First and Last Name_____

Life Science Quiz 12

Point values for each item are shown in parentheses. Questions on this quiz may be answered with two to four sentences. Write all responses in complete sentences using correct spelling and grammar.

1. Describe how living things obtain what they need to move, grow, and reproduce. (20)

2. Describe three different ways mammals bring offspring into the world. (20)

3. Name and briefly describe the four basic types of organic molecules used by cells. (20)

4. Describe the Cycle of Scientific Enterprise. (20)

5. Describe photosynthesis. (20)

First and Last Name_____

Life Science Quiz 15

Point values for each item are shown in parentheses. Questions on this quiz may be answered with two to four sentences. Write all responses in complete sentences using correct spelling and grammar.

1. Describe how the human nervous system transmits signals. (20)

2. Describe how the human brain and nervous system are organized. (20)

3. Distinguish between theories and hypotheses. (20)

4. Describe Francesco Redi's famous experiment. (20)

5. Distinguish between atoms, elements, and molecules. (20)

First and Last Name_____

Life Science Quiz 18

Point values for each item are shown in parentheses. Questions on this quiz may be answered with two to four sentences. Write all responses in complete sentences using correct spelling and grammar.

1. Compare and contrast three different forms of symbiosis. (20)

2. Describe several biotic and abiotic factors that limit the carrying capacity of an ecosystem. (20)

3. Describe what science has to say about how the human brain stores memories. (20)

4. Describe the differing purposes of mitosis and meiosis. (20)

5. Explain why scientific facts and theories are regarded as provisional. (20)

First and Last Name_____

Life Science Quiz 21

Point values for each item are shown in parentheses. Questions on this quiz may be answered with two to four sentences. Write all responses in complete sentences using correct spelling and grammar.

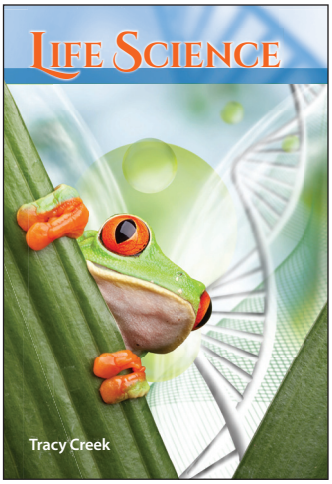
1. Draw a simple sketch of the water cycle. (20)

2. Describe how the human nervous system and brain are organized. (20)

3. Give examples of several different ways animals reproduce. (20)

4. Describe how the structure of the small intestine defines its function. (20)

5. Describe three ways we know truth. (20)



Life Science

All Keys and Sample Answers

Thank you for using Novare Science's *Life Science*. This document contains sample answers to all verbal questions in the text, on quizzes, and on exams. The sample answers in this document are provided to aid in situations in which the adult teacher responsible for conducting the course does not possess a background in this subject, or in which a student is studying independently. The written answers provided here are only samples and should not be considered the only correct responses to the questions.

In environments where there are multiple students in a class or group, it is recommended that students form their own answers to Learning Checks and Chapter Exercises in complete sentences as a homework assignment. These should be graded for completion only, not accuracy. Then in the group setting, students bring their preliminary answers to class where they collaborate with each other and the teacher to improve their answers. The final product is a useful study tool developed by the group. In such a setting, there is little need for the written answers in the present document, but it is provided for the many home study situations in which there is no collaborative group.

Additional information about how this course should be conducted is provided in the textbook introduction and in documents in the Digital Resources. A full presentation of strategies and techniques for mastery-learning can be found in *From Wonder to Mastery*, available from our website.

Thank you!

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There is an errata page available under the support tab for this text at classicalsubjects.com.

Contents

Chapter Exercises

Chapter 1

Learning Check 1.1

1. Why do scientists find it difficult to define life?

Scientists have difficulty defining life because life is not simply a thing. Life involves complex systems of connected processes.

2. List and briefly describe six characteristics of living things.

First, living things are organized—atoms combine to form molecules, which combine to form cells (the basic unit of life). Cells combine to form tissues, which combine to form organs, which combine to form organ systems, which combine to form whole organisms.

Second, living things gather matter and energy. Plants can get energy from the Sun and matter from nutrient molecules such as carbon dioxide and water. They use these to build molecules for growth and energy. Other organisms get their energy and matter by consuming plants or animals.

Third, living things grow, develop, and reproduce. All organisms grow from single seeds or cells. They continue to develop until adulthood at which time they are able to reproduce.

Fourth, living things use and pass on genetic information. The cell or seed that each organism grows from contains genetic information from both parents. This information contains all the instructions needed for cells to build all the different parts of an organism's body.

Fifth, living things respond to stimuli such as light, darkness, gravity, heat, proximity of water sources, and the need to eliminate waste. Both plants and animals respond to these stimuli in order to maintain homeostasis—a healthy balance of the conditions necessary to keep an organism's cells alive.

Sixth, living things adapt to their environment. This refers to the way the characteristics of organisms shift over time and over generations so that offspring are better able to survive and reproduce in a certain environment.

Learning Check 1.2

1. What is science?

Science is the process of using experiment, observation, and reasoning to develop mental models of the natural world. The mental models scientists develop are called theories.

2. Explain what a model is and identify your own example of a model that could be used to explain something.

A model is a practical representation describing how some part of the world works.

[Student examples of models will vary.]

3. What is a theory?

A theory is a mental model describing how some part of the natural world works. Theories must account for the related scientific facts and provide means for producing new hypotheses.

4. Why do scientists develop theories?

Just as a physical model can aid understanding, a mental model or theory provides a way to think about some aspect of the natural world.

Learning Check 1.3

1. What is the difference between a theory and a hypothesis?

A theory is a mental model used to explain how some part of the natural world works. A hypothesis is a specific testable prediction, based on a particular theory, of what will happen in certain circumstances.

2. What are two major characteristics of a successful scientific theory?

A successful theory must account for, explain, and tie together the related scientific facts. Successful theories must also provide the means for developing new hypotheses that can be tested through observation or experiment.

3. Describe the observations that led to the first statement of the cell theory.

The first was Anton van Leeuwenhoek's observations in the 1600s of single-celled animals ("animalcules") using his microscope. Around the same time, Robert Hooke was using a microscope to observe many different microscopic samples. Hooke's observation of a piece of cork led him to use the word "cell" to describe the structure, since the structure reminded him of the individual monks' cells in a monastery. In the 1900s, Matthias Jakob Schleiden used a microscope to study plant samples. He came to realize that all plants and parts of plants were made of cells. Around the same time, Theodor Schwann reached the same conclusion regarding animal tissues—that they are all made of individual cells. Schwann published the first statement of cell theory in 1839—"all living things are made of cells."

4. What is the purpose of an experiment?

The purpose of an experiment is to put a hypothesis to the test.

5. If an experimental result fails to support the hypothesis, how do scientists respond? Describe the steps in the review process and the order in which they are taken.

The steps leading to the result were theory—hypothesis—experimental procedure. If the results do not support the hypothesis, scientists analyze the situation by first reviewing everything about the experiment, including the measurement techniques. If this does not explain the negative results, then the hypothesis is reviewed to see if it accurately reflects the consequences of the theory. A third step would be to review the theory itself, and that is a big deal. Theories take years or decades of validation to achieve acceptance; calling a theory into question would also require time and sources of evidence. If such evidence accumulates, the scientists would work on modifying or even replacing the theory.

Learning Check 1.4

1. How does the scientific method relate to doing experimental research?

Experiments are one of the major components in the Cycle of Scientific Enterprise. The scientific method provides an objective, standardized approach to conducting valid experiments.

2. List several other methods for doing science besides experimental research.

Other possibilities include working with mathematics, making observations, collecting evidence, and using reasoning to make deductions.

3. What is the relationship between a scientist's hypothesis and the scientific method?

The hypothesis is the specific prediction that will be put to the test by an experiment. The purpose of the scientific method is to ensure that the experiment is valid, and thus to ensure that the experimental results are also valid. If the experimental results are valid, then valid conclusions can be drawn about the hypothesis.

4. What is meant by the phrase "repeat the work" in the scientific method?

This phrase applies in two senses. First, a particular scientist performs multiple trials in all experiments to confirm and validate the results. Second, other scientific teams must also replicate the results for the results to be considered valid by the larger scientific community.

5. Why is it difficult to analyze experimental results?

This is due to the fact that contemporary scientific experiments are complex and difficult to perform. There are so many factors, components, measurement instruments, and procedures that analyzing results is a complex process.

Learning Check 1.5

1. What s a scientific fact?

A scientific fact is a statement, supported by a lot of scientific evidence, that is correct so far as we know.

2. Are scientific facts true? Explain.

We do not speak of scientific statements as being true because they are not truth claims. Regarding scientific facts, what we say is that they are correct so far as we know but that a fact can change if new information becomes known.

3. If you hear someone say, "We don't need to believe that; it's just a theory," how could you respectfully explain why this statement is inappropriate?

One can explain that developing successful, accurate theories is the goal of science—it's what science is all about. Theories are not just guesses or hunches; they are models that have taken many years to develop and are supported by a great deal of scientific evidence.

4. How does a theory become widely accepted?

Theories must provide the means for developing new hypotheses, which are tested by experiment. When the experimental results support the hypothesis under test, then the theory the hypothesis is based on is also supported. Repeated experimental results that support hypotheses drawn from a particular theory lead to the theory becoming more and more strongly supported, and thus more and more widely accepted.

Learning Check 1.6/1.7

1. Is science in the business of making truth claims? Explain your answer.

In short, no. Science is in the business of developing strong, successful theories that accurately model nature.

2. Define truth.

Truth is the way things really are.

3. List five examples of truths you know from the obviousness of your own direct experience.

Student answers will vary. Example responses:

a. I am a girl (or boy).

b. I am alive.

c. I carpool to school each weekday during the school year.

d. I ate toast and jam for breakfast this morning.

e. I have a cat named Felix.

4. List five examples of truths revealed in the Bible. Write down the exact equation, along with the citation.

Student answers will vary. Example responses:

a. Unless one is born again he cannot see the kingdom of God. John 3.3

b. God so loved the world, that he gave his only Son, that whoever believes in him should not perish but have eternal life. John 3.16

c. In [Christ] we have redemption through his blood, the forgiveness of our trespasses. Eph 1.7

d. God works in us, both to will and to work for his good pleasure. Phil 2.13

e. [Christ Jesus] is the image of the invisible God, the firstborn of all creation. Col 1.15

5. Describe the three ways of knowing truth.

The first way to know truth is by one's own direct experience. The second way is by valid reasoning beginning with true premises. The third way is by divine revelation. There are two sources of revelation. Special Revelation is truth revealed through God's Word (the Scriptures); General Revelation is truth revealed through God's Works (creation).

6. How do scientists understand the relationship between theories and truth?

Theories are models of nature, and scientists hope that over time these theories or models are getting closer and closer to the truth.

Learning Check 1.8

1. Describe the scale of life science.

Organisms themselves range from about 140 nm in size for the smallest known organism, up to 3.8 km across for the largest. But life science also involves the study of the organic molecules all cells are made of, the entire biosphere of Earth, and all the living things in between.

2. Write at least two questions you have that could be answered through life science.

Student answers will vary. Example responses:

a. Why do some species become extinct?

b. What are all the known different types of owls?

c. Why do siblings often look both alike and yet different?

3. List four goals of life science.

a. Find new ways to raise crops and process food.

b. Understand how energy transformations work in biological systems so that we can develop more effective biology-related products.

c. Develop better medical treatments and therapies.

d. Understand how to be better stewards of the creation God has given us to dwell in.

Chapter 1 Exercises

1. List and briefly describe the series of characteristics scientists use to identify life.

There are six characteristics scientists use to identify life: 1. Living things are organized—that is, molecules combine to form bigger molecules, which combine to form cells, which combine to form tissues, which combine to form organs, which combine to form organ systems, which combine to form organisms. 2. Living things gather matter and energy—all living things require matter to use as building blocks for growth, and all living things require sources of energy to power the processes that maintain homeostasis and cause growth and reproduction. 3. Living things grow, develop, and reproduce—they all begin as single cells, but then grow to adulthood and reproduce. 4. Living things use and pass on genetic information—genetic information is used to grow and develop, making different types of cells in the process. The genetic information is passed on to offspring during reproduction. 5. Living things respond to stimuli—they must maintain homeostasis, so they respond to stimuli such as temperature, water content, amounts of energy and nutrients, and so on to maintain the conditions needed to sustain life. 6. Living things adapt to their environment—this refers to the multiple-generations process by which organisms acquire traits that enable their populations to survive and thrive even though conditions in the environment change over time.

2. Describe each of the steps in the Cycle of Scientific Enterprise. Define each term and explain how the terms relate to

one another.

(1) Known scientific facts are accounted for, explained, and tied together by a (2) theory, a model that attempts to explain and represent part of the natural world. From the theory, a (3) hypothesis is formed, which is an educated prediction about what will happen under certain conditions. The hypothesis is tested in an (4) experiment, which produces data. The data are submitted to (5) analysis to determine if the experimental results support the hypothesis. If the results do support the hypothesis, then the new data (new facts) take their place with the other facts supporting the theory. If the new data do not support the hypothesis, then a process of (6) review begins, in which the experiment, hypothesis, and maybe even theory are examined to determine why the experiment delivered a negative result.

3. Write a paragraph or two explaining the difference between scientific theories and truth.

Truth is simply the ways things really are. Humans do not have absolute knowledge of the ways things really are; we don't know the absolute truth about nature. So we investigate nature by forming theories about the way a part of nature works. These theories are models or representations of nature. Strong theories are useful because they repeatedly lead to hypotheses that are supported by experimental results. Scientists hope that over time our scientific theories grow closer and closer to the truth of how nature really is.

4. Explain the purpose for the sequence of steps in the scientific method.

The steps in the scientific method are intended to provide a reliable way for scientists to conduct valid experiments.

5. Describe Louis Pasteur's contribution to the scientific method.

Pasteur modeled the way the scientific method works while solving the problem of why French wine was being spoiled. He first researched the problem by examining the spoiled wine under a microscope. Seeing tiny living things in the wine (they were bacteria), he formed the hypothesis that these organisms were the cause of the spoilage and that they were getting into the wine from the air. He then conducted an experiment. He prepared a nutrient broth and placed it in two flasks: a straight-necked flask and a flask with an s-shaped neck. The s-shaped neck would prevent things in the air from falling into the broth in the flask. Pasteur discovered that the broth in the straight-necked flask was spoiled and grew the microorganisms, while the broth in the flask with the s-shaped neck did not have any of the microorganisms and was not spoiled. These results supported Pasteur's hypothesis, and Pasteur concluded that the microorganisms came from the air and were not spontaneously produced in the broth. He repeated his tests under different conditions and got the same results.

6. Explain why it is inappropriate to ridicule a scientific theory by calling it "just a theory." In your explanation, describe appropriate ways to speak of scientific theories.

A theory is not some kind of lower form of knowledge. Developing successful, accurate theories is the goal of science—it's what science is all about. Theories are not just guesses or hunches; they are models that have taken many years to develop and are supported by a great deal of scientific evidence. Widely accepted theories have repeatedly, over many years, led to hypotheses that were tested and supported by the experimental results. Developing such strong solidly supported theories are what science is all about, and thus it is not appropriate to speak dismissively of them.

7. State the contributions of Anton van Leeuwenhoek, Robert Hooke, Matthias Jakob Schleiden, and Theodor Schwann to the cell theory.

Leeuwenhoek first observed microorganisms—single-celled animals—in the late 17th century. Around the same time, Hooke observed cork under a microscope and saw that it's structure resembled the monks' cells in a monastery, leading Hooke to introduce the term cell. In the 19th century, Schleiden studied numerous plant samples under a microscope and concluded that all plants were composed of cells. Around the same time, Schwann drew the same conclusion about animal tissues. In 1839, Schwann published the first statement of cell theory: all living things are composed of cells.

8. Describe the importance of Francesco Redi's and Louis Pasteur's experiments.

Both Redi's and Pasteur's experiments failed to provide support for the notion of spontaneous generation, a popular idea at the time. According to that idea, new creatures could spontaneously form from other forms of matter. This notion was supported by the fact that maggots seemed to come out of nowhere and appear on rotting meat. Redi's experiment showed that maggots appear where flies lay their eggs and not just on meat that happens to be rotting. Pasteur's experiment showed that harmful bacteria do not spontaneously form in a food; they are in the air and lead to food spoilage if the food is in contact with the air. As a result of these experiments, the theory of spontaneous generation was abandoned. We now understand that all living things are made cells, and cells only come from other cells; they do not form by spontaneous generation.

9. Describe the key ideas in the cell theory.

All living things are made of one or more cells. All living things arise from pre-existing cells by division. The cell is the fundamental unit of structure and function in all living organisms. The activity of an organism depends on the total activity of independent cells.

Chapter 2

Learning Check 2.1

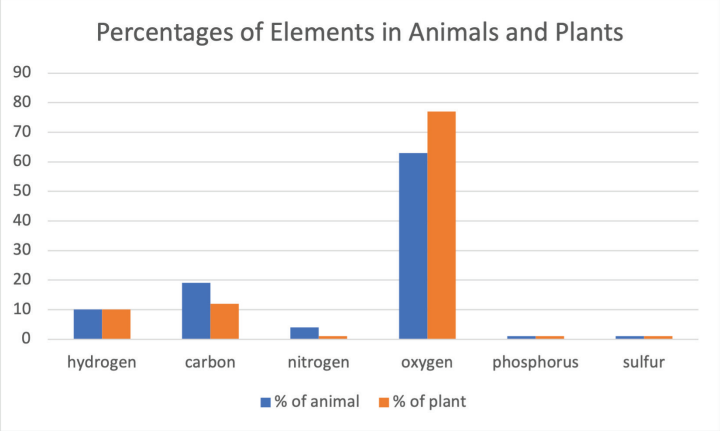
1. What causes matter to change state from solid to liquid or from liquid to gas?

The amount of energy in the particles of a substance determine the state it is in. Solids possess the lowest amount of particle energy, liquids possess a greater amount of particle energy, and gases possess the highest amount of particle energy. The energy in the particles of a substance is increased by heating. This is why heating a solid causes it to melt into a liquid, and heating the liquid causes it to vaporize into a gas.

2. What determines the chemical identity of an atom?

An atom's chemical identity is determined by how many protons the atom has in the atomic nucleus.

3. Using the data from Table 2.1, create a bar chart that compares the percentages of carbon, hydrogen, nitrogen, and oxygen in plants to the percentages of those elements in animals.



Learning Check 2.2

1. Compare and contrast elements and compounds.

An element is a substance composed of atoms with the same atomic number, that is, all the atoms have the same number of protons in their nuclei. A compound is formed when atoms of two or more different elements are chemically bound together.

2. Describe how a molecule of an element differs from a molecule of a compound.

The answer is essentially the same as the answer to the previous question. A molecule is composed of more then one atom bound together. If the atoms are all the same (i.e., have the same numbers of protons), then the molecule is an element. The elements hydrogen, nitrogen, and oxygen all form molecules of two atoms of the same element joined together. However, if the atoms in the molecule are not all the same, then the molecule is a compound, not an element.

3. Explain what must occur for elements to form compounds.

For a compound to form, a chemical reaction must occur in which the atoms are chemically bound together. Many chemical reactions require a source of energy (such as heat or a spark) to get the reaction going.

4. What does a chemical formula represent?

A chemical formula shows the different elements in a compound and their relative ratios to each other. The elements are shown by their chemical symbols, and subscripts on the symbols show the number of each type of atom in one unit of the compound.

5. Discuss the importance of water to life.

Water is essential for life as we know it. The unique properties of water enable water to perform many different functions. The properties are a result of the fact that water molecules are polar and stick to each other (hydrogen bonding). At the global level, water is a very effective solvent, so it dissolves lots of different substances and can transport nutrients. Water's high specific heat capacity means that lots of heat must be added to or removed from water to make its temperature change. Combined with the large amount of water on Earth's surface, this helps regulate and moderate the temperatures on Earth's surface. Water's polarity also means that water molecules stick to other polar molecules, and this results in phenomena such as capillary action in the roots and stems of plants. When water molecules are cooled to near freezing, they begin to spread apart to form crystals of ice. This means that the density of ice is lower than the density of water, so ice floats. This is crucial for life in water because it means that ponds freeze from the top down, protecting the life in the water below, instead of from bottom up, which would kill all the life in the water.

6. Describe the structure of a water molecule.

The molecule contains one oxygen atom and two hydrogen atoms, arranged in an L-shape with the oxygen atom in the middle. Oxygen atoms attract electrons more strongly than hydrogen atoms do, so the electrons in the molecule tend to cluster around the oxygen atom at the elbow instead of near the hydrogen atoms at the end and this gives the molecule its polar character.

Learning Check 2.3

1. What are two key differences between DNA and RNA?

One is that DNA consists of two strands of nucleotides, twisted around each other (double helix), while RNA consists of a single strand of nucleotides. A second difference is that while DNA is made of the C, G, A, and T nucleotides, RNA replaces the T with a U nucleotide, and is thus made of C, G, A, and U.

2. Create a table that includes four organic molecules, their monomers, their polymers, and a short description of each one.

carbohydrate	monosaccharide	polysaccharide	These molecules are used to provide immediate energy, storage for energy, and structural material for building plants.
lipid	glycerol/fatty acids	triglyceride	These molecules fats and oils. They store energy, provide protective cushions and coatings, and—most importantly—form the cell membranes surrounding all cells.
protein	amino acid	polypeptide	Proteins are the basic building blocks of all living things. There are millions of different proteins, all formed from just 20 amino acids. Proteins are involved in growth and repair of tissue, form the structural components of feathers, claws, hooves, hair, and skin, serve as chemical messengers, function as enzymes to facilitate reactions, and serve as transport molecules.
nucleic acid	nucleotide	nucleic acid	These carry the organisms genetic information, passed from one generation to the next. They also contain the coding for manufacturing proteins.

Learning Check 2.4

1. Why is the cell considered to be a living structure?

The cell is a living structure because cells possess all six of the characteristics associated with life: they are organized; they gather matter and energy; they grow, develop, and reproduce; they use and pass on genetic information; they respond to stimuli; and they can develop adaptations.

2. Compare and contrast prokaryotic cells and eukaryotic cells.

All cells include DNA, ribosomes, cytoplasm, and are bound by a cell membrane. Prokaryotic cells lack the membrane-bound nucleus and other organelles that eukaryotic cells have. Prokaryotic cells are surrounded by a cell wall and a capsule. Some prokaryotic cells have flagella and some are covered with fimbriae.

3. Compare and contrast eukaryotic plant cells and eukaryotic animal cells.

The two have similar structures and contain similar organelles. One difference is that plant cells all have a rigid cell wall that gives the plant its rigidity. Another difference is that plant cells contain very large vacuoles that occupy a large part of the cell. The vacuoles store water, waste, food, and other cell products.

4. How does the size of a bacterial cell compare to the size of an average animal cell.

Animal cells are 10–20 times the size of bacteria cells.

5. If a single cell can carry out all the functions necessary for life, why are larger plants and animals made up of trillions of specialized cells rather than one large cell?

One reason is that the surface area-to-volume ratio for small cells is much greater than it would be for larger cells. This is important because of all the molecular transport that goes on through the cell membrane; greater surface area provides a lot more space for molecules to pass in and out of the cell. Another reason is the specialization of different types of cells. Muscle cells contract, blood cells transport oxygen, and nerve cells send signals.

6. What types of cells are protected by cell walls?

Prokaryotic cells, plant cells, algae cells, and fungi cells all have cell walls.

7. Describe the structure and purpose of each of the following:

a. cell wall

The cell wall provides protection and rigidity. It is composed of cellulose arranged in log thread-like fibers that form a lattice. Cell walls may also contain pectin and lignin.

b. cell membrane

The cell membrane separates the contents of the cell from the surrounding environment and allows molecules to pass through. It is made of a bilayer of phospholipids. It has various proteins inserted that enable various molecules to pass through.

c. cytoplasm

This is the fluid filling the cell. It is laced with cytoskeleton fibers that hold the cell's shape, hold the organelles in place, and provide tracks for proteins to move on. The cytoplasm is where all the different organelles are in the cell.

d. nucleus

The nucleus is the command center of the cell. It is a membrane-bound organelle that holds all the chromosomes, which are the cell's DNA.

e. chloroplasts

The function of chloroplasts is to perform photosynthesis and generate the energy to power plants. They are surrounded by a double membrane. They are filled with a fluid and contain hundreds of thylakoids containing chlorophyll, the green pigment that absorbs light.

f. mitochondria

Mitochondria are called the "power plants" of the cell because they manufacture the cell's energy molecule, ATP. They are surrounded with a double membrane. The inner membrane has many folds called cristae to produce a large surface area. This area is covered with proteins that allow molecules to pass in and out, as well as ATP generators.

g. ribosomes

Ribosomes manufacture proteins. They are large molecules made of protein and RNA. They are in two pieces, like a clam shell. Ribosomes follow the coding in the DNA to assemble amino acids into proteins.

Chapter 2 Exercises

1. How does the size of a bacterium compare with the diameter of a single human hair?

Bacteria are about 1 micrometer across. The diameter of a human hair is about 20 to 40 times the size, or 20 to 40 micrometers in diameter.

2. Identify and describe three states of matter.

The states of matter are distinguished by the energy in the atoms. The lowest energy state is solids. In solids, the atoms are locked together and vibrate in place, so solids have a specific volume and fixed shape. When the energy is higher, the state is liquid. The particles have enough energy that they are free from each other and can move around, but they still cling together. This means that liquids have a fixed volume but not a fixed shape; they take the shape of the container. Gases have the highest amount of energy. The particles have enough energy that they are completely free of one another, so the substance has no fixed volume and no fixed shape. Instead, gases fill whatever container they are in.

3. Describe the particles found in an atom.

In the nucleus are the protons and neutrons. Protons each carry the same amount of positive charge. Outside the nucleus are the electrons, which each carry the same amount of charge as the protons except the electrons' charge is negative.

4. List the six elements that are most important in living things.

hydrogen, carbon, nitrogen, oxygen, phosphorus, sulfur

5. Identify seven remarkable properties of water.

a. It's an excellent solvent. (So it can transport dissolved nutrients.)

b. It exhibits capillary action. (So it climbs up plant roots and stems.)

c. It has a high specific heat capacity. (This moderates the climate.)

d. It has a high heat of vaporization. (This means a lot of heat is required to evaporate water, so evaporation is slowed.)

e. It has a high heat of fusion. (A lot of heat must be removed from water before it can freeze.)

f. It has a high surface tension. (This enables small insects to walk on the surface of water.)

g. It expands when it freezes. (Thus, ice floats and ponds freeze from the top down.)

6. Describe the importance of organic molecules.

They are essential for life. Carbohydrates provide energy and store energy. Lipids also store energy but also are used to form cell membranes. Proteins are the work horses in cells—they are messengers, transporters, gateways, builders, and enzymes. Nucleic acids are the genetic code carriers.

7. What does the cell theory state?

All living things are made of cells that come from pre-existing cells by division.

8. What evidence supports the cell theory?

First, microscopic observations of cellular structures. Second, observations of cell division at the growing tips of plants. Third, experimental evidence that organisms do not spontaneously form, but come from other organisms.

9. How is a cell like a 24-hour bagel shop?

First, cells receive materials and supplies, and ship out finished products. Second, cells store materials for future use. Third, cells must process and eliminate waste. Fourth, the activities of cells are directed by a command center, the nucleus. Fifth, the

activities in cells are ongoing, 24 hours per day.

Chapter 3

Learning Check 3.1

1. How do the body's cells become specialized in structure and function?

Initially, a person's body is composed of just a few identical cells. But in a wonderful way, the DNA inside each cell directs the selection of the proteins the cell produces, and different cells become specialized in different ways.

2. List the four broad categories of tissues the body is composed of.

epithelial tissue, connective tissue, muscle tissue, and nervous tissue.

3. Describe some of the tasks performed by epithelial tissue.

Epithelial tissue covers body surfaces, lines body cavities, produces mucous (digestive tract), absorbs molecules (small intestine and kidneys), and sweeps dust and microbes away from the lungs (nasal passages).

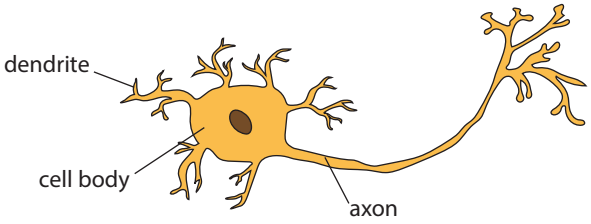
4. Name several types of connective tissue cells and describe the matrix material that each builds.

One is fibers, produced by fibroblast cells. Fibers cover all the muscles, nerves, and blood vessels. The matrix is fibrous. Osteoblasts and osteocytes are cells that produce bone connective tissue. The matrix material here is solid. Chondroblasts produce cartilage tissue in a gelatinous matrix. Adipose tissue is made of fat cells, and the matrix is also gelatinous. Red and white blood cells are suspended in plasma, a fluid matrix and connective tissue.

5. Compare and contrast skeletal muscle tissue, cardiac muscle tissue, and smooth muscle tissue.

Skeletal tissue is made of long fibers made of many cells joined together, so the fibers have many nuclei. Between the fibers are filaments of actin and myosin that make the fibers contract and give the tissue a striated appearance. This tissue is voluntary. Cardiac tissue is also striated. This tissue is extensively branched and interconnected so that if one cell contracts they all contract. This tissue is involuntary. Smooth tissue is also involuntary, but it is not striated because the filaments are more randomly distributed. This tissue contracts more slowly but can stay contracted for a longer time.

6. Sketch and label a neuron.



7. What is the purpose of the myelin manufactured by neuroglia cells?

Myelin covers the axons of neurons like the insulation on a wire. The myelin coating enables the nerve impulses to travel very fast.

Learning Check 3.2

1. What four tissues do most organs incorporate?

Most organs incorporate each of the four basic tissue types—epithelial tissue, connective tissue, muscle tissue, and nervous tissue.

2. Explain why organs don't perform their functions independently.

The body is organized into systems of organs, so each organ is part of a system designed to perform certain tasks and not just working on its own.

3. What is the importance of homeostasis?

In short, without homeostasis a creature would die. Various conditions in organism's body must be maintained within a narrow range. Such conditions include temperature, blood pH, and salt content. To stay alive, these must be controlled, and this is what homeostasis is.

4. Name four major body cavities and list the organs contained in each.

The cranial cavity contains the brain.

The vertebral cavity contains the spine and spinal cord.

The thoracic cavity contains the heart, lungs, esophagus, windpipe, thymus gland, and aorta.

The abdominal cavity contains liver, stomach, pancreas, spleen, kidneys, bladder, small intestine, large intestine, and reproductive organs.

Learning Check 3.3

1. Name the bones that protect the brain and spinal cord.

The cranium protects the brain. The vertebrae protect the spinal cord.

2. Name the bones that protect the heart and lungs.

The ribcage and sternum, together called the thoracic cage, protect the heart and lungs.

3. Compare and contrast immovable joints, slightly movable joints, and freely movable joints.

These are all ways that bones are joined together. The difference between them is in the range of movement they allow. Immovable joints, such as in the cranium, don't allow any movement at all. Slightly movable joints, such as between the vertebrae, allow for some movement such as bending and twisting. Freely movable joints, such as the knee and elbow, allow for a full range of movement.

4. What components of the skeletal system allow bones to slide smoothly over each other at freely movable joints?

This is possible because of the cartilage and its lubricating fluid.

5. Describe how muscles and bones work together in the arms and legs to enable a person to bend and straighten limbs.

The muscles are attached to the bones in pairs. One muscle bends a joint and its mate pulls the joints the opposite way to straighten it.

6. Why are bones considered to be living organs?

They contain blood vessels and the marrow is actively producing red and white blood cells. The space in the center is also used for storing fats as one ages.

7. Name the tissue that manufactures red and white blood cells. Where is this tissue located?

The red marrow makes blood cells. It is located in the spongy bone and in the central hollow space in bones.

8. What two resources are stored in bones?

The bones store red marrow, for making blood cells, and yellow marrow, for storing energy-rich fats.

Learning Check 3.4

1. What is the difference between voluntary muscles and involuntary muscles?

One must decide and act to move the voluntary muscles. Involuntary muscles are controlled by the brain to move without one thinking about them.

2. How do your muscles know when to contract and when to relax?

Involuntary muscles are controlled by the brain to contract and relax. Voluntary muscles contract and relax when we make them do so.

3. How can you strengthen your skeletal muscles?

These can be strengthened by lifting weights or by lifting and pushing against the body.

4. How can you strengthen your heat and increase your endurance?

This is done by aerobic exercise such as walking, running, swimming, and cycling.

5. Where do your muscles get the energy they need to move?

The blood carries energy-rich molecules to the muscle cells and these cells convert their energy into the energy in movement or the energy in heat.

6. How does your muscle system help your body maintain homeostasis?

The heat produced helps the body maintain its internal temperature.

Learning Check 3.5

1. What are the three functions of the nervous system?

These are sensory input, data integration, and motor output.

2. Describe the nerve pathway called a reflex arc.

This nerve pathway enables quick responses in emergencies. A sensor sends a signal to the spinal cord which immediately sends a motor output control signal without involving the brain.

Learning Check 3.6

1. Describe the work of William Harvey and the important theory he first developed.

Harvey worked in the early 17th century, observing patients and performing experiments as part of his medical practice. He was the first to propose the theory that the blood circulated in a looped system, pumped by the heart.

2. Describe the composition of normal blood.

Blood is about 55% plasma. The rest is the white blood cells, platelets, and red blood cells that are suspended in the plasma.

3. What is the function of hemoglobin molecules?

Hemoglobin molecules are designed to carry oxygen molecules from the lungs to the cells where it is used in the cellular respiration reactions that produce energy for the body.

4. Why does the body need white blood cells?

White blood cells are part of the immune system. They make antibody molecules that attack bacteria and viruses. Some white blood cells look for cells that have been infected by viruses or have become cancerous, which they kill. Other white blood cells detect tissue damage.

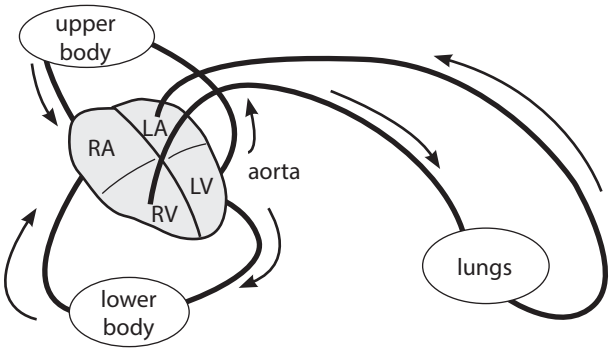
5. Describe how platelets repair leaks in the blood vessels.

When platelets detect a leak, millions of them form a platelet plug. If the wound is large, they create a web of protein molecules called fibrin that traps red blood cells so they form a clot. Then motor proteins in the platelets pull the fibrin fibers tight, drawing the edges of the wound together. If the clot is on the surface of the skin, a scab forms.

6. Why is it important to know the blood types of blood donors and recipients?

If the wrong type of blood were given, the white blood cells in the recipient would recognize the donated blood cells as foreign and attack them.

7. Sketch a simple heart and draw arrows that show the path of circulating blood.



8. What is the function of pulmonary circulation?

Pulmonary circulation is the flow of blood to and from the lungs where the red blood cells pick up oxygen molecules and dispose of carbon dioxide molecules.

9. What is the function of systemic circulation?

Systemic circulation sends freshly oxygenated blood to the body so that oxygen molecules can be delivered to the cells and waste carbon dioxide can be collected from the cells.

10. Compare and contrast arteries, veins, and capillaries.

All three are vessels for moving blood around, but they differ in key respects. Arteries carry blood away from the heart, so they have thick, elastic walls to handle the high pressure. They are formed of three layers, and the middle one is made of muscle fibers that can be controlled by the brain to enlarge or constrict the arteries to control how much blood flows. Veins carry blood back to the heart. They also have three-layered walls, but they are not as thick or as elastic. Veins contain little one-way valves to prevent blood from flowing the wrong direction. Capillaries are tiny (microscopic) and the walls are only one cell thick so that oxygen, nutrient, and waste molecules can pass through.

11. Where does the exchange of oxygen and carbon dioxide take place?

This occurs at the alveoli in the lungs, between the air in the alveoli and the blood in the capillaries surrounding the alveoli.

Learning Check 3.7

1. What is the function of the digestive system?

The function of the digestive system is to break down food into small molecules and to absorb those molecules into the blood.

2. Compare and contrast the digestive tract and accessory organs.

All are organs involved in the processing of food. But food passes through the organs in the digestive tract. The accessory organs supply substances to help with digestion but do not have food passing through them.

3. What is the difference between mechanical digestion and chemical digestion?

Mechanical digestion involves chewing, mixing, and churning food to break it apart. Chemical digestion involves chemicals

that break down the food molecules into small molecules that can be absorbed.

4. What happens during ingestion?

First, biting and chewing. Then, enzymes in the mouth begin breaking down carbohydrate molecules. After chewing, the tongue moves the food to the back of the mouth and it is swallowed.

5. How does the stomach begin to break down proteins?

The stomach produces hydrochloric acid and other digestive solutions for this purpose.

6. What is the function of the small intestine?

The small intestine is where nutrients from food are absorbed into the blood. The small intestine is lined with villi and microvilli to facilitate the absorption.

7. How do the liver and pancreas help digestion?

They both produce enzymes that help with digestion. Bile produced by the liver separates fats into tiny droplets. Also, chemicals from the pancreas neutralize the stomach acid to protect the small intestine.

8. What happens during absorption?

Nutrient molecules from food are absorbed into the bloodstream.

9. What is the purpose of the villi and microvilli in the small intestine?

To provide the lining of the small intestine with a massive surface area for absorbing nutrients.

10. What happens during elimination?

Excess food in the form of feces is eliminated from the body.

Learning Check 3.8

1. What is the function of the excretory system?

The excretory system removes waste molecules and excess water from the blood.

2. Which other systems are involved in the excretory system?

The digestive system, the respiratory system, the skin, and the urinary system.

3. Name the organs of the urinary system.

The kidneys, the ureters, the urinary bladder, and the urethra.

4. How do the kidneys help your body maintain homeostasis?

Maintaining homeostasis requires maintaining the correct balance of dissolved solids in the blood. This is what the kidneys do.

5. Describe the structure and function of a nephron.

A ball of capillaries rests in a cup called the Bowman's capsule. Waste products and water move out of the blood and into the cup. A tubule leads from the cup a connects to a collecting duct. There are lots of other capillaries surrounding the tubule so that some water and useful molecules can be reabsorbed. Whatever is not reabsorbed flows out of the kidney in the ureter and to the bladder.

6. How does the bladder change in appearance as it fills with urine?

When the bladder is empty, it is wrinkled with thick walls. As it fills, it stretches like a balloon and the walls thin out.

Chapter 3 Exercises

1. Describe the five levels of organization of living organisms.

cells—There are many different types with various special functions.

tissues—Many cells of the same type together form a tissue.

organs—Several different tissue types are typically involved in an organ that serves a specific function in the body.

organ systems—Individual organs are part of organ systems that perform numerous functions.

organism—An organism includes many different organ systems.

2. How do the four major tissue types work together in a single organ?

Each organ incorporates at least two tissue types. Most organs have a surface of epithelium, muscle tissue for movement or control of blood flow, nervous tissue to regulate activity, and connective tissue to hold it all together.

3. What is an organ system?

Organs don't function independently. Each organ is part of one or more systems that incorporate several organs to perform specific functions.

4. What is homeostasis?

Numerous parameters in the body of an organism must be maintained within specific ranges for the organism to stay alive. These parameters include temperature, blood pH, water content, concentration of waste molecules, and many others. Maintaining all these parameters within their required ranges is homeostasis.

5. What is the difference between the axial skeleton and the appendicular skeleton?

The axial skeleton includes the bones in the central core of the body—cranium, spinal column, ribcage, sternum, and pelvis. All the bones that are parts of limbs are part of the appendicular skeleton.

6. Why do the cells that make up skeletal muscle tissue contain a large number of mitochondria?

The skeletal muscles enable the body to move, and movement requires a great deal of energy in the form of ATP. Mitochondria are the organelles that produce ATP, so skeletal muscles have lots of them.

7. How do the organs of the circulatory and respiratory systems work together?

The functions of the circulatory system include getting oxygen to the cells for cellular respiration and getting rid of the carbon dioxide produced by cellular respiration. This is done by circulation of blood to the lungs, the major organ of the respiratory system. There, the capillaries wrap around the alveoli. Oxygen molecules from the air in the alveoli move into the red blood cells through the capillary walls, and carbon dioxide molecules move out of the blood and into the alveoli. From the alveoli, the carbon dioxide is expelled from the body when a person breathes out. Once the blood has been purged of carbon dioxide and loaded up with a fresh supply of oxygen, it is pumped around the body to the cells to deliver oxygen molecules and pickup more carbon dioxide molecules.

8. How do the organs of the circulatory and digestive systems work together?

The functions of the circulatory system include getting nutrients from the digestive system to the cells. These nutrients include amino acids for building proteins, and sugar and fat molecules for energy production. These molecules are absorbed from digested food in the small intestine. The villi and microvilli where the absorption occurs are packed with capillaries so that blood can pass through and pickup nutrients and then carry them to cells in other parts of the body.

9. Why does the heart have four chambers, two atria and two ventricles?

The circulatory system operates in a double-loop fashion—one loop going to the lungs and the other loop going to the rest of the body. The right atrium and ventricle send blood to the lungs; the left pair send blood to the rest of the body. The reason each side has two chambers is due to the way the pumping action works. Between contractions, the atria fill completely and

the ventricles fill partly. When the heart contracts, the atria contract first, forcing blood from the atria into the ventricles. The ventricles contract next, forcing blood out of the heart.

10. Describe the work and theoretical contribution of William Harvey.

Harvey observed patients and conducted experiments. He was the first to propose that the blood circulates in a closed loop, with the heart acting as the pump.

11. What is the difference between breathing and cellular respiration?

Cellular respiration is the series of chemical reactions that occurs to produce energy for the cells in the form of molecules of ATP. Breathing, which produces the oxygen for the cellular respiration reactions, is the process of bringing in fresh air for exchanging oxygen and carbon dioxide molecules in the blood—oxygen molecules moving out of the air and into the blood, and carbon dioxide molecules moving out of the blood and into the air.

12. Why do living organisms need to eat?

Organisms eat for two reasons. First, matter is needed for structural material and proteins for building cells to grow. Second, cells need energy to function. The fats and sugars provide that.

13. Where in the digestive tract are nutrients absorbed into the bloodstream?

This occurs at the small intestine. The villi and microvilli lining the inside surface of the small intestine provide a large surface area for this absorption to occur. The microvilli are packed with capillaries so that nutrients can pass through the wall of the intestine and into the blood.

14. What structure in the nephron prevents the blood from losing too much water while it is being cleansed?

This is the renal tubule, extending from the glomerulus to the collecting duct. It is surrounded by capillaries that reabsorb water and some useful nutrients.

Sample Course Lesson List **Life Science** **Fall Term**

Lesson No.	Topic	Text Key	Assignment	Notes
1	Welcome			
2	Characteristics of Living Things	1.1		
3	Characteristics of Living Things	1.1	Learning Check 1.1	
4	Defining Science	1.2	Learning Check 1.2	
5	The Cycle of Scientific Enterprise	1.3		
6	The Cycle of Scientific Enterprise	1.3	Learning Check 1.3	
7	Scientific Method	1.4	Learning Check 1.4	
8	Quiz 1/Facts and Theories	1.5	Learning Check 1.5	Discuss Facts and Theories after quiz
9	Activity 1			Activities are in *The Apprentice's Companion for Life Science*
10	Ways of Knowing Truth/Nature of Scientific Knowledge	1.6/1.7	Learning Check 1.6/1.7	
11	Scale and Goals of Life Science	1.8	Learning Check 1.8	
12	Quiz 2/Activity 2			Activity 2 after quiz
13	Discuss/Assign Activity 3		Chapter 1 Exercises	WR#1 (Weekly review Guides are distributed at the end of each week throughout the year.)
14	Discuss Ch 1 Exercises			
15	A Short Chemistry Lesson: Part 1/2	2.1, 2.2.1, 2.2.2	Learning Check 2.1	
16	Chemistry of Water	2.2.3	Learning Check 2.2	
17	Quiz 3/Act 4			Activity 4 after quiz
18	Organic Molecules	2.3	Learning Check 2.3	WR#2
19	Organic Molecules	2.3	Learning Check 2.3	
20	Cell Size/Organization; Prok & Euk Cells	2.4.1–2.4.3		
21	Quiz 4/Act 5			Activity 5 after quiz
22	Cell Wall, Membrane; Cytoplasm, Cytoskeleton	2.4.4–2.4.7		WR#3
23	Nucleus, Chloroplasts	2.4.8, 2.4.9		
24	Mitochondria, Ribosomes	2.4.10, 2.4.11		
25	Class Work on Learning Check 2.4; Chapter 2 Exercises		Learning Check 2.4; Chapter 2 Exercises	
26	Quiz 5/Discuss Ch 2 Exercises			Discuss Ch 2 Exercises after quiz
27	Tissue Types	3.1.1–3.1.6; 3.2	Learning Check 3.1	WR#4
28	Skeletal System	3.3	Learning Check 3.2	
29	Muscle System, Nervous System Intro	3.4, 3.5	Learning Checks 3.4, 3.5	
30	Circulatory System	3.6.1–3.6.3		
31	Quiz 6/Act 6			WR#5
32	Respiratory System; begin Activity 7	3.6.4	Learning Check 3.6	
33	Activity 7			
34	Quiz 7/Activity 8			Activity 8 after quiz
35	Digestive System	3.7	Learning Check 3.7	WR#6
36	Excretory System	3.8	Learning Check 3.8	
37	Activities 8 & 9			
38	Class work Chapter 3 Exercises		Chapter 3 Exercises	
39	Quiz 8/ Discuss Ch 3 Exercises			Discuss Ch 3 Exercises after quiz
40	Mitosis	4.1.1		WR#7
41	Meiosis	4.1.2	Learning Check 4.1	
42	Activity 10/Flowering Plants	4.2.1		
43	Pollination & Fertilization; Other Methods of Plant Reproduction	4.2.2, 4.2.3	Learning Check 4.2	
44	Quiz 9/Activity 11			Activity 11 after quiz
45	Genes & Punnett squares	4.3.1		WR#8
46	Environmental Influences on Plant Growth	4.3.2	Learning Check 4.3	
47	Animal Reproduction	4.4	Learning Check 4.4	
48	Quiz 10/Activity 12			Activity 12 after quiz
49	Genetic/Environmental Factors	4.5	Learning Check 4.5	WR#9
50	Class work Chapter 4 Exercises		Chapter 4 Exercises	
51	Discuss Ch 4 Exercises			
52	Photosynthesis	5.1	Learning Check 5.1	
53	Quiz 11/Cellular Respiration	5.2.1		5.2.1 after quiz
54	Drill Day			WR#10
55	Cellular Respiration and Photosynthesis	5.2.2	Learning Check 5.2	
56	Activity 13/class work			
57	Metabolism	5.3	Learning Check 5.3	
58	Quiz 12/class work			
59	Activity 14			WR#11
60	Complete Activity 14			
61	Homeostasis	5.4	Learning Check 5.4	
62	Energy Flow and Nutrient Cycles	5.5	Learning Check 5.5	
63	Quiz 13/class work on Chapter 5 Exercises		Chapter 5 Exercises	
64	Discuss Ch 5 Exercises			WR#12
65	Nervous System, Neurons	6.1.1, 6.1.2		

66	Central Nervous System	6.1.3		
67	Central/Peripheral Nervous Systems	6.1.3/4		
68	Quiz 14/Peripheral Nervous System	6.1.4		Complete 6.1.4 after quiz
69	Class work on Learning Check 6.1	6.1.4	Learning Check 6.1	WR#13

Sample Course Lesson List **Life Science** **Spring Term**

Lesson Number	Topic	Text Key	Assignment	Notes
1	Sensory Receptors	6.2.1–6.2.3		
2	Taste and Smell	6.2.4		
3	Activity 15			
4	Hearing and Balance	6.2.5		WR#14
5	Sight	6.2.6	Learning Check 6.2	
6	Plant Sensory Systems	6.3	Learning Check 6.3; Chapter 6 Exercises	
7	Discuss Ch 6 Exercises			
8	Quiz 15/Activity 16			Begin Activity 16 after quiz
9	Interdependence; Five Ecological Levels; Population Growth	7.1, 7.2	Learning Check 7.1, 7.2	WR#15
10	Activity 17 + Competition, Predation	7.3.1–7.3.3		
11	Symbiosis	7.3.4	Learning Check 7.3	
12	Quiz 16/Activity 18			Activity 18 after quiz
13	Measuring Populations	7.4.1		WR#16
14	Limiting Factors	7.4.2		
15	Class work Learning Check 7.4 & Ch 7 Exercises		Learning Check 7.4; Chapter 7 Exercises	
16	Drill Day			
17	Quiz 17/Discuss Chapter 7 Exercises			Begin 8.1 after quiz
18	Components of Ecosystems; Interdependence; Autotrophs & Heterotrophs; Detritivores & Decomposers	8.1.1–8.1.3		WR#17
19	Class work Learning Check 8.1		Learning Check 8.1	
20	Trophic Levels & Food Chains	8.2.1		
21	Quiz 18/Food Webs	8.2.2		8.2.2 after quiz
22	Ecological Niches	8.2.3	Learning Check 8.2	WR#18
23	Activity 19			
24	Energy and Matter	8.3.1		
25	Pyramid Diagrams	8.3.2		
26	Quiz 19/Class work LC 8.3		Learning Check 8.3	
27	Activity 20 Discussion			WR#19
28	Matter & Energy Movement; Water Cycle	8.4.1, 8.4.2		
29	Nitrogen & Phosphorus Cycles	8.4.3, 8.4.4	Learning Check 8.4	
30	Classwork LC 8.4, Chapter 8 Exercises		Chapter 8 Exercises	
31	Quiz 20/Discuss Chapter 8 Exercises			WR#20
32	Climate, Range of Species	9.1.1, 9.1.2		
33	Solar Radiation, Seasons, Air Flow	9.1.3		
34	Quiz 21/Discuss Activity 21			Discuss Activity 21 after quiz
35	Geographical Factors—all 4 of them	9.1.4		WR#21 (9.5 in the first edition is a typo; elevation is a factor in 9.1.4, not a new section.)
36	Classwork LC 9.1		Learning Check 9.1	
37	Biomes, Types + Terrestrial	9.2		
38	Biomes, Aquatic	9.2		
39	Quiz 22/Class work on LC 9.2	9.2	Learning Check 9.2	Class work on LC 9.2 after quiz
40	Activity 20 Presentations			WR#22
41	Drill Day			
42	Changes in Ecosystems; Ecological Succession	9.3.1, 9.3.2		
43	Biodiversity, Human disturbances	9.3.3, 9.3.4	Learning Check 9.3; Chapter 9 Exercises	
44	Quiz 23/ class work LC 9.3, Ch 9 Ex			class work after quiz
45	Discuss Ch 9 Exercises			WR#23
46	Activity 22			
47	Biodiversity	10.1.1-10.1.3		
48	Threats to Biodiversity	10.1.4	Learning Check 10.1	
49	Provisioning & Regulating Services	10.2.1–10.2.3		
50	Supporting and Cultural Services	10.2.3, 10.2.4	Learning Check 10.2	WR#24
51	Activity 23			
52	Human Pressures: Land Use	10.3.1		
53	Human Pressures: Water and Food	10.3.2, 10.3.3		
54	Quiz 24/Class work LC 10.3		Learning Check 10.3	class work after quiz
55	Maintaining Biodiversity and Services	10.4		WR#25
56	Maintaining Biodiversity and Services	10.4		
57	Class work on LC 10.4		Learning Check 10.4	
58	Class work on Chapter 10 Exercises		Chapter 10 Exercises	
59	Quiz 25/Discuss Ch 10 Exercises			Discuss Ch 10 Ex after quiz
60	Discussion of how to approach evolution	11.1.1		WR#26
61	Strata and Stratigraphy	11.1.2-11.1.4		
62	Rocks and Fossils; Dating; Extinctions	11.1.5–11.1.7	Learning Check 11.1	
63	Activity 24			

64	Darwin's Observations and Theory; Mechanisms of Evolutionary Change	11.2.1–11.2.4	Learning Check 11.2	
65	Fossil and Biogeographical Evidence	11.3.1, 11.3.2		WR#27
66	Anatomical, Embryological, Molecular Evidence	11.3.3–11.3.5		
67	Class work on Learning Check 11.3		Learning Check 11.3	
68	Class work on Ch 11 Exercises		Chapter 11 Exercises	
69	Quiz 26/Discuss Ch 11 Exercises			Discuss Ch 11 Exercises after quiz
70	Inheritance of Traits	12.1	Learning Check 12.1	WR#28
71	Activity 25			
72	Genetic Mutations	12.2.1		
73	Selective Breeding; Genetic Modification; Gene Therapy	12.2.2–12.2.4	Learning Check 12.2	
74	Quiz 27/ Changes to Gene Pools	12.3.1, 12.3.2		WR#29; Discuss 12.3.1, 12.3.2 after quiz
75	Traits that Support Reproduction	12.3.3	Learning Check 12.3	
76	Class work on LC 12.3			
77	Activity 26			
78	Quiz 28/ Species	12.4.1		Class work after quiz
79	Speciation	12.4.2	Learning Check 12.4	WR#30
80	Classification	12.5		
81	Class work LC 12.5		Learning Check 12.5	
82	Class work Chapter 12 Exercises		Chapter 12 Exercises	
83	Quiz 29 (Optional)			
84	Discuss Ch 12 Exercises			WR#31

Life Science
Weekly Review Guide No. 4
Distribute on Lesson 27

Go get your study buddy.

Your assignments this week include the following review and practice tasks:

1. Complete your flash cards for Chapter 2. Go through them all twice, on two different days. From your flash card stack, cull out any items you have forgotten and rehearse them repeatedly until you have them down. Then do those items again the next day.

2. Review your last quiz and write new answers from memory for any question where you lost more than four points. If you can't write answers from memory, find the flash cards dealing with these items and go through them until you have them down.

3. Go through all your flashcards for Chapter 1 once. From your flash card stack, cull out any items you have forgotten and rehearse them repeatedly until you have them down. Then do those items again the next day.

4. Read over the Chapter 2 Objectives list and make sure you can do all the things on it.

5. Specifically rehearse:

    a. Definitions for atom, element, and molecule. (These are some of the building blocks for cells, Chapter 2, Objective 1.)

    b. Name and describe the four basic types of organic molecules used by cells.

    c. Descriptions of function for nucleus, chloroplast, mitochondrion, ribosome.

    d. State the three ways we know truth.

    e. Definitions for science, truth, scientific fact, theory, and hypothesis.

Life Science
Weekly Review Guide No. 16
Distribute on Lesson 13

Go get your study buddy.

Your assignments this week include the following review and practice tasks:

1. Review your last quiz and write new answers from memory for any question where you lost more than four points. If you can't write answers from memory, find the flash cards dealing with these items and go through them until you have them down.

2. Make your Chapter 7 flashcard set. Go through it several times.

3. Go through all your flashcards for Chapters 1 and 2. From your flash card stack, cull out any items you have forgotten and rehearse them repeatedly until you have them down. Then do those items again the next day.

4. Specifically rehearse:

    a. Definitions for atom, element, molecule.

    b. William Harvey's work and new theory.

    c. Describe how you know the body is a system of subsystems composed of groups of cells.

Life Science
Weekly Review Guide No. 21
Distribute on Lesson 34

Go get that study buddy. Take him or her to a new spot that's still quiet where you can practice.

Your assignments this week include the following review and practice tasks:

1. Review your last quiz and write new answers from memory for any question where you lost more than four points. If you can't write answers from memory, find the flash cards dealing with these items and go through them until you have them down.

2. Get started making your flash cards for Chapter 9. Then go through them several times.

3. Go through all your flashcards for Chapters 3 and 4. From your flash card stack, cull out any items you have forgotten and rehearse them repeatedly until you have them down. Then do those items again the next day.

4. Specifically rehearse:

    a. Define science, theory, hypothesis, scientific fact, and truth.

    b. Describe the Cycle of Scientific Enterprise.

    c. Explain why science is mental model building.

    d. Describe what science says about how we form memories.

    e. Describe the types of sensory receptors humans have.

    f. Describe how people process and use information with sensory receptors.

    g. Describe the sensory systems in plants.

    h. Describe the three types of symbiosis.

    i. Describe biotic and abiotic factors that limit the carrying capacity of an ecosystem.