

Comparing Animal Cells

A human being is a very complex organism with a highly organized structure. Every part of a human's body is designed to function in a certain way. In this investigation you will examine a variety of cells that come from different parts of a human body. You will compare and contrast between each of the cells to assess how form fits function and see how these cells combine to make a variety of human tissues, organs, and organ systems.

Materials:

compound light microscope
colored pencils
prepared slide—human blood
prepared slide—frog blood

prepared slide—motor nerve
prepared slide—striated muscle
prepared slide—artery and vein

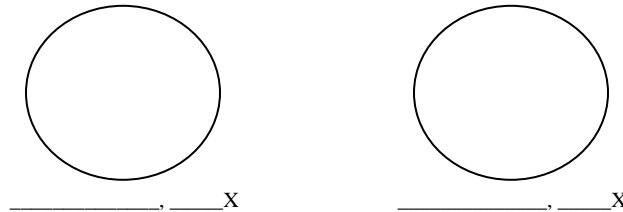
You will use "proper microscope use" as your guide for set up, viewing your specimen, and clean up for this entire lab. Be sure the teacher sees you using it!

Part 1: Form Fits Function

Directions:

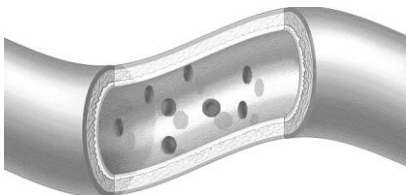
BLOOD CELLS

Step 1 Get a prepared slide of human blood and draw one of the most common types of cells you can see. Try to draw it the same size as you see it. Do the exact same for one of the frog blood cells.



Step 2 Examine the two cells you drew above. Describe the most obvious differences between human and frog blood. Why do you think these differences exist?

Step 3 Red blood cells carry oxygen to and carbon dioxide away from every cell in the human body via the circulatory system. The circulatory system is like a complex highway of blood vessels that range in size. All blood vessels are tube-like (see image) and some are so small they can only be seen with a microscope. How does the design of a red blood cell match its function?



Interior of a blood vessel
(web.indstate.edu)

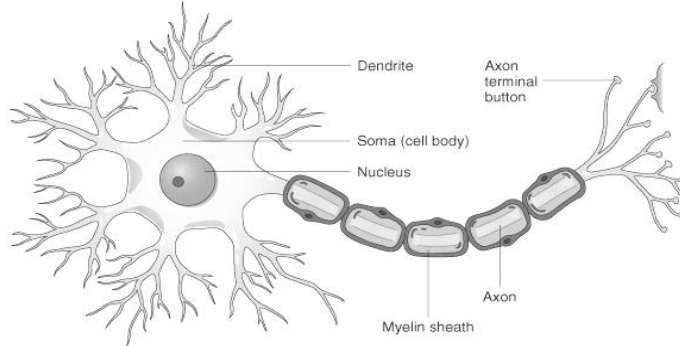
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MOTOR NERVE CELLS

Step 4 Nerve cells, also called neurons, are designed to carry messages throughout the body. Get a prepared slide of the motor nerve cells and observe under high power.

Step 5 Examine the diagram below of a neuron to familiarize yourself with its parts.



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- What cell parts can you see and identify under high power?
- Why do you suppose the neuron has these long branching parts?
- How does the neuron compare to the cheek cells you observed a couple weeks ago?

MUSCLE CELLS

Step 7 Examine the prepared slide of striated muscle under high power. There are two main parts that you should see, **nuclei** and **striations** (stripes). Wiggle your index finger up and down. The reason you are able to do that is because millions of striated muscle cells are contracting and expanding to pull your bones into the positions you want them to be in. After examining the muscle cells, explain why they are long and narrow and have these striations.

Step 8 An organelle important to all cells is the mitochondrion. Mitochondria are too small to be seen using only 400X, but there are many more mitochondria found in muscle cells than any other cell. Why do you suppose muscle cells require more mitochondria?

Name: _____ # _____

Date: _____ Core: _____

Summary

You have just observed a variety of cells from the human body. They are all different types of animal cells.

- 1) How are animal cells alike?

- 2) List some ways that animal cells are different.

- 3) Why do these differences exist?

Part 2: How Organisms Are Organized

Directions:

BLOOD VESSELS

Step 1 As you observed in the lab about plant cells, multi-cellular organisms are highly organized. List the levels of organization below:

Step 2 The human is no different and is made of a number of organ systems to keep it alive. One example is the circulatory system which is responsible for transporting blood to every cell in the body. What are some other human organ systems...name as many as you can think of below?

Step 3 Pick one of the systems above and list all the organs associated with that organ system.

Step 4 Let's go back to the circulatory system. The circulatory system uses the heart to pump blood through all the blood vessels in the body. Two major types of blood vessels are arteries and veins. Arteries carry blood away from the heart and veins carry blood to the heart. Blood is forced through the arteries by the pumping action of the heart, whereas the blood in the veins receives no help from the heart to get the blood back to the lungs. To keep the blood flowing in only one direction, veins have one-way valves that shut off preventing blood from moving backwards. Blood vessels contract and expand to "squeeze" the blood through the vessels and keep it moving. This squeezing of the blood vessels is involuntary and happens without you even thinking about it or trying to make it happen.

(a) Based on what you just read, name the organs in the circulatory system?

Name: _____ # _____

Date: _____ Core: _____

(b) Which organ carries blood away from the heart?

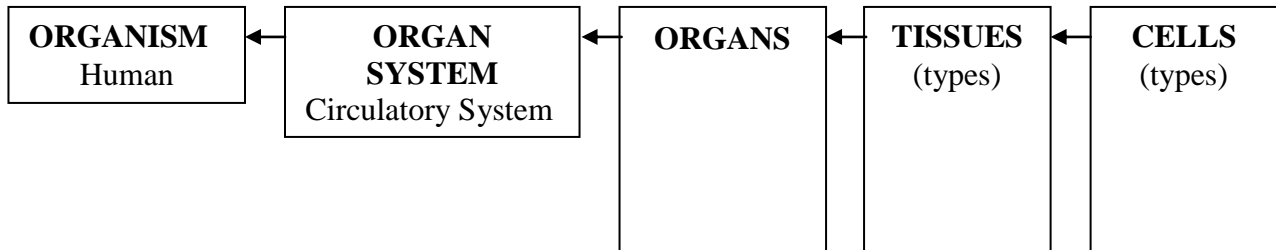
(c) Which organ carries blood back to the heart?

Step 5 Using the prepared slide of the artery and vein, observe the slide under low and medium power. This is a cross section of these two blood vessels, so you can see what cells make up these organs. What evidence do you see that these two blood vessels are in fact organs?

Step 6 You have now observed several different types of animal cells. Which ones have you seen before that are combining to make up these organs?

Summary

1) Multi-celled organisms are highly organized. Using the information from this lab and the slides you observed, complete the diagram below by naming the things that fit with each level of organization (hierarchy) for the circulatory system of a human. It is best to work from complex to simple to complete this. The first two have been done for you.



2) All cells are equipped with parts (organelles) that help them do their job and stay alive. How do you think the jobs that an amoeba (a one-celled organism) performs are different from the jobs that one brain cell in a human (a multi-cellular organism) performs?

3) In a multi-cellular organism, why do you think the cells that perform the same function (i.e., muscle cells) are organized together within that organism?