Class XII Session 2026-27
Subject - Chemistry
Sample Question Paper - 8

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. Alkyl halides undergoing nucleophilic bimolecular substitution reaction involve **[1]**

   a) inversion of configuration b) retention of configuration

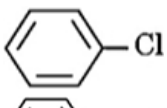
   c) formation of carbocation d) formation of racemic mixture

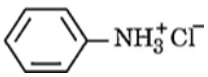
2. The most appropriate base pair in a double helix of DNA is **[1]**

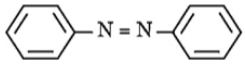
   a) A – C b) C – T

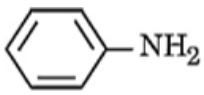
   c) A – T d) T – G

3. When nitrobenzene is heated with tin and concentrated HCl, the product formed is: **[1]**

   a) 

   b) 

   c) 

   d) 

4. Iodoform test is **not** given by **[1]**

   a) Ethanal b) Ethanol

   c) Hexan-3-one d) Hexan-2-one

5. Rate of reaction does not remain constant throughout because **[1]**

a) The density of reactants keep on changing

b) Volume of reactants keep on changing

c) Concentration of reactants keep on changing

d) Temperature of reactants keep on changing

6. Match the items given in column I with that in column II: **[1]**

Column I	Column II
(a) Urea	(i) i < 1
(b) $FeCl_3$	(ii) i = 1
(c) Benzoic acid in Benzene	(iii) i = 2
(d) $MgSO_4$	(iv) i = 4

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

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

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

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

7. Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature? **[1]**

a) $CH_3CH_2-\underset{\underset{CH_3}{|}}{C}-CH_2OH$

b) $CH_3CH_2-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-OH$

c) $CH_3CH_2-\underset{\underset{CH_3}{|}}{C}-OH$

d) CH_3CH_2—CH_2—OH

8. Which of the following statement is not correct? **[1]**

a) Atomic radii of Zr and Hf are same because of lanthanide contraction.

b) In lanthanide series, ionic radius of Ln^{3+} ions decreases

c) La is actually an element of transition series rather than lanthanide series

d) $La(OH)_3$, is less basic than $Lu(OH)_3$

9. The half-life of a reaction is halved as the initial concentration of the reactant is doubled. The order of the reaction is: **[1]**

a) 3

b) 1

c) 2

d) 0

10. Methyl ketones are usually characterized by: **[1]**

a) Schiff's test

b) Iodoform test

c) Benedict's reagent d) Tollen's reagent

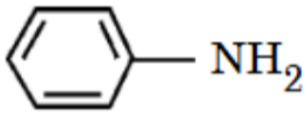
11. Williamson synthesis of preparing unsymmetrical ether is: **[1]**

a) Elimination reaction b) S_N2 reaction

c) Electrophilic addition reaction d) S_N1 reaction

12. An amine 'X' reacts with Hinsberg reagent and the product obtained is insoluble in alkali. The amine 'X' is: **[1]**

a) $(CH_3)_2 - NH$

b) 

c) $CH_3 - CH_2 - NH_2$

d) $(CH_3)_3\ N$

13. **Assertion (A):** Glucose is used in silvering of mirrors. **[1]**
Reason (R): Glucose is less acidic than a monohydric alcohol.

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):** The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses. **[1]**
Reason (R): There is a weak molecular association in aldehydes and ketones arising out of the dipole-dipole interactions.

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.

15. **Assertion (A):** Boiling point of RCl is greater than RF. **[1]**
Reason (R): R-Cl is more stable than R-F.

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:** Phenol is a weak acid than ethanol. **[1]**
Reason: Groups with +M effect and -I affect decrease acidity at m-position.

a) If both Assertion & Reason are true and the reason is the correct explanation of the assertion.

b) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion.

c) If Assertion is true statement but Reason is false.

d) If both Assertion and Reason are false statements.

Section B

17. A 5% solution (by mass) of cane sugar in water has a freezing point of 271K. Calculate the freezing point of 5% glucose in water if the freezing point of pure water is 273.15 K. **[2]**

OR

Explain why on addition of 1 mol of NaCl to 1 litre of water, the boiling point of water increases, while addition of 1 mol of methyl alcohol to one litre of water decreases its boiling point.

18. The spin only magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. Predict the geometry of the complex ion? **[2]**

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

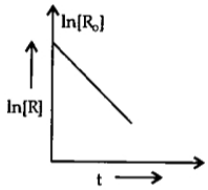
a. What is the general electronic configuration of lanthanoids?

b. What are the common oxidation states of Cerium (At. no. 58)?

c. Why do actinoids show a wide range of oxidation states?

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

i. For a chemical reaction R $\rightarrow$ P, variation in In [R] vs time (t) plot is given below: **[1]**



For this reaction:

i. Predict the order of reaction.

ii. What is the unit of rate constant (k)?

ii. If half life period of a first order reaction is X and $\frac{3}{4}th$ life period of the same reaction is Y, how are x and y related each other? **[1]**

21. Identify A to E in the following series of reactions, **[2]**

$$A \xrightarrow{[O]} B \xrightarrow{Ca(OH)_2} C \xrightarrow[-CaCO_3]{Distilled} D \xrightarrow[2[H]]{LiAlH_4} E \xrightarrow{HBr} CH_3 - \underset{\underset{Br}{|}}{C}H - CH_3$$

Section C

22. Calculate the cell voltage of the voltaic cell which is set up by joining the following half-cells at $25^\circ C$. **[3]**

$Al/Al^{3+}(0 \cdot 002M)$ and $Ni/Ni^{2+}(0 \cdot 002M)$

Given : $E^0_{Ni^{2+}/Ni} = -0.25\ V$

$E^0_{Al^{3+}/Al} = -1.66\ V$

$\log 5 = 0.6990$

23. The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times how will it affect the rate of formation of Y? **[3]**

24. a. Write the chemical equation for the following: **[3]**

i. Preparation of phenol from cumene

ii. Nitration of anisole

b. Complete the following:

$(CH_3)_3C - O - CH_3 + HI \rightarrow$

25. Write the reactions involved in the following reactions: **[3]**

i. Clemmensen reduction

ii. Cannizzaro reaction

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

$Mg(s)|Mg^{2+}(0.2M)||Ag^{+}(1 \times 10^{-3}M)|Ag(s)$

$E^0(Ag^+/Ag) = 0.80V$

$E^0(Mg^{2+}/Mg) = -2.37V$

27. In the following pairs of halogen compounds, which would undergo S_N2 reaction faster? **[3]**

i. $CH_3CH_2CH_2Cl$ or $(CH_3)_2CH\text{-}Cl$

ii. $CH_3CH_2CH_2I$ or $CH_3CH_2CH_2Br$

28. Calculate the cell voltage of the voltaic cell which is set up by joining following half-cells at $25^\circ C$: **[3]**

$Al/Al^{3+}(0.001M)$ and $Ni/Ni^{2+}(0.1M)$

Given: $E^0_{Ni^{2+}/Ni} = -0.25\ V, E^0_{Al^{3+}/Al} = -1.66\ V$

Section D

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

The f-block consists of elements in which 4f and 5f orbitals are progressively filled. They are placed in a separate panel at the bottom of the periodic table. The names transition metals and inner transition metals are often used to refer to the elements of d-and f-blocks respectively. The d–block occupies the large middle section of the periodic table flanked between s and p blocks in the periodic table. In general, the electronic configuration of the outer orbitals of these elements is (n - 1)$d^{1-10}ns^{1-2}$. The electronic configurations of outer orbitals of Zn, Cd, Hg and Cn are represented by the general formula (n - 1)$d^{10}ns^2$. The transition metals and their compounds also exhibit catalytic property and paramagnetic behaviour. Transition metal also forms an alloy. An alloy is a blend of metals prepared by mixing the components. Alloys may be homogeneous solid solutions in which the atoms of one metal are distributed randomly among the atoms of the other.

i. Transition metals form alloys. Justify? (1)

ii. Why do transition elements exhibit higher enthalpies of atomization? (1)

iii. Transition metals and many of their compounds show paramagnetic behaviour. Give reason. (2)

OR

Transition metals and their many compounds act as good catalyst. Give reason. (2)

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

Vapour pressure of a liquid or a solution is the pressure exerted by the vapour in equilibrium with the liquid or solution at a particular temperature. It depends upon

the nature of the liquid and temperature. The non-volatile solute in solution reduces the escaping tendency of the solvent molecules in the vapour phase because some of the solute particles occupy the positions of the solvent molecules on the liquid surface. The relative lowering of the vapour pressure of a solution containing a non-volatile solute is equal to the mole fraction of the solute in the solution. This is also known as Raoult's law. However, for solutions of volatile solutes, the vapour pressure of a component in a solution at a given temperature is equal to the mole fraction of that component in the solution multiplied by the vapour pressure of that pure component. The solutions in which each component obeys Raoult's law is called an ideal solution. For ideal solutions ΔH_{mixing} and ΔV_{mixing} are also zero. Practically no solution is ideal. A non-ideal solution is that solution in which solute and solvent molecules interact with one another with a different force than the forces of interaction between the molecules of the pure components. There are two types of non-ideal solutions, showing positive deviations and negative deviations from ideal behaviour. If for the two components A and B, the forces of interaction between A and B molecules are less than the A-A and B-B interactions, the non-ideal solutions have positive deviations. On the other hand, if the forces of interaction between A and B molecules are more than the A-A and B-B interactions, the non-ideal solutions have negative deviations.

i. What is the mole fraction of A in solution obeying result's low if the vapour pressure of a pure liquid A is 40 mm of Hg at 300 K. The vapour pressure of this liquid in solution with liquid B is 32 mm of Hg? (1)

ii. Vapour pressure of a solution of heptane & octane is given by the equation: (1)
P(sol.)(mm Hg) = 35 + 65x, where x is the mole fraction of heptane. Calculate the vapour pressure of pure octane. (2)

iii. What is the value of ΔV_{mixing} and ΔH_{mixing} for non-ideal solution showing negative deviation?

OR

Acetic acid + pyridine, the mixture is an example of which type of solution? (2)

Section E

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

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

i. 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?

ii. a. What is the difference between a nucleoside and nucleotide?
b. What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?

iii. Deficiency of which vitamin causes scurvy?

iv. Which one of the following is a polysaccharide?

Sucrose, Glucose, Starch, Fructose

v. Write the full forms of DNA and RNA.

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

i. What are the three components of nucleic acids?

ii. Name the vitamin whose deficiency causes convulsions.

iii. Define the following terms:

a. Peptide linkage

b. Essential amino acids

iv. i. Name any two bases which are common to both DNA and RNA.

ii. Which vitamin deficiency causes:

1. Bone deformities in children?

2. Pernicious anaemia?

v. Define the following terms:

i. Glycosidic linkage

ii. Native protein

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

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

i. What is the IUPAC name of $[Pt(NH_3)_4Cl_2]^{2+}$?

ii. Write IUPAC name of the given complex:
$[Co(NH_3)_5Cl]Cl_2$

What is the secondary valency of Co in this complex?

iii. Write the IUPAC name of the complex:

$[Co(H_2O)(CN)(en)_2]^{2+}$

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

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

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

v. What were the two valences given by Werner for coordination compounds?

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

i. Write the IUPAC name of $[Cu(NH_3)_4]SO_4$.

ii. Write the IUPAC name of $[N:(H_2O)_6](ClO_4)_2$

iii. What is ambidentate ligand? Give an example.

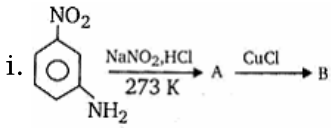
iv. Indicate the types of isomerisms shown by the complex : $K[Fe(H_2O)_2(en)_2Cl_2]$?

v. Write IUPAC names of the following coordination entities:

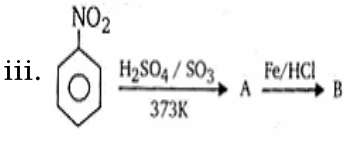
a. $[Cr(NH_3)_3(H_2O)_3]Cl_3$

b. $K_3[Al(C_2O_4)_3]$

33. Identify A and B in the following reactions: **[5]**

i. 

ii. $CH_3CH_2CH_2Br \xrightarrow{NaGN} A \xrightarrow{LiAJH_i} B$

iii. 

OR

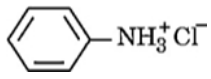
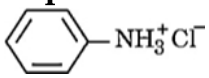
An organic compound **A** with molecular formula C_7H_7NO reacts with Br_2/aq. KOH to give compound **B**, which upon reaction with $NaNO_2$ and HCl at 0^oC gives **C**. Compound **C** on heating with CH_3CH_2OH gives a hydrocarbon **D**. Compound **B** on further reaction with Br_2 water gives white precipitate of compound **E**. Identify the compound A, B, C, D and E; also justify your answer by giving relevant chemical equations.

Solution

Section A

1. **(a)** inversion of configuration
   Explanation:
   inversion of configuration

2. **(c)** A – T
   Explanation:
   Two nucleic acid chains are wound about each other and held together by hydrogen bonds between pairs of bases. The two strands are complementary to each other because the hydrogen bonds are formed between specific pairs of bases. Adenine forms hydrogen bonds with thymine whereas cytosine forms hydrogen bonds with guanine. So base pair in a double helix of DNA is A-T.

3. **(b)** 
   Explanation:
   

4. **(c)** Hexan-3-one
   Explanation:
   Hexan-3-one

5. **(c)** Concentration of reactants keep on changing
   Explanation:
   Rate of reaction is dependent on the concentration of reactants if the concentration of reactants change then the rate of reaction become non-uniform.

6. **(d)** (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
   Explanation:
   (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

7. **(b)** $CH_3CH_2-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-OH$
   Explanation:

Alkyl halides can be obtained by treating alcohol with haloacids. The reactivity of tertiary alcohols with the haloacids is the highest and primary alcohols are the lowest. Formation of alkyl chloride using primary and secondary alcohols requires the usage of a catalyst $ZnCl_2$, where dry hydrogen chloride gas is passed through a solution of alcohol or by heating a mixture of alcohol and concentrated aqueous halogen acid. Reaction with tertiary alcohols does not require a catalyst and can be carried out by using tertiary alcohols. the reaction is conducted by simply shaking with concentrated HCl at room temperature.

8.

(d) $La(OH)_3$, is less basic than $Lu(OH)_3$

Explanation:

The solution identifies statement $La(OH)_3$, is less basic than $Lu(OH)_3$ as incorrect because it asserts that $La(OH)_3$ is less basic than $Lu(OH)_3$. In reality, $La(OH)_3$ is more basic than $Lu(OH)_3$ due to the larger ionic radius of La^{3+} compared to Lu^{3+}, which leads to a weaker attraction between La^{3+} and OH^- ions, making $La(OH)_3$ more soluble and thus more basic. The other statements are correct regarding the trends in the lanthanide series and the properties of the elements mentioned.

9.

(c) 2

Explanation:

For 2nd order reaction, the half-life is inversely related to the concentration of the reactant.

$t_{1/2}$ for second order reaction $\alpha \frac{1}{[R]}$

10.

(b) Iodoform test

Explanation:

$CH_3COR + I_2 + NaOH \rightarrow CHI_3 + RCOO^-Na^+$

Iodoform test is a characteristic test given by methyl ketones. CHI formed is yellow precipitate.

11.

(b) S_N2 reaction

Explanation:

S_N2 reaction

12. **(a)** $(CH_3)_2 - NH$

Explanation:

$(CH_3)_2 - NH$

13.

(c) A is true but R is false.

Explanation:

K_u for glucose is 6.6×10^{-12} and K_u for C_2H_5OH is 7.4×10^{-20}. Thus glucose is more acidic than a monohydric alcohol.

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

Explanation:

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

15.

(c) A is true but R is false.

Explanation:

For the same alkyl group, the boiling points are in the order RI > RBr > RCl > RF. This is because with the increase in the size of halogen, the magnitude of van der Waals' force increases and boiling point increases. Bond strength decreases as the size of the halogen increases. $CH_3F > CH_3Cl > CH_3Br > CH_3I$ and stability decrease as the strength of C-X bond decreases.

16.

(d) If both Assertion and Reason are false statements.

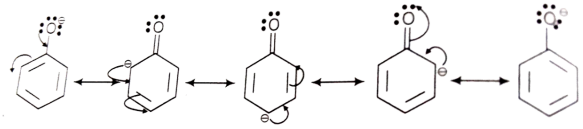
Explanation:

The given assertion and its reason both are incorrect.

EtOH is a weaker acid than phenol because it is tough to remove H^+ ion from EtOH whereas phenol readily gives H^+ to form phenoxide ion (highly stable due to resonance).

The correct reason is that phenoxide ion is stabilized by resonance but ethoxide ion is not stabilized by resonance.

Resonance in phenoxide ion



Section B

17. Given,5% sugar solution means, w_B = 5g

w_A = 95g,M_B = 342g mol^{-1}

Similarly, for 5% glucose solution, w_B(glucose) = 5g

w_A = 95 g and M_B(glucose) = 180 g mol^{-1}

ΔT_f(canesugar) = 273.15K - 271K = 2.15K

$\Delta T_f = \frac{K_f \times w_B \times 1000}{M_B w_A}$

$2.15 = \frac{K_f \times 5 \times 1000}{342 \times 95}$

$k_f = \frac{2.15 \times 342 \times 95}{5 \times 1000} = 13.9707$

similarly, for glucose

$\Delta T_f(glucose) = \frac{13.9707 \times 5 \times 1000}{180 \times 95}$

$\Delta T_f = 4.085K$

Freezing point of the solution

= 273.15K - 4.085K = 269.065 K

OR

NaCl is a non-volatile solute, therefore, the addition of NaCl to water lowers the vapour pressure of water. As a result boiling point of water increases. On the other hand, methyl alcohol is more volatile than water, therefore its addition increases the total vapour pressure over the solution. As a result, the boiling point of water decreases.

18. Since the coordination number of Mn^{2+} ion in the complex ion is 4, the geometry will be either tetrahedral shape (sp^3 hybridisation) or square planar shape (dsp^2 hybridisation). But the fact that the spin only magnetic moment of the$(MnBr_4)^{2-}$ complex ion is 5.9 BM, it should be tetrahedral in shape rather than square planar because of the presence of five unpaired electrons in the d orbitals.

19. a. The general electronic configuration of lanthanoids is $4f^{1-14}\ 5d^{0-1}\ 6s^2$

b. +3 and +4

c. 5f 6d 7s orbitals are of comparable energies

20. Answer the following:

(a) i. First order

ii. s^{-1}/$time^{-1}$ is the unit of rate constant (k).

(b) Y = 2X.

21. $\underset{\substack{Ethanal\\(A)}}{CH_3CHO} \xrightarrow{[O]} \underset{\substack{Acetic\ acid\\(B)}}{CH_3COOH} \xrightarrow{Ca(OH)_2} \underset{\substack{Calcium\ acetate\\(C)}}{(CH_3COO)_2Ca}$

$\xrightarrow[-CaCO_3]{Distilled} \underset{\substack{Acetone\\(D)}}{CH_3-\overset{\overset{O}{\|}}{C}-CH_3} \xrightarrow[2[H]]{LiAlH_4} \underset{\substack{Propan-2-ol\\(E)}}{CH_3-\overset{\overset{OH}{|}}{C}H-CH_3} \xrightarrow{HBr} \underset{\substack{2-Bromopropane\\(F)}}{CH_3-\overset{\overset{Br}{|}}{C}H-CH_3}$

Section C

22. $2Al + 3Ni^{2+} \rightarrow 2Al^{3+} + 3Ni$

$E^{\circ}_{cell} = E^{\circ}_{Ni^{2+}/Ni} - E^{\circ}_{Al^{3+}/Al}$; $E^{\circ}_{cell} = -0.25 - (-1.66) = 1.41\ V$

$n = 6$

$$E_{cell} = E^{\circ}_{cell} - \frac{2.303RT}{nF}\log\frac{[Al^{3+}]^2}{[Ni^{2+}]^3}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log\frac{[0.002]^2}{[0.002]^3}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log\frac{[2\times10^{-3}]^2}{[2\times10^{-3}]^3}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log(5\times10^2)$$

$$E_{cell} = 1.41 - \frac{0.059}{6}(2.6990)$$

$$E_{cell} = 1.41 - 0.0265$$

$$E_{cell} = 1.3835\ V$$

23. The reaction $X \rightarrow Y$ follows second order kinetics.

Therefore, the rate equation for this reaction will be:

Rate = $k[X]^2$ (1)

Let [X] = a mol^{-1}, then equation (1) can be written as:

$Rate_1 = k(a)^2 = ka^2$

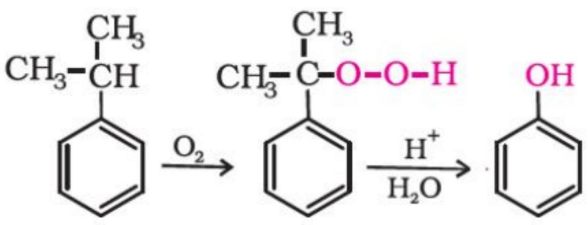
If the concentration of X is increased to three times, then [X] = 3 a mol L^{-1}

Now, the rate equation will be:

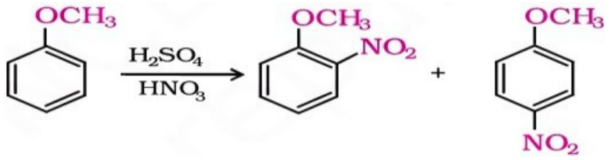
$Rate = k(3a)^2 = 9(ka^2)$

Hence, the rate of formation will increase by 9 times.

24. a. i.

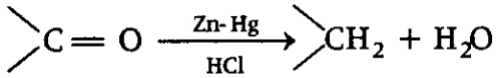


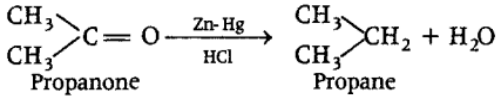
ii.



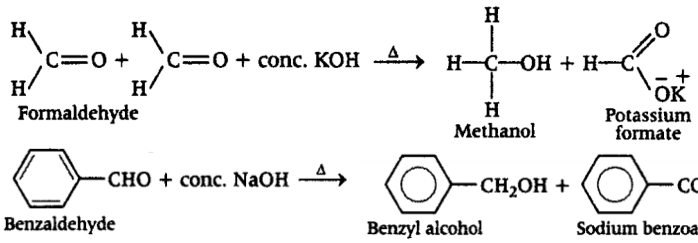
b. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-O-CH_3 + HI \longrightarrow CH_3OH + CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-I$

25. i. **Clemmensen reduction** The carbonyl group of aldehydes and ketones is reduced to - CH_2 group on treatment with zinc-amalgam and concentrated hydrochloric acid. This reaction is known as Clemmensen reduction.



e.g. 

ii. **Cannizzaro reaction** Aldehydes which do not have n-H atoms undergo self oxidation and reduction reaction on treatment with cone. alkali this reaction is known as Cannizzaro reaction. In this reaction, one molecule of aldehyde is reduced to alcohol while another molecule is oxidised to the salt of carboxylic acid.



26. $Mg(s) \longrightarrow Mg^{2+}(aq) + 2e^-$

$2\,Ag^+(aq) + 2e^- \longrightarrow 2\,Ag(s)$

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

applying nernst equation

$E_{cell} = E^0_{cell} - \frac{0.0591}{2}\log\frac{[Mg^{2+}]}{[Ag^{2+}]}$

$E^0(Ag^+/Ag) - E^0(Mg^{2+}/Mg) - \frac{0.0591}{2}\log\frac{0.2}{(10^{-3})^2}$

$= +0.80V - (-2.37V) - \frac{0.0591}{2}\log(2\times10^5)$

$= +3.17V - \frac{0.0591}{2}\left[\log 2 + \log 10^5\right]$

$= +3.17V - \frac{0.0591}{2}\times 5.3010$

= +3.17V - 0.1566V

= 3.0134 V

27. i. $CH_3CH_2CH_2Cl$: It is primary halide and therefore undergoes S_N2 reaction faster.

ii. $CH_3CH_2CH_2I$: As iodine is a better leaving group because of its large size, it will be released at a faster rate in the presence of incoming nucleophile as compared to Br.

28. $2Al + 3Ni^{2+} \rightarrow 2Al^{3+} + 3Ni$

E° cell $= E^\circ Ni^{2+}/Ni - E^\circ{}_{Al}{}^{3+}/Al$; E° cell $= -0.25 - (-1.66) = 1.41\ V$

$n = 6$

$$E_{cell} = E^{\circ}{}_{cell} - \frac{2.303RT}{nF}\log\frac{\left[Al\right]^{3+}\Big]^2}{\left[Ni^{2+}\right]^3}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log\frac{[0.001]^2}{[0.1]^3}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log\frac{[10]^{-6}}{[10]^{-3}}$$

$$E_{cell} = 1.41 - \frac{0.059}{6}\log 10^{-3}$$

$$E_{cell} = 1.41 - 0.0295$$

$$E_{cell} = 1.3805\ V$$

Section D

29. i. The transition metals are quite similar in size and, therefore, the atoms of one metal can substitute the atoms of other metal in its crystal lattice. Thus, on cooling a mixture solution of two or more transition metals, solid alloys are formed.

ii. The high enthalpies of atomization are due to a large number of unpaired electrons in their atoms. Therefore, they have stronger interatomic interactions and hence, stronger bonding between atoms.

iii. Transition elements and many of their compounds are paramagnetic, i.e., they are weakly attracted by a magnetic field. This is due to the presence of unpaired electrons in atoms, ions or molecules. The paramagnetic character increases as the number of unpaired electrons increases.

OR

a. The ability of transition metal ion to pass easily from one oxidation state to another and thus providing a new path to reaction with lower activation energy.

b. The surface of transition metal acts as very good adsorbent and thus provides increased concentration of reactants on their surface causing the reaction to occur.

30. i. $P_A = x_A \times P_A^{\circ}$

$32 = x_A \times 40$

$x_A = \frac{32}{40}$

$x_A = 0.8$

ii. For pure octane, x = 0

$\therefore$ p(sol.)(mm Hg) = P (octane) = 35 + 65 $\times$ 0 = 35 mm of Hg

iii. The value of ΔV_{mixing} and ΔH_{mixing} is negative.

iv. It is an example of Non-ideal solution.

Section E

31. Attempt either A or B

(a) Answer the following questions:

i. a. $\underset{\underset{CH_2OH}{|}}{\overset{\overset{CHO}{|}}{(CHOH)}}_4 \xrightarrow{HI.\Delta} \underset{(n-Hexane)}{CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3}$

b. Peptide linkage

ii. a. Nucleoside $\rightarrow$ Nitrogenous base + Sugar whereas

Nucleotide $\rightarrow$ Nitrogenous base + Sugar + Phosphate group.

b. Thymine base, 2-Deoxyribose sugar, and a Phosphoric acid.

iii. Vitamin C

iv. Starch

v. DNA $\longrightarrow$ Deoxyribonucleic acid
RNA $\longrightarrow$ Ribonucleic acid

(b) Answer the following questions:

i. The three components of nucleic acid are base, sugar and phosphate group..

ii. B_6 / Pyridoxine

iii. a. A linkage which joins two amino acidsthrough -CONH-bond. / The amide linkage(-CO-NH) which is formed when amino group of one alpha amino acid combines with carboxylic group of another amino acid.

b. Amino acids which cannot be synthesised in the body and must be obtained through diet.

iv. i. Adenine, Guanine

ii. 1. Vitamin D
2. Vitamin B_{12}

v. i. A linkage between two monosaccharide units through oxygen atom.
ii. Protein having a unique three-dimensional structure and biological activity.

32. Attempt either A or B

(a) Answer the following questions:

i. Tetraamminedichlidooroplatinum (IV) ion

ii. Pentaamminechloridocobalt(III)chloride
Six/6

iii. Aquacyanidobis(ethane-1,2-diamine)cobalt(III) ion

iv. 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.

v. Werner gave the concept of two valences-

a. Primary or ionisable valences.

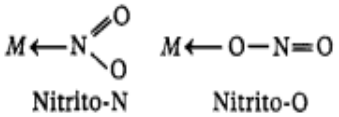
b. Secondary or non ionisable valences.

(b) Answer the following questions:

i. Tetraamine copper II sulphate

ii. Hexaqua nickel (II) chloride

iii. Ligands which can ligate through two different atoms (with any one at a time) present in it are called ambidentate ligands. e.g. NO_2^-, SCN^-, CNO^-, etc NO_2^- can ligate through two sites, e.g.



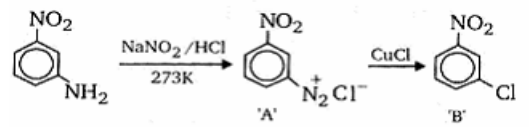
Nitrito-N Nitrito-O

iv. Both geometrical and optical isomerisms will be present.

v. a. Triamminetriaquachromium (III) chloride

b. Potassium trioxalatoaluminate (III)

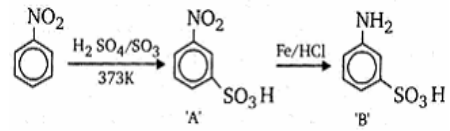
33. i.



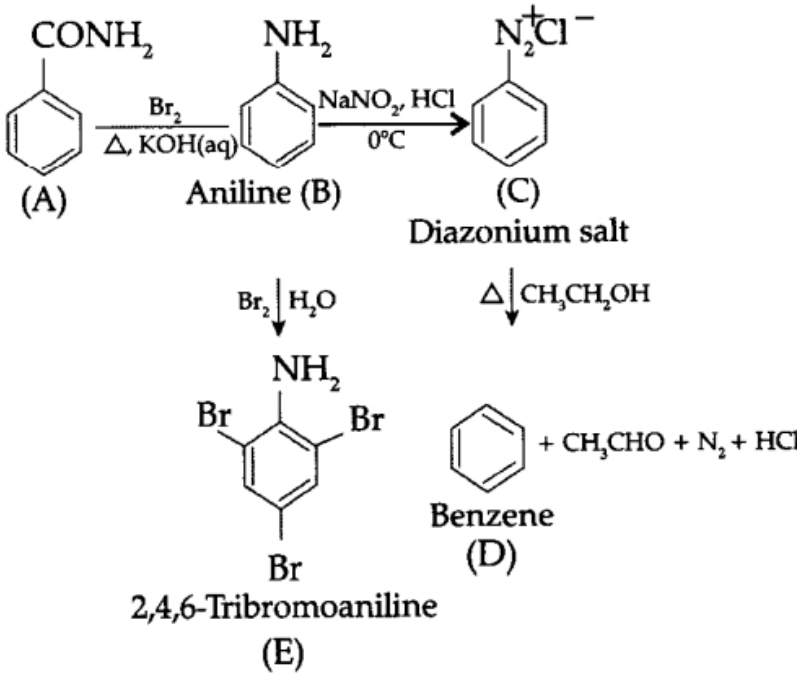
3-Chloronitrobenzene

ii. $CH_3CH_2CH_2Br \xrightarrow{NaGN} \underset{'A'}{CH_3CH_2CH_2C \equiv N} \xrightarrow{LiAJH_4} \underset{\substack{Bu\tan a\min e \\ 'B'}}{CH_3CH_2CH_2CH_2NH_2}$

iii.



OR


CONH2
NH2
N2+Cl−
Br2
Δ, KOH(aq)
NaNO2, HCl
0°C
(A)
Aniline (B)
(C)
Diazonium salt
Br2
H2O
Δ
CH3CH2OH
NH2
Br
Br
Br
+ CH3CHO + N2 + HCl
Benzene
(D)
2,4,6-Tribromoaniline
(E)