

Complete each of the following problems. For numerical problems, you must show your work in order to possibly earn full credit.

1. Identify the following as either *chemical* or *physical* changes or properties. (2 pts. ea.)

<u>Chemical</u>	a. Sodium reacts with water to form sodium hydroxide.
<u>Physical</u>	b. Frost forms on a cold window pane.
<u>Physical</u>	c. Sugar is a solid at room temperature.
<u>Chemical</u>	d. Antacids often help an upset stomach.

2. Convert the following metric quantities. (4 pts. ea.)

a. 36 nL = ? mL

Pertinent conversion factors: $1 \text{ nL} = 10^{-9} \text{ L}$, $1 \text{ mL} = 10^{-3} \text{ L}$

$$36 \text{ nL} \times \frac{10^{-9} \text{ L}}{1 \text{ nL}} \times \frac{1 \text{ mL}}{10^{-3} \text{ L}} = 36 \times 10^{-6} \text{ mL} = 3.6 \times 10^{-5} \text{ mL}$$

b. $1.8 \times 10^{-10} \text{ kg} = ? \text{ }\mu\text{g}$

Pertinent conversion factors: $1 \text{ kg} = 10^3 \text{ g}$, $1 \text{ }\mu\text{g} = 10^{-6} \text{ g}$

$$1.8 \times 10^{-10} \text{ kg} \times \frac{10^3 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ }\mu\text{g}}{10^{-6} \text{ g}} = 1.8 \times 10^{-1} \text{ }\mu\text{g} = 0.18 \text{ }\mu\text{g}$$

3. When you exhale, you typically breathe out roughly 500 mL of air. If 1.0 L of exhaled air has a mass of 1,200 mg, how many breaths will it take to exhale 100 g air? (8 pts.)

$$\frac{500 \text{ mL air}}{1 \text{ breath}} \times \frac{10^{-3} \text{ L}}{1 \text{ mL}} \times \frac{1,200 \text{ mg air}}{1 \text{ L}} \times \frac{10^{-3} \text{ g}}{1 \text{ mg}} = \frac{0.60 \text{ g air}}{1 \text{ breath}}$$
$$100 \text{ g air} \times \frac{1 \text{ breath}}{0.60 \text{ g air}} = 166.7 = 167 \text{ breaths}$$

Bonus: List one example of each of the following. There are many acceptable answers to each part. (2 points each)

a. a chemical element: _____

b. a chemical compound: _____