

5ml or 0.25M H_2SO_4

$$\frac{5}{1000} = 5 \times 10^{-3} \text{ dm}^3$$

Concentration = mol/volume

$$\text{mol} = \text{conc} \times \text{volume} = 0.25 \times 5 \times 10^{-3}$$

$$= 1.25 \times 10^{-3} \text{ mol}$$

$$1.25 \times 10^{-3} \times \frac{1}{1} = 1.25 \times 10^{-3} \text{ mol of BaSO}_4$$

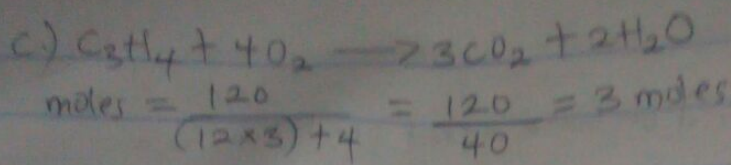
$$\text{mass} = \text{M.M} \times \text{mole} = 1.25 \times 10^{-3} \times 233$$

$$= 0.291 \text{ g}$$

Mass of water driven off $\times 100$

mass of hydrate

$$= \frac{113 \text{ g}}{25.0 \text{ g}} = 45.2\%$$



$$3 \text{ moles } C_3H_4 \times \frac{3 \text{ moles } CO_2}{1 \text{ mole } C_3H_4} = 9 \text{ moles of } CO_2$$

$$\text{Mass} = \text{moles} \times M.M$$

$$= 9 \times 44 = \underline{\underline{396g}}$$

The long term of the periodic table can be divided into four main blocks, P, S, D, F. The division is primarily based on their electronic configuration.

S-block: The elements in which the last electron enters the s-sub shell of their outermost energy level are called s-block elements. This block is located at the extreme left of the periodic table.

It consists of the group I and II elements.

D-block: The elements in which the last electron enters the d-sub shell of penultimate energy level are called d-block elements. Their general valence shell configuration is $(n-1)d^{1-10}ns^{1-2}$, where n represents the outermost energy level.

P-block: elements in which the last electron enters the p-sub shell of their outermost energy level are called s-p-block elements.

Their general configuration of outermost shell is ns^2np^{1-6} , the only exception is helium. This block is located at the extreme right of the periodic table.

F-block: The ^{elements} outermost in which the last electron enters the f-sublevel of the anti-penultimate shell are called f-blocks.

Their general configuration is $(n-2)f^{1-14}(n-1)d^{0-1}ns^2$

6) Exogy Eye goggles

7) Because a scrap or piece of paper can get lost easily

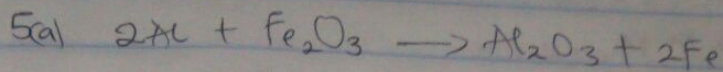
8) $\text{density} = \frac{\text{mass}}{\text{volume}}$

$$= \frac{8.47g}{3.24cm^3} = 2.6g/cm^3 \text{ or } 2614.2g/dm^3$$

a) Buffer capacity, $\beta = \frac{dc}{dpH}$

$dc =$ number of moles of acid or base added per litre of the buffer

$dpH =$ change in pH



Mass of $Al_2O_3 = 124g$ of Aluminium

$$\text{moles} = \frac{\text{mass}}{M.M} = \frac{124}{26.982} = 4.6 \text{ moles}$$

$$4.6 \text{ moles of } Al_2 \times \frac{1 \text{ mol of } Al_2O_3}{2 \text{ mol of } Al} = 2.3 \text{ moles of } Al_2O_3$$

$$\text{mass} = \text{moles} \times M.M$$

$$M.M \text{ of } Al_2O_3 = (26.982 \times 2) + (3 \times 16) = 101.964$$

$$2.3 \times 101.964 = 234.5172g \approx 235g$$

Mass of excess reagent

= Mass of reagent - mass of product

mass of $(Al_2O_3 + Fe)$

$$Fe_2O_3 = \frac{601}{(2 \times 55.845) + (16 \times 3)} = 3.76 \text{ moles}$$

$$3.76 \times \frac{2}{1} = 7.52 \text{ moles of } Fe$$

$$\text{Mass} = \text{moles} \times M.M$$

$$= 7.52 \times 33.845 = 420g$$

excess reagent

$$(601 + 124) - (420 + 235)$$

$$= 70g$$

$$b) \% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

$$\text{actual yield} = 46.0g$$

theoretical yield given as; $C_6H_6 + Cl_2 \rightarrow C_6H_5Cl + HCl$

$$\text{moles} = \frac{40}{(12 \times 6) + 6} = 0.51 \text{ moles}$$

$$0.51 \text{ moles of } C_6H_6 \times \frac{1}{1} = 0.51 \text{ moles of } C_6H_5Cl$$

$$\text{Mass} = 0.51 \times 112.5 = 57.375g$$

$$\% \text{ yield} = \frac{46}{57.375} \times 100 = 80.17\%$$

$$b) t_{1/2} = 500$$

$$500 = \frac{0.693}{k_1}$$

$$k_1 = \frac{0.693}{500} = 1.39 \times 10^{-3}$$

$$k_1 = \ln \left[\frac{a}{a-x} \right] / t$$

$$= 1.39 \times 10^{-3} \times 800 = \ln \left[\frac{a}{a-x} \right]$$

$$1.112 = \ln \left[\frac{a}{a-x} \right]$$

$$\ln^{-1}(1.112) = \frac{a}{a-x}$$

$$3 = \frac{a}{a-x}$$

$$3a - 3x = a$$

$$x = \frac{2}{3}a$$

\therefore 66.6% of a must have reacted after 800 secs.

$$4(a) \text{ pH} = \text{pK}_a + \log_{10} \frac{[\text{base}]}{[\text{conjugate acid}]}$$

$$b) [\text{H}_3\text{O}^+] = \frac{K_a [\text{acid}]}{[\text{conjugate base}]}$$

$$= \frac{1.8 \times 10^{-5} \times 0.2}{0.15} = 2.4 \times 10^{-5}$$

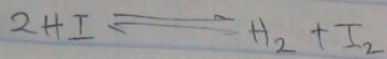
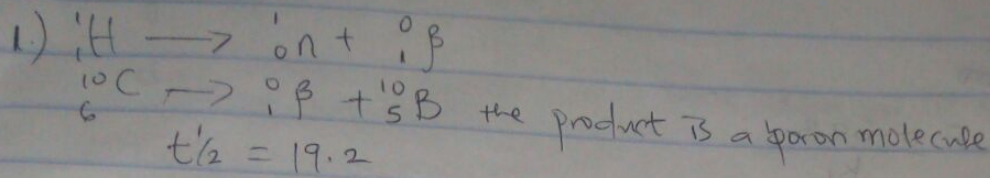
$$\text{pH} = \text{pK}_a + \log \frac{[\text{conj base}]}{[\text{acid}]}$$

$$\text{pK}_a = -\log K_a$$

$$= -\log [1.8 \times 10^{-5}] = 4.74$$

$$4.74 + \log \frac{[0.15]}{0.2} = 4.6$$

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CHEM 101 ASSIGNMENT



To calculate K_c ;

V = volume of the reaction

$$\therefore K_c = \frac{\frac{na}{V} - \frac{na}{V}}{\frac{[2n(1-a)]^2}{V^2}}$$

$\frac{a^2}{4(1-a)^2} = \text{Where } a = 0.223$

$$K_c = \frac{0.223^2}{4(1-0.223)^2} = 0.0206$$

2.) $\ln \left[\frac{a}{a-x} \right] \times \frac{1}{t}$

$a = 46.1$

$a-x \quad 0 \quad 37.1 \quad 29.8 \quad 19.6$

$t \quad 0 \quad 5 \quad 10 \quad 20$

$\therefore \text{at } t=5 \quad K_1 = \ln \left[\frac{46.1}{37.1} \right] \times \frac{1}{5} = 0.043$

$\text{at } t=10 \quad K_1 = \ln \left[\frac{46.1}{29.8} \right] \times \frac{1}{10} = 0.044$

$\text{at } t=15 \quad K_1 = \ln \left[\frac{46.1}{19.6} \right] \times \frac{1}{15} = 0.043$

The constant K_1 proves that the reaction is first order reaction $t_{1/2} = \frac{0.693}{K_1}$

$$K_1 = \frac{0.043 + 0.043 + 0.044}{3}$$

$$= 0.043$$

$$t_{1/2} = \frac{0.693}{0.043} = \underline{\underline{16.125}}$$