

Name

Per:

Date:

Density Worksheet

Chemistry in Context 2008-9

Perhaps someone has tried to trick you with this question: "Which is heavier, a pound of lead or a pound of feathers?" Many people would instinctively answer "lead." When they give this incorrect answer, these people are really thinking of density. If a piece of lead and a feather of the same volume are weighed, the lead would have a greater mass than the feather. It would take a much larger volume of feathers to equal the mass of a given volume of lead.

Density is the relationship of the mass of an object to its volume. Density is usually reported in units of grams per cubic centimeter (g/cm^3). For example, water has a density of 1.00 g/cm^3 . Since a cubic centimeter contains the same volume as a milliliter, in some cases you may see density expressed as g/mL .

$$\text{Density} = \frac{\text{mass}}{\text{volume}} \quad \text{or} \quad D = \frac{M}{V}$$

To solve density problems, list the known and unknown values, then use one of the following.

▶ When a problem requires you to calculate density, use the density equation, $D = \frac{M}{V}$

▶ You can solve for mass by multiplying both sides of the density equation by volume.

$$D V = \frac{M \cancel{V}}{\cancel{V}} \quad \text{or} \quad M = D V$$

▶ You can solve for volume by dividing both sides of the equation above by density.

$$\frac{M}{D} = \frac{\cancel{M} V}{\cancel{D}} \quad \text{or} \quad V = \frac{M}{D}$$

Example: What is the mass of an object that has a density of 8 g/cm^3 and a volume of 64 cm^3 ?

Known: $D = 8 \text{ g/cm}^3$

$V = 64 \text{ cm}^3$

Unknown: $M = ?$

Equation to use: $M = D V$

"Plug and chug": $M = (8 \text{ g/cm}^3) (64 \text{ cm}^3) = 512 \text{ g}$

PROBLEMS List the known and unknown values; try to derive the equation without looking above.

1. A piece of tin has a mass of 16.52 g and a volume of 2.26 cm^3 . What is the density of tin?

Known:

Unknown:

2. A man has a 50.0 cm^3 bottle completely filled with 163 g of a slimy green liquid. What is the density of the liquid?

Known:

Unknown:

3. A sealed 2500 cm^3 flask is full to capacity with 0.36 g of a substance. Determine the density of the substance. Guess if the substance is a gas, a liquid, or a solid.

Known:

Unknown:

4. Different kinds of wood have different densities. The density of oak wood is generally 0.7 g/cm^3 . If a 35 cm^3 piece of wood has a mass of 25 g , is the wood likely to be oak?

Known:

Unknown:

5. The density of pine is generally about 0.5 g/cm^3 . What is the mass of a 800 cm^3 piece of pine?

Known:

Unknown:

6. What is the volume of 325 g of metal with a density of 9.0 g/cm^3 ?

Known:

Unknown:

7. Diamonds have a density of 3.5 g/cm^3 . How big is a diamond that has a mass of 0.10 g ?

Known:

Unknown:

8. What mass of water in grams will fill a tank 100 cm long, 50 cm wide, and 30 cm high?

Known:

Unknown:

9. A graduated cylinder is filled with water to a level of 40.0 mL . When a piece of copper is lowered into the cylinder, the water level rises to 63.4 mL . Find the volume of the copper sample. If the density of the copper is 8.9 g/cm^3 , what is its mass?

Known:

Unknown: