Stoichiometry - Sheet #1 Mass - Mass Problems

When 142 g of calcium fluoride are reacted with an excess of sodium bromide, calculate the

How many grams of sodium aluminate can be obtained from 7.71 g of aluminum chloride 2. according to the reaction:

$$AICI_3(aq) + 4NaOH(aq) \rightarrow NaAIO_2(aq) + 3NaCI(aq) + 2H_2O(I)$$
 7.71 g

How many grams of carbon dioxide are obtained when 2.96 g of cerium(III) oxalate are formed 3. according to the reaction:

$$2Ce(IO_3)_4(aq) + 24H_2C_2O_4(aq) \rightarrow Ce_2(C_2O_4)_3(aq) + 4I_2(aq) + 42CO_2(g) + 24H_2O(I)$$
2.96 5

$$\left(\frac{2.96g \text{ Ce}_{z}(C_{z}O_{4})_{3}}{544.2988 \text{ g/md}}\right)\left(\frac{42\text{ m/CO}_{z}}{1 \text{ mol}}\right)\left(\frac{44.0098\text{ g/md}}{10.1 \text{ g}}\right) = 10.1 \text{ g}$$

Calculate the mass of sodium permanganate that can be prepared from 1.27 g of sodium bismutate according to the reaction:

$$2Mn(NO_3)_2 + 5NaBiO_3 + 14HNO_3 \rightarrow 2NaMnO_4 + 5Bi(NO_3)_3 + 3NaNO_3 + 7H_2O_3 + 2NaMnO_4 + 5Ma_3 + 2NaMnO_4 + 5Ma_5 + 2NaMnO_5 + 2NAMnO_5$$

5. If excess sulfuric acid is reacted with sodium hydroxide, 15.0 g of water is formed. What mass of sodium hydroxide was used?
$$H_2SO_4 + 2NaO_4 \rightarrow Na_2SO_4 + 2H_2O_2 = \frac{15.09}{15.09}$$

$$\left(\frac{15.09}{18.015289/mul}\right) \left(\frac{2mol}{2mol} \frac{NaO_4}{H_2O}\right) \left(\frac{39.997}{2mol} \frac{119}{mul}\right) = \frac{33.39}{233.39} \frac{NaO_4}{NaO_4}$$

6. 50.0 g of calcium carbonate was added to excess phosphoric acid. What mass of calcium phosphate was formed?
$$3 \text{ Ca CO}_3 + 2 \text{ H}_3 \text{ PO}_4 \rightarrow \text{ Ca}_3 \text{ (PO}_4)_2 + 3 \text{ H}_2 \text{ CO}_3$$
50.0 g

7. Calculate the mass of barium nitrate that must decompose in order to produce 112 g of oxygen. $Ba(NO_3)_2 \rightarrow Ba(NO_2)_2 + O_2$

$$\left(\frac{112 \text{ g Oz}}{31.9988 \text{ g/mol}}\right)\left(\frac{1 \text{ mol Ba}(NO_8)_2}{1 \text{ mol Oz}}\right)\left(\frac{261.3398 \text{ g}}{\text{/mol}}\right) = 915 \text{ g Ba/Ng}$$

8. Calculate the mass of potassium chloride that is produced when 17.0 g of potassium carbonate reacts with hydrochloric acid.

$$K_z CO_3 + 2 HCI \rightarrow 2 KCI + H_z CO_3$$
17.0 q

 $(17.0 \text{ q} \ K_z CO_3)$
 $(2 \text{ mol } KCI)$
 $(274.5513g)$
 $(274.5513g)$
 $(274.5513g)$
 $(274.5513g)$
 $(274.5513g)$
 $(274.5513g)$
 $(274.5513g)$

9. When "x" grams of calcium chloride was reacted with an excess of bromine, 14.0 kg of a gas was formed. Calculate "x".
$$CaCl_z + Br_z \rightarrow CaBr_z + Cl_z$$
14 000 g

$$\left(\frac{14 \ 000 \ q \ Cl_z}{70.906 \ g/mol}\right) \left(\frac{1 \ mol \ CaCl_z}{1 \ mol \ Cl_z}\right) \left(\frac{10.984 \ g}{mol}\right) = 21 \ 913.18$$

$$= 21.9 \ kg \ CaCl_z$$

$$21.900 \ c_1$$

10. How many grams of zinc oxide are formed when zinc reacts with oxygen?
$$2 Z_{n} + 0 \Rightarrow 2 Z_{n} O$$

$$2 Zn + O_2 \rightarrow 2 ZnO$$
10.0g

$$\left(\frac{10.0 \text{ g zn}}{65.38 \text{ g/mol}}\right)\left(\frac{2 \text{ mol } ZnO}{2 \text{ mol } Zn}\right)\left(\frac{81.3794 \text{ s/mol}}{2 \text{ mol}}\right) = \left[\frac{12.4 \text{ g } ZnO}{2 \text{ mol}}\right]$$

11. Sodium nitrate decomposes to give 3.00 g of oxygen. Calculate the mass of sodium nitrate used. 2 NaNO3
$$\rightarrow$$
 2 NaNOz + O2

Potassium metal reacts with 70.0 g of chlorine. Calculate the mass of product.

13. Calculate the mass of magnesium oxide that must be decomposed in order to produce 48.0 g of oxygen. $Z MgO \rightarrow Z Mg + O_{Z}$

14. Sodium chloride was reacted with an excess of sulfuric acid to give hydrochloric acid and 142 g of a second product. What is the product, and how much sodium chloride was reacted?

$$\left(\frac{142 \text{ g Na}_z \text{ SO}_4}{142.04314 \text{ g/md}}\right) \left(\frac{7 \text{ mol NaCl}}{1 \text{ mol Na}_z \text{ SO}_4}\right) \left(\frac{58.44277 \text{ g/md}}{117 \text{ g NaCl}}\right)$$

15. What mass of copper(I) sulfide can be produced from 9.90 g of copper(I) chloride reacting with an excess of hydrogen sulfide gas?

16. How many grams of calcium hydroxide will be needed to react completely with 10.0 g of phosphoric acid? $3 Ca (OH)_z + 2 H_3 PO_4 \rightarrow Ca_3 (PO_4)_z + 6 H_2 O$? 10.04

$$\left(\frac{10.0 \text{ g H}_{3} \text{ PO}_{4}}{97.99518 \text{ g/mol}}\right)\left(\frac{3 \text{ mol } Ca(OH)_{2}}{2 \text{ mol } H_{3} \text{ PO}_{4}}\right)\left(\frac{74.09768 \text{ g}}{\text{mol}}\right) = \left[\frac{11.3 \text{ g } Ca(OH)_{2}}{11.3 \text{ g } Ca(OH)_{2}}\right]$$

17. How many grams of hydrogen can be produced from the reaction of 72.0 g of sodium with an excess of water? $2 \text{Na} + 2 \text{H}_2 \text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$ 72.0 q

18. An excess of nitrogen reacts with 6.57 g of hydrogen. How many grams of ammonia are produced? $\mu_{Nz} + 3H_z \rightarrow 2NH_3$

produced?
$$4Nz + 3Hz \rightarrow 2NH_3$$

6.57g ?g

$$\left(\frac{6.57 \, \text{g Hz}}{2.01588 \, \text{g/mol}}\right) \left(\frac{2 \, \text{mol NH}_3}{3 \, \text{mol Hz}}\right) \left(\frac{17.03052 \, \text{g}}{\text{full}}\right) = \boxed{37.0 \, \text{g NH}_3}$$

19. How many grams of oxygen are required to burn completely 84.9 g of carbon?

$$C(s) + O_2(g) \rightarrow CO_2(g)$$

84.9 \sim 7.

20. In the decomposition of potassium chlorate, 82.6 g of oxygen are formed. How many grams of potassium chloride are produced?

21. The action of carbon monoxide can be expressed by the equation,

$$Fe_2O_3(cr) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$$

What would be the minimum amount of carbon monoxide used if 80.3 g of iron were produced?

22. How many grams of hydrochloric acid are required to react completely with 44.7 g of calcium hydroxide?

$$^{\circ ?}$$
 ZHCl + $Ca(OH)_z \rightarrow CaCl_z + ZH_zO$
? q 44.7q

hydrochloric acid?
$$2AI + 6HCI \Rightarrow 2AICI_3 + 3H_2$$

 $4.77q$?

24. Calculate the mass of lithium carbonate that must decompose to produce 78.0 g of carbon dioxide.

$$\begin{array}{cccc}
\text{Aloxide.} & \text{Li}_2\text{CO}_3 & \rightarrow \text{Li}_2\text{O} + \text{CO}_2 \\
? & 78.09
\end{array}$$

25. How many grams of oxygen gas are formed when 100.0 g of magnesium chlorate are decomposed?

$$Mg(ClO_3)_2 \rightarrow MgCl_2 + 3O_2$$
100.09

26. Hydrochloric acid was reacted with zinc to produce 137 g of hydrogen gas. What mass of zinc did you begin with?

$$2 HCI + Zn \rightarrow ZnCI_2 + H_2$$

$$? 137g$$