

Microscopes



Learning Objectives

- Using the scientific method, students will safely and properly operate microscopes to identify unknown substances.
- Compare different materials (ie: plant and animal cells) at a microscopic level.

State Standards Addressed

- 3rd grade – Colorado State Life Science Competency: Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems’ dependence on natural selection.
- 4th grade – Colorado State Life Science Standard 1: All living things share similar characteristics, but they also have differences that can be described and classified.
- 5th grade – Colorado State Life Science Standard 1: All organisms have structures and systems with separate functions.
- 6th grade – Colorado State Physical Science Standard 1: All matter is made of atoms, which are far too small to see directly through a light microscope. Elements have unique atoms and thus, unique properties. Atoms themselves are made of even smaller particles.
- 6th grade – Colorado State Life Science Standard 1: Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species.
- 7th grade – Colorado State Life Science Standard 2: The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions.
- 7th grade – Colorado State Life Science Standard 3: Cells are the smallest unit of life that can function independently and perform all the necessary functions of life.
- 8th grade – Colorado State Life Science Standard 2: Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals’ traits in the next generation.

Important Microscope (and Microscopic) Facts and Vocabulary

Microscope: A tool that is used to see objects which are too small to see with the naked eye.

Lens: In a microscope, a curved piece of glass or plastic that bends light to make small objects appear larger.

Compound microscope: A microscope that uses multiple lenses to collect light and focus it into your eye. Multiple lenses allow you to get a more magnified view of an object.

Hand lens: Also called a magnifying glass. Used to magnify objects, and the lens itself can be mounted on a handle or in a round frame with no handle.

Magnify: To enlarge something in appearance, but not in physical size.

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Cell: Usually microscopic, cells are a building block of life, meaning that all living things are made of cells.

Animal Cell: The type of cell that animals are made of. They do not have rigid cell walls around them, so they can have a variety of shapes.

Plant Cell: The type of cell that plants are made of. They have a rigid exterior cell wall and chloroplasts, which generally make plants green and allow them to photosynthesize.

Cell Wall: A fairly rigid layer around the outside of a plant or fungi cell that provides structural support and protection.

Cell Membrane: A thin structure that separates the inside of a cell from the outside environment.

Nucleus: The control center of a cell that contains genetic material called DNA.

Cytoplasm: A gel-like substance that is inside the cell membrane and holds all the cell's internal structures in place and protects them. You could think of it as the jello in a jello fruit cup, and the fruit is the internal structures.

Optional (and Highly-Recommended) Pre- and Post-Lab Activities

Water Lenses: Have kids put a drop of water onto a laminated newspaper, or a coin. They should be able to see the image or writing underneath magnified because of how the beaded up water droplet bends the light to act like a lens.

Microscopic Wonders: Visit some websites to see what different objects look like under a microscope. Some examples include <http://www.environmentalgraffiti.com/featured/images-inside-human-body-images/8292> , <http://twistedifter.com/2013/03/microscopic-images-of-snow-crystals/> , <http://legacy.mos.org/sln/sem/sem.html>

Venn Diagram: After the lab, students can use their new-found knowledge and the pictures they drew during the lab to make a Venn diagram comparing and contrasting plant and animal cells.

What's the Magnification?: Use what you know about compound lenses to determine the total magnification of looking through the following lenses:

10x lens and 100x lens

10x lens and 2x lens

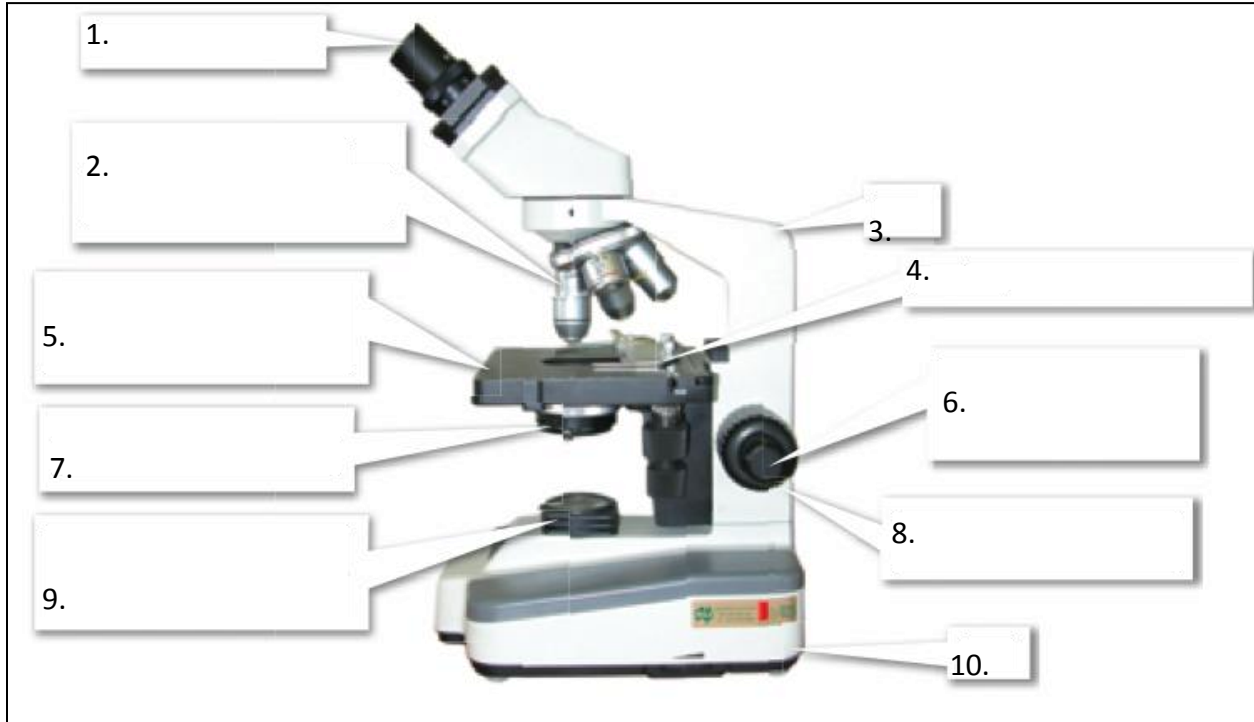
2x lens and 10x lens

10x lens and 10x lens and 100x lens

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Microscopic Drawings: Ask students to use their imaginations to draw an everyday object at a microscopic level.

Label the Microscope: Label the different parts of the microscope and explain what they do.



1. Eyepiece lens: The first lens that you eye looks through. Usually magnifies at 10x.
2. Objective lenses: Provides further magnification options. Usually 4x, 10x, and 40x.
3. Arm: Holds up the lenses on a microscope. Hold onto this if you ever need to move a microscope.
4. Stage clips: used to hold a slide plate in place while it is looked at through the lenses.
5. Stage: the flat area that holds the sample that is being looked at through the lenses.
6. Fine focus adjustment knob: Can be turned to focus the image even more, after you adjust the course focus.
7. Diaphragm: A rotating disk that can change the amount of light that is let through to the object you are looking at.
8. Course focus adjustment knob: Can be turned to focus the image that you see.
9. Light Source: shines light up through a thin material so that you can see it through the lenses.
10. Base: the stand for the microscope. Hold onto this if you ever need to move a microscope.