AP Chem Unit 1 Stioch FR Practice

1. $C_xH_yN_zO + O_2 \xrightarrow{\text{excess}} CO_2 + H_2O + NO_2$

$C_xH_yN_zO$: 1.2359 g, 0.0648 g is H

CO_2: 2.241 g

(A)

(i) ? g C in 1.2359 g The amount of C in CO_2 & $C_xH_yN_zO$ is the same. We do not know Ratio's in $C_xH_yN_zO$ ∴ use CO_2

$$\left(\frac{2.241\text{ g } CO_2}{1}\right)\left(\frac{1\text{ mole } CO_2}{44.01\text{ g } CO_2}\right)\left(\frac{1\text{ mole C}}{1\text{ mole } CO_2}\right)\left(\frac{12.01\text{ g C}}{1\text{ mole C}}\right)$$

$$= 0.6116\text{ g C}$$

(ii) mass % N = 28.84% ? g N in 1.2359 g

$$(1.2359\text{ g } C_xH_yN_zO)(.2884\text{ N}) = .3564\text{ g N}$$

(iii) ? g O in 1.2359 g

1.2359 g $C_xH_yN_zO$
− .6116 g C
− .3564 g N
− .0648 g H
.2031 g O

(iv) Empirical Formula?

$$\left(\frac{.6116\text{ g C}}{1}\right)\left(\frac{1\text{ mole C}}{12.01\text{ g C}}\right) = .05092\text{ mole C} \Rightarrow 4\text{ C}$$

$$\left(\frac{.3564\text{ g N}}{1}\right)\left(\frac{1\text{ mole N}}{14.01\text{ g N}}\right) = .02544\text{ mole N} \Rightarrow 2\text{ N}$$

$$\left(\frac{0.0648\text{ g H}}{1}\right)\left(\frac{1\text{ mole H}}{1.008\text{ g H}}\right) = .0643\text{ mole H} \Rightarrow 5\text{ H}$$

$$\left(\frac{.2031\text{ g O}}{1}\right)\left(\frac{1\text{ mole O}}{16.00\text{ g O}}\right) = .01269\text{ mole O} \Rightarrow 1\text{ O}$$

$C_4H_5N_2O$

(2.) $UF_6 + H_2O \rightarrow UFO_{(s)} + HF_{(g)}$

4.267g 3.730g .970g

95.0% F

.922g F

A) empirical formula of GAS?

$(.970g)(.950\ F) = .922\ g\ F$

$\left(\frac{95.0\ g\ F}{1}\right)\left(\frac{1\ mole\ F}{19.00\ g\ F}\right) = \frac{5.00\ mole\ F}{5.00}$

$\left(\frac{5.0\ g\ H}{1}\right)\left(\frac{1\ mole\ H}{1.008\ g\ H}\right) = \frac{5.00\ mole\ H}{5.00}$ ∴ Ratio 1:1

HF

or $\left(\frac{.922\ g\ F}{1}\right)\left(\frac{1\ mole\ F}{19.00\ g\ F}\right) = .0485\ mole\ F$

$\left(\frac{.970\ g_{Total} - .922\ g\ F}{1}\right)\left(\frac{1\ mole\ H}{1.008\ g\ H}\right) = .0476\ mole\ H$ ∴ Ratio 1:1

HF

B) Fraction of F (orginal UF_6) is in UFO & in HF?

1st Amount of F in UF_6 4.267g

U 1x238.03

F 6x19.00

352.03

$\left(\frac{4.267\ g\ UF_6}{1}\right)\left(\frac{1\ mole\ UF_6}{352.03\ g\ UF_6}\right)\left(\frac{6\ mole\ F}{1\ mole\ UF_6}\right)\left(\frac{19.00\ g\ F}{1\ mole\ F}\right)$

$= 1.38\ g\ F$

$F_{gas}/F_{orginal}$ $\frac{.922\ g\ F}{1.38\ g\ F} = .668$ $\frac{F_{gas}}{UF_6}$

1.38g Retant F − .922g GAS F = .46 g Solid F

$\frac{.46\ g\ GAS\ F}{1.38\ g\ Retant\ F} = .33$ $\frac{F_{solid}}{F_{orginal}}$

or Fraction of F in Solid

1 − .668 = .332

② c) Formula of $UFO_{(s)}$?

3.730g Total
- .46g F
- 2.89g U
.38 g O

4.267g UF_6 orginal

1.38g F / 2.89g U Same on R+P side

$\left(\frac{2.89\text{g U}}{1}\right)\left(\frac{1\text{ mole U}}{238.03\text{g U}}\right) = .0121 \text{ mole U} / .0121 = 1$

$\left(\frac{0.46\text{g F}}{1}\right)\left(\frac{1\text{ mole F}}{19.00\text{g F}}\right) = .024 \text{ mole F} / .0121 \doteq 2$

$\left(\frac{.38\text{g O}}{1}\right)\left(\frac{1\text{ mole O}}{16.00\text{g O}}\right) = .024 \text{ mole O} / .0121 \doteq 2$

UF_2O_2

D) write Balanced Eqn

$$UF_6 + 2H_2O \rightarrow UF_2O_2 + 4HF$$

③ $BeC_2O_4(s)$ & Hydrate

A) ? mass% of C in $BeC_2O_4 \cdot 3H_2O$

Be $1 \times 9.01 = 9.01$ g

C $2 \times 12.01 = 24.02$ g

O $4 \times 16.00 = 64.00$ g / 97.03 g BeC_2O_4

$3H_2O$ $3 \times 18.02 = 54.06$ g

151.09 g $BeC_2O_4 \cdot 3H_2O$

16.00
2.016
18.02

$$\frac{24.02\ g\ C}{151.09\ g\ BeC_2O_4 \cdot 3H_2O} \times 100 = 15.90\%\ C$$

B) $BeC_2O_4 \cdot 3H_2O \xrightarrow{220^\circ C} BeC_2O_4(s) + 3H_2O(g)$

3.21 g ? g ? L @ 220°C, 735 mm Hg

$$\left(\frac{3.21\ g\ BeC_2O_4 \cdot 3H_2O}{1}\right)\left(\frac{1\ mole\ BeC_2O_4 \cdot 3H_2O}{150.09\ g\ BeC_2O_4 \cdot 3H_2O}\right)\left(\frac{1\ mole\ BeC_2O_4}{1\ mole\ BeC_2O_4 \cdot 3H_2O}\right)$$

$$\left(\frac{97.03\ g\ BeC_2O_4}{1\ mole\ BeC_2O_4}\right) = 2.06\ g\ BeC_2O_4(s)$$

$PV = nRT$

$V = ?$

$P = \left(735\ mm\ Hg\right)\left(\frac{1\ atm}{760\ mm\ Hg}\right) = .967\ atm$

$R = .08206\ \frac{L\ atm}{mole\ K}$

$T = 220^\circ C + 273 = 493\ K$

$$n = \frac{3.21\ g\ R}{2.06\ BeC_2O_4} \left(\frac{1.15\ g\ H_2O}{1}\right)\left(\frac{1\ mole\ H_2O}{18.02\ g\ H_2O}\right) = .0638\ mole\ H_2O$$

$1.15\ g\ 3H_2O$

(3) B) conti

$$V = \frac{nRT}{P} = \frac{(.0638 \text{ mole } H_2O)\left(.08206 \frac{L\,atm}{mole\,K}\right)(493\,K)}{.967\ atm}$$

$$V = 2.67\ L$$