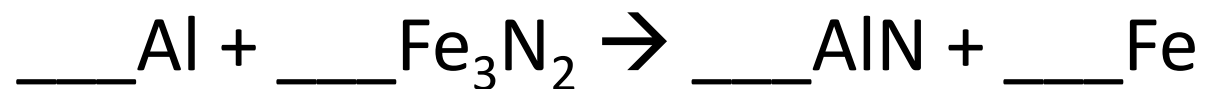


Unit 5 Review

Chemical Reactions and
Stoichiometry

Chemical Equations

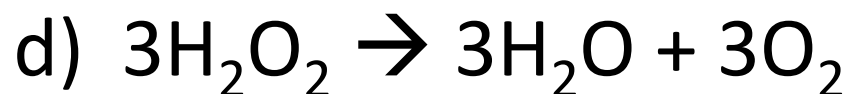
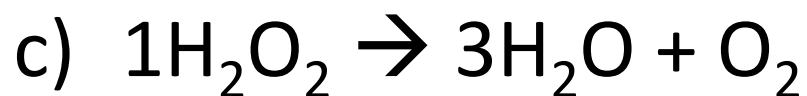
- Which coefficients are needed to balance the following equation?



- a) 3, 1, 3, 1
- b) 1, 3, 2, 3
- c) 2, 1, 2, 3
- d) The equation is balanced

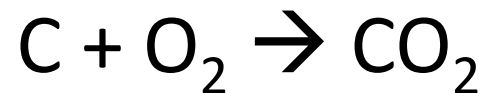
Chemical Equations

- Hydrogen peroxide decomposes into oxygen and water. Which is the balanced equation for this reaction?



Chemical Reactions

- Classify the following reaction:



- a) Synthesis
- b) Single replacement
- c) Decomposition
- d) Double replacement

Stoichiometry

- Consider the following balanced reaction:



If 3 moles of Fe_2O_3 react with excess Na, how many moles of Na_2O will be produced

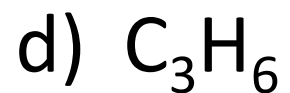
- a) 3
- b) 6
- c) 9
- d) 12

Limiting Reactants

- In the equation $A + B \rightarrow C + D$, if the quantity of A is insufficient to react completely with B, then:
 - a) B is the limiting reactant
 - b) The reaction will not take place
 - c) A is the limiting reactant
 - d) More C will form than D

Chemical Formulas

- Which of the following is an empirical formula?



Moles

- Convert 132 g of CO₂ to moles

$$132 \text{ g} \quad \times \quad \frac{1 \text{ mol}}{44 \text{ g}} \quad = \quad 3 \text{ mol CO}_2$$

Moles

- Convert 0.825 mol Iron to atoms of Iron

$$0.825 \text{ mol X} \times \frac{6.02 \times 10^{23}}{1 \text{ mol}} = 4.97 \times 10^{23}$$

Percent Composition

- What is the percent composition of fluorine in MgF_2 ?

$$\text{MgF}_2 = 24 + 19 + 19 = 62$$

$$\% \text{ F} = (38 \div 62) \times 100 = 61.29\%$$

Empirical Formula

- What is the empirical formula of a compound that is 27.27% Carbon and 72.72% Oxygen?

$$27.27 \text{ g C} \times 1 \text{ mol}/12 \text{ g} = 2.27 \text{ mol C}$$

$$72.72 \text{ g O} \times 1 \text{ mol}/16 \text{ g} = 4.55 \text{ mol O}$$

$$2.27/2.27 = 1 \text{ mol C}$$

$$4.55/2.27 = 2 \text{ mol O}$$

Empirical formula = CO_2

Molecular formula

- A compound's empirical formula is CH_2O . The molecular mass is 180 g. What is the molecular formula?

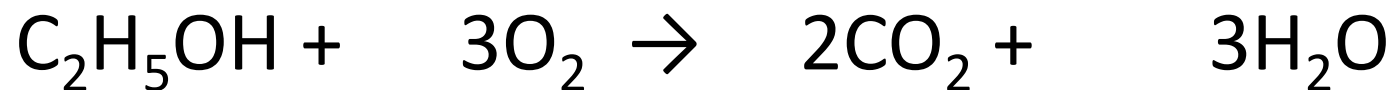
$$\text{Mass of empirical formula} = 12 + 2 + 16 = 30 \text{ g}$$

$$\text{Ratio of empirical mass to molecular mass} = 180 \div 30 = 6$$

$$\text{Molecular formula} = \text{C}_6\text{H}_{12}\text{O}_6$$

Balancing Equations

- Balance the following equation:



Stoichiometry

- What volume of gas is produced if there are 130.0 g of NaN_3 used in the reaction? (the density of nitrogen gas is 0.916 g/L)



$$130 \text{ g NaN}_3 \times (1 \text{ mol}/65) = 2 \text{ mol NaN}_3$$

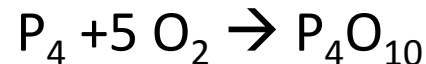
$$2 \text{ mol NaN}_3 \times (3 \text{ mol N}_2/2 \text{ mol NaN}_3) = 3 \text{ mol N}_2$$

$$3 \text{ mol N}_2 \times (28 \text{ g} / 1 \text{ mol}) = 84 \text{ g N}_2$$

$$84 \text{ g N}_2 \times (1 \text{ Liter}/0.916 \text{ g}) = 91.7 \text{ L N}_2$$

Limiting reactant

- If 25 g of P_4 and 50 g O_2 react according to the following equation, how much P_4O_{10} will be produced?



$$25 \text{ g } P_4 \times (1 \text{ mol}/124 \text{ g}) = 0.20 \text{ mol } P_4$$

$$50 \text{ g } O_2 \times (1 \text{ mol}/32 \text{ g}) = 1.56 \text{ mol } O_2$$

$$\text{Ratio} = 1.56/0.20 = 7.8 \text{ } O_2 / 1 \text{ } P_4$$

P_4 is limiting

$$0.2 \text{ mol } P_4 \times (1 \text{ mol } P_4 / 1 \text{ mol } P_4O_{10}) = 0.2 \text{ mol } P_4O_{10}$$

$$0.2 \text{ mol } P_4O_{10} \times (284 \text{ g} / 1 \text{ mol}) = 56.8 \text{ g } P_4O_{10}$$

Percent Yield

- What is the percent yield if 0.5 g of AgNO_3 actually produces 0.455 g Ag_2CrO_4 ?



$$0.5 \text{ g AgNO}_3 \times (1 \text{ mol} / 169.9 \text{ g}) = 0.00294 \text{ mol}$$

$$0.00294 \text{ mol} \times (1 \text{ mol} / 1 \text{ mol}) = 0.00294 \text{ mol}$$

$$0.00294 \text{ mol Ag}_2\text{CrO}_4 \times (331.7 \text{ g} / 1 \text{ mol}) = 0.488 \text{ g Ag}_2\text{CrO}_4$$

$$(0.455 \text{ g} / 0.488 \text{ g}) \times 100 = 93.2 \% \text{ yield}$$