

Safety Symbols

These symbols warn of possible dangers in the laboratory and remind you to work carefully.



Safety Goggles Wear safety goggles to protect your eyes in any activity involving chemicals, flames or heating, or glassware.



Lab Apron Wear a laboratory apron to protect your skin and clothing from damage.



Breakage Handle breakable materials, such as glassware, with care. Do not touch broken glassware.



Heat-Resistant Gloves Use an oven mitt or other hand protection when handling hot materials such as hot plates or hot glassware.



Plastic Gloves Wear disposable plastic gloves when working with organisms and harmful chemicals. Keep your hands away from your face, and dispose of the gloves according to your teacher's instructions.



Heating Use a clamp or tongs to pick up hot glassware. Do not touch hot objects with your bare hands.



Flames Before you work with flames, tie back loose hair and clothing. Follow instructions from your teacher about lighting and extinguishing flames.



No Flames When using flammable materials, make sure there are no flames, sparks, or other exposed heat sources present.



Corrosive Chemical Avoid getting acid or other corrosive chemicals on your skin or clothing or in your eyes. Do not inhale the vapors. Wash your hands after the activity.



Poison Do not let any poisonous chemical come into contact with your skin, and do not inhale its vapors. Wash your hands when you are finished with the activity.



Fumes Work in a ventilated area when harmful vapors may be involved. Avoid inhaling vapors directly. Only test an odor when directed to do so by your teacher, and use a wafting motion to direct the vapor toward your nose.



Sharp Object Scissors, scalpels, knives, needles, pins, and tacks can cut your skin. Always direct a sharp edge or point away from yourself and others.



Animal Safety Treat live or preserved animals or animal parts with care to avoid harming the animals or yourself. Wash your hands when you are finished with the activity.



Plant Safety Handle plants only as directed by your teacher. If you are allergic to certain plants, tell your teacher; do not do an activity involving those plants. Avoid touching harmful plants such as poison ivy. Wash your hands when you are finished with the activity.



Electric Shock To avoid electric shock, never use electrical equipment around water, or when the equipment is wet or your hands are wet. Be sure cords are untangled and cannot trip anyone. Unplug equipment not in use.



Physical Safety When an experiment involves physical activity, avoid injuring yourself or others. Alert your teacher if there is any reason you should not participate.



Disposal Dispose of chemicals and other laboratory materials safely. Follow the instructions from your teacher.



Hand Washing Wash your hands thoroughly when finished with the activity. Use soap and warm water. Rinse well.



General Safety Awareness When this symbol appears, follow the instructions provided. When you are asked to develop your own procedure in a lab, have your teacher approve your plan before you go further.

Science Safety Rules

General Precautions

Follow all instructions. Never perform activities without the approval and supervision of your teacher. Do not engage in horseplay. Never eat or drink in the laboratory. Keep work areas clean and uncluttered.

Dress Code

Wear safety goggles whenever you work with chemicals, glassware, heat sources such as burners, or any substance that might get into your eyes. If you wear contact lenses, notify your teacher.

Wear a lab apron or coat whenever you work with corrosive chemicals or substances that can stain. Tie back long hair. Remove or tie back any article of clothing or jewelry that can hang down and touch chemicals, flames, or equipment. Roll up long sleeves. Never wear open shoes or sandals.

First Aid

Report all accidents, injuries, or fires to your teacher, no matter how minor. Be aware of the location of the first-aid kit, emergency equipment such as the fire extinguisher and fire blanket, and the nearest telephone. Know whom to contact in an emergency.

Heating and Fire Safety

Keep all combustible materials away from flames. When heating a substance in a test tube, make sure that the mouth of the tube is not pointed at you or anyone else. Never heat a liquid in a closed container. Use an oven mitt to pick up a container that has been heated.

Using Chemicals Safely

Never put your face near the mouth of a container that holds chemicals. Never touch, taste, or smell a chemical unless your teacher tells you to.

Use only those chemicals needed in the activity. Keep all containers closed when chemicals are not being used. Pour all chemicals over the sink or a container, not over your work surface. Dispose of excess chemicals as instructed by your teacher.

Be extra careful when working with acids or bases. When mixing an acid and water, always pour the water into the container first and then add the acid to the water. Never pour water into an acid. Wash chemical spills and splashes immediately with plenty of water.

Using Glassware Safely

If glassware is broken or chipped, notify your teacher immediately. Never handle broken or chipped glass with your bare hands.

Never force glass tubing or thermometers into a rubber stopper or rubber tubing. Have your teacher insert the glass tubing or thermometer if required for an activity.

Using Sharp Instruments

Handle sharp instruments with extreme care. Never cut material toward you; cut away from you.

Animal and Plant Safety

Never perform experiments that cause pain, discomfort, or harm to animals. Only handle animals if absolutely necessary. If you know that you are allergic to certain plants, molds, or animals, tell your teacher before doing an activity in which these are used. Wash your hands thoroughly after any activity involving animals, animal parts, plants, plant parts, or soil.

During field work, wear long pants, long sleeves, socks, and closed shoes. Avoid poisonous plants and fungi as well as plants with thorns.

End-of-Experiment Rules

Unplug all electrical equipment. Clean up your work area. Dispose of waste materials as instructed by your teacher. Wash your hands after every experiment.



Appendix B Using a Microscope

The microscope is an essential tool in the study of life science. It allows you to see things that are too small to be seen with the unaided eye.

You will probably use a compound microscope like the one you see here. The compound microscope has more than one lens that magnifies the object you view.

Typically, a compound microscope has one lens in the eyepiece, the part you look through. The eyepiece lens usually magnifies $10\times$. Any object you view through this lens would appear 10 times larger than it is.

The compound microscope may contain one or two other lenses called objective lenses. If there are two objective lenses, they are called the low-power and

high-power objective lenses. The low-power objective lens usually magnifies $10\times$. The high-power objective lens usually magnifies $40\times$.

To calculate the total magnification with which you are viewing an object, multiply the magnification of the eyepiece lens by the magnification of the objective lens you are using. For example, the eyepiece's magnification of $10\times$ multiplied by the low-power objective's magnification of $10\times$ equals a total magnification of $100\times$.

Use the photo of the compound microscope to become familiar with the parts of the microscope and their functions.

The Parts of a Compound Microscope



Using the Microscope

Use the following procedures when you are working with a microscope.

1. To carry the microscope, grasp the microscope's arm with one hand. Place your other hand under the base.
2. Place the microscope on a table with the arm toward you.
3. Turn the coarse adjustment knob to raise the body tube.
4. Revolve the nosepiece until the low-power objective lens clicks into place.
5. Adjust the diaphragm. While looking through the eyepiece, also adjust the mirror until you see a bright white circle of light. **CAUTION:** *Never use direct sunlight as a light source.*
6. Place a slide on the stage. Center the specimen over the opening on the stage. Use the stage clips to hold the slide in place. **CAUTION:** *Glass slides are fragile.*
7. Look at the stage from the side. Carefully turn the coarse adjustment knob to lower the body tube until the low-power objective almost touches the slide.
8. Looking through the eyepiece, very slowly turn the coarse adjustment knob until the specimen comes into focus.
9. To switch to the high-power objective lens, look at the microscope from the side. Carefully revolve the nosepiece until the high-power objective lens clicks into place. Make sure the lens does not hit the slide.
10. Looking through the eyepiece, turn the fine adjustment knob until the specimen comes into focus.

Making a Wet-Mount Slide

Use the following procedures to make a wet-mount slide of a specimen.

1. Obtain a clean microscope slide and a coverslip. **CAUTION:** *Glass slides and coverslips are fragile.*
2. Place the specimen on the slide. The specimen must be thin enough for light to pass through it.
3. Using a plastic dropper, place a drop of water on the specimen.
4. Gently place one edge of the coverslip against the slide so that it touches the edge of the water drop at a 45° angle. Slowly lower the coverslip over the specimen. If air bubbles are trapped beneath the coverslip, tap the coverslip gently with the eraser end of a pencil.
5. Remove any excess water at the edge of the coverslip with a paper towel.

