

Name:

Date:

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Unit1: Scientific Reasoning

### Scientific Problem Solving

Whenever you solve a problem in science class, the first and most important step is for you to understand which quantity, or variable, you are solving for. The rest is easy, as long as you follow these steps and show all of your work in a neat and organized way.

#### Problem Solving Steps:

- List all given information
- Write down the most useful equation
- Rearrange the equation for the variable you are solving for
- Plug in the given values
- Record your answer with proper units

#### Example:

A student calculates the volume of a block of wood to be  $45 \text{ cm}^3$ . She knows that this type of wood has a density of  $0.85 \text{ g/cm}^3$ . What is the mass of this block of wood?

#### Solution:

$$V = 45 \text{ cm}^3$$

$$D = 0.85 \text{ g/cm}^3$$

$$m = ?$$

$$D = \frac{m}{V}$$

Multiply both sides by V to isolate m:

$$V \cdot D = \frac{m}{\cancel{V}} \cdot \cancel{V}$$

$$m = VD$$

Plug in the given information and cancel units:

$$(45 \text{ cm}^3)(0.85 \text{ g/cm}^3) = 38.25 \text{ g}$$

#### To Do:

Solve the following problems, showing **ALL** work on a separate sheet of paper.

- What is the density of a substance if it has a mass of 20 g and a volume of 5 mL?
- What is the density of an object if its volume is  $60 \text{ cm}^3$  and its mass is 12 grams?
- The density of a substance is  $45 \text{ g/mL}$  and its mass is 15 grams. What is the volume of this substance?
- The volume of an object is  $100 \text{ cm}^3$  and its density is  $1.6 \text{ g/cm}^3$ . What is the object's mass?
- What is the density of a box with dimensions of 2 cm by 4 cm by 10 cm and has a mass of 40 grams?
- What is the volume of an object if it has a density of  $0.5 \text{ kg/cm}^3$  and a mass of 100 grams? (Hint: watch those units!)

Rearrange each equation for the variable listed. Show **ALL** work.

$$v = \frac{\Delta x}{\Delta t}$$

- Rearrange to solve for  $\Delta x$
- Rearrange to solve for  $\Delta t$

$$v = \lambda f$$

- Rearrange for  $\lambda$
- Rearrange for  $f$

$$PV = nRT$$

- Rearrange for P
- Rearrange for V
- Rearrange for n
- Rearrange for R
- Rearrange for T