

Kids Microscope

Instruction Manual for
MI-1100STD – Kids Microscope
MI-1100LED – Kids LED Cordless Microscope

The logo for Home Science Tools features the words "HOME SCIENCE TOOLS" in a bold, sans-serif font. Above the letter "I" in "SCIENCE" is a small icon of a microscope. Below the main text, the tagline "THE GATEWAY TO DISCOVERY" is written in a smaller, all-caps font.

HOME SCIENCE TOOLS
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Welcome to an exciting world of discovery with your new Kids Microscope!

This manual will give you a familiarity with the different features of your microscope, how to use them, and how to preserve your investment by proper maintenance and care.

There are two microscopes in the Kids Microscope series. They share the same basic features and functions, but you will find a discussion of the power options for the MI-1100LED model on page 3.

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General Microscope Care

Unpacking

Your Kids Microscope is shipped in a two-part Styrofoam case. Keep this case for storage, transport, and shipping. It is perfect packing material should you ever need to send your microscope in for repairs covered by the warranty.

When handling your microscope, always pick it up by the arm. Avoid touching the lens surfaces on the eyepiece or objective lens, as finger prints will decrease image quality.

Cleaning

The best optical quality can be compromised by dirty lenses. Using a dustcover and cleaning the lenses regularly will greatly enhance your microscope use.

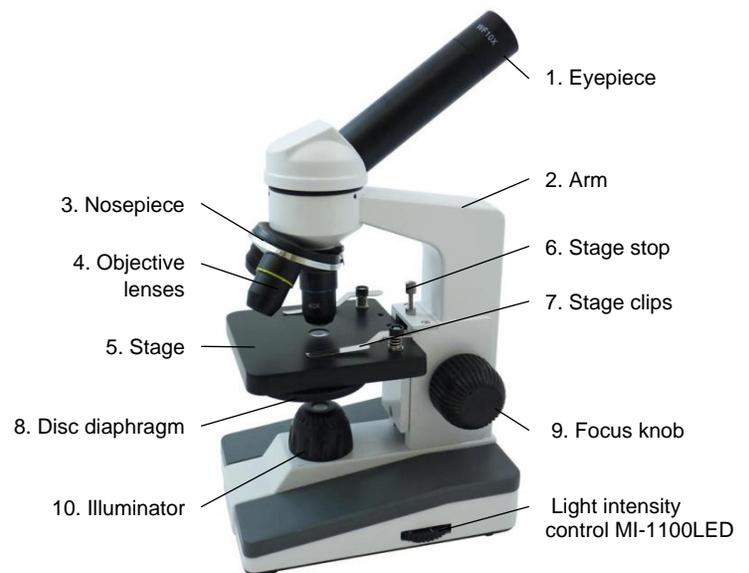
To clean lens surfaces, remove dust by using a soft brush or a can of compressed air. Then moisten a piece of lens paper (our item MI-PAPER) with some lens cleaning solution (MI-

LENSCLN). Gently clean the eyepiece and objective lens exterior surface using a circular motion. Repeat with a second paper moistened with solution if necessary. Repeat once again with a piece of dry lens paper until the lens is clean and dry. **Do not spray lens cleaner directly on the lens.**

Features & Definitions

Microscope Diagram

Description of Components



- 1. Eyepiece:** This is the part of the microscope that you look through. It is inclined at a 45° angle for comfortable viewing. It contains a lens that magnifies 10x.
- 2. Arm:** The arm not only supports the head and nosepiece, it is also the best “handle” for picking up and moving the microscope.
- 3. Nosepiece:** This is also called the “objective turret.” It holds the objective lenses and rotates 360°. You can change magnification by turning it until the lens you want to use “clicks” into place.
- 4. Objective lenses:** These are the lenses closest to the specimen. The standard objectives are 4x, 10x, and 40x, which multiply with the 10x eyepiece lens to provide magnification levels of 40x, 100x, and 400x. The shortest lens has the lowest magnification

level, while the longest has the highest. The lenses have the following features:

- They are *achromatic* – they help prevent color distortion.
 - They are *parcentered* – if you center your slide using one objective, it will still be centered when you move to another objective.
 - They are *parfocal* – if you focus your specimen using one objective, it will stay coarsely focused when you move to another objective. (You will still have to make minor adjustments.)
 - The 40x objective is *retractable* – the tip containing the lens is spring-loaded to prevent damage to the objective or slide.
5. **Stage:** The stage is the platform that supports the specimen slide below the objective lenses. It moves up and down when you turn the focus knob, allowing you to get just the right distance between the slide and the lens.
 6. **Stage stop:** This is a screw with a lock nut located between the stage and the arm of the microscope. It prevents the stage from coming too far up and grinding against the objective lens. It is also called a “safety rack stop,” and is pre-adjusted by the manufacturer. Instructions for readjusting it manually are on page 4.
 7. **Stage clips:** The stage clips hold microscope slides in place. Pressing on the end closest to the arm of the scope will lift up the other end, allowing you to place your slide underneath.
 8. **Disc diaphragm:** The diaphragm controls the amount of light coming through the specimen in order to provide optimum resolution for the objective lens. The diaphragm on this microscope is a rotating disc under the stage with holes that are numbered by size; for example, a hole labeled 6 is 6mm in diameter and a hole labeled 2 has a diameter of 2mm. Use the smaller holes for lower magnification and the larger holes for higher magnification.
 9. **Focus knob:** The focus knob is used to raise or lower the stage until the image is in focus. The focus mechanism uses a slip clutch to prevent damage to the gears.
 10. **Illuminator:** The illuminator provides light underneath the stage. The MI-1100STD contains a 15-watt tungsten bulb. The MI-

1100LED contains an LED bulb and light intensity control knob located on the base. This intensity control helps adjust illumination contrast. Instructions for changing the bulbs are on page 4.

Power Options for MI-1100LED

The LED Microscope comes with a built-in rechargeable NiMH battery and charger. The fully charged battery provides about 15 hours of totally portable microscope use. The AC adapter is used to recharge the battery. (The battery should be fully charged before first use, or use the adapter.)

Red and green lights on the back of the microscope indicate charging status. Please follow these charging guidelines to maintain maximum battery life for your microscope.

1. Turn off the illuminator and plug in the AC adapter.
2. A red light only indicates the battery is charging and has less than 70% of full charge.
3. Both a red and green light indicates the battery is charging and has 70-90% of charge.
4. A green light only indicates the battery is fully charged and ready for use.
5. Typical charging time is 4-8 hours. Do not charge the battery or leave the AC adapter plugged in for more than 12 hours.

Operating Procedure

Now that you have an overview of what each component of your microscope is for, you can follow this step-by-step procedure to help you get started using it.

1. Set your microscope on a table or other flat surface where you will have plenty of room to work. Plug the microscope’s power cord into an outlet, making sure that the excess cord is out of the way so no one can trip over it. (The MI-1100LED also operates on battery power.)
2. Flip the switch to turn on your microscope’s light source and then turn the disc diaphragm to the largest hole, which allows the greatest amount of light through. (You will adjust this again later for best contrast.) The MI-1100LED also has a light intensity control on the base: turn the intensity up fully.
3. Rotate the nosepiece to the lowest-power (4x) objective. You will hear a click when it is properly in place. Always start with the lowest power: it is easiest to scan a slide at a low setting, as you have a larger field of view.

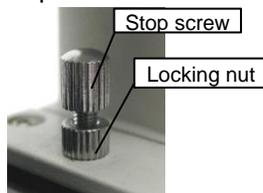
- Turn the focus knob to move the stage down (away) from the objective lens as far as possible.
- Set a microscope slide (coverslip facing up) in place under the stage clips. A prepared slide works best when you do this for the first time. Move the slide until the specimen is under the objective lens.
- Adjust the focus knob until the specimen is in focus. Slowly move the slide to center the specimen under the lens, if necessary, by nudging it with your fingers.
- Adjust the diaphragm to get the best lighting. Start with the most light and gradually lessen it until the specimen image has clear, sharp contrast. On the MI-1100LED you can also adjust the light intensity control for contrast.
- Scan the slide (right to left and top to bottom) at low power to get an overview of the specimen (nudge the slide very slowly with your fingers). Then center the part of the specimen you want to view at higher power.
- Rotate the nosepiece to the 10x for 100x magnification. Refocus and view the slide carefully. Adjust the diaphragm again until the image has the best contrast. Repeat with the 40x objective for 400x magnification.

Maintenance

Adjusting the Stage Stop

The stage stop is set at the factory to ensure that the stage cannot come up far enough to hit the objective lenses. Under normal circumstances you will not have to adjust this. However, if you cannot focus a slide, follow these steps:

- Loosen the knurled locking nut by turning it counterclockwise. (Use needle-nose pliers for this.)
- Loosen the stop screw.



Warranty

Home Science Tools warrants this microscope to be free from defects in material and workmanship under normal use and service for five years from the date of purchase. This warranty does not cover light bulbs, batteries, or damage due to misuse, abuse, alterations, or accident. Warranty does not cover lenses that have become inoperable due to excessive dirtiness as a result of misuse or lack of normal maintenance.

You will need to return your microscope freight prepaid for warranty service to Home Science Tools, or the repair facility we designate. We will repair or replace your microscope at no charge and return it freight prepaid to you. Please call 1-800-860-6272 to arrange warranty service before returning this instrument. Please note that warranties apply only to the original purchaser and are not transferable.

Focus on a standard slide until you obtain a sharp image.

- Tighten the stop screw by turning it clockwise until it stops, then turn it back ½ turn.
- Re-tighten the locking nut.

Changing the Tungsten Bulb in the MI-1100STD

- Obtain the correct 15-watt tungsten replacement bulb (our item MI-BULB2). One is included with your microscope.
- Unplug your microscope from the power supply and allow it to cool before replacing the bulb.
- Carefully lay the microscope on its side.
- Using a #2 Phillips screwdriver, remove the screw from the center of each rubber foot. 
- Remove the bottom plate and gently push the bulb in and turn it to release it from the socket. 
- Replace with a new bulb, then put the plate back in place and replace the rubber feet.

Changing the LED Bulb in the MI-1100LED

- Obtain the correct LED replacement bulb (our item MI-BULB10). One is included.
- Unplug the microscope from the power supply and allow it to cool before replacing the bulb.
- Raise the stage to its upmost position.
- Turn the top segment of the illuminator housing counterclockwise; remove, and set aside.
- Remove the LED bulb by pulling it straight out. 
- Replace with a new LED bulb, and twist the top of the illuminator housing back in place.

Troubleshooting

If you are experiencing difficulty with your microscope, try these troubleshooting techniques:

Problem	Possible Reason and Solution
Light fails to operate	<ol style="list-style-type: none"> 1. The batteries are dead (MI-1100LED). <i>Use the AC adapter to recharge the batteries.</i> 2. The light intensity control is off (MI-1100LED). <i>Turn up the light intensity.</i> 3. The bulb is burned out. <i>Replace the bulb. (See "Changing the Bulb," p. 4.)</i> 4. The incorrect bulb is installed. <i>Replace with the correct bulb.</i>
Light flickers	<ol style="list-style-type: none"> 1. The bulb is not properly inserted into the socket. <i>Properly insert the bulb.</i> 2. The bulb is about to burn out. <i>Replace the bulb.</i>
No image	<ol style="list-style-type: none"> 1. The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> 2. The light is too bright. <i>Adjust the diaphragm.</i>
Unable to focus slide	<ol style="list-style-type: none"> 1. The slide coverslip is too thick. <i>Use 0.17 mm thick (No. 1) coverslip.</i> 2. The slide is upside down. <i>Place the slide on the stage with the coverslip facing up.</i> 3. The stage stop is not set at the proper position. <i>Adjust the stage stop. (See "Adjusting the Stage Stop," p. 4.)</i>
Poor resolution, image not sharp	<ol style="list-style-type: none"> 1. The objective or eyepiece lenses are dirty. <i>Clean the lenses. (See "Cleaning," p. 2.)</i> 2. There is too much light. <i>Adjust the diaphragm.</i>
Spots in field	<ol style="list-style-type: none"> 1. The specimen slide, objective, or eyepiece lens is dirty. <i>Clean the slide or lenses. (See "Cleaning," p. 2.)</i>
Uneven illumination of field	<ol style="list-style-type: none"> 1. The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> 2. The diaphragm is not properly indexed. <i>Adjust the diaphragm to the proper level.</i>

Specifications

Eyepiece	Widefield 10x eyepiece with fully coated optics. Inclined 45° head.
Nosepiece	3-hole, ball-bearing mounted with positive click stops.
Objectives	All objectives are achromatic, parfocalled, parcentered, and fully coated. <ul style="list-style-type: none"> • 4x, 0.10 N.A., red ring, 3.6mm field of view, 40x magnification • 10x, 0.25 N.A., yellow ring, 1.4mm field of view, 100x magnification • 40x, 0.65 N.A., blue ring, 0.4mm field of view, 400x magnification, retractable
Focusing	Single intermediate focusing control with slip clutch. All metal rack-and-pinion focusing with adjustable stage stop.
Stage	Acid and chemical resistant 95 x 95mm metal stage with stage clips (not designed for use with a mechanical stage).
Condenser	Fixed 0.65 NA condenser.
Diaphragm	Calibrated 6-hole disc diaphragm.
Illuminator	15-watt tungsten illuminator with grounded 110-volt cord on model MI-1100STD, 20-watt equivalent LED illuminator with AC Adapter or optional batteries on model MI-1100LED.

Ideas for Using Your Microscope

You have a microscope—now what? With the following directions you can get started right away making your own microscope slides!

How to Make Simple Microscope Slides

Learn more about using the Kids microscope by making simple slides using common items from around the house!

Materials Needed:

- clear Scotch tape
- a few granules of salt, sugar, ground coffee, sand, or any other grainy material

Making Simple Slides

To make a slide, tear a 2½-3" long piece of Scotch tape and set it sticky side up on the kitchen table or other work area. Fold over about ½" of the tape on each end to form finger holds on the sides of the slide. Next, sprinkle a few grains of salt or sugar in the middle of the sticky part of the slide.



You can repeat this with the other substances if you like, just be sure to label each slide you make with an ink pen or permanent marker so you will know what's on the slides!

You can make tape slides with many other materials as well. Try hair (from pets and family members), thread and fiber (from carpets or clothing), or small dead insects such as gnats, ants, or fruit flies. Label each slide and view them one at a time with your microscope, experimenting with different magnification.

How to Make Your Own Prepared Slide

Learn how to make temporary mounts of specimens and view them with your microscope. Below are a few ideas for studying different types of cells found in items that you probably already have around your house.

Cork Cells

In the late 1600s, a scientist named Robert Hooke looked through his microscope at a thin slice of cork. He noticed that the dead wood was made up of many tiny compartments, and upon further observation Hooke named these empty compartments cells. It was later known that the cells in cork are only empty because the living

matter that once occupied them has died and left behind tiny pockets of air. You can take a closer look at the cells, also called lenticels, of a piece of cork by following these instructions.

Materials Needed:

- small cork
- plain glass microscope slide
- slide coverslip
- sharp knife or razor blade
- water

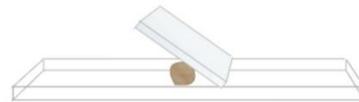
How to make the microscope slide:

Carefully cut a very thin slice of cork using a razor blade or sharp knife (the thinner the slice, the easier it will be to view with your microscope).



To make a wet mount of the cork, put one drop of water in the center of a plain glass slide – the water droplet should be larger than the slice of cork. Gently set the slice of cork on top of the drop of water (tweezers might be helpful for this). If you are not able to cut a thin enough slice of the whole diameter of the cork, a smaller section will work.

Take one coverslip and hold it at an angle to the slide so that one edge of it touches the water droplet on the surface of the slide.



Then, being careful not to move the cork around, lower the cover slip without trapping any air bubbles beneath it. The water should form a seal around the cork. Use the corner of a paper towel to blot up any excess water at the edges of the coverslip. To keep the slide from drying out, you can make a seal of petroleum jelly around the cover slip with a toothpick. Begin with the lowest-power objective to view your slide. Then switch to a higher power objective to see more detail. Use this same wet mount method for other specimens such as cheek cells or leaf cells.

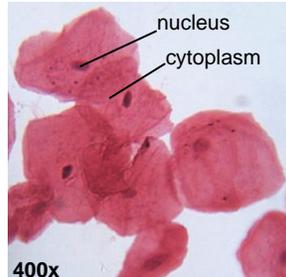
Record Your Observations

Our Microscope Observation worksheet (on the last page) will help you keep track of what you see and remember what you have learned. Blanks are provided for recording general information about each slide (e.g. wet mount stained with methylene blue). In addition, there is space to write down your observations and make sketches of what you see at each magnification level.

Prepared Slides

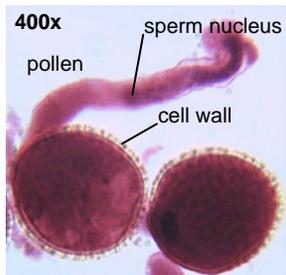
The easiest way to build your microscope skills (controlling focus, light contrast, and more) is to view prepared slides. A slide starter set is included with your microscope. Your starter slide set comes with five prepared slides, described below. These descriptions get you started working with each specimen, but you can research more information on the internet.

Mouth Smear – Epithelial tissue is found many places in the body – on the surface of the skin, the lining of the mouth, stomach, and blood vessels, and in the glands. The mouth smear slide is squamous epithelium taken from the lining of the cheek.



Scan the slide on low power (40x) and find a group of cells that look one layer thick. You should see very small dark spots in the middle of the cells – these are the *nuclei*, which contain DNA and control cellular functions. As you view the slide at higher power, you will see more detail. Identify the nucleus, the *cell membrane* (the wall between cells), and the *cytoplasm* (the fluid inside the cell membrane).

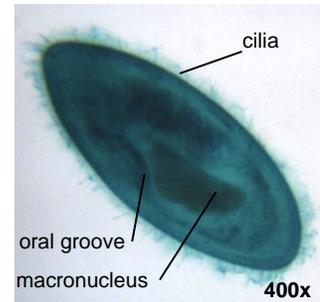
Pollen – When a pollen grain begins to germinate, it grows a long, thin tube called a *pollen tube* that stretches down a flower's style to the ovary. The two sperm in the pollen grain travel through the pollen tube. One of them then fertilizes the egg in the ovary.



As you look at the slide at high power (400x), notice how thick the walls of the pollen grains are. Locate the pollen tubes that have grown off some of the grains. Look for dark spots in the tubes – these are the sperm nuclei. If there is a large dark spot in the pollen grain, this is the “generative nucleus” that will split to produce the two sperm.

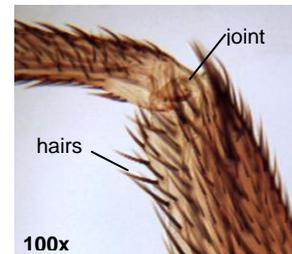
Paramecium – A paramecium is a single-celled protozoan that moves using *cilia*, tiny hairs around its cell wall that wave back and forth. It eats by sweeping food down an *oral groove* lined with cilia into a gullet. The gullet closes off when it is full and becomes a floating storage unit, called a food vacuole.

Take a good look at different paramecia on your slide. You can see a large, dark *macronucleus* in each paramecium, and in some the smaller dark *micronucleus* next to it. The macronucleus



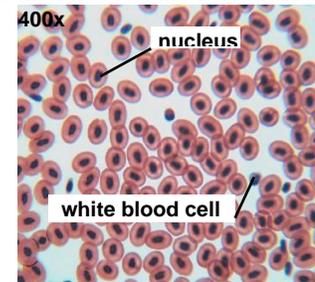
controls the metabolism of the cell (how the cell gets energy from food) and the micronucleus controls the cell's reproduction. With some patience in focusing you can see the cilia at 400x on some of the specimens. If you look closely you may also see the oral groove – it looks like a short depression coming in from the edge of the cell.

Housefly Leg – Houseflies have tiny hairs on their legs and feet. They use these hairs for feeling and tasting. Yes, they really can taste with their feet!



As you look at the housefly foot slide, you won't get the whole specimen in focus at one time. This is because it is a three-dimensional specimen with different layers. Take a look at the foot at low power. Notice that it has several different joints. At higher powers you can see the individual hairs clearly. Focus in to see where the hair joins the foot.

Frog Blood – Frog blood looks quite different from human blood. Human blood cells don't have nuclei, so they are unable to reproduce themselves by dividing their DNA. Instead, they are made in our bone marrow. Frog blood cells *do* have nuclei and thus are able to divide.



At lowest power hundreds of tiny red blood cells will fill your field of view. Even when magnified only 40x, a miniscule purple dot is visible on each cell. This dot is the nucleus. At higher power you may find a few white blood cells – these are different shapes than the red blood cells and appear to be mostly a purple nucleus with only a thin light-colored layer outside. Red blood cells carry oxygen throughout the body, while white blood cells work as part of the immune system.

Date of slide: _____

Name of sample: _____

Collected from: _____

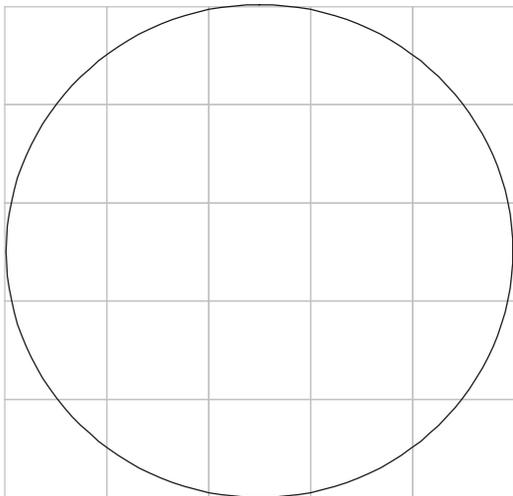
Stain: _____

Mount: _____

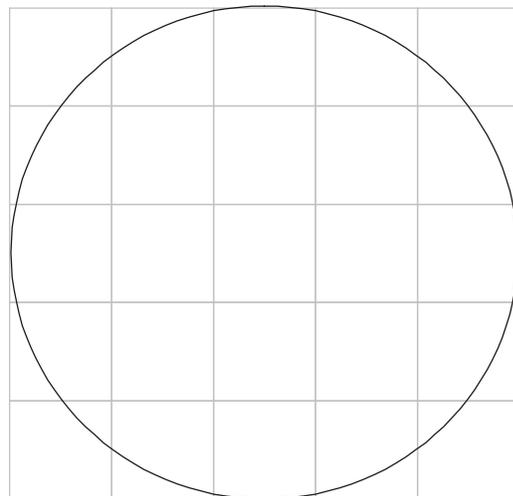
Lighting: _____

Observations

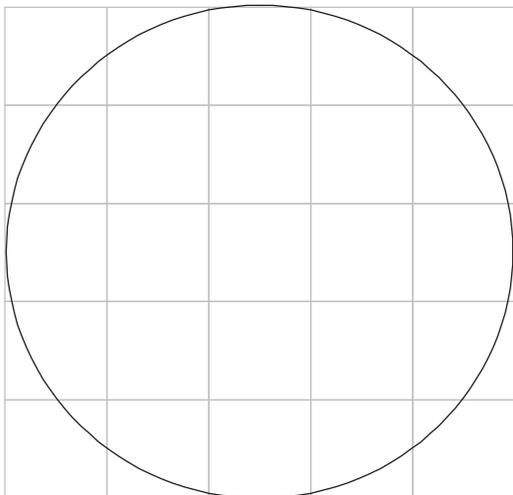
Sketches



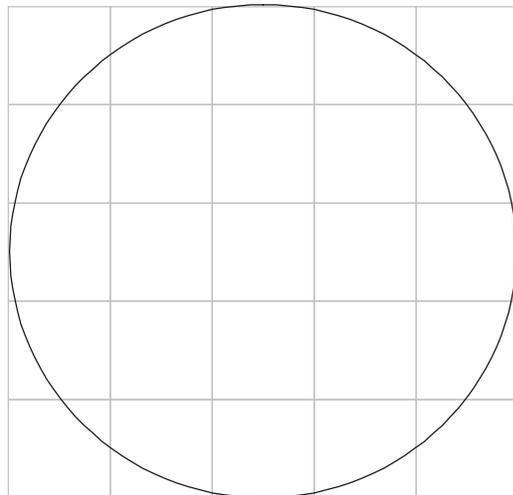
40x magnification



100x magnification



400x magnification



Other: _____