

Answer Section

CHAPTER 1: INTRODUCTION: EVOLUTION AND THE FOUNDATIONS OF BIOLOGY

FOCUS QUESTIONS

- 1.1.
 - a. The biosphere includes all life on Earth and the environments inhabited by life—most regions of land and water, the sediments and rocks below Earth's surface, and the atmosphere up to several kilometers.
 - b. An ecosystem includes all the living organisms in an area and the nonliving parts of the environment with which they interact.
 - c. A community consists of all the organisms inhabiting a particular area. Each diverse form of life is called a *species*.
 - d. A population includes all the individuals of a single species in an area.
 - e. An organism is an individual living entity.
 - f. Organs, found in more complex organisms, are body parts that perform a particular function. Organ systems are groups of organs that perform a larger function.
 - g. Tissues are groups of cells that collectively perform a specialized function. Several tissues make up an organ.
 - h. Cells are the fundamental units of life.
 - i. Organelles are the functional components of cells.
 - j. Molecules are composed of two or more atoms. Molecules are the chemical units that make up living organisms.
- 1.2. The order of nucleotides in a DNA molecule that makes up a gene "spells" the instructions, which are transcribed into RNA and then translated into a protein with a specific function.
- 1.3. Chemical nutrients are recycled as photosynthesizing plants absorb water, minerals, and CO₂, producing sugar and releasing O₂; consumers eat plants and other organisms; and decomposers return nutrients to the ecosystem. Energy flows through ecosystems, entering as solar energy, being transformed to chemical energy that drives cellular work, and exiting as heat.
- 1.4. These organisms are characterized to a large extent by their mode of nutrition. Plants are photosynthetic, fungi absorb their nutrients from decomposing organic material, and animals ingest other organisms.
- 1.5. Most species tend to produce more offspring than can survive. Organisms with heritable traits best suited to the environment will tend to survive and leave more offspring. Over time, favorable adaptations will accumulate in a population. New species may arise as small populations are exposed to different environments and natural selection favors different traits.
- 1.6.
 - a. The control groups were the camouflaged mice models placed in their native habitat. The experimental group in each habitat was the non-camouflaged mice models.
 - b. This experiment could not control for the number of predators in each area and thus for the total number of attacks on non-camouflaged mice. By presenting data as the predation rate or proportion of total attacks, the effect of this variable was eliminated.
- 1.7.
 - a. A hypothesis is less broad in scope than a theory; it is a tentative explanation for a smaller set of observations. A theory can generate many testable hypotheses and is supported by a large body of evidence. Both hypotheses and theories are revised when new data fail to support their predictions.
 - b. Science seeks to understand natural phenomena; technology is the practical use of scientific knowledge.

SUGGESTED ANSWERS TO STRUCTURE YOUR KNOWLEDGE

1. a. With every increase in organizational level, the organization and interactions of component parts lead to new, emergent properties of the dynamic system. Cells are an organism's basic units of structure and function. They come in two distinct forms: prokaryotic and eukaryotic.
- b. DNA is the molecule of inheritance; it codes information for proteins and the functions of a cell and is passed on from one generation to the next.
- c. All organisms require energy. Energy flows through ecosystems from sunlight to chemical energy in producers and consumers and then escapes as heat. Chemical nutrients are recycled within an ecosystem.
- d. An organism interacts with other organisms. These interactions may be mutually beneficial, or

one or both species may be harmed. Organisms also interact with the physical environment, and the environment is affected by the organisms that live there.

e. Evolution explains the unity and diversity of life. All organisms are modified descendants of common ancestors. Darwin's theory of natural selection leading to unequal reproductive success accounts for the adaptation of populations to Earth's varying environments.

ANSWERS TO TEST YOUR KNOWLEDGE

Multiple Choice:

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| 1. d | 3. b | 5. e | 7. e |
| 2. d | 4. d | 6. c | |