Chemistry 120 ... Winter 2010

Problem Set #1 R.J. Le Roy Due: Wednesday, january 13

Submit STAPLED Solutions in Class *or* to my office (ESC-332) by 5:00 PM

- *Atomic masses should be taken from the table on the inner cover of the textbook.*
- Pay attention to significant digits!
- ***Solutions should be written/printed on only one side of the paper. The markers have the discretion to deduct marks for disorganized and/or messy work which is hard to read.***

{Questions taken from the Lecture Notes for Chapters 1-4.}

Exercise 15. A sample of gaseous compound made up only of B and H weighing 0.596 g occupies 484 mL at STP. Then burned in excess O_2 is yields 1.17 g of H_2O, and all of the boron is converted to B_2O_3.

What are: (a) its empirical formula? (b) its molecular weight?
(c) its molecular formula? (d) the weight of B_2O_3 produced?

Exercise 16. A 4.22 g sample of a mixture of $CaCl_2$ and NaCl was dissolved, and then treated to precipitate all of the Ca as $CaCO_3$(s), which was then heated to drive off CO_2(g), leaving a sample of pure CaO(s) which was found to weigh 0.969 g. What percentage of the original mixture was $CaCl_2$?

Exercise 17. If Fe_3Br_8 is produced by the following mechanism, where the two reactions have the indicated efficiencies, what mass of Fe_3Br_8 is produced from 10.0 g of Fe and excess Br_2?

$$\begin{aligned} Fe + Br_2 &\longrightarrow FeBr_2 && \text{efficiency } 92.5\% \\ 3\,FeBr_2 + Br_2 &\longrightarrow Fe_3Br_8 && \text{efficiency } 82.0\% \end{aligned}$$

Exercise 18. A "stock" solution of HCl(aq) is 36% HCl by mass, and the density of this solution is 1.18 g/mL.

(a) What is the molarity of this stock solution?

(b) What volume of this stock solution is required to make 0.750 L of a 0.250 M solution of HCl(aq)?