Name _____ HONORS CHEM ____/____/____

Scientific Notation, Density, Percent Error & Metric Conversions

Homework: Solve each of the following problems on a separate sheet of paper.

1. Perform the following mathematical operations, and express the result to the correct number of significant figures.
   a. $(6.022 \times 10^{23}) \times (2.33 \times 10^{3}) =$ **1.40×10^{27}**
   b. $1.00876 + 0.87206 - 0.0996 =$ **1.7812**
   c. $(7.915 - 7.908) \div 7.915 \times 100. =$ **0.09**
   d. $(3.000 \times 10^{5}) \div (4.00 \times 10^{-6}) =$ **7.50×10^{10}**
   e. $2.38 \div 55.8 \times (6.022 \times 10^{23}) =$ **2.57×10^{22}**

2. Convert each of the following.
   a. 8.57 micrograms to centigrams = **8.57×10^{-4} centigrams**
   b. 2.11×10^{-4} dekaliters to milliliters = **2.11 milliliters**
   c. 1.95×10^{11} nanometers to meters = **1.95×10^{2} meters**
   d. 2.27 kilograms to decigrams = **2.27×10^{4} decigrams**
   e. 6.19×10^{-8} megagrams to micrograms = **6.19×10^{4} micrograms**

3. The density of pure platinum is 21.45 g/mL at 20°C. If 5.50 grams of pure platinum is added to 14.45 mL of water, to what volume will the level in the cylinder rise?

$$\frac{21.45\text{g}}{\text{mL}} = \frac{5.50\text{g}}{\text{x mL}}$$

x = 0.256 mL
0.256 mL + 14.45 mL = 14.706 mL (rounded to) **14.71 mL**

4. A 20.00 gram sample of a solid is placed in a graduated cylinder and then filled to the 50.00 mL mark with benzene. The mass of the benzene and the solid together is 58.80 g. Assuming that the solid is insoluble in benzene and the density of benzene is 0.880 grams/cm^3, calculate the density of the solid.

Benzene mass = 58.80 g – 20.00 grams = 38.80 grams
Benzene density = 0.880 g/mL (given)
Benzene volume = 44.1 mL

Solid volume = 50.00 – 44.1 = 5.9 mL
Solid mass = 20.00 grams (given)
Solid density = **3.4 g/mL**

In class practice

Calculate the following, giving your answers in scientific notation and significant figures.

1. $(3.691 \times 10^{7}) \times (2.01 \times 10^{5}) =$ **7.42×10^{2}**

2. $(2.65 \times 10^{3}) \div (4.01 \times 10^{-3}) =$ **6.61×10^{5}**

3. $(2.01 \times 10^{10})(3.6 \times 10^{-5})(9.01 \times 10^{0}) =$ **6.5×10^{6}**

4. $(2.570 \times 10^{1}) \times (3.101 \times 10^{4}) \div (3.60 \times 10^{9}) =$ **2.21×10^{-4}**

Solve each of the following density problems.

1. What are the two units in which density could be written? **g/mL or g/cm^3**

2. What is the density of water? **1.0 g/mL**

3. What is the density of a piece of cork that has a mass of 0.650 g and a volume of 2.7 cm^3? **0.24 g/mL**

4. Barium perchlorate has a density of 2.74 g/cm^3. What is the mass of 27.2 cm^3 of this substance? **74.5 g**

5. Bismuth phosphate has a density of 6.32 g/cm^3. What is the mass of 25.9 cm^3 of this substance? **164 g**

6. Cerium sulfate has a density of 3.17 g/cm^3. Calculate the volume of 599 g of this substance. **189 cm^3**

7. Chromium silicide has a density of 5.50g/cm^3. Calculate the volume of 35.9 g of this substance. **6.53 cm^3**

Calculate the percent error and percent yield for each of the following.

1. Experimental : 13.5 g/mL, theoretical: 15.0 g/mL % error: **10.%** % yield: **90.%**

2. Experimental : 0.55 g/mL, theoretical: 0.66 g/mL % error: **17%** % yield: **83%**

3. Experimental : 29.5 g/mL, theoretical: 28.0 g/mL % error: **5.4%** % yield: **94.6%**

Perform each of the following metric conversions.

1. How many kilograms (kg) are there in 2.023 x 10^{-3} milligram (mg)? **2.023 x 10^{-9}**
2. A book is found to have a mass of 0.6321 kilogram (kg). Calculate its mass in grams (g). **6.321 x 10^{2}**
3. How many meters (m) are there in 4312 centimeters (cm)? **4.312 x 10^{1}**
4. How many meters are there in 2.0043 x 10^{-5} kilometers? **2.0043 x 10^{-2}**
5. Calculate the number of kilometers there are in 1.549 micrometers. **1.549 x 10^{-9}**