SEMESTER 1 REVIEW (CHEM 1 HW1) FITCH (1)

PART 1 - MOLES, MASSES & GENERAL

1. MASS # = 31 AMU
   ATOMIC # = 15
   CHARGE = 0 (ZERO)
   ATOM = P = PHOSPHORUS

2. IONIC BONDS ARE DUE TO CHARGE DIFFERENCES (+ ATTRACTED TO −) CAUSED BY ELECTRONS MOVING FROM ATOM TO ATOM. COVALENT BONDS ARE DUE TO SHARING ELECTRONS. COVALENT = 2 NON METALS, IONIC = METAL + NON METAL.

3. $Mn = 54.94 \text{ g/mol}$

4. $O_2 = 32.00 \text{ g/mol}$

5. HALOGENS = −1
   ALKALI METALS = +1
   ALKALINE EARTH METALS = +2
   Al = +3
   Cr(III) = +3

6. $Ca_3(PO_4)_2$

7. $AlBr_3$

8. $CF_4 = 12 + (4 \cdot 19.00) = 88 \text{ g/mol}$

$$(15 \text{ mol } CF_4)\left(\frac{88.00 \text{ g}}{1 \text{ mol}}\right) = 1320.00 \text{ g } CF_4$$

9. $Al_2O_3 = (2 \cdot 26.98) + (3 \cdot 16) = 101.96 \text{ g/mol}$

$$(7.2 \text{ mol } Al_2O_3)(101.96 \text{ g/mol}) = 734.11 \text{ g } Al_2O_3$$

CHEM 5 HW 1 (SEMESTER 1 REVIEW)

PART 2 - STOICH.

$SF_4 + 2H_2O \rightarrow SO_2 + 4HF$

1. $(2.5 \text{ mol } SF_4)\left(\frac{2 \text{ mol } H_2O}{1 \text{ mol } SF_4}\right) = \boxed{5 \text{ mol } H_2O}$

2. $(.034 \text{ mol } SF_4)\left(\frac{1 \text{ mol } SO_2}{1 \text{ mol } SF_4}\right) = .034 \text{ mol } SO_2$

$\frac{32.06}{32.00}\frac{}{64.06}(.034 \text{ mol } SO_2)\left(\frac{64.06 \text{ g}}{\text{mol}}\right) = \boxed{2.18 \text{ g } SO_2}$

3. $(36 \text{ g } H_2O)\left(\frac{1 \text{ mol}}{18.02 \text{ g}}\right) = 2.0 \text{ mol } H_2O$

$(2.0 \text{ mol } H_2O)\left(\frac{1 \text{ mol } SO_2}{2 \text{ mol } H_2O}\right) = 1 \text{ mol } SO_2$

$(1 \text{ mol } SO_2)\left(\frac{64.06 \text{ g}}{\text{mol}}\right) = \boxed{64.06 \text{ g } SO_2}$

4. $C_{25}H_{52} + 38O_2 \rightarrow 25CO_2 + 26H_2O$

$(5 \text{ mol } C_{25}H_{52})\left(\frac{25 \text{ mol } CO_2}{1 \text{ mol } C_{25}H_{52}}\right) = \boxed{125 \text{ mol } CO_2}$

$(5 \text{ mol } C_{25}H_{52})\left(\frac{26 \text{ mol } H_2O}{1 \text{ mol } C_{25}H_{52}}\right) = \boxed{130 \text{ mol } H_2O}$

5. $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

$(2.45\text{g Fe})\left(\frac{1\text{ mol}}{55.85\text{g}}\right) = .04387\text{ mol Fe}$

$(.04387\text{ mol Fe})\left(\frac{1\text{ mol Cu}}{1\text{ mol Fe}}\right) = .04387\text{ mol Cu}$

$= .044\text{ mol Cu}$

6. $TiCl_4 + 2Mg \rightarrow 2MgCl_2 + Ti$

$(100\text{g Ti})\left(\frac{1\text{ mol}}{47.9\text{g}}\right) = 2.0877\text{ mol Ti}$

$(2.0877\text{ mol Ti})\left(\frac{2\text{ mol Mg}}{1\text{ mol Ti}}\right) = 4.1754\text{ mol Mg}$

$(4.1754\text{ mol Mg})\left(\frac{24.31\text{g}}{\text{mol}}\right) = 101.50\text{g Mg}$

7. $CaCO_3 + 2NaCl \rightarrow Na_2CO_3 + CaCl_2$

$(2000\text{g NaCl})\left(\frac{1\text{ mol}}{58.44\text{g}}\right) = 34.22\text{ mol NaCl}$

$(34.22\text{ mol NaCl})\left(\frac{1\text{ mol } Na_2CO_3}{2\text{ mol NaCl}}\right) = 17.11\text{ mol } Na_2CO_3$

$(22.99 \cdot 2) + (1 \cdot 12.01) + (3 \cdot 16) = 105.99\text{ g/mol } Na_2CO_3$

$(17.11\text{ mol } Na_2CO_3)\left(\frac{105.99\text{g}}{\text{mol}}\right) = 1813.49\text{g } Na_2CO_3$

$(34.22\text{ mol NaCl})\left(\frac{1\text{ mol } CaCl_2}{2\text{ mol NaCl}}\right) = 17.11\text{ mol } CaCl_2$

$(1 \cdot 40.08) + (2 \cdot 35.45) = 110.98\text{ g/mol}$

$(17.11\text{ mol } CaCl_2)(110.98\text{ g/mol}) = 1898.87\text{g } CaCl_2$

SEM. 1 REVIEW (CONT)

8. a) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

b) $(10\ \text{mol}\ C_3H_8)\left(\frac{3\ \text{mol}\ CO_2}{1\ \text{mol}\ C_3H_8}\right) = 30\ \text{mol}\ CO_2$ POSSIBLE

$(40\ \text{mol}\ O_2)\left(\frac{3\ \text{mol}\ CO_2}{5\ \text{mol}\ O_2}\right) = 24\ \text{mol}\ CO_2$ POSSIBLE

∴ 40 mol O_2 IS LIMITING

c) 24 mol CO_2 PRODUCED (FROM b))

$(40\ \text{mol}\ O_2)\left(\frac{4\ \text{mol}\ H_2O}{5\ \text{mol}\ O_2}\right) = 32\ \text{mol}\ H_2O$ PRODUCED

9. a) $3CaCl_2 + 2Na_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6NaCl$

b) 174.1 g $CaCl_2$ 200.0 g Na_3PO_4

$(174.1\ g\ CaCl_2)\left(\frac{1\ \text{mol}}{110.98\ g}\right) = 1.569\ \text{mol}\ CaCl_2$

$(1.5699\ \text{mol}\ CaCl_2)\left(\frac{1\ \text{mol}\ Ca_3(PO_4)_2}{3\ \text{mol}\ CaCl_2}\right) = .523\ \text{mol}\ Ca_3(PO_4)_2$ POSSIBLE

$(22.99 \cdot 3) + (2 \cdot 30.97) + (4 \cdot 16.00)$

$(200\ g\ Na_3PO_4)\left(\frac{1\ \text{mol}}{163.94\ g}\right) = 1.22\ \text{mol}\ Na_3PO_4$

$(1.22\ \text{mol}\ Na_3PO_4)\left(\frac{1\ \text{mol}\ Ca_3(PO_4)_2}{2\ \text{mol}\ Na_3PO_4}\right) = .61\ \text{mol}\ Ca_3(PO_4)_2$ POSSIBLE

∴ $CaCl_2$ IS LIMITING

9. c) Na_3PO_4 IS IN EXCESS

d) $(1.5689\ mol\ CaCl_2)\left(\frac{2\ mol\ Na_3PO_4}{3\ mol\ CaCl_2}\right) = 1.046\ mol\ Na_3PO_4$ USED (REACTED)

FROM 9b GIVEN → $(1.22\ mol\ Na_3PO_4) - 1.046\ mol = .174\ mol\ Na_3PO_4$ IN EXCESS

e) $(1.5689\ mol\ CaCl_2)\left(\frac{6\ mol\ NaCl}{3\ mol\ CaCl_2}\right) = 3.138\ mol\ NaCl$

$(3.138\ mol\ NaCl)\left(\frac{58.44\ g}{mol}\right) = 183.38\ g\ NaCl$

FROM 9b → $(.523\ mol\ Ca_3(PO_4)_2)\left(\frac{312.36\ g}{mol}\right) = 163.36\ g\ Ca_3(PO_4)_2$

(40.08·3) + (32.06·2) + (16.00·8)

PART 3 DENSITY - $D = \frac{M}{V}$

1. $\frac{5\ g}{2\ cm^3} = 2.5\ g/cm^3$

2. $(13.53\ g/cm^3) = 13.53\ g/mL$

$(25\ mL)\left(\frac{13.53\ g}{mL}\right) = 338.25\ g\ Hg$

3. $28\ g\ CO_2$ 22.4 L

$\frac{(28\ g)(1\ K)}{(22.4\ L)(1000\ mL)} = .00125\ g/mL = 1.25 \times 10^{-3}\ \frac{g}{mL}$

PART 3

4. $1\ mol\ CO_2 = 22.4\ L$

$$(1\ mol\ CO_2)\left(\frac{44.01\ g}{mol}\right) = 44.01\ g\ CO_2$$

$$\left(\frac{44.01\ g}{22.4\ L}\right)\left(\frac{1\ L}{1000\ ml}\right) = .001965\ g/ml = 1.96 \times 10^{-3}\ \frac{g}{ml}$$

5. $$\left(\frac{32.0\ g}{22.4\ L}\right)\left(\frac{1\ L}{1000\ ml}\right) = .001429\ \frac{g}{ml} = 1.43 \times 10^{-3}\ g/ml$$