CHEM 130 **Name** _____
Quiz 2 – September 1, 2017

Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

1. Perform the following conversions. Report your answers in scientific notation. (6 pts.)

   a. 140 pm (diameter of a copper atom) = _____cm

$$140\ \cancel{pm} \times \frac{10^{-12}\ \cancel{m}}{1\ \cancel{pm}} \times \frac{1\ cm}{10^{-2}\ \cancel{m}} = \mathbf{1.4 \times 10^{-8}\ cm}$$

   b 19.3 g/cm^3 (density of gold) = _____kg/m^3

$$\frac{19.3\ \cancel{g}}{\cancel{cm}^3} \times \frac{1\ kg}{10^3\ \cancel{g}} \times \frac{(1\ \cancel{cm})^3}{(10^{-2}\ m)^3} = \mathbf{1.93 \times 10^4\ kg/m^3}$$

2. When using a statistical analysis to evaluate the uncertainty in a dataset, what key assumption do we make? A single sentence should be sufficient for your answer. (3 pts.)

   We assume no systematic errors are present, only random errors.

3. My cell phone, in its case, measures 7.49±0.02 cm wide, 14.90±0.02 cm long and 10.1±0.2 mm thick. What is its volume, with associated uncertainty, in cubic centimeters? (8 pts)

volume = (7.49±0.02 cm)(14.90±0.02 cm)(1.01±0.02 cm) = (112.72±? cm^3)

$$e_R = 112.72\text{cm}^3 \sqrt{\left(\frac{0.02\text{cm}}{7.49\text{cm}}\right)^2 + \left(\frac{0.02\text{cm}}{14.90\text{cm}}\right)^2 + \left(\frac{0.02\text{cm}}{1.01\text{cm}}\right)^2}$$

$$e_R = 112.72\text{cm}^3 \sqrt{(0.00267)^2 + (0.00134)^2 + (0.0198)^2}$$

e_R = 112.72cm^3 x 0.02002 = 2.26

so, the volume is 112.72 ± 2.26 cm^3 = 113 ± 2 cm^3

Answer_____**113 ± 2 cm^3**____

4. Since 1982, the composition of a Lincoln penny has been 97.5 % zinc and 2.5% copper by mass and each penny has a total mass of 2.50 g. Today, copper sells for $3.08 per pound and zinc sells for $1.41 per pound . From this information, what is the value of the copper and zinc in a single penny? 1.00 lb = 454 g (8 pts)

Copper:

$$2.50\ \text{g coin} \times \frac{2.5\ \text{g copper}}{100\ \text{g coin}} \times \frac{1\ \text{lb}}{454\ \text{g}} \times \frac{\$3.08}{1\ \text{lb copper}} = \mathbf{\$0.00042_4}$$

Zinc:

$$2.50\ \text{g coin} \times \frac{97.5\ \text{g zinc}}{100\ \text{g coin}} \times \frac{1\ \text{lb}}{454\ \text{g}} \times \frac{\$1.41}{1\ \text{lb zinc}} = \mathbf{\$0.0075_7}$$

Value of copper_____**0.00042**$_4$ _____ **Value of zinc**____**0.0075**$_7$_____

Possibly Useful Information

$\%\ \text{by mass} = \frac{\text{g component}}{100\ \text{g sample}}$	$d = m/v$
$e_R = \sqrt{e_A^2 + e_B^2 + e_C^2}$	$e_R = R\sqrt{\left(\frac{e_A}{A}\right)^2 + \left(\frac{e_B}{B}\right)^2 + \left(\frac{e_C}{C}\right)^2}$