Answers to Practice Quizzes

Chapter 1

1. Apo Island’s marine preserve allows fishing with hand-held lines, bamboo traps, large mesh nets, spear fishing without SCUBA gear, and hand netting. Fishing with dynamite, cyanide, trawling, and Muro-ami are forbidden. This has increased fish populations and made it easier to catch the fish needed to support a family. The healthy reef community now attracts ecotourists and provides jobs for islanders.
2. Science assumes that the world is knowable and that we can learn about it through careful observations. Some other principles of science are described in table 1.1.
3. A hypothesis is a testable, provisional explanation. A scientific theory is an explanation supported by a large body of empirical evidence and regarded by a majority of scientists as likely to be correct.
4. The scientific method involves 1) identifying a question, 2) forming a testable hypothesis, 3) collecting data, 4) interpreting results, 5) reporting results for peer review, 6) publishing findings. See figure 1.4.
5. Probability is a measure of how likely something is to occur. An example is flipping a coin. Each toss has a 50% probability of landing on a particular side.
6. By convention, we put the dependent variable on the vertical (Y) axis and the independent (or explanatory) variable on the horizontal (X) axis.
7. The first step in critical thinking is to ask, “What is the purpose of my thinking?”
8. Utilitarian conservation is pragmatic, efficient resource use for the greatest good for the greatest number for the longest time. Gifford Pinchott and Teddy Roosevelt were leaders in this movement. Biocentric preservation emphasizes the right of other organisms—and nature as a whole—to exist regardless of their usefulness to us. John Muir was a leading proponent of this philosophy.
9. Water is a critical resource because 1.1 billion people lack access to clean water, 15 million people die annually from diseases linked to polluted water or inadequate sanitation, and by 2025, the U.N. warns, three-quarters of all humans may live in water-stressed countries.
10. In figure 1.7, the most dramatic warming occurs at high latitudes, especially northern Canada, Siberia, and parts of the Arctic Ocean.
11. Marine reserves, such as Apo Island, are restoring fish populations; cities are cleaner and more livable; population growth has slowed or stabilized in most of the world; many infectious diseases are decreasing; food supplies have kept up with population growth; renewable energy is making progress; and information and technology for solving problems is spreading around the world at an ever increasing pace.
12. The poorest people are often both the victims and agents of environmental degradation. Forced to meet short-term survival needs at the cost of long-term sustainability, they suffer most from environmental damage because they have few other options.
13. Sustainability is a search for ecological stability and human progress that can last over the long term. Sustainable development is defined as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

Chapter 2

1. Three primary nutrients in fertilizers are nitrogen (N), phosphorus (P), and potassium (K).
2. Systems are networks of interactions among interdependent units or compartments as well as processes or flows that link those components. A positive feedbackloop uses the output from a process to increase or enhance that process; in a negative feedback loop the output of a process to inhibit or reverse that process.
3. Carbon atoms, like all matter, are constantly cycled in living organisms. Given the huge number of carbon atoms in your body, it’s almost certain that some of them were also part of some prehistoric organisms.
4. Water molecules are polar, which makes water a superb solvent. Water is the only inorganic liquid that exists at normal ambient temperatures. This provides a liquid medium for life processes. Water molecules are highly cohesive. This results in capillary action. Water expands when it crystallizes so that ice floats. Water has a high heat of vaporization, so we can remove a large amount of heat through evaporation. Water has a high specific heat, making it an ideal medium for storing heat and moderating the earth’s temperature.
5. DNA (deoxyribonucleic acid) is a molecule made up of nucleotides (purines or pyrimidines coupled to phosphate and sugar molecules) linked together in long chains. The specific sequence of nucleotides in a DNA molecule carries the genetic information that codes for protein structure and gives each organism its unique heritable characteristics.
6. High-quality energy is intense, concentrated, high-temperature, and useful for work. Low-quality energy is diffused, dispersed, low temperature, and difficult to gather or use for productive work.
7. Materials always cycle in the biosphere because of the law of conservation of matter. Energy flows in a linear fashion because of the second law of thermodynamics, which says that in every energy exchange, some of the energy is converted from higher quality to lower quality. Thus, to keep living processes going, there has to be a constant energy input and a sink to which surplus waste energy can be dumped.
8. Our eyes are sensitive only to visible light (0.4 to 0.7 um), which happens to be the most common wavelengths in solar radiation. Short ultraviolet wavelengths (microwaves (10 nm or 10 x 10-9 m) are 1 million (1 x 106) times shorter than microwaves (1 mm or 1 x 10-3 m).
9. Extremophiles live in extreme conditions at the bottom of the ocean, in hot springs, or deep in the earth’s crust. They get the energy they need to live by chemosynthesis: reactions that use chemicals, such as hydrogen sulfide or hydrogen gas as an energy source.
10. For most organisms on the earth’s surface, the ultimate source of energy is the sun, and the sink for waste energy is outer space.
11. Green plants capture solar energy through photosynthesis, a series of chemical reactions that occur in chloroplasts. The energy captured in this process is used to create chemical bonds in organic molecules. These molecules serve both as an energy source and building material for all plants and animals.
12. A species is made of all the organisms of the same kind that are able to breed under natural conditions and produce live, fertile offspring. A population consists of all the members of a species living in a given area at the same time. A biological community is made up of all the populations of different species living and interacting in a given area at a specific time.
13. Big, fierce animals (like grizzly bears, tigers, and great white sharks) are usually the top carnivores in their ecosystem. They need to be large and fierce to catch their prey. Because they are at the top of the ecological pyramid, it takes many organisms at lower trophic levels (and therefore, large home ranges) to support these big carnivores. Thus, there are never very many of them in a given area. Their adaptations as top predators make them dangerous to humans. They also often compete with us for food, so we tend to eliminate them either directly by hunting, or indirectly by reducing their food supplies or eliminating their habitat.
14. An example of an inverted ecological numbers pyramid might be a single large tree supporting many herbivorous insects, or a single coyote supporting many parasites.
15. Humans release about 7 GT of carbon annually compared to 100 GT released by respiration from land-based plants, animals, and microbes.