

CHAPTER 4

Text Reference: Section 4-5

Non-SI Supplementary Problems

The density of a liquid is often expressed as the number of grams per milliliter of the substance (g/mL). Because the density of a gas is often much less than that of a liquid, the density of a gas is usually expressed as grams per liter (g/L).

Example: A sample of an unknown liquid is found to have a volume of 87.3 mL and a mass of 99.1 grams. Calculate its density, expressing your answer in terms of the units given.

$$\begin{aligned} \text{Density} &= \frac{\text{mass}}{\text{volume}} \\ &= \frac{99.1 \text{ g}}{87.3 \text{ mL}} \\ &= 1.135 \text{ g/mL} = 1.14 \text{ g/mL} \end{aligned}$$

Exercises

Solve the following problems on a separate sheet of paper, showing all work. Express your answers in the correct units with the appropriate number of significant figures.

1. What is the density of an element if a sample having a mass of 43.2 g has a volume of 96.5 mL?

2. A sample of a gas has a volume of 4.0 L and a mass of 4.922 g. What is its density?

3. Mercury has a density of 13.6 g/mL. What is the volume of a sample of mercury that has a mass of 2242 g?

4. If a liquid has a density of 0.880 g/cm³, what volume of this liquid would have a mass of 54 g?

5. What is the mass of 84 mL of a liquid if its density is 1.25 g/mL?

6. What is the mass of 25 mL of oxygen gas if its density is 1.43 g/L?

7. A student determines the mass and volume of three samples of a liquid to be:

Sample	Volume	Mass
A	116 mL	85 g
B	168 mL	101 g
C	158 mL	115 g

Could all of these be samples of the same substance? If not, which could be?

8. A gas is confined in a rectangular tank 25.0 cm long, 8.0 cm high and 10.4 cm wide.

If the density of the gas is 19.3 g/L, what is the mass of the gas?

9. The density of an acid is 1.85 g/mL. What volume of the acid would have a mass of 64 g?

10. If 40.0 mL of a liquid with a mass of 44.8 g was mixed with 50.0 mL of a liquid having a mass of 48.0 g, what would the density of the resulting liquid be?

11. A student measures the mass and volume of samples of three liquids to be:

Liquid	Volume	Mass
A	48.5 mL	37.2 g
B	12.8 mL	174.1 g
C	64.7 mL	71.2 g

a. What is the density of each liquid?

b. These liquids do not mix. If the samples are poured into one container, which will rise to the top? Which will sink to the bottom?