



Lesson Plan

Animal Tissues & Cells

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Lesson: Animal Tissues & Cells

Module Code: 0201.1

Note: This lesson plan corresponds to the Foldscope Prepared Slide Box Set #1 - Animal Tissues & Cells

Grade Level: Middle school and up

Duration: 1 hour (recommended)

Learning Objectives: Students will understand the organizational levels of an animal. They will understand the differences in appearance and function among the four main types of tissue and be able to identify them under a microscope. They will understand the basics of tissue differentiation and how this occurs during embryonic development.

Section	Overview	Learning Goal
Activity 1	Organizational levels of an animal	Students understand the characteristics of cells, tissues, organs, and organ systems in relation to animal tissues.
Activity 2	Tissue types	Students understand differences in appearance and function among the four main types of tissue and be able to identify them under a microscope.
Activity 3	Tissue development	Students understand the basics of tissue differentiation and how this occurs during embryonic development.
Activity 4	Extended	Students prepare a fresh animal tissue slide and observe with Foldscope. Students apply their understanding of animal tissue from prepared slides to a fresh sample.

Materials:

- Foldscopes
- Foldscope Prepared Slide Box Set #1 - Animal Tissues & Cells. (This product is available for purchase at <https://www.foldscope.com/order>)

Activity 1 — Organizational levels of an animal

Section	Description
Intro Content	<p>All living things are made up of cells. In complex multicellular organisms, cells are organized into tissues, groups of cells that share a common embryonic origin and are arranged in an orderly pattern to achieve a particular function. There are four main types of tissue that will be covered below. Organs are structures made from multiple tissue types that together carry out a complex task. For example, your lungs, heart, and brain are all important organs. Organs with related functions are grouped together into organ systems, such as the respiratory system, which takes in oxygen and releases carbon dioxide, and the circulatory system, which flows blood to deliver oxygen throughout the body. These systems all work together to keep an organism alive.</p>
Activity	<ol style="list-style-type: none"> 1. Look at one of the primary tissue slides (slides 1-1 to 1-12). 2. Can you see the individual cells? What features allow you to identify a cell? <i>Cells should be identifiable primarily by the outline of their cell membrane, and the dark dot of a nucleus within.</i> 3. What variations do you notice among different types of cells? <i>Cells in different tissues will be different shapes, sizes, and densities.</i> 4. Can you distinguish multiple types of tissue within a single sample? <i>Many of these samples should contain multiple types of tissue, which is differentiable by appearance.</i>

Activity 2 — Tissue Types

Section	Description
Intro Content	<p>There are four main types of tissues. Epithelial tissue consists of tightly packed sheets of cells that cover surfaces and line body cavities. Connective tissue supports and connects other tissues. It is made up of cells suspended in an extracellular matrix. Muscle tissue contains proteins that allow the cells to contract, making this tissue responsible for allowing the body and its organs to move. Nervous tissue processes and transmits information by sending electrical impulses. The study of tissue appearance, structure, and function at a microscopic scale is called histology. By studying tissue samples from patients, histologists can observe disruptions in tissue that may allow them to diagnose an injury or disease.</p>
Activity	<ol style="list-style-type: none"> Which tissue slides do you think are the best examples for each type of tissue? <i>Exemplary slides for each tissue type:</i> <ul style="list-style-type: none"> - <i>Epithelial: 1-1, 1-2, 1-8, 1-9</i> - <i>Connective: 1-14, 1-15, 1-16</i> - <i>Muscle: 1-3 and 1-4</i> - <i>Nervous: 1-5 and 1-6</i> What differences and similarities can you observe among the different types of tissue? How do these differences in appearance reflect their differences in function? <i>Epithelial tissue will have cells that are more densely packed together. The tissue often is shaped in ways that increase its surface area. Connective tissue will have cells that are suspended in an extracellular matrix. Muscle tissue will have cells that are clearly striated into elongated layers. Nervous tissue will be made of neurons, which have a distinctive cell shape.</i>

Activity 3 — Tissue Development

Section	Description
Intro Content	<p>All of an organism's cells originate from the zygote, a fertilized egg. After fertilization, the zygote begins mitosis, the process of dividing cells. As these cells divide, they begin to differentiate into three distinct germ layers: the ectoderm, mesoderm, and endoderm. These three germ layers then further differentiate to form specific types of tissue associated with their position. The ectoderm, which is the outermost layer, produces epithelial and nervous tissue that gives rise to cells closer to the surface of the body, such as skin cells, neurons, and pigment cells. The mesoderm is the middle layer, which produces epithelial and muscle tissue; these give rise to central tissues such as cardiac, skeletal, and smooth muscle, red blood cells, and kidney cells. The endoderm, the innermost layer, produces epithelial tissue that forms the lining of airways and the digestive system, as well as many glands; this includes lung cells, thyroid cells, and pancreatic cells.</p>
Activity	<ol style="list-style-type: none"> 1. Observe slide 1-17. <ol style="list-style-type: none"> a) What process is being shown here? <i>Slide 1-17 shows animal cells at various stages of mitosis.</i> b) What do you see on the slide that indicates this process is occurring? <i>Students should be able to see cells with two nuclei, indicating that they are preparing to divide; they should also be able to see cells whose cell membranes are pinching in the middle as they begin to split.</i> 2. Observe slides 1-18, 1-19, and 1-20. <ol style="list-style-type: none"> a) What is being shown in these slides? How does this connect to slide 1-17 and tissue germ layers? <i>Slides 1-18, 1-19, and 1-20 show a frog embryo whose tissues are beginning to differentiate. The cleavage stage in 1-18 is a fertilized egg that has just undergone mitosis to form tens of thousands of cells. Divisions continue through the blastula phase in slide 1-19 as the embryo forms a liquid-filled cavity called a blastocoel. This cavity begins filling with cells in the gastrula stage, where the distinction between endoderm, mesoderm, and ectoderm first appears.</i>

Activity 4 — Extended

Section	Description
Intro Content	<p>Slice a piece of fresh meat, such as a chicken breast, chicken leg, or fish, very thinly and cut it small enough to mount on a slide with a ring sticker. Can you see individual cells? What tissue types do you observe? Cut another slice from another part of the meat. Is there different tissue there? What function does this tissue play in the animal?</p> <p>For Foldscope tutorials on sample preparation and viewing visit (https://www.youtube.com/playlist?list=PLnO8NcEb6LFy1p0rCVBfHY0JUgBswRC4m)</p>

Resources: <https://opentextbc.ca/anatomyandphysiology/chapter/4-1-types-of-tissues/>
<https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-body-structure-and-homeostasis/a/tissues-organs-organ-systems>
<https://courses.lumenlearning.com/boundless-ap/chapter/introduction-to-tissues/>
<https://www.augusta.edu/scimath/biology/docs/animaltissues.pdf>
<https://www.uwlax.edu/biology/zoo-lab/lab-2--microscopy-and-the-study-of-tissues/>



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