

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.)

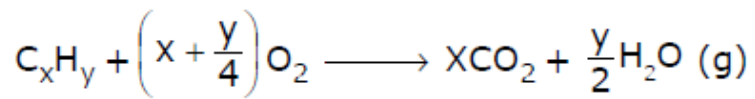
Both have equal volume = V

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

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

NaOH mole > HCl mole

Basic Solution



(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)

$$w_{\text{salt}} = 1 \text{ gm}$$

$$w_{\text{Hg}} = 0.5934 \text{ gm}$$

$$\text{Let wt. \% of H} = x$$

$$\text{Let wt. \% of C} = 8x$$

$$\text{Let wt. \% of O} = 16x$$

Since its dibasic acid

$$\therefore 1 \text{ mole salt} = 2 \text{ moles Ag}$$

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

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

$$\text{Given wt of salt} = 1 \text{ gm}$$

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

$$= 364 \text{ gm/mol}$$

$$\text{Now } x + 8x + 16x = 364$$

$$x = 14.5 \text{ gm}$$

$$\text{wt. of H present} = 14.5 \text{ gm}$$

$$\text{Moles of H present} = 14.5$$

$$\text{wt. of C present} = 8 \times 14.5$$

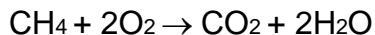
$$\text{Moles of C present} = \frac{8 \times 14.5}{12} = 9.7$$

$$\text{wt. of O present} = 16 \times 14.5$$

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

Hence H and O are present in same ratio.

These for option (B) satisfy this criteria.



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 = $\frac{1}{2} \times 2 = 10$ mol

$$\text{Total no. of moles} = n_{\text{O}_2} + n_{\text{N}_2} + n_{\text{CH}_4}$$

$$= 2 + 8 + 1$$

$$= 11$$

$$\text{Mole fraction } \text{O}_2 = \frac{2}{11} \qquad \text{Mole fraction } \text{CH}_4 = \frac{1}{11}$$

$$\text{Mole fraction } \text{N}_2 = \frac{8}{11}$$



30 ml

180 ml produced

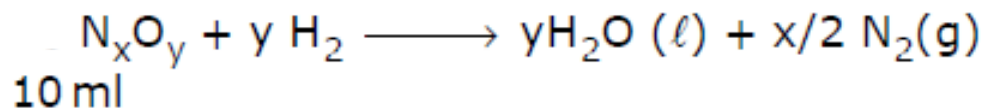
Volume used initially

$$= 30 + 210 = 240$$

for $\text{C}_6\text{H}_5\text{OH}$ for O_2

Volume formed = 180 ml

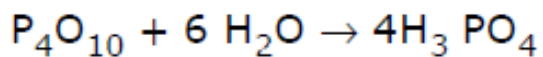
Change in v % = $240 - 180 = 60$ ml



$$\text{H}_2 = 10 y \text{ ml} = 30 \text{ ml}$$

$$\text{N}_2 = 10 \text{ ml} = 10 x/2 \text{ ml}$$

$$x = 2$$



284 gm 108gm 392 gm

108 gm water reacts with $\text{P}_4\text{O}_{10} = 284 \text{ gm}$

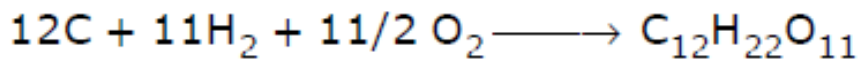
27 gm water will react with $\text{P}_4\text{O}_{10} = \frac{284}{108} \times 27$

= 71 gm

$$C = 84/12 = 7 \text{ mole}$$

$$H_2 = 12 \text{ g} = 6 \text{ mole}$$

$$O_2 = 56/22.4 = 5/2 \text{ mole}$$



$$\text{L.R.} = O_2$$

11/2 mole O_2 produce 1 mole source

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

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

$$= 5/11 \times 342$$

$$= 155.45 \text{ g}$$

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

$$\text{Mole of N}_2 = \frac{PV}{RT}$$

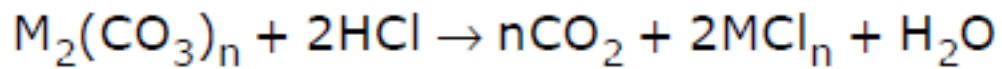
$$P = 860 - 24 = 836 \text{ mm Hg}$$

$$\text{Mole of N}_2 = \frac{\left(\frac{836}{760}\right) \times \left(\frac{100}{11 \times 1000}\right)}{0.08 \times 250}$$

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

$$\text{mass of N}_2 = 0.014 \text{ g}$$

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



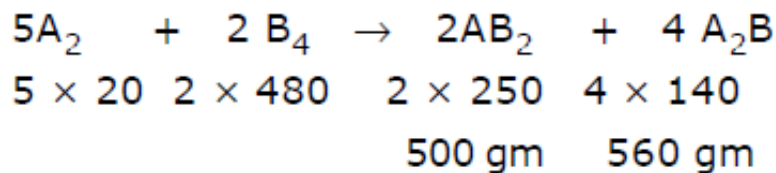
balancing O atom

$$3n = 2n + 1$$

$$n = 1$$

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

Let % by mole of NO_2 be x.



Here limiting product is $AB_2 = 500 \text{ gm}$

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

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

$$B_2 \text{ needed} = 480 \times 4 = 1920 \text{ gm}$$

$$\text{Total mass of mixture} = 2120 \text{ gm}$$



n mole 2n mole for max. energy

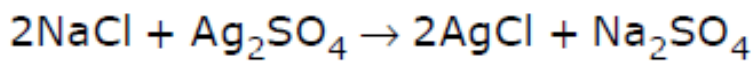
60 n gram 2n × 32 gram

\Rightarrow 60 n gram 64 n gram

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

produced $\text{CO}_2 = 2n = 10$ mole

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



Initially

$$\text{No. of moles of Ag}_2\text{SO}_4 = 2 \times 2 = 4$$

$$\text{No. of moles of NaCl} = 4 \times 1$$

$$\text{AgCl formed} = 4 \text{ moles}$$

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

$$\text{No. of moles of Cl}^- \text{ left} = 0$$

$$\text{No. of moles of Na}^+ = 4$$

$$\text{No. of moles of SO}_4^{-2} = 4$$

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

100 gm oleum gives $\text{H}_2\text{SO}_4 = 112 \text{ gm}$

12.5 gm will give $\text{H}_2\text{SO}_4 = \frac{112}{100} \times 12.5 = 14 \text{ gm}$

No. of moles of $\text{H}_2\text{SO}_4 = \frac{14}{98}$

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

$$\text{CO}_2 = 132 \text{ g} = \frac{132}{44} \text{ mole} = 3 \text{ mole}$$

$$\text{H}_2\text{O} = 54 \text{ g} = \frac{54}{18} \text{ mole} = 3 \text{ mole}$$

$$\Rightarrow \text{C atoms} = 3 \text{ mole}$$

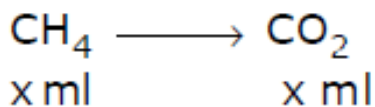
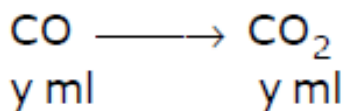
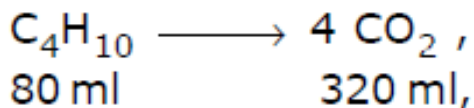
$$\text{H atoms} = 6 \text{ mole}$$

by option C

$$\text{C}_4\text{H}_{10} = 80 \text{ ml}$$

$$\text{CH}_4 = x \text{ ml} \quad \text{CO} = y \text{ ml}$$

$$x + y = 120 \text{ ml}$$



total CO_2 volume

$$= 320 + x + y \text{ ml}$$

$$= 320 + 120$$

$$= 440 \text{ ml}$$

$$V_1 \text{ ml } 0.2 \text{ M NaOH, } V_2 \text{ ml } 0.1 \text{ M CaCl}_2 = (-\text{ve}) \times \frac{60}{100}$$

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

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

$$= 0.2V_1 + 0.2 V_2 \text{ mole}$$

by equation

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

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

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

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

$$V_1 = 200 \text{ ml, } V_2 = 800 \text{ ml}$$

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

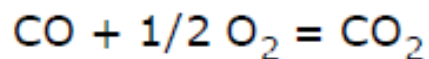
$$\text{No. of moles of} = \frac{0.015}{150} = 1 \times 10^{-4}$$

$$\begin{aligned}\text{No. of I}^{-}\text{ ions} &= 10^{-4} \times 6.023 \times 10^{23} \\ &= 6.023 \times 10^{19}\end{aligned}$$

Same empirical formula
 \Rightarrow same composition by mass

$$\text{CO} = x \text{ ml} ; \text{CO}_2 = y \text{ ml}, \text{N}_2 = z \text{ ml}$$

$$x + y + z = 200 \quad \dots(i)$$



$$x \quad \quad \quad \text{O} \quad \text{Contraction} = x/2$$

$$\text{O} \quad \quad \quad x$$

CO_2 No reaction ; $\text{N}_2 + \text{O}_2 \longrightarrow$ no reaction

$$\text{change in volume} = x/2 = 40$$

$$x = 80 \text{ ml}$$

$$x + y = 200 \times \frac{50}{100} = 100 \quad \dots(ii)$$

$$y = 20 \text{ ml} \quad ; \quad z = 100 \text{ ml}$$

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

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

$$M_{\text{gas}} = 29 \times 1.17 = 33.9$$

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

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

$$= 3 \times 0.25 = \mathbf{0.75 \text{ mol}}$$