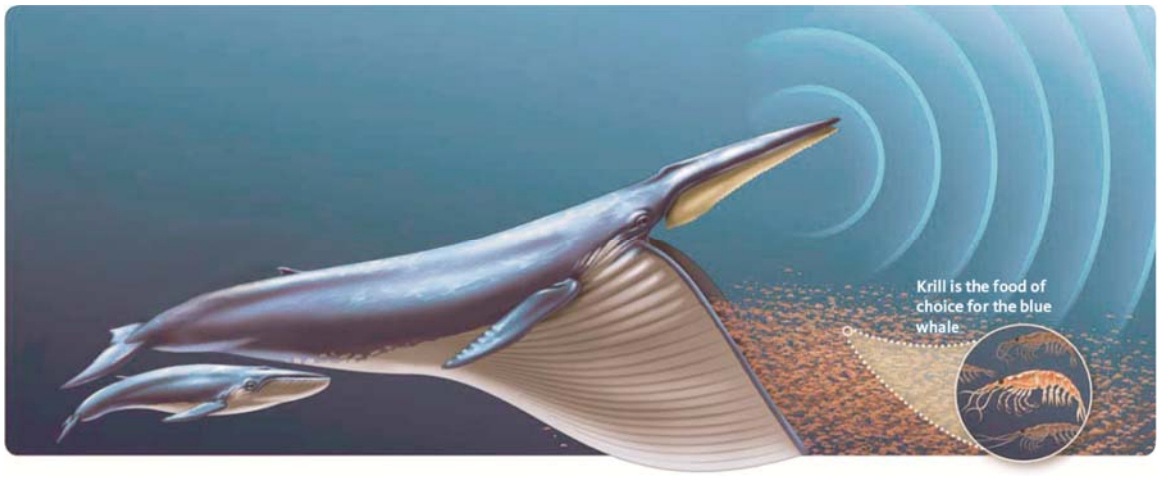
Chapter 1—Biology: The Scientific Study of Life

MULTIPLE CHOICE

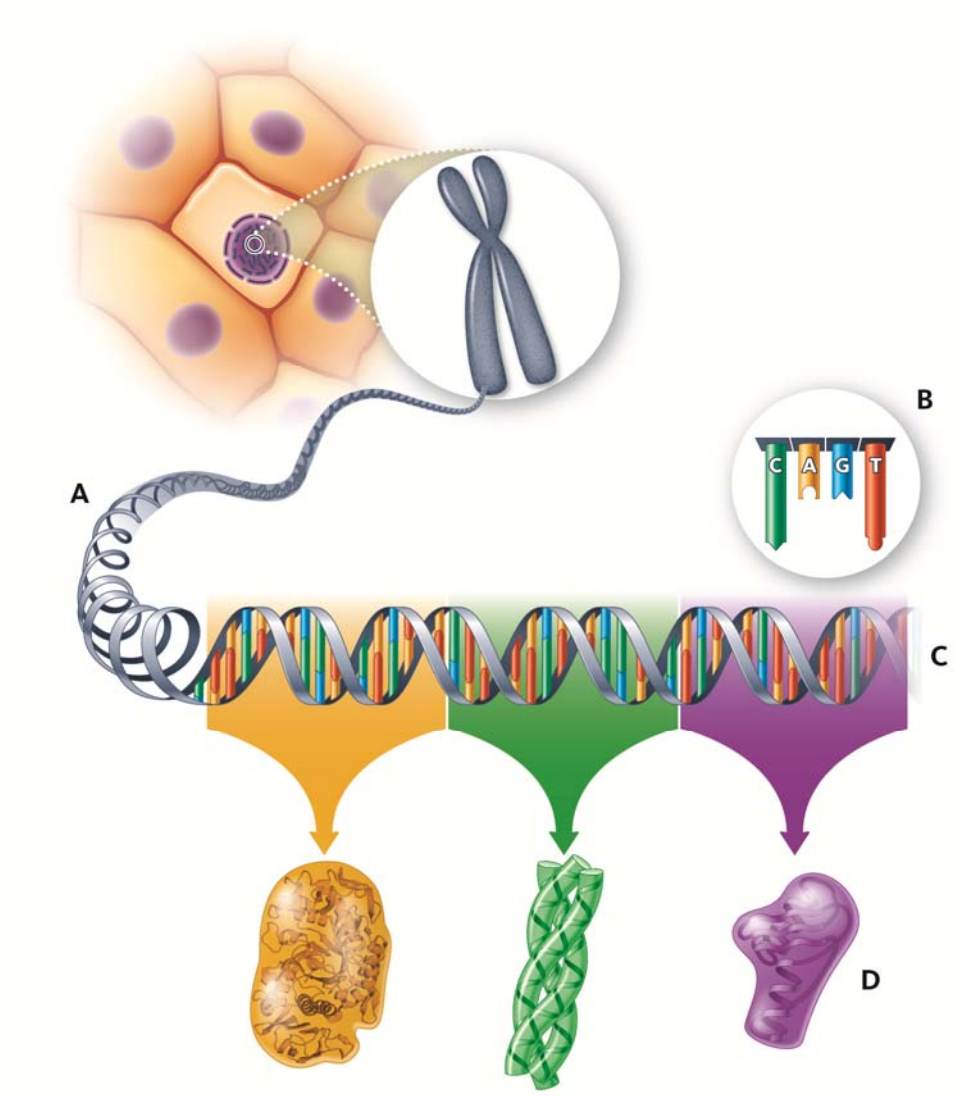


1. In this figure, which includes whales, their krill prey, and the ocean in which they live, what is the highest hierarchical level that is represented?
   a. population
   b. community
   c. ecosystem
   d. biosphere
   e. organisms

   ANS: C PTS: 1 DIF: Easy REF: Comprehension
   OBJ: List at least five ways the blue whale can be used to study life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Hierarchy NOT: Figure 1.1

2. All of the following are characteristics shared by living organisms EXCEPT:
   a. All are composed of cells.
   b. All require energy.
   c. All are consumers.
   d. All reproduce.
   e. All maintain some form of homeostasis.

   ANS: C PTS: 1 DIF: Easy REF: Comprehension
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Key characteristics



3. In this figure, (A) is a portion of a molecule of _____ that provides instructions in the form of _____ (C).
   a. proteins; DNA
   b. DNA; genes
   c. genes; proteins
   d. DNA; proteins

   ANS: B PTS: 1 DIF: Moderate REF: Comprehension
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: DNA NOT: Figure 1.6

4. In this figure, a portion of _____ (A) that codes for a specific _____ (D) is called a _____ (C).
   a. protein; DNA; gene
   b. DNA; gene; protein
   c. gene; protein; DNA
   d. DNA; protein; gene

ANS: D PTS: 1 DIF: Moderate REF: Application
OBJ: List and describe the six shared characteristics of life.
TOP: 1.2 Organisms Share Many of the Same Characteristics
KEY: DNA NOT: Figure 1.6

5. Which of the following correctly lists the terms in hierarchical order from smallest to largest?
   a. nucleotides, DNA, genes, proteins, genome
   b. DNA, genes, proteins, genome, nucleotides
   c. genome, genes, proteins, nucleotides, DNA
   d. proteins, genes, genome, DNA, nucleotides
   e. genes, genome, nucleotides, DNA, proteins

   ANS: A PTS: 1 DIF: Easy REF: Comprehension
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Hierarchy; DNA

6. Sitting in the sun on a hot day, a dog starts to pant and finally gets up and moves into the shade. These activities help the dog maintain a constant body temperature; thus, this is an example of what process found in all living organism?
   a. energy acquisition
   b. reproduction
   c. homeostasis
   d. evolution

   ANS: C PTS: 1 DIF: Moderate REF: Application
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Homeostasis

7. Which of the following correctly lists the terms in hierarchical order from smallest to largest?
   a. electron, atom, carbon element, water molecule, carbohydrate
   b. atom, electron, carbohydrate, carbon element, water molecule
   c. carbohydrate, carbon element, atom, water molecule, electron
   d. water molecule, carbon element, electron, carbohydrate, atom

   ANS: A PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Hierarchy; Atoms, molecules, and macromolecules

8. Which of the following is(are) shared by both prokaryotic and eukaryotic cells?
   a. cell wall
   b. nucleus
   c. cytoplasm
   d. organ systems

   ANS: C PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Cells

9. All of the following are found in eukaryotic cells EXCEPT
   a. a nucleus.
   b. a mitochondrion.
   c. a nucleoid.
   d. ribosomes.

   ANS: C PTS: 1 DIF: Easy REF: Knowledge
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Cells

10. Which of the following describes an organ?
    a. groups of similar cells that perform specialized functions
    b. composed of at least two types of tissues
    c. structure that contains DNA
    d. a thin bilayer that separates individual cells

    ANS: B PTS: 1 DIF: Easy REF: Knowledge
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Organs

11. Some parasites, including tapeworms, are able to absorb all the nutrients they need to survive from their host and so have no digestive system. Ancestors of these tapeworms did have a digestive system, but over many generations, their genome has changed. This change in the genome is an example of
    a. an adaptation.
    b. evolution.
    c. diversity.
    d. homeostasis.

    ANS: B PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe how the unity and diversity of life are explained by evolution.
    TOP: 1.4 The Unity and Diversity of Life Are Explained by Evolution
    KEY: Evolution

    Global warming has led to less snow cover in some areas. Snow cover provides insulation for some burrowing, hibernating animals. In a population of rodents, some animals have slightly thicker fur, and animals with this trait are more likely to survive the winters with low snow cover and thus produce offspring in the spring.

12. This scenario is an example of
    a. an adaptation.
    b. evolution.
    c. natural selection.
    d. homology.

    ANS: C PTS: 1 DIF: Moderate REF: Evaluation
    OBJ: Describe how the unity and diversity of life are explained by evolution.
    TOP: 1.4 The Unity and Diversity of Life Are Explained by Evolution
    KEY: Natural selection

13. The thicker fur that is present in some animals in the population is an example of
    a. an adaptation.
    b. evolution.
    c. natural selection.
    d. homology.

    ANS: A PTS: 1 DIF: Moderate REF: Evaluation
    OBJ: Describe how the unity and diversity of life are explained by evolution.
    TOP: 1.4 The Unity and Diversity of Life Are Explained by Evolution
    KEY: Adaptation

14. There are different versions of the gene that codes for fur thickness, one of which codes for thicker fur and another that codes for thinner fur. In 1995, about 50 percent of the animals had thicker fur, and the other 50 percent had thinner fur. In the spring of 2012, after several years of low snow cover, 70 percent of the population had thicker fur, while only 30 percent had thinner fur. This change in the population is an example of
    a. an adaptation.
    b. evolution.
    c. natural selection.
    d. homology.

    ANS: B PTS: 1 DIF: Moderate REF: Evaluation
    OBJ: Describe how the unity and diversity of life are explained by evolution.
    TOP: 1.4 The Unity and Diversity of Life Are Explained by Evolution
    KEY: Evolution

15. An enzyme is what type of macromolecule?
    a. carbohydrate
    b. protein
    c. lipid
    d. element

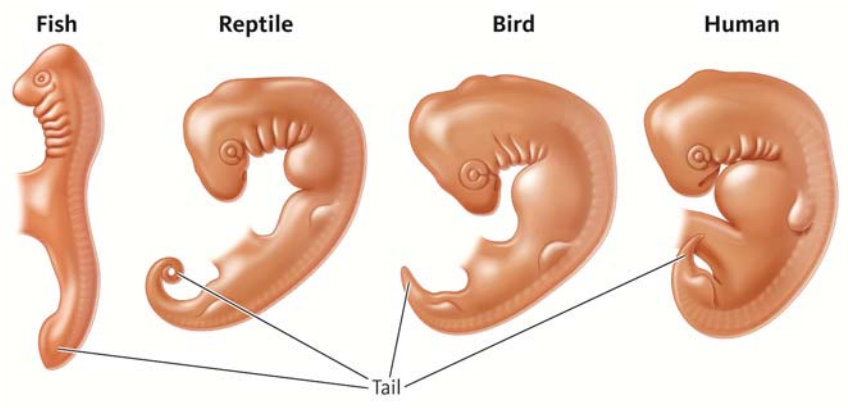
    ANS: B PTS: 1 DIF: Easy REF: Knowledge
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Macromolecule; Enzyme

16. Small animals such as insects and some lizards are able to “walk on water.” This ability is due to the
    a. strong bonds between oxygen and hydrogen atoms forming the water molecule.
    b. attraction among different water molecules due to the unequal attraction of electrons of hydrogen and oxygen in individual water molecules.
    c. bonds that form between two atoms that are oppositely charged.
    d. strong bonds that form between water molecules due to sharing of electrons in the same orbit.

    ANS: B PTS: 1 DIF: Easy REF: Comprehension
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Water

17. Linda is studying the interaction between porcupines, pinion pine trees, and pine bark beetles. Over the course of her study in northern Texas, she observes the behaviors of 25 porcupines, records the location of 151 pinion pines, and traps 332 beetles. Her study encompasses _____ organisms and _____ population(s).
    a. 508; 1
    b. 3; 3
    c. 508; 508
    d. 508; 3
    e. 3; 508

    ANS: D PTS: 1 DIF: Moderate REF: Application
    OBJ: List and describe the six shared characteristics of life.
    TOP: 1.2 Organisms Share Many of the Same Characteristics
    KEY: Organisms; Populations



18. The tail shown in this figure is found in all embryonic vertebrates as a result of similar development patterns and indicates that they share a common ancestor. Based on this information, the particular trait (tail) is an example of
    a. homology.
    b. an adaptation.
    c. natural selection.
    d. fossil evidence.

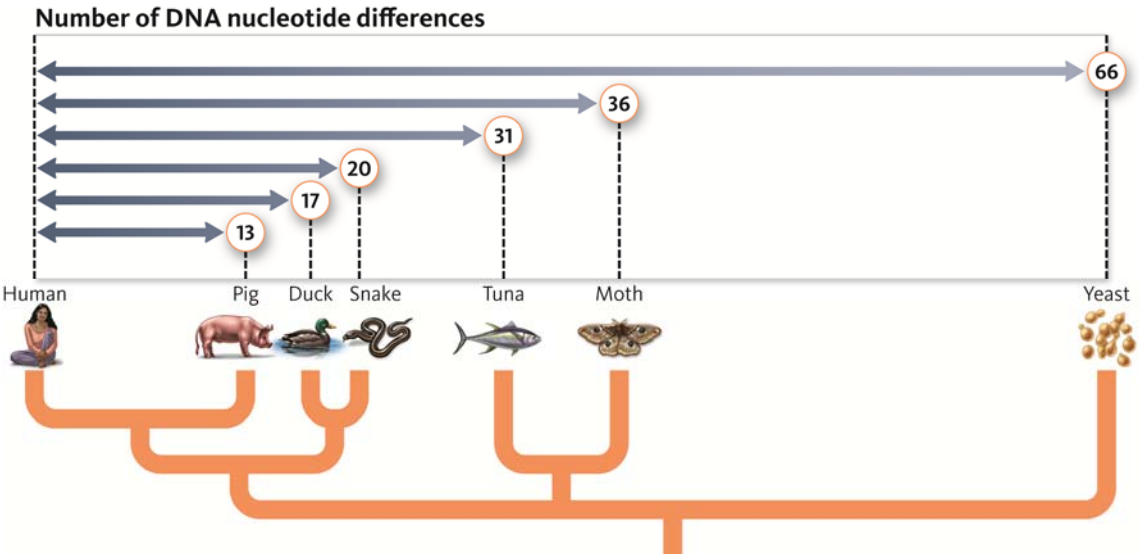
    ANS: A PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Homologous structures NOT: Figure 1.26

19. What is the significance of the fossil *Archaeopteryx*?
    a. It establishes the time sequence of the transition from dinosaur to birds.
    b. The bones of this animal were the first to be used for radiometric dating, which allowed the absolute age of the fossil to be determined.
    c. It was the first fossil discovered from which both physiological and anatomical data could be gathered.
    d. It was the first reptile–bird fossil discovered and helped to establish the relationship between birds and dinosaurs.

ANS: D PTS: 1 DIF: Easy REF: Comprehension
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Fossils

20. Archeologists digging through several layers of rock discover fossils in the different layers. Typically, the deeper the fossil layer, the older the specimen. This is an example of what type of dating?
a. relative dating
b. absolute dating
c. radiometric dating
d. geometric dating

ANS: A PTS: 1 DIF: Easy REF: Knowledge
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Fossils



21. Based on this diagram, which of the following pairs are most closely related?
a. pig and duck
b. tuna and snake
c. duck and snake
d. moth and pig

ANS: C PTS: 1 DIF: Moderate REF: Analysis
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Molecular data NOT: Figure 1.27

22. Based on this diagram, humans are not related to
    a. yeast.
    b. tuna.
    c. moths.
    d. Humans are related to all organisms in this diagram.

    ANS: D PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Molecular data NOT: Figure 1.27

23. What is the organism with the longest evolutionary history in this diagram?
    a. human
    b. pig
    c. snake
    d. yeast

    ANS: D PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Molecular data NOT: Figure 1.27

24. Based on this diagram, which organisms evolved more recently?
    a. humans and pigs
    b. moths
    c. tuna
    d. yeast

    ANS: A PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Molecular data NOT: Figure 1.27

25. Which of the following are used to characterize the evolutionary relationship between organisms?
    a. fossil evidence
    b. developmental patterns
    c. molecular data
    d. observable characteristics
    e. all of these

    ANS: E PTS: 1 DIF: Easy REF: Comprehension
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Evidence of evolution

A recent study of the effects of the general anesthetic isoflurane suggests that it has a direct impact on an organism's biological clock. This study focused on honeybees because their clock genes are similar to those found in mammals. Prior to the start of this study, bees were trained to fly to an artificial flower to obtain sugar water and then return to the hive. In this study, researchers caught the bees as they approached the artificial flower. Half of the bees were anesthetized, and the other half were contained and not allowed to return to the hive immediately. After six hours, when all the anesthetized bees had awoken, both groups of bees were released. Honeybees use the sun to navigate, and their biological clock allows them to correct for the time of day. The bees that were not anesthetized flew directly to the hive, making adjustments for the time of day. However, those that were anesthetized made adjustments as if the time were hours earlier and flew at the wrong angle. Doctors report that people often emerge from general anesthesia disoriented in time and may sleep fitfully for a while afterward. Based on the honeybee study, researchers are looking into ways to keep the internal clock ticking normally even during surgery.

26. In a natural system, honeybees as well as the flowers they feed on and pollinate would be considered a(n)
    a. ecosystem.
    b. population.
    c. community.
    d. organ system.

    ANS: C PTS: 1 DIF: Easy REF: Application
    OBJ: List and describe the six shared characteristics of life.
    TOP: 1.2 Organisms Share Many of the Same Characteristics
    KEY: Communities

27. Honeybees and the flowers they feed on are called _____, which are composed of large, complex cells with many specialized compartments.
    a. prokaryotes
    b. macromolecules
    c. microbes
    d. eukaryotes

    ANS: D PTS: 1 DIF: Easy REF: Application
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Cells

28. Which of the following is the best hypothesis for the honeybee study?
    a. Honeybees navigate using the sun.
    b. Patients undergoing anesthesia during surgery are often disoriented when they awaken.
    c. Isoflurane interferes with the functioning of an organism's biological clock.
    d. Both mammals and honeybees have biological clocks that are similar in function.

    ANS: C PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Scientific method; Hypothesis

29. In this study, which is the control group?
    a. the honeybees that were anesthetized
    b. the honeybees that were not anesthetized

    ANS: B PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Scientific method

30. Both honeybees and birds have wings for flight; thus, these structures are homologous in the two animal groups.
    a. true, because the wings have a similar function and thus must be anatomically similar
    b. false, because the wings look very different between the two groups
    c. true, because all animals have a common ancestor
    d. false, because birds and honeybees do not share a common ancestor from which this trait was derived

    ANS: D PTS: 1 DIF: Moderate REF: Application
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Homologous structures

31. In this study, which is the experimental group?
    a. the honeybees that were anesthetized
    b. the honeybees that were not anesthetized

    ANS: A PTS: 1 DIF: Moderate REF: Application
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Scientific method

32. Based on this study, which of the following is true?
    a. The researchers have proven their theory.
    b. The researchers have evidence to support their hypothesis.
    c. The data from the experiment is inconclusive.
    d. The researchers must run several more similar trials before their hypothesis is proven.

    ANS: B PTS: 1 DIF: Easy REF: Comprehension
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Scientific method

33. The genes that play a role in the biological clock form part of gene storing structures in the nucleus known as
    a. nucleotides.
    b. chromosomes.
    c. tissues.
    d. proteins.

ANS: B PTS: 1 DIF: Easy REF: Comprehension
OBJ: List and describe the six shared characteristics of life.
TOP: 1.2 Organisms Share Many of the Same Characteristics
KEY: Chromosomes

34. The genes that play a role in the biological clock code for what specific molecules?
    a. nucleotides
    b. tissues
    c. proteins
    d. carbohydrates
    e. DNA

    ANS: C PTS: 1 DIF: Easy REF: Comprehension
    OBJ: List and describe the six shared characteristics of life.
    TOP: 1.2 Organisms Share Many of the Same Characteristics
    KEY: Proteins

35. Honeybees that feed on nectar are categorized as
    a. producers.
    b. consumers.
    c. decomposers.
    d. photosynthetic.

    ANS: B PTS: 1 DIF: Easy REF: Knowledge
    OBJ: List and describe the six shared characteristics of life.
    TOP: 1.2 Organisms Share Many of the Same Characteristics
    KEY: Consumers

36. Honeybees must maintain specific temperatures to thrive. On hot days, the hive can quickly overheat, so some bees will stand near the entrance and fan their wings to provide cool air currents into the hive. In winter, honeybees cluster together in their hives and vibrate their wings in a form of shivering to generate heat and maintain the hive at a constant temperature. This heating and cooling is a form of
    a. homeostasis.
    b. evolution.
    c. competition.
    d. homology.

    ANS: A PTS: 1 DIF: Easy REF: Application
    OBJ: List and describe the six shared characteristics of life.
    TOP: 1.2 Organisms Share Many of the Same Characteristics
    KEY: Homeostasis

37. The sugars that honeybees feed on are what type of macromolecules?
    a. lipids
    b. carbohydrates
    c. proteins
    d. nucleic acids

    ANS: B PTS: 1 DIF: Easy REF: Knowledge
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Macromolecules

MATCHING

Match each of the following terms with the appropriate description. Select the best answer using each choice only once.

a. oxygen
b. protein
c. negatively charged particle
d. DNA
e. lowest level in the hierarchy that is considered a living organism
f. positively charged particle

1. cell
2. structural molecule
3. electron
4. element
5. proton
6. molecule that carries genetic information

1. ANS: E PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Cells
2. ANS: B PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Macromolecules
3. ANS: C PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Atoms
4. ANS: A PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Elements
5. ANS: F PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: Atoms
6. ANS: D PTS: 1 DIF: Easy REF: Comprehension
   OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
   TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
   KEY: DNA

Match each of the following terms with the appropriate description. Select the best answer using each choice only once.

a. consumer
b. producer
c. decomposer
d. eukaryotic
e. prokaryotic

7. a bacterium that obtains its energy from dead and decaying matter
8. acacia tree
9. a giraffe eating leaves from tall acacia trees
10. the cells of the giraffe and acacia tree
11. the type of cell that characterizes bacteria

7. ANS: C PTS: 1 DIF: Easy REF: Application
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Decomposers
8. ANS: B PTS: 1 DIF: Easy REF: Application
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Producers
9. ANS: A PTS: 1 DIF: Easy REF: Application
   OBJ: List and describe the six shared characteristics of life.
   TOP: 1.2 Organisms Share Many of the Same Characteristics
   KEY: Consumers
10. ANS: D PTS: 1 DIF: Easy REF: Application
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Cells
11. ANS: E PTS: 1 DIF: Easy REF: Application
    OBJ: Explain how organisms are systems of complex interactions at all levels of hierarchy.
    TOP: 1.3 Organisms Are Complex Interactive Systems at All Levels of Organization
    KEY: Cells

For each of the five questions below, choose the letter that best corresponds with each statement. Each letter is used only once.

a. state results
b. form hypothesis
c. experimental design
d. observational experiment
e. draw conclusions from experiment

12. Biologists suggest that 2–3 cups of coffee can decrease death rates among women.
13. Ashley set up mist nets to catch bats flying over a small stream. Each bat that was caught was weighed and its sex was determined.
14. Lauren watched butterflies feeding in a large field of wildflowers. She noticed that more butterflies approached the yellow and purple flowers than the red flowers.
15. Brandon reported that red-foot tortoises preferred red colored fruits and vegetables to those that were green or white.
16. Out of twenty spiders, five ate only crickets, twelve ate both crickets and waxworms, and three did not eat.

12. ANS: B PTS: 1 DIF: Moderate REF: Analysis
    OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
    TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
    KEY: Scientific method

13. ANS: C PTS: 1 DIF: Moderate REF: Analysis
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Scientific method
14. ANS: D PTS: 1 DIF: Moderate REF: Analysis
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Scientific method
15. ANS: E PTS: 1 DIF: Moderate REF: Analysis
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Scientific method
16. ANS: A PTS: 1 DIF: Moderate REF: Analysis
OBJ: Describe the process of science, including how scientists use evidence to answer questions about life.
TOP: 1.5 Biologists Use Evidence to Answer Questions about the Living World
KEY: Scientific method