CHEM 103
PLI 1
Tuesday, May 24, 2016

Please simplify/solve/express in scientific notation to 3 sig figs. If you can, try to manipulate each one in multiple ways. For instance:

$$\left(16\cdot\frac{1}{4}\right)^{\frac{1}{2}} = 16^{\frac{1}{2}}\cdot\left(\frac{1}{4}\right)^{\frac{1}{2}} = \sqrt{16}\cdot\frac{\sqrt{1}}{\sqrt{4}} = 4\cdot\frac{1}{2} = 2 \qquad \text{OR} \qquad \left(16\cdot\frac{1}{4}\right)^{\frac{1}{2}} = (4)^{\frac{1}{2}} = 2$$

There is often an "eastist" way to simplify a given expression, but it takes practice to develop comfort with different operations.

1) $\sqrt[5]{1.28\times10^{19}} = (1.28\times10^{19})^{\frac{1}{5}}$

$= 6.63\times10^{3}$

2) $\log x = 8.73$ rewrite in exponential form

$10^{8.73} = x$

$x \approx 5.37\times10^{8}$

3) $\left(12\cdot\frac{1}{6}\right)^{7} = 2^{7} = 128$

$= 1.28\times10^{2}$

4) $4^{5}\cdot6^{5} = (4\cdot6)^{5} = 24^{5}$

$\approx 7.96\times10^{6}$

5) $\frac{1}{2}\cdot\ln(50)\cdot\ln(400) =$

$= \ln(50)\cdot\frac{1}{2}\ln(400)$

$= \ln(50)\cdot\ln(\sqrt{400})$

$= \ln(50)\cdot\ln(20) = 1.17\times10^{1}$

6) $\log_{x} 8 = 3$

$x^{3} = 8$

$x = 8^{\frac{1}{3}} = 2$

$x = 2.00\times10^{0}$

7) If Jane and Dan are 1.97×10^{-2} miles apart, how many micrometers apart are they?
Givens: 1 mile = 5,280 ft. 1 ft. = 12 in. 1 in. = 0.0254 m 1 m = 1×10^{6} μm

$$1.97\times10^{-2}\,\text{mi}\left(\frac{5280\text{ ft}}{1\text{ mi}}\right)\left(\frac{12\text{ in}}{1\text{ ft}}\right)\left(\frac{0.0254\text{ m}}{1\text{ in}}\right)\left(\frac{1\times10^{6}\,\mu\text{m}}{1\text{ m}}\right)$$

$= 3.17\times10^{7}\,\mu\text{m}$

*usually, standards used for conversions do not affect significant figures because they are considered exact values, and could be expressed with infinite significant figures
(e.g. 12 inches = 1.00000000 ft)

8) Pure water has its highest density of 1000.kg/m³ at temperature 4°C.
You heat water to 90°C and find that a 15.0mL sample has mass 14.5 g.
By what percent of its original, highest density has your sample's density decreased?
Givens: 1 mL = 1 cm³ 1 m³ = 1 x 10⁶ cm³ (does this make sense?) 1 kg = 1000 g

original density = $\frac{\text{mass}}{\text{volume}}$ = 1000. kg/m³

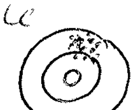
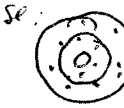
new mass = 14.5 g $\left(\frac{1 \text{ kg}}{1000 \text{ g}}\right)$ = 1.45×10^{-2} kg

new density = $\frac{\text{new mass}}{\text{new volume}}$ = $\frac{1.45 \times 10^{-2} \text{ kg}}{1.50 \times 10^{-5} \text{ m}^3}$ = 966.67 kg/m³ ≅ 967 kg/m³

new volume = 15.0 mL $\left(\frac{1 \text{ cm}^3}{1 \text{ mL}}\right)\left(\frac{1 \text{ m}^3}{1 \times 10^6 \text{ cm}^3}\right)$ = 1.50×10^{-5} m³

% decrease = $\frac{1000. \text{ kg/m}^3 - 967 \text{ kg/m}^3}{1000. \text{ kg/m}^3}$ (100) = 3.3 %

10) What is the difference between accuracy and precision? Is it possible for measurements to be precise but not accurate? Accurate but not precise?

Accuracy refers to the closeness of a measured value to the actual value. Precision refers to the closeness of multiple measurements to one another. || Precise but not accurate: 
Accurate but not precise:  (the average is accurate)

9) Given the chemical symbol, provide the name of the following elements:

a. Na sodium
b. F fluorine
c. Cu copper
d. Ag silver
e. Fe iron
f. Pb lead

10) Please connect and fill in the boxes with the terms below, providing brief explanations.

Compounds
Homogenous mixture
Heterogeneous mixture
Pure substances
Mixtures
Elements
Matter