



300X, 600X, 1200X  
MONOCULAR COMPOUND MICROSCOPE  
EXPLORER KIT



Read all warnings and safety information below before using the microscope.

### **Warning**

This set may include chemicals that could be harmful if misused. Read all cautionary statements in this manual. This also contains instruments and other materials with sharp points and edges. This set is not to be used by children under 8 years of age, and always with adult supervision.

Use under adult supervision. For children 8 years and older. The following chemicals may be included in this package and could be harmful if misused.

Eosin Biological Dye

Caution: Harmful. Do not swallow. In case of accident, call a doctor. Keep away from young children.

Gum Media

Caution: Do not swallow. In case of accident, call a doctor. Keep away from young children.

### **Safety Information**

General First Aid Information

In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice

If swallowed: Wash out mouth with water drink some fresh water. Do not induce vomiting. Seek immediate medical advice.

If inhaled: Remove person to fresh air.

In case of skin contact and burns: Wash affected area with plenty of water for 15 minutes.

In case of a cut: Was the cut with antiseptic solution ( if unavailable use clean water. Next, carefully place a bandage over the wound. In case of serious injury, you should seek first aid and inform a doctor as soon as possible.

If in doubt or serious injury occurs, seek medical attention immediately. In addition to the container, take these instructions and any material used in the slide preparation with you.

### **Advice For Supervising Adults**

Read and follow the instructions, the safety information and the first aid information carefully. Keep them on hand for reference.

The incorrect use of chemicals can cause injury and damage to one's health. Use only the slide preparations listed in the instructions.

The microscope is for children 8 years and older and only with adult supervision

Because children's abilities vary, even within age groups, supervising adults should exercise discretion regarding which slide preparations are suitable and safe for children. The instructions should aid adults in assessing slide preparations to discern their suitability for each child.

Supervising adults should discuss the warning and safety information with the child before commencing the preparation of slides. Pay particular attention to the safe handling of chemicals if used.

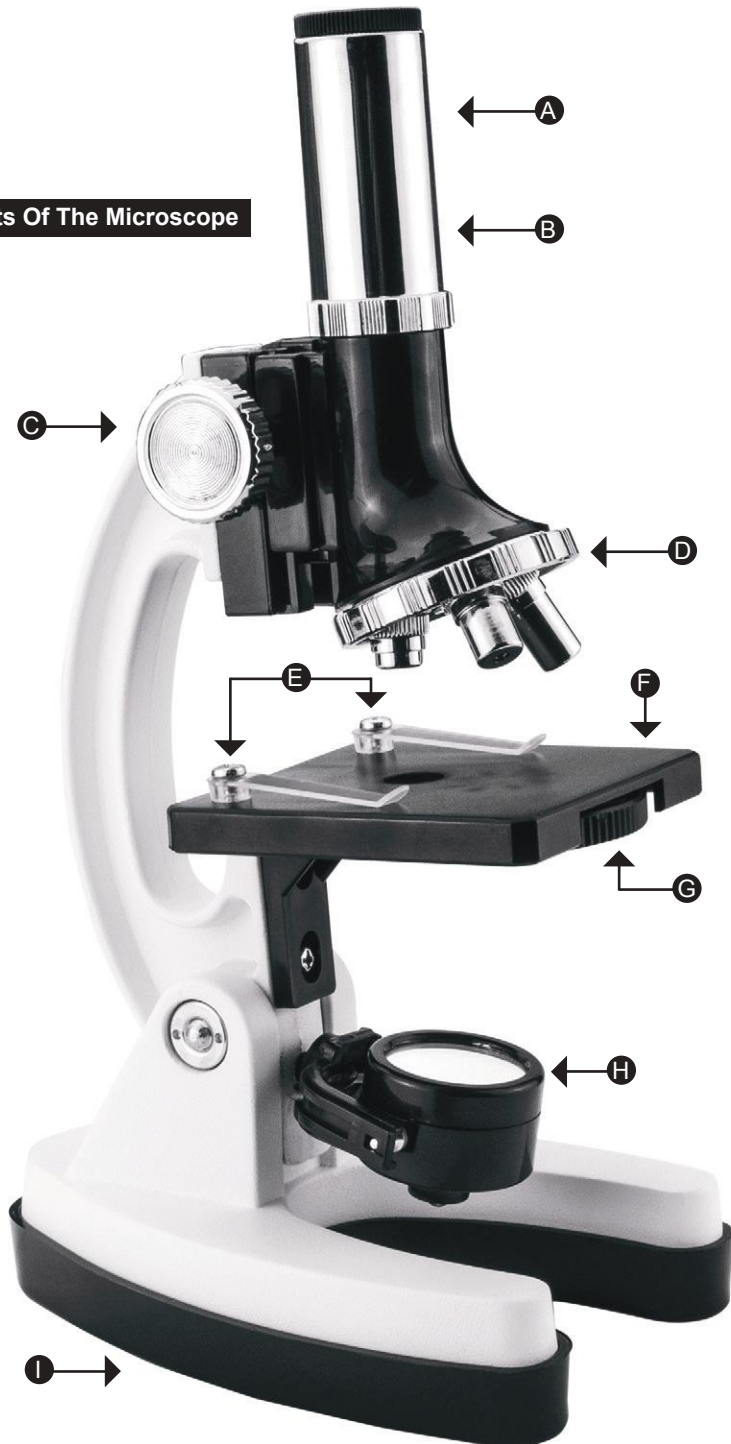
A separate tin or bucket should be used for the disposal of solid waste materials. Any wasted solution should be poured directly down a drain, but never into a sink.

To be used solely under the strict supervision of adults that have studied the precautions provided.

Caution

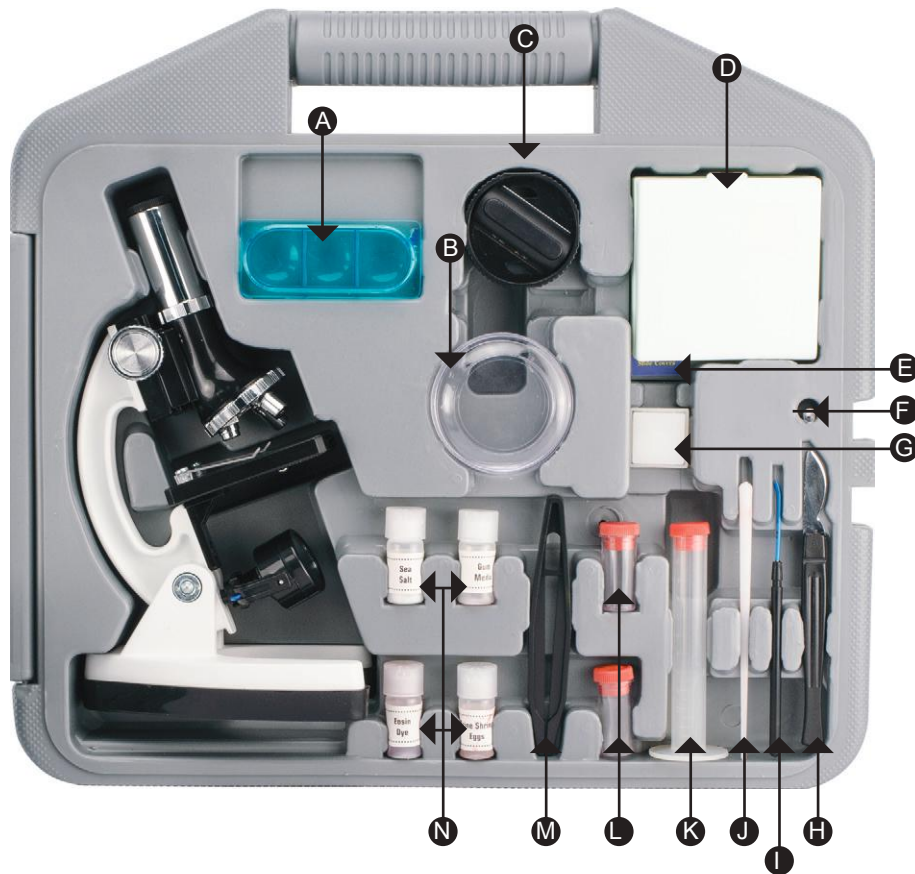
Use care to install batteries in the orientation indicated by the illustrations in the battery slots of the battery holder. Follow battery manufacturer's precautions. Do not install batteries backwards or mix new and used batteries. Do not mix battery types. If these precautions are not followed batteries may explode, catch fire or leak. Improperly installed batteries void warranty.

**Parts Of The Microscope**



A	Eyepiece	With fixed lens that has a 20x magnification. Remove the dust cover from the eyepiece and put it aside in a safe place.
B	Body Tube	Connected to the eyepiece and helps focus the lenses.
C	Focus Knob	Slowly turn the knob back and forth to focus an object in the eyepiece. Notice what happens to the power indicator as you turn the knob.
D	Power Indicator/ Objective Turret	The turret has 3 lenses or objectives; 15x, 30x and 60x. The shorter the objective the lower the power or magnification. The longest objective is the highest power. To calculate the magnification you are using multiply the value of the objective by the power of the eyepiece (note the power indicator on the turret makes this calculation for you) For example, turn the power indicator to the longest objecting 60x and multiply the power of your fixed eyepiece 20x - you will magnify the object by 1200 times (note the at power indicator reads 1200) This means that the object appears 1200 times larger than it appears to the naked dye.
E	Stage Clips	2 clips hold the glass slide firmly onto the stage.
F	Stage	Flat Platform with a hole in the center to allow reflected light off the mirror or light source to enter the microscope.
G	Color Filter And Aperture Wheel	The color filters are incorporated with in the stage. Use these filters to add colors and enhance an image in the eyepiece.
H	Mirror/Light Source	While holding the base down, pull on the arm to tip the microscope back. Examine the mirror and light source located below the stage to see how you can adjust them and choose one or the other. The light source turns on automatically when tipped upwards toward the stage. The mirror gathers and reflects light into the microscope.
I	Base/Battery Compartment	Place the microscope on its side. To remove the protective plastic over, remove the screws with a Phillips head screwdriver. Gently lift and the base will open. Insert two "AA" batteries (not included) in the base. Match the positive (+) and negative (-) poles of the batteries with the markings on the base. To replace lid, position it over the opening and replace the screws.

**Included Accessories**



A	Shrimp Hatchery	J	Stirring Rod
B	Petri Dish	K	Graduated Cylinder
C	Micro Slicer	L	Collective Vials
D	Prepared / Blank Slides	M	Tweezers
E	Cover Slips	N	Labeled Containers
F	Replacement Light Bulb		Sea Salt
G	Slide Covers and Labels		Gum Media
H	Scalpel		Eosin
I	Needle		Brine Shrimp Eggs

Carefully lift the microscope from the case. Place one hand around the microscope arm and the other under the base. For best results, use the microscope on a flat sturdy surface. Always be mindful of your mirror and light source. The more light that is reflected or transmitted through the hole in the stage, the brighter and sharper the images will appear in the microscope eyepiece.

**Tip**

Begin viewing at the lowest magnification or power and focus the object. Once the images is focus increase magnification by turning the objective turret and refocuses.

Always keep both eyes open when looking through the eyepiece. Doing so will relive stress on you eyes

**Caution**

Be careful as you turn the focus knob so that the objective lens does not make contact with a slide or the stage. This may cause damage to the slide and also to the objective lens.

To prevent the wires attached to the light from breaking, never rotate the light source a full 360 degrees.

**Batteries**

Place the microscope on its side. To remove the protective plastic over, remove the screws with a Phillips head screwdriver. Gently lift and the base will open. Insert two "AA" batteries (not included) in the base. Match the positive (+) and negative (-) poles of the batteries with the markings on the base. To replace lid, position it over the opening and replace the screws.



**Start Observing**

Rotate the focus knob and lower the stage as for as it will go. Place the 20x eyepiece into the microscope, if necessary. Turn the objective turret to the shortest objective 15x.

Put one of the prepared glass slides under the stage clips and position the prepared specimen over the hole in the stage.

Look through the eyepiece and slowly turn the focus knob until the specimen can be seen in focus.

Rotate the focus knob to lower the body tube as far as it will go. Observe what happens when you slowly move the light source or the mirror. Adjust the mirror or light source to provide the amount of light that gives you the best image.

Look in the eyepiece and observe what happens to the image when you move the slide from side to side and up and down.

If you wish to increase magnification, rotate the objective turret to a higher power and refocus.

### Try Out the Color Filter

Rotate the color filter located below the stage. Below the stage, a fitting will line up with the opening in the center of the filter. Rotate the filter wheel to change filter colors.

Turn on the light. Set it so it shines through the filter. Take a blank slide and place a few grains of salt or sugar on it. Rotate the filter and see how the filtered light enhances the image of the salt or sugar.

### Caution

Be careful not to touch the slide with the objective lens. You can break the slide and/or the lens by touching the slide with the lens.

When you are finished observing, be sure to turn the light source around, if necessary, so that it turns off and doesn't wear down the batteries. Remove the batteries before storing the microscope for a month or longer.

### Note

The view presented in the eyepiece is upside-down and reversed from left to right of the object. In other words, if you wish to examine more of the left side, move the slide to the right. Or if you wish to examine more of the top of the image, move the slide down and vice-versa.

Use the color filter especially when looking at clear or dim specimens.

### Hatching Brine Shrimp

Brine shrimp are tiny crustaceans that are ideal for study with a microscope. Crustaceans are sea creatures with hard shells and antennae. Crabs and lobsters are perhaps the most well known crustaceans. Brine shrimp are the major part of the diet of many sea creatures. The word brine means water containing noticeable amounts of salt. Brine shrimp are salt-water creatures.

Your microscope kit comes supplied with sea salt and brine shrimp eggs. The brine shrimp eggs included with this set are dried and will remain alive for up to five years if stored in a cool, dry place.

Perform the following procedure to hatch the brine shrimp eggs:

To hatch the eggs, first prepare a brine solution. Pour the entire contents of the vial containing the sea salt into a quart of tap water. Add the brine shrimp eggs into the solution. Allow the solution to stand at room temperature (70° - 80°F or 21° - 26°C) for 24 to 48 hours and the eggs will hatch into nauplius larvae (this is the first stage of development after leaving the eggs).

Place some of the larvae into the shrimp hatchery.

Place some fresh brine solution in another dish. Add a small amount of yeast to this new solution. Then, using the eyedropper, transfer some of the larvae into this dish as well. The yeast will serve as food and produce oxygen for the larvae as they develop into maturity. Without food and oxygen, the shrimp cannot develop and will die. Mature brine shrimp are known as *Artemia Salina*.

### Note

Using an eyedropper with just the right pressure to get a desired amount of liquid onto a slide can be harder than it looks. Take out a clean slide and practice squeezing a drop of water onto the slide until you feel comfortable that you can control the size of the drop that you're squeezing out.

Observe the life cycle of the shrimp as they grow: the dried eggs, the hatching eggs, the developing larvae, and finally, the mature shrimp.

The mature shrimp may be fed to fish in an aquarium if you so wish. However, first remove the shrimp from the brine solution and place them into fresh water. An increase in salt may harm the fish in the aquarium.

TIP: Don't always assume that increasing magnification will produce the best image for viewing. Each time you increase in magnification, the amount of light decreases, and the section of the image you are able to view also decreases. This is desirable for some specimens, but not for others. Experiment observing with all three objectives for all specimens until you get a feel for magnification levels.

Begin to start thinking like a scientist as you perform your experiments. Observe carefully, take notes (make sure you date them), and most importantly, keep your equipment and the working environment clean. Experiments work best with clean and uncontaminated equipment. And your parents will be appreciative of a clean work area, too.

### Make Your Own Slides

It's so easy to make slides that the variety of slides you can create will be limited only by your own imagination.

A section of almost any material can be placed on a slide and observed with a microscope. All you need is the proper equipment and a little patience, and you'll be making slides in no time. Everything you need for the experiments in this booklet can be found in this kit or your home (make sure to ask a parent first before you borrow any of his or her items, such as the measuring cup). Locate the following items:

- Scissors
- Paper towels
- Petroleum jelly
- A measuring cup



- Natural, uncolored toothpicks
- 2 or 3 small bottle caps
- Wide mouth jar and lid
- 3 or 4 paper cups, or any small containers, which can be discarded after use.

Next, set up your work area.... the kitchen table (make sure to ask a parent for his or her permission), the desk in your room.... any place where you can work undisturbed.

Label3 of your cups: clean, flush and waste. Fill the flush cup with clean water. Next, you will obtain a specimen and make your first slide.

**Want to See Crystals**

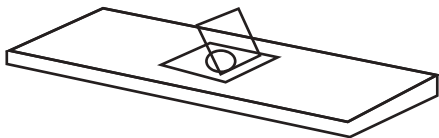
Use a measuring cup to measure one or two ounces of hot (but not boiling) water and pour it into a clean cup. Slowly add as much salt to the water as will dissolve. Stir the solution continuously while adding the salt.

Use the stirring rod which adding the salt. Remove the sheath from the tip of needle (make sure you save this and place it back over the needle when you're done using it) Use the needle to carefully place one or two drop of the salt solution onto a clean slide.

Remove the sheath from the tip of the needle make sure the slide to dry. The slide will dry covered with a white substance. Place the slide into the microscope stage. Rotate the light source of the microscope until it turns on. Before reading any further, look through the microscope eyepiece and write down what you observe.

If you carefully performed the experiment, you will see little crystal cubes. A grain of table salt is made up of many cubes. Place one or two grains of table salt on another blank slide and compare it with the slide containing the crystal cubes.

If you wish to save your crystal slides, use a toothpick to put one or two drops of gum media on the slide and gently place a cover slip on top of the media. (See image below) Lightly tap the cover slip with a toothpick to evenly spread the media under the slip.



Attach a label to each slide and set aside for a few days until the media dries. If you don't wish to save the slides, wash the slides in clean water and liquid soap. Rinse well and dry.

**Further Experiments**

Try out the above procedure with other salts such as Epsom and Rochelle. Sugar will also crystallize, but you will need to let it dry overnight for the crystals to form.

**Preparing a Mount**

Dip your spatula in some clean water and make a smear across a clean slide. Use your tweezers to place a portion of an insect-a wing, a leg, or an antenna on the slide. Attach a cover slip over the specimen and place the slide on the microscope stage.

Obtain a piece of hair from your head or from your pet and place it on a wet slide. Try this again with more than one type of hair on a slide and compare how they differ. Also try a piece of fern (or other plant) and pollen and compare them as well.

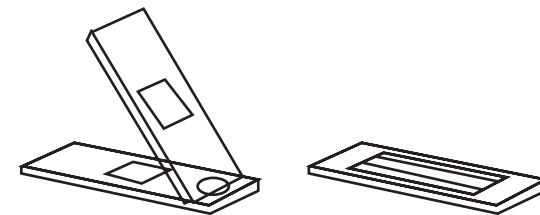
To save your slides, put gum media on a clean dry slide and then position your specimen in the media. Place a cover slip over the media and attach a label.

**Creating Smears**

Using your scalpel, gently scrape off small shavings from the surface of a freshly cut potato.

Smear the shavings onto a clean slide. Clean the scalpel by swishing it in fresh water. Use the needle to put one drop of clean water onto the slide. (See image below). Attach a cover slip to the slide and place to the microscope stage. Observe the slide and write down your observations. You will see hundreds of starch grains.

Take a few kernels from an uncooked ear of corn. Scrape off some shavings and make a smear as you did with the potato. Compare how the corn is different from potato. Create smears of other foods such as apples, bananas, peaches, and pineapples. You will observe that these items have membranes rather than starch.



Before you make a permanent mount, you may wish to stain the specimen first.

Not all specimens are easily observed in the microscope. Staining specimens make them easier to see. Staining is not difficult, but it does require care. It is recommended that you keep paper towels nearby, as the process can be messy.

First, create a fresh smear (you may use shavings from an apple or other piece of fruit), as described previously. Do not place any water or a cover slip on the specimen. Set the slide aside to dry, if necessary.

When the slide is dry, use the needle to place one drop of Eosin on the slide. Eosin Dye will stain your specimen.

Tilt the slide from side to side to spread the stain over the specimen. Remove the excess fluid to the waste cup. Put down the slide and wait about two minutes.

**Caution**

To flush away the excess stain and to stop the staining action, hold the slide at an angle over the waste cup. Using the eyedropper, touch the slide just above the specimen area and slowly let the water drain into the cup.

With a paper towel, pat the underside of slide dry. Be very careful and try not to touch the specimen. Allow the specimen to air dry for several minutes.

Some of the specimen will be flushed away, but enough will remain on the slide to make good observations. To save your slides, follow the procedure described previously.

**Note**

In order to stain a slide, you will need to prepare the Eosin: Without opening the container, look closely at the container marked Eosin. You'll notice a few grains of 'dust' at the bottom of the container. These are the grains of Eosin. Remove the container's lid fill the container with water. Gently stir the mixture. You have now prepared the Eosin for use.

**A Simple Section Slide**

Section slides are extremely thin slices of tissues of skin, leaves, flower stems, and other materials. Generally, section slides are very difficult to make without special equipment and procedures. However, there is one common house hold item, which can be sectioned without special equipment: the common onion, made up of layers of tissue.

Peel off the very thinnest layer you can. One that is nearly transparent will make an ideal section. Insert specimens you wish into the hole of the micro-slicer. Rotate the knob to cut your specimen into a thin slice, about 1/4 x 114 inch.

Put two drops of Eosin in a collecting vial. Pick up the piece of onion with your tweezers and place it in the vial.

Wait for one or two minute. Remove the piece from the stain and flush clean

water, holding it with tweezers over the waste cup. Place it on a clean side. To save your slide, follow the procedure described previously.

**Life Under Glass**

Fill a wide mouth jar with fresh water. Let it stand for three or four days without the lid. Then drop a handful of dry grass and a pinch or two of dirt into the jar. Put the cap on the jar and keep it in a place where it will receive light (but not direct sunlight).

In about five days, you may examine the water. First make a special slide: Using a needle or stirring rod, make a ring of petroleum jelly on a clean slide. The ring should be smaller than a cover slip and be about half as thick as a slide.

Put a drop of water from the jar onto the slide inside the ring. Use the lowest power of your microscope and write down your observations. Did you detect any movement in the water? The movement is caused by microscopic animals. Try to focus on one of the animals- this may not be very easy as a drop of water is like an ocean to a microscopic creature.

If the animals seem to be moving too fast to study or don't stay in focus for very long, soak up a little bit of water with a corner of a paper towel.

**Caution**

The blade of the micro slicer is very sharp. Handle the micro-slicer with care.

Remember, you can make a specimen slide out of almost any material. When you are on a playground, at school, in a park, or just sitting around at home, train yourself to look at all the material around you. Keep an eye out for what might make a good specimen and discover the hidden microscopic world that surrounds us all.

**Care**

- When treated with care, will provide you with years of use and discovery fun.
- Always carry the microscope with two hands, one around its arm and one under the base.
  - Always remove slides from the stage before putting the microscope away.
  - Cover the microscope when not in use.
  - Do not use anything except lens cleaning tissue to clean the lenses.
  - Never touch a slide with the objective lenses of the turret.
  - Remove the batteries before storing the microscope for a month or longer.