Class XII Session 2026-27
Subject - Chemistry
Sample Question Paper - 7

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.

1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

Section A

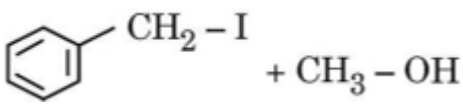
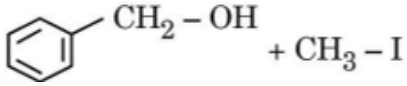
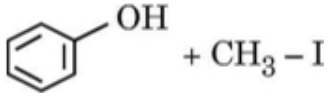
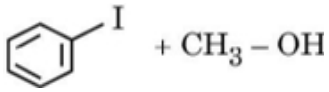
1. The conversion of an alkyl halide into an alcohol by aqueous NaOH is classified as **[1]**

   a) a dehydration reaction
   b) an addition reaction
   c) a substitution reaction
   d) a dehydrohalogenation reaction

2. Which of the following statements is not true about glucose? **[1]**

   a) On heating with HI it forms n-hexane.
   b) It is present in pyranose form.
   c) It is an aldohexose.
   d) It gives 2, 4 DNP test.

3. Anisole reacts with HI to give: **[1]**

   a) 
   b) 
   c) 
   d) 

4. Which of the following compound can be differenciated using Tollen's reagent **[1]**

   a) $CH_3 - CHO$ and $CH_3 - COOH$
   b) All of these

c) $CH_3 - COOH$ and HCOOH

d) CH_3COOH and $Ph - CHO$

5. Which among the following is an example of first order reaction? **[1]**

a) Decomposition of nitrogen pentoxide

b) Inversion of cane sugar

c) Formation and dissociation of ozone

d) Acid catalysed hydrolysis of ethyl acetate

6. Match the column and choose correct option **[1]**

Vant'Hoff factor	**Behaviour of compound**
(a) i = 1	(i) Impossible
(b) i > 1	(ii) Association is the solution
(c) i < 1	(iii) Dissociation in the solution
(d) i = 0	(iv) No dissociation or association

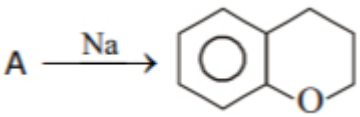
a) (a) - (iv), (b) - (iv), (c) - (iii), (d) - (ii)

b) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

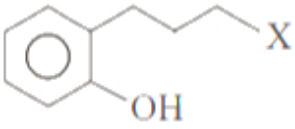
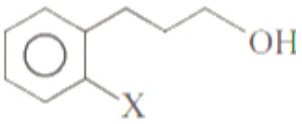
c) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

d) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

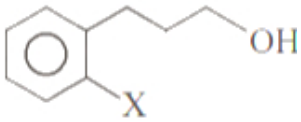
7. **[1]**

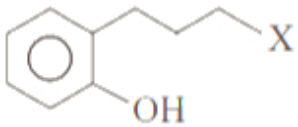


A can be

a) Both  and 

b) None of these

c) 

d) 

8. On addition of small amount of $KMnO_4$ to concentrated H_2SO_4, a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following. **[1]**

a) MnO_2

b) Mn_2O_7

c) Mn_2O_3

d) $MnSO_4$

9. A reaction follows second order kinetics. How is the rate of reaction affected if the concentration of the reactant is reduced to half? Choose the correct value from the following: **[1]**

a) three times

b) four times

c) eight times

d) $\frac{1}{4}$ of the original value

10. Give the products of the reaction [1]

$PhC \equiv CMe \xrightarrow{H_3O^+, Hg^{2+}} ?$

a) PhCOCOMe

b) $PhCH_2COCH_3$

c) $PhCOCH_2CH_3$

d) $PhCH_2CH_2CHO$

11. CH_3CH_2OH can be converted to CH_3CHO by: [1]

a) catalytic hydrogenation

b) treatment with $LiAlH_4$

c) treatment with $KMnO_4$

d) treatment with PCC

12. In the nitration of benzene using a mixture of conc. H_2SO_4 and conc. HNO_3, the species which initiates the reaction is _____. [1]

a) NO^+_2

b) NO_2

c) NO^+

d) NO_2^-

13. **Assertion (A):** In the iodometric titration starch is used as an indicator. [1]
Reason (R): Starch is a polysaccharide.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Benzaldehyde undergoes aldol condensation. [1]
Reason (R): Aldehydes that do not have α-hydrogen undergo aldol condensation.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) Both A and R are false.

15. **Assertion (A):** 3° substrates are more reactive for E_2 reaction than 2° and 1°. [1]

Reason (R): 3° substrate form more stable carbocation.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** Dehydration of alcohols with conc. acid at high temperature give saytzeff alkenes as major product. [1]
Reason (R): Dehydration of alcohols proceed by carbanion intermediate.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. a. Find the value of van't Hoff factor for acetic acid in benzene as per the given equation: [2]
$2CH_3COOH \leftrightharpoons (CH_3COOH)_2$, assuming its complete association.

b. Osmotic pressure of a solution containing 3.5 g of dissolved protein in 0.05 L of a solution is 0.035 atm at 310 K. Calculate the molar mass of the protein. (R = 0·0821 L atm K^{-1} mol^{-1})

OR

Give an example of solid solution in which the solute is a gas.

18. $PdCl_2 \cdot 2KCl$ does not give precipitate of AgCl with $AgNO_3$ solution. Write the structural formula and IUPAC name of the complex. **[2]**

19. Give reasons for the following: **[2]**

i. The transition metals generally form coloured compounds.

ii. E^o value for $(Mn^{3+} | Mn^{2+})$ is highly positive than that for $(Cr^{3+} | Cr^{2+})$ couple.

iii. The chemistry of actinoids elements is not so smooth as that of the lanthanoids.

20. **Answer the following:** **[2]**

i. Define half life period of a reaction. **[1]**

ii. The decomposition of dimethyl ether leads to the formation of CH_4, H_2 and CO, and the reaction rate is given by, Rate = k $[CH_3COCH_3]^{3/2}$. If the pressure is measured in bar and time in minutes, then what are the units of rate and rate constants? **[1]**

21. a. Carboxylic acid is more acidic than phenol. Give reason. **[2]**

b. Give a chemical test to distinguish between benzaldehyde and acetophenone.

Section C

22. Calculate the emf of the following cell: **[3]**

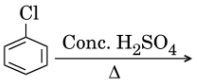
$Ni(s) + 2Ag^+(0.01M) \longrightarrow Ni^{2+}(0.1M) + 2Ag(s)$

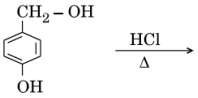
Given that $E^\circ_{\text{cell}} = 1.05\ V, \log 10 = 1$

23. The rate constant of a reaction quadruples when the temperature changes from 300 K to 320 K. Calculate the activation energy for this reaction. **[3]**

$[\log 2 = 0.30, \log 4 = 0.60, 2.303R = 19.15\ J\ K^{-1}\ mol^{-1}]$

24. Write the major product(s) of the following reactions: **[3]**

i. 

ii. 

iii. $(CH_3)_3C - OH \xrightarrow[573K]{Cu}$

25. i. Oxidation of propanal is easier than propanone. Why? **[3]**

ii. How can you distinguish between Acetophenone and Benzophenone?

iii. Draw the structure of the following derivative: 2,4-Dinitrophenylhydrazone of Propanone.

26. Calculate emf of the following cell at $25^\circ C$: **[3]**

$Sn/Sn^{2+}(0.001M) \| H^+(0.01M) \left| H_{2(g)}(1bar) \right| Pt_{(s)}$

Given: $E^{\circ}\left(Sn^{2+}/Sn\right) = -0.14\ V, E^{\circ}H^{+}/H_2 = 0.00\ V (\log 10 = 1)$

27. Among all the isomers of molecular formula C_4H_9Br, identify **[3]**

a. the one isomer which is optically active.

b. the one isomer which is highly reactive towards S_N2.

c. the two isomers which give same product on dehydrohalogenation with alcoholic KOH.

28. a. State the following: **[3]**

i. Kohlrausch law of independent migration of ions and

ii. Faraday's first law of electrolysis.

b. Using $E^{\circ}_{\text{values}}$ of X and Y given below, predict which is better for coating the surface of iron to prevent corrosion and why?

Given $E^{\circ}_{X^{2+}/X} = -2.36\ V$,

$E^{\circ}_{Y^{2+}/Y} = -0.14\ V$,

$E^{\circ}_{Fe^{2+}/Fe} = -0.44\ V$

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

Transition metals have incomplete d-subshell either in neutral atom or in their ions. The presence of partly filled d-orbitals in their atoms makes transition elements different from that of the non-transition elements. With partly filled d-orbitals, these elements exhibit certain characteristic properties such as display of a variety of oxidation states, formation of coloured ions and entering into complex formation with a variety of ligands. The transition metals and their compounds also exhibit catalytic properties and paramagnetic behaviour. The transition metals are very hard and have low volatility. An examination of the $E^{o}_{\frac{M^{2+}}{M}}$ values shows the varying trends:

	$E^{o}_{\frac{M^{2+}}{M}}$
V	-1.18
Cr	-0.91
Mn	-1.18
Fe	-0.44
Co	-0.28
Ni	-0.25
Cu	+0.34
Zn	-0.76

Answer the following questions:

a. On what basis can we say that Cu is a transition element but Zn is not? (Atomic number: Cu = 29, Zn = 30) **(1)**

b. Why do transition elements show variety of oxidation states? **(1)**

c. i. Why do $E^{o}_{\frac{M^{2+}}{M}}$ values show irregular trend from Vanadium to Zinc?

ii. How is the variability in oxidation states of transition metals different from that of the non-transition elements? **(2×1 = 2)**

OR

i. Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing. Why? (Atomic number: Cr = 24, Mn = 25)

ii. Complete the following ionic equation: **(2×1 = 2)**

$2MnO_4^- + H_2O + I^- \longrightarrow$

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The solutions which boil at a constant temperature like a pure liquid and possess the same composition in liquid, as well as vapour state are called azeotropes. The components of azeotropes cannot be separated by fractional distillation. Only non-ideal solutions form azeotropes. Solutions with negative deviation form maximum boiling azeotrope and the solutions with positive deviation form minimum boiling azeotrope. The boiling point of azeotrope is never equal to the boiling points of any of the components of the azeotrope.

i. The azeotropic solutions of two miscible liquids show what type of deviation from Raoult's law? (1)

ii. The azeotropic mixture of water & HCI boils at $108.5^{\circ}C$. What type of deviation is shown by the solution? Does this solution behave as ideal or non-ideal? (1)

iii. Do ideal solutions form azeotropes? (2)

OR

Out of pure liquid and azeotrope showing positive deviation, Which one has a higher boiling point? (2)

Section E

31. **Attempt either A or B** **[5]**

i. **Answer the following questions:** **[1]**

i. How do enzymes help a substrate to be attacked by the reagent effectively?

ii. a. Write chemical reaction to show that open structure of D-glucose contains the straight chain.

b. What type of linkage is responsible for the formation of protein?

iii. i. Glucose on reaction with acetic acid gives glucose pentaacetate. What does it suggest about the structure of glucose?

ii. Write difference between fibrous protein and globular protein. Give two points.

iv. What are polypeptides?

v. What is the function of enzymes?

ii. **Answer the following questions:** **[1]**

i. Write uses of B-Complex.

ii. Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain.

iii. Aldopentoses named ribose and 2-deoxyribose are found in nucleic acids. What is their relative configuration?

iv. Name the disaccharide which on hydrolysis gives glucose and galactose.

v. What type of linkage is present in polysaccharides?

32. **Attempt either A or B** **[5]**

i. **Answer the following questions:** **[1]**

i. a. Which of the following species cannot act as a ligand ? Give reason.

OH^-, NH_4^+, CH_3NH_2, H_2O

b. The complex $[Co(NH_3)_5(NO_2)]Cl_2$ is red in colour. Give IUPAC name of its linkage isomer.

ii. For the complex $[Fe\ (CN)_6]^{3-}$, write the hybridization, magnetic character and spin nature of the complex. (At. number: Fe = 26)

iii. How is excess of copper and iron removed from body?

iv. Give an example of coordination isomerism.

v. Name the following coordination compounds according to IUPAC norms:

i. $[Co\ (NH_3)_4(H_2O)Cl]Cl_2$

ii. $[CrCl_2\ (en)_2]Cl$

ii. **Answer the following questions:** **[1]**

i. Arrange the following in increasing order of crystal field splitting energy:

$[Cr(CN)_6]^{3-}$, $[Cr(NH_3)_6]^{3+}$, $[CrCl_6]^{3-}$

ii. Write the IUPAC name and hybridisation of the following complexes:

i. $[Co(NH_3)_6]^{3+}$

ii. $[NiCl_4]^{2-}$

(Given : Atomic number : Ni = 28, Co = 27)

iii. Name the type of isomerism that occurs in complexes in which

both cation and anion are complex ions.

iv. Write the hybridization and magnetic character of following complexes:

i. $[Fe(H_2O)_6]^{2+}$

ii. $[Fe(CO)_5]$

(Atomic no. of Fe = 26)

v. Write IUPAC name of given compound : $[Fe(C_2O_4)_3]^{3-}$.

33. a. Give reasons for the following : **[5]**

i. Acetylation of aniline reduces its activation effect.

ii. CH_3NH_2 is more basic than $C_6H_5NH_2$.

iii. Although $-NH_2$ is o/p-directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

b. Explain the following reactions:

i. Coupling reaction

ii. Gabriel phthalimide reaction

OR

An amide 'A' with molecular formula C_7H_7ON undergoes Hoffmann Bromamide degradation reaction to give amine 'B'. 'B' on treatment with nitrous acid at $273 - 278\ K$ form 'C' and on treatment with chloroform and ethanolic potassium hydroxide forms 'D'. 'C' on treatment, with ethanol gives 'E'. Identify 'A', 'B', 'C,' 'D' and 'E.' and write the sequence of chemical equations.

Solution

Section A

1.

(c) a substitution reaction

Explanation:

R - X + NaOH $\rightarrow$ R - OH + NAX

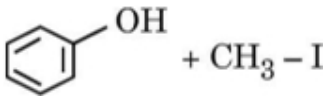
2.

(d) It gives 2, 4 DNP test.

Explanation:

Glucose doesn't react with Schiff's reagent & 2,4 DNP reagent despite having an aldehyde group because there is no free aldehyde group present in the cyclic form as it forms hemiacetal. Thus, it does not give 2,4–DNP test.

3.

(c)  $+ CH_3 - I$

Explanation:

When anisole (phenyl methyl ether) reacts with hydrogen iodide (HI), it produces phenol and methyl iodide

4.

(b) All of these

Explanation:

Tollen's reagent is used to differentiate between aldehydes and ketones, as well as to identify certain carboxylic acids. In option, Tollen's reagent can distinguish between acetic acid (a carboxylic acid) and benzaldehyde (an aldehyde) because aldehydes reduce Tollen's reagent while carboxylic acids do not. In option, Tollen's reagent can differentiate between acetaldehyde (an aldehyde) and acetic acid (a carboxylic acid) for the same reason. In option , Tollen's reagent can also differentiate between acetic acid and formic acid (HCOOH), as formic acid can reduce Tollen's reagent due to its aldehyde-like properties. Since Tollen's reagent can differentiate all the pairs in the options provided, the correct answer is that all of these compounds can be differentiated using Tollen's reagent.

5. **(a)** Decomposition of nitrogen pentoxide

Explanation:

Decomposition of N_2O_5 is 1st order reaction as follows

$N_2O_5 \rightleftharpoons NO_2 + NO_3$

$NO_2 + NO_3 \rightarrow NO_2 + O_2 + NO \ slow \ step$

$NO + N_2O_5 \rightarrow 3NO_2 \ fast \ step$

as we know slow step is the rate-determining step, rate =k[N_2O_5]

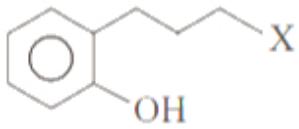
6.

(d) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

Explanation:

(a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

7.

(d) 

Explanation:

The solution indicates that option is the correct choice. This means that the characteristics or conditions described in option are applicable to A, while other options do not accurately represent A's situation. The reasoning likely aligns with the definitions or criteria provided in the question, confirming that only option is valid for A.

8.

(b) Mn_2O_7

Explanation:

$2KMnO_4 + 2H_2SO_4(Conc) \longrightarrow Mn_2O_7 + 2KHSO_4 + H_2O$

9.

(d) $\frac{1}{4}$ of the original value

Explanation:

$\frac{1}{4}$ of the original value

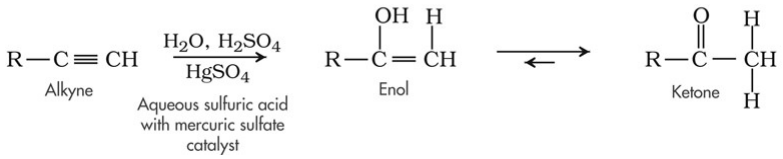
10.

(c) $PhCOCH_2CH_3$

Explanation:

Hydration of given alkyne will occur according to Markovnikoff's rule leading to the formation of enol which will tautomerise to give keto form.

The general reaction of alkyne hydrations shown below:



Same reaction will occur with

$PhC \equiv CMe \xrightarrow{H_3O^+, Hg^{2+}} ?PhC(OH) = CHCH_3 \Leftrightarrow PhCOCH_2CH_3$.

11.

(d) treatment with PCC

Explanation:

treatment with PCC

12. **(a)** NO^+_2

Explanation:

NO^+_2 Nitronium ion electrophile initiates the process of nitration of benzene. It is obtained as:

$H_2SO_4(conc.) \longrightarrow H^+ + HSO_4^-$

$H^+ + HNO_3 \longrightarrow H_2NO_3^+$

$H_2NO_3^+ \longrightarrow NO_2^+ + H_2O$

13.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Starch $(C_6H_{10}O_5)_n$ is a polysaccharide. It consists of two fractions - one is known as a- amylose and the other is (3-amylose or amylopectin. In iodometric and iodometric titrations, a starch solution is used as an indicator. It gives a blue or violet colour with free iodine. At the endpoint, the blue or violet colour disappears when iodine is completely changed to iodide.

14.

(d) Both A and R are false.

Explanation:

A idehydes having a methyl or methylene group in the α-position or more correctly having atleast one hydrogen atom in the α-position undergo dimerisation in presence of a base at low temperature to form β-hydroxy aldehydes called aldols.

15.

(c) A is true but R is false.

Explanation:

A is true but R is false.

16.

(c) A is true but R is false.

Explanation:

A is true but R is false.

Section B

17. a. 0.5 (in case of dimer)

b. $M = \frac{wRT}{\Pi V}$

$= \frac{3.5 \times 0.0821 \times 310}{0.035 \times 0.05}$

$= 50902 \text{ g mol}^{-1}$

OR

In case a solid solution is formed between two substances (one having very large particles and the other having very small particles), an interstitial solid solution will be formed. For example, a solution of hydrogen in palladium is a solid solution in which the solute is a gas.

18. $K_2\left[PdCl_4\right]$

Potassium tetrachloridopalladate(II)

19. i. Due to presence of unpaired electrons / d-d transition.

ii. Mn^{3+} is $3d^4$ while Cr^{3+} is $3d^3$ which in t_2g half filled is extra stable.

iii. Lanthanoids display a limited number of oxidation states because the energy difference between 4f, 5d, and 6s orbitals is quite large. On the other hand, **the energy difference between 5f, 6d, and 7s orbitals is very less**. Hence, actinoids display a large number of oxidation states.

20. Answer the following:

(a) Half-life of a reaction is the time in which the concentration of a reactant is reduced to half of its original value.

(b) In terms of pressures,

Unit of rate$= bar \min^{-1}$.

Unit of K $= \frac{Rate}{[PCH_3OCH_3]^{3/2}}$.

$= \frac{bar\min^{-1}}{bar^{3/2}}$.

$= bar^{-1/2}\min^{-1}$.

21. a. In carboxylate ion, the negative charge is delocalized over two electronegative oxygen atoms, hence carboxylate ion is more stable than phenoxide ion./Due to two equivalent resonating structures of carboxylate ion.

    b. Add NaOH and iodine to both the compounds and heat, acetophenone gives yellow ppt of iodoform (CHI_3), whereas Benzaldehyde does not.

Section C

22. $E^\circ_{\text{cell}} = 1.05\ V$

$\mathrm{E_{cell}} = 1.05\frac{0.059}{2}\log\frac{[\mathrm{Ni}]^{2+}}{[\mathrm{Ag+}]^2}$

$= 1.05 - 0.059/2\log\frac{(0.1)}{(0.01)^2}$

=1.05 - 0.0825

$= 0.9615\ V$

23. $\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left(\frac{T_2-T_1}{T_1T_2}\right)$

It is given that, $k_2 = 4k_1$

Therefore, $\log\frac{4k_1}{k_1} = \frac{E_a}{2.303\times R}\left(\frac{320-300}{320\times300}\right)$

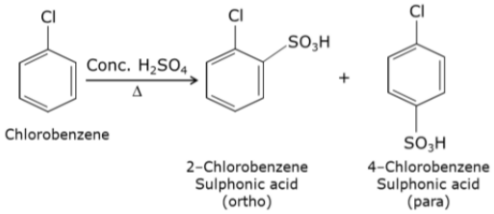
$0.60 = \frac{20\times E_a}{19.15\times320\times300}$

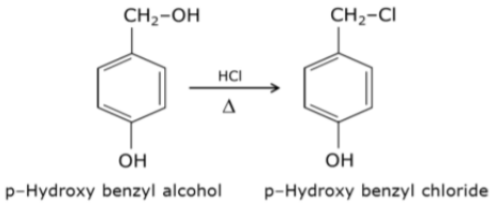
$E_a = \frac{0.60\times19.15\times320\times300}{20}$

$= 55152\ J\ mol^{-1}$ or

$= 55.152\ kJ\ mol^{-1}$

24. The major project are:

i. 

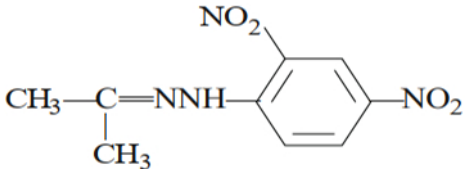
ii. 

iii. $\underset{Tert.\ Butanol}{(CH_3)_3C-OH} \xrightarrow[573K]{Cu} \underset{2-Methylpropene}{CH_3-\overset{CH_3}{\overset{|}{C}}=CH_2}$

25. i. Because of oxidation of propanal involves cleavage of C-H bond which is weaker than C-C bond of propanone.

    ii. On heating with NaOH and I_2, acetophenone gives yellow precipitate of iodoform whereas benzophenone does not.

iii.



26. $E_{cell} = E^{o}_{cell} - \frac{0{\cdot}059}{2}\log\frac{[Sn^{2+}]}{[H^{+}]^{2}}$

$E^{o}_{cell} = 0 - (-0{\cdot}14\ V) = 0{\cdot}14\ V$

$E_{cell} = 0{\cdot}14 - \frac{0{\cdot}059}{2}\log\frac{(0{\cdot}001)}{(0{\cdot}01)^{2}}$

$= 0{\cdot}14 - \frac{0{\cdot}059}{2}\log 10$

$= 0{\cdot}14 - 0{\cdot}0295 = 0{\cdot}1105\ V$ or $0.11\ V$

27. Isomers of molecular formula C_4H_9Br are:

i. $H_3C - CH_2 - CH_2 - CH_2 - Br$
1-Bromobutane

ii. $H_3C - CH_2 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$
2-Bromobutane

iii. $H_3C - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2Br$
1-Bromo-2-methylpropane

iv. $H_3C - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}} - Br$
2-Bromo-2-methylpropane

a. (ii) isomer is optically active.
b. (i) isomer is highly reactive towards S_N2.
c. (iii) and (iv) isomers give same product on dehydrohalogenation with alcoholic KOH.

28. a. i. The limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.
ii. The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte.

b. 'X' is better, as X has more negative electrode potential than Fe/X has more oxidation potential than Fe.

Section D

29. a. Cu has incomplete d-orbital in +2 oxidation state whereas Zn has fully filled d-orbital in ground state as well as in +2 oxidation state.

b. Because both (n-1)d and ns subshell electrons take part in the bond formation due to their comparable energies/ due to the presence of unpaired electrons in d-orbitals.

c. i. Because of irregular values of $(\triangle_i H_1 + \triangle_i H_2)$ and sublimation enthalpies.

ii. In transition metals, oxidation states differ by +1 whereas in non-transition metals differ by +2.

OR

i. Because Cr^{2+} will be converted to Cr^{3+} which has more stable half filled t_{2g} configuration while Mn^{3+} changes to Mn^{2+} which has more stable half-filled d^5 configuration.

ii. $2MnO_4^- + H_2O + I^- \longrightarrow 2\ MnO_2 + 2\ OH^- + IO_3^-$

30. i. The azeotropic solutions of two miscible liquids may show positive or negative deviation from Raoult's law.

ii. The solution is a non-ideal solution and shows a negative deviation from Raoult's law.

iii. No, ideal solutions don't form azeotropes. Only the non-ideal solution form azeotrope.

OR

The boiling point of a pure liquid is higher as compared to azeotrope showing positive deviation.

Section E

31. Attempt either A or B

(a) Answer the following questions:

i. Active site of enzymes holds the substrate molecule in a suitable position so that the enzyme help substrate can be attacked by the reagent effectively.

ii. a. $\left(\begin{array}{l}\mathrm{CHO}\\|\\\mathrm{CHOH}\\|\\\mathrm{CH_2OH}\end{array}\right)_4 \xrightarrow{\mathrm{HI.\Delta}} \underset{(\mathrm{n-Hexane})}{\mathrm{CH_3-CH_2-CH_2-CH_2-CH_2-CH_3}}$

b. Peptide linkage

iii. i. Glucose on reaction with acetic acid gives glucose pentaacetate which implies that 5-OH groups are present in it.

ii.

Fibrous protein	**Globular protein**
It contains linear thread like molecules which tend to lie side by side to form fibres.	It contains compact form of molecules which are folded together.
Example: keratin, collagen	Example: enzymes, hormones

iv. Polypeptides are formed when several molecules generally more than ten of α-amino acids are joined together by a peptide bond.

v. Enzymes are proteins that help speed up chemical reactions in our bodies. Enzymes are essential for digestion, liver function and much more.

(b) Answer the following questions:

i. It is required for making red blood cells, muscles.

ii. On prolonged heating with HI, glucose gives n-hexane which suggest that all the six carbon atoms in glucose are linked linearly.

$$\underset{Glu\cos e}{HOH_2C(CHOH)_4CHO} + HI \xrightarrow{\Delta} \underset{n-hexane}{CH_3(CH_2)_4CH_3}$$

iii. Both the aldopentoses(ribose and 2-deoxyribose) have D-configuration.

iv. Lactose

v. Glycosidic linkage

32. Attempt either A or B

(a) Answer the following questions:

i. a. NH_4^+, cannot act as ligand.

Due to the unavailability of lone pair of electrons/cannot act as a Lewis base.

b. Pentaamminenitrito-O-cobalt (III)chloride

ii. Hybridization: d^2sp^3

Magnetic character: Paramagnetic Spin nature of the complex Low spin.

iii. Excess of copper and iron are removed by chelating Ligands D – penicillamine and Deferoxamine B through the formation of coordination compounds.

iv. Example of coordination isomerism is $[Cr(NH_3)_6][Co(CN)_6]$ and $[Co(NH_3)_6][Cr(CN)_6]$.

v. IUPAC name of the following coordination compounds are:

i. $[Co(NH_3)_4(H_2O)Cl]\ Cl_2$: Tetra ammine aquachloridocobalt (III) chloride

ii. $[Cr\ Cl_2(en)_2]\ Cl$: Dichlorido bis-(ethane-1,2- diamine) chromium (Ill) chloride.

(b) Answer the following questions:

i. $[Cr(Cl)_6]^{3-} < [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$

ii. i. Hexaamminecobalt(III)

d^2sp^3

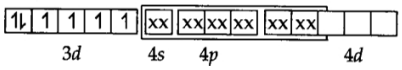
ii. Tetrachloridonickelate (II)

sp^3

iii. Coordination isomerism

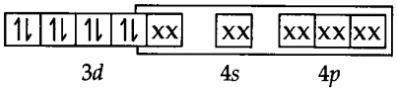
iv. i. In $[Fe(H_2O)_6]^{2+}$ the oxidation state of Fe is +2.

The outermost electronic configuration of Fe is $3d^6\ 4s^2\ 4p^0$. H_2O is weak field ligand and do not cause pairing up of electrons.



In this complex, there are 4 unpaired electrons. Therefore, it involves sp^3d^2 hybridisation and is paramagnetic.

ii. In $[Fe(CO)_5]$ the oxidation state of Fe is zero. The outermost electronic configuration of Fe is $3d^64s^24p^0$. CO is strong field ligand, causes pairing up of 4s electrons into the 3d orbitals.

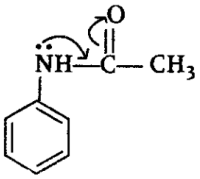


In this complex, there is no unpaired electron.

Therefore, it involves dsp^3 hybridization and is diamagnetic.

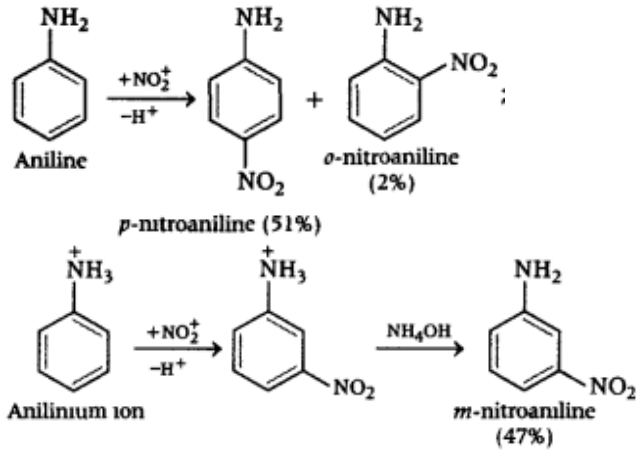
v. Trioxalatoferrate (III) ion

33. a. i. Due to the electron-withdrawing effect of the acetyl group, the lone pair of electrons on N-atom is attracted by the acetyl group. As a result, the lone pair of electrons on N-atom is not exclusively available for donation to the benzene ring and hence, activating the effect of the - NH_2 group is reduced.

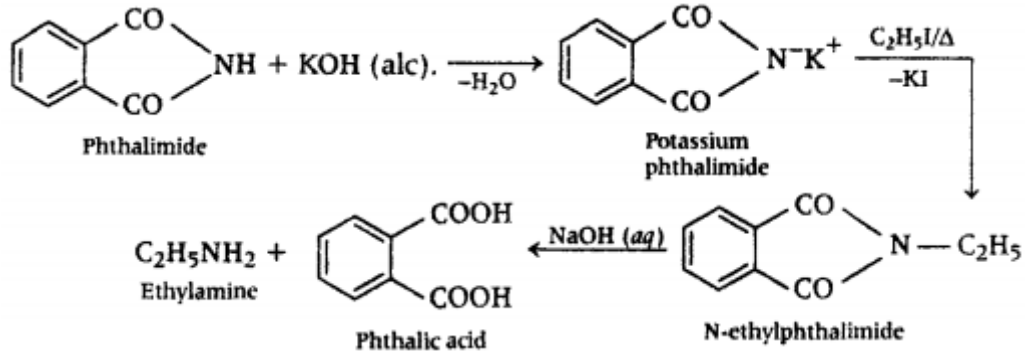


ii. In aromatic amines, the lone pair of electrons present on nitrogen takes part in resonance and hence, not available for donation. Alsoaniline is more stable than anilinium ion. Hence aniline has a very little tendency to accept a proton to form anilinium ion. However, in aliphatic amines, the lone pair is easily available for donation. That's why aliphatic amines are more basic than aromatic amines.

iii. Nitration is usually carried out with a mixture of conc. HNO_3 and cone. H_2SO_4. So in the presence of these acids, aniline gets protonated to form anilinium ion. Therefore, the reaction mixture consists of aniline + and anilinium ion. -NH_2 group in aniline is o,p-directing and activating, whereas the $\overset{+}{N}H_3$ group in anilinium ism-directing and deactivating. Now, nitration of aniline mainly gives p-nitroaniline due to steric hindrance at a-position and the nitration of anilinium ion gives m-nitroaniline.

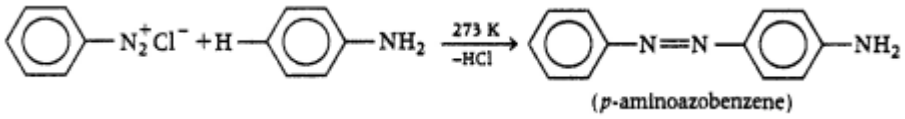


b. i. Gabriel phthalimide reaction Phthalimide on treatment with ethanolic KOHgives potassium phthalimide which on heating with a suitable alkyl halide gives N-substituted phthalimide, which upon subsequent hydrolysis with alkali gives primary amines.



This reaction is called Gabriel phthalimide reaction.

ii. Coupling reaction Arenediazonium salts react with highly reactive (i.e. electron-rich) aromatic compounds such as aniline, phenols to form brightly coloured azo compounds, Ar-N = N-Ar. This reaction is called a coupling reaction. e.g. Benzene diazonium chloride reacts with aniline in faintly acidic medium (pH 4- 5) at 273·278K, in which the molecule at its para-position is coupled with the diazonium salt to form p-aminoazobenzene.
This is an example of a coupling reaction.



OR

