Review Guide for Chapter 3 Test: Chemical Quantities and Stoichiometry

Avogadro's Number and the Mole ($N_A = 6.02 \times 10^{23}$)

Number of "things" in one mole

Molar Mass (sum of atomic masses expressed in grams per mole)

1)Find the molar mass of $(NH_4)_3PO_4$

Mole Conversions (mole island…"the mole is the soul")

2)Convert 20.0 g of CH_4 to moles

3)What is the mass of 38.5 L of CO_2 gas at STP?

4)How many molecules of H_2O have the same total mass as 1.8 L of O_2 at STP?

Percent Composition (by mass)

5)What is the percent of composition of glucose ($C_6H_{12}O_6$)?

6)How many grams of $Pb(NO_3)_2$ contain 25.0 grams of Pb?

Empirical and Molecular Formula

7)What is the empirical formula for a compound containing 26.57% K, 35.36% Cr, and 38.07% O?

8)A compound is found to contain 24.8% carbon, 2.0% hydrogen and 73.2% chlorine with a molecular mass of 96.9 g/mol. What is the molecular formula?

Balancing Chemical Equations

9)____C_4H_{10} + ____O_2 => ____CO_2 + ____H_2O

10)____KOH + ____$Co_3(PO_4)_2$ => ____K_3PO_4 + ____$Co(OH)_2$

Reaction Stoichiometry

<u>Mole-mole problems (mole ratios)</u>

11)If 1.3mol of Cu reacts with excess $AgNO_3$ in the reaction: **$Cu + 2AgNO_3 \Rightarrow Cu(NO_3)_2 + 2Ag$**

A)How many moles of Ag are produced?

B)How many moles of $AgNO_3$ react with the copper?

Mass-mass problems (convert-ratio-convert)

12)Pentane reacts with oxygen to produce carbon dioxide and water according to the following reaction:$\mathbf{C_5H_{12} + 8O_2 => 5CO_2 + 6H_2O}$

A)What mass of oxygen gas is needed to completely burn 200. g of pentane?

B)What mass of carbon dioxide is produced?

Mixed conversions problems

13)What volume of oxygen gas at STP is needed to produce 150 g of H_2O? $\mathbf{2H_2 + O_2 => 2H_2O}$

Limiting reactants

14)If 21.4g of CO is reacted with 91.3g of Fe_2O_3, the products will be CO_2 and iron.

A)Which substance is the limiting reactant?

B)What mass of iron will be produced?

Actual, Theoretical, and Percent Yield

15)When 10.5 grams of $C_2H_4O_2$ reacts with excess O_2, 13.51 grams of CO_2 are produced. What is the percent yield of carbon dioxide in this reaction? $\mathbf{C_2H_4O_2 + 2O_2 => 2CO_2 + 2H_2O}$

16)A student needs to produce 15.0 grams oxygen gas from the decomposition of $KClO_3$.
Given that the percent yield of the reaction is 85%, what mass of potassium chlorate should the student use to ensure they produce enough oxygen? $\mathbf{2KClO_3 => 2KCl + 3O_2}$

ANSWERS

1) 149.12 g/mol 2) 1.25 moles 3) 75.6 grams 4) 8.6×10^{22} molecules 5) 40%C, 6.7%H, 53.3%O 6) 40.0 grams 7) $K_2Cr_2O_7$ 8) $C_2H_2Cl_2$ 9) $2\ C_4H_{10} + 13\ O_2 => 8\ CO_2 + 10\ H_2O$ 10) $6\ KOH + Co_3(PO_4)_2 => 2\ K_3PO_4 + 3\ Co(OH)_2$	11A) 2.6 moles 11B) 2.6 moles 12A) 711 grams 12B) 611 grams 13) 93 Liters 14A) CO 14B) 28.4 grams 15) 87.7% 16) 45 grams