Chemistry 112 **Unit 4 Test** **December 2013**
Chapter 3 & 10

Name: Solutions

Place your answer in the space provided. **ALL** work must be shown for questions involving calculations. Final answers must be given with the proper number of significant digits and the correct unit.

1. Explain the difference between precision and accuracy. [2 pts]

   Precision - how well measured values agree with each other.

   Accuracy - how well a measurement agrees with the true value.

2. Perform the following operations. Make sure that your answer has the correct number of significant figures and the proper units. [8 pts]

   (a) 5.2 cm x 7.55 cm = $41.525 \approx 42\ cm^2$

   (b) 20.05 g – 2.2 g = $17.85 \approx 17.8\ g$

   (c) 35.75km / 1.5hr = $23.83 \approx 24\ km/h$

   (d) 34.65km + 31.5km + 33.125km = $99.275 \approx 99.3\ km$

3. Suppose that gold is selling at \$1750/ounce. How many milligrams of gold could you buy for one dollar? (16 oz = 1 lb; 1 lb = 454 g) [3 pts]

$$\$1 \times \frac{1\ oz}{\$1750} \times \frac{1\ lb}{16\ oz} \times \frac{454\ g}{1\ lb} \times \frac{1000\ mg}{1\ g} = 16.21\ mg$$

4. In the US, 1 gallon of gasoline is selling for \$4.139 USD. In Moncton, the price of gas is \$1.275 CAD per litre. If 1 USD = 0.7443 CAD, are we paying more or less for gas than the Americans? (1 gallon = 3.79 L) [4 pts]

$$\frac{\$4.139\ USD}{1\ ga} \times \frac{1\ ga}{3.79\ L} \times \frac{0.7443\ CAD}{1\ USD} = \$0.8128\ CAD/L$$ (Americans pay)

\$1.275 CAD/L Canadians pay

Canadians pay more

5. What is the mass of Avogadro's number of formula units of ammonium sulfate? [2 pts]

1 mol

$(NH_4)_2SO_4$ $\begin{matrix} 2 \times 14.0067 \\ 8 \times 1.00794 \\ 1 \times 32.065 \\ 4 \times 15.9994 \end{matrix}$ $= 132.1395\ g/mol$

6. What is the volume of 13.7 g of oxygen gas? [3 pts]

$$13.7\ g\ O_2 \times \frac{1\ mol}{31.9988\ g} \times \frac{22.4\ L}{1\ mol} = 9.5903$$

$$\approx 9.59\ L$$

7. How many formula units of $CaCl_2$ are there in 6.25 g of $CaCl_2$? [3 pts]

$$6.25\ g \times \frac{1\ mol\ CaCl_2}{110.984\ g} \times \frac{6.022 \times 10^{24}\ f.u.}{1\ mol\ CaCl_2} = 3.3912 \times 10^{22}$$

$$\approx 3.39 \times 10^{22}\ f.u.\ CaCl_2$$

8. How many carbon atoms are there in 1.25 g of calcium acetate? [4 pts]

$$1.25\ g\ Ca(C_2H_3O_2)_2 \times \frac{1\ mol\ Ca(C_2H_3O_2)_2}{158.1660\ g\ Ca(C_2H_3O_2)_2} \times \frac{6.022 \times 10^{23}\ f.u.\ Ca(C_2H_3O_2)_2}{1\ mol\ Ca(C_2H_3O_2)_2} \times \frac{4\ atoms\ O}{1\ f.u.\ Ca(C_2H_3O_2)_2}$$

$$= 1.9036 \times 10^{22} \approx 1.90 \times 10^{22}\ atoms\ O$$

9. A sample of iron (III) oxide contains 3.74×10^{21} oxygen ions. What is the mass of the original sample of iron (III) oxide? [4 pts]

Fe_2O_3

$$3.74 \times 10^{21}\ O\ atoms \times \frac{1\ f.u.\ Fe_2O_3}{3\ O\ atoms} \times \frac{1\ mol\ Fe_2O_3}{6.022 \times 10^{23}\ f.u.\ Fe_2O_3} \times \frac{159.6882\ g\ Fe_2O_3}{1\ mol\ Fe_2O_3}$$

$$= 0.33058 \approx 0.331\ g\ Fe_2O_3$$