

GOAL:

Determine the density of tap water.

Collect evidence to support your answer through measurement and observation. Remember that density (*like most physical properties*) is independent of the sample size, so you'll want your data to show that water has the same density regardless of amount.

SAFETY:

If a graduated cylinder breaks, the glass will be sharp and could cut you. **DO NOT CLEAN UP BROKEN GLASS.** Instead, ask the teacher for assistance.

DENSITY:

Find "density" on page 122 of your textbook and answer the following questions.

- 1) What is "density"?

Density is a measure of the mass of a material in a given volume.

- 2) What two measurements must you know in order to calculate density?

You need to know mass and volume.

- 3) What SI units do we use for the density of a substance?

The SI unit for density is grams per milliliter (g/mL) or grams per cubic centimeter (g/cm³).

VOLUME:

Find "volume" on page 121 of your textbook and answer the following questions.

- 4) What is "volume"?

Volume is the amount of space that matter takes up.

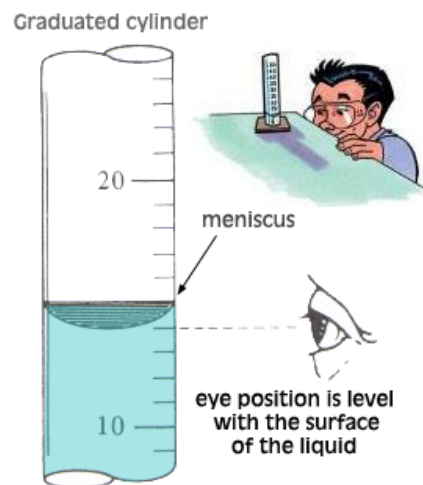
- 5) Tap water is a liquid. What SI units do we usually use for the volume of a liquid?

The SI unit for volume of liquids is milliliters (mL).

Measure a volume of 10mL of water using a graduated cylinder.

Using a Graduated Cylinder

- I. Place the graduated cylinder on a flat surface and view the height of the liquid in the cylinder with your eyes directly level with the liquid.
- II. The liquid will tend to curve downward. This curve is called the meniscus. Always read the measurement at the bottom of the meniscus.



(The unit of measurement is milliliter)

MASS:

Find "mass" on page 119-120 of your textbook and answer the following questions.

- 6) What is "mass"?

Mass is the amount of matter in an object.

- 7) How does the force of gravity affect an object's mass?

It doesn't. Gravity only affects weight, not mass.

- 8) What SI units do we usually use for the mass of a substance?

The SI unit for mass is grams (g).

Determine the mass of 10mL of water.

- 9) What is the mass of the graduated cylinder with 10mL of water? **YOUR MEASUREMENT HERE**
- 10) In order to find the mass of the water, we must subtract the mass of its container (the graduated cylinder). What is the mass of the empty graduated cylinder? **YOUR MEASUREMENT HERE**

DATA TABLE:

TRIAL #	VOLUME OF WATER (mL)	MASS OF CONTAINER WITH WATER (g)	MASS OF EMPTY CONTAINER (g)
1	10 mL	YOUR DATA	YOUR DATA
2	25 mL	YOUR DATA	YOUR DATA
3	50 mL	YOUR DATA	YOUR DATA
4	75 mL	YOUR DATA	YOUR DATA
5	100 mL	YOUR DATA	YOUR DATA

CALCULATIONS:

TRIAL #	VOLUME OF WATER (mL) <i>record the volume of water from the data table above for each trial</i>	MASS OF WATER (g) <i>subtract the mass of the container from the mass of the container with water</i>	DENSITY OF WATER (g/mL) <i>divide the mass of the water by the volume of the water</i>
1	10 mL	Should be @ 10 g	Should be @ 1 g/mL
2	25 mL	Should be @ 25 g	Should be @ 1 g/mL
3	50 mL	Should be @ 50 g	Should be @ 1 g/mL
4	75 mL	Should be @ 75 g	Should be @ 1 g/mL
5	100 mL	Should be @ 100 g	Should be @ 1 g/mL

CONCLUSIONS:

11) Did you get similar results for the density of water for all five trials?

YES, you should get results for all 5 trials that are about 1 g/mL.

12) Should we expect the density of water to be the same for all five trials? Explain your answer.

YES, density is independent of sample size, so it should have a density of 1 g/mL regardless of the amount being tested.

13) What is the average density of tap water based on your measurements? (*add up the densities for each trial and divide by the number of trials*)

Your average density for tap water should be very close to 1 g/mL (between 0.95 and 1.05 g/mL)

14) Recall the definitions of mass, volume, and density. When we calculate an object's density, what is it that we're actually describing about that substance?

Density describes how close together the particles are in the substance

15) Read about density on pages 122 and 124 of your textbook. What are two ways that we can use density to learn about an unknown substance?

Density can be used to predict whether an object will sink or float.

Density can be used to identify unknown samples of a substance.