

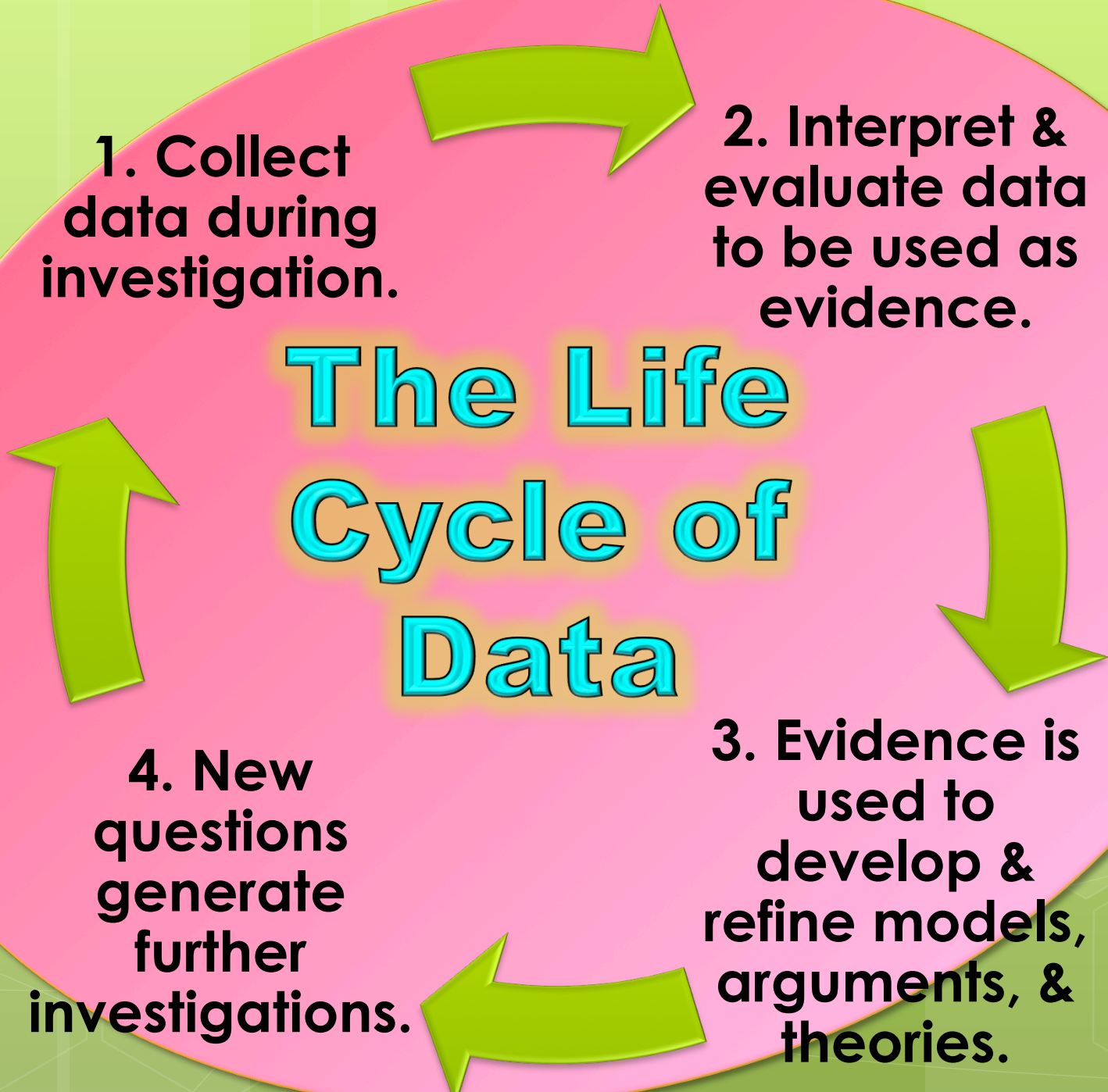
1. Collect data during investigation.

2. Interpret & evaluate data to be used as evidence.

The Life Cycle of Data

3. Evidence is used to develop & refine models, arguments, & theories.

4. New questions generate further investigations.



Scientific Tools

Magnifier/Hand Lens (Grades K & 5)

- A magnifier, or hand lens, is a science tool that can be used to see details of objects that are too small to be seen clearly with unaided eyes.
- A magnifier should be held between the eye and the object being viewed.
- The magnifier should be moved back and forth until the object looks clear.
- Magnifiers can be used to observe physical properties of objects.



Scientific Tools

Eye Dropper (Grade K)

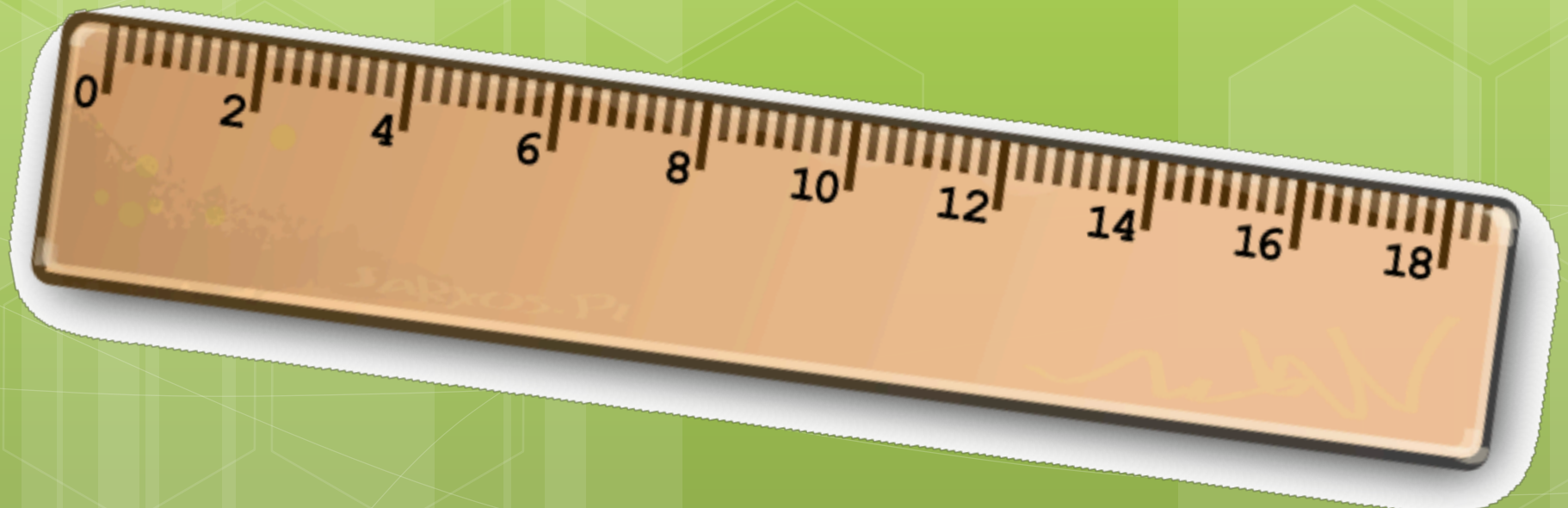
- Eyedroppers are short tubes fitted with rubber bulbs at the top of the tube that are used to measure liquids by drops when gathering specific data.
- Squeeze the bulb before inserting it into the liquid to obtain some of the liquid. Eyedroppers can be used to add small amounts of liquids.



Scientific Tools

Ruler (Grade 1)

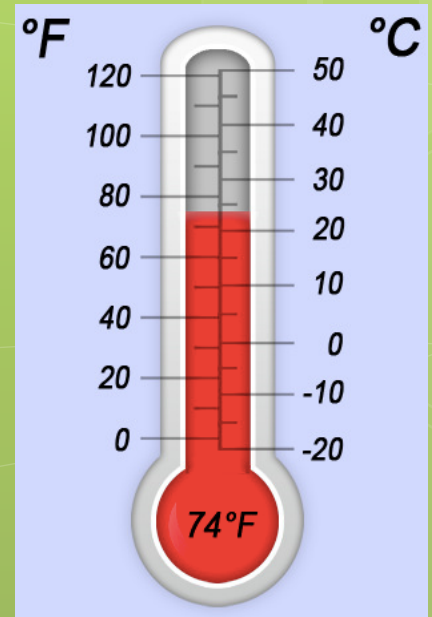
- A ruler is a measurement tool that can be used to measure the length, width, or height of an object or the distance between two objects.
- When using a ruler, make sure to begin measuring from the zero (0) mark, not necessarily the edge of the ruler.



Scientific Tools

Thermometer (Grade 2)

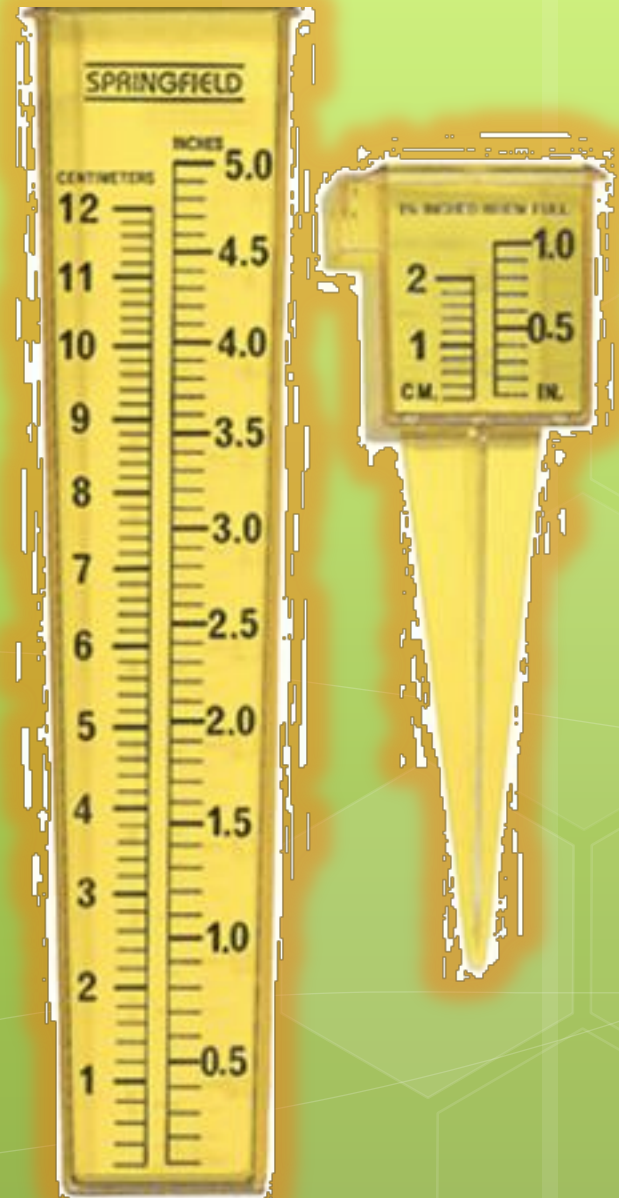
- A thermometer is a tool that measures temperature. When using a thermometer, make sure not to place the bulb of the thermometer on the bottom or sides of the container or touch the bulb when taking air temperature.
- When reading the temperature on a thermometer, it should be vertical and at eye level with the top of the liquid in the glass tube.
- A thermometer measures temperature in degrees Fahrenheit ($^{\circ}\text{F}$) and Celsius ($^{\circ}\text{C}$) to the nearest degree.



Scientific Tools

Rain Gauge (Grade 2)

- A rain gauge is a tool that measures the amount of rainfall.
- To collect rainfall accurately, the rain gauge must be in an open area.
- To read the rain gauge, hold it at eye level.
- A rain gauge measures the amount of rainfall in inches (in).



Scientific Tools

Balance (Grade 2)

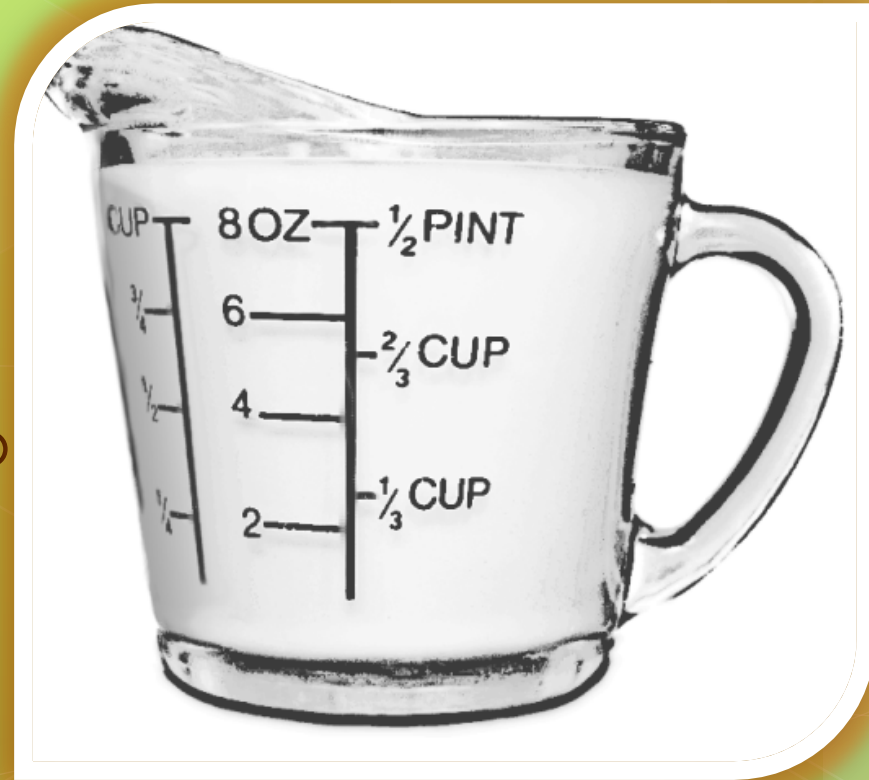


- A balance is a tool that measures the mass of an object compared to a known mass. Mass is the amount of matter, or material, in an object.
- When using a pan or bucket balance, be sure the balance pointer begins at zero (is level).
- Place the object being measured on one side.
- Place the known masses on the opposite side until the balance is level and the pointer is again at zero.
- When the balance is level, the mass of the object is equal to the total of the known masses.
- A balance measures the mass of an object in grams (g).

Scientific Tools

Measuring Cup (Grade 2)

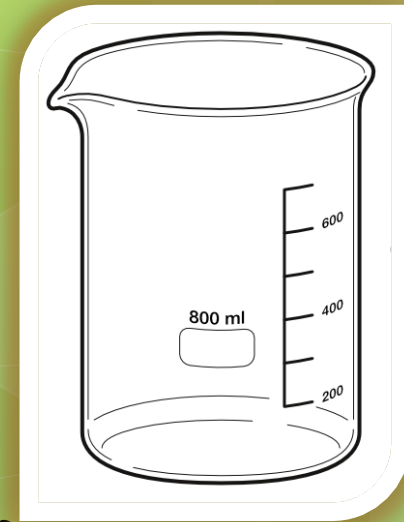
- A measuring cup is a tool that measures volume.
 - To read the measuring cup, place the cup on a level surface.
- When using the measuring cup to measure volume of a solid, be sure the top surface of the solid is level.
- A measuring cup measures volume in fluid ounces (oz), parts of a cup (c), milliliters (mL), or liters (L).



Scientific Tools

Beaker (Grade 3)

- A beaker is a tool that measures liquid volume.
- To read the volume of a liquid in a beaker, place the tool on a level surface.
- When using a beaker to measure the volume of a granular (powdered) solid, be sure the top surface of the solid is level.
- Choose the appropriate size beaker for the measurement task—use small beakers for measuring small amounts, and large beakers for large amounts.
- A beaker measures the volume in metric units such as milliliters (mL) or liters (L).



Scientific Tools

Meter Tape/Stick (Grade 3)

- A meter tape, or meter stick, is a measurement tool that can be used to measure the length, width, or height of an object or the distance between two objects.
- When using a meter tape, or stick, make sure to begin measuring from the zero (0) mark, not necessarily the edge of the tool.
- A meter tape, or stick, measures in metric units such as centimeters (cm) or meters (m).



Scientific Tools

Forceps/Tweezers (Grade 3)

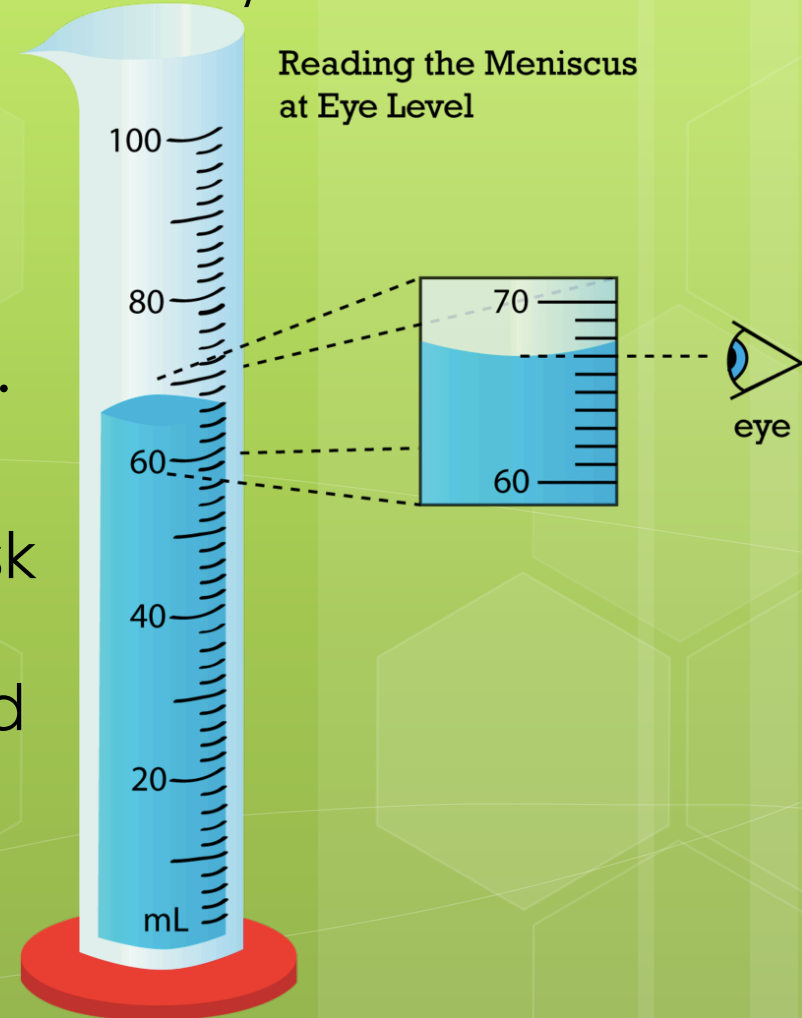
- Forceps/tweezers are tools that grasp or pick up small materials.



Scientific Tools

Graduated Cylinder (Grades 3 & 5)

- A graduated cylinder is a tool that measures volume of liquids.
- To read the graduated cylinder, place the tool on a level surface.
- Choose the right size graduated cylinder for the measurement task —use small graduated cylinder for measuring small amounts, and large graduated cylinder for large amounts.
- The graduated marks are in metric units such as milliliters (mL).



Scientific Tools

Graduated Syringe (Grade 3)



- A graduated syringe is a tool that measures volume of liquids.
- Place the end of the syringe in the liquid and then pull the plunger out to draw in the appropriate amount of liquid.
- A graduated syringe measures in metric units such as milliliters (mL).
- It is also essential for students to use tools such as rulers (measuring to millimeters), pan balances (measuring in grams), or measuring cups (measuring in parts of a cup).

Scientific Tools

Tuning Fork (Grade 4)

- A tuning fork is a tool that produces vibrations when struck appropriately.
- Use the rubber mallet or rubber surface to strike the tuning fork.



Scientific Tools

Compass (Grade 4)

- A compass is a tool that is used to determine the cardinal directions of North, South, East, and West when using a wind vane to identify wind direction.



Scientific Tools

Anemometer (Grade 4)

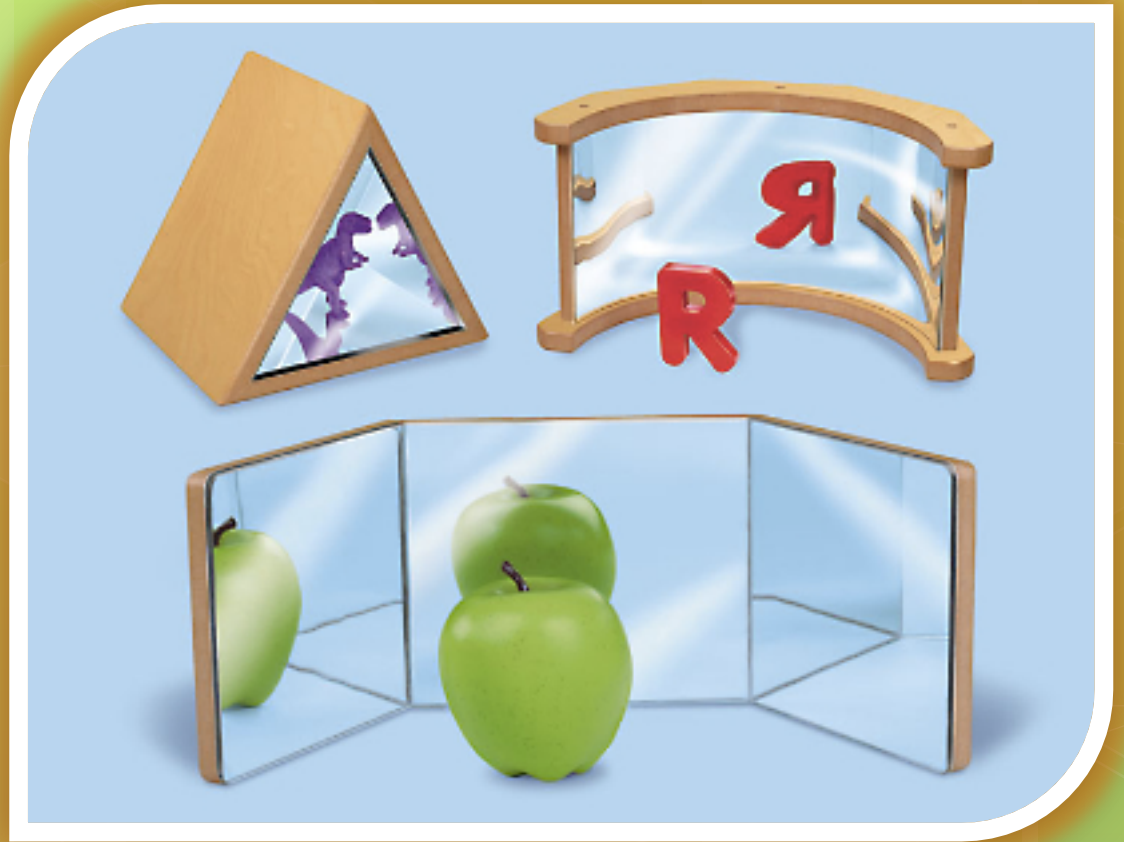
- An anemometer is a weather instrument used to determine wind speed.
- An anemometer should be vertical and needs to be able to spin without obstruction.
- An anemometer measures wind speed in miles per hour (mph).



Scientific Tools

Mirror (Grade 4)

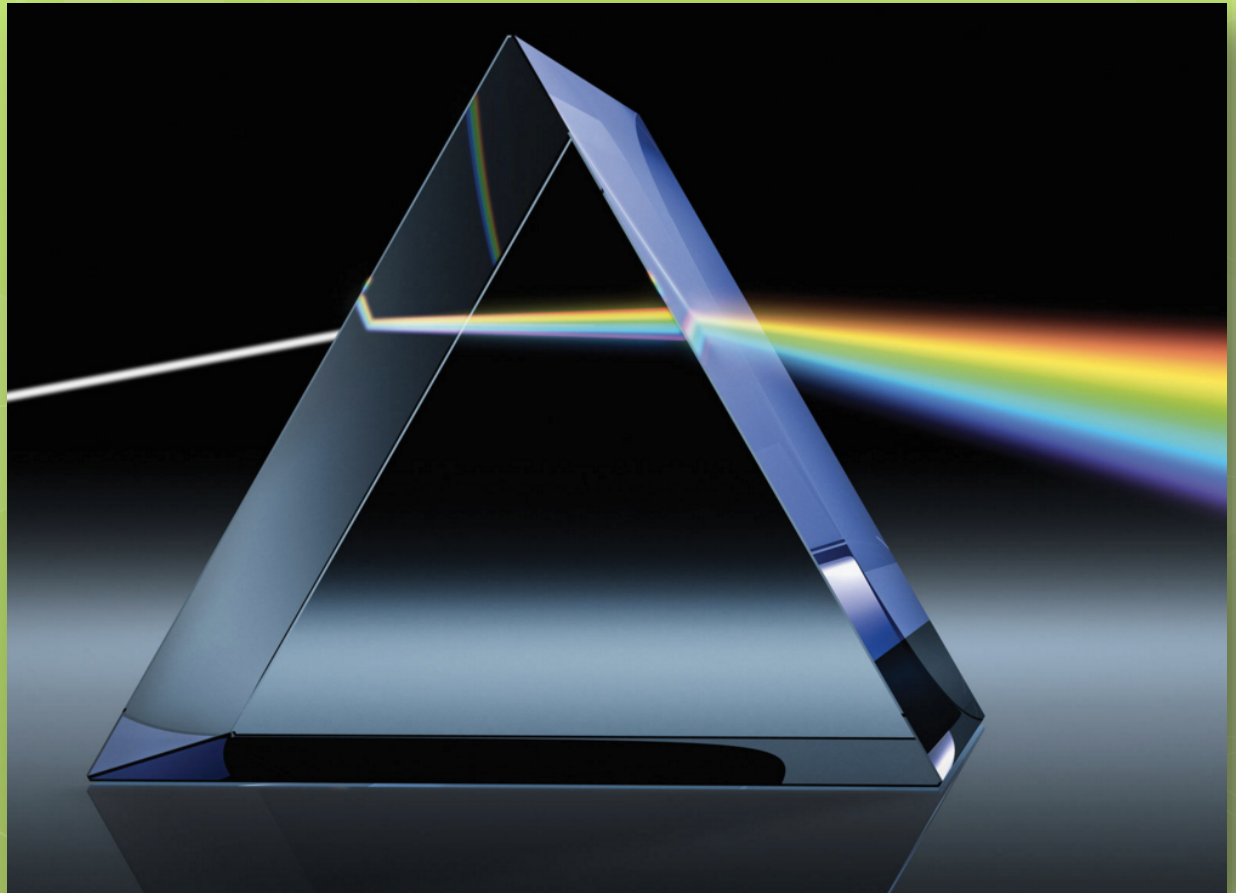
- A mirror (plane/flat) is a tool that reflects light toward a given direction.



Scientific Tools

Prism (Grades 4 and 8)

- A prism is a tool that breaks light into the colors of the spectrum.
- To use a prism appropriately, the light has to enter the prism at the correct angle to the surface in order to separate the white light.



Scientific Tools

Timer (Grade 5)

- A timing device is an instrument used to measure time.
- An example of a timing device is a stop watch or clock with a second hand.
- Time is measured in seconds (s), minutes (min), hours (hr), and days.



Scientific Tools

Spring Scale (Grade 6)

- A spring scale is a tool used to measure the weight of an object or the force on an object.
- Some spring scales have a slider that moves in response to the weight/force of an object. The measurement is read on one of two scales located on either side of the slider.



Scientific Tools

Spring Scale (continued) (Grade 6)

- Some spring scales have a spring that is visible through a clear plastic tube with two scales labeled on either side of the tube.
- Before an object is attached to the spring scale, make sure the marker is on the zero (0) by adjusting the slider or knob usually found on the top of the scale.
- A spring scale measures weight or force in Newtons (N).



Scientific Tools

Digital Balance (Grade 6)

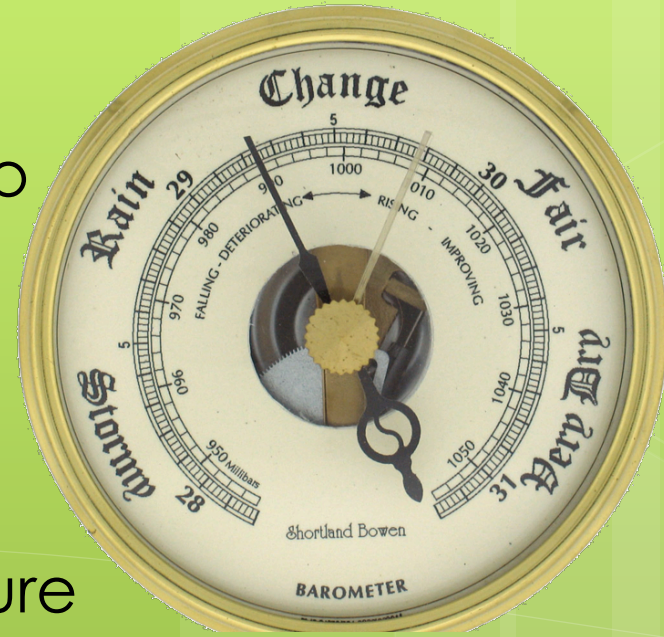
- A digital balance is a tool used to measure the mass of an object.



Scientific Tools

Barometer (Grade 6)

- A barometer is an instrument used to measure air pressure or a change in pressure readings.
- Many of the barometers have qualitative descriptions of weather conditions associated with air pressure but this alone should not be used to forecast weather.
- To read your barometer, first tap the glass lightly, but firmly, to ensure that the reading pointer attached to the linkage mechanism inside the barometer is not sticking.



Scientific Tools

Barometer (continued) (Grade 6)

- The other pointer that is found on most instruments is the set pointer and is usually made of brass.
- The set pointer can be turned by means of the knob at the center of the glass so that it covers the reading pointer. If the reading pointer has moved between readings then it can be determined that the pressure is now lower or higher and by how much.
- A barometer scale is measured in millimeters or inches of mercury or millibars (mb).



Scientific Tools

Sling Psychrometer (Grade 6)

- A sling psychrometer is a tool used to measure relative humidity.
- A sling psychrometer is made of two thermometers—a wet bulb and a dry bulb—held together by a handle.
- The wet bulb thermometer is covered with a piece of cloth and moistened.
- The two thermometers are then moved through the air. After a period of time the temperature of each thermometer is recorded. A relative humidity chart is used to determine the relative humidity percent.



Scientific Tools

Sling Psychrometer (Grade 6)

Sling Psychrometer

Dry Bulb

- Provides the current temperature

Wet Bulb

- Wick is saturated with water



- Thermometers are swung around the handle.
- When swung, water evaporates from the wick, cooling the wet-bulb thermometer.
- Drier air results in a lower temperature.

- All temperature readings during investigations will be taken using the Celsius scale unless the data refers to weather when the Fahrenheit scale is used.

Scientific Tools

Microscope (Grade 7)

- A microscope is a tool that is used to magnify the features of an object. A compound microscope has two or more lenses.
- Eyepiece - contains the 10X magnifying lens



Scientific Tools

Microscope (Grade 7)

- Coarse adjustment knob/focus—focuses the image under low power
- Fine adjustment knob/focus—focuses the image under high power



Scientific Tools

Microscope (Grade 7)

- Objective lenses - two or three separate lenses that contain varying powers of magnifying lenses
- Stage and stage clips - supports and hold the microscope slide in place while viewing



Scientific Tools

Microscope (Grade 7)

- Diaphragm - controls the amount of light available
- Light source - a mirror, external or internal light source that shines light through the object being viewed



Scientific Tools

Microscope (Grade 7)

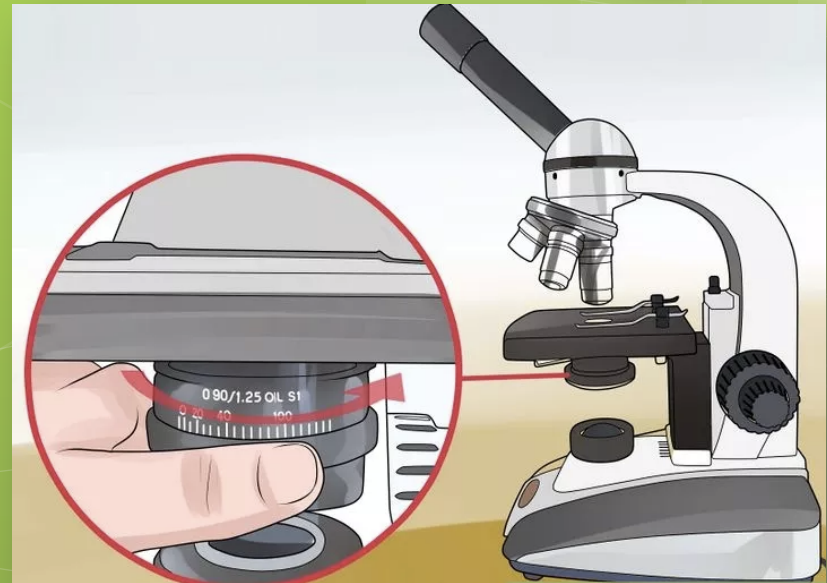
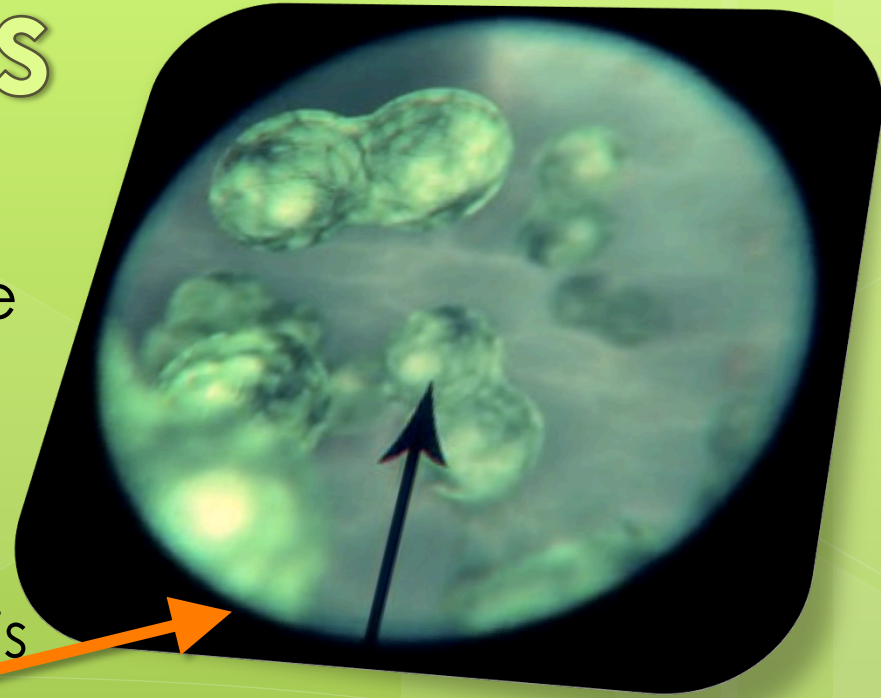
- Arm - supports the body tube which connects the eyepiece to the set of objective lenses
- Base - supports the microscope



Scientific Tools

Microscope (Grade 7)

- It is essential for students to use the microscope safely and accurately.
- When looking through a microscope, the lighted area is the **field of view**.
- Adjust the diaphragm until an adequate amount of light is available.
- To make the field of view brighter, open the diaphragm. To make the field of view darker, close the diaphragm.



Scientific Tools

Microscope (Grade 7)

- To view an object under the microscope, first focus on the lowest power objective lens. Then change to the highest power objective lens if necessary.



1. Scanning (4x) objective

2. Low power (10x) objective

3. High power (40x) objective

4. Oil immersion (100x) objective

Scientific Tools

Microscope (Grade 7)

- When focusing the image under low power objective, use the coarse adjustment knob first.
- Use only the fine adjustment knob to sharpen the focus when using the high power objective.



Scientific Tools

Microscope (Grade 7)

- To calculate the magnification of objects, multiply the magnification of the eyepiece times the magnification of the objective lens being used.

Objective lens

eyepiece

Scanning Power:

Eyepiece 10x times objective lens 4x = 40x

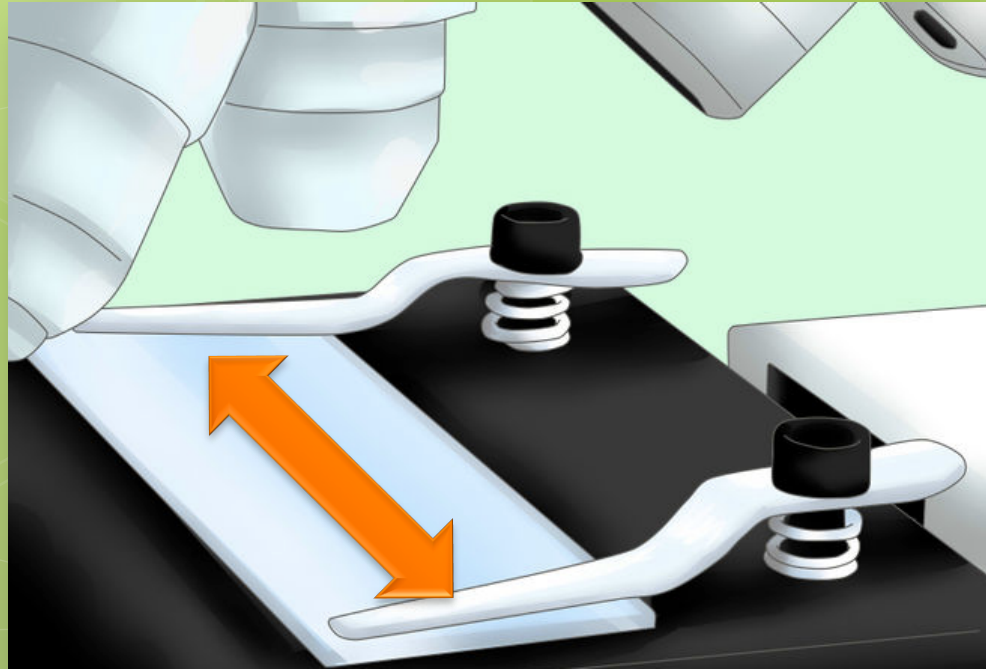
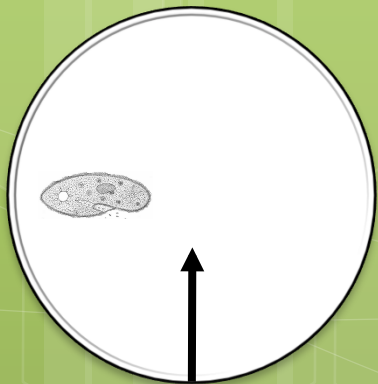


Scientific Tools

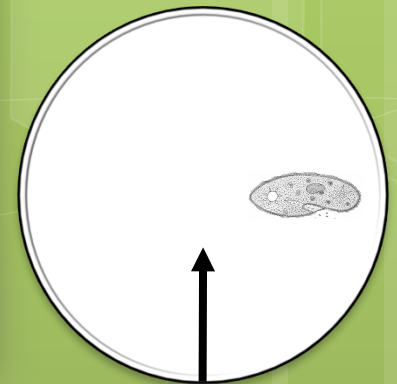
Microscope (Grade 7)

- Objects on the slide move in the **opposite** direction when being viewed through the eyepiece (for example, if the slide is moved to the left, the object being viewed appears to move to the right).

Slide
moved
to right



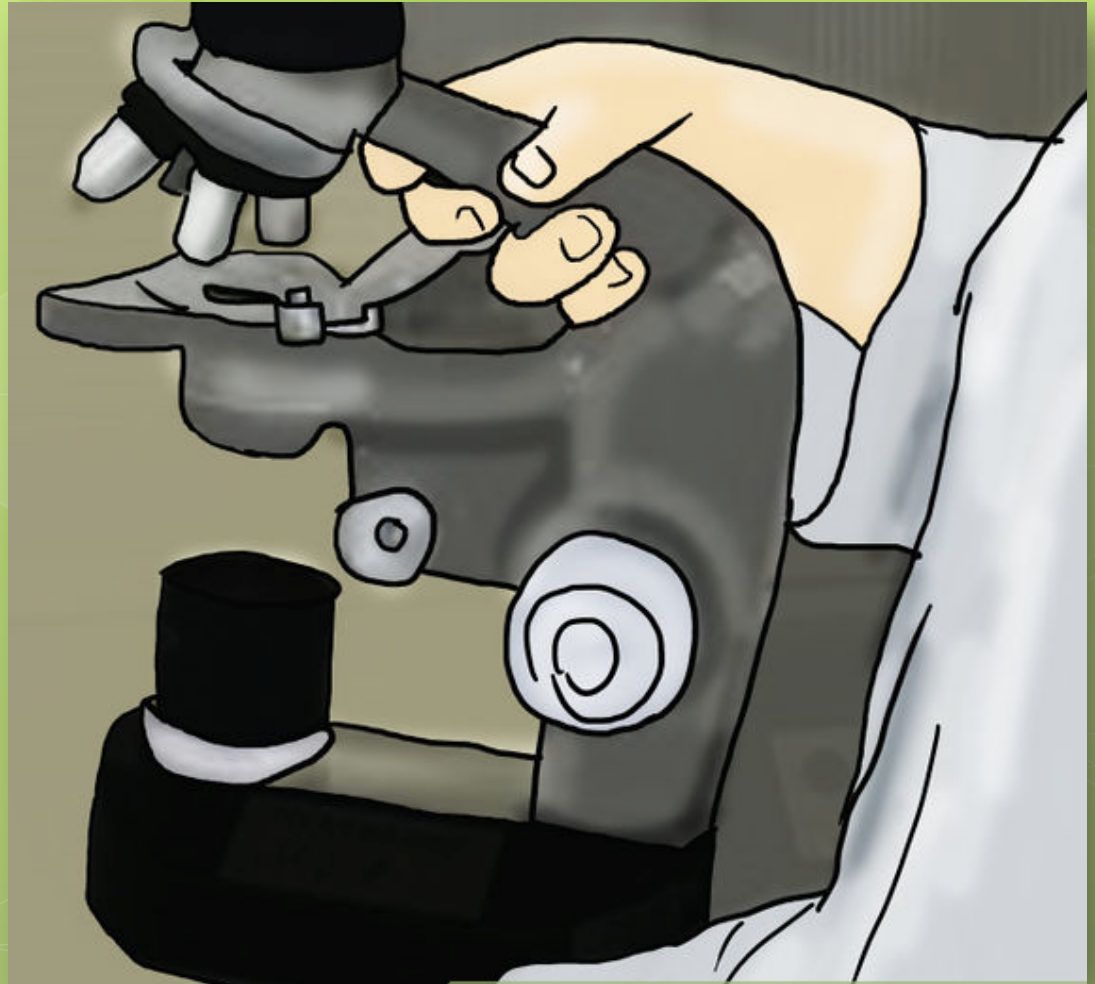
Slide
moved
to left



Scientific Tools

Microscope (Grade 7)

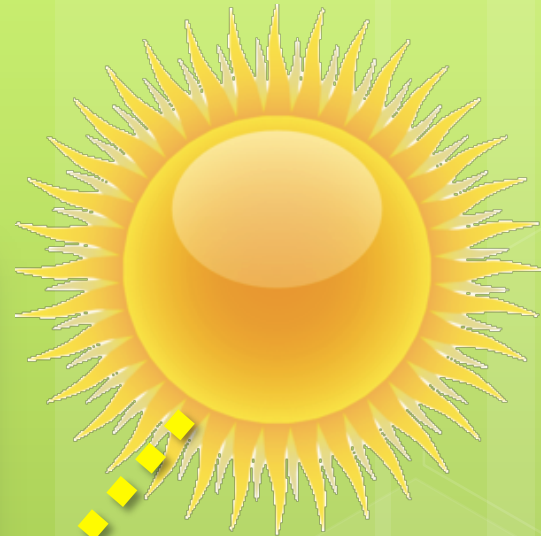
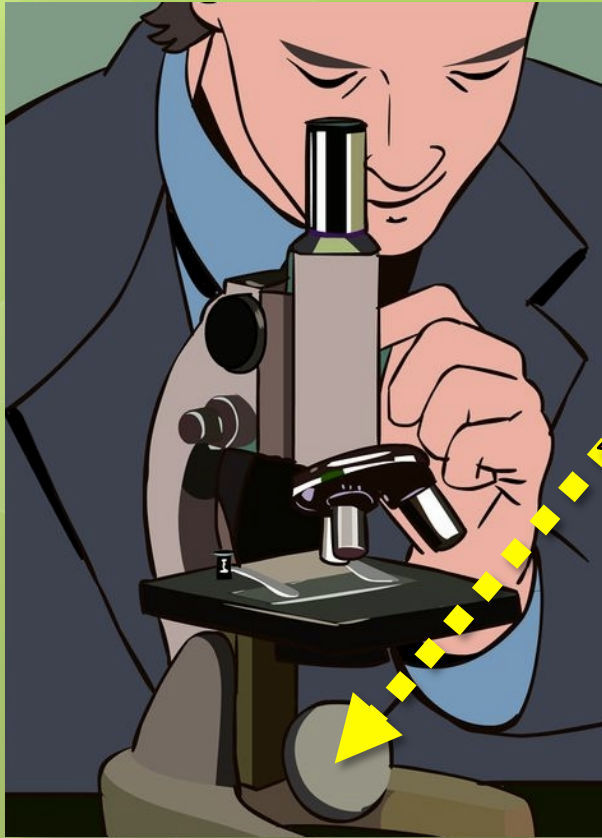
- It is essential for students to use care when handling the microscope.
- A microscope should be held and carried with one hand under the base and one hand on the arm.



Scientific Tools

Microscope (Grade 7)

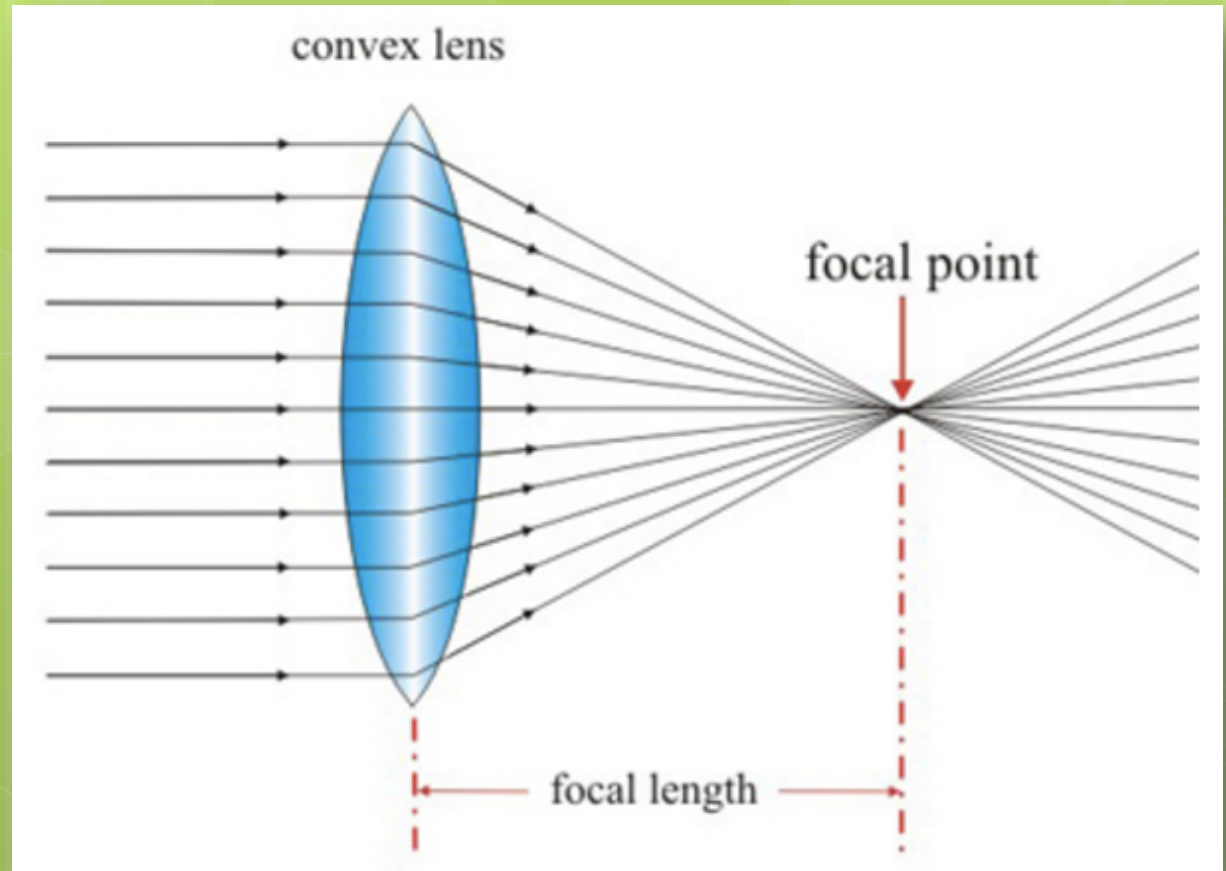
- Some microscopes may have a mirror as the light source.
- Care should be taken not to aim the mirror directly at the Sun.



Scientific Tools

Convex Lens (Grade 8)

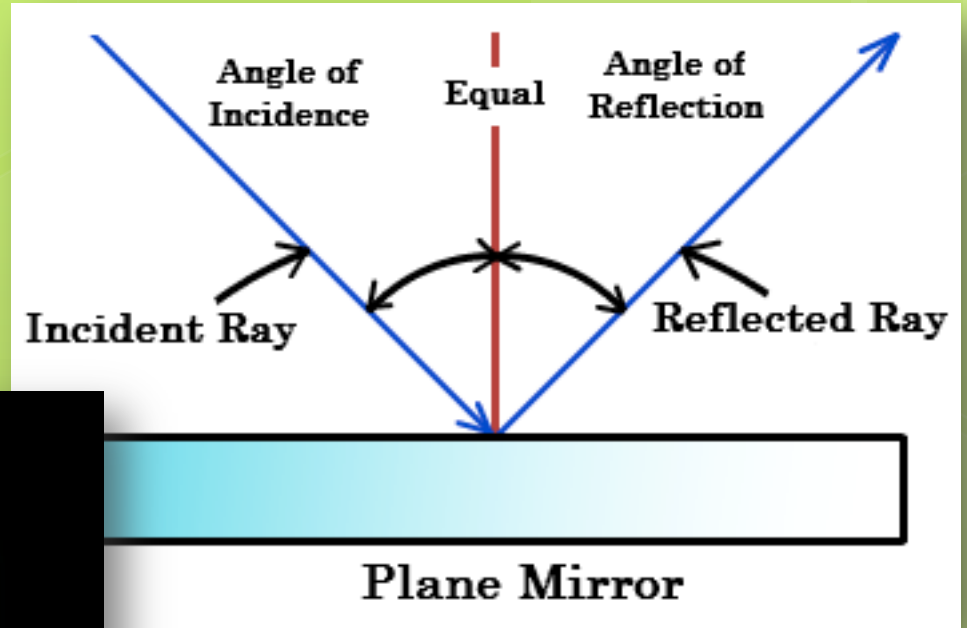
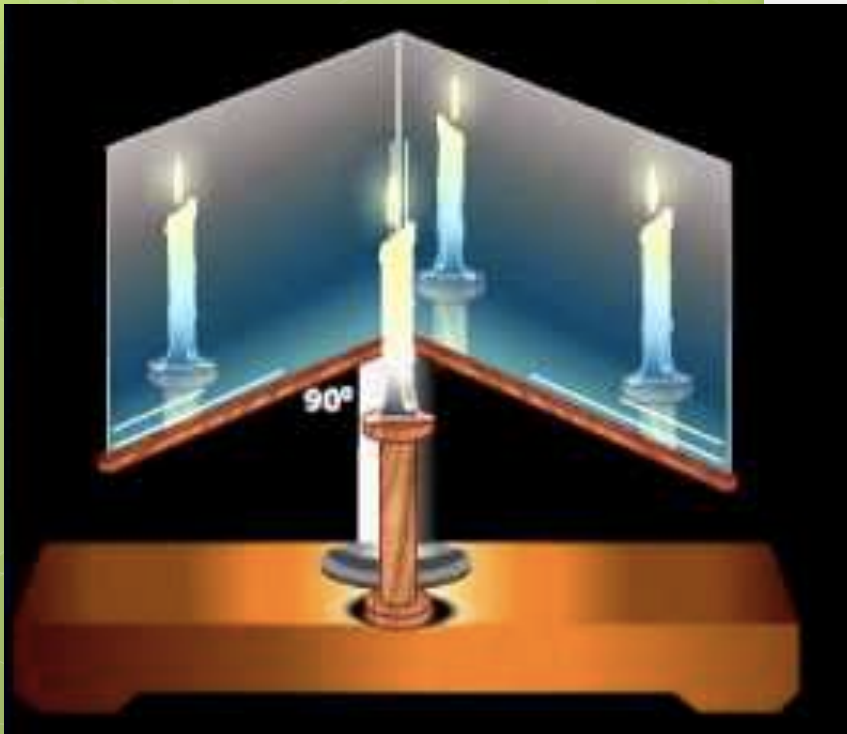
- Convex lenses are tools used to bend, or refract, light causing objects to be magnified.



Scientific Tools

Plane Mirror (Grade 8)

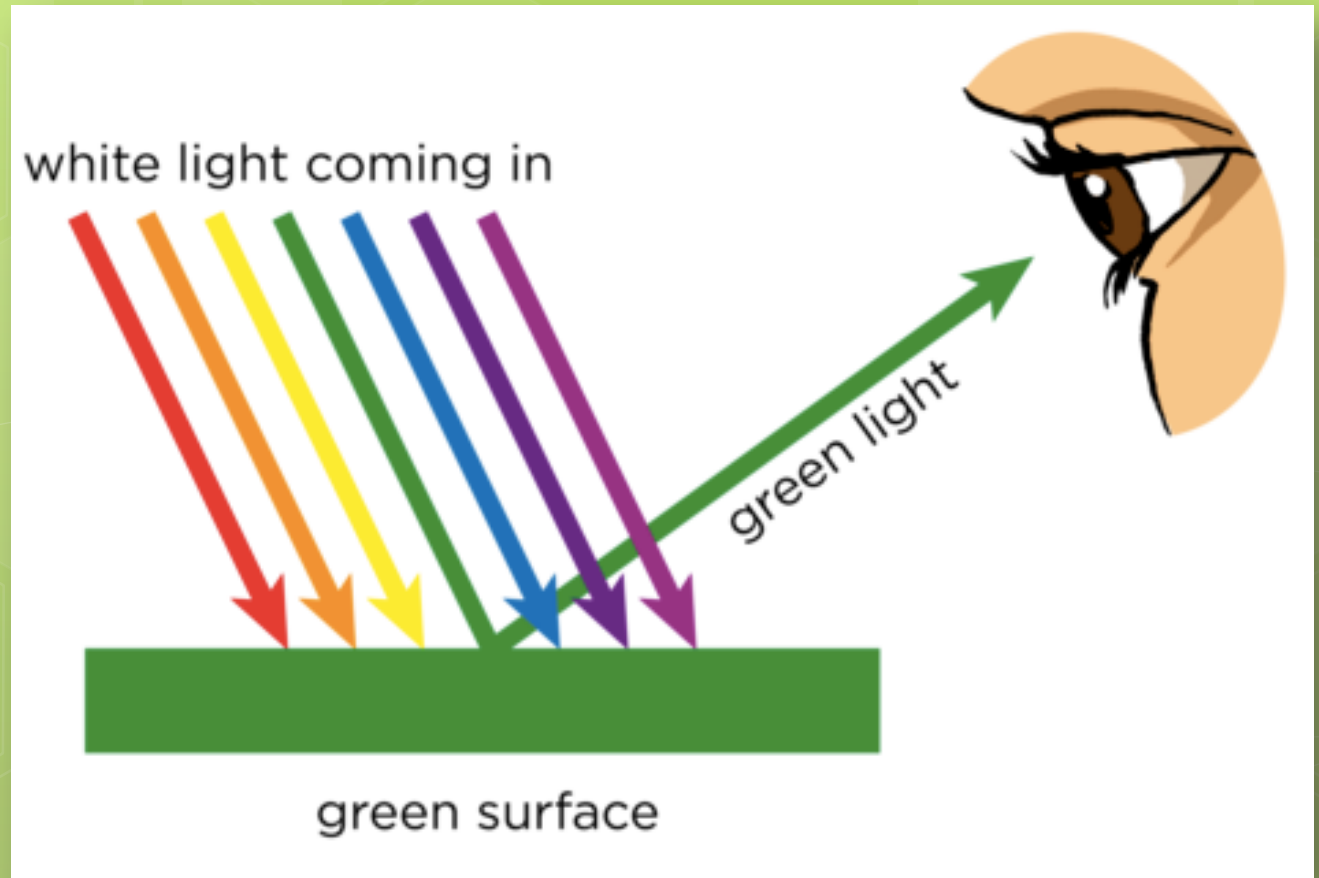
- A plane mirror is a tool used to reflect light.



Scientific Tools

Color Filters (Grade 8)

- A color filter is a tool that blocks certain wavelengths of light and transmits others.



Scientific Tools

Spring (Grade 8)

- A coiled metal spring is a tool used to model waves.

