

# DENSITY

$\rho$  = the Greek letter "rho" which we use for Density

Answer these questions on a separate page in the correct scientific manner including:

a) Equation b) Substitution of values and c) Solution with units.

1. A block has a mass of 100 grams and measures  $l = 10$  cm,  $w = 10$  cm,  $h = 2$  cm. Find its volume and density.

length width height

$$V = 10 \times 10 \times 2 = 200 \text{ cm}^3$$

$$\rho = \frac{m}{V} = \frac{100 \text{ g}}{200 \text{ cm}^3} = \frac{0.5 \text{ g}}{\text{cm}^3} = \frac{0.5 \text{ g}}{\text{mL}} \quad (1 \text{ cm}^3 \text{ is the same as 1 mL})$$

2. A steel cube (iron) has a mass of 78.6 grams and a volume of 10 cm<sup>3</sup>.

a) Calculate the density of the iron cube.  $\rho = \frac{m}{V} = \frac{78.6 \text{ g}}{10 \text{ cm}^3} = \frac{7.86 \text{ g}}{\text{cm}^3}$

- b) What is the density of iron as given in your Table of Properties?

If you "google" the Density Table of Properties, the density of iron is 7.86 g/mL which is the same

3. A cube has a mass of 89.5 grams and a volume of 10 cm<sup>3</sup>.

a) Calculate the density of the cube.  $\rho = \frac{\text{mass}}{\text{Volume}} = \frac{89.5 \text{ g}}{10 \text{ cm}^3} = \frac{8.95 \text{ g}}{\text{cm}^3}$

- b) Look in the Table of Properties to determine if the cube is aluminum, carbon, copper or gold.

It is copper (BUT you would have to google it to find out)

4. Describe in your own words how to determine the density of a regularly shaped block.

DESCRIBE IN DETAIL the LAB we did with the "VOLUME DISPLACEMENT METHOD"

5. A stone has a mass of 150 g and causes the water level in a graduated cylinder to rise from 50 mL to 75 mL when placed in it.

- a) Calculate the density of the stone.

$$\text{Volume} = \frac{75 \text{ mL}}{-50 \text{ mL}}$$

- b) Will this stone float or sink in water? Give a reason.

$$\rho = \frac{m}{V} = \frac{150 \text{ g}}{25 \text{ mL}} = 6 \text{ g/mL} \quad \text{IT WILL SINK BECAUSE it's Density is greater than water's Density.}$$

6. A stone displaces 10 mL of water.

- c) What is the volume of the stone (use correct units)?

- d) If the stone has a density of 6 g/cm<sup>3</sup>, what is the mass of the stone?

$$10 \text{ cm}^3 = 10 \text{ mL} \quad m = \rho \times V = \frac{6 \text{ g}}{\text{cm}^3} \times 10 \text{ cm}^3 = 60 \text{ g}$$

7. A piece of volcanic pumice causes the water level in a cylinder to rise from 50 to 60 mL. If the pumice has a mass of 9 grams, what is the density of the pumice?

$$\rho = \frac{\text{mass}}{\text{Volume}} = \frac{9 \text{ g}}{10 \text{ mL}} = .9 \text{ g/mL}$$

$$V = 10 \text{ mL}$$

you are not responsible for this

7b Will the pumice sink or float in water?  
WHY?

It will FLOAT because it is less dense than water.

NEVER say that it floats because it is LIGHTER.

7c Is there any reason to doubt the results reported in 7a?

Why, yes indeed. The volume displaced in 7a is questionable, because the less dense pumice would naturally float in water so they must have pushed it down to determine how much the water rises.

But I would wonder if that gave inaccurate results for the volume change if they had to push the pumice under water.

8. What is the volume of an unknown liquid with a density of  $\frac{1.35 \text{ g}}{\text{mL}}$  if you have a 54 g sample?

$$V = \frac{m}{\rho} = \frac{54 \text{ g}}{1.35 \text{ g/mL}} = \underline{40 \text{ mL}}$$