Name Key (1-9) Date _____ Class _____

11–2 Practice Problems

1. Determine the mass of lithium hydroxide produced when 0.38 g of lithium nitride reacts with water according to the following equation:

$$Li_3N + 3H_2O \rightarrow NH_3 + 3LiOH$$

$\frac{0.38\text{g } Li_3N}{1} \times \frac{1\text{mol } Li_3N}{35\text{g } Li_3N} \times \frac{3\text{mol LiOH}}{1\text{mol } Li_3N} \times \frac{24\text{g LiOH}}{1\text{mol LiOH}} = \boxed{0.78\text{g LiOH}}$

2. What mass of sodium chloride is produced when chlorine reacts with 0.29 g of sodium iodide?

$$2NaI + Cl_2 \rightarrow 2NaCl + I_2$$

$\frac{0.29\text{g NaI}}{1} \times \frac{1\text{mol}}{150} \times \frac{2\text{mol NaCl}}{2\text{mol NaI}} \times \frac{58\text{g}}{1\text{mol}} = \boxed{0.112\text{g NaCl}}$

3. Determine the mass of carbon dioxide produced when 0.85 g of butane reacts with oxygen according to the following equation:

$$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$$

$\frac{0.85\text{g } C_4H_{10}}{1} \times \frac{1\text{mol}}{58\text{g}} \times \frac{8\text{mol } CO_2}{2\text{mol } C_4H_{10}} \times \frac{44\text{g}}{1\text{mol}} = \boxed{2.58\text{g } CO_2}$

4. Determine the mass of antimony produced when 0.46 g of antimony(III) oxide reacts with carbon according to the following equation:

$$Sb_2O_3 + 3C \rightarrow 2Sb + 3CO$$

$\frac{0.46\text{g } Sb_2O_3}{1} \times \frac{1\text{mol}}{291.52\text{g}} \times \frac{2\text{mol Sb}}{1\text{mol } Sb_2O_3} \times \frac{121.76\text{g}}{1\text{mol}} = \boxed{0.38\text{g Sb}}$

5. What mass of hydrogen peroxide (H_2O_2) must decompose to produce 0.77 g of water?

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

$\frac{0.77\text{g } H_2O}{1} \times \frac{1\text{mol}}{18\text{g}} \times \frac{2H_2O_2}{2H_2O} \times \frac{34\text{g}}{1\text{mol}} = \boxed{1.45\text{g } H_2O_2}$

6. What mass of carbon monoxide must react with oxygen to produce 0.69 g of carbon dioxide?

$$2CO + O_2 \rightarrow 2CO_2$$

$\frac{0.69\text{g } CO_2}{1} \times \frac{1\text{mol}}{44\text{g}} \times \frac{2\text{mol CO}}{2\text{mol } CO_2} \times \frac{28\text{g}}{1\text{mol}} = \boxed{0.44\text{g CO}}$

7. Determine the mass of sodium nitrate produced when 0.73 g of nickel(II) nitrate reacts with sodium hydroxide according to the following equation:

$$Ni(NO_3)_2 + 2NaOH \rightarrow Ni(OH)_2 + 2NaNO_3$$

$\frac{0.73\text{g } Ni(NO_3)_2}{1} \times \frac{1\text{mol}}{183\text{g}} \times \frac{2\text{mol } NaNO_3}{1\text{mol } Ni(NO_3)_2} \times \frac{85\text{g}}{1\text{mol}} = \boxed{0.68\text{g } NaNO_3}$

8. Determine the mass of calcium hydroxide produced when calcium carbide reacts with 0.64 g of water according to the following equation:

$$CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$$

$\frac{0.64\text{g } H_2O}{1} \times \frac{1\text{mol}}{18\text{g}} \times \frac{1\text{mol } Ca(OH)_2}{2\text{mol } H_2O} \times \frac{74\text{g}}{1\text{mol}} = \boxed{1.32\text{g } Ca(OH)_2}$

9. How many grams of ozone (O_3) must decompose to produce 0.87 g of oxygen?

$$2O_3 \rightarrow 3O_2$$

$\frac{0.87\text{g } O_2}{1} \times \frac{1\text{mol}}{32\text{g } O_2} \times \frac{2\text{mol}}{3\text{mol}} \times \frac{48\text{g } O_3}{1\text{mol}} = \boxed{0.87\text{g } O_3}$

10. Find the mass of sugar ($C_6H_{12}O_6$) required to produce 1.82 L of carbon dioxide gas at STP from the reaction described by the following equation:

$$C_6H_{12}O_6 \rightarrow 2C_2H_6O + 2CO_2$$

11. How many liters of oxygen are necessary for the combustion of 425 g of sulfur, assuming that the reaction occurs at STP? The balanced equation is $S + O_2 \rightarrow SO_2$.

12. Find the mass of benzene (C_6H_6) required to produce 2.66 L of carbon dioxide gas at STP from the reaction described by the following equation:

$$2C_6H_6 + 15O_2 \rightarrow 6H_2O + 12CO_2$$

Name _____ Date _____ Class _____

11–2 *Practice Problems (continued)*

13. Find the mass of sodium required to produce 5.68 L of hydrogen gas at STP from the reaction described by the following equation:
$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

14. How many liters of oxygen are necessary for the combustion of 277 g of carbon monoxide, assuming that the reaction occurs at STP? The balanced equation is
$$2CO + O_2 \rightarrow 2CO_2$$

15. How many liters of oxygen are necessary for the combustion of 134 g of magnesium, assuming that the reaction occurs at STP? The balanced equation is
$$2Mg + O_2 \rightarrow 2MgO$$

16. Find the mass of aluminum required to produce 4.72 L of hydrogen gas at STP from the reaction described by the following equation:
$$2Al + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2$$

17. How many liters of hydrogen are produced if 225 g of iron reacts with hydrochloric acid, assuming that the reaction occurs at STP? The balanced equation is
$$Fe + 2HCl \rightarrow FeCl_2 + H_2$$

18. Find the mass of S_8 required to produce 2.47 L of sulfur dioxide gas at STP from the reaction described by the following equation:
$$S_8 + 8O_2 \rightarrow 8SO_2$$

19. Propane (C_3H_8) burns in oxygen to produce carbon dioxide and water vapor. The balanced equation for this reaction is $C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2$. What volume of carbon dioxide is produced when 2.8 L of oxygen are consumed?

20. What volumes of H_2S gas and oxygen are necessary to produce 14.2 L of sulfur dioxide gas? The balanced equation is
$$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$$

21. What volumes of sulfur dioxide and dihydrogen sulfide gases are necessary to produce 11.4 L of water vapor? The balanced equation is
$$SO_2 + 2H_2S \rightarrow 3S + 2H_2O$$

22. Glucose ($C_6H_{12}O_6$) burns in oxygen to produce carbon dioxide and water vapor as described in the following equation: $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$. What volume of carbon dioxide is produced when 3.7 L of oxygen are consumed?

23. The compound TNT (trinitrotoluene) decomposes explosively into carbon, carbon monoxide, hydrogen, and nitrogen. What volumes of hydrogen and nitrogen are produced if 5.8 L of CO is produced? The balanced equation is
$$2C_7H_5(NO_2)_3 \rightarrow 2C + 12CO + 5H_2 + 3N_2$$

24. Nitroglycerin decomposes explosively to produce carbon dioxide, water, nitrogen, and oxygen. What volumes of nitrogen and oxygen are produced if 4.3 L of carbon dioxide is produced? The balanced equation is
$$4C_3H_5(NO_3)_3 \rightarrow 12CO_2 + 10H_2O + O_2 + 6N_2$$

25. Acetylene (C_2H_2) burns in oxygen to produce carbon dioxide and water. The balanced equation for this reaction is $2C_2H_2 + 5O_2 \rightarrow 2H_2O + 4CO_2$. What volume of carbon dioxide is produced when 1.6 L of oxygen are consumed?

Name Key #10-25 Date _____ Class _____

11–2 Practice Problems

1. Determine the mass of lithium hydroxide produced when 0.38 g of lithium nitride reacts with water according to the following equation:
$Li_3N + 3H_2O \rightarrow NH_3 + 3LiOH$

2. What mass of sodium chloride is produced when chlorine reacts with 0.29 g of sodium iodide?

3. Determine the mass of carbon dioxide produced when 0.85 g of butane reacts with oxygen according to the following equation:
$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

4. Determine the mass of antimony produced when 0.46 g of antimony(III) oxide reacts with carbon according to the following equation:
$Sb_2O_3 + 3C \rightarrow 2Sb + 3CO$

5. What mass of hydrogen peroxide (H_2O_2) must decompose to produce 0.77 g of water?

6. What mass of carbon monoxide must react with oxygen to produce 0.69 g of carbon dioxide?

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$Ni(NO_3)_2 + 2NaOH \rightarrow Ni(OH)_2 + 2NaNO_3$

8. Determine the mass of calcium hydroxide produced when calcium carbide reacts with 0.64 g of water according to the following equation:
$CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$

9. How many grams of ozone (O_3) must decompose to produce 0.87 g of oxygen?

10. Find the mass of sugar ($C_6H_{12}O_6$) required to produce 1.82 L of carbon dioxide gas at STP from the reaction described by the following equation:
$C_6H_{12}O_6 \rightarrow 2C_2H_6O + 2CO_2$

$\frac{1.82 L CO_2}{1} \times \frac{1 mol}{22.4 L} \times \frac{1 mol C_6H_{12}O_6}{2 mol CO_2} \times \frac{180 g}{1 mol C_6H_{12}O_6} = 7.31 g C_6H_{12}O_6$

11. How many liters of oxygen are necessary for the combustion of 425 g of sulfur, assuming that the reaction occurs at STP? The balanced equation is $S + O_2 \rightarrow SO_2$.

$\frac{425 g S}{1} \times \frac{1 mol}{32 g S} \times \frac{1 mol O_2}{1 mol S} \times \frac{22.4 L}{1 mol O_2} = 297.5 L O_2$

12. Find the mass of benzene (C_6H_6) required to produce 2.66 L of carbon dioxide gas at STP from the reaction described by the following equation:
$2C_6H_6 + 15O_2 \rightarrow 6H_2O + 12CO_2$

$\frac{2.66 L CO_2}{1} \times \frac{1 mol}{22.4 L} \times \frac{2 mol C_6H_6}{12 mol CO_2} \times \frac{78 g}{1 mol} = 1.54 g C_6H_6$

Name _____ Date _____ Class _____

11–2 Practice Problems (continued)

13. Find the mass of sodium required to produce 5.68 L of hydrogen gas at STP from the reaction described by the following equation:
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23. The compound TNT (trinitrotoluene) decomposes explosively into carbon, carbon monoxide, hydrogen, and nitrogen. What volumes of hydrogen and nitrogen are produced if 5.8 L of CO is produced? The balanced equation is
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$$4C_3H_5(NO_3)_3 \rightarrow 12CO_2 + 10H_2O + O_2 + 6N_2$$

25. Acetylene (C_2H_2) burns in oxygen to produce carbon dioxide and water. The balanced equation for this reaction is $2C_2H_2 + 5O_2 \rightarrow 2H_2O + 4CO_2$. What volume of carbon dioxide is produced when 1.6 L of oxygen are consumed?

13) $\frac{5.68\,L\,H_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{2\,mol\,Na}{1\,mol\,H_2} \times \frac{23\,g}{1\,mol\,Na} = \boxed{11.66\,g\,Na}$

14) $\frac{277\,g\,CO}{1} \times \frac{1\,mol}{28\,g} \times \frac{1\,mol}{2\,mol} \times \frac{22.4\,L}{1\,mol\,O_2} = \boxed{110.8\,L\,O_2}$

15) $\frac{134\,g\,Mg}{1} \times \frac{1\,mol}{24\,g} \times \frac{1\,mol\,O_2}{2\,mol\,Mg} \times \frac{22.4\,L}{1\,mol\,O_2} = \boxed{62.53\,L\,O_2}$

16) $\frac{4.72\,L\,H_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{2\,mol\,Al}{3\,mol\,H_2} \times \frac{27\,g\,Al}{1\,mol\,Al} = \boxed{3.79\,g\,Al}$

17) $\frac{225\,g\,Fe}{1} \times \frac{1\,mol}{56\,g} \times \frac{1\,mol\,H_2}{1\,mol\,Fe} \times \frac{22.4\,L}{1\,mol\,H_2} = \boxed{90\,L\,H_2}$

18) $\frac{2.47\,L\,SO_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{1\,mol\,S_8}{8\,mol\,SO_2} \times \frac{256\,g}{1\,mol} = \boxed{3.53\,g\,S_8}$

19) $\frac{2.8\,L\,O_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{3\,mol\,CO_2}{5\,mol\,O_2} \times \frac{22.4\,L}{1\,mol} = \boxed{1.68\,L\,CO_2}$

20) $\frac{14.2\,L\,SO_2}{1} \times \frac{1\,mol}{22.4} \times \frac{2\,mol\,H_2S}{2\,mol\,SO_2} \times \frac{22.4\,L}{1\,mol} = \boxed{14.2\,L\,H_2S}$

$\frac{14.2\,L\,SO_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{3\,mol\,O_2}{2\,mol\,SO_2} \times \frac{22.4\,L}{1\,mol} = \boxed{21.3\,L\,O_2}$

21) $\frac{11.4\,L\,H_2O}{1} \times \frac{1\,mol}{22.4} \times \frac{1\,mol\,SO_2}{2\,mol\,H_2O} \times \frac{22.4\,L}{1\,mol} = \boxed{5.7\,L\,SO_2}$

$\frac{11.4\,L\,H_2O}{1} \times \frac{1\,mol}{22.4} \times \frac{2\,mol\,H_2S}{2\,mol} \times \frac{22.4\,L}{1\,mol} = \boxed{11.4\,L\,H_2S}$

22) $\frac{3.7\,L\,O_2}{1} \times \frac{1\,mol}{22.4\,L} \times \frac{6\,mol\,CO_2}{6\,mol\,O_2} \times \frac{22.4}{1\,mol} = \boxed{3.7\,L\,CO_2}$

23) $\frac{5.8\text{L CO}}{1} \times \frac{1\text{mol}}{22.4\text{L}} \times \frac{5\text{mol H}_2}{12\text{mol CO}} \times \frac{22.4}{1\text{mol}} = \boxed{2.417\text{L H}_2}$

$\frac{5.8\text{L CO}}{1} \times \frac{1\text{mol}}{22.4\text{L}} \times \frac{3\text{mol N}_2}{12\text{mol CO}} \times \frac{22.4}{1\text{mol}} = \boxed{1.45\text{L N}_2}$

24) $\frac{4.3\text{L CO}_2}{1} \times \frac{1\text{mol}}{22.4\text{L}} \times \frac{6\text{mol}}{12\text{mol}} \times \frac{22.4\text{L N}_2}{1\text{mol}} = \boxed{2.15\text{L N}_2}$

$\frac{4.3\text{L CO}_2}{1} \times \frac{1\text{mol}}{22.4\text{L}} \times \frac{1\text{mol}}{12\text{mol}} \times \frac{22.4\text{L O}_2}{1\text{mol}} = \boxed{0.358\text{L O}_2}$

25) $\frac{1.6\text{L O}_2}{1} \times \frac{1\text{mol}}{22.4} \times \frac{4\text{mol}}{5\text{mol}} \times \frac{22.4\text{L CO}_2}{1\text{mol}} = \boxed{1.28\text{L CO}_2}$