CHEM-1094 **TEST # 3** **NAME:**_____

1. **a)** Calculate molecular mass of glucose **$C_6H_{12}O_6$** **[1]** _____

b) Calculate molar mass of glucose. **[1]** _____

2. For 27.0 g of glucose, calculate **[8]**

a) moles of glucose _____

b) molecules of glucose _____

c) moles of atoms _____

d) number of atoms _____

3. How many ions are there in 20.0 g of $Al_2(SO_4)_3$ (MM=342.3)? **[2]**

4. A certain experiment requires 3.01×10^{23} atoms of carbon. How many grams of C_6H_6 (MM=78.0) must be used to obtain the carbon atoms? **[2]**

5. Vanillin is a common flavouring agent. It has a molar mass of 152 g/mol and is 63.15 % C and 5.30 % H; the remainder is oxygen. Determine the molecular formula of vanillin. **[5]**

6. Laughing gas, N_2O (MM=44.0), is made by the careful decomposition of ammonium nitrate (MM=80.0)

$$NH_4NO_3(s) \rightarrow N_2O(g) + 2\ H_2O(g)$$

If you begin with 125 g of ammonium nitrate, how many grams of laughing gas can you obtain? **[2]**

7. The reaction of red phosphorus and liquid bromine is given below

$$2\ P(s) + 3\ Br_2(l) \rightarrow 2\ PBr_3(l)$$

12.7 g of Br_2 (MM=159.8) are reacted with an excess of P (MM=31.0). If 10.9 g of PBr_3 (MM=270.7) are isolated, what is the % yield of this compound? **[4]**

8. Dinitrogen tetrafluoride, N_2F_4 (MM=104), can be produced by the reaction of NH_3 (MM=17.0) with F_2 (MM=38.0).

$$2\ NH_3(g) + 5\ F_2(g) \rightarrow N_2F_4(g) + 6\ HF(g)$$

a) If 4.00 g of NH_3 and 14.0 g of F_2 are allowed to react, which is the limiting reagent? **[4]**

b) How many grams of N_2F_4 are produced? **[2]**

c) How many grams of which reagent, if any, are left unreacted? **[3]**

9. The thermite reaction is given below

$2\ Al(s) + Fe_2O_3(s) \rightarrow Al_2O_3(s) + 2\ Fe(s) + 852\ kJ$

a) Is this exothermic or endothermic reaction? **[1]** _____

b) How many kJ of energy are involved if 20.0 g Al (MM=27.0) is reacted? **[2]**

c) Calculate the final temperature of 155 g of water, initially at 25°C, if the heat involved in part **(b)** above is used to heat water. The Specific heat of water is 4.184 J/g °C. **[3]**

10. 25.00 mL of 0.100 M $H_3PO_4(aq)$ is titrated against 0.200 M NaOH(aq). How many mL of NaOH are needed to reach the end point? **[4]**

$$H_3PO_4(aq) + 3\ NaOH(aq) \rightarrow Na_3PO_4(aq) + 3\ H_2O(l)$$

11. Density of hydrochloric acid solution is 1.145 g/mL and is 25.0% HCl by mass. Calculate the molarity of HCl solution. **[3]**

12. The element magnesium has three stable isotopes with the following masses and abundances:

^{24}Mg	23.9850 amu	78.99%
^{25}Mg	24.9850 amu	10.00%
^{26}Mg	25.9826 amu	11.01%

Calculate the average atomic mass of magnesium from these data. **[3]**