CAREER POINT

MOCK TEST PAPER

CENTRAL BOARD OF
SENIOR SECONDARY EXAMINATION

CHEMISTRY (Theory)

SOLUTIONS

Sol. 1 Negative deviation

Sol. 2 Fe^{3+} is a better coagulating ion due to greater positive charge on it-

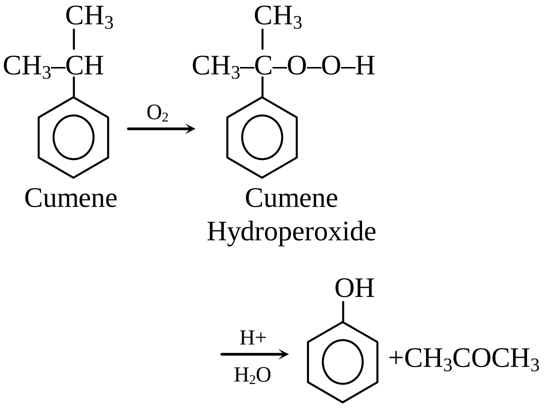
Sol. 3 sucrose + $H_2O \longrightarrow$ Glucose + fructose

Sol. 4 Due to the formation of $[PCl_4]^+ [PCl_6]^-$

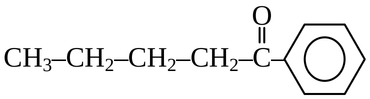
Sol. 5 cresol , aniline

Sol. 6 H_2SO_4 cannot be used along with KI in the conversion of an alcohol to an alkyl iodide as it converts KI to corresponding HI and then oxidieses it to $I_{2.}$

Sol. 7



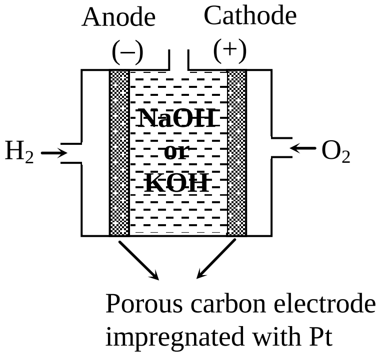
Sol. 8 1-Phenyl pentan-1-one



Sol. 9 (a) p-type, because In has 3 valence electrons. Holes are produced which can move through the crystal like positive charge.

(b) n-type, because P has 5 valence electrons. The fifth electron becomes delocalised and is free contribute to electrical conduction.

Sol. 10



At anode at high pressure H_2 is supplied and following chemical reaction takes place

At Anode : $H_2(g)\ 2OH^-(aq) \rightleftharpoons 2\,H_2O(\ell) + 2e^-$

At cathode at pressure oxygen is supplied and following reaction takes place

$$\frac{1}{2}O_2(g) + H_2O(\ell) + 2e^- \rightleftharpoons 2OH^-(aq)$$

Cell reaction :

$$H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(\ell)$$

OR

Conducting can be defined as the tendency of the solution to conduct electricity and conductance of all the ions present in 1 cm^3 of solution which is present between electrodes present 1 cm apart and area of electrode is such that whole solution is present between them-

Molar conducting can be defined as conductance of all the ions present in V cm^3 of solution containing 1 mol electrolyte and solution is kept between electrodes present 1 cm apart and area of electrode is such that it contain whole solution between them units of specific conductivity

$$K = S\ cm^{-1}$$

molar conductivity

$$\Lambda_m = S\,cm^2 mol^{-1}$$

Sol. 11 Given $W_A = 19.5$ g , $W_B = 500$g,

$K_f = 1.86$ $Kgmol^{-1}$

$\Delta T_f(obs) = 1°C$

$$\Delta T_f = \frac{K_f \times W_B \times 1000}{M_B \times M_A}$$

$$M_B = \frac{K_f \cdot W_B \times 1000}{\Delta T_f \times M_A}$$

$$= \frac{1.86 K\,kg\ mol^{-1} \times 19.5 g \times 1000 g}{1.0 K \times 500 kg}$$

$= 72.54$ $gmol^{-1}$

Molecular mass of CH_2FCOOH

$= 12 + 2 + 19 + 32 + 1 = 78$ g mol^{-1}

i = normal molecular mass/observed molecular mass = 78/72.54 = 1.0753

$$CH_2FCOOH \rightleftharpoons CH_2FCOO^- + H^+$$

C mol L^{-1}	0	0
$C(1 - \alpha)$	$C\alpha$	$C\alpha$

a = i – 1 = 1.07453–1 = 0.0753

$$k_a = \frac{[CH_2FCOO^-][H^+]}{[CH_2FCOOH]} = \frac{C\alpha}{C(1-\alpha)} = \frac{C\alpha^2}{1-\alpha}$$

$$C = \frac{19.5 \times 1000}{78 \times 500} = 0.5M$$

$K_a = C\alpha^2$

$K_a = 0.5 \times (0.0753)^2$

$K_a = 3.07 \times 10^{-3}$

Sol. 12 (a) Due to the formation of chemical bonds between adsorbate and adsorbent in case of chemisorptions

(b) Brownian movement and Tyndall effect

(c) The movement of colloidal particles under an applied electrical potential is electrophoresis. When electrophoresis of dispersed particle in a colloidal system is prevented by some suitable means, it is observed that dispersion medium itself begins to move in an electric field. This phenomenon is known as electro osmosis.

Sol. 13 No. of moles of ethylene glycol = n_B

Molar mass of $C_2H_6O_2 = (24 + 6 + 32)$g mol^{-1}

$$N_B = \frac{222g}{62mol^{-1}} = 3.58\ mol$$

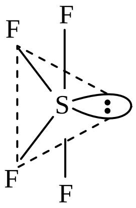
mass of solution = (250 + 222)g = 472g

Sol. 14 (a) As flux to remove FeO impurities in the form of slag $FeSiO_3$.

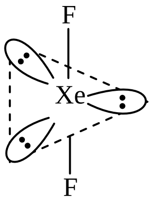
(b) Roasting :- Heating of ore in excess of air below its melting point

Calcinations :- Heating of ore in limited supply of air below its melting point

Sol. 15 (a)



(b)



Sol. 16 (a) Due to strong inter particle force

(b) Due to variable oxidation state

Sol. 17 In gaseous phase, basic character of amines increases with increases in number of electron releasing groups, due to + I effect, so trend of basic character is 3° > 2° > 1°.

But in aqueous phase, salvation of ammonium cation occurs by water molecules, greater the size of ion, lesser will be the salvation, and lesser will be the stability of ion, so on combining + I effect and salvation effect, in aqueous phase trend changes to
2° > 3° > 1°.

Sol. 18 (a) During Friedel Craft's alkylation, aluminium chloride acts as a catalyst, as well as a Lewis acid, if forms salt with– NH_2 group of aniline, so that–NH_2 group acquires a positive charge, and acts as a deactivating group, so aniline does not undergo FCA.

(b) During nitration in strongly acidic medium aniline is protonated to form anilinium ion, which is a meta directing group, so along with o^- & p^- isomers, meta isomers is also obtained.

Sol. 19 (a) In the first cell silver is deposited at cathode according to the equation

(i) $Ag^+ (aq) + e^- \rightarrow Ag (s)$

107.8 gAg = 1F electricity

1. 78gAg = 0.01F

= 965C electricity

(ii) The oxygen gas is liberated at anode of first cell as well as second cell according to equation

$$2H_2O(\ell) \rightarrow 4H^+{}_{(aq)} + 4e^- + O_2(g)$$

4 Electricity = 1 mol O2 in each cell

4F = 32g O_2 in each cell

$$0.01F = \frac{32g}{4g} \times 0.01g$$

= 0.08 g O_2 in each cell

Total weight of O_2 liberated

= 2 × 0.08g = 0.16 g (in both cells)

(b)

(i) The equilibrium constant

K and E^0_{cell} are related by the relation

$$E^0_{cell} = (RT/nF)\ln K$$

(ii) When the concentration decreases the number of ions present in unit volume of solution decreases, as a result electrical conductivity decreases.

OR

(a) Galvanic cells, that are designed to convert the energy of combustion of fuels like H_2, CH_4, CH_3OH etc. directly into electrical energy are called fuel cells. They produce electricity with an efficiency of about 70% and are pollution free.

(b) Reactions taking place in Leclanche cell

Anode : $Zn(s) \longrightarrow Zn^{2+} (aq) + 2e^-$

Cathode :

$$2\,MnO_2(s) + 2NH_4^+ (aq) + 2e^-$$

$$\longrightarrow 2MnO(OH) + 2NH_3$$

(c) $Zn(s)Zn^{2+}(aq) \,||\, Ag_2O(s) \,|\, Ag(s) \,|\, OH^-(aq)$

$E^0_{cell} = E^0(Ag_2O/Ag) – E^0Zn^{2+} / Zn$

$E^0(Ag_2O/Ag) = 0.344V – (–0.76\ V)$

$= 1.104\ V$

$Zn(s) + Ag_2O(s) + H_2O(l)$

$\rightarrow Zn^2 +(aq)+2Ag(s) + 2OH^-(aq)$

n = 2

$$2.303RT = \frac{nE^0_{cell}}{0.059} \text{ at } 25°C$$

$$\log k_c = \frac{2 \times 1.104}{0.059} = 37.42$$

k_c = anti log (37.42) = 2.34×10^{37}

Sol. 20 (a) Lyophillic colloids-(i) They have strong forces of attraction between the dispersed phase and dispersion medium. (ii) They are reversible in nature

Lyobolic colloids (i) They have work force of attraction between the dispersed phase and dispersion medium (ii) They are irreversible in nature. (Any one difference)

(b) (i) Due to the scattering of light by colloidal particles, the path of light becomes visible. The effect is called Tyndall effect. The illuminated path of the beam of light is called Tyndall cone.

(ii) The colloidal particles get precipitated at one of the electrodes, having charge opposite to the charge they have.

Sol. 21 (A) $\underset{(2°,\ 3° \text{or } 4°)}{\text{Normal Protein}} \xrightarrow[\text{Factors}]{} \underset{(\text{always } 1°)}{\text{Denatured Protein}}$

(B) $\text{Nucleotide} = \text{Nit.Base} + \underset{\text{sugar}}{\text{Pentose}} + H_3PO_4$

(C) pH at which amino Acids do not Migrate towards any electrode.

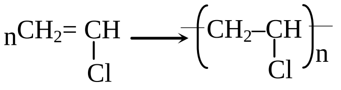
Sol. 22 (A) **Thermoset polymer :**

→ Due to extensive cross bonds shape cannot be changed by heating & cooling eg. Bakelite

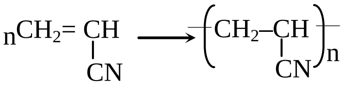
Thermoplastic polymer :

→ Unbranched or less branched polymers

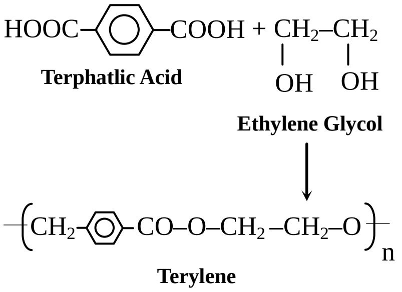
→ Shape may be changed by heating & cooling

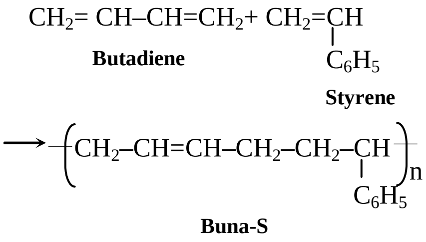
(B) (i)

$n\underset{\displaystyle Cl}{CH_2=CH} \longrightarrow -\!\left(CH_2-\underset{\displaystyle Cl}{CH}\right)_n\!-$

PVC

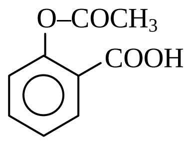
(ii)

$n\underset{\displaystyle CN}{CH_2=CH} \longrightarrow -\!\left(CH_2-\underset{\displaystyle CN}{CH}\right)_n\!-$

PAN

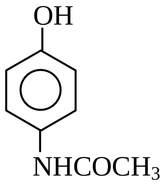
(iii)


(iv)

$CH_2=CH-CH=CH_2 + \underset{\displaystyle C_6H_5}{CH_2=CH} \longrightarrow -\!\left(CH_2-CH=CH-CH_2-CH_2-\underset{\displaystyle C_6H_5}{CH}\right)_n\!-$

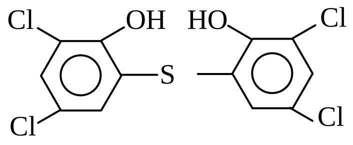
Sol. 23 **(A)**(i) Aspirin



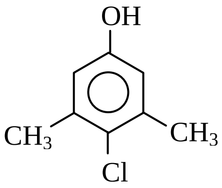
(ii) Paracetamol



(iii) Bithionol



(iv) Chloroxylenol



(B) Antacids → Chemicals which reduces acidity in stomach

e.g. (1) Omeprazole

(2) Lanso prazole

(3) $Al(OH)_3$

(4) Mg(OH)2 etc

Sol. 24 (a) Ce^{+4} (b)

(i) $Cr_2O_7^{-2} + 3Sn^{+2} + 14H^+$

$\rightarrow 2Cr^{+3} + 3Sn^{+4} + 7H_2O$

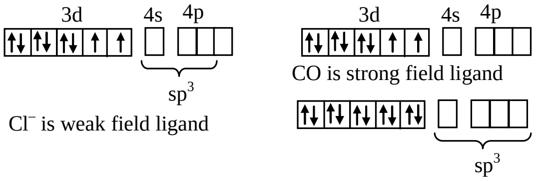
(ii) $MnO_4^- + 5Fe^{+2} + 8H^+$

$\rightarrow Mn^{+2} + 5Fe^{+3} + 4H_2O$

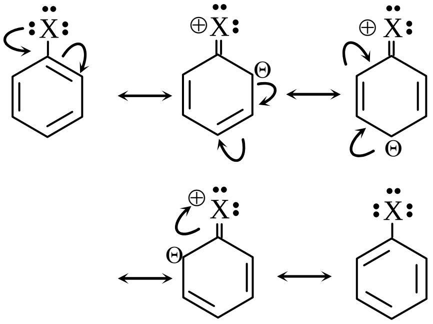
Sol. 25 (a) Trans

(b) $[NiCl_4]^{-2}$ $[Ni(CO)_4]$

Ni^{+2} = [Ar] $4S^0$ $3d^8$ Ni = [Ar] $4s^2$ $3d^8$



Sol. 26 In haloarenes C–X bond acquires a partial double bond character due to resonance. As a result the bond cleavage in haloarenes is difficult than haloalkanes and therefore, they are less reactive towards nucleophilic substitution reaction.



OR

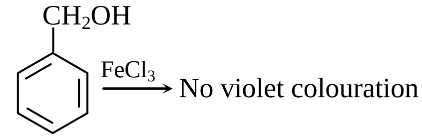
(i) CH_3–I reacts faster than CH_3–Br as iodine is a better leaving group because of its larger size.

(ii) CH_3–Cl (1° halide) reacts faster than $(CH_3)_3CCl$ (3° halide) since in case tertiary butyl chloride three bulky methyl group hinder the approaching nucleophile.

Sol. 27 (i) Phenol gives a violet colouration with $FeCl_3$ solution while benzyl alcohol does not.

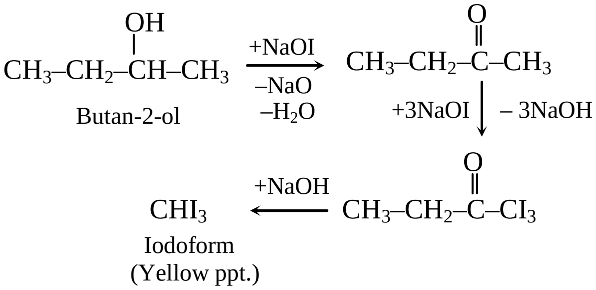
$6C_6H_5OH$ + $FeCl_3$

$$\longrightarrow \underset{\text{(Violetcolouration)}}{[(C_6H_5O)6Fe]^{3-}} + 3HCl + 3H^+$$

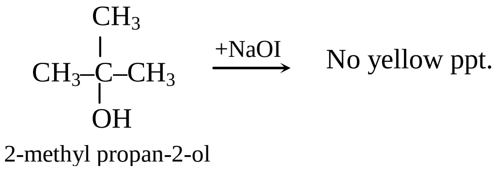


Benzyl alcohol

(ii) Butan-2-ol when warmed with NaOI (I_2/NaOH) gives yellow precipitate iodoform while 2-Methylpropan-2-ol does not give this test



$$\underset{\text{Butan-2-ol}}{CH_3-CH_2-\overset{OH}{CH}-CH_3} \xrightarrow[-NaO,\ -H_2O]{+NaOI} CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow[-3NaOH]{+3NaOI} CH_3-CH_2-\overset{O}{\overset{\|}{C}}-CI_3 \xrightarrow{+NaOH} \underset{\text{Iodoform (Yellow ppt.)}}{CHI_3}$$



$$\underset{\text{2-methyl propan-2-ol}}{CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_3} \xrightarrow{+NaOI} \text{No yellow ppt.}$$

Sol. 28 (a)

(i) Rate equation

$$\text{Rate} = \frac{-d[C_{12}H_{22}O_{11}]}{dt} = \frac{d[H_2O]}{dt}$$

$$= \frac{d[C_6H_{12}O_6]}{dt} = \frac{d[C_6H_{12}O_6]}{dt}$$

(ii) Rate law equation

Rate = $K[C_{12}H_{22}O_{11}]$

(iii) Molecularity $\longrightarrow$ 2

(iv) Order $\longrightarrow$ first order

(b) As the reaction is of first order therefore

$$k = \frac{2.303}{t}\log\frac{P_0}{2P_0 - P_t}$$

when t = 100s

$$k = \frac{(2.303)}{100}\log\frac{(0.5)}{2\times 0.5 - 0.6}$$

k = (2.303) / 100 log 1.25

= (2.303) / 100 (.0969)

= 2.2316×10^{-3} sec^{-1}

When

$P_0 = 0.65$ atm i.e. $P_0 + P = 0.65$ atm

$P = 0.65 - P_0 = 0.65 - 0.50 = 0.15$ atm

Therefore the pressure of SO_2Cl_2 at time t $(P_{SO_2C\ell_2})$

$= P_0 - P = (0.50 - 0.15)$ atm $= 0.35$ atm

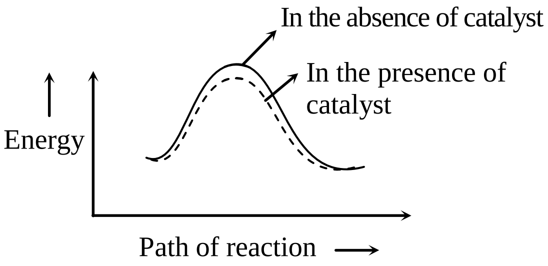
Rate at that time $= K \times (P_{SO_2C\ell_2})$

$= 2.2316 \times 10^{-3} \times 0.35$

$= 7.8 \times 10^{-4}$ atm sec^{-1}

OR

(a)



Effect of catalyst on activation energy

(b) Because catalyst catalyses the forwards as well as backward reaction to the same extent.

(c) Given

$K_1 = 4.5 \times 10^3\ s^{-1}$; $T_1 = 283$ K

$K_2 = 1.5 \times 10^4 s^{-1}$; $T_2 = ?$, $Ea = 60$ KJ mol^{-1}

$$\log \frac{K_2}{K_1} = \frac{Ea}{2.303R}\left[\frac{T_2 - T_1}{T_1 \cdot T_2}\right]$$

$\log (1.5 \times 10^4) / (4.5 \times 10^3)$

$$= 60000 / (2.303 \times 8.314)\left[\frac{T_2 - T_1}{T_1T_2}\right]$$

$\log 3.333 = 3133.63\ [(T_2 - 283) / 283T_2]$

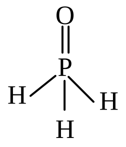
$T_2 = 283 / 0.9528$

$= 297\ K = (297 - 273)°C$

$= 24°C$

Sol. 29 (a) (i) due to increment in bond length

(ii) In its structure only one H is attached with O



(b) (i) $2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$

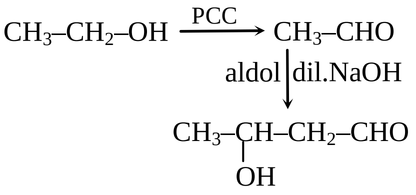
(ii) $2XeF_2 + 2H_2O \xrightarrow{\Delta} 2Xe + 4HF + O_2$

(iii) $Ca_3P_2 + 6H_2O \longrightarrow 3Ca(OH)_2 + 2PH_3$

Sol. 30

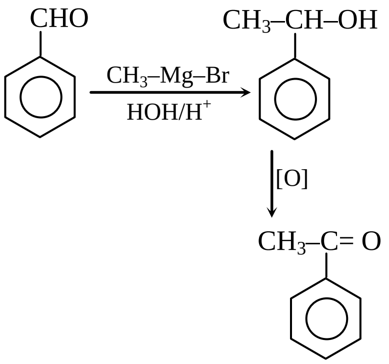
(a)

(i)



$CH_3–CH_2–OH \xrightarrow{PCC} CH_3–CHO \xrightarrow[\text{dil.NaOH}]{\text{aldol}} CH_3–\underset{OH}{\underset{|}{C}}H–CH_2–CHO$

(ii)



(b)

(A) Butyl butanoate	(B) Butanoic acid
(C) Butanol	(D) But-1-ene