

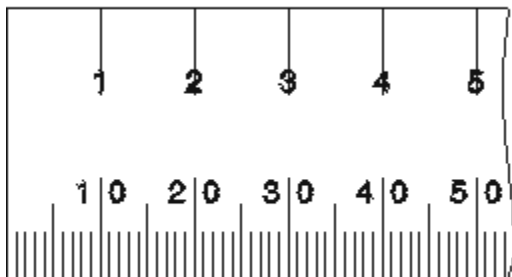
Lab Equipment Training

Measuring with a scale and units:

A scale is a series of lines and numbers used to measure things. Each scale measures things in “units,” like inches or centimeters. The units are as important as the numbers are.

Many of the measuring tools used in the science lab have scales on them. When you measure using a scale of any kind, you use the numbers to figure out what the lines stand for. Only then can you determine the measurement and label with units.

Centimeters



Millimeters

1. Ruler/Meterstick



The ruler is used to measure length in millimeters or centimeters. Make sure to determine whether zero is at the edge of the ruler or set away from the edge. Start your measurement from zero, wherever it is.

Measure and record the longest lengths of each of the objects on your table. Label with units.

- 1.
- 2.
- 3.
- 4.

2. Beam Balance

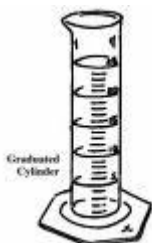


The beam balance is used to measure mass of an object or substance in grams. Please see the accompanying handout that explains how to use the beam balance.

Tare your balance and measure and record the masses of the objects on the table. Label with grams

- 1.
- 2.
- 3.
- 4.

3. Graduated Cylinder



The graduated cylinder is used to measure the volume of liquids in milliliters. Please see the accompanying handout that explains how to read the graduated cylinder. The glass graduated cylinder is delicate.

Examine the graduated cylinders on your lab table. Note that they are different sizes. Practice adding water to each one and measuring the volume with your lab group. Come to agreement about the volumes shown each time.

3. Thermometer



The lab thermometer is used to measure the temperature of objects or substances using the Celsius scale. The thermometer measures the temperature of whatever the bulb (red end) is touching. The thermometer may have a Fahrenheit scale as well. The thermometer is delicate, especially the bulb. Don't leave it standing up too tall where it could fall over easily!

Measure the temperatures of the objects and substances and record below.

- 1.
- 2.
- 3.

Reading a Graduated Cylinder

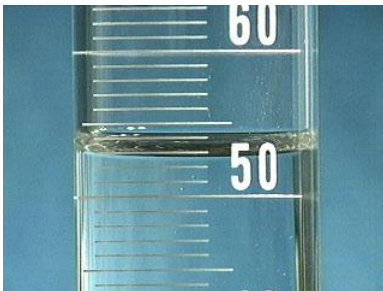


1. Measure from the lowest part of the water's curved surface, in the middle, called the meniscus.
2. Identify the nearest numbers.
3. Identify the value of each line.
4. If the meniscus is right on a line, that's the measurement.
5. If the meniscus is between lines, round to the nearest line.

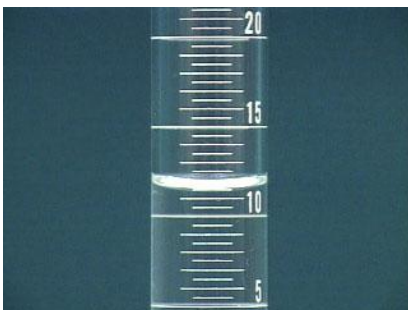
First (above): Between 6 and 8 are ten lines, so each line counts for two tenths. The big line in the middle is seven. The meniscus is right on the third line from the top, so it is 6.6ml.



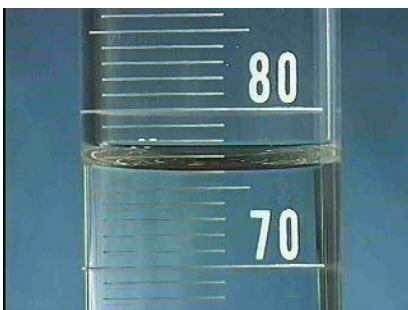
Second: Between 20 and 25 there are 10 lines, so each counts for .5 or $\frac{1}{2}$. The longer lines are the ones while the shorter lines are the halves. The meniscus is right on the third line, so it is 21.5ml.



Third: Between 50 and 60 are 10 lines, so each line counts for 1. The meniscus is closest to the third line, so it is 53ml.



Fourth: Between 10 and 15 are 10 lines, so each line counts for .5 or $\frac{1}{2}$. The meniscus is right on the third line, so it is 11.5ml.



Fifth: There are 10 lines between 70 and 80, so each line counts for one. The larger line between is for 5. The meniscus is on the sixth line, so it is 76ml.

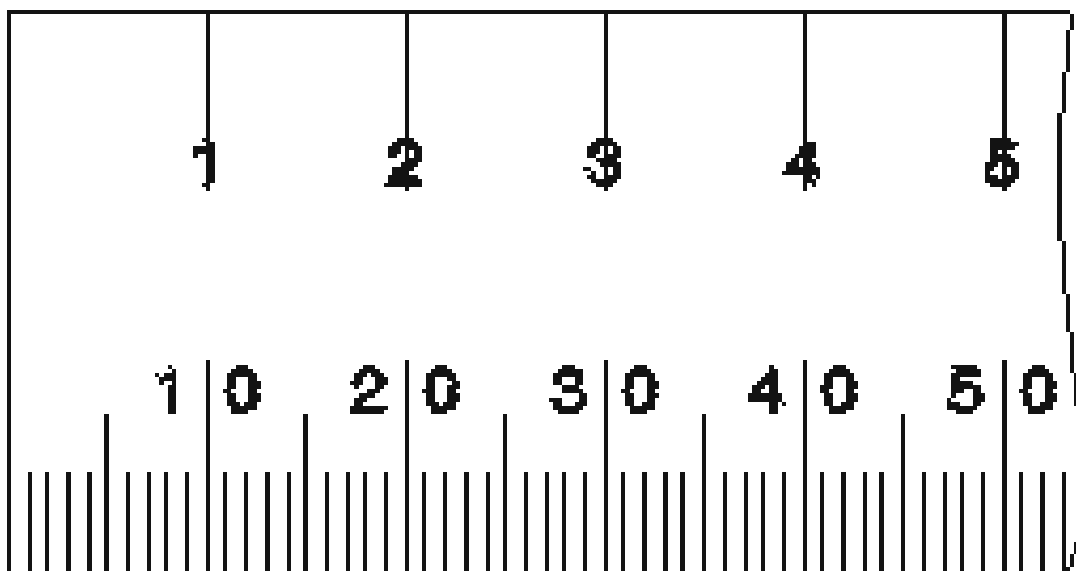
Using a Beam Balance

A beam balance measures *mass* in grams. Spring scales measure *weight*. The balance is able to measure mass without regard to gravity because it compares the weight of the scale weights and the weight of the object being weighed. Since gravity acts the same on both, it can be ignored, making the resulting measurement one of mass not weight.

Directions:

1. Slide all three weights to zero (as far to the left as they can go)
2. Check the “zero” line at the far right. If the white line on the black pointer aligns with the white line to the left of the zero, then the balance is adjusted properly. If the lines do not match, then the balance must be adjusted (tared). Adjustments are made by twisting the silver knob at the far left-hand side of the balance until the two white lines match. The balance is now adjusted.
3. Place the object to be massed in the center of the flat pan at the left. Start by moving the largest weight first (500g center beam). Move it right one notch at a time until the balance arm rocks down. Then move it back one notch left. Repeat this procedure with the 100 g beam next. Finally, get the zero lines to match by sliding the weight on the fine measurement beam (10g) to the right. When the zero lines match, add up the mass in grams of all three beams. The resulting sum is the mass of your object.
4. If you are measuring a granular or powdered substance, put a paper on the pan before adding the substance. If you are measuring a liquid, measure the liquid in a beaker or graduate. Measure and subtract the mass of the paper or liquid container from the total mass to get the mass of the substance.

Centimeters



Millimeters

Materials:

Beam balance

Ruler

Graduated cylinder

Thermometer

100 ml beakers (2)

Styrofoam cup

Warm water

Objects to measure(4)