Name Answer Key Hour _____

LIMITING REACTANTS

(Honors Chemistry)

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

1a.)If you start with 14.8 g of C_3H_8 and 3.44 g of oxygen gas, which is the limiting reagent?

$$\frac{14.8\ g\ C_3H_8}{} \left| \frac{1\ mol}{44\text{-}g} \right| \frac{5\ mol\ O_2}{1\ mol\ C_3H_8} \left| \frac{32\text{-}g}{1\ mol} \right. = 53.8\text{-}g\ O_2$$

$$\frac{3.44\text{-}g\ O_2}{} \left| \frac{1\ mol}{32\text{-}g} \right| \frac{1\ mol\ C_3H_8}{5\ mol\ O_2} \left| \frac{44\text{-}g}{1\ mol} \right. = .94\text{-}g\ C_3H_8$$

LR = O_2

1b.) Using the information in question 1a, determine the number of moles of carbon dioxide that can be produced.

$$\frac{3.44g\ O_2}{} \left| \frac{1\ mol\ O_2}{32\text{-}g} \right| \frac{3\ mol\ CO_2}{5\ mol\ O_2} = 6.45 \times 10^{-2}\ mol\ CO_2$$

1c.) Using the information in question 1a, determine the mass of water that can be produced.

$$\frac{3.44\text{-}g\ O_2}{} \left| \frac{1\ mol\ O_2}{32\text{-}g} \right| \frac{4\ mol\ H_2O}{5\ mol\ O_2} \left| \frac{18\text{-}g\ H_2O}{1\ mol\ H_2O} \right. = 1.55\text{-}g\ H_2O$$

1d.) Using the information in question 1a, determine the mass of the excess reagent.

ER = C_3H_8

Started with: 14.8-g

Used: .94-g

13.86-g C_3H_8 in Excess

$$Al_2(SO_3)_3 + 6NaOH \rightarrow 3Na_2SO_3 + 2Al(OH)_3$$

2a.) If 10.0 g of aluminum sulfite reacts with 10.0 g of sodium hydroxide, what is the limiting reagent?

$$10.0\text{-g } Al_2(SO_3)_3 \left| \frac{1 \text{ mol } Al_2(SO_3)_3}{294\text{-g}} \right| \frac{6 \text{ mol NaOH}}{1 \text{ mol } Al_2(SO_3)_3} \left| \frac{40\text{-g}}{1 \text{ mol NaOH}} \right. = 8.16\text{-g NaOH}$$

$$10.0\text{-g NaOH} \left| \frac{1 \text{ mol NaOH}}{40\text{-g}} \right| \frac{1 \text{ mol } Al_2(SO_3)_3}{6 \text{ mol NaOH}} \left| \frac{294\text{-g}}{1 \text{ mol } Al_2(SO_3)_3} \right. = 12.25\text{-g } Al_2(SO_3)_3$$

LR = $Al_2(SO_3)_3$

2b.) Using the information in question 2a, determine the number of moles of $Al(OH)_3$ that can be produced

$$10.0\text{-g } Al_2(SO_3)_3 \left| \frac{1 \text{ mol } Al_2(SO_3)_3}{294\text{-g}} \right| \frac{2 \text{ mol } Al(OH)_3}{1 \text{ mol } Al_2(SO_3)_3}$$

$$= 6.80 \times 10^{-2} \text{ mol } Al(OH)_3$$

2c.) Using the information in question 2a, determine the mass of sodium sulfite that can be produced.

$$10.0\text{-g } Al_2(SO_3)_3 \quad \frac{1 \text{ mol } Al_2SO_3}{294\text{-g}} \quad \frac{3 \text{ mol } Na_2SO_3}{1 \text{ mol } Al_2(SO_3)_3} \quad \frac{126\text{-g}}{1 \text{ mol } Na_2SO_3}$$

$$= 1.29 \times 10^{1}\text{-g } Na_2SO_4$$

2d.) Using the information in question 2a, determine the mass of the excess reagent.

ER = NaOH

Started: 10.0-g

Used: 8.16-g

1.84-g in Excess

$$4Al_2O_3 + 9Fe \rightarrow 3Fe_3O_4 + 8Al$$

3a.) If 25.4 g of aluminum oxide is reacted with 10.2 g of iron, what is the limiting reagent?

$$\frac{25.4\text{-g } Al_2O_3}{} \left| \frac{1 \text{ mol } Al_2O_3}{102\text{-g}} \right| \frac{9 \text{ mol Fe}}{4 \text{ mol } Al_2O_3} \left| \frac{56\text{-g Fe}}{1 \text{ mol Fe}} \right. = 31.4\text{-g Fe}$$

$$\frac{10.2\text{-g Fe}}{} \left| \frac{1 \text{ mol Fe}}{56\text{-g}} \right| \frac{4 \text{ mol } Al_2O_3}{9 \text{ mol Fe}} \left| \frac{102 \text{ g } Al_2O_3}{1 \text{ mol } Al_2O_3} \right. = 8.26\text{-g } Al_2O_3$$

LR = Fe

3b.) Using the information in question 3a, determine the number of moles of aluminum produced.

$$\frac{10.2\text{-g Fe}}{} \left| \frac{1 \text{ mol Fe}}{56\text{-g}} \right| \frac{8 \text{ mol Al}}{9 \text{ mol Fe}} = 1.62 \times 10^{-1} \text{ mol Al}$$

3c.) Using the information in question 3a, what is the mass of Fe_3O_4 that can be produced?

$$\frac{10.2\text{-g Fe}}{} \left| \frac{1 \text{ mol Fe}}{56\text{-g}} \right| \frac{3 \text{mol } Fe_3O_4}{9 \text{ mol Fe}} \left| \frac{232\text{-g}}{1 \text{mol } Fe_3O_4} \right. = 1.41 \times 10^{1} \text{ g } Fe_3O_4$$

3d.) Using the information in question 3a, determine the mass of the excess reagent.

ER = Al_2O_3

Started with: 25.4-g

Used: 8.26-g

17.14-g Al_2O_3 in Excess

$$CS_2 + 2O_2 \rightarrow 2SO_2 + C$$

4a.) What is the limiting reagent when 15.0 g of carbon disulfide reacts with 35.0 g of oxygen gas?

$$15.0\text{-g } CS_2 \left| \frac{1\text{ mol } CS_2}{76\text{-g}} \right| \frac{2\text{ mol } O_2}{1\text{ mol } CS_2} \left| \frac{32\text{-g}}{1\text{ mol } O_2} \right. = 12.6\text{-g } O_2$$

$$35.0\text{-g } O_2 \left| \frac{1\text{ mol } O_2}{32\text{-g}} \right| \frac{1\text{ mol } CS_2}{2\text{ mol } O_2} \left| \frac{76\text{-g}}{1\text{ mol } CS_2} \right. = 41.6\text{-g } CS_2$$

LR = CS_2

4b.) Using the information in 4a, how many grams of carbon can be produced?

$$15.0\text{-g } CS_2 \left| \frac{1\text{ mol } CS_2}{76\text{-g}} \right| \frac{1\text{ mol C}}{1\text{ mol } CS_2} \left| \frac{12\text{-g}}{1\text{ mol C}} \right. =$$

2.37-g C

4c.) Using the information in 4a, how many grams of sulfur dioxide can be produced?

$$15.0\text{-g } CS_2 \left| \frac{1\text{ mol } CS_2}{76\text{-g}} \right| \frac{2\text{ mol } SO_2}{1\text{ mol } CS_2} \left| \frac{64\text{-g}}{1\text{ mol } SO_2} \right.$$

2.53×10^1 -g SO_2

Using the information in 4a, determine the mass of the excess reagent.

ER = O_2

Started With : 35.0-g

Used : 12.6-g

22.4-g O_2 in Excess