

7. What does the word "barbarian" mean?
8. Who was William Harvey?
9. What are the differences between capillaries, veins and arteries?
10. Why is human blood red?
11. Name the body parts involved in the digestive process.
12. What are the parts of the nervous system?
13. How does the brain organize memories?

Activities

- Examine cells using a microscope. Compare cells from a variety of plants and animals. Instructions have to be given on the proper use and care of microscopes, and on the preparation of specimens for viewing.
- Research where minerals like calcium, magnesium, phosphorus, iron, iodine, sodium and potassium can be found, and the benefit of these minerals for the body.
- Have students design experiments to test conditions that influence learning. For example, they could test reading comprehension in a quiet environment versus a noisy one, the effect on learning of different types of background noise (white noise, instrumental music, vocal music, conversation, television) played at the same volume, or the number of repetitions necessary to learn and retain nonsense words.

Internet Resources

Periodically, Internet Resources are updated on our web site at www.libraryvideo.com

- faculty.washington.edu/chudler/neurok.html
Neuroscience for Kids is an excellent resource for exploring the nervous system.
- www.thetech.org/genetics
This web site from The Tech Museum offers news stories, online exhibits and at-home activities related to genetics.
- www.icnet.uk/kids/cellsrus/cellsrus.html
"Cells Are Us" illustrates cell division and growth in an engaging, humorous manner.
- www.hhmi.org/senses/
This online report from the Howard Hughes Medical Institute is an excellent resource for students studying the senses.
- www.medtropolis.com/vbody.asp
The "Virtual Body" site from MEDtropolis contains a narrated tour of the human skeleton.

Suggested Print Resources

- Harris, Henry. *The Birth of the Cell*. Yale University Press, New Haven, CT; 2001.
- Harris, Nicholas. *The Incredible Journey Through the Human Body (Incredible Journey Series)*. Peter Bedrick Books, Lincolnwood, IL; 2000.
- Little, Marjorie. *The Endocrine System*. Chelsea House Publishers, Philadelphia, PA; 2001.
- Weise, Jim. *Head to Toe Science*. Wiley Publishing, New York, NY; 2000.

TEACHER'S GUIDE

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V6053



Human Machine (Bodyzone)

Grades 4–8

The *Eyewitness DVD Series* explores the natural world with fascinating film footage and nature photography fused with striking special effects and stunning graphics. The programs offer a unique "eyewitness" view of events that shape the Earth and the living things that inhabit it.

Interactive menus allow viewers to easily select and replay any section of a program. Other features include interactive assessment quizzes and "Hotspots" — video icons that appear throughout the program and allow students to further explore specific science content or areas of interest. Each title contains a segment that reveals all the behind-the-scenes wizardry that goes into the production of the *Eyewitness* series, along with recommended web sites for further research.

Included in this guide is a brief synopsis of the program, background on the science concepts presented in the show, discussion topics, activities, vocabulary and additional resources for students to explore.



Background

No machine is as complex as the human body — a light, flexible, yet strong framework driven by beautifully engineered organs and made up of billions of tiny cells. Each living cell in the body carries out all of the processes that allow us to live and to grow. Similar cells group together to form special tissues (e.g. muscle tissue, nerve tissue, bone tissue) that group together to form organs (e.g. heart, lungs, brain). Organs group together to create organ systems. Major body systems include the skeletal and muscular systems, the circulatory and respiratory systems, the digestive and excretory systems, and the nervous system. The highest level of organization is the whole organism — a living human being. The key is the ability of all the separate body systems to work together.

The circulatory system includes the blood, the tirelessly pumping heart, and blood vessels called arteries, veins and capillaries. This system delivers oxygen and nutrients to cells, removes waste and carries disease-fighting white blood cells of the immune system. The circulatory system works hand in hand with the respiratory system, which brings fresh oxygen into our bodies through lung tissue called alveoli. The respiratory system also works as part of the excretory system by removing carbon dioxide and other gases when we exhale.

The human body's immune system always stands guard to protect us against microscopic germs that can cause infection and disease. Some common disease-causing microorganisms are viruses, fungi, protozoa and bacteria. These organisms that cause infectious diseases are commonly called pathogens. They find their way into our bodies through openings such as the eyes, nose and mouth. Fortunately, the human immune system maintains a number of lines of defense to protect us from pathogen invaders. The skin that covers our body is the first line of defense, acting as a barrier that keeps out germs. Bodily secretions like tears wash away some germs while saliva, gastric juices and mucus trap and kill many pathogens, and sneezing and coughing can expel others.

The skeletal system is responsible for providing body structure, protection for delicate organs, storage of minerals and the production of blood cells. This system is composed of 206 bones connected to each other at joints with special tissue called ligaments. Muscle tissue is attached to the skeletal system by tendons, and when muscles are stimulated by the nervous system, they contract, moving the bones to which they are attached. There are also involuntary muscles that keep our heart beating and our lungs breathing.

The digestive system is responsible for physically and chemically breaking down the food that we eat into tiny pieces that all the cells of the body can absorb and use for energy. This system involves the mouth, teeth, salivary glands, esophagus, stomach, the small intestines, the liver, the pancreas and the large intestine.

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The nervous system is the body's command center. All other systems rely on messages sent from the brain through special nerve cells called neurons. The organs and tissues of the nervous system are responsible for receiving and interpreting information from all around us.

The brain is the most complex organ that humans possess. Along with the rest of the nervous system, it controls all the operations of the human body. It directs all bodily functions through electrochemical signals and maintains the capacity for memory, thinking and decision-making. The nervous system is the vast communication network that involves the brain, spinal cord and billions of nerve cells called neurons, located throughout the body. Messages in the form of high-speed electronic impulses are constantly sent and received by neurons made of nerve cells.

Vocabulary

alveoli — Tiny sacs in the lungs where the oxygen from the air enters the blood and the carbon dioxide from the body goes into the air.

William Beaumont (1785–1853) — The U.S. Army surgeon who, in 1822, studied and learned about the functioning of the human stomach by treating a patient who had been shot, which left his stomach exposed.

cells — The microscopic, living building blocks of which every living thing is comprised. The human body is composed of over 75 trillion cells.

circulatory system — The blood, blood vessels and the heart. This system is responsible for transporting nutrients, eliminating waste and maintaining the health of every cell.

digestive system — The mouth, stomach and intestines. This system is responsible for breaking down the food we eat into particles that are small enough for the cells to take in.

endocrine system — The organs that make and send special chemical messengers called hormones throughout the body to help the body to grow, to burn sugar for energy, to digest foods, to recover from injury and to help the body perform well under pressure.

excretory system — The organs responsible for eliminating waste products from the human body, including the kidneys, bladder and even the skin.

hormones — Special chemicals made by the endocrine system to help the body to grow and develop.

immune system — All of the cells and organs in the body that protect against disease-causing germs.

Anton von Leeuwenhoek (1632–1723) — The Dutch scientist and lens grinder who was the first to observe living cells.

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muscular system — The 600 muscles that give your body the ability to move and bend. Some muscles are attached to bones and can be moved voluntarily while others, like the heart, contract and relax on their own.

nervous system — The organs that are responsible for controlling the entire body (the brain, nerves, spinal cord) and the sense organs that help us learn what is going on around us (ears, eyes, nose, tongue and skin).

organs — Body parts that perform a given function, like the heart, lungs and brain.

reproductive system — The organs, glands, and other structures that allow an organism to produce offspring.

respiratory system — The nose, mouth, trachea and the lungs. This system is responsible for taking in oxygen from the air and getting rid of carbon dioxide and water vapor.

skeletal system — The 206 bones of the human body and the tissues that connect them. The skeletal system gives your body its structure and provides protection for the inner organs.

tissue — A group of cells with the same structure and function. Different types of tissue join together to form organs; organs work together to form organ systems that make up the human body.

Discussion Topics

- What is a system? Give an example of a living system and an example of a nonliving system.
- Discuss the role of the heart in the body and its use as a symbol throughout history.
- Discuss why the development of sanitation methods has saved more lives around the world than all medicines and medical treatment combined.
- Good nutrition is important for the health of the human body. Discuss ways that people can improve their health in terms of nutrition.
- Which sense is the most important? Why?

Focus Questions

1. What is the role of the lungs?
2. Why are tears important?
3. What are rods and cones? How do they work?
4. How many bones comprise the human body? How many muscles?
5. Describe the epidermis and how it reacts to the environment to protect the other organs of the body.
6. How do we hear sounds?

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