Microscope In Case

User Guide



⚠WARNING! CHOKING HAZARD Small Parts.
Not for children under 8 years.
Suitable for children 13 years and older with adult supervision only.

⚠WARNING:
This toy contains functional sharp points on needles. Also functional sharp edge on scalpel and slicer. Use with care and only under supervision of adults. Do not throw packaging away. Always keep packaging for future reference and safety reasons.

This set contains chemicals that may be harmful if misused. Read cautions in the Instruction Manual and on individual containers carefully. Not to be used by children except under adult supervision. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes. Keep small children and animals away from experiments. This kit also contains instruments and other materials with sharp edges and points that may be harmful if misused. Eye protection is recommended.

⚠CAUTION - BATTERY SAFETY INFORMATION
- Non-rechargeable batteries are not to be recharged
- Rechargeable batteries must be removed before recharging
- Rechargeable batteries should only be recharged under adult supervision
- Do not mix alkaline, standard (carbon-zinc), or rechargeable (nickel-cadmium) batteries
- Exhausted batteries are to be removed
- Do not mix old and new batteries
- Do not dispose of batteries in fire; batteries may explode or leak
- If this product will not be used for an extended period of time, remove the batteries from the product
- The supply terminals are not to be short-circuited
- Batteries are to be inserted with correct polarity
- Clean the battery contacts and also those of the product prior to battery installation
- As always, dispose of batteries in an eco-friendly manner

⚠CAUTION:
- **If batteries or parts are swallowed, see a doctor immediately.**

The following chemicals in this package could be harmful if misused:

- **Eosin Biological Dye**

⚠CAUTION: Avoid eye and skin contact. Do not swallow. Do not inhale. May cause irritation. In case of accident, call a doctor. Keep away from young children.

- **Gum Media**

⚠CAUTION: Avoid eye and skin contact. May cause irritation. In case of accident, call a doctor. Keep away from young children. Contains instruments and other materials with sharp points and edges.

SAFETY INFORMATION

General First Aid Information
a) In case of eye contact: Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
b) If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
c) In case of inhalation: Remove person to fresh air.
d) In case of skin contact and burns: Wash affected area with plenty of water for 15 minutes.
e) In case of a cut: Wash 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.
f) 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

a) Read and follow the instructions, the safety information and the first aid information carefully. Keep them on hand for reference.
b) The incorrect use of chemicals can cause injury and damage to one's health. Use only the slide preparations listed in the instructions.
c) This microscope is for children 13 years and older, and only with adult supervision. To be used solely under the strict supervision of adults that have studied the precautions provided.
d) 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.
e) Supervising adults should discuss the warnings and safety information with the child before commencing the preparation of slides. Pay particular attention to the safe handling of chemicals (if used).
f) Your preparation space should be kept clean, clear and away from any food storage areas. Prepare your slides in a well-lit area and close to a water supply. A solid table with a heat resistant top should also be used.
g) 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 basin.

LET'S BEGIN!

Carefully lift the microscope from the box using two hands. Place one hand around the microscope arm and the other under the base. For best results, use the microscope on flat, sturdy surfaces. 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.

ACCESSORIES

A.SCALPEL
B. NEEDLE
C. STIRRING ROD
D. GRADUATED CYLINDER
E. COLLECTING VIALS
F. TWEEZERS
G. SLIDE COVERS AND LABELS
H. REPLACEMENT LIGHT BULB
I. PREPARED/BLANK SLIDES
J. MICRO-SLICER
K. PETRI DISH
L. GUM MEDIA
M. EOSIN
N. SEA SALT
O. BRINE SHRIMP EGGS
P. SHRIMP HATCHERY
Q. COVER SLIPS (UNDER BOX OF SLIDES)

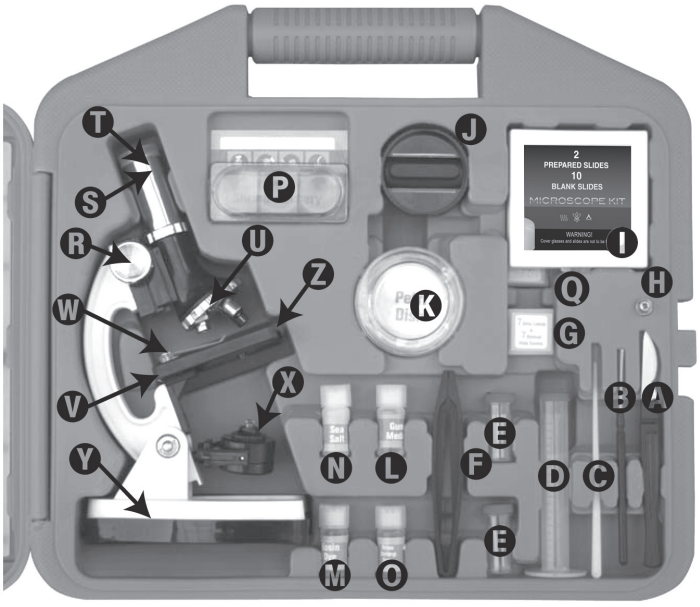


Figure 1

TIP:

Begin viewing at the lowest magnification or power and focus the object. Once the image is focused, increase magnification by turning the objective turret and refocus.



Figure 2



Figure 3
Install batteries in the base.

MICROSCOPE FEATURES

R. Focus Knob. Slowly turn the knob back and forth to focus an object in the eyepiece. Notice what happens to the power indicator (U, Fig. 1) as you turn the knob.

S. The Body Tube. Connected to the eyepiece and helps focus the lenses.

T. The Eyepiece with fixed lens that has a 10X magnification. Remove the dust cover from the eyepiece and put it aside in a safe place.

U. Power Indicator/ Objective Turret. The turret has 3 lenses or objectives: 10X, 40X, and 90X (See Fig. 2). 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 that the power indicator on the turret makes this calculation for you). For example, turn the power indicator to the longest objective (90X), and multiply by the power of your fixed eyepiece (10X) – you will magnify the object by 900 times (note that the power indicator reads 900). This means that the object appears 900 times larger than it appears to the naked eye! Gently turn the power indicator on the objective turret (U, Fig. 1).You will feel and hear the objective lens click into place. Practice turning the focus knob (R, Fig. 1) in both directions and notice how far you can turn it without letting the objective come into contact with the stage (V, Fig. 1).

V. The Stage is a flat platform with a hole in the center to allow reflected light off the mirror or light source to enter the microscope.

W. The Stage Clips (2) hold the glass slide firmly onto the stage.

X. 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.

TIP:
Always keep both eyes open when looking through the eyepiece. Doing so will relieve stress on your 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.

⚠ CAUTION:
To prevent the wires attached to the light from breaking, never rotate the light source a full 360°.

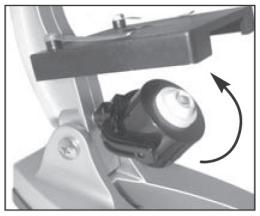


Figure 4
Rotate light to turn on.

Y. **Base/Battery Compartment**. Place the microscope on its side. To remove the protective plastic cover, remove the screws with a Philips head screwdriver. Gently lift and the base will open. Insert two "AA" batteries (user supplied) in the base. Match the positive (+) and negative (-) poles of the batteries with the (+) and (-) markings on the base (Fig. 3). To replace lid, position it over the opening and replace the screws.
Z. Color Filter and Aperture Wheel. The color filters are incorporated in the stage. Use these filters to add colors and enhance an image in the eyepiece.

Start Observing!
Tip: It is recommended that you begin viewing at the lowest magnification or power and focus the object. Once the image is focused, increase magnification by turning the objective turret and refocus.

⚠ 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. Now that you've studied the features of your microscope, its time to take it out for a test drive and try out a simple observing exercise.

1. Rotate the focus knob (R, Fig. 1) and raise the body tube (S, Fig. 1) as far as it will go. Turn the turret (U, Fig. 1) to the shortest objective (the power indicator will read 100x).
2. Put one of the prepared glass slides under the stage clips (W, Fig. 1) and position the prepared specimen over the hole in the stage.
3. Rotate the focus knob to lower the body tube as far as it will go.
4. Look through the eyepiece (T, Fig. 1) and slowly turn the focus knob until the specimen can be seen in focus.

⚠ CAUTION:
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 upsidedown 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.

⚠ 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..

5. Observe what happens when you slowly move the light source (Fig. 4) or the mirror. Adjust the mirror or light source to provide the amount of light that gives you the best image.
6. Look in the eyepiece and observe what happens to the image when you move the slide to the left and then to the right.
7. If you wish to increase magnification, rotate the objective turret to a higher power and refocus. Practice rotating the turret to change magnification.

Tip: Always keep both eyes open when looking through the eyepiece. Doing so will relieve stress on your eyes. 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.

Try Out the Color Filter
Locate the color filter located at the front of the stage (Z, Fig. 1). Rotate the filter to change filter colors. Observe how the color filter affects your view of the prepared slide. Next, 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.

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

The Brine Shrimp Hatchery
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.

NOTE:

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

Your microscope kit comes supplied with sea salt (N, Fig. 1), brine shrimp eggs (O, Fig. 1) and a shrimp hatchery (P, Fig. 1). 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:

1. To hatch the eggs, first prepare a brine solution. Pour the entire contents of the vial containing the sea salt (N, Fig. 1) into a quart (946 cc) of 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).
2. Place some of the larvae into one of the compartments of the shrimp hatchery (P, Fig. 1).
3. Place some fresh brine solution in another compartment. Add a small amount of yeast to this new solution. Then, using an eyedropper, transfer some of the larvae into this compartment 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.
4. Observe the life cycle of the shrimp as they grow: the dried eggs, the hatching eggs, the developing larvae, and finally, the mature shrimp.
5. 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.

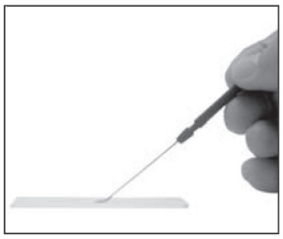


Figure 5
Use the needle to place a drop of water on a clean slide.

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.

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 following experiments can be found in this kit or around your home (make sure to ask a parent first before you borrow any of his or her items, such as the measuring cup).

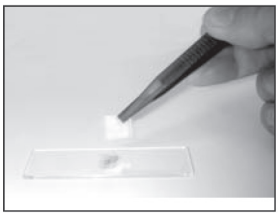
Locate the follow items:

- Petroleum jelly
- Wide mouth jar and lid
- A measuring cup
- Paper towels
- A potato, uncooked corn kernels, an apple, and other foods
- 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 or any place where you can work undisturbed. Label 3 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 the measuring cup to measure one or two ounces of hot (but not boiling) water and pour it into the clean cup. Slowly add as much table salt to the water as will dissolve. Stir the solution with the stirring rod (C, Fig. 1) while 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 (B, Fig. 1) to carefully place one or two drops of the salt solution onto a clean slide (Fig. 5).

⚠ **CAUTION:** The needle has a very sharp point. Always use caution while handling it.


Figure 6
Place a cover slip on the slide.

Allow the slide to dry. The slide will dry covered with a white substance. Place the slide onto 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 (store bought) salt is made up of many cubes. Place one or two grains of fresh salt on another blank slide and compare it with the slide containing the crystal cubes.

If you wish to save your crystal slides, use the needle to put one or two drops of gum media (L, Fig. 1) on the slide and gently place a cover slip (Q, Fig. 1) on top of the media (Fig. 6). Lightly tap the cover slip with the needle or the stirring rod 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. Read the "Save That Slide" section for more information about saving slides.

Further Crystal 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 scalpel (A, Fig. 1) in some clean water and make a smear across a clean slide. Use your tweezers (F, Fig. 1) to place a portion of an insect—a wing, a leg or an antenna—on the slide. Attach a cover slip (Q, Fig. 1) over the specimen and place the slide on the microscope stage.

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

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. Parents appreciate a clean work area.

NOTE:

In order to stain a slide, you will need to prepare the Eosin Dye:
Without opening the container, look closely at the container marked "Eosin Dye" (M, Fig. 1).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 and fill the container with water. Gently stir the mixture.You have now prepared Eosin Dye for use.

Creating Smears

Use your scalpel (A, Fig. 1) to 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 the fresh water. Use your needle to put one drop of clean water onto the slide. Attach a cover slip to the slide and place it on 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.

Staining Smears

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 Dye (M, Fig. 1) 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:

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

To flush away the excess stain and to stop the staining action, hold the slide at an angle over the waste cup. Using the needle, 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 the 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.

The Micro-Slicer

Insert specimens you wish to study into the holes of the micro-slicer (J, Fig. 1). Rotate the knob to cut your specimen into thin slices. The Micro-slicer is an ideal tool in the making of section slides.

⚠ **CAUTION**: The blade of the micro-slicer is very sharp. Handle the micro-slicer with care.

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 household 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. Slice into a piece about 1/4 x 1/4 inch (7 x 7 mm). Put two drops of Eosin Dye (M, Fig. 1) in a collecting vial (E, Fig. 1). Pick up the piece of onion with your tweezers and place it in the vial.

Wait for a minute or two. Remove the piece from the stain and flush it with clean water, holding it with tweezers over the waste cup. Place it on a clean slide. To save your slide, follow the procedure described previously in the "Want to See Crystals?" section.

Use your micro-slicer to slice off very thin slices of other types of foods.

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 the 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. 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.

Save That Slide
To save your slides, put gum media (L, Fig. 1) on a clean dry slide and then position your specimen in the media. Place a glass cover slip (Q, Fig. 1) over the media and attach a label. See Fig. 6.

Note: Your set contains both glass slips and statical
(thin plastic) slips. Statical slips are thin plastic sheets that will stick to your slide using static electricity. They are ideal for temporary slides. Glass slips must be attached to the slide using gum media. Use a glass slip if you wish to make a permanent slide.

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.

Remember to Turn Off the Light Source
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.

Make a Record of Your Experiments
Begin to start thinking like a scientist as you perform your experiments. Observe carefully and make records of your experiments (make sure you date them). Record the types of specimens you observe; their colors, shapes and patterns; how they look through each objective; how you prepare your slides; what tools you use; how different specimens compare with each other; and so forth. Experiment observing with all three objectives for all specimens until you get a feel for magnification levels. And most importantly, keep your equipment and the working environment clean. Experiments work best with clean and uncontaminated equipment.

Care for Your Equipment
The Microscope is a precision optical instrument and, 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 needle with the sheath 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.