

Chapter 2—Science, Matter, Energy, and Systems

MULTIPLE CHOICE

1. Science
 - a. studies the past to predict the future.
 - b. attempts to discover how the physical world works by experimenting,, making measurements and observations.
 - c. is best described as a collection of facts found through using scientific methods.
 - d. is supported by small amounts of evidence.
 - e. none of these answers.

ANS: B PTS: 1 DIF: Moderate TOP: 2-1 What do Scientists do?

2. Which of the following is *not* part of the scientific method?
 - a. reasoning
 - b. imagination
 - c. scientific tests
 - d. religious beliefs
 - e. observation

ANS: D PTS: 1 DIF: Easy TOP: 2-1 What do Scientists do?

3. Which of the following behaviors would be *least* accepted by the scientific community?
 - a. observing patterns in nature
 - b. hypothesizing about evidence
 - c. overstating a claim
 - d. arguing over alternative interpretations
 - e. developing experiments to test a hypothesis

ANS: C PTS: 1 DIF: Moderate TOP: 2-1 What do Scientists do?

4. Which of the following statements is *incorrect*?
 - a. Scientific laws are descriptions of nature with no known exceptions.
 - b. Hypotheses explain observed scientific data.
 - c. A hypothesis tested many times by reproducible controlled experiments becomes a scientific theory.
 - d. The law of gravity is a scientific law.
 - e. A tentative explanation that needs further evaluation is a scientific theory.

ANS: E PTS: 1 DIF: Difficult TOP: 2-1 What do Scientists do?

5. Which of the following does *not* characterize frontier science?
 - a. It often involves disputes among scientists.
 - b. It often deals with preliminary data.
 - c. It can lead the public to think that all scientific ideas have the same level of uncertainty.
 - d. The public usually readily understands it.
 - e. It often captures news headlines.

ANS: D PTS: 1 DIF: Moderate TOP: 2-1 What do Scientists do?

6. Which of the following statements is *incorrect* about reliable science?
- It can be proven absolutely.
 - Hypotheses are not totally free of human bias.
 - It assumes that the natural world follows cause and effect patterns that we can understand..
 - It involves data, hypotheses and theories that are widely accepted by experts in the particular field.
 - It is subject to testing, peer review, reproducibility and debate.

ANS: A PTS: 1 DIF: Difficult TOP: 2-1 What do Scientists do?

7. Liquid, solid, and gas are
- physical forms of matter.
 - chemical forms of matter.
 - mixtures.
 - compounds.
 - forms of energy.

ANS: A PTS: 1 DIF: Easy
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

8. Matter is anything that
- has mass and occupies space.
 - has the capacity to do work.
 - can be changed in form.
 - can produce change.
 - moves mass.

ANS: A PTS: 1 DIF: Easy
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

9. Protons, neutrons, and electrons are all
- forms of energy.
 - equal in mass.
 - subatomic particles that make up atoms.
 - negative ions.
 - charged particles.

ANS: C PTS: 1 DIF: Easy
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

10. The atomic number is the number of
- atoms in a molecule.
 - protons in an atom.
 - nuclei in a molecule.
 - electrons in an atom.
 - protons and neutrons in an atom.

ANS: B PTS: 1 DIF: Easy
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

11. The atomic mass is equal to the sum of the
- neutrons and isotopes.
 - neutrons and electrons.
 - neutrons and protons.
 - protons, neutrons, and electrons.
 - protons only.

ANS: C PTS: 1 DIF: Easy
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

12. Forms of an element having the same atomic number but different atomic mass numbers are called
- atomic number.
 - mass numbers.
 - isotopes.
 - nuclei.
 - electrons.

ANS: C PTS: 1 DIF: Moderate
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

13. Carbon, hydrogen, oxygen and nitrogen make up approximately what percentage of most living organisms?
- 25%.
 - 50%
 - 75%
 - 80%
 - 96%.

ANS: E PTS: 1 DIF: Moderate
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

14. The acidity or alkalinity of water or soil is important to determine
- the uptake of chemicals in the soil by plants.
 - how dissolved substances interact with their environment.
 - a only
 - b only
 - a and b

ANS: E PTS: 1 DIF: Moderate
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

15. Which of the following is *not* an example of an organic compound?
- aspirin.
 - plastics.
 - ammonia.
 - limestone.
 - sugar.

ANS: C PTS: 1 DIF: Moderate
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

16. Which of the following is *not* an example of a macromolecule?
- lipids.
 - nucleic acids.
 - proteins.
 - complex carbohydrates.
 - nucleotides.

ANS: E PTS: 1 DIF: Moderate
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

17. Which statement best summarizes the *law of conservation of matter*?
- We can rearrange matter but we cannot create or destroy it.
 - Matter that is highly concentrated and readily available is most useful as a human resource.
 - Matter consists of elements and compounds.
 - Matter can undergo a physical change in its chemical composition.
 - Matter should never be wasted.

ANS: A PTS: 1 DIF: Difficult
TOP: 2-2 What Is Matter and What Happens When it Undergoes Change?

18. Energy can be formally defined as
- the random motion of molecules.
 - the ability to do work or produce heat transfer.
 - a force that is exerted over some distance.
 - the movement of molecules.
 - the loss of matter.

ANS: B PTS: 1 DIF: Moderate
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

19. All of the following are examples of kinetic energy *except*
- electromagnetic radiation.
 - a stick of dynamite.
 - flow of heat.
 - a falling rock.
 - flowing water.

ANS: B PTS: 1 DIF: Moderate
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

20. An example of potential energy is
- electricity flowing through a wire.
 - the chemical energy in a candy bar.
 - a bullet fired at high velocity.
 - a leaf falling from a tree.
 - water flowing.

ANS: B PTS: 1 DIF: Easy
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

21. Which of the following is an example of low-quality energy?
- water from a dam
 - heat in the ocean
 - nuclei of uranium-235
 - burning coal
 - sunlight

ANS: B PTS: 1 DIF: Easy
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

22. Which of the following statements is *not* an example of a physical change?
- confetti is cut from pieces of paper
 - water evaporates from a lake
 - ice cubes are formed in the freezer
 - a plant converts carbon dioxide into carbohydrate
 - a tree is cut down

ANS: D PTS: 1 DIF: Difficult
TOP: 2-3 What Is Energy and What Happens When it Undergoes Change?

23. According to the first law of thermodynamics, energy input is
- usually greater than energy output.
 - always greater than energy output.
 - always equal to energy output.
 - usually less than energy output.
 - always less than energy input.

ANS: C PTS: 1 DIF: Difficult
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

24. The matter and energy laws tell us that we can recycle
- both matter and energy.
 - neither matter nor energy.
 - matter but not energy.
 - energy but not matter.
 - none of these answers

ANS: C PTS: 1 DIF: Moderate
TOP: 2-3 What Is Energy and What Happens when it Undergoes Change?

25. The level of organization in Ecology from the smallest to the largest unit is
- organism, population, community, biosphere, ecosystem.
 - organism, ecosystem, community, population, biosphere.
 - organism, community, population, biosphere, ecosystem.
 - organism, community, population, ecosystem, biosphere.
 - organism, population, community, ecosystem, biosphere.

ANS: E PTS: 1 DIF: Moderate
TOP: 2-4 What Keeps Us and Other Organisms Alive?

26. Types of dogs like Huskies, Labradors, Beagles, and German Shepherds are all one
- organism.
 - species.
 - population.
 - community.
 - none of these answers.

ANS: B PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

27. The place where an organism lives is its
- habitat.
 - niche.
 - community.
 - population.
 - neighborhood.

ANS: A PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

28. All of the plant and animal species living together and interacting with one another on a small island are called the island's
- ecosystem.
 - habitat.
 - community.
 - population.
 - biosphere.

ANS: C PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

29. A community of living organisms interacting with one another and the physical and chemical factors of their nonliving environment is called
- a species.
 - an ecosystem.
 - a population.
 - a lithosphere.
 - a community.

ANS: B PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

30. The portion of the atmosphere responsible for filtering out harmful ultraviolet radiation is called the
- troposphere.
 - stratosphere.
 - biosphere.
 - hydrosphere.
 - ecosphere.

ANS: B PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

31. The portion of the atmosphere containing the air we breathe is called the
- troposphere.
 - stratosphere.
 - biosphere.
 - hydrosphere.
 - ecosphere.

ANS: A PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

32. The portion of the atmosphere where almost all of earth's weather occurs is called the
- troposphere.
 - stratosphere.
 - biosphere.
 - hydrosphere.
 - ecosphere.

ANS: A PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

33. The Earth's crust and upper mantle are called the
- troposphere.
 - stratosphere.
 - lithosphere.
 - hydrosphere.
 - ecosphere.

ANS: C PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

34. The portion of the earth that contains fossil fuels and soil chemicals is called the
- troposphere.
 - stratosphere.
 - lithosphere.
 - hydrosphere.
 - geosphere.

ANS: E PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

35. The part of Earth where living organisms are found is called the
- troposphere.
 - stratosphere.
 - biosphere.
 - hydrosphere.
 - lithosphere.

ANS: C PTS: 1 DIF: Easy
TOP: 2-4 What Keeps Us and Other Organisms Alive?

36. The part of Earth where air, water, soil and organisms interact is called the
- troposphere.
 - stratosphere.
 - biosphere.
 - hydrosphere.
 - lithosphere.

ANS: C PTS: 1 DIF: Moderate
TOP: 2-4 What Keeps Us and Other Organisms Alive?

37. A factor present in concentrations too much or too little to support population growth, even if all the other factors are in optimal range is known as the
- trophic level.
 - range of tolerance.
 - biotic factor.
 - abiotic factor.
 - limiting factor.

ANS: E PTS: 1 DIF: Moderate
TOP: 2-5 What Are the Major Components of an Ecosystem?

38. The limiting factor for whales *would not* include
- temperature.
 - precipitation.
 - nutrient availability.
 - sunlight.
 - salinity.

ANS: B PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

39. The *most* inclusive components of the biotic portion of an ecosystem are
- producers, consumers, and decomposers.
 - primary and secondary consumers.
 - herbivores, carnivores, and omnivores.
 - all nonliving chemicals or matter.
 - none of these answers

ANS: A PTS: 1 DIF: Difficult
TOP: 2-5 What Are the Major Components of an Ecosystem?

40. Producers (autotrophs)
- cannot live without consumers (heterotrophs).
 - are known as herbivores.
 - might carry on photosynthesis.
 - only occur in aquatic ecosystems.
 - none of these answers

ANS: C PTS: 1 DIF: Difficult
TOP: 2-5 What Are the Major Components of an Ecosystem?

41. In open water, the dominant producers are
- trees.
 - ferns.
 - fish.
 - grasses.
 - phytoplankton.

ANS: E PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

42. Photosynthesis captures approximately what percent of energy from the sun?
- 1%
 - 10%
 - 25%
 - 80%
 - 90%

ANS: A PTS: 1 DIF: Difficult
TOP: 2-5 What Are the Major Components of an Ecosystem?

43. Photosynthesis
- converts glucose into energy and water.
 - requires the combustion of carbon.
 - produces carbon dioxide and oxygen gas.
 - yields glucose and oxygen gas as products.
 - yields glucose and carbon dioxide gas as products.

ANS: D PTS: 1 DIF: Difficult
TOP: 2-5 What Are the Major Components of an Ecosystem?

44. The net chemical effect of aerobic respiration
- converts glucose into energy and water.
 - requires the combustion of carbon.
 - produces carbon dioxide and oxygen gas.
 - yields glucose and oxygen gas as products.
 - yields glucose and carbon dioxide gas as products.

ANS: B PTS: 1 DIF: Difficult
TOP: 2-5 What Are the Major Components of an Ecosystem?

45. Organisms that feed exclusively on plants are called
- detritus feeders.
 - omnivores.
 - carnivores.
 - herbivores.
 - decomposers.

ANS: D PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

46. Organisms that feed on both plants and animals are called
- autotrophs.
 - omnivores.
 - carnivores.
 - herbivores.
 - decomposers.

ANS: B PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

47. All of the following are consumers *except*
- herbivores.
 - carnivores.
 - omnivores.
 - autotrophs.
 - decomposers.

ANS: D PTS: 1 DIF: Moderate
TOP: 2-5 What Are the Major Components of an Ecosystem?

48. The organisms that are classified as primary consumers are the
- detritivores.
 - omnivores.
 - carnivores.
 - herbivores.
 - decomposers.

ANS: D PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

49. All of the following live off remains or wastes of organisms *except*
- omnivores.
 - decomposers.
 - scavengers.
 - detritivores.
 - detritus feeders.

ANS: A PTS: 1 DIF: Easy
TOP: 2-5 What Are the Major Components of an Ecosystem?

50. The group that includes infectious germs, purifies water by breaking down wastes, decompose organic wastes into nutrients, and provide much of the world's oxygen are
- phytoplankton.
 - infectious disease.
 - abiotic.
 - microbes.
 - fungus.

ANS: D PTS: 1 DIF: Moderate
TOP: 2-5 What Are the Major Components of an Ecosystem?

51. Complex feeding patterns of consumers in an ecosystem are called
- food webs.
 - food chains.
 - trophic levels.
 - pyramids of energy.
 - trophic chains.

ANS: A PTS: 1 DIF: Easy
TOP: 2-6 What Happens to Energy in an Ecosystem?

52. In food chains, energy moves from one source to the next, resulting in a loss of useful energy to the environment as heat. This energy in the biosphere is usually replaced by
- the sun.
 - decomposers.
 - other organisms.
 - plants.
 - animals.

ANS: A PTS: 1 DIF: Moderate
TOP: 2-6 What Happens to Energy in an Ecosystem?

53. In food chains, energy moves from one source to the next, resulting in a loss of useful energy to the environment as heat. The amount of chemical energy transferred between trophic levels is usually
- 5%
 - 10%
 - 15%
 - 90%
 - 100%

ANS: B PTS: 1 DIF: Difficult
TOP: 2-6 What Happens to Energy in an Ecosystem?

54. *Most* of the energy input in a food chain is
- in the form of heat.
 - converted to biomass.
 - recycled as it reaches the chain's end.
 - degraded to low-quality heat.
 - converted to carbon dioxide.

ANS: D PTS: 1 DIF: Moderate
TOP: 2-6 What Happens to Energy in an Ecosystem?

55. Gross primary productivity is the rate
- at which producers manufacture chemical energy through photosynthesis.
 - at which producers use chemical energy through respiration.
 - at which producers manufacture chemical energy minus energy used through respiration.
 - at which chemical energy is transferred from one trophic level to the next.
 - at which consumers use chemical energy through respiration.

ANS: A PTS: 1 DIF: Moderate
TOP: 2-6 What Happens to Energy in an Ecosystem?

56. Net primary productivity is the rate
- at which producers manufacture chemical energy through photosynthesis.
 - at which producers use chemical energy through respiration.
 - at which producers manufacture chemical energy minus energy used through respiration.
 - at which chemical energy is transferred from one trophic level to the next.
 - at which consumers use chemical energy through respiration.

ANS: C PTS: 1 DIF: Moderate
TOP: 2-6 What Happens to Energy in an Ecosystem?

57. Which of the following terrestrial ecosystems has the highest net primary productivity?
- agricultural land
 - tropical forest
 - temperate forest
 - coniferous forest
 - desert scrub

ANS: B PTS: 1 DIF: Easy
TOP: 2-6 What Happens to Energy in an Ecosystem?

58. Which of the following aquatic ecosystems has the highest net primary productivity?
- lakes
 - rivers and streams
 - hydrothermal vents
 - continental shelf
 - estuaries

ANS: E PTS: 1 DIF: Easy
TOP: 2-6 What Happens to Energy in an Ecosystem?

59. All of the following are elements involved in major nutrient biogeochemical cycles *except*
- nitrogen.
 - calcium.
 - carbon.
 - phosphorus.
 - water.

ANS: B PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

60. Which of the following statements is *false*?
- Nutrients are cycled in the ecosphere in biogeochemical cycles.
 - Biogeochemical cycles connect all past, present, and future forms of life.
 - Biogeochemical cycles are ultimately driven by the sun and by gravity.
 - There are three types of biogeochemical cycles: air, water, and land.
 - all of these statements are correct

ANS: D PTS: 1 DIF: Difficult
TOP: 2-7 What Happens to Matter in an Ecosystem?

61. Carbon is a major component of
- atmospheric gases.
 - sedimentary rocks.
 - the oceans.
 - organic compounds.
 - sandy soils.

ANS: D PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

62. The following statements about the carbon cycle are true *except*
- If the carbon cycle removes too much carbon dioxide, the atmosphere will get cooler.
 - Photosynthesis and aerobic respiration circulates carbon dioxide in the biosphere.
 - Oxygen and hydrogen cycle closely with carbon.
 - Some carbon atoms are sequestered in fossil fuels therefore cycle very slowly through geological processes.
 - The carbon cycle does not involve the hydrosphere.

ANS: E PTS: 1 DIF: Difficult
TOP: 2-7 What Happens to Matter in an Ecosystem?

63. All of the following increase the amount of carbon dioxide in the atmosphere *except*
- respiration.
 - photosynthesis.
 - combustion.
 - decomposition.
 - none of these answers

ANS: B PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

64. Transfer of carbon between organisms depends primarily on
- fuel combustion and decomposition.
 - photosynthesis and cellular respiration.
 - soil bacteria and precipitation.
 - volcanic activity and organic decay.
 - the rock cycle.

ANS: B PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

65. The two ways in which humans have *most* interfered with the carbon cycle are
- removal of forests and aerobic respiration.
 - aerobic respiration and burning of fossil fuels.
 - respiration and photosynthesis.
 - burning of fossil fuels and removal of forests.
 - respiration and removal of forests.

ANS: D PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

66. Which of the following statements about human alteration of the nitrogen cycle is *false*?
- Large quantities of nitric oxide are released into the atmosphere when fuel is burned.
 - Nitric oxide can be converted in the atmosphere to nitric acid, which contributes to acid deposition.
 - Eating protein puts "dead ends" in the nitrogen cycle.
 - Nitrate and ammonium ions are depleted from the soil by harvesting nitrogen-rich crops.
 - Irrigation of crops removes nitrogen from topsoil.

ANS: C PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

67. All of the following human behaviors substantially affect the nitrogen cycle *except*
- addition of sewage to aquatic systems.
 - use of nitrogen fertilizers.
 - runoff from feedlots.
 - runoff from salt-treated icy highways.
 - burning of fuels.

ANS: D PTS: 1 DIF: Difficult

TOP: 2-7 What Happens to Matter in an Ecosystem?

68. Which of the following is *not* one of the common phosphorus reservoirs in the ecosystem?
- water
 - organisms
 - atmosphere
 - rocks
 - marine sediment

ANS: C PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

69. Phosphate can be sequestered from the phosphorus cycles for long periods of time in
- running water.
 - sea floor deposits.
 - the atmosphere.
 - sea birds.
 - rivers.

ANS: B PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

70. Humans intervene in the phosphorus cycle in all of the following ways *except*
- use of inorganic, phosphorus-containing fertilizers.
 - runoff of municipal and animal wastes.
 - clearing tropical forests.
 - burning of fossil fuels.
 - mining large quantities of phosphate rock.

ANS: D PTS: 1 DIF: Difficult

TOP: 2-7 What Happens to Matter in an Ecosystem?

71. The following statements are true about the hydrologic cycle *except*
- Evaporation and precipitation act as natural water purification systems.
 - Water is a major medium for transporting nutrients between ecosystems.
 - Water stored as ice in glaciers is stored for relatively long periods of time.
 - 24% of the of the earth's water supply is available as freshwater supplies for human consumption.
 - The water cycle is limited to the hydrosphere.

ANS: E PTS: 1 DIF: Difficult

TOP: 2-7 What Happens to Matter in an Ecosystem?

72. Humans strongly affect the hydrologic cycle through all of the following *except*
- water withdrawal from streams, lakes and rivers.
 - clearing vegetation for agriculture.
 - boiling water.
 - draining wetlands.
 - creating housing developments and parking lots.

ANS: C PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

73. The hydrologic cycle is driven by all of the following *except*
- condensation
 - transpiration
 - precipitation
 - gravity
 - erosion

ANS: E PTS: 1 DIF: Easy

TOP: 2-7 What Happens to Matter in an Ecosystem?

74. All of the following are broad classes of rock *except*
- sedimentary.
 - igneous.
 - metamorphic.
 - crystalline.
 - none of these

ANS: D PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

75. Heat and pressure convert
- igneous rock into sedimentary rock.
 - sedimentary rock into metamorphic rock.
 - igneous rock into minerals.
 - metamorphic rock into sedimentary rock.
 - metamorphic rock into igneous.

ANS: B PTS: 1 DIF: Moderate

TOP: 2-7 What Happens to Matter in an Ecosystem?

76. Sedimentary rocks are formed from
- volcanic eruptions.
 - particles of weathered rock.
 - tectonic plate collisions.
 - meteorite impact.
 - compacted plant remains.

ANS: B PTS: 1 DIF: Moderate
TOP: 2-7 What Happens to Matter in an Ecosystem?

TRUE/FALSE

1. The scientific method is the way in which scientists gather data and formulate and test hypotheses, models, theories, and laws.

ANS: T PTS: 1 DIF: Easy

2. The scientific method is useful in environmental science because it has no known limitations.

ANS: F PTS: 1 DIF: Easy

3. An important feature of reliable science is skepticism.

ANS: T PTS: 1 DIF: Easy

4. pH is a measure of the comparative amounts of hydrogen and hydroxide ion concentrations in a volume of solution, which influences the uptake of soil nutrients.

ANS: T PTS: 1 DIF: Moderate

5. According to the Law of Conservation of Matter, a chemical change in an atom causes some destruction in the atom.

ANS: F PTS: 1 DIF: Difficult

6. According to the Law of Conservation of Matter, a physical change in an atom causes some destruction in the atom.

ANS: F PTS: 1 DIF: Difficult

7. Energy flow can be used to diagram the ecological interdependence of species.

ANS: T PTS: 1 DIF: Moderate

8. We can never recycle or reuse high quality energy.

ANS: T PTS: 1 DIF: Difficult

9. Ecology is the study of connections in the natural world.

ANS: T PTS: 1 DIF: Easy

10. A set of organisms that are similar in genetic make up and reproduce sexually to produce fertile offspring are members of the same species.
- ANS: T PTS: 1 DIF: Moderate
11. The biosphere contains portions of the lower atmosphere, all of the hydrosphere and all of the geosphere.
- ANS: F PTS: 1 DIF: Moderate
12. All insects are pests.
- ANS: F PTS: 1 DIF: Easy
13. Most land species rely on insects for survival.
- ANS: T PTS: 1 DIF: Moderate
14. More humans can be supported on Earth if we all ate lower on the food chain.
- ANS: T PTS: 1 DIF: Moderate
15. All of the brown tree frogs and green tree frogs living in the same area would be part of the same population.
- ANS: F PTS: 1 DIF: Moderate
16. Humans interfere with the natural nitrogen cycle by logging activities.
- ANS: T PTS: 1 DIF: Moderate
17. A deer is both a primary consumer and in the second trophic level.
- ANS: T PTS: 1 DIF: Moderate
18. A cockroach is an example of an omnivore because it feeds on both plants and animals.
- ANS: T PTS: 1 DIF: Easy
19. Energy cannot be recycled.
- ANS: T PTS: 1 DIF: Easy
20. Burning coal demonstrates the first law of thermodynamics.
- ANS: T PTS: 1 DIF: Moderate
21. The following is a correct example of a typical food chain:
grass ← grasshopper ← snake ← mouse ← hawk.
- ANS: F PTS: 1 DIF: Moderate
-

22. Increasing levels of carbon dioxide is one of the major contributors to global warming.
ANS: T PTS: 1 DIF: Easy
23. Water vapor is not a greenhouse gas.
ANS: F PTS: 1 DIF: Moderate
24. Nitrogen is the most abundant element in the atmosphere.
ANS: T PTS: 1 DIF: Moderate
25. Atmospheric nitrogen can be used directly by multicellular plants and animals.
ANS: F PTS: 1 DIF: Moderate
26. Electrical discharges and nitrogen-fixing bacteria convert atmospheric nitrogen into nutrients that multicellular organisms can use.
ANS: T PTS: 1 DIF: Moderate
27. Ammonia in soil may undergo nitrification by specialized bacteria to nitrites then nitrates.
ANS: T PTS: 1 DIF: Moderate
28. Nitrogen may be returned from plants and animals back to the soil as leaves, skin , hair and dead bodies.
ANS: T PTS: 1 DIF: Difficult
29. Denitification processes convert nitrogen gas in the atmosphere into ammonia.
ANS: F PTS: 1 DIF: Difficult
30. The phosphorus cycle is slower than the carbon, water and nitrogen cycle.
ANS: T PTS: 1 DIF: Moderate

COMPLETION

1. A possible explanation of what is observed in nature or the results of an experiment is called a scientific _____.

ANS: hypothesis

PTS: 1 DIF: Easy

2. Before an interpretation of an observation can become a theory, it must first be a testable scientific _____.

ANS: hypothesis

PTS: 1 DIF: Moderate

3. A representation or simulation of a system being studied is called a _____.

ANS: model

PTS: 1 DIF: Easy

4. Scientists continually question the results and supporting data behind their hypotheses in a process known as _____.

ANS: peer review

PTS: 1 DIF: Easy

5. New scientific results that have not been fully tested and accepted by peer review are known as _____.

ANS: frontier science or tentative science

PTS: 1 DIF: Easy

6. Anything that has mass and takes up space, and can exist as solid, liquid and/or gas is called _____.

ANS: matter

PTS: 1 DIF: Easy

7. _____ is a measure of how useful a form of matter is to humans as a resource.

ANS: Matter quality

PTS: 1 DIF: Moderate

8. The smallest unit of matter into which an element can be divided and still retain its chemical properties is a(n) _____.

ANS: atom

PTS: 1 DIF: Easy

9. Atoms, ions, and molecules are the building blocks of _____.

ANS: matter

PTS: 1 DIF: Moderate

10. The nucleus of an atom consists of one or more _____ and in some cases one or more neutrons.

ANS: protons

PTS: 1 DIF: Easy

11. An atom of sodium has eleven protons and therefore has eleven _____.

ANS: neutrons

PTS: 1 DIF: Moderate

12. The number of protons in the nucleus of an atom equals to its _____.

ANS: atomic number

PTS: 1 DIF: Easy

13. The total number of protons and neutrons in the nucleus of an atom equals to its _____.

ANS: mass number

PTS: 1 DIF: Easy

14. The forms of an element with the same atomic number and different mass numbers are known as _____.

ANS: isotopes

PTS: 1 DIF: Easy

15. Sequences of nucleotides that contain information about characteristics passed from parents to offspring are called _____.

ANS: genes

PTS: 1 DIF: Easy

16. When ice melts into liquid water, a(n) _____ change has occurred.

ANS: physical

PTS: 1 DIF: Moderate

17. When you release an object from a high altitude, the object's potential energy converts to _____.

ANS: kinetic energy

PTS: 1 DIF: Difficult

18. _____ explains why a barrel of oil can be used only once as fuel.

ANS: The second law of thermodynamics

PTS: 1 DIF: Difficult

19. _____ explains why we cannot get more energy out of physical or chemical change than we put in.

ANS: The first law of thermodynamics

PTS: 1 DIF: Difficult

20. _____ explains why we cannot “throw away” any pollution that we produce.

ANS: The law of conservation of matter

PTS: 1 DIF: Difficult

21. A group of individuals of the same species that live in the same place at the same time is a(n) _____.

ANS: population

PTS: 1 DIF: Moderate

22. The variation in a population is called _____.

ANS: genetic diversity

PTS: 1 DIF: Moderate

23. The place where a population or organism lives is called its _____.

ANS: habitat

PTS: 1 DIF: Easy

24. Populations of different species living in a particular place interacting with each other is called a(n) _____.

ANS: community

PTS: 1 DIF: Moderate

25. A community of different species interacting with one another and with energy and matter is called a(n) _____.

ANS: ecosystem

PTS: 1 DIF: Moderate

26. The temperature in a certain area can be an abiotic _____ for the population size of migratory birds.

ANS: limiting factor

PTS: 1 DIF: Easy

27. A moderate temperature produces a(n) _____ for tiger snakes, who cannot survive at extremely high or extremely low temperatures.

ANS: optimum range

PTS: 1 DIF: Moderate

28. _____ are essential to us because they consume waste and recycle nutrients.

ANS: Decomposers

PTS: 1 DIF: Moderate

29. _____ is the terrestrial ecosystem in which you would find the fewest decomposers.

ANS: Desert

PTS: 1 DIF: Moderate

30. Forest, deserts and grasslands have distinct climate and species and are known as _____.

ANS: Biomes

PTS: 1 DIF: Moderate

31. CO₂ promotes the _____ that warms the troposphere.

ANS: greenhouse effect

PTS: 1 DIF: Easy

32. The water cycle, hydrogen cycle, phosphorus cycle, and oxygen cycle are all _____ cycles.

ANS: nutrient or biogeochemical

PTS: 1 DIF: Easy

33. The _____ cycle is disrupted by human activities such as sewage waste, deforestation, burning of fuels, and agricultural fertilizers.

ANS: nitrogen

PTS: 1 DIF: Moderate

34. Bacteria are more important in the _____ than in the carbon or phosphorus cycle.

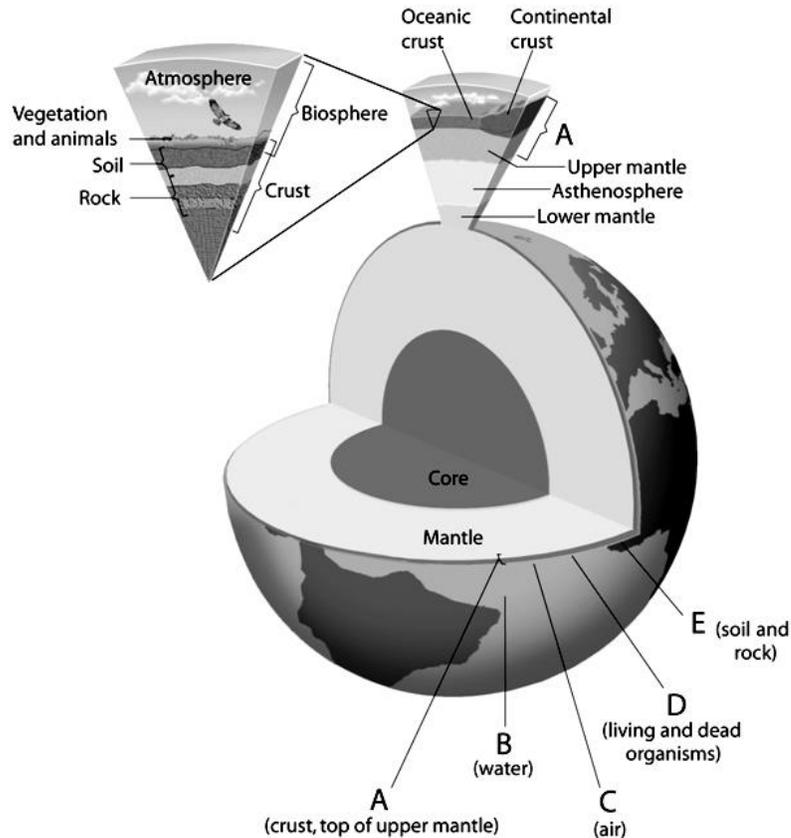
ANS: nitrogen cycle

PTS: 1

DIF: Moderate

MATCHING

Labeling



1. On the generalized structure of the earth figure, choose the letter of the layer that contains nonrenewable fossil fuels and minerals.
2. On the generalized structure of the earth figure, choose the letter of the layer that is made up of the troposphere and the stratosphere.
3. On the generalized structure of the earth figure, choose the letter of the layer that is composed of all of the earth's ecosystems.

1. ANS: E

PTS: 1

DIF: Easy

OBJ: Labeling

2. ANS: C

PTS: 1

DIF: Easy

OBJ: Labeling

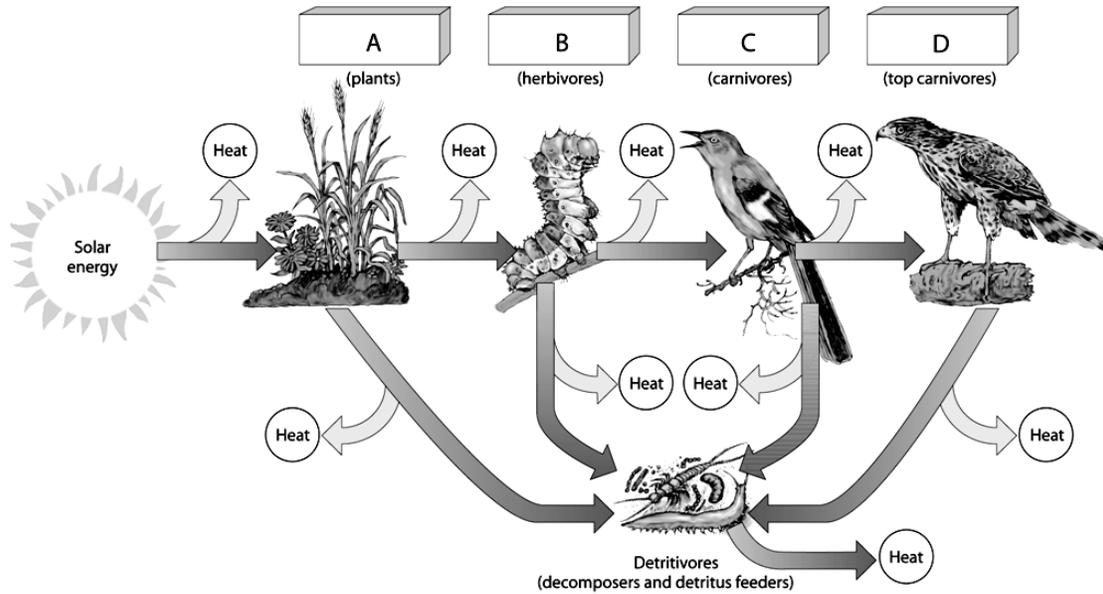
3. ANS: D

PTS: 1

DIF: Easy

OBJ: Labeling

Labeling

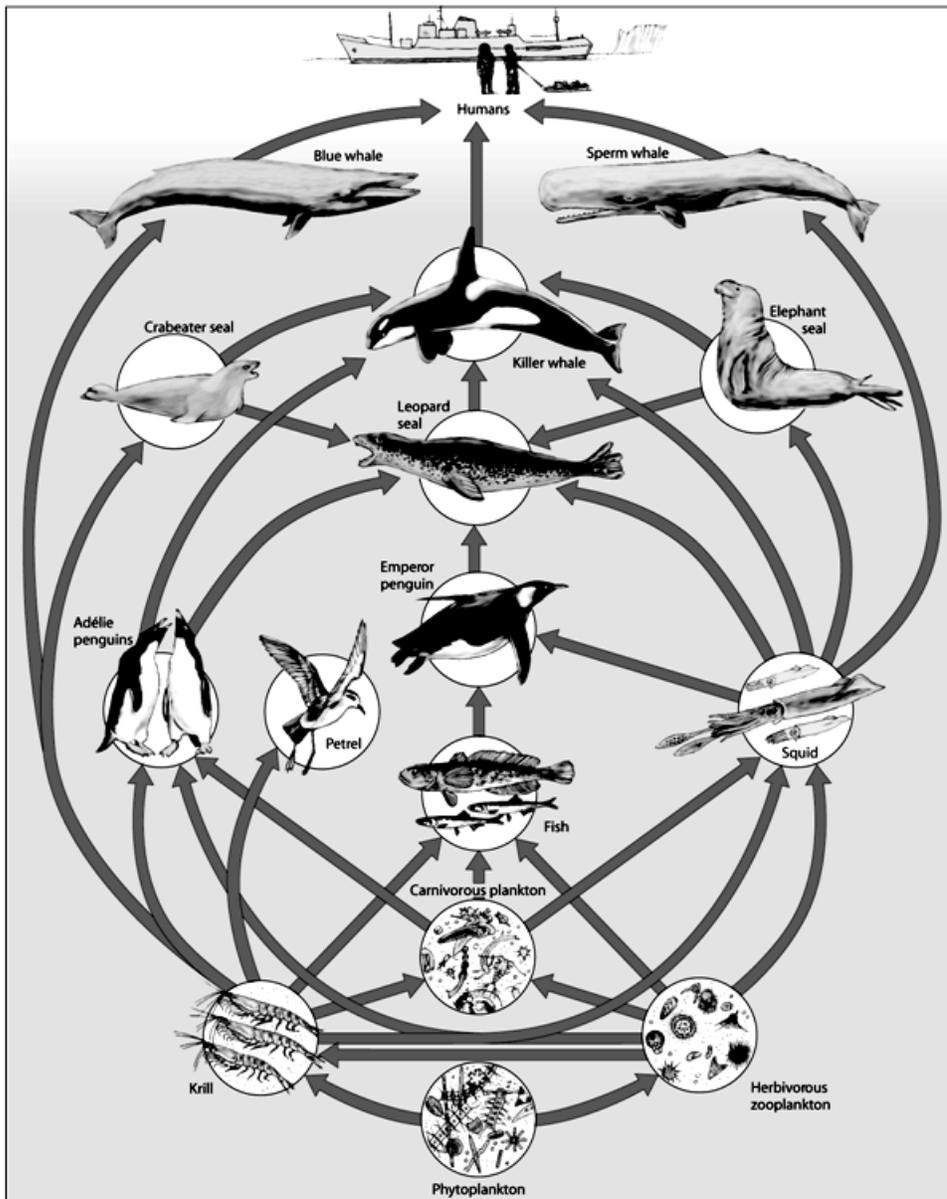


4. On the food chain figure, choose the level that includes hawks, tigers, and white sharks.
5. On the food chain figure, choose the level that is the source of all food in an ecosystem.
6. On the food chain figure, choose the level that primarily feeds on producers.

- | | | | |
|-----------|--------|-----------|---------------|
| 4. ANS: D | PTS: 1 | DIF: Easy | OBJ: Labeling |
| 5. ANS: A | PTS: 1 | DIF: Easy | OBJ: Labeling |
| 6. ANS: B | PTS: 1 | DIF: Easy | OBJ: Labeling |

OTHER

Critical Thinking



1. What is depicted in this image?

ANS:
a food web

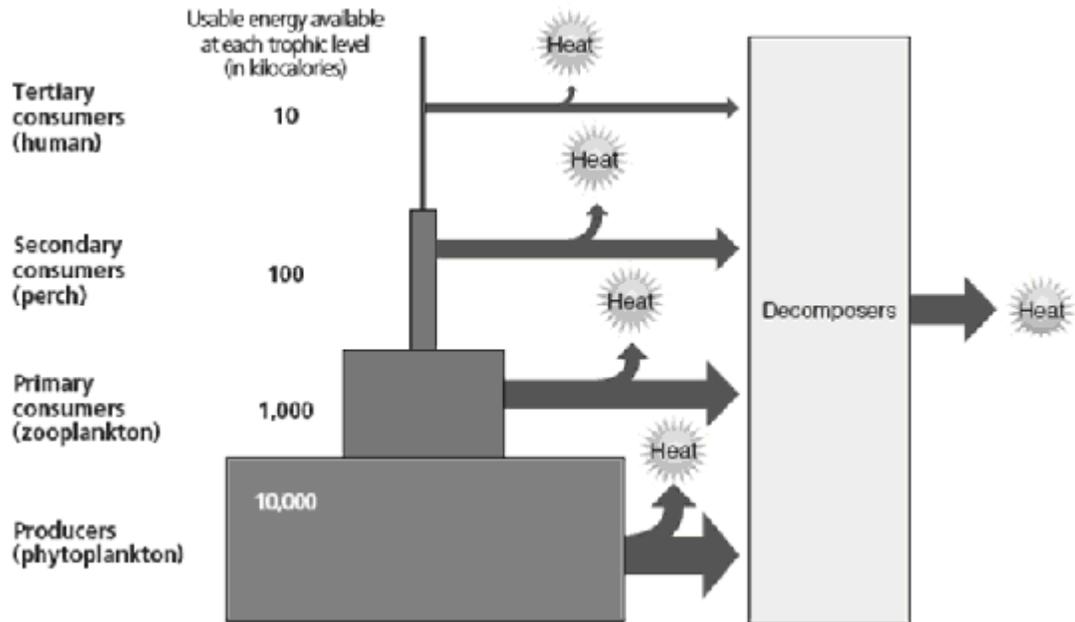
PTS: 1 DIF: Easy OBJ: Critical Thinking

2. Using this image, outline a possible food chain.

ANS:
example: Phytoplankton – krill – fish – emperor penguin – leopard seal, etc.

PTS: 1 DIF: Difficult OBJ: Critical Thinking

Critical Thinking



3. What does this figure depict?

ANS:

A pyramid of energy flow

PTS: 1

DIF: Easy

4. How much energy would potentially be available if a fifth trophic level was added to the pyramid?

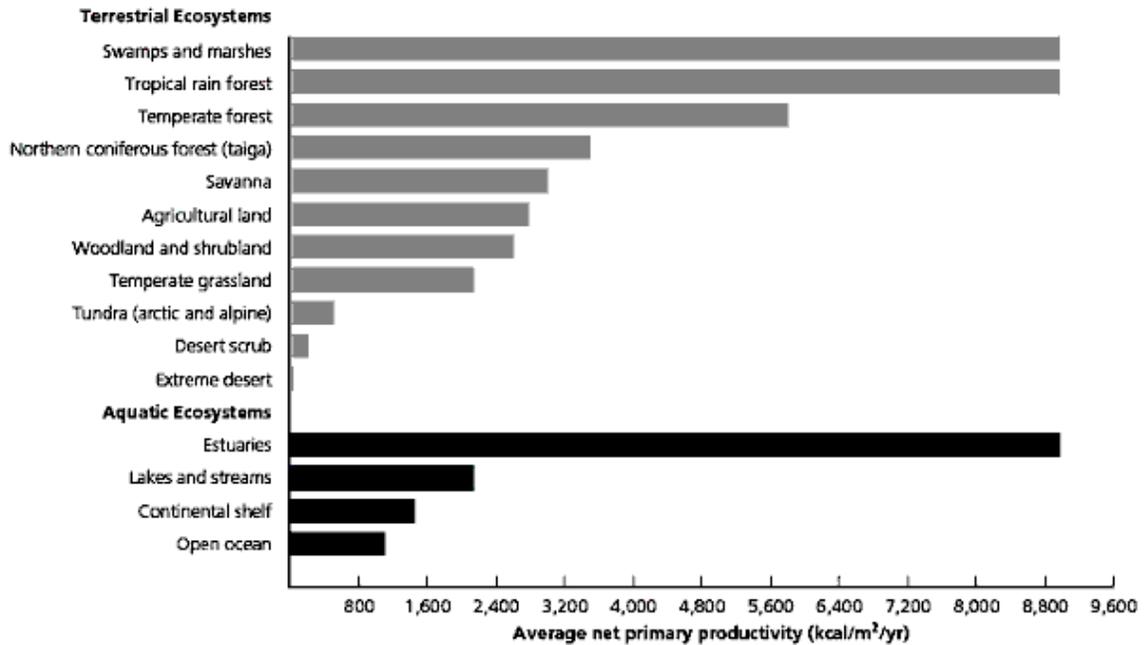
ANS:

1%

PTS: 1

DIF: Easy

Critical Thinking



5. Which of the ecosystems depicted have the greatest net primary productivity?

ANS:

swamps and marshes; tropical rain forests; estuaries

PTS: 1

DIF: Easy

OBJ: Critical Thinking

6. Which two terrestrial ecosystems produce the least kilocalories of energy per year?

ANS:

desert scrub and extreme desert

PTS: 1

DIF: Easy

OBJ: Critical Thinking

SHORT ANSWER

1. Draw or describe a scientific model using at least five steps.

ANS:

Problem – research – question – experiment – data – analysis – hypothesis – theory – model.

PTS: 1

DIF: Moderate

2. List three critical thinking questions that you can use to uncover unreliable science.

ANS:

Was the experiment well designed and tested?

Are the results reproducible?

Are the proposed hypothesis reasonable and unbiased?

Answers will vary.

PTS: 1 DIF: Moderate

3. Discuss two (2) important limitations of science.

ANS:

Answers should include two of the following:

There is always some level of uncertainty associated with scientific measurements.

Results and hypothesis are not totally free of bias.

There are complex interactions and a large number of variables which make experimentation difficult.

Scientists often use statistical tools in lieu of accurate measurements.

The scientific process cannot be applied to moral or ethical questions.

PTS: 1 DIF: Difficult

4. Describe briefly describe cells, nuclei, chromosomes, DNA, and genes, and their relationship to each other.

ANS:

An organism contains cells, which are the structural building blocks of life. Each cell has a nucleus, which contains chromosomes. Chromosomes are composed of genes which are made up of sequences of DNA. DNA is a unique code that differentiates species and individuals.

PTS: 1 DIF: Difficult

5. The *law of conservation of matter* has very important consequences in terms of how we handle our wastes. Explain this statement.

ANS:

Matter can neither be created or destroyed therefore when was cannot truly ‘dispose’ of our waste. We can only change its chemical or physical form.

PTS: 1 DIF: Difficult

6. Explain the three stages of the rock cycle and give two examples of each rock stage.

ANS:

Magma cools into igneous rock, such as granite and lava. Rocks that undergo erosion and weathering, and then compact together, such as sandstone and shale, form sedimentary rock. Rocks that undergo chemical changes, such as from high heat or extreme pressure, are called metamorphic rock. Examples are slate and marble.

PTS: 1 DIF: Moderate

7. Explain the five ways humans disrupt the nitrogen cycle.

ANS:

Burning fuel causes acid rain; agricultural wastes cause nitrous oxide; deforestation causes the release of stored nitrogen; municipal sewage into aquatic systems causes excess nitrates; and soil depletion causes the depletion on nitrogen from topsoil.

PTS: 1 DIF: Moderate

8. Solar energy can be direct or produce other indirect sources of energy. Give three examples of indirect sources of solar energy.

ANS:

Hydropower- flowing water kept fluid from solar energy.

Wind- air masses in motion driven by the heat of the sun.

Biomass- solar energy converted to chemical energy in plants.

PTS: 1 DIF: Difficult

9. Discuss how the laws of thermodynamics and the law of conservation of matter sustain life on earth.

ANS:

The laws of thermodynamics govern the *flow* of energy from the sun through living organisms. The law of conservation of matter governs the *cycling* of matter through the biosphere.

PTS: 1 DIF: Difficult

10. Why do food chains and webs rarely support more than four or five trophic levels?

ANS:

Typically, only 10% of energy is transferred from one trophic level to the next. There is not enough energy at the top trophic levels to support many organisms.

PTS: 1 DIF: Difficult