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Density Quiz: Solutions

Use the density data table to answer the questions below.

- A. Determine the volume in milliliters occupied by 300 g of mercury.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 13.6 \text{ g/cm}^3 &= 300 \text{ g} / \text{Volume} \\ \text{Volume} &= 22.1 \text{ cm}^3 [1\text{mL} / 1 \text{ cm}^3] = 22.1 \text{ mL}\end{aligned}$$

- B. Determine the mass of an aluminum cube with side lengths of 2 cm.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 2.70 \text{ g/cm}^3 &= \text{Mass} / \text{Length}^3 = \text{Mass} / [2 \text{ cm}]^3 \\ \text{Mass} &= 21.6 \text{ g}\end{aligned}$$

- C. A student obtains 12 mL of water in a 25 mL graduated cylinder. When a 4 oz irregularly shaped object is placed in the cylinder, the water level is 22.8 mL. Determine the density of the object and its identity.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ \text{Density} &= 4 \text{ oz} [1 \text{ lb} / 16 \text{ oz}] [1 \text{ kg} / 2.205 \text{ lb}] [1000\text{g} / \text{kg}] / [22.8 \text{ mL} - 12 \text{ mL}] \\ \text{Density} &= 10.5 \text{ g/mL} [1 \text{ mL} / 1 \text{ cm}^3] = 10.5 \text{ g/cm}^3 \\ \text{The object is made of silver.}\end{aligned}$$

- D. Pumice has a density of 0.951 g/cm^3 . Will pumice float on water? Gasoline?

Pumice will float in water because it is less dense.
Pumice will sink in gasoline because it is more dense.



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- E. A cookie recipe requires 1 cup of sugar which has a mass of 200 g. Determine the volume of the sugar.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 1.59 \text{ g/cm}^3 &= 200 \text{ g} / \text{Volume} \\ \text{Volume} &= 126 \text{ cm}^3\end{aligned}$$

- F. In units of liters, determine the volume of 10 lbs of air.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 0.00129 \text{ g/cm}^3 [1000 \text{ cm}^3 / \text{L}] &= 10 \text{ lbs} [\text{kg} / 2.205 \text{ lbs}] [1000\text{g} / \text{kg}] / \text{Volume} \\ \text{Volume} &= 3520 \text{ L}\end{aligned}$$

- G. A spherical container can hold a maximum amount of 500 g of honey. Determine the radius of the container.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 1.42 \text{ g/cm}^3 &= 500 \text{ g} / [4/3 \pi (\text{radius})^3] \\ \text{radius} &= 4.38 \text{ cm}\end{aligned}$$

- H. Determine the density of water with units of kg/m^3 .

$$1 \text{ g/cm}^3 [\text{kg} / 1000 \text{ g}] [100 \text{ cm} / \text{m}]^3 = 1000 \text{ kg/m}^3$$

- I. Which has a greater mass - 100 cm^3 of copper or 100 cm^3 of lead?

$$\begin{aligned}\text{Density}_{\text{Cu}} &= \text{Mass}_{\text{Cu}} / \text{Volume}_{\text{Cu}} \\ 8.89 \text{ g/cm}^3 &= \text{Mass}_{\text{Cu}} / 100 \text{ cm}^3 \\ \text{Mass}_{\text{Cu}} &= 889 \text{ g}\end{aligned}$$

$$\begin{aligned}\text{Density}_{\text{Pb}} &= \text{Mass}_{\text{Pb}} / \text{Volume}_{\text{Pb}} \\ 11.3 \text{ g/cm}^3 &= \text{Mass}_{\text{Pb}} / 100 \text{ cm}^3 \\ \text{Mass}_{\text{Pb}} &= 1130 \text{ g (Greatest Mass)}\end{aligned}$$

- J. A 14 gauge copper wire has a diameter of 0.06410 cm and a mass of 27.4 g. Determine the length of the wire with units of meters.

$$\begin{aligned}\text{Density} &= \text{Mass} / \text{Volume} \\ 8.89 \text{ g/cm}^3 &= 27.4 \text{ g} / [\pi (0.06410 \text{ cm} / 2)^2 \text{Length}] \\ \text{Length} &= 955 \text{ cm} [\text{m} / 100 \text{ cm}] = 9.55 \text{ m}\end{aligned}$$