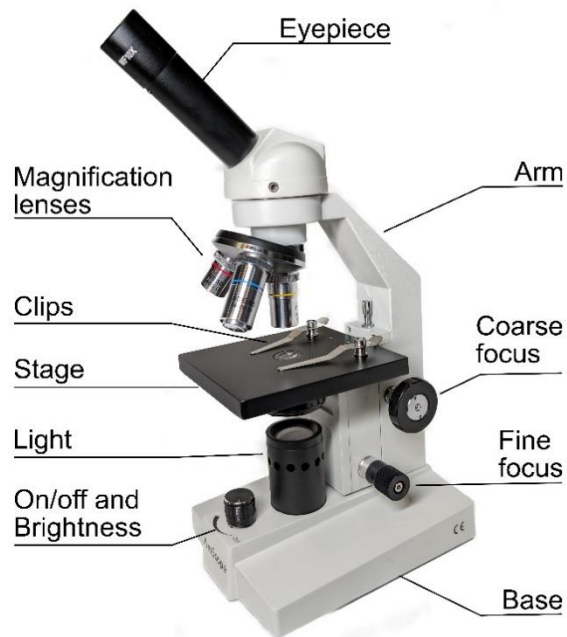


## Explore the Air Around You – Microscope Guide

There are hundreds of different brands of microscopes available, from giant scopes that can see individual molecules, to tiny scopes that can fit in your pocket. For this activity, we are using an AmScope compound microscope, shown in Figure 1.

**Figure 1**

*Labeled image of AmScope microscope*



A microscope uses two different techniques to make the sample you're looking at appear larger. The first is **magnification**; this means that the microscope increases the image size that your eye sees when looking at a sample by using lenses and an eyepiece. The second is **resolution**; microscopes use knobs to change the distance between the sample and your eye, which changes how clear the image is. These two things together make it possible to see tiny items very clearly.

Microscopes have three major parts: the base, the stage, and the arm. You should always lift and carry a microscope by holding it by the base and stabilizing it with your other hand holding the arm of the microscope – ***never pick up or carry a microscope by the arm alone!*** Figure 2 shows the proper way to carry the microscope.

## Figure 2

*Carrying the microscope correctly*



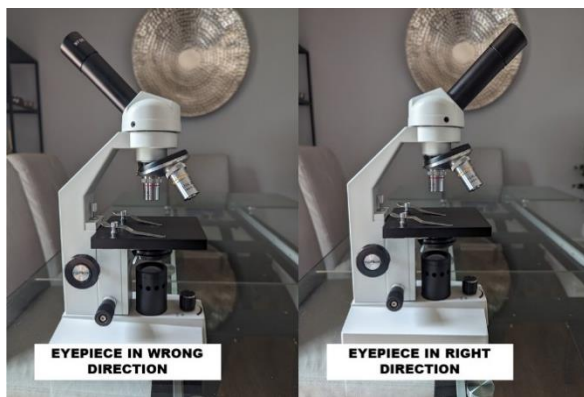
The eyepiece of this microscope increases (magnifies) the image by a proportion of 10, while each magnification lens on this microscope adds a different amount (x4, x10, and x40). That means that the image you see will be 10x (10 times) the magnification lens amount that you are using. For example, if you are using the x4 (red) magnification lens, the image you see is 40x larger than the actual sample. This microscope will allow you to look at samples 40 and 100 times larger than the samples.

## How to use the AmScope Student Compound Microscope

1. Place the microscope on a stable flat surface, like a table or counter. Gently turn the eyepiece so it points out over the lenses, following the curve of the arm as shown in Figure 3.

### Figure 3

*Picture of wrong and right way to turn the eyepiece.*



2. You will want to have the stage at its lowest position in the beginning. To lower the stage, turn the coarse focus knob towards you/counterclockwise.
3. Once the stage is lowered, push the clips out of the way, especially if you are using a petri dish; the petri dish won't fit on the stage if the clips are pointing inward.
4. Turn the microscope on by rotating the on/off/brightness knob. The best practice is to start with the light at its medium brightness and then adjust it to be brighter or dimmer once you start focusing the image.
5. Rotate the magnification lenses so that the shortest lens is being used. The magnification lens that is the farthest away from you and directly above the light is the lens that is being used; you can rotate the lenses by gently spinning the disc

they are attached to. You will feel the lenses click into place when they are directly above the light.

6. Once the x4 magnification lens is set, bring one eye to the eyepiece. When you use a single eyepiece microscope, keep both eyes open instead of closing the eye that is not at the eyepiece. If you find this difficult or catch yourself squinting, a good trick is to use your non-dominant hand to gently cup over the eye you are not using for the eyepiece. If you wear glasses, you will want to remove them when looking through the eyepiece to avoid scratching them.
7. You are now ready to start focusing the images on the petri dish. Slowly rotate the coarse focus knob away from you/clockwise. This will bring the stage and samples up towards the magnification lenses. Keeping your eye about a centimeter or half an inch away from the eyepiece can also help you see better. If you are seeing your eyelashes, it usually means you're holding your eyes too close to the eyepiece.
8. As the stage starts to approach the right distance from the magnification lens, the image you see will start to go from blurry white to white with blurry blobs to a fairly clear image. If you keep turning the coarse focus knob past that point, the image will return to being blurry again. You will need to slowly turn the knob to find the sweet spot of having the stage at the right distance for the correct magnification.
9. Once your image is relatively clear, you can use the fine focus knob to increase the resolution of the image. This small knob will need even smaller motions to adjust the image. As you move the dish around to find other particles, you may need to readjust the image using the fine focus knob.
10. When you find a particle that you would like to investigate further, you will need to increase the magnification. Without moving the dish (so that the particle you found using the x4 lens remains in the center of the eyepiece), slowly lower the stage

using the coarse focus knob by 1-2 inches or 2-4 cm. Rotate the magnification lenses so that the x100 (yellow) lens is active. You must lower the stage before switching lenses so that you do not hit the yellow lens on the petri dish.

11. Return your eye to the eyepiece and very slowly start to raise the stage again towards the magnification lens until it is in the focusing sweet spot. Until you are very comfortable with the microscope, it is a good idea to take this step very slowly and check frequently to make sure that you do not accidentally bring the stage too high and press the plate into the magnification lens.
12. Once you have brought the stage to the right height, you can use the fine focus knob again to make the image as clear as possible. The particle you had been looking at before should be centered in the image.

You will notice there is a hole in the disc that holds the magnification lenses that could hold a third lens. This is for a lens that magnifies x400; it has not been included in this kit because it needs to be so close to the stage to focus that many people (even experienced scientists!) have accidentally crushed the petri dish into the lens.

It takes about 10-20 minutes to get familiar with finding and focusing on the particles in the petri dishes, so don't give up. Once you figure out how one microscope works, you will likely be able to figure out how to use any microscope. If you need help getting your images to focus, ask a librarian.