

Metric System Group Exercises

A. Measuring Distances

With all distance measurements ask the following questions to make sure you are doing it right. Which side of the ruler are you using? Where is the zero mark? Which unit of distance is the most appropriate for each measurement?

- Use a small ruler to measure the length of the width of the joint closest to the nail of your right thumb.
- Use a meter stick to measure the height of a door frame.
- Use a meter stick to measure the distance from the front wall of the room (under the white board) to the base of the cabinet under the vacuum hood.

B. Measuring Volume of a Rectangular Object

- Measure and record the length (L), height (H), and width (W) of a block in centimeters.
- Calculate its volume (V) in cubic centimeters (cm³) by multiplying L x W x H
- Convert the blocks volume from cm³ to mm³

C. Massing Objects

- Determine the mass of 1 pennies to the nearest tenth of a gram using a balance.
- Determine the mass of 3 golf pencils to the nearest tenth of a gram using a balance.

D. Measuring the Volume of a Cylindrical Object

- Measure and record the height (H) and diameter (D) of a test tube in centimeters.
- Calculate its volume (V) in cm³. Use the formula from geometry $\pi r^2 \cdot h$

E. Measuring the Volume of Fluids Using a Graduated Cylinder

- Carefully pour the water from sample container A into a 50-ml graduated cylinder. Place the cylinder on the table and view at eye level to read the volume at the bottom of the meniscus (curved surface of the water). Record the measured volume. Pour the water back into the container from which it came.
- Repeat the previous step with the water from sample container B.

F. Finding Volume by Displacement

- Fill a 50-ml graduated cylinder to the 20 ml mark with water. Tilt the cylinder and carefully slide 6 pebbles into the water. Record the new volume.
- Calculate the total volume of the pebbles.

G. Measuring Temperature

- Record the temperature in Celsius of water taken from the tap (sink).
- Record the temperature in Celsius of the air in our classroom.
- Convert the above temperatures from Celsius to Fahrenheit, and then to Kelvin using the following equations.

$$^{\circ}\text{F} = \frac{9}{5}(^{\circ}\text{C}) + 32 \quad ^{\circ}\text{C} = \frac{5}{9}(^{\circ}\text{F} - 32) \quad \text{K} = ^{\circ}\text{C} + 273.15$$



H. Heating Materials Safely

- At one workstation, the instructor will supervise the use of the following: a small beaker, hot plate, hot gloves, tongs, and thermometer
- Fill the beaker about half full with tap water, place on hot plate, and heat on high until a full boil is reached
- Measure the temperature of the boiling water without touching the bottom of the beaker
- Remove beaker, pour out contents in sink, and allow beaker to cool.

I. Calculating Density

- Mass an empty 25-ml graduated cylinder to the nearest tenth of a gram.
- Accurately measure 20 ml of tap water in the 25-ml graduated cylinder (use a pipette to add single drops as you approach 20 ml).
- Mass the graduated cylinder + water to the nearest tenth of a gram.
- Calculate the mass of the water using the difference between the two measurements.
- Calculate (use math, not equipment) the mass of 10 mL of water.
- Calculate (use math, not equipment) the mass of 1 mL of water. (This would be the density measurement of water in grams per milliliter)