

Lesson 4.1: Aquatic Microscopy

Primary Lesson Standard: MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Essential Questions:

- 1) Inquiry:
 - a) What do you notice?
 - b) What do you wonder?
- 2) How is a microscope used to view specimens?
- 3) How does adjusting the magnification of a microscope affect the clarity and detail of the specimen being observed?
- 4) What techniques are used to properly focus a microscope, and how does achieving proper focus contribute to accurate observation and analysis of microscopic specimens?

Learning Objectives:

Students will be able to:

- 1) Understand the basic principles of microscope operation and demonstrate proficiency in using a microscope to view specimens effectively.
- 2) Demonstrate the ability to adjust magnification levels appropriately to optimize observation.
- 3) Explain how achieving proper focus enhances the accuracy of observations and facilitates detailed analysis of microscopic structures and features.

Key Concept: Microscopes are indispensable tools in scientific exploration, enabling researchers to delve into the intricate world of microscopic organisms and structures. Understanding how to effectively utilize a microscope involves mastering fundamental techniques such as adjusting magnification and achieving proper focus. By learning how to manipulate magnification settings, individuals can enhance the clarity and level of detail observed in specimens, facilitating accurate analysis and interpretation of microscopic features. Furthermore, proficiency in focusing techniques ensures precise observation, contributing to the reliability and validity of scientific observations and analyses. Through hands-on experience and practice, learners can develop the skills necessary to navigate the

complexities of microscope operation and unlock the hidden wonders of the microscopic realm.


Vocabulary: Microscope, magnification, focus, micrometer, specimen

Assessment: Worksheet in GSSC notebook

Instructions: *All parts of this lesson can be found in this document.*

Read the page and click on the links as you go.

Set up computer and projector. Review the lesson to be sure background information is adequately understood to explain to students.

Watch:  Award-Winning Footage Of The Microscopic World Around Us (3:19 minutes)

Interactive Lab: Use this [virtual microscope](#) to explore how to create slides and focus the microscope. Make note of the steps you take to use the microscope and the names of the microscope parts. Be sure that you can calculate the magnification of your sample. (Remember: multiply the magnification of the eye-piece or ocular lens by the magnification of the objective.)

Watch:  Using a microscope The parts and how to focus (5:52 minutes)

Worksheet:  Lesson 4.1: Microscopy Worksheet_Cascades

Microscopic units and measurements are used to classify and describe very small objects, living and nonliving. Under the microscope, measurements are made in metric units from **millimeters** (*mm*) down to , to *micrometers* (also called **microns**, symbol: **µm**) which is one millionth of a meter (1/1,000,000). It can be written in **scientific notation** as 1×10^{-6} m.

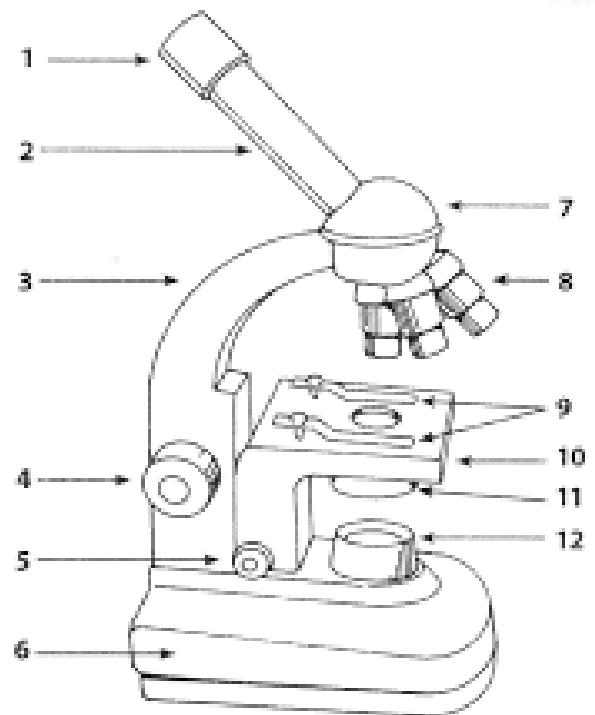
An electron microscope can measure in *nanometers*, or *billionths* of a meter. It can be written in **scientific notation** as 1×10^{-9} m. Click on the link to see a diatom under an electron microscope. [Electron Microscopy Interactive Tutorials - Virtual Scanning Electron](#)

Microscopy

Often a **stage micrometer** (microscopic ruler) is built into the microscope or a microscope slide with a measuring scale on it. The stage micrometer is used to measure a specimen or to calibrate the instrument so that accurate measurements can be made.

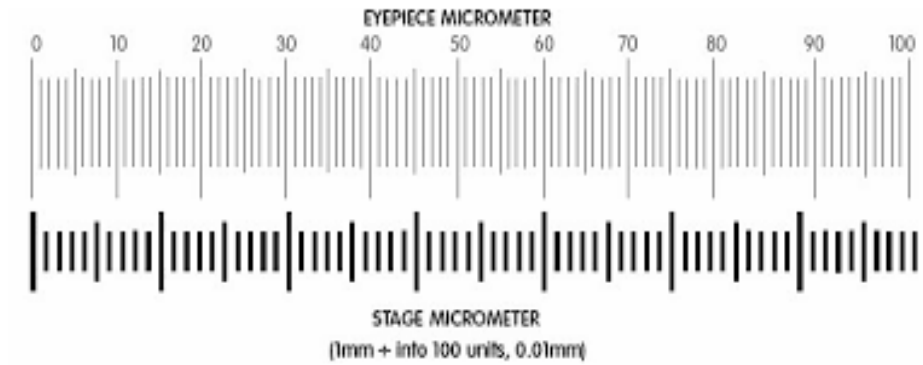
Label the microscope:

1. Eyepiece or ocular lens
2. Eyepiece tube or body tube
3. Arm
4. Coarse focus
5. Fine focus
6. Base
7. Nosepiece
8. Objective lenses
9. Stage clips
10. Stage
11. Diaphragm
12. Illuminator/light



Describe the steps to using a microscope:

 Turn on power, place slide on stage and in clips, start with lowest objective, coarse adjustment, fine adjustment, increase magnification (optional), adjust the diaphragm and light



Eye-piece Magnification (10X) with micrometer

You are viewing a specimen through the 4X *objective*.

- What is the total magnification? 40 X

Now turn to the 40 X *objective*.

- What is the total magnification? 400 X

Clue: Remember, 10X magnification for the ocular lens.

- What is the **micrometer** used for?
 - a) Calibrating the microscope.
 - b) Measuring the sample.

Optional Extensions:

- [Explore the Salish Sea: A Nature Guide for Kids](#) by Joe Gaydos-provided upon request
- [Garden of the Salish Sea Curriculum Games Kit](#)-materials provided upon request
- Watch [Why Are Plankton the Most Vital Organisms on Earth? | BBC Earth](#) (3:37 minutes) to understand how important plankton are to the global ecosystem.
- Watch [The Secret Life of Plankton](#) (6:01 minutes) to experience the fascinating microscopic world of plankton.
- Macroinvertebrate Bioassess game-provided upon request