There are two Sections in this Exam.

Section 1:

Single Correct Questions (Each question carries +4 marks for correct answer and – 1 mark for wrong answer, 0 marks for not attempting)

Section 2:

Integer type questions (Each question carries +4 marks for correct answer and 0 mark for wrong answer and not attempting.)

Both have equal volume = V

$$HCl = \frac{\left(v \times \frac{10}{100}\right) \times d_{HCl}}{36.5} \text{ mole}$$

$$NaOH = \frac{\left(v \times \frac{10}{100}\right) \times 1.5\ d_{HCl}}{40} \text{ mole}$$

NaOH mole > HCl mole

Basic Solution

$$C_xH_y + \left(x + \frac{y}{4}\right) O_2 \longrightarrow XCO_2 + \frac{y}{2} H_2O \text{ (g)}$$

(g) (g)

$$\frac{\left(1 + x + \frac{y}{4}\right)}{\left(x + \frac{y}{2}\right)} = \frac{600}{700}$$

$$x + 7 = \frac{5y}{4}$$

by option (A)

$w_{salt} = 1$ gm

$w_{Hg} = 0.5934$ gm

Let wt. % of H = x

Let wt. % of C = 8x

Let wt. % of O = 16x

Since its dibasic acid

$\therefore$ 1 mole salt = 2 moles Ag

$$\text{Moles of Ag} = \frac{0.5934}{108}$$

$$\therefore \text{moles of salt /acid} = \frac{0.5934}{108} \times \frac{1}{2}$$

Given wt of salt = 1 gm

$$\text{So, Molecular wt. of salt} = \frac{1}{0.5934} \times 108 \times 2$$

= 364 gm/mol

Now x + 8x + 16 x = 364

x = 14.5 gm

wt. of H present = 14.5 gm

Moles of H present = 14.5

wt. of C present = 8 × 14.5

$$\text{Moles of C present} = \frac{8 \times 14.5}{2} = 9.7$$

wt. of O present = 16 × 14.5

$$\text{Moles of O present} = \frac{16 \times 14.5}{16} = 14.5$$

Hence H and O are present in same ratio.

These for option (B) satisfy this critaria.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
Max. Heat obtained when reactants are present in their stoichiometric ratio.
For 1 mole CH_4 O_2 required = 2 moles

0.2 moles O_2 is in air = 1 mole,   2 mole O_2 will be in air = ½ x 2 = 10 mol

Total no. of moles = $n_{O_2} + n_{N_2} + n_{CH_4}$

= 2 + 8 + 1

= 11

Mole fraction $O_2 = \frac{2}{11}$ Mole fraction $CH_4 = \frac{1}{11}$

Mole fraction $N_2 = \frac{8}{11}$

$$C_6H_5OH + 7O_2 \longrightarrow 6CO_2 + 3H_2O(\ell)$$

30 ml

180 ml produced

Volume used initially

$= 30 + 210 = 240$

for C_6H_5OH for O_2

Volume formed = 180 ml

Change in v % = 240 + 80 = 60 ml

$$N_xO_y + y\,H_2 \longrightarrow yH_2O\ (\ell) + x/2\ N_2(g)$$

10 ml

$H_2 = 10\,y$ ml $= 30$ ml

$N_2 = 10$ ml $= 10\,x/2$ ml

$x = 2$

$P_4O_{10} + 6\ H_2O \rightarrow 4H_3\ PO_4$

284 gm   108gm   392 gm

108 gm water reacts with P_4O_{10} = 284 gm

27 gm water will react with $P_4O_{10} = \frac{284}{108} \times 27$

= 71 gm

$C = 84/12 = 7$ mole

$H_2 = 12$ g $= 6$ mole

$O_2 = 56/22.4 = 5/2$ mole

$$12C + 11H_2 + 11/2\ O_2 \longrightarrow C_{12}H_{22}O_{11}$$

L.R. $= O_2$

11/2 mole O_2 produce 1 mole source

5/2 mole O_2 will for 5/11 mole source

mass of scross $= 5/11 \times$ (mol. mass)

$= 5/11 \times 342$

$= 155.45$ g

$118\ \% \Rightarrow$ 100 g used 18 g water

$\Rightarrow$ 50 g need 8 g water

(50 g + 18 g water)

$\Rightarrow$ 59 g H_2SO_4 + 9 g water

$$\text{Mole of } N_2 = \frac{PV}{RT}$$

$$P = 860 - 24 = 836 \text{ mm Hg}$$

$$\text{Mole of } N_2 = \frac{\left(\frac{836}{760}\right) \times \left(\frac{100}{11 \times 1000}\right)}{0.08 \times 250}$$

$$= 5 \times 10^{-4} \text{ mole}$$

$$\text{mass of } N_2 = 0.014 \text{ g}$$

$$\% \text{ of N} = \frac{0.014}{0.42} \times 100 = \frac{10}{3} \%$$

$$M_2(CO_3)_n + 2HCl \rightarrow nCO_2 + 2MCl_n + H_2O$$

balancing O atom

$$3n = 2n + 1$$

$$n = 1$$

$$46x + 30(100 - x) = 34 \times 100$$

Let % by mole of NO_2 be x.

$$5A_2 \quad + \quad 2B_4 \quad \rightarrow \quad 2AB_2 \quad + \quad 4A_2B$$

$$5 \times 20 \quad 2 \times 480 \quad 2 \times 250 \quad 4 \times 140$$

$$500\text{ gm} \quad 560\text{ gm}$$

Here limiting product is AB_2 = 500 gm

$$\text{Mol. req.} = \frac{1000}{250} = 4$$

So, A_2 needed = $10 \times 20 = 200$ gm

B_2 needed = $480 \times 4 = 1920$ gm

Total mass of mixture = 2120 gm

$$C_2H_4O_2 + 2O_2 \longrightarrow 2CO_2 + 2H_2O$$

n mole **2n mole** **for max. energy**

60 n gram **2n × 32 gram**

$\Rightarrow$ 60 n gram 64 n gram

$\Rightarrow 60\,n + 64\,n = 620 \Rightarrow n = 5$

produced $CO_2 = 2n = 10$ mole

CO_2 mass produced $= 10 \times 44 = 440$ gram

$2NaCl + Ag_2SO_4 \rightarrow 2AgCl + Na_2SO_4$

Initially

No. of moles of $Ag_2SO_4 = 2 \times 2 = 4$

No. of moles of $NaCl = 4 \times 1$

AgCl formed = 4 moles

No. of moles of Ag^{2+} left $= 4 \times 2 - 4 = 4$

No. of moles of Cl^- left $= 0$

No. of moles of $Na^+ = 4$

No. of moles of $SO_4^{-2} = 4$

Sum of molar conc. $= \dfrac{12}{6} = 2$ M

100 gm oleum gives H_2SO_4 = 112 gm

12.5 gm will give $H_2SO_4 = \frac{112}{100} \times 12.5 = 14$ gm

No. of moles of $H_2SO_4 = \frac{14}{98}$

Conc. of H^+ ions $= \frac{\frac{14}{98} \times 2}{100} = 2.85 \times 10^{-3}$ M

$$CO_2 = 132\ g = \frac{132}{44}\ \text{mole} = 3\ \text{mole}$$

$$H_2O = 54\ g = \frac{54}{18}\ \text{mole} = 3\ \text{mole}$$

$\Rightarrow$ C atoms = 3 mole

H atoms = 6 mole

by option C

$C_4H_{10} = 80$ ml

CH_4 = x ml CO = y ml

x + y = 120 ml

$$C_4H_{10} \longrightarrow 4\,CO_2\,,$$

80 ml 320 ml,

$$CO \longrightarrow CO_2$$

y ml y ml

$$CH_4 \longrightarrow CO_2$$

x ml x ml

total CO_2 volume

= 320 + x + y ml

= 320 + 120

= 440 ml

V_1 ml 0.2 M NaOH, V_2 ml 0.1 M $CaCl_2$

$(+\text{ve ion}) = 0.2\ V_1 = 0.1\ V_2$ mole

$(-\text{ve ion}) = 0.2\ V_1 + 0.1 \times 2V_2$

$= 0.2V_1 + 0.2\ V_2$ mole

by equation

$$(+\text{ve}) = (-\text{ve}) - (-\text{ve}) \times \frac{40}{100}$$

$$= (-\text{ve}) \times \frac{60}{100}$$

$$\Rightarrow 0.2\ V_1 + 0.1\ V_2 = 0.2\ (V_1 + V_2) \times \frac{6}{10}$$

$$\Rightarrow 2V_1 + V_2 = 1.2\ V_1 + 1.2\ V_2$$

$$\Rightarrow 0.8\ V_1 = 0.2\ V_2 \Rightarrow 4V_1 = V_2$$

$V_1 = 200$ ml, $V_2 = 800$ ml

$$\text{NaI mass} = \frac{3 \times 0.5}{100} = 0.015 \text{ gm}$$

$$\text{No. of moles of} = \frac{0.015}{150} = 1 \times 10^{-4}$$

$$\text{No. of } I^- \text{ ions} = 10^{-4} \times 6.023 \times 10^{23}$$

$$= 6.023 \times 10^{19}$$

Same emprical formula

$\Rightarrow$ same compostion by mass

$CO = x$ ml ; $CO_2 = y$ ml, $N_2 = z$ ml

$x + y + z = 200$ ....(i)

$CO + 1/2\ O_2 = CO_2$

x $\quad$ o $\quad$ Contraction = $x/2$

o $\quad$ x

CO_2 No reaction ; $N_2 + O_2 \longrightarrow$ no reaction

change in volume = $x/2 = 40$

$x = 80$ ml

$$x + y = 200 \times \frac{50}{100} = 100 \qquad \text{...(ii)}$$

$y = 20$ ml ; $z = 100$ ml

$$1.17 = \frac{M_{gas}}{M_{air}}$$

$$1.17 = \frac{M_{gas}}{29}$$

$$M\ gas = 29 \times 1.17 = 33.9$$

$$1 \text{ moles of x will give} = \frac{5}{2} = 2.5 \text{ mol}$$

$$\text{But yield} = \frac{1.25}{2.5} \times 100 = \mathbf{50\%}$$

0.86

Let mole of B = x

V.D = 25   mole of a = 100 x

Mol. mass = 50

$$\Rightarrow 250 = \frac{80x + 40(100 - x)}{100}$$

$$x = \frac{100}{4} = 25$$

Limiting reactant is A

Ideally with 2 moles of A, D formed = 3 moles

But yield = 25%

So, moles of D formed

$= 3 \times 0.25 =$ **0.75 mol**