Name_____ Date_____

TEKS 4.B.9.B **Biology**

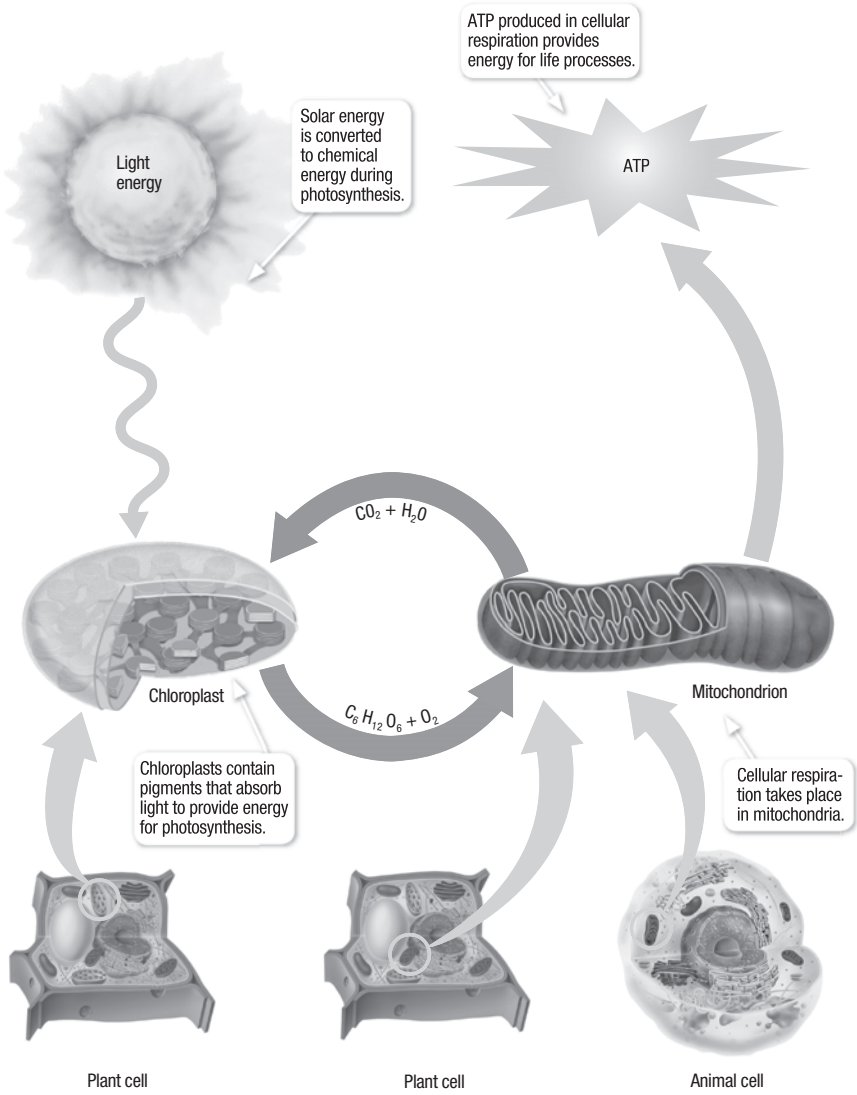
BIOLOGICAL PROCESSES AND SYSTEMS

The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.9) **Science concepts.** The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to (B) compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter;

STANDARD REVIEW

Photosynthesis and cellular respiration are related processes. The diagram below shows how the substances produced by photosynthesis are used during cellular respiration and vice versa.



Name_____ Date_____

TEKS 4.B.9.C Biology

BIOLOGICAL PROCESSES AND SYSTEMS

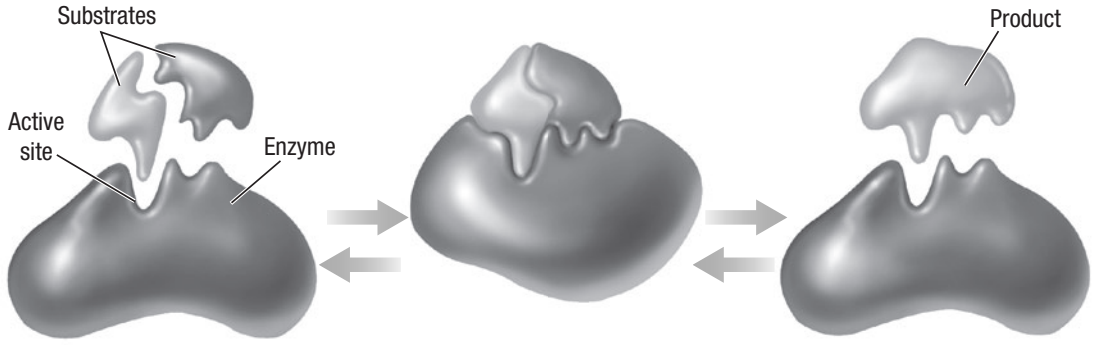
The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.9) **Science concepts.** The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to (C) identify and investigate the role of enzymes.

STANDARD REVIEW

The chemical reactions in cells occur quickly and at relatively low temperatures because of the action of many enzymes. Enzymes are substances that increase the speed of chemical reactions. Most enzymes are proteins. Enzymes are catalysts, which are substances that reduce the activation energy of a chemical reaction. An enzyme increases the speed of a chemical reaction by reducing the activation energy of the reaction. Enzymes help organisms maintain homeostasis. Without enzymes, chemical reactions would not occur quickly enough to sustain life.

Enzymes assist biochemical reactions by bringing key molecules together. A substance on which an enzyme acts during a chemical reaction is called a substrate. Enzymes act only on specific substrates. An enzyme's shape determines its activity. Typically, an enzyme is a large protein with one or more deep folds on its surface. These folds form pockets called active sites. As shown in the figure below, an enzyme's substrate fits into the active site. An enzyme acts only on a specific substrate because only that substrate fits into its active site. Your body's cells contain many different enzymes, and each enzyme catalyzes a different chemical reaction.



Any factor that changes the shape of an enzyme can affect the enzyme's activity. For example, enzymes operate most efficiently within a certain range of temperatures. Temperatures outside this range can either break or strengthen some of the enzyme's bonds, changing its shape. Moreover, each enzyme operates best within a certain range of pH values. A pH value outside this range can cause bonds in an enzyme to break, reducing the enzyme's effectiveness.

Name_____ Date_____

TEKS 4.B.10.A Biology

BIOLOGICAL PROCESSES AND SYSTEMS

The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.10) **Science concepts.** The student knows that biological systems are composed of multiple levels. The student is expected to (A) describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals;

STANDARD REVIEW

Your body's major organ systems work together to maintain homeostasis. For example, the cardiovascular system, which includes the heart, blood, and blood vessels, works with the respiratory system, which includes the lungs. The cardiovascular system picks up oxygen from the lungs and carries the oxygen to cells in the body. These cells produce carbon dioxide, which the cardiovascular system returns to the respiratory system. The respiratory system expels the carbon dioxide.

Your digestive system breaks down the food you eat into nutrients that your body can absorb. Your urinary system removes wastes from the blood and regulates your body's fluids. Chemicals produced by your endocrine system also play an important role in digestion.

The female reproductive system produces eggs and nourishes and protects the fetus. The male reproductive system produces and delivers sperm. The endocrine system produces hormones that control the process of reproduction.

The immune system consists of cells and tissues found throughout the body. Your skin is the first of your immune system's nonspecific defenses against pathogens. Skin acts as a nearly impenetrable barrier to invading pathogens, keeping them outside the body.

When pathogens break through your body's first line of defense, four important nonspecific defenses take action:

- Body temperature increases and slows the growth of bacteria.
- An inflammatory response causes local blood vessels to dilate, increasing blood flow to the infection site.
- Blood flow brings white blood cells that can attack and kill pathogens.
- Blood flow also brings special proteins that kill or inhibit pathogens.

Pathogens that have survived the first and second lines of nonspecific defenses still face a third line of specific defenses—the immune response. The immune response consists of an army of individual cells that rush throughout the body to combat specific invading pathogens.

Name_____ Date_____

TEKS 4.B.10.B Biology

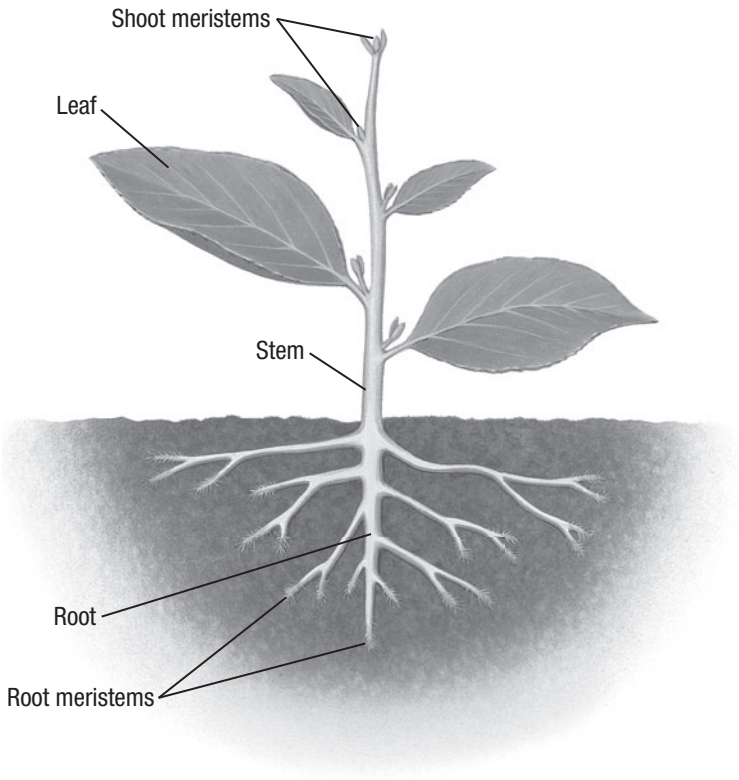
BIOLOGICAL PROCESSES AND SYSTEMS

The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.10) **Science concepts.** The student knows that biological systems are composed of multiple levels. The student is expected to (B) describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants;

STANDARD REVIEW

Nearly all plants have a body that consists of a vertical shaft from which specialized structures branch, as shown below. The part of a plant's body that grows mostly upward is called the shoot. In most plants, the part of the body that grows downward is called the root. Zones of actively dividing plant cells, called meristems, produce plant growth. The vertical body form results as new cells are made at the tips of the plant body.



Specialized cells that transport water and other materials within a plant are found in vascular tissues. Relatively soft-walled cells transport organic nutrients in a kind of tissue called phloem. Hard-walled cells transport water and mineral nutrients in a kind of tissue called xylem, which also helps support the plant body.

Name_____ Date_____

TEKS 4.B.10.B Biology

A watertight covering called the cuticle, which reduces water loss, is a waxy layer that covers the nonwoody aboveground parts of most plants. The cuticle does not let oxygen or carbon dioxide pass through it. Pores called stomata (singular, stoma) permit plants to exchange oxygen and carbon dioxide. A pair of specialized cells called guard cells border each stoma, as seen below. Stomata open and close as the guard cells change shape.

Some plants reproduce through seeds. A seed is a structure that contains the embryo of a plant. An embryo is an early stage in the development of plants and animals. Most plants living today are seed plants—vascular plants that produce seeds. Some, such as pine trees, are gymnosperms, seed plants whose seeds do not develop within a sealed container (a fruit). Most seed plants are flowering plants, or angiosperms. Angiosperms produce seeds that develop enclosed within a specialized structure called a fruit.

Name_____ Date_____

TEKS 4.B.10.C Biology

BIOLOGICAL PROCESSES AND SYSTEMS

The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.10) **Science concepts.** The student knows that biological systems are composed of multiple levels. The student is expected to (C) analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.

STANDARD REVIEW

Biologists have described several different levels of biological organization. The diagram below shows the simplest of these different levels arranged in increasing complexity within an individual living thing.

cell → tissue → organ → organ system → individual organism

An organism is an individual living thing. All living things are made of one or more cells. Cells are highly organized, tiny structures with thin coverings called membranes. A cell is the smallest unit capable of all life functions. The basic structure of cells is the same in all organisms, although some cells are more complex than others. Some organisms have only a single cell, while others are multicellular (composed of many cells). Your body contains more than 100 trillion cells.

The specialized cells of most plants and animals are organized into structures called tissues. A tissue is a distinct group of cells with similar structure and function. Muscle, for example, is a tissue composed of many muscle cells that work together. Different tissues may be organized into an organ, which is a specialized structure with a specific function. An example of an organ is the heart, which is composed of muscle, nerve, and other tissues that work together as a pump. Various organs that carry out a major body function make up an organ system. The circulatory system, which is composed of the heart, the blood vessels, and the blood within them, is an example of an organ system. An individual organism is composed of several organ systems that work together to maintain homeostasis.

Name_____ Date_____

TEKS 4.B.11.A Biology

BIOLOGICAL PROCESSES AND SYSTEMS

The student will demonstrate an understanding of metabolic processes, energy conversions, and interactions and functions of systems in organisms.

(B.11) **Science concepts.** The student knows that biological systems work to achieve and maintain balance. The student is expected to (A) describe the role of internal feedback mechanisms in the maintenance of homeostasis.

STANDARD REVIEW

All living organisms must maintain a stable internal environment in order to function properly. The maintenance of stable internal conditions in spite of changes in the external environment is called homeostasis. The body maintains homeostasis by sensing and responding to changes in the external environment.

Almost all body processes use a system called negative feedback to maintain homeostasis. Negative feedback is a system in which the results of a process provide a signal for the process to stop. One example of this is the regulation of body temperature. Despite temperature changes in the environment, our bodies maintain a fairly constant internal temperature of about 37 °C. The body regulates its internal temperature using negative feedback in much the same way that a thermostat works. When the body senses that its internal temperature has dropped below normal, a chemical signal causes the body to produce heat. The result is shivering, a process you are probably familiar with. When your body temperature returns to normal, the chemical signal is turned off, and you stop shivering. If your body temperature rises above normal, another chemical signal is sent. This signal tells the body to begin cooling itself through the evaporation of sweat and by increasing blood flow to small vessels below the skin. This releases heat and cools the body. If temperatures become too high, proteins begin to denature (change shape) and stop functioning. If temperatures drop too far below the normal range, cellular processes will stop.