Lesson Plan for Intro to Microscopes

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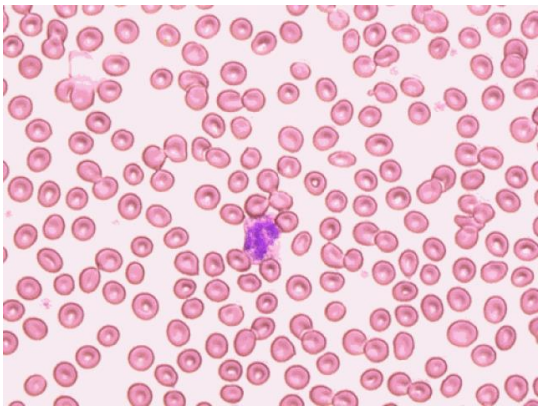
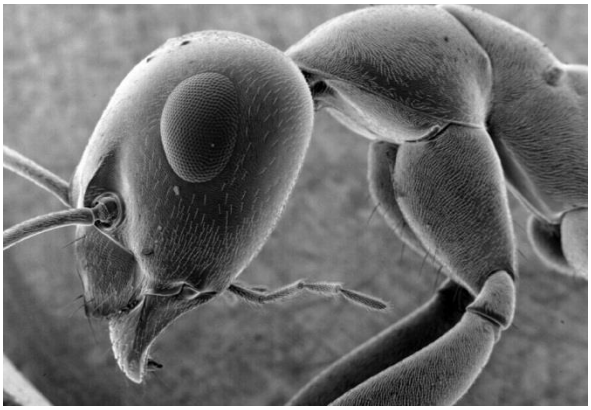
Introduction/Background Info

Microscopes are powerful tools that let us see things that are invisible to our own eyes. Scientists and engineers use microscopes to analyze materials and explore microscopic universes. We can look at things as tiny as the cells in our blood (left) or get up close and personal with an ant (right).





A light microscope image of blood cells (left) and an electron microscope image of an ant (right)

www.biologycorner.com/microscope/micro-blood.gif, bentsci.edublogs.org/files/2009/10/m12_formicidae.jpg

In this lesson, we will learn how to use a basic light microscope and start experiencing the amazing microscopic world around us. Then, we will use our new microscope skills to be scientists and explore our surroundings at the microscopic level. Using microscopes, students can look at what distinguishes different materials like fabric and paper and discover what lurks in soil, water, or a jar of dry yeast. Most importantly, students will learn how fun microscopes can be!

Microscopes are fun for everyone, not just scientists: even POTUS likes to play with microscopes!

thenode.biologists.com/wp-content/uploads/2010/09/microscope.jpg, the-scientist.com/2012/10/01/obamas-science-report-card/

Student Objectives

- Learn how to operate a simple light microscope
- Observe how the microscope inverts the image you are looking at (letters)
- Observe the difference between using the top light versus the bottom light (leaves)
- Explore and make observations about the microscopic details of everyday things

Overview of Lesson Process

- Introduce the microscope and explain the different parts of the microscope (5-10min)
- In groups, mentors will guide students through the activity with the microscopes. (40min)
- Wrap up the lesson by asking students to explain their observations. Ask students what they would like to look at under the microscope next week (5-10min)

Materials

- Ken-A-Vision Professor Microscopes ($60 - $80 each from Fisher)
- Small sheets of paper with printed words (print ahead of time, free)
- Pressed leaves (collect and press ahead of time, free)
- Plastic microscope slides and coverslips ($20-30 from Fisher)
- A variety of materials collected from outside, around the house, around the classroom, etc.

Procedures

Part 1: Tour of the microscope

Walk students through all the parts of the microscope:

1. Show students the eyepiece and objectives and explain how these magnify your sample. Rotate the objectives and explain the difference in magnification. We will use the 4x and 10x objectives.
2. Show students where to place the sample on the stage. Explain that the microscope will only magnify the part of your sample that is directly under the objective.
3. Use the focus knobs to move the stage up and down. Changing the distance between your sample and the objectives brings the sample in and out of focus.
4. Turn on the top lighting and then the bottom lighting. Top lighting lets us look at the surface of our sample, while bottom lighting helps us look *through* think samples.
5. Finally, with the bottom lighting on, turn the gray wheel on the side of the stage. This changes the amount of light that reaches your sample. More light is often necessary for thicker samples and/or at higher magnifications.

Part 2: Why are things backwards?

Because microscopes use a series of lenses to magnify your sample, the final image actually appears backwards! Help students observe this first hand by looking at printed words.

1. Place the printed paper sample on the microscope stage so that the writing appears left-to-right when looking from the eyepiece end of the microscope.
2. Using the 4x objective, focus on the words on the paper. Have the students take turns looking at the sample, making sure they notice that the letters now appear backward, like a mirror image.

3. Switch to the 10x objective to show students the difference between the different objectives. Switching from the 4x to the 10x objective is like "zooming in" on the sample

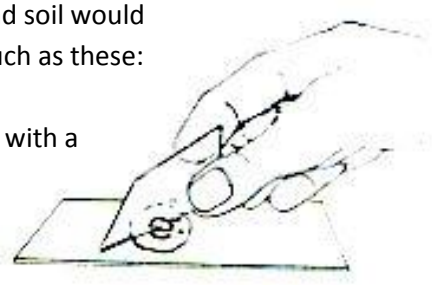
Part 3: Different perspectives: top versus bottom lighting

Top lighting lets us look at the surface of a sample, while bottom lighting lets us look *through* thinner samples. Explore these different perspectives by using top and bottom lighting on pressed leaves.

1. Place a pressed leaf on the stage and focus using the 10x objective and top lighting. Have students look at the leaf and describe what they see.
2. Now switch to bottom lighting and re-focus if necessary. Have students look again and describe what they see and how this looks different from the top-lit perspective.
3. Discuss with the students the difference between top and bottom lighting. When might it be more appropriate to use one or another? Would bottom lighting work on thick samples?

Part 4: Making Slides (Optional)

Some objects can't be put directly on the stage. Things like yeast, water, and soil would make a huge mess! Teach students how to make slides to look at objects such as these:



1. Put a drop of water on a clean plastic slide.
2. Add a bit of whatever you want to look at (yeast, soil, etc.) and mix with a toothpick.
3. Carefully place a coverslip on top of the drop. Start at one end and slowly lay down the coverslip to avoid making giant air bubbles in your sample.
4. Have students try making slides themselves with a few different samples.
5. At the end of the lesson, rinse and save used slides and coverslips separately for re-use.

Part 5: Microscope Exploration

Check out all of the slides the students made and any other objects that don't require special sample preparation. This can be pretty much anything from around the classroom, outside, etc. that is small enough to fit on the stage. Petri dishes can be used to look at messy samples like soil with the top lighting. Encourage students to choose the samples and have the students try to place the samples on the stage and focus on them (remember to always start with the 4x objective). As always, ask students to describe their observations. What does the sample look like? Is there anything surprising? How do different objects compare to each other? Involve students as much as possible in the microscope operation. Ask lots of questions and have students discuss their findings with one another. If you run out of slides to look at and there is more lesson time, just find more objects and/or make more slides.

Part 6: Wrap-Up Discussion

Have students share their observations with one another. What was the coolest thing they saw? The grossest? The prettiest? What surprised them the most? Did anything look very different than expected?

Resources

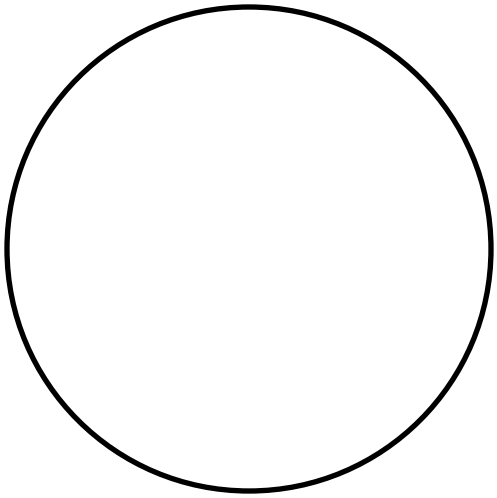
For a great way to get more microscope experience at home without having to purchase a microscope, check out the "virtual microscope" at http://www.udel.edu/biology/ketcham/microscope/scope.html

Worksheet for Microscopes

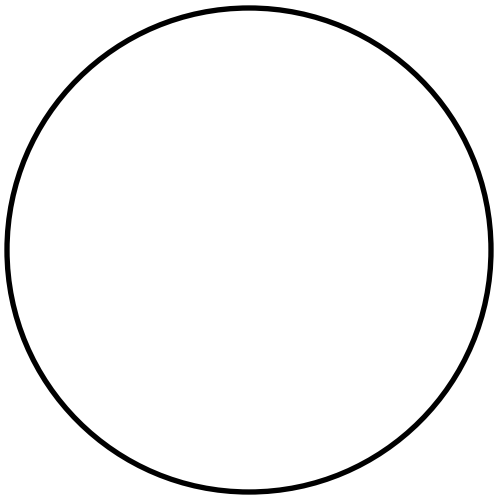
You might be surprised how by how different things can look under a microscope. Even the most familiar everyday objects can look out-of-this-world!

Choose some objects to look at under the microscope. Before looking in the microscope, draw what you predict these samples will look like In the circle on the left. Then look into the microscope and draw what you *actually see* in the circle on the right.

Object Name:_____

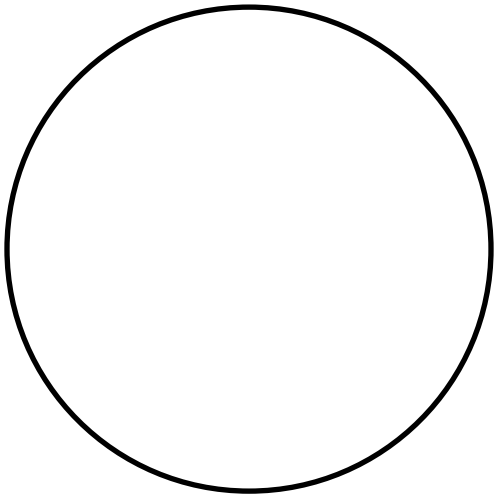


Predicted



Actual

Object Name:_____



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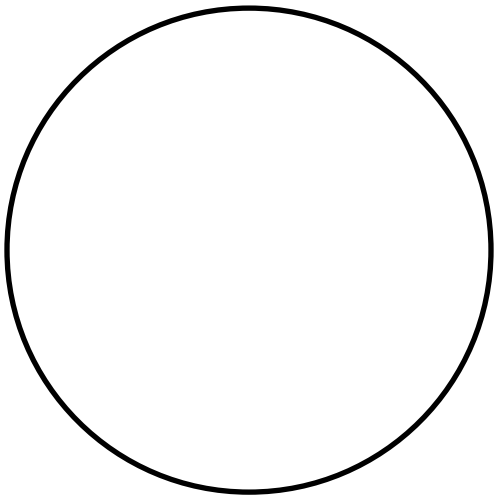

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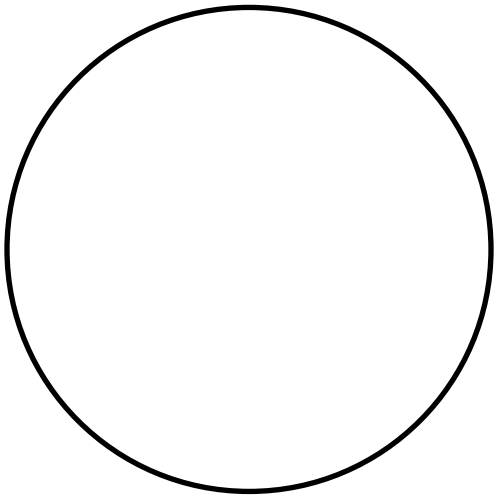

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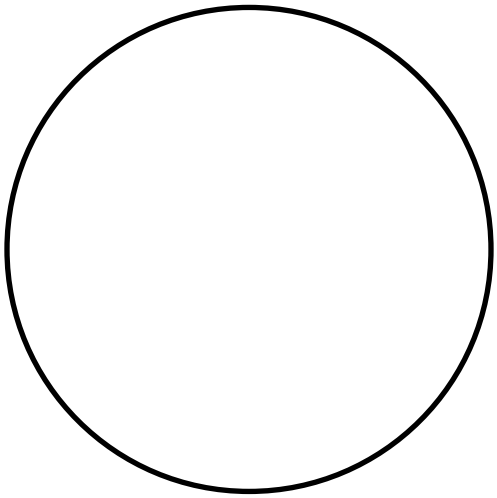

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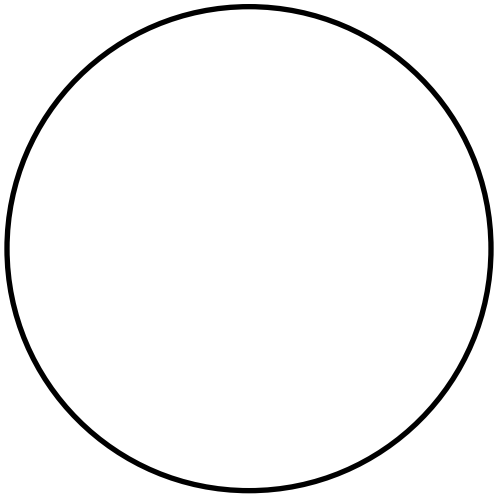

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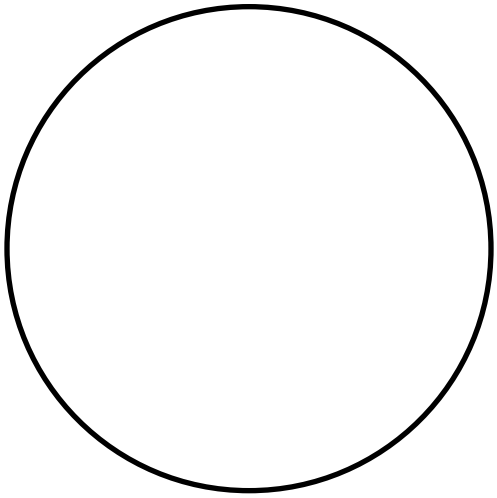

Actual

How do your predictions compare to what you saw?