Dr. Taylor **Chapter 8.3, 8.4 and 9.5 Homework** **Spring 2012**

Chapter 8.3 and 8.4 book homework: 25, 27, 29, 31, 33, 35, 37, 43, 47, 49,51, 53, 55 and 57

Chapter 9.5 book homework: 61, 63, 65, 67, 71, 73, 75, 77, 79 and 81

1. How many grams of solid sodium hydroxide are needed to make 500.0 mL of a 2.000 M NaOH solution?

2. How many grams of calcium chloride are required to prepare a 250 mL solution with a concentration of 0.46 M?

3. Calculate the molarity of a solution that contains 4.6 g of sodium chloride in 350 mL of solution.

4. How many grams of potassium sulfate are needed to make 300.0 mL of a 0.062 M solution?

5. A Chemistry student goes into the laboratory and takes 25.0 mL of 0.60 M HCl and **ADDS** 75.0 mL of water. What is the final concentration of the dilution?

6. A 0.45 M solution of acetic acid with a volume of 10.0 ml was added to 153 ml of water. What is the new concentration of the acetic acid solution?

7. A stock solution of sodium acetate was made with a concentration of 2.0 *M*. What volume of the stock solution and water must you add together to make 50.0 ml of a 0.80 M solution?

8. If a 160 mL solution of 0.50 M HNO_3 is diluted to a total volume of 600.0 mL what is the molarity of the resulting solution?

9. A laboratory method of preparing O_2 involves the decomposition of $KClO_3$ as seen by the following reaction. If a12.8 g sample of $KClO_3$ is decomposed. How many

$$2\ KClO_3 \longrightarrow 2\ KCl + 3\ O_2$$

a) moles O_2 are produced
b) molecules of O_2 are produced
c) grams of KCl are produced

10. Refer to the equation $CS_2 + 2CaO \rightarrow CO_2 + 2CaS$

A. How many moles of CO_2 can be obtained from the reaction of 4 moles of CS_2?
B. How many moles of CaO are consumed if 0.3 mole CS_2 reacts?
C. How many grams of CaS are produced if 53 g of CO_2 are produced?
D. How many grams of CaO are required to react completely with 38 g of CS_2?

11. Using the equation shown below, how many grams of ammonia will be formed if 75 grams of nitrogen reacts with excess hydrogen?

$$3H_2 + N_2 \rightarrow 2NH_3$$

12. Given the following reaction: $3\,Fe + 4\,H_2O \longrightarrow Fe_3O_4 + 4\,H_2$

A) How many moles of H_2 are produced from 64.4 g Fe.
B) How many grams of H_2O would be consumed if there were 76.3 g Fe
C) If 9.02 mol H_2 is produced what mass of Fe_3O_4 is also produced

13. A laboratory manual calls for the use of 13.0 g C_4H_9OH, 21.6 g NaBr and 33.8 g H_2SO_4 as reactants in the following reaction:

$$C_4H_9OH + NaBr + H_2SO_4 \longrightarrow C_4H_9Br + NaHSO_4 + H_2O$$

A student who followed these directions obtained 16.8 g C_4H_9Br
What are
A) the theoretical yield
B) the actual yield
C) the percent yield

14. Consider the following reaction: $PCl_3(l) + Cl_2(g) \rightarrow PCl_5(s)$
Calculate the number of grams of $PCl_5(s)$ produced from 55.8 g of $PCl_3(l)$ if the percent yield is 78%.

15. Consider the following reaction. **$5NaN_3(s) + NaNO_3(aq) \rightarrow 3Na_2O(s) + 8N_2(g)$**
If 2.50 g of $NaN_3(s)$ react with excess $NaNO_3(aq)$, 0.995 g of $N_2(g)$ is recovered. What is the percent yield?

16. Consider the following reaction. **$6Na(l) + Al_2O_3(s) \rightarrow 2Al(l) + 3Na_2O(s)$**
When 5.52 g of sodium react with 25.0g $Al_2O_3(s)$, 1.00 g of Al(l) is produced. What is the percent yield?

17. Consider the following reaction. **$3H_2(g) + WO_3(s) \rightarrow 3H_2O(g) + W(s)$**
When 500.0 g of $WO_3(s)$ react with excess hydrogen, 375 g of W(s) are obtained. What is the percent yield?

18. If you had the same percent yield as in question 17, how many grams of WO_3 would you need to obtain 500.0 g of W(s)?

19. How many grams of carbon monoxide gas are produced from the reaction of 5.00 moles of $SnO_2(s)$ with 9.00 moles of carbon according to the equation below assuming 100% yield?

$$SnO_2(s) + 2C(s) \rightarrow Sn(s) + 2CO(g)$$

20. Considering the results from question 19, how many grams of CO would be obtained if the reaction only gave a 86% yield?

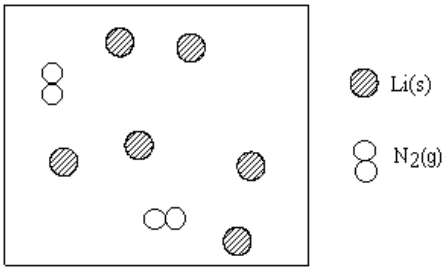
21. Consider the following reaction: **$3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(l) + NO(g)$**
How many moles of nitric acid are produced starting from 231g of $NO_2(g)$ and 36.2g of water?

22. What would be the percent yield of the reaction in problem 21 if 180g of HNO_3 were obtained?

23. When a chemist mixed 0.334 L of 0.112 M sodium chloride with 2.12 L of 0.0343 M lead(II) nitrate, 4.98 g of lead(II) chloride was isolated. Calculate the % yield.

24. Phosphorus reacts with iodine as shown in the chemical reaction below. What is the percent yield of the reaction if 28.2 g PI_3 is obtained from the reaction of 48.0 g of I_2 with excess phosphorus?
$2P(s) + 3I_2(s) \rightarrow 2PI_3(s)$

25. Consider the reaction : **$6Li(s) + N_2(g) \rightarrow 2Li_3N(s)$**
The following represents a mixture of Li(s) and $N_2(g)$ just before reaction occurs.



If each symbol represents 1 mole of Li(s) and 1 mole of $N_2(g)$, what is the limiting reactant and how many moles of the excess reactant remain after the reaction is complete?

26. What would be the percent yield if 28.0 g of Li_3N were obtained?

27. If you obtained the same yield of Li_3N as in problem 35 how many grams of N_2 would you need to start with to obtain the theoretical yield of Li_3N?

ANSWERS:

1. 40.00 grams	**2. 13 grams**	**3. 0.22 M**	**4. 3.2 g**	**5. 0.15 M**
6. 0.28 M	**7. 20 mL of sodium acetate solution and 30 mL of H_2O**			**8. 0.13 M**
9A) 0.157 mol O_2	**B) 9.43 x 10^{22} molec O_2**		**C) 7.79g KCl**	
10A) 4 moles	**B. 0.6 mole**	**C. 170 g**	**D. 56 g**	**11. 91 g**
12.A) 1.54 mol H_2	**B) 32.8 g H_2O**	**C) 522 g Fe_3O_4**	**13. A) 24.3g**	**B) 16.8g**
C) 69%	**14. 65.9 g PCl_5**	**15. 57.7%**	**16. 46.3%**	**17. 94.6%**
18. 672 g WO_3	**19. 252 g CO**	**20 217 g CO**	**21. 3.33 mol HNO_3**	**22. 86%**
23. 95.8%	**24. 54.3%**	**25. Li(s), 1 mol $N_2(g)$**	**26. 40%**	**27. 70.0 g N_2**