CHEM 115 A QUIZ #2
September 28, 2004

For calculations, show the set-up and the solution to the problem. Include units and record the answer to the correct number of significant digits. For short answers, construct clear and concise answers using complete sentences, proper spellings, and correct grammar.

(12.5 points)
1. Calculate (a) the mass of 4.68 moles of water, (b) the moles of sulfate ions in 106.2 g of aluminum sulfate, and (c) the mass of $2.00 \times 10^{22}$ atoms of carbon (C).

(a)

(b)

(c)

(12.5 points)
2. Cadaverine is a foul smelling compound with an unknown formula $C_xH_yN_z$ and a molecular mass of 102.2 u (or amu). When a 0.3560 g sample of cadaverine burns in excess $O_2$, 0.7665 g $CO_2$ and 0.4392 g $H_2O$ are produced. The nitrogen oxides produced are not collected.

(a) What is the empirical formula of this compound?

(b) What is the molecular formula of cadaverine?
(8 points)

3. Gasoline, a mixture of hydrocarbons, is used as a fuel for automobiles. Assume that gasoline can be represented as $C_8H_{18}$.

Balance the following chemical reaction for the combustion of “gasoline”.

$$C_8H_{18} (l) + O_2 (g) \rightarrow CO_2 (g) + H_2O (l)$$

(b) When 1.00 kg of “gasoline” burns in excess oxygen, what mass of CO$_2$ (in grams) is created? (assume 100% yield)

(17 points)

4. (a) Balance the following reaction.

$$\text{HCl (aq)} + \text{Mg (s)} \rightarrow \text{MgCl}_2 (aq) + \text{H}_2 (g)$$

If 4.86 g of Mg is reacted with 25.0 mL of 6.00 M HCl:

(b) What is the limiting reactant? AND (c) What is the theoretical yield of MgCl$_2$ in moles AND in grams?

BONUS (for 2.5 points) If the volume of the final solution is 25.0 mL, what is the concentration of the solution of MgCl$_2$ (aq) that is created AND what is the total concentration of Cl$^-$ (aq)?