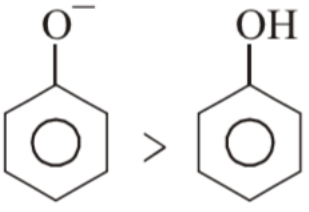
Section-1

1 $\text{Molarity} = \left(\frac{34/34}{2}\right)M = \frac{1}{2}M$

$\therefore$ Volume strength of the solution = $\frac{1}{2} \times 11.2V = 5.6V$

2 Syn gas or water gas $\Rightarrow CO + H_2$

3 Negative charged O-atom has more electron donating power than neutral O-atom therefore resonance energy.



4 Let, % of C be 7.5 x % and H be x %

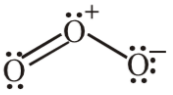
$\therefore$ 7.5 x + x + 32 = 100

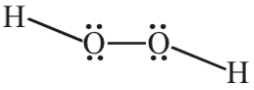
$\therefore$ x = 8

$\therefore$ % of C = 60%, H = 8 % and O = 32 %

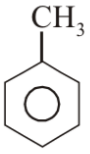
$\therefore$ E.F. = $C_{\frac{60}{12}}H_{\frac{8}{1}}O_{\frac{32}{16}} = C_5H_8O_2$

5 $O_2 \rightarrow$ B.O. $\Rightarrow$ [O = O] = 2

$O_3 \rightarrow$  [due to resonance] B.O. = 1.5

$H_2O_2 \rightarrow$  B.O. = 1

Bond length $\propto \frac{1}{\text{B.O.}}$ $\quad H_2O_2 > O_3 > O_2$

6  More number of α – H, more will be hyperconjugation

7 Let, V_{O_2} = x mL, and

V_{N_2} = y mL $\therefore$ x + y = 3000 ....(i)

$3.O_2\,(g) \xrightarrow{\text{Ozonizer}} 2.O_3(g)$

t = 0	x = mL	0
$t = t_f$	(x–3u)mL	(2u)mL= 600mL
		$\therefore$ u = 300

$\Rightarrow$ x – 3 × 300 = 1100

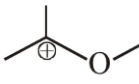
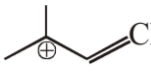
$\therefore$ x = 2000 $\therefore$ Eqn (1) $\Rightarrow$ y = 1000

V_{O_2} = 2 L and V_{N_2} = 1 L **Ans.**

8 In solvay process manufacture of sodium bicarbonate, the final biproduct is :

$NH_4HCO_3 + NaCl \longrightarrow NaHCO_3\downarrow + NH_4Cl$

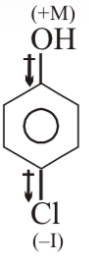
$NH_4Cl + CaO \longrightarrow NH_3\uparrow + CaCl_2 + H_2O$

9  is more stable than  due to back-bonding.

10 $d = \frac{15}{5L} = 3\ g/L = 3\ kg/m^3$

$\therefore v_{rms} = \sqrt{\frac{3P}{d}} = \sqrt{\frac{3\times10^4}{3}}$ m/s = 100 m/s

11 Be and Mg does not impart colour to the flame due to their high Ionisation energy

12 

13 $\frac{5L}{300K} = \frac{(5+\Delta V)L}{(T)K}$ ....(i)

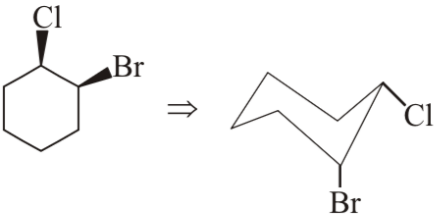
and $\frac{1.5L}{240K} = \frac{(\Delta V)L}{(T)K}$ ....(ii)

(i) / (ii) $\Rightarrow \frac{5/300}{1.5/240} = \left(\frac{5+\Delta V}{\Delta V}\right)$

$\therefore \Delta V = 3$

$\therefore$ eq^n. (ii) $\Rightarrow$ T = 480

14 Due to inert pair effect as we more down the group stability of (+1) oxidation state increases.



15 Chlorine atom lies at equatorial position because of its smaller size, bond length is shorter than Bromine to avoid 1,3 diaxial repulsion.

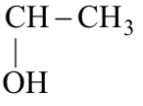
16 Theory based

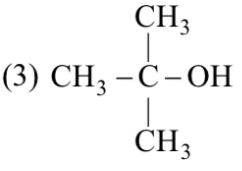
17 $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

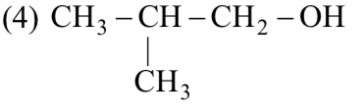
White Phosphorus

18 **4 isomers with alcohol functional group**

(1) $CH_3 - CH_2 - CH_2 - CH_2 - OH$

(2) 

(3) 

(4) 

(1) $CH_3 - O - CH_2 - CH_2 - CH_3$

(2) $CH_3 - O - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$

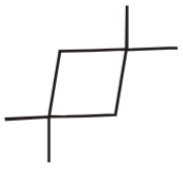
(3) $CH_3 - CH_2 - O - CH_2 - CH_3$

19 Theory based.

20 $2SO_2(g) + O_2(g) \xrightarrow{V_2O_5} 2SO_3(g)$

* Manufacture of H_2SO_4 by "Contact process"

21



22 At both position same groups are present

$[Ca^{2+}] = 400 \text{ ppm} = 400 \text{ mg/L}$

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

$\therefore [H^+] = 20 \times 10^{-3} \text{ mol/L}$

$\therefore n_{H^+} = 20 \text{ mmol}$

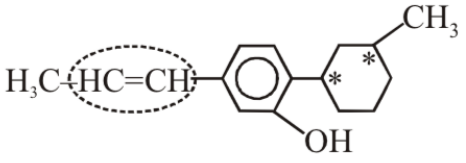
$H^+ + NaOH \rightarrow Na^+ + H_2O$

20 mmol 1M

$\therefore V_{NaOH} = \left(\frac{20}{1}\right) \text{mL} = 20 \text{ mL}$ **Ans.**

23 $NH_3 + 3Cl_2 \text{ (excess)} \longrightarrow NCl_3 + 3HCl$

24



4-stereogeneic centres

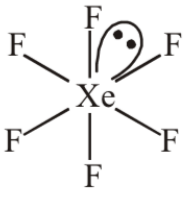
stereoisomers $= 2^n \Rightarrow n = 3$

$2^3 = 8$

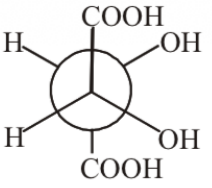
25 $\left(P + \frac{a}{V_m^2}\right) V_m = RT \Rightarrow Z = 1 - \frac{a}{V_m RT}$

$\Rightarrow Z = 1 - \frac{96}{20 \times 0.08 \times 300} = 0.8$ **Ans.**

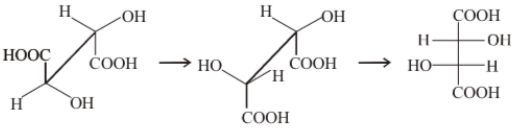
26 XeF_6 (sp^3d^3) Distorted octahedral →

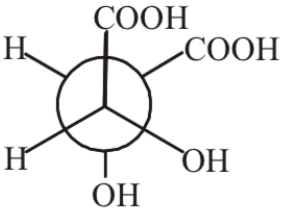


27

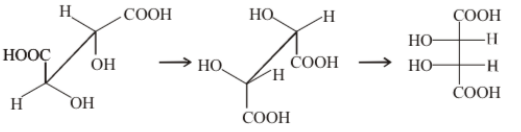


(I)





(II)



I and II are diastereomers

28 $3 \times n_{FeC_2O_4} = 5 \times 50 \times 0.1$

$\therefore n_{FeC_2O_4} = \frac{25}{3} \text{ mmol.}$

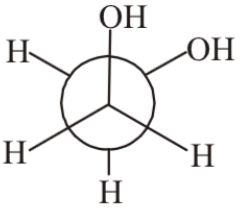
$\therefore m_{FeC_2O_4} = \frac{25}{3} \times \frac{144}{1000} \text{ g} = 1.2 \text{ g}$ **Ans.**

29 $CaO \rightarrow$ Basic oxide

$CO_2, SiO_2 \rightarrow$ Acidic oxide

$SnO_2 \rightarrow$ Amphoteric oxide

30 (1) Gauche form of ethane-1,2-diol is most stable due to H-bonding



(2) $CH_3 - \overset{\displaystyle O}{\overset{\|}{C}} - NH_2 \rightleftharpoons CH_3 - \underset{\displaystyle OH}{\underset{|}{C}} = NH$

Shows G.I.

(3) In methyl cyclohexane, methyl group lies at equatorial position than axial position to avoid 1,3-diaxial repulsion.

Section-2+3

1.	A
2.	C
3.	A
4.	B
5.	A
6.	B
7.	C
8.	B
9.	ABC
10.	ACD
11.	ABC
12.	AC

1. $$\log\frac{P_2}{P_1}=\frac{\Delta H}{2.303R}\left[\frac{1}{T_1}-\frac{1}{T_2}\right]$$

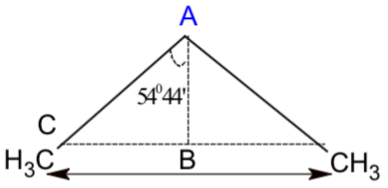
$$\log\frac{P_2}{760}=\frac{9720}{2.303\times2}\left[\frac{1}{373}-\frac{1}{348}\right]$$

$P_2=298\text{torr}$

$$\frac{298-P_{sol.}}{298}=\frac{0.1}{0.1+\frac{1000}{18}}\approx\frac{0.1}{\frac{1000}{18}}$$

$P_{sol}=297.46\text{torr}$

Lowering in VP=(298-297.46)=0.54torr

2. 

$$\text{Sin}(54^0\,44')=\frac{CB}{AC}$$

$$\text{Terminal carbon carbon distance}=2\times CB$$

$$=2\times\ 1.54\ \times\text{Sin}(54^0\,44')$$

$$=2.51\ A^0$$

3. 0.5.mol of CH_3COONa and 0.5mol H_2O is formed.

$$\Delta T_f=\frac{0.5\times2}{20.5\times18\times10^{-3}}=5.04$$

4. 100g H_2O_2 per hr.
(100/34)mol H_2O_2 per hr.
(100/34)mol $(NH_4)_2S_2O_8$ per hr.

$$\frac{100\times2}{34}\text{mole e}^-\text{ per hr}$$

$i=157.68\text{amp}$

current required=315 amp

5. $$E_{cell}=E^0{}_{cell}-\frac{0.059}{1}\log Q$$

$$0=E^0{}_{cell}-\frac{0.059}{1}\log K$$

$0=(x-0.799) - \frac{0.059}{1}\log(6\times10^{-8})$

$x = 0.37$

6. $SO_3^{2-} + 2H^+ \longrightarrow SO_2 + 2H^+$

7. A, B, D is having plane of symmetry.

8. $\text{Intercept}=E^0_{Cu^{2+}/Cu}=0.34$

$E_{Cu/Cu^{2+}}=E_{Cu/Cu^{2+}} - \frac{0.059}{2}\log[Cu^{2+}]$

$E_{Cu/Cu^{2+}} = -0.34 - \frac{0.059}{2}\log 0.1$

$E_{Cu/Cu^{2+}} = -0.3105V$

9. In isothermal process $\Delta U=0$,

10. $\frac{35.6}{24}$ mole Mg

$(\frac{35.6}{24}\times 2)$ mole of e^-

$(\frac{35.6}{24}\times 2\times 96500)$ coloumb