



TEACHER GUIDE

Body Works

DESCRIPTION

What does a real heart look like? How does its function relate to our brain, muscles, bones and lungs? This program uses preserved human specimens, anatomical models, and physical exam techniques to impress your students with their own insides. From cells to tissues to organs, we overview human skeletal, muscular, nervous, pulmonary and cardiovascular systems, relating their functions to healthy behavioral and nutritional choices.

OBJECTIVES

- List the hierarchy of organism organization: cells, tissues, organs and organ systems
- Describe how the body uses oxygen and nutrients to make energy at the cellular level
- Discuss major structures and functions of the skeletal, muscular, nervous, respiratory and circulatory systems of the human body

OHIO'S LEARNING STANDARDS*

Grade 6

Science: Life Science – Cellular to Multicellular

- Cells are the fundamental unit of life.
- All cells come from pre-existing cells.
- Cells carry on specific functions that sustain life.
- Living systems at all levels of organization demonstrate the complementary nature of structure and function.

National Health Education Standards: Standard 1

- Students will comprehend concepts related to health promotion and disease prevention to enhance health.

*We have presented this program to grades 4-7 with great success. Your state science requirements may differ from Ohio; this program is used by teachers to enhance nutrition, biology, and physical education curriculum.



BEFORE YOUR PROGRAM & HOW TO SET UP YOUR ROOM

- Please have student desks clear before the program begins.
- Please provide an empty desk or small table for the museum educator to set up display items.
- If booking multiple programs, transitions will be easier if museum staff sets up in only one location.
- Introduce the vocabulary and additional resources provided below.

VOCABULARY

alveoli – tiny, thin-walled sacs of the lungs where oxygen and carbon dioxide are exchanged

artery – blood vessel that carries blood away from the heart. The tissue of an artery is tough and elastic to handle high blood pressure from the ventricles of the heart.

anatomy – The structure of an organism or the science of the structure of animals or plants

bone marrow – the living core of a bone, where bone cells exist and new blood cells are created

carotid artery - major blood vessels in the neck that supply blood to the brain, neck, and face. There are two carotid arteries, one on the right and one on the left.

cell – a microscopic living unit of protoplasm. Sometimes called a “building block” of living multicellular plants and animals; a bacteria is a single-cell organism.

diaphragm – a muscle between the chest and abdomen that moves up and down to push air in and out of the lungs

involuntary muscle – muscles that work automatically, with no conscious control from the organism

metabolism – the chemical and physical processes continuously going on in living organisms and cells, including the changing of food into living tissue and the changing of living tissue into waste products and energy

neuron – a nerve cell

nutrients – materials that provide living organisms with substances they require for life and growth



organ – in animals and plants, a part that is adapted to perform a specific function

organism – any living thing

organ system - several organs within an organism which must operate together to provide a specific function for life

physiology – the science dealing with the functions and processes of living organisms

tissue – the substance of a living organism that is made of cells. A doctor might take a “tissue sample” of an organ that they suspect is diseased in order to look at its cells under a microscope.

vein – blood vessel that carries blood towards the heart. Vein tissue is thinner than arterial, because of the lower blood pressure inside them.

voluntary muscle –muscles over which the brain has conscious control

EXTENSION ACTIVITIES

Calculate Your Resting Heart Rate

- 1) Sit quietly in a chair.
- 2) Feel for your pulse. Take the first two fingers of your right hand and place them on the inside of your left wrist, at the base of the thumb just where the hand and wrist meet. Press gently. What do you feel? You can also try placing the same fingers on the side of your throat, just below the jawbone.
- 3) For 15 seconds, count how many times you feel your heart beat. (You may need a friend to keep time while you count). Multiply that number by 4 to calculate your heart rate (beats per minute).

Compare your Heart Rate With Your Class

- 1) Graph your data. Mark each heart rate on a graph, with the x-axis as “time” and the y- axis as “number of beats.”
- 2) Calculate the average. Can you figure out the average heart rate for the class? (Total all heart rates and divide by the number of people measured).
- 3) Why is there variation? What other measurements could you take that might explain variation in resting heart rate in your class (age, weight, height, shoe size, head circumference, hair color, etc.)? Which of these measurements correlate with heart rate? Graph your data (x-axis is new variable, y-axis is heart rate). Do your data points make a pattern or line?



Manipulate your Heart Rate

- 1) Make a prediction: Compared to resting, what will happen to your heart rate when you exercise? Should it increase or decrease in beats per minute?
- 2) Pair up and make observations. While you watch, have your partner run in place or do jumping jacks for one minute. Record changes in the body you observe during exercise. At the end of the minute, measure your partner's heart rate. Trade places; you do the exercise while your partner makes observations.
- 3) Graph your data. Mark each heart rate of class members on a graph, with the x-axis as "time" and the y-axis as "number of beats." Compare with the data from activity #2. Use different bars to represent resting vs. exercising.
- 4) Make a conclusion: How do the data confirm or not confirm your hypothesis? Does heart rate speed up or slow down during exercise? Why? What other changes did you observe in the body during exercise?

Observe an Animal's Heart Rate

- 1) If you have a pet dog or cat, try finding their pulse in their carotid artery. Gently place two fingers on the back of their jawbone, and slide your fingers down onto the side of the animal's neck, just behind its windpipe. You can also try placing your hand on the inside top of your pet's hind leg.
- 2) Can you feel a pulse? Is it faster or slower than yours? Try the steps from activity #1 and calculate the pet's resting heart rate.

EDUCATOR RESOURCE CENTER (ERC)



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Contact the ERC at 216-231-2075 for information on individual or school membership.

Visit the Museum's ERC website for more information
<https://www.cmnh.org/ERC>

MATERIALS FOR LOAN

With close to 100 dioramas and over 130 thematic teaching kits, our lending library has the materials you need to make science come alive for your students.

If you're interested in additional resources be sure to check out the following ERC materials or browse ERC materials online at
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