Unit 9 QC#2

Name: Key

UNITS ARE IMPORTANT (g, L, moles, etc AND what substance are you referring to!)

1. A 50.6 g sample of $Mg(OH)_2$ is reacted with 45.0 g of HCl according to the reaction:

$$Mg(OH)_2 + 2\ HCl \rightarrow MgCl_2 + 2\ H_2O$$

58.31g 72.9g 95.21g

$Mg(OH)_2$: $\frac{58.31g}{50.6g} = \frac{95.21g}{x}$ → 82.6g $MgCl_2$

HCl: $\frac{72.9g}{45g} = \frac{95.21g}{x}$ → 58.8g $MgCl_2$

What is the theoretical yield of $MgCl_2$? 58.8g $MgCl_2$

What is the limiting reactant? HCl

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2. If there is 23.4 L of Hydrogen gas at STP that reacts with 32.4L of Oxygen gas at STP, please determine the mass of water vapor that can be produced.

$2H_2 + O_2 \rightarrow 2H_2O$

44.8L 22.4L 44.8L

H_2: $\frac{44.8}{23.4} = \frac{44.8L}{x}$ → 23.4L (LR)

O_2: $\frac{22.4}{32.4} = \frac{44.8L}{x}$ → 64.8L

$\frac{23.4L}{22.4L} = 1.04$ moles of water that can be made (for every mole of what we have)

$1.04\ mol \left|\frac{18g}{1\ mol}\right. = 18.8g$ ($1\ mol\ H_2O = 18g$)

What is the theoretical yield of H_2O in grams? 18.8g

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3. If 5.00 grams of copper metal react with a solution containing 20.0 grams of $AgNO_3$, please answer the following questions. (HINT: the copper will become the copper (II) ion.)

$Cu^{+2} + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$

63.55g 339.76g 215.74g

Cu: $\frac{63.55}{5} = \frac{215.74}{x}$ → 17g Ag

$AgNO_3$: $\frac{339.76g}{20} = \frac{215.74}{x}$ → 12.7g

What is the limiting reactant? $AgNO_3$

What is the excess reactant? Cu^{+2}

What is the theoretical yield of silver that is formed? 12.7g

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4. Heating together the solids NH_4Cl and $Ca(OH)_2$ can generate ammonia(NH_3), aqueous $CaCl_2$, and liquid H_2O. If a mixture of 33.0 g each of NH_4Cl and $Ca(OH)_2$ is heated, how many grams of each product can be formed? (hint, you still need to find the LR, since we know that gets used up completely).

$2NH_4Cl_{(s)} + Ca(OH)_{2(s)} \rightarrow 2NH_{3(g)} + CaCl_{2(aq)} + 2H_2O_{(l)}$

106.92g 74.08g 34.02g 110.98g 36g

Mass of each product:

$NH_3 = 10.5g$

$CaCl_2 = 34.3g$

$H_2O = 11.1g$

NH_4Cl: $\frac{106.92}{33} = \frac{34.02}{x}$ → 10.5g NH_3 * NH_4Cl is LR! * 15.2g NH_3

$Ca(OH)_2$: $\frac{74.08g}{33} = \frac{34.02}{x}$

$\frac{106.92}{33} = \frac{110.98}{x}$ → 34.3g $CaCl_2$

$\frac{106.92}{33} = \frac{36}{x}$ → 11.1g H_2O