Ch 12 Review Problems

Chemistry

Name ___Key___

Date _____ Per _____

Solve the following problems in the space provided. Show your work to receive full credit.

1. The compound tin(II) fluoride, or stannous fluoride, once was a common ingredient in toothpaste. It is produced according to the following reaction:
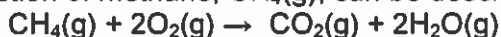
   $Sn(s) + 2HF(g) \rightarrow SnF_2(s) + H_2(g)$

   If 22 grams of HF react with Sn, how many grams of stannous fluoride, SnF_2, are produced?

   $$\frac{22g \, HF}{} \left| \frac{1 mol \, HF}{20.1g} \right| \frac{1 \, mol \, SnF_2}{2 mol \, HF} \left| \frac{156.7g \, SnF_2}{1 mol} \right| = \boxed{86g \, SnF_2}$$

   Sn 118.7

   F   19

2. The combustion of methane, $CH_4(g)$, can be described by the following equation:

   $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

   Calculate the mass of methane required to form 34 moles of carbon dioxide.

   $$\frac{34 \, mol \, CO_2}{} \left| \frac{1 \, mol \, CH_4}{1 \, mol \, CO_2} \right| \frac{16.05g}{1 mol \, CH_4} = 545.7g \, CH_4 = \boxed{550g \, CH_4}$$

3. Calculate the number of liters of oxygen gas needed to produce 13.0 L of sulfur dioxide gas at STP according to the following reaction?

   $2H_2S(g) + 3O_2(g) \rightarrow 2SO_2(g) + 2H_2O(g)$
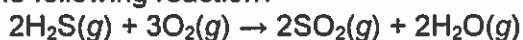
   $$\frac{13L \, SO_2}{} \left| \frac{1 mol}{22.4L} \right| \frac{3 mol \, O_2}{2 mol \, SO_2} \left| \frac{22.4L}{1 mol} \right| = \boxed{19.5L \, O_2}$$

4. Heating an ore of antimony (Sb_2S_3) in the presence of iron gives the element antimony and iron(II) sulfide. If the reaction proceeds with a 94% yield and 45g of iron is used, what is the actual and theoretical yield of iron(II) sulfide?

   $Sb_2S_3 (s) + 3Fe (s) \rightarrow 2Sb (s) + 3FeS (s)$
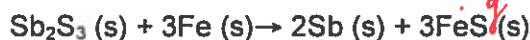
   $$\frac{45g \, Fe}{} \left| \frac{1 mol}{55.85g} \right| \frac{3 mol \, FeS}{3 mol \, Fe} \left| \frac{87.95g}{1 mol} \right| = \boxed{71g \, FeS}$$

   theor

   $94\% = \frac{A}{71} \times 100$

   $\boxed{A = 66g \, FeS}$

5. What is conserved in a chemical reaction? Mass

6. If the percent yield is equal to 100%, then the actual yield __=__ the theoretical yield.

7. What do the coefficents in a balanced chemical reaction tell you? the ~~relationship~~ relative # of moles of reactant to product

8. If 17.00 g aluminum sulfide and 9.00 g water react according to the following equation:

$$Al_2S_3 + 6H_2O \rightarrow 2Al(OH)_3 + 3 H_2S$$

17g   9g

a) What is the limiting reagent?

$$\boxed{LR: H_2O}$$

$$\frac{9\ g\ H_2O}{} \left|\frac{1\ mol}{18.02g}\right| \frac{3\ mol\ H_2S}{6\ mol\ H_2O} \left|\frac{34.12g\ H_2S}{1\ mol}\right| = \boxed{8.5g\ H_2S}$$

b) What is the maximum mass of H₂S that can be formed?

$$\frac{17g\ Al_2S_3}{} \left|\frac{1\ mol\ Al_2S_3}{150.26g}\right| \frac{3\ mol\ H_2S}{1\ mol} \left|\frac{34.12g\ H_2S}{1\ mol}\right| = 11.6g\ H_2S$$

c) How much of the excess reactant remains after the reaction stops?

$$\frac{9g\ H_2O}{} \left|\frac{1\ mol\ H_2O}{18.02g}\right| \frac{1\ mol\ Al_2S_3}{6\ mol\ H_2O} \left|\frac{150.26g\ Al_2S_3}{1\ mol}\right| = 12.5g\ Al_2S_3\ used$$

$$17g - 12.5g = \boxed{4.5g\ Al_2S_3\ left\ over}$$

Balance the following equations.

9) $3\,CuO(s) + 2\,NH_3(aq) \rightarrow 3\,Cu(s) + 3\,H_2O(l) + N_2(g)$

10) $4\,NH_3(g) + 5\,O_2(g) \rightarrow 4\,NO(g) + 6\,H_2O(g)$

11) $2\,KClO_3(s) \rightarrow 2\,KCl(s) + 3\,O_2(g)$
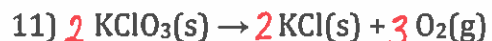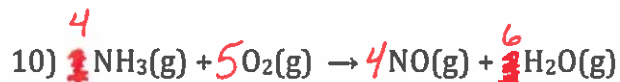
Finish the following reactions and put the type of reaction that is occurring.

S 12) $Na + O_2 \rightarrow Na_2O$

DR 13) $Pb(NO_3)_2 + KCl \rightarrow PbCl_2 + KNO_3$

C 14) $C_2H_6 + O_2 \rightarrow CO_2 + H_2O$

Answer the following questions.

15) Why is it not correct to balance an equation by changing the subscripts in the formulas in a chemical equation?

the subscripts are determined by the charge

16) What is the molar volume of any gas at STP? (How many liters of gas are in one mole of gas at STP?)

1 mole = 22.4 L @ STP