

SEMESTER 1 REVIEW (QUEST 1001)

PART 1

PART 1 - Masses, masses & elements

1. Mass # = 31 u

Atomic # = 15

Charge = 0 (neutral)

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 valence, ionic = metal + nonmetal.

3. $K_2 = 59.94 \text{ g/mol}$

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

5. Alkalis = -1

Alkali metals = +1

Alkaline earth metals = +2

AP = +3

Cr(VI) = +3

6. $Ca_3(PO_4)_2$

7. $AlBr_3$

8. $CF_4 = 12 + (4 \cdot 19.00) = 78 \text{ g/mol}$

$(15 \text{ mol } CF_4)(78.00 \text{ g}) = 1170.00 \text{ g } CF_4$

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

$(7.2 \text{ mol } Al_2O_3)(101.96 \text{ g/mol}) = 734.112 \text{ g } Al_2O_3$

CHEM 5 HW1 (SEMESTER 1 REVIEW) ①
 PART 2 - STOICH.



$$1. (2.5 \text{ mol } 5Fe) \times \frac{2 \text{ mol } H_2O}{1 \text{ mol } 5Fe} = \boxed{5 \text{ mol } H_2O}$$

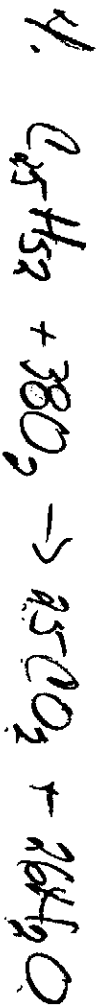
$$2. (0.034 \text{ mol } 5Fe) \times \frac{1 \text{ mol } 5O_2}{1 \text{ mol } 5Fe} = \boxed{0.034 \text{ mol } 5O_2}$$

$$\frac{3300}{33.00} (0.034 \text{ mol } 5O_2) \times \frac{64.06 \text{ g}}{\text{mol}} = \boxed{2.18 \text{ g } 5O_2}$$

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

$$(2.0 \text{ mol } H_2O) \times \frac{1 \text{ mol } 5O_2}{2 \text{ mol } H_2O} = \boxed{1 \text{ mol } 5O_2}$$

$$(1 \text{ mol } 5O_2) \times \frac{64.06 \text{ g}}{\text{mol}} = \boxed{64.06 \text{ g } 5O_2}$$



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

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

SEM 1 ANSWER (2021/17)

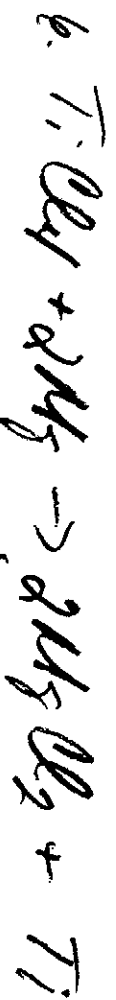
③



$$\frac{(2.45 \text{ g Fe}) (1 \text{ mol})}{(55.85 \text{ g})} = 0.4387 \text{ mol Fe}$$

$$\frac{(0.4387 \text{ mol Fe}) (1 \text{ mol Ca})}{(1 \text{ mol Fe})} = 1.04387 \text{ mol Ca}$$

1.044 mol Ca



$$\frac{(100 \text{ g Ti}) (1 \text{ mol})}{(47.9 \text{ g})} = 2.0872 \text{ mol Ti}$$

$$\frac{(2.0872 \text{ mol Ti}) (2 \text{ mol HF})}{(1 \text{ mol Ti})} = 4.1754 \text{ mol HF}$$

$$\frac{(4.1754 \text{ mol HF}) (24.31 \text{ g})}{(1 \text{ mol HF})} = \underline{101.50 \text{ g HF}}$$



$$\frac{(2000 \text{ g HCl}) (1 \text{ mol})}{(36.46 \text{ g})} = 54.85 \text{ mol HCl}$$

$$\frac{(54.85 \text{ mol HCl}) (1 \text{ mol H}_2\text{CO}_3)}{(2 \text{ mol HCl})} = 27.42 \text{ mol H}_2\text{CO}_3$$

$$(27.42 \text{ mol}) (44.01 \text{ g/mol}) = 1207.1 \text{ g H}_2\text{CO}_3$$

$$\frac{(17.11 \text{ mol H}_2\text{CO}_3) (105.99 \text{ g/mol})}{(1 \text{ mol H}_2\text{CO}_3)} = \underline{1813.49 \text{ g H}_2\text{CO}_3}$$

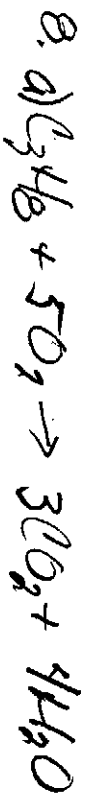
$$\frac{(34.22 \text{ mol HCl}) (1 \text{ mol CaCl}_2)}{(2 \text{ mol HCl})} = 17.11 \text{ mol CaCl}_2$$

$$\frac{(1.40 \text{ mol}) + (2.35 \text{ mol})}{(1 \text{ mol HCl})} = 3.75 \text{ mol HCl}$$

$$\frac{(17.11 \text{ mol CaCl}_2) (110.98 \text{ g/mol})}{(1 \text{ mol CaCl}_2)} = \underline{1898.87 \text{ g CaCl}_2}$$

SEMI 1 REVIEW (cont)

④



b) $(10 \text{ mol } C_3H_8) \times \frac{3 \text{ mol } CO_2}{1 \text{ mol } C_3H_8} = 30 \text{ mol } CO_2 \text{ possible}$

$(40 \text{ mol } O_2) \times \frac{3 \text{ mol } CO_2}{5 \text{ mol } O_2} = 24 \text{ mol } CO_2 \text{ possible}$

$\therefore 40 \text{ mol } O_2 \text{ is limiting}$

c) $24 \text{ mol } CO_2 \text{ produced (from b)}$

$(40 \text{ mol } O_2) \times \frac{4 \text{ mol } H_2O}{5 \text{ mol } O_2} = 32 \text{ mol } H_2O \text{ produced}$



b) $174.17 \text{ g } CaCl_2 \quad 300.0 \text{ g } Al_2O_3$

$(174.17 \text{ g } CaCl_2) \times \frac{1 \text{ mol}}{(110.985)} = 1.569 \text{ mol } CaCl_2$

$(1.569 \text{ mol } CaCl_2) \times \frac{1 \text{ mol } Ca_3(PO_4)_2}{3 \text{ mol } CaCl_2} = 0.523 \text{ mol } Ca_3(PO_4)_2 \text{ possible}$

$(300 \text{ g } Al_2O_3) \times \frac{1 \text{ mol}}{101.96} = 2.94 \text{ mol } Al_2O_3$

$(1.32 \text{ mol } Al_2O_3) \times \frac{1 \text{ mol } Ca_3(PO_4)_2}{2 \text{ mol } Al_2O_3} = 0.66 \text{ mol } Ca_3(PO_4)_2 \text{ possible}$

$\therefore CaCl_2 \text{ is limiting}$

SEM 1 REVIEW (cont)

⑤

9. d) Na_3PO_4 is in EXCESS

$$\begin{aligned} & \text{d) } (1.5589 \text{ mol CaCl}_2) \times \frac{2 \text{ mol Na}_3\text{PO}_4}{3 \text{ mol CaCl}_2} = 1.046 \text{ mol Na}_3\text{PO}_4 \\ & \text{FLOW 9b} \\ & \text{INVEST } \downarrow \\ & (1.32 \text{ mol Na}_3\text{PO}_4) - 1.046 \text{ mol} = 1.174 \text{ mol Na}_3\text{PO}_4 \\ & \text{IN EXCESS} \end{aligned}$$

$$\begin{aligned} & \text{e) } (1.5589 \text{ mol CaCl}_2) \times \frac{6 \text{ mol H}_2\text{O}}{3 \text{ mol CaCl}_2} = 3.138 \text{ mol H}_2\text{O} \\ & (3.158 \text{ mol H}_2\text{O}) \times \frac{58.44 \text{ g}}{\text{mol}} = 183.38 \text{ g H}_2\text{O} \end{aligned}$$

$$\begin{aligned} & \text{FROM } \rightarrow (.533 \text{ mol Ca}_3(\text{PO}_4)_2) \times (312.36 \text{ g}) = 163.36 \text{ g Ca}_3(\text{PO}_4)_2 \\ & 40.07 \times 3 \\ & + \\ & 32.06 \times 2 \\ & + \\ & 16.00 \times 8 \end{aligned}$$

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

$$\begin{aligned} & 1. \frac{5g}{2 \text{ cm}^3} = \boxed{2.5 \text{ g/cm}^3} \\ & 2. (13.53 \text{ g/cm}^3) = 13.53 \text{ g/cm}^3 \\ & (85 \text{ mol}) \times (13.53 \text{ g}) = \boxed{1358.25 \text{ g Hg}} \end{aligned}$$

3. 28 g CO_2 at 2.4 L

$$\frac{(28 \text{ g}) \times (11.4)}{20.18 \times 1000 \text{ mol}} = 1.25 \times 10^{-3} \frac{\text{g}}{\text{ml}}$$

SEM 1 REV (cont)

(6)

Part 3

4. 1 mol CO₂ : 22.4 L

$$(1 \text{ mol CO}_2) \left(\frac{44.01 \text{ g}}{\text{mol}} \right) = 44.01 \text{ g CO}_2$$

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

5.

$$\left(\frac{32.0 \text{ g}}{22.4 \text{ L}} \right) \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) = .00143 \frac{\text{g}}{\text{mL}} = \boxed{1.43 \times 10^{-3} \frac{\text{g}}{\text{mL}}}$$