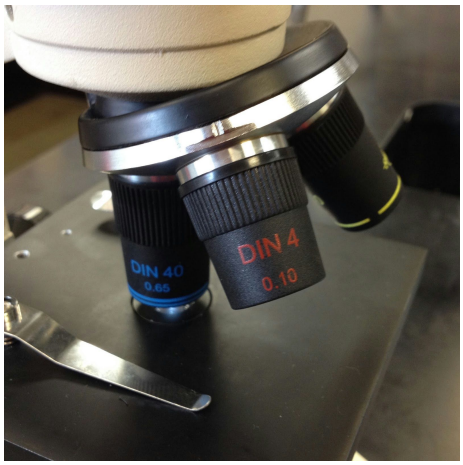
Lesson 8: Magnification Power

Summary

Students will investigate the scale of magnification under the microscope.



Next Generation Science Standards

Disciplinary Core Ideas

- ETS.2.A: Interdependence of Science, Engineering, and Technology

Science and Engineering Practices

- Asking questions
- Constructing explanations

Cross Cutting Concepts

- Structure and function
- Scale, proportion, and quantity

Vocabulary

magnification (as a number), or “power”

Materials

- ★ microscopes (ideally 1/pair, but 1/table would work)
- ★ hand lenses, 1 per student
- ★ clear plastic rulers, 1 per student (or you could cut some up- they only need a portion about 2-3 cm long)
- ★ sheets with the letter e, one per student

Engage (10 min.)

➔ Have the hand lenses, rulers, and letters available for the opener.

OPENER

- **(REVIEW)** How much does a hand lens magnify the letter e? Come up with a way to measure this. Write your answer in your lab notebook, and show how you found it. Sample answer: If the e measures 2mm across on the paper and 6mm across when magnified, it is magnified 3x.
- Suppose you had a lens that magnified 4x and another lens that magnified 10x. How much could you magnify the e using the two lenses together? Why? 40x. After being magnified 4x and then another 10x, the image would be 40x the size of the original. (There might be disagreement about whether the answer should be 14x or 40x. Let students convince each other using arguments or drawings.)

➔ Introduce the word ***magnification*** and have students write it in their science notebooks. Magnification is the scale factor by which an image is magnified. For example, under 10x magnification, a 1mm wide object will appear 10mm wide. The magnification number is also referred to as the ***power*** of a lens or microscope.

➔ On a typical microscope, there a two lenses: one in the eye piece, and another -- the objective lens -- that you select on the nosepiece. Lenses are labelled with their magnification (or power).

➔ Have students locate the magnification numbers on each lens. There may be other numbers as well -- make sure students are finding the correct numbers: usually 10x for the ocular lense, and 4x, 10x, 40x for the objective lenses.

➔ If there are 2 lenses, as there are on compound microscopes, then you multiply the 2 magnifications together to find the total magnification.

Explore (15 min.)

1. Draw the letter e using each of the 3 objectives.
2. Find the total magnification when using each of the 3 objectives. Show how you found it, using words and pictures. For a typical student microscope, 10 x

4 = 40x for the low power; 10 x 10 = 100x for the medium power; 10 x 40 = 400x for the high power

3. If the high power magnifies the most, then why would you ever use the low or medium power objectives? Low power allows you to see the entire letter e, while medium power zooms in for a more detailed view. High power gives the most detailed view, but zooms in so far that you can no longer see the whole letter. Also, high power can be more challenging to focus, and if you are not careful you can hit the object you are trying to observe and damage it (or the microscope).

Explain/Elaborate (10 min.)

➔ Discuss students' observations as a class.

Extend

For students who finish early:

- ❖ Find a way to quantify how much of the object you can see with each objective. Can you actually measure the field of view? Write out your notes/ calculations as you work.

Evaluate (5 min.)

EXIT CARD

- ❖ Why do these microscopes have 3 different objective lenses? What are the advantages and disadvantages of each?

Homework

HOMEWORK

- Study your microscope study guide and the procedures for focusing the microscope. (There will be a quiz on _____.)