

Georgia Performance Standards Human Anatomy and Physiology Alignment to *National Science Education Standards*

Life Science

The Cell

SAP

Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage genetic material.	1e
Most cell functions involve chemical reactions. Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules allows the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.	1d
	4a
Cells can differentiate, and complex multicellular organisms are formed as a highly organized arrangement of differentiated cells. In the development of these multicellular organisms, the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues, and organs that comprise the final organism. This differentiation is regulated through the expression of different genes.	1e
	5c
	5d

The Molecular Basis of Heredity

SAP

Most of the cells in a human contain two copies of each of 22 different chromosomes. In addition, there is a pair of chromosomes that determines sex. Transmission of genetic information to offspring occurs through egg and sperm cells that contain only one representative from each chromosome pair. An egg and a sperm unite to form a new individual. The fact that the human body is formed from cells that contain two copies of each chromosome—and therefore two copies of each gene—explains many features of human heredity, such as how variations that are hidden in one generation can be expressed in the next.	5a
	5b
Changes in DNA (mutations) occur spontaneously at low rates. Some of these changes make no difference to the organism, whereas others can change cells and organisms. Only mutations and germ cells can create the variation that changes an organisms' offspring.	5c

Matter, Energy, and Organization in Living Systems

SAP

All matter tends toward more disorganized states. Living systems require a continuous input of energy to maintain their chemical and physical organizations. With death, and the cessation of energy input, living systems rapidly disintegrate.	5e
The energy for life primarily derives from the sun. Molecules can be used to assemble larger molecules with biological activity (including proteins, DNA, sugars, and fats). In addition, the energy stored in bonds between the atoms (chemical energy) can be used as sources of energy for life processes.	1d
	4a
	4b
The chemical bonds of food molecules contain food energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Cells usually store this energy temporarily in phosphate bonds of small high-energy compound called ATP.	1d
	2b
	4a
	4b

Matter, Energy, and Organization in Living Systems (Continued)

SAP

The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organism	1c
	2a
	3b
	3c
	4a
	4b
	4c
	4d
5b	

The Behavior of Organisms

SAP

Multicellular animals have nervous systems that generate behavior. Nervous systems are formed from specialized cells that conduct signals rapidly through the long cell extensions that make up nerves. The nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules. In sense organs, specialized cells detect light, sound, and specific chemicals and enable animals to monitor what is going on in the world around them.	3a
	3b
	3c
Organisms have behavior responses to internal changes and to external stimuli. Responses to external stimuli can result from interactions with the organism's own species and others, as well as environmental changes; these responses can either be innate or learned. The broad patterns of behavior exhibited by animals have evolved to ensure reproductive success. Animals often live in unpredictable environments and so their behavior must be flexible enough to deal with uncertainty and change.	2a
	3c

Physical Science

Chemical Reactions

SAP

Chemical reactions occur all around us, in healthcare, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell of our bodies.	1 through 5
Catalysts accelerate chemical reactions. Chemical reactions in living systems are catalyzed by protein molecules called enzymes.	1 through 5

Science in Personal and Social Perspectives

Personal and Community Health

SAP

Hazards and the potential for accidents exist. Regardless of the environment, the possibility of injury, illness, disability, or death may be present. Humans have a variety of mechanisms—sensory, motor, emotional, social, and technological—that can reduce and modify hazards.	3a
	3c

Personal and Community Health (Continued)

SAP

The severity of disease symptoms is dependent on many factors such as human resistance and the virulence of the disease-producing organism. Many diseases can be prevented, controlled, or cured. Some diseases, such as cancer, result from specific body dysfunctions and cannot be transmitted.	1b
	2a
	4e
	5e