

Practice Problems

1. Circle the word/phrase that best fits the statement:

- A. **PHYSICAL** OR CHEMICAL] changes are changes in which the identity of the substance does not change.
- B. Chemical changes sometimes produce a **GAS** or GEL] which can be observed by wafting.
- C. When two clear solutions mix, [NOTHING HAPPENS or **A PRECIPITATE**] forms producing a cloudy mixture.
- D. **QUANTITATIVE** or QUALITATIVE] properties deal with numbers.
- E. **PURE SUBSTANCE** or MIXTURE] contains only one type of atom or molecule.
- F. **REACTIVITY**, DENSITY, or MELTING] is not a physical property.
- G. A mixture that is completely uniform in composition is a **HOMOGENEOUS** or HETEROGENEOUS] mixture.

2. Indicate whether its a chemical or physical change:

- A. milk souring **Chem**
- B. gasoline burning **Chem**
- C. Ice melting **Phys**
- D. Chopping wood **Phys**
- E. Breath fogging a mirror **Phys**

3. Indicate whether the material is a COMPOUND, ELEMENT, HOMOGENEOUS MIXTURE, or HETEROGENEOUS MIXTURE.

- A. hydrogen peroxide **C**
- B. copper **E**
- C. a salad **Het. M**
- D. Sugar **C**
- E. stainless steel **Hom M**
- F. Nitrogen Gas **E**
- G. Ozone **E** (allotrope of oxygen)

4. Indicate TRUE or FALSE.

- A. F Elements can be separated easily into simpler substances.
- B. T Compounds can be separated into simpler substances
- C. T The properties of compounds are different from those of their components.
- D. F Allotropes can be described as elements and compounds.
- E. T Chemical properties are only observed when a substance undergoes a chemical change.

5. Identify the number of sig figs in each measurement:

- A. **3** 0.370 g
- B. **4** 70,420 mL
- C. **1** 5×10^4 m/s
- D. **2** 0.0039 s
- E. **3** 7.30×10^{14} ms

6. Convert the following:

- A. 3.5 Liters to Cubic Centimeters
- B. 0.75 kg to mg
- C. 4×10^{14} nanoseconds to centiseconds
- D. 0.52 km to m
- E. 750 microliters to liters
- F. 7 Megagrams to milligrams

A) $3.5 \text{ L} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} = \boxed{3,500 \text{ cm}^3}$

D) $0.52 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = \boxed{520 \text{ m}}$

B) $0.75 \text{ kg} \times \frac{1,000,000 \text{ mg}}{1 \text{ kg}} = \boxed{750,000 \text{ mg}}$

E) $750 \mu\text{L} \times \frac{1 \text{ L}}{1,000,000 \mu\text{L}} = \boxed{7.5 \times 10^{-4} \text{ L}}$

C) $4 \times 10^{14} \text{ ns} \times \frac{1 \text{ cs}}{1 \times 10^7 \text{ ns}} = \boxed{4 \times 10^7 \text{ cs}}$

F) $7 \text{ Mg} \times \frac{1 \times 10^6 \text{ g}}{1 \text{ Mg}} \times \frac{1 \times 10^3 \text{ mg}}{1 \text{ g}} = \boxed{7 \times 10^9 \text{ mg}}$

7. Perform the following Arithmetic and place the answer in the correct number of sig figs (multiplication/division rules for significant figures trump addition/subtraction rules)

A. $(21 \text{ mL} - 19.0 \text{ mL}) / 4 \times 10^2 \text{ mg} \rightarrow 5 \times 10^{-3} \text{ mL/mg}$

B. $734 \text{ m} \times 7.3 \times 10^2 \text{ m} - 3.23 \times 10^2 \text{ m} = 3.0 \times 10^5 \text{ m}^2$

C. $(0.0323 \text{ kg} + 0.324 \text{ kg}) \times 8.8 \times 10^{-1} \text{ m}^2 = 3.1 \times 10^{-1} \text{ kg} \cdot \text{m}^2$

8. Calculate the number of seconds in the entire month of October.

$$31 \text{ days} \times \frac{24 \text{ hr}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ s}}{1 \text{ min}} = 2,678,400 \text{ s}$$

9. Each chemistry teacher provides 6 test tubes to each lab group. In each class there are 12 lab groups, and the teacher has four classes. There are a total of 5 chemistry teachers. How many test tubes does the chemistry department provide for their students? (Use dimensional analysis)

$$5 \text{ teachers} \times \frac{4 \text{ classes}}{1 \text{ teacher}} \times \frac{12 \text{ lab groups}}{1 \text{ class}} \times \frac{6 \text{ test tubes}}{1 \text{ lab group}} = 1,440 \text{ test tubes}$$

10. A light year is the distance that light can travel in one year. If the sun is 150,000,000 km away, how many light years is the sun from the earth? Light travels at the speed of $3.0 \times 10^8 \text{ m/s}$. Place your answer in scientific notation.

$$150,000,000 \text{ km} \times \frac{1000 \text{ m}}{1 \text{ km}} = 1.5 \times 10^{11} \text{ m} \rightarrow 1.5 \times 10^{11} \text{ m} \times \frac{1 \text{ yr}}{9.4 \times 10^{15} \text{ m}} = 1.6 \times 10^{-5} \text{ yrs}$$

$$\frac{3.0 \times 10^8 \text{ m}}{1 \text{ sec}} \times \frac{60 \text{ s}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ d}} \times \frac{365 \text{ d}}{1 \text{ yr}} = 9.4 \times 10^{15} \frac{\text{m}}{\text{yr}}$$

11. What is the cost in dollars for the nails used to build a fence 125 meters long if it requires 30 nails per meter? Assume 40 nails are sold per box at a cost of \$3.35 a box.

$$125 \text{ m} \times \frac{30 \text{ nails}}{1 \text{ m}} \times \frac{1 \text{ box}}{40 \text{ nails}} \times \frac{\$3.35}{1 \text{ box}} = \$314$$

12. Determine the Volume that a 35.2 grams sample of carbon tetrachloride will occupy if it has density of 1.60 g/mL.

$$D = \frac{M}{V} \rightarrow V = \frac{M}{D} = \frac{35.2 \text{ g}}{1.60 \text{ g/mL}} = 22.0 \text{ mL}$$

13. The density of ethanol is 0.789 g/mL. What is the mass of a 100 mL sample?

$$D = \frac{M}{V} \quad M = D \cdot V$$

$$= (0.789 \text{ g/mL})(100 \text{ mL}) = 78.9 \text{ g} \rightarrow \text{rounded to } 80 \text{ using sig fig rules}$$

14. Gold can be hammered into extremely thin sheets called gold leaf. If a 200 mg piece of gold with a density of 19.32 g/mL is hammered into a sheet measuring 2.4 ft by 1.0 ft, what is the average thickness of the sheet in meters (Volume of a rectangular prism is $L \times W \times H$)

1st... $D = \frac{M}{V} \rightarrow V = \frac{M}{D}$

$$V = \frac{0.200 \text{ g}}{19.32 \text{ g/mL}} = 0.0104 \text{ mL}$$

$$\approx 0.0104 \text{ m}^3$$

Change ft to m:

$$2.4 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.73 \text{ m}$$

$$1.0 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.30 \text{ m}$$

Finish ✓