11-1 Practice Problems

1. Lead will react with Hydrochloric Acid to produce Lead (II) Chloride and Hydrogen gas. How many moles of Hydrochloric Acid are needed to completely react with 0.36-mol of Lead?

2. How many moles of HNO_3 will be produced when 0.51-mol of N_2O_5 reacts according to the following equation?

$$N_2O_5 + H_2O \rightarrow 2HNO_3$$

3. Iron will react with Oxygen Gas to produce Fe_2O_3. How many moles of Fe_2O_3 will be produced if 0.18-mol of Fe reacts?

4. How many moles of NaBr will be produced when 0.69-mol of Bromine reacts according to the following equation?

$$Br_2 + 2NaI \rightarrow 2NaBr + I_2$$

5. Phosphorus will react with Bromine to produce Phosphorus Tribromide. How many moles of Phosphorus Tribromide will be produced if 0.78-mol of Bromine is reacted?

6. Carbon will react with Zinc Oxide to produce Zinc and Carbon Dioxide. How many moles of Carbon Dioxide will be produced if 0.38-mol of ZnO is completely reacted?

7. How many moles of Oxygen will be needed to react with 0.38-mol of C_3H_8 according to the following equation?

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

8. Nitrogen gas can react with Hydrogen gas to produce Ammonia. How many moles of Nitrogen will be needed to produce 0.48- mol of NH_3?

9. How many moles of Hydrogen will be produced if 0.44-mol of CaH_2 reacts according to the following equation?

$$CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2$$

10. How many moles of water will be produced if 2.35-mol of Oxygen reacts according to the following equation?

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

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 gas reacts with 0.29 g of Sodium Iodide (Iodine is also produced in this reaction?

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 gas to produce 0.69 g of Carbon Dioxide?

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:

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

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 liters of Oxygen gas are necessary for the combustion of 425 g of Sulfur, assuming that the reaction occurs at STP? The balanced equation is:

$$S + O_2 \rightarrow SO_2$$

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 grams of Ozone must decompose to produce 0.87 g of Oxygen gas?

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:

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

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:

$2Na + 2H_2O \rightarrow 2NaOH + H_2$

14. How many liters of Oxygen gas are necessary for the combustion of 277 g of Carbon Monoxide, assuming that the reaction occurs at STP?

$2CO + O_2 \rightarrow 2CO_2$

15. How many liters of Oxygen gas are necessary for the combustion of 134 g of Magnesium, assuming that the reaction occurs at STP?

$2Mg + O_2 \rightarrow 2MgO$

16. Find the mass of Aluminum required to produce 4.72 L of Hydrogen gas at STP.

$2Al + 3H_2SO_4 \rightarrow A1_2(SO_4)_3 + 3H_2$

17. TNT (Trinitrotoluene) decomposes explosively What volumes of Hydrogen gas and Nitrogen gas are produced if 5.8 L of CO is produced?

$2C_7H_5(NO_2)_3 \rightarrow 2C + 12CO + 5H_2 + 3N_2$

18. Propane (C_3H_8) burns in Oxygen gas to produce Carbon Dioxide and water vapor. What volume of Carbon Dioxide is produced when 2.8 L of Oxygen are consumed?

$C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2$

19. Find the mass of S_8 required to produce 2.47 L of Sulfur Dioxide gas at STP.

$S_8 + 8O_2 \rightarrow 8SO_2$

20. What volumes of H_2S gas and Oxygen gas are necessary to produce 14.2 L of Sulfur Dioxide gas?

$2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

21. What volumes of Sulfur Dioxide and Dihydrogen Sulfide gases are necessary to produce 11.4 L of water vapor?

$SO_2 + 2H_2S \rightarrow 3S + 2H_2O$

22. Glucose ($C_6H_{12}O_6$) burns in Oxygen to produce Carbon Dioxide and water vapor. What Volume of CO_2 is produced when 3.7 L of oxygen are consumed?

$C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$.

23. How many liters of Hydrogen gas are produced if 225 g of Iron reacts with Hydrochloric acid (assuming STP)?

$Fe + 2HCl \rightarrow FeCl_2 + H_2$

24. Nitroglycerin decomposes explosively. What volumes of Nitrogen gas and Oxygen gas are produced if 4.3 L of Carbon Dioxide is produced?

$4C_3H_5(NO_3)_3 \rightarrow 12CO_2 + 10H_2O + O_2 + 6N_2$

25. Acetylene (C_2H_2) burns in Oxygen to produce Carbon Dioxide and water. What volume of Carbon Dioxide is produced when 1.6 L of Oxygen are consumed?

$2C_2H_2 + 5O_2 \rightarrow 2H_2O + 4CO_2$

11-3 Practice Problems

1. Identify the limiting reactant when 1.22-g of O_2 reacts with 1.05-g of H_2 to produce water.

2. Identify the limiting reactant when 4.68-g of Fe reacts with 2.88-g of S_8 to produce FeS.

3. Identify the limiting reactant when 5.87-g of $Mg(OH)_2$ reacts with 12.84-g of HC1 to form $MgCl_2$ and water.

4. Identify the limiting reactant when 6.25-g of $AgNO_3$ reacts with 4.12-g of NaCl to form $NaNO_3$ and AgCl.

5. Identify the limiting reactant when 7.81-g of HC1 reacts with 5.24-g of NaOH to produce NaCl and H_2O.

6. Identify the limiting reactant when 6.33-g of H_2SO_4 reacts with 5.92-g of NaOH to produce Na_2SO_4 and water.

7. Identify the limiting reactant when 43.25-g of CaC_2 reacts with 33.71-g of water to produce $Ca(OH)_2$ and C_2H_2.

8. Identify the limiting reactant when 65.14-g of $CaCl_2$ reacts with 74.68-g of Na_2CO_3 to produce $CaCO_3$ and NaCl.

9. Identify the limiting reactant when 4.687-g of SF_4 reacts with 6.281-g of I_2O_5 to produce IF_5 and SO_2.

10. If 4.1-g of Cr is heated with 9.3-g of $C1_2$, what mass $CrCl_3$ will be produced?

11. What mass of SO_2 is produced from the reaction between 31.5-g of S_8 and 8.65-g of O_2?

12. What mass of SO_3 is produced from the reaction of 12.4-g of SO_2 and 3.45-g of O_2?

13. What mass of H_2SO_4 is produced from the reaction of 6.58-g of SO_3 and 1.64-g of H_2O?

14. What mass of CdS is produced if 8.47-g of Cadmium reacts with 2.51-g of Sulfur?

11-3 Practice Problems (continued)

19. Determine the percent yield for the reaction between 3.74-g of Na with excess O_2 if 5.34-g of Na_2O_2 is recovered.

20. Determine the percent yield for the reaction between 6.92-g of K and 4.28-g of O_2 if 7.36-g of K_2O_2 is produced.

21. Determine the percent yield for the reaction between 82.4-g of Rb and 11.6-g of O_2 if 39.7-g of Rb_2O is produced.

22. Determine the percent yield for the reaction between 46.1-g of Cs and 13.4-g of O_2 if 28.3-g of Cs_2O is produced.

23. Determine the percent yield for the reaction between 28.1-g of Sb_4O_6 and excess C if 17.3-g of Sb is recovered along with an unknown amount of CO.

24. Determine the percent yield for the reaction between 45.9-g of NaBr and excess Chlorine-gas to produce 12.8-g of NaCl and an unknown amount of Bromine-gas.

25. Determine the percent yield for the reaction between 15.8-g of NH_3 and excess Oxygen-gas to produce 21.8-g of NO-gas and water.

26. Determine the percent yield for the reaction between 98.7-g of Sb_2S_3 and excess Oxygen-gas if 72.4-g of Sb_4O_6 is recovered with an unknown amount of Bromine-gas.

27. Determine the percent yield for the reaction between 46.5-g of ZnS and 13.3g of Oxygen-gas if 18.4-g of ZnO is recovered with an unknown amount of Sulfur Dioxide.