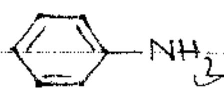
Class-XII

Chemistry(043)

Section - A

1. (a) osmotic pressure
2. (c) low atmospheric pressure
3. (d) $Zn \mid Zn^{2+} \parallel Ag^{+} \mid Ag$
4. (c) negative, positive
5. (c) E_a
6. (c) 0
7. (b) +3
8. (c) ionisation isomerism
9. (b) Swarts reaction
10. (a) $1° < 2° < 3°$
11. (b) CH_3NH_2
12. (c) 
13. (c) $C_1 - C_4$ α linkage
14. (c) polypeptides
15. (b) Both Assertion (A) and ~~Reason~~ Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
16. (c) Assertion (A) is true but Reason (R) is false.

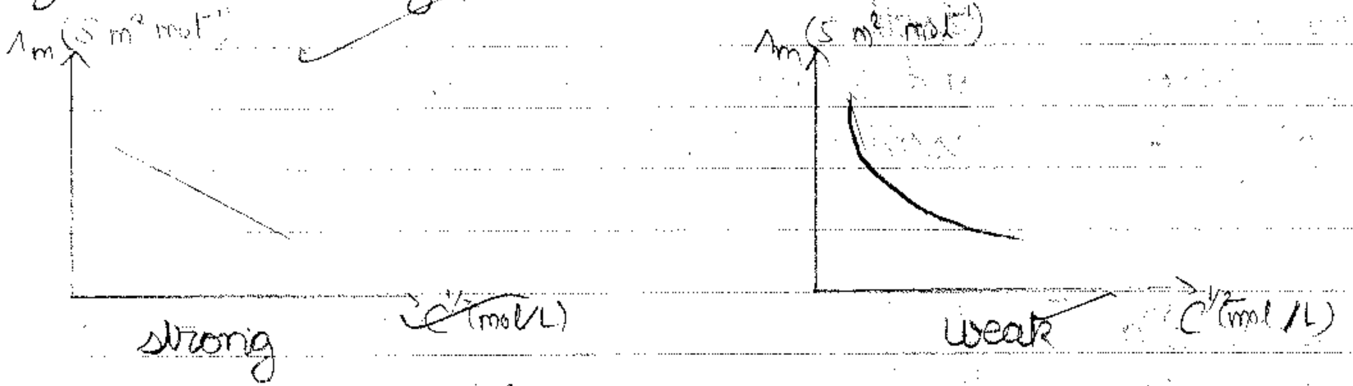
17. (a) Both Assertion (A) and Reason (R) are True and Reason (R) is the correct explanation of the Assertion (A).
18. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

Section - B

19. Henry's Law states that the solubility of a gas in a liquid is directly proportional to its partial pressure over the liquid surface.
Mathematically, $P = K_H \chi$
where P: partial pressure of the gas
χ : mole fraction of the gas in the solution
K_H : Henry's Law constant

One application of Henry's Law is seen in carbonated drinks. The cans are sealed under high pressure, and as soon as a can is opened, the pressure drops. This leads to CO_2 escaping from the drink, which we see as fizz.

20. (a) Electrolyte B is strong while A is weak.



From the graphs, it can be seen that the molar conductivity of a weak electrolyte increases much more rapidly than that of a strong electrolyte on dilution. Hence, A must be weak while B is strong

21. (a) $2MnO_4^- + 5NO_2^- + 6H^+ \longrightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(b) $Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$

½

22. (a) $CH_3-CH(OH)-CH_3 \xrightarrow{PCl_5} CH_3-CH(Cl)-CH_3 \xrightarrow{AgCN} CH_3-CH(NC)-CH_3$

(A) 2-chloropropane (B) propane-2-isonitrile

(b) $CH_3CH_2CH_2Cl + KOH \xrightarrow{ethanol} CH_3-CH=CH_2 \xrightarrow{HBr} CH_3-CHBr-CH_3$

(A) propene (B) 2-bromopropane

23.(b)(i) I. Protonation of alcohol

$H_2\ddot{O}: + H^+ \longrightarrow H_3O^+$

$CH_3-CH_2-\ddot{O}H \xrightarrow[-H_2O]{H_3O^+} CH_3-CH_2-\overset{+}{O}H_2$

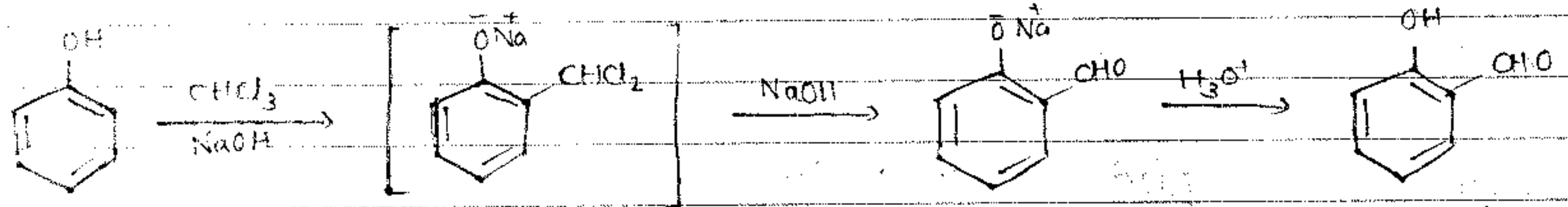
II. Dehydration

$CH_3-CH_2-\overset{+}{O}H_2 \xrightarrow{-H_2O} CH_3-\overset{+}{C}H_2$

III. Abstraction of β-hydrogen

$\underset{H}{CH_2}-\overset{+}{C}H_2 \xrightarrow[-H_3O^+]{H_2\ddot{O}:} CH_2=CH_2$

(ii)

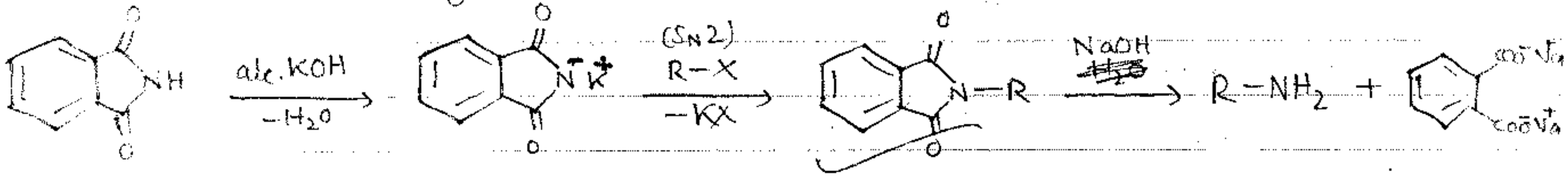


phenol   benzal chloride intermediate   salicylaldehyde

24.(a) Carbylamine reaction is a test used to detect 1° amines, that react with chloroform and ethanolic KOH to give isocyanides, that have a foul odour.

$$R-NH_2 + CHCl_3 + 3KOH \longrightarrow R-\overset{+}{N}\equiv\overset{-}{C} + 3KCl + 3H_2O$$

(b) Gabriel phthalimide synthesis is used to prepare 1° amines from phthalimide and alkyl halides. It involves an S_N2 reaction.



25.(a)
$$\begin{matrix} CHO \\ | \\ (CHOH)_4 \\ | \\ CH_2OH \end{matrix} \xrightarrow{HI} \begin{matrix} CH_3 \\ | \\ (CH_2)_4 \\ | \\ CH_3 \end{matrix}$$

D-glucose → n-hexane

The formation of n-hexane on reaction of glucose with HI shows that it has an open chain structure.

(b) $-\overset{O}{\overset{\|}{C}}-NH-$ A peptide or amide linkage is responsible for the formation of proteins.

Section-C

26.(a)

Ideal solution	Non-ideal solution
(i) It follows Raoult's law at all concentrations.	It does not follow Raoult's law at all concentrations.
(ii) The solute-solvent interactions are identical to the solute-solute and solvent-solvent interactions.	The solute-solvent interactions are weaker or stronger than the solute-solute and solvent-solvent interactions.

(b) Moles of urea $= \frac{30}{60} = 0.5$ mol

Moles of water $= \frac{846}{18} = 47$ mol

We know,

$RLVP = \chi_{solute}$

$\Rightarrow \frac{P^0 - P^s}{P^0} = \chi_{solute}$

$\Rightarrow \frac{23.8 - P}{23.8} = \frac{~~0.5~~ 1}{~~47.5~~ 95}$

$\Rightarrow 95 \times 23.8 - 95P = 23.8$

$\Rightarrow 95P = 94 \times 23.8$

$\Rightarrow P = \frac{94}{95} \times 23.8$

$\therefore P \simeq 23.55$

Rough

23.8×94 = 952 + 21420 = 22372

95) 2237.20 (23.5

−190

337

−285

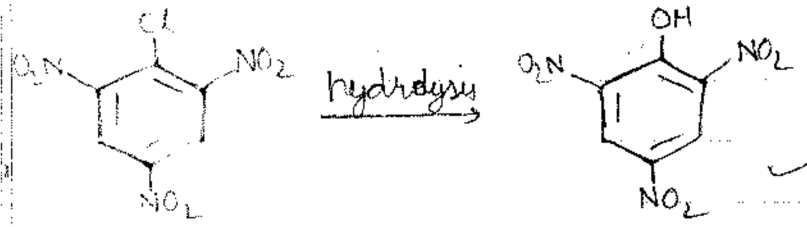
522

−475

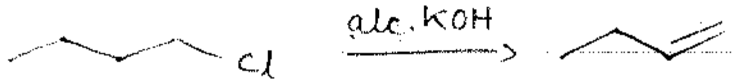
470

The vapour pressure of the solution is 23·55 mm Hg.

27. (a) $CH_3Cl \xrightarrow[\text{acetone}]{NaI} CH_3I$ (iodomethane)

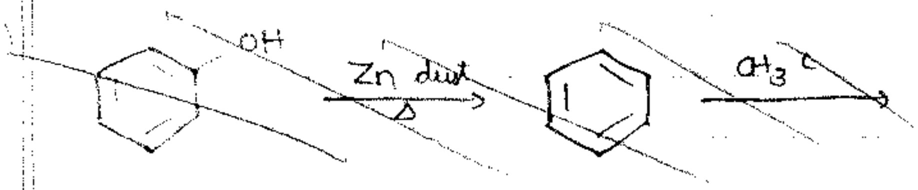
(b) 

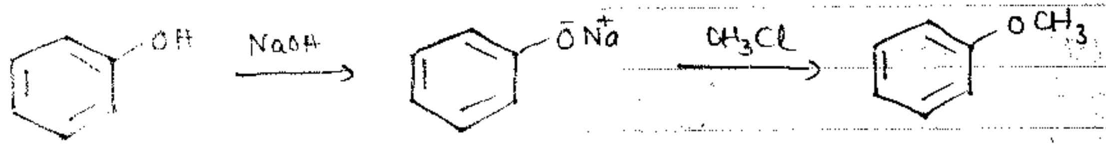
(picric acid)

(c) 

(but-1-ene)

28. (b) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow[\text{(ii) } H^+/H_2O]{\text{(i) } CH_3MgBr} CH_3-\underset{CH_3}{\underset{|}{\overset{OH}{\overset{|}{C}}}}-CH_3$



(c) 

(d) $CH_3-CH=CH_2 \xrightarrow[\text{peroxide}]{HBr} CH_3-CH_2-CH_2-Br \xrightarrow{aq.\ NaOH} CH_3-CH_2-CH_2-OH$

29.(b) B does not reduce Fehlings solution but shows positive iodoform test. It must be a ~~ketone~~ methyl ketone.
A, therefore, must be a 2° alcohol

$$\underset{\text{(A)}}{CH_3-\underset{OH}{\underset{|}{CH}}-CH_3} \xrightarrow[573\ K]{Cu} \underset{\text{(B)}}{CH_3-\overset{O}{\overset{\|}{C}}-CH_3} \xrightarrow[NaOH]{I_2} CH_3-\overset{O}{\overset{\|}{C}}-\bar{O}\overset{+}{Na} + \underset{\text{(C)}}{CHI_3}$$

propan-2-ol   propanone   iodoform

30.(a) (i) β-D-galactose and β-D-glucose
(ii) α-D-glucose and α-D-glucose

(b) The basic structural difference between starch and cellulose is that starch is made up of α-D-glucose monomers while cellulose is made up of β-D-glucose monomers.

Section- D

31.(i) The average rate of a reaction is defined as the decrease in concentration of the ~~reaction~~ reactants or the increase in the concentration of the products over a certain time interval.

$$\text{Avg. rate} = -\frac{\Delta[R]}{\Delta t} = +\frac{\Delta[P]}{\Delta t}$$

(ii) Two factors that affect the rate of reaction are temperature and catalyst.

(iii) (1) The rate of reaction for zero order reaction is always constant.

(2) Unit of k for zero order is mol L^{-1} s^{-1}.

32. (i) $[Pt Cl_2(NH_3)_2]$

(ii) The secondary valency of $[Co(en)_3]^{3+}$ is 6.

(iii) (1) $Fe_4[Fe(CN)_6]_3$
(2) pentaamminechloridocobalt(III) chloride

Section - E

33. (b)(i) Faraday's First law of Electrolysis states that the mass of a substance consumed / deposited / evolved is directly proportional to the amount of charge passed through the electrolytic solution.

(ii) $Cu^{2+} + 2e^- \longrightarrow Cu$
2F charge is required for the reduction of 1 mol Cu^{2+} to Cu.

(ii) By Nernst Equation

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{n} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$$

$$= 2.71 - \frac{0.059}{2} \log \frac{\cancel{0.1}^{10}}{\cancel{0.01}}$$

$$= 2.71 - \frac{0.059}{2}$$

$$= 2.71 - 0.03$$

$$= 2.68 \text{ V}$$

35.(b)(i) (1) iodoform test

$CH_3COCH_2CH_3 \xrightarrow{I_2/NaOH} CHI_3$ (yellow ppt.) $\Rightarrow$ methyl ketone

$CH_3CH_2CH_2CHO \xrightarrow{I_2/NaOH}$ no yellow ppt. $\Rightarrow$ not methyl ketone

(2) Tollens' test

$CH_3CHO \xrightarrow{[Ag(NH_3)_2]^+/OH^-}$ Ag ↓ (silver mirror) $\Rightarrow$ aldehyde

$CH_3COOH \xrightarrow{[Ag(NH_3)_2]^+/OH^-}$ no silver mirror $\Rightarrow$ not aldehyde

(ii)

(iii) $CH_3COOH \xrightarrow{PCl_5} CH_3COCl$ (A) $\xrightarrow[Pd-BaSO_4]{H_2} CH_3-CHO$ (B) $\xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3MgBr} CH_3-CH(OH)-CH_3$ (C)

(B) $\xrightarrow{LiAlH_4} CH_3-CH_2-OH$ (D)

½

A: ethanoyl chloride
B: ethanal
C: propan-2-ol
D: ethanol

34.(i) Mn: $[Ar]3d^5 4s^2$

Mn can lose all its 3d and 4s electrons to attain stable noble gas configuration in its +7 state. Elements to the left of Mn do not have 7 valence electrons to lose, while for elements to the right, the ionisation energy becomes too high to lose so many electrons.

(ii) Transition metals and their compounds are generally found to be good catalysts because of their ability to form complexes, and because they can show variable oxidation states.

(iii) Cr^{2+} : $[Ar]3d^4$ $\xrightarrow{-e^-}$ Cr^{3+} : $[Ar]3d^3$

Cr^{3+} has a stable t_{2g}^3 configuration (half-filled orbitals), so Cr^{2+} is reducing in nature.

Mn^{3+} : $[Ar]3d^4$ $\xrightarrow{+e^-}$ Mn^{2+} : $[Ar]3d^5$

Mn^{2+} has a stable half-filled d-subshell configuration, so Mn^{3+} is an oxidising agent.

(iv) Zn : $[Ar]3d^{10}4s^2$

Zn has no unpaired electrons, hence metallic bonding in Zn is weak. Thus, it has the lowest enthalpy of atomisation in the 3d series.

(v) Cu^+ is unstable in an aqueous solⁿ as it disproportionates into Cu^{2+} and Cu.

$$2Cu^+(aq) \longrightarrow Cu^{2+}(aq) + Cu(s)$$