis ensures that offspring inherit genes from their parents.
- G. Meiosis ensures that offspring will not inherit any genetic disorders.
- H. Meiosis ensures that offspring are genetically different from their parents.
- I. Meiosis ensures that offspring will have identical phenotypes to their parents.
- 39 Rivers and the aquatic life that live within them can change over time due to human activity and natural forces. Which of these changes would likely have the greatest effect on a river system?
- A. A city being built near the mouth of the river.
- B. A bridge that crosses the river high in the mountains.
- C. A change in the salinity of the ocean into which it flows.
- D. A dam on the river near where it flows from the mountains.

- 40** Tropical rain forests receive as much as 450 cm of rain per year. They are the richest biome in terms of number of species. Which statement **best explains** how destruction of tropical rain forests could affect the carbon cycle?
- F. Destroying rain forest trees would cause carbon dioxide levels in the atmosphere to drop dangerously low.
  - G. A loss of rain forest trees would have only a small effect on the carbon cycle, because they are green all year long.
  - H. Rain forest destruction would cause only a small increase in carbon dioxide levels if the roots were left to remove carbon dioxide from the air.
  - I. Cutting down rain forests could increase atmospheric carbon dioxide levels, because trees that could take up carbon dioxide would be removed.
- 41** The United States experienced a rapid growth of its population of in the early 1900s. Which of the following factors did **not** contribute to this rapid population growth?
- A. Immigration was greater than emigration.
  - B. The birth rate was higher than the death rate.
  - C. More people moved from farms to large cities.
  - D. Advances in technology led to cleaner food and water supplies.
- 42** Noxious weeds are weeds that invade ecosystems and grow very quickly and aggressively. In Colorado, more than 1 million acres are affected by noxious weeds. How do noxious weeds affect the biodiversity of an ecosystem?
- F. The biodiversity increases slightly because they represent another species in the area.
  - G. They increase the biodiversity because they increase the total energy of the producers.
  - H. The biodiversity usually decreases greatly as the noxious weeds outcompete the local plants.
  - I. The biodiversity is not affected at all since the noxious weeds simply replace the dominant plant in the ecosystem.

- 43 The diagram below is an energy pyramid.



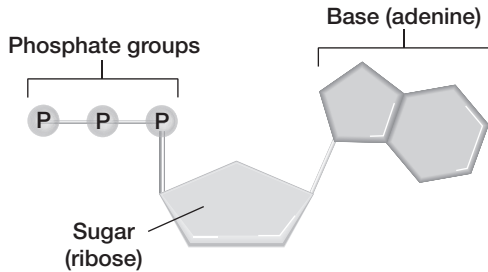
In what level is there the **least energy** available?

- A. the level that contains rats
  - B. the level that contains grasses
  - C. the level that contains the owl
  - D. the level that contains grasshoppers
- 44 A renewable resource is a natural resource that can be replaced at the same rate at which the resource is used. Which of the following is true of renewable resources?
- F. They are less useful than nonrenewable resources.
  - G. Many of them can become scarce if used too quickly.
  - H. They must be converted into nonrenewable resources.
  - I. No matter how much we conserve, they will one day be gone.
- 45 There is a general pattern in how environmental workers and activists overcome environmental problems. Which lists five steps of solving an environmental problem in the order in which they happen?
- A. assessment, public education, political action, risk analysis, follow-through
  - B. assessment, risk analysis, public education, political action, follow-through
  - C. follow-through, assessment, public education, political action, risk analysis
  - D. public education, risk analysis, assessment, follow-through, political action

- 46** In 1985, a researcher in Antarctica noticed that ozone levels in the atmosphere seemed to be as much as 35 percent lower than the average values during the 1960s. Satellite images taken over the South Pole revealed that the ozone concentration was unexpectedly lower over Antarctica than elsewhere in the Earth's atmosphere. It was as if an "ozone eater" were causing a mysterious zone of below-normal concentration, an area that researchers called the ozone hole. Which human activities are thought to be responsible for creating this ozone hole in the upper atmosphere?
- F. increasing the human population and cutting down forests
  - G. burning fossil fuels and the related increase in atmospheric CO<sub>2</sub>
  - H. burning sulfur-rich coal and increasing levels of greenhouse gases
  - I. producing and releasing chemicals called chlorofluorocarbons (CFCs)
- 47** What are the subunits that make up complex carbohydrates?
- A. amino acids
  - B. fatty acids
  - C. monosaccharides
  - D. nucleotides
- 48** Photosynthesis allows plants to produce most of the organic molecules they need. What is the primary source of energy for photosynthesis?
- F. ATP
  - G. fermentation
  - H. heat
  - I. sunlight
- 49** Which of the following pairings shows the substance released during cellular respiration and the cellular structure that is responsible for that process?
- A. O<sub>2</sub> and chloroplast
  - B. ATP and chloroplast
  - C. CO<sub>2</sub> and mitochondria
  - D. glucose and mitochondria
- 50** In the carbon cycle, cellular respiration is the process responsible for the conversion of carbon-containing sugars into carbon dioxide gas, which can then become part of the atmosphere. What process can remove this gas from the atmosphere and return it to the biosphere?
- F. fermentation
  - G. glycolysis
  - H. photosynthesis
  - I. transpiration



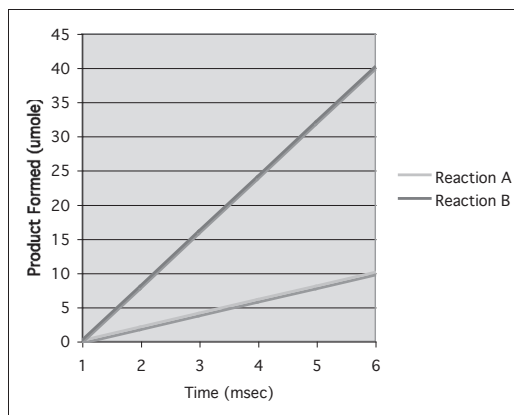
51 Frank made the drawing of ATP shown below.



How is this molecule **most often** involved with the production of energy in a cell?

- A. Energy is released when the third phosphate group breaks off.
- B. Energy is produced when a fourth phosphate group binds to the molecule.
- C. Energy is produced when the sugar ribose is metabolized in the Krebs cycle.
- D. Energy is released when the adenine base is used to form part of an RNA molecule.

52 The graph below shows the reaction rates of two different reactions.



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

- F. Reaction *A* is catalyzed by an enzyme.
- G. Reaction *B* is catalyzed by an enzyme.
- H. Reaction *A* occurs at a faster rate than Reaction *B*.
- I. Reaction *A* and reaction *B* have the same reaction rate.

- 53 Water is often called the “universal solvent” because it can dissolve many different kinds of substances. What kinds of substances mix easily with water?
- A. lipids, fats, and oils
  - B. ionic and polar substances
  - C. nonpolar covalent substances
  - D. polar and nonpolar substances
- 54 A student places a bunch of grapes in a bowl of plain water and a second bunch of grapes in a bowl of salt water. After an hour, the grapes in the plain water are swollen, whereas the grapes in the salt water are shriveled. What cellular process caused the grapes to shrivel?
- F. active transport
  - G. diffusion
  - H. exocytosis
  - I. osmosis
- 55 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

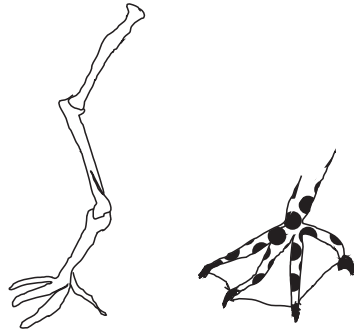
Based on the information in the table, which animal is **most closely** related to humans?

- A. chicken
- B. gorilla
- C. lamprey
- D. rhesus monkey

- 56** The Hardy-Weinberg principle states that the frequencies of alleles in a population do not change unless evolutionary forces act on the population. According to this principle, which of the following is **not** a factor in bringing about a change in the frequency of alleles and genotypes in a population?

F. gene flow  
H. mutation  
G. genetic equilibrium  
I. natural selection

- 57** Examine the illustrations of the two bird feet shown below.



In what types of environments would such feet have a selective advantage?

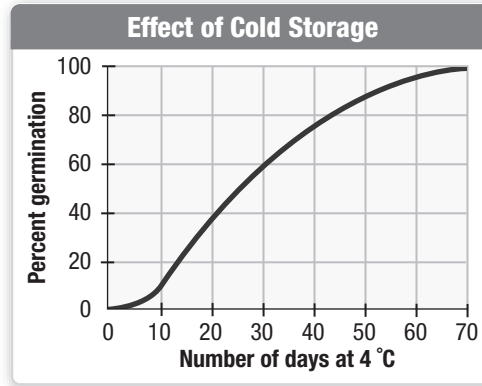
- 58** A trait for flower color shows incomplete dominance, where heterozygous individuals have pink flowers. If a homozygous individual were crossed with a heterozygous individual, what percentage of their offspring would exhibit pink flowers?

F. 0%  
H. 75%  
G. 50%  
I. 100%

- 59** Genetic engineering involves both ethical and scientific issues. Which of the following is **not** an ethical factor in pursuing genetic research?

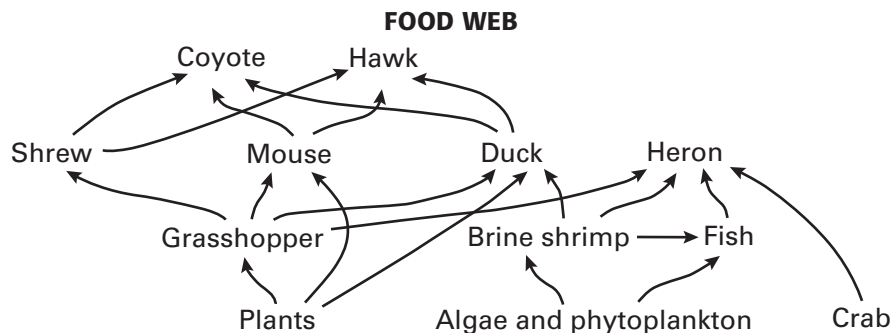
A. debate over the wisdom of allowing patents for specific genes or gene sequences  
B. concern that a genetically modified organism could cause unforeseen environmental harm  
C. debate over whether research on introns or research on transposons should receive the most funding  
D. concern about who should be allowed to have information about the results of genetic tests on individuals

- 60 The graph below shows the percentage of seeds that germinate after being in cold storage for a varying number of days.



Some plants require a cold period to break seed dormancy. What would likely happen to seeds that usually experience a period of dormancy in cold weather if they are planted in a tropical climate?

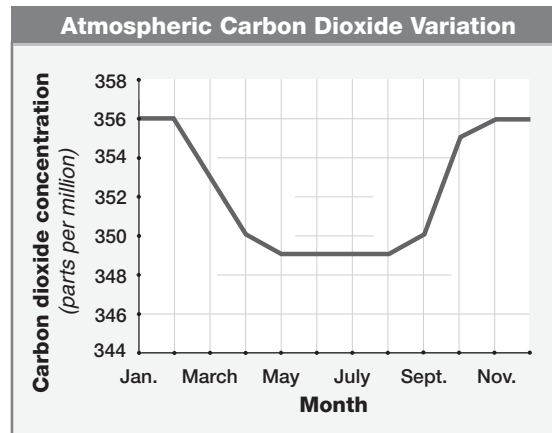
- F. The seeds would not germinate.
  - G. The seeds would germinate very quickly.
  - H. The plants that grew from the seeds would have larger flowers.
  - I. The flowers of the new plants would not produce any more seeds.
- 61 The food web below represents the interactions between organisms in a salt marsh ecosystem and organisms in an old field ecosystem.



Which group of organisms is missing from this diagram?

- A. Consumers are missing from this diagram.
- B. Producers are missing from this diagram.
- C. Decomposers are missing from this diagram.
- D. All the different types of organisms are included.

- 62 The International Panel on Climate Change is a group of scientists from many countries who study and monitor the temperature of Earth's atmosphere. The panel has concluded that Earth's climate is growing steadily warmer. The reason for this global warming, they contend, is an increase of carbon dioxide in the atmosphere, resulting from the burning of fossil fuels in power plants, factories, and automobile engines. Carbon dioxide is a greenhouse gas that causes heat to build up in the atmosphere. Although there are seasonal variations in the amount of atmospheric carbon dioxide, the panel reports that overall atmospheric levels have been steadily rising since the late 1700s, when the Industrial Revolution began. The graph below shows how atmospheric carbon dioxide concentration varies over a year.



How can the dip in carbon dioxide levels shown on the graph be related to the carbon cycle?

- F. Fewer trees are cut for firewood during warmer months.
- G. Erosion of farmland removes carbon dioxide from the air.
- H. More carbon dioxide is dissolved in lake and ocean waters during the warm summer months.
- I. Increased plant growth and photosynthesis during summer months remove more carbon dioxide from the atmosphere.

- 63** Which of the following statements is true?
- A. Water molecules gain energy during evaporation.
  - B. Water molecules lose energy during evaporation.
  - D. Water molecules lose energy during precipitation.
  - C. Water molecules gain energy during condensation.
- 64** Enzymes catalyze chemical reactions that keep cells alive. Imagine that a cell had no enzymes. How would having no enzymes affect the chemical reactions in the cell?
- F. They would happen too slowly to support cellular processes.
  - G. They would happen too rapidly to support cellular processes.
  - H. They would happen at the same rate as they do with enzymes.
  - I. They would happen normally, only they would use different reactants.