**Body Tissues Lab**

**Modified by Jennifer Durako from**

**(Alabama Learning Exchange.** [**http://alex.state.al.us/lesson\_view.php?id=26216**](http://alex.state.al.us/lesson_view.php?id=26216) **and SIUE IBHE Biology Workshop)**

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| **NGSS Alignment**  **HS-LS1-2**  **Science and Engineering Practices**  **Disciplinary Core Ideas**  **Crosscutting Concepts**  **Overarching Questions**  **Big Ideas** | **Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms**  **D**[**eveloping and Using Models**](http://www.nap.edu/openbook.php?record_id=13165&page=56)  [Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.](http://www.nap.edu/openbook.php?record_id=13165&page=56)   * [Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=56) * [Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)](http://www.nap.edu/openbook.php?record_id=13165&page=56)   [**LS1.A: Structure and Function**](http://www.nap.edu/openbook.php?record_id=13165&page=143%22)   * [Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=143) * [Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=143)   [**Structure and Function**](http://www.nap.edu/openbook.php?record_id=13165&page=96)  [Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=96)  1. How do the different levels of cellular organization work together to create multicellular organisms?   2. How can models be used to show how organ systems interact to perform functions and maintain homeostasis for multicellular organisms?  BIG IDEA 1: Cells are organized into tissues, organs, and organ systems which each play a particular role in higher order organisms. Organ systems are organized into organisms.   BIG IDEA 2: Organ systems interact to perform a wide variety of functions for multicellular organisms. These functions promote the concept of homeostasis, one of the characteristics of life. |

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**INTRODUCTION**

Histology is the study of the microscopic anatomy of tissues. Four basic tissues are generally recognized in the organization of vertebrate animals. These are: (1) Epithelial Tissue, (2) Connective Tissue, (3) Muscle Tissue, and (4) Nerve Tissue. Each basic tissue has a number of subtypes which display specific structural and functional properties and occur in specific locations. Much of the detail of theses lies beyond of the scope of this outline. In general, the four basic tissues combine in various patterns to form the organs of the vertebrate body. These patterns are very specific and can tell us much about how and what the respective organs contribute to the overall structure and function of the organism. An elementary understanding of histology provides an essential bridge between the gross anatomy and physiology of organisms like ourselves and the structures and functions of single cells.

The most common way to study histology is through extensive microscopic observation of “sections” of various organs taken from appropriate organisms - human, rat, primate, dog, cat, etc. Sections are thin slices that are essentially two dimensional. Some sections are cross sections while others are longitudinal sections. Depending on the way the tissue is cut, different features will be observed.

**PURPOSE**

1. Students will observe, identify, and draw cells and tissues listed below.
2. Students will be able to explain the organization and relationships among cells, tissues and organs.
3. Students will learn the functions of the cells, tissues and organs listed in this laboratory exercise.
4. Students will construct a “Body Tissue Portfolio” to use as a reference when constructing their “Model of Cellular Organization”.

**SAFETY**

Follow standard laboratory procedures as required when working with microscopes and computers.

**MATERIALS**

prepared slides microscope computer colored pencils digital microscope

**PROCEDURE**

1. Read the information on each tissue from the PowerPoint linked on the website. mrsdurakosclassroom.weebly.com. 🡪 Honors Lesson Plans🡪Click on link
2. Draw and label each tissue you observe on the 40X objective (High Power) unless told otherwise.

**Drawing Body Tissues**

1. Students should have drawing paper, pencils, and colored pencils.
2. Students will use pencils/colored pencils to draw and color their drawing. (Must be detailed)
3. Students will design a way to display their drawings inside their portfolio.
   1. Must be organized.
   2. Not more than two drawings per page. Must include labels.
      1. Tissue Type (Should include cell, tissue, organ if available.)
      2. Magnification (High power objective when possible, 40x10=400X)
   3. Tissues should have a brief description of the function.
   4. Must be in color and color must be the same as the sample/slide.
   5. After students have completed all of the assigned drawings, they will punch holes into their drawing paper and put them into a folder to make their **Body Tissue Portfolio**.

**Cells make up tissues; tissues make up organs; organs make up systems; systems make up the organism.**  **The four types of tissues in vertebrate animals are:**

**I. Epithelium** is lining tissue. It lines body surfaces and most cavities and functions in secretion and absorption.

1. **Squamous epithelium** consists of flat, tile-like cells. These cells line the heart, blood vessels, lung and abdominal cavities, mouth and esophagus, and form the outer layer of skin. Use the slide of the kidney section to observe squamous epithelium lining the kidney tubules.
2. **Cuboidal epithelium** is made up of cube-shaped cells. Generally this tissue surrounds tubules and is secretory in function. Use the slide of the kidney section
3. **Columnar epithelium** consists of column-shaped cells which line the stomach and intestine. They are secretory in function. The slide of the small intestine section demonstrates this type of tissue.
4. **Ciliated epithelium** has cilia, tiny, hair-like structures, on one surface. Ciliated epithelium lines the trachea, Fallopian tubes (oviducts), and sperm ducts. The slide of the small intestine section and the slide of hyaline cartilage show this tissue type.

**II. Connective Tissue** binds body parts together. Cells are often widely scattered through much extracellular material which makes up the matrix.

1. **Bone** - Identify Haversion canals, lacuna, ossified matrix, and osteocytes on the ground bone slide.
2. **Adipose tissue** is made up of fat cells.
3. **Areolar tissue** contains many fibers and is widely distributed in the body. It forms the dermis of the skin. Areolar tissue surrounds organs and binds them to the body.
4. **White fibrous tissue** makes up tendons which connect muscles to muscles and muscles to bones.
5. **Yellow elastic tissue** makes up ligaments which connect bones to bones.
6. **Hyaline cartilage** has a gel-like matrix and is found in ribs, the nose, and the ends of the long bones.
7. **Elastic cartilage** is located in the ear.
8. **Fibro-cartilage** is composed of mainly tough fibers and is located in the intervertebral disks of the spinal cord.

**Blood** is liquid tissue made up of the following components.

1. **Plasma** is the fluid part of the blood.
2. **Erythrocytes** or red blood cells are numerous circular unnucleated cells. They are red due to the red pigment hemoglobin which carries oxygen to the blood.
3. **Leucocytes** or white blood cells are large, nucleated cells which fight infection. The nuclei of leucocytes stain purple on the slides.
4. **Platelets or thrombocytes** (clot cells) are cell fragments which function in blood clotting. See the tiny stained particles outside the cells on the slide.

**III. Muscle tissue** produces movement. Muscles move body parts and move substances around the body as needed.

1. **Skeletal or striated muscle** consists of unbranched, voluntary, striated, multinucleate fibers (cells) bound together into bundles usually associated with bone. Most nuclei are located laterally.
2. **Smooth muscle** is made up of unbranched, unstriated, uninucleate, spindle-shaped cells of the hollow viscera including the esophagus, stomach, intestines, blood vessels and glands.
3. **Cardiac muscle** is branched, involuntarly, striated, multinucleate (nuclei mainly centrally located) fibers with intercalated disks. Cardiac muscle makes up the heart.

**IV. Nerve tissue** is made up of neurons (nerve cells). They are located in the brain, spinal cord and nerves. Nerve tissue serves as a communication network for the body.

**STUDENT DATA SHEET Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Hour\_\_\_\_**

**Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**OBSERVATIONS**

Draw and label each tissue you observe on your drawing/sketch paper provided.

**Choose 2 from Epithelial Tissue**

1. Lung

2. Kidney

3. epithelium (goblet or squamous)

4. skin

5. thyroid or thymus

6. liver

7. stomach

8. small intestine (duodenum, jejunum, ileum)

**Choose 2 from Connective Tissue**

9. Bone

10. adipose

11. areolar

12. cartilage (hyaline, elastic, or larynx)

13. blood

**Do All Muscle Tissue**

14. skeletal (striated muscle)

15. smooth muscle (artery/vein)

16. cardiac muscle

**Choose 1 from Nervous** **Tissue**

17. brain (cerebellum, cerebrum)

18. spinal cord

19. nerves

Choose 2 extra tissue samples. The extra can be from the list, but doesn’t have to be on the list.

**Total number of drawings=10**

**ANALYSIS-Insert the analysis questions and answers as the back page of your portfolio.**

**Answer each question in complete sentences.**

1.What magnification is best for the observation of most tissue slides? Why?

2.Explain the relationship among cells, tissues, organs, organ systems, and organisms.

3.Provide one ***specific*** example of this hierarchical relationship.

4.List the four types of tissues found in vertebrate animals and give the function of each.

5.List five organs mentioned in the lab and give a function of each.