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

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, $\boxed{D = \frac{M}{V}}$
- You can solve for mass by multiplying both sides of the density equation by volume.

  $D\,V = \frac{M\cancel{V}}{\cancel{V}}$ or $\boxed{M = D\,V}$
- You can solve for volume by dividing both sides of the equation above by density.

  $\frac{M}{D} = \frac{\cancel{D}\,V}{\cancel{D}}$ or $\boxed{V = \frac{M}{D}}$

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:	$D = 8\ g/cm^3$
	$V = 64\ cm^3$
Unknown:	$M = ?$
Equation to use:	$M = D\,V$
"Plug and chug":	$M = (8\ g/cm^3)\ (64\ cm^3) = 512\ g$

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: