

Worksheet # C6: The Density of Liquids

1. What is the formula for density? $D = \frac{\text{mass}}{\text{volume}}$ _____

2. What is the mathematical principle behind conversions? You're multiplying by
a form of one when you're using conversion factors. _____

Equalities:

1.000 pounds = 453.59 grams 1 cm³ = 1 cc = 1 mL
 1.000 grams = 0.0353 ounces 1.000 teaspoons = 4.9289 mL
 1.000 gallons = 4.0000 quarts = 16.000 cups = 3.7854 liters

3. A glass cylinder on the contains four liquids. Given the following information about each of the liquids, determine each of their densities. Then draw a picture of the cylinder and label it to show which layer is which liquid.

a. 150. mL of Liquid A has a mass of 129 grams.

$$D = \frac{\text{mass}}{\text{volume}} = \frac{129 \text{ grams}}{150. \text{ mL}} = .860 \text{ g/mL}$$

b. 2.664 pounds of liquid B would fill up 4.56 cups.

$$D = \frac{\text{mass}}{\text{volume}} = \frac{2.664 \text{ pounds}}{4.56 \text{ cups}} \times \frac{453.59 \text{ g}}{1 \text{ pound}} \times \frac{16.000 \text{ cups}}{3.7854 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 1.12 \text{ g/mL}$$

c. 3.56 teaspoons of liquid C weighs 0.490 ounces

$$D = \frac{\text{mass}}{\text{volume}} = \frac{0.490 \text{ oz}}{3.56 \text{ tsp}} \times \frac{1 \text{ gram}}{0.0353 \text{ oz}} \times \frac{1 \text{ tsp}}{4.9289 \text{ mL}} = .791 \text{ g/mL}$$

d. 1.00 kg of liquid D would have a volume of 1.00 L

$$D = \frac{\text{mass}}{\text{volume}} = \frac{1.00 \text{ kg}}{1.00 \text{ L}} \times \frac{1000 \text{ gram}}{1 \text{ kg}} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 1.00 \text{ g/mL}$$

So the picture would show four liquids:

- c.
- a.
- d.
- b.

4. Conversion practice

Equalities:

1.000 pounds = 0.45359 kilograms = 453.59 grams

1 cm³ = 1 cc = 1 mL

1.000 grams = 0.0353 ounces

1.000 teaspoons = 4.9289 mL

1.000 gallons = 16.000 cups = 3.7854 liters

1.000 inch = 2.54 cm

1.000 mile = 5,280.00 feet = 1.6093 km

a. How many inches are in 1.00 kilometer?

$$1.00 \text{ km} \times \frac{5280.00 \text{ ft}}{1.6093 \text{ km}} \times \frac{12 \text{ in}}{1 \text{ ft}} = 39371.15516 = 39400 \text{ in}$$

b. How many teaspoons are in 1.00 cup?

$$1.00 \text{ cup} \times \frac{3.7854 \text{ L}}{16.000 \text{ cups}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ tsp}}{4.9289 \text{ mL}} = 48.0 \text{ tsp}$$

c. The density of water is 1.00 g/mL. How many pounds would 1.00 gallon of water weigh?

$$1.00 \text{ gal} \times \frac{3.7854 \text{ L}}{1 \text{ gal}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1.00 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ pound}}{453.59 \text{ g}} = 8.35 \text{ pounds}$$

d. How many kilograms would an 8.00 pound baby weigh?

$$8.00 \text{ pounds} \times \frac{453.59 \text{ g}}{1 \text{ pound}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 3.63 \text{ kg}$$

e. A quarter has a width of 2.38 cm. If you had enough quarters to make a row of them 1.000 mile long, how rich would you be? (Answer in dollars.)

$$1.00 \text{ mile} \times \frac{5280.00 \text{ ft}}{1 \text{ mile}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ quarter}}{2.38 \text{ cm}} \times \frac{1 \text{ dollar}}{4 \text{ quarters}} = 16900 \text{ dollars}$$

OR

$$1.00 \text{ mile} \times \frac{1.6093 \text{ km}}{1 \text{ mile}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ quarter}}{2.38 \text{ cm}} \times \frac{1 \text{ dollar}}{4 \text{ quarters}} = 16900 \text{ dollars}$$