Solved Paper 2014

CHEMISTRY

Time : 3 Hours **Class-XII** **Max. Marks : 70**

General Instructions:

(i) All questions are compulsory.

*(ii) Question numbers **1** to **8** are very short-answer questions and carry **1** mark each.*

*(iii) Question numbers **9** to **18** are short-answer questions and carry **2** marks each.*

*(iv) Question numbers **19** to **27** are also short-answer questions and carry **3** marks each.*

*(v) Question numbers **28** to **30** are long-answer questions and carry **5** marks each.*

*(vi) Use Log Tables, if necessary. Use of calculators is **not** allowed.*

Delhi Set I **Code No. 2/1/1**

*** 1. Given one example each of 'oil in water' and 'water in oil' emulsion. 1**

*** 2. Which reducing agent is employed to get copper from the leached low grade copper ore? 1**

3. Which of the following is more stable complex and why? $[Co(NH_3)_6]^{3+}$ and $[Co(en)_3]^{3+}$ 1

Ans. $[Co(en)_3]^{3+}$ is more stable than that of the $[Co(NH_3)_6]^{3+}$.

This is because the chelating ligands form a more stable complex than the non-chelating ligands.

Since, ethylenediamine is a bidentate ligand and forms a stable chelate than that of the ammonia ligand.

4. Write the IUPAC name of the compound 1

CH_3–CH–CH_2–COOH
|
OH

Ans. IUPAC name of given compound is 3-hydoxy butanoic acid

As it is clear that the given compounds contain 4 carbons so the name would be butane.

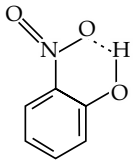
It contains carboxylic group at first carbon so it will become butanoic acid and the third carbon contains hydroxyl group. So, the IUPAC name will be 3-hydroxybutanoic acid.

5. Which of the following isomers is more volatile: *o*-nitrophenol or *p*-nitrophenol? 1

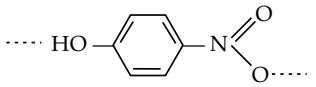
Ans. *o*-nitrophenol is more volatile than *p*-nitrophenol.

In para nitrophenol, intermolecular hydrogen bonding is present.

This intermolecular hydrogen bonding causes the association of molecules.

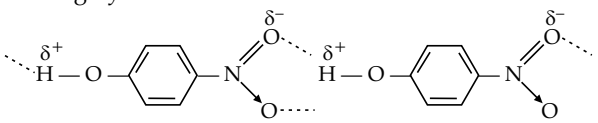


o-nitrophenol
(Intermolecular H-bonding)



p-nitrophenol
(Intermolecular H-bonding)

In *o*-nitrophenol an intramolecular hydrogen bonding between the partial positively charged (δ+) hydrogen of phenolic group and between the partial negatively charged (δ–) oxygen of nitro group. So, it involves only a single molecule, and the boiling point is lesser and so the compound is highly volatile.



In *p*-nitrophenol, there exists intermolecular hydrogen bonding. Here, positively charged (δ+) hydrogen in the phenolic group of one molecule and the partial negatively charged (δ–) oxygen in nitro group of another molecule. So, the hydrogen bonding involves multiple molecules. The boiling point is higher and compound is less volatile compared to *o*-nitrophenol.

6. What are isotonic solutions? 1

Ans. When both Solutions A and B have identical osmotic pressure, they are said to be isotonic.

The concentration of solute in an isotonic solution is identical to that of the solvent inside a cell.

7. Arrange the following compounds in increasing order of solubility in water:

$C_6H_5NH_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$ 1

* *Out of Syllabus*

Ans. Increasing order of solubility of $C_6H_5NH_2$, $(C_2H_5)_2NH$ and $C_2H_5NH_2$ are as follows:

$C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2$

This is because as the number of H bonded to N increases the H–bonding increases which increases the solubility in water.

$C_6H_5NH_2$ is least soluble due to presence of hydrophobic benzene ring in the skeleton of structure.

8. Which of the two components of starch is water soluble? 1

Ans. Starch have two components:

'Amylose' and 'Amylopectin' in which 'amylose' is water soluble.

*** 9. An element with density 11.2 gm cm^{-3} forms f.c.c. lattice with edge length 4×10^{-8} cm. Calculate the atomic mass of the element. (Given $N_A = 6.022 \times 10^{23}$ mol^{-1}) 2**

*** 10. Examine the given defective crystal**

A^+	B^-	A^+	B^-	A^+
B^-	O	B^-	A^+	B^-
A^+	B^-	A^+	O	A^+
B^-	A^+	B^-	A^+	B^-

Answer the following questions:

(i) What type of stoichiometric defect is shown by crystal?

(ii) How is the density of the crystal affected by this defect?

(iii) What type of ionic substances show such defect? 2

11. Calculate the mass of compound (molar mass = 256 g mol^{-1}) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K(K_f = 5.12 K kg mol^{-1}). 2

Ans. Let X g of the compound is to be dissolved.

Number of moles of compound,

$$n = \frac{\text{molar mass}}{\text{given mass}} = \frac{256}{W}$$

$$\text{Mass of Benzene} = 75 \text{ g} = 0.075 \text{ Kg}$$

$$\text{Molality} = \frac{\text{moles of solute}}{\text{mass of solvent in kg}}$$

$$= \frac{W}{256 \times 0.075} = \frac{W}{19.2}$$

Freezing point depression $\Delta T_f = 0.48$ K

Molar depression of freezing point constant

= 5.12 K kg/mol

It is defined as the total number of molecules of reactants.

$\Rightarrow$ $T_f = K_f 0.48$

$= 5.12 W = 1.8$ g

Hence, 1.8 g solute has been dissolved.

12. Define an ideal solution and write one of its characteristics. 2

Ans. An ideal solution is one that perfectly complies with Raoult's law across the whole concentration range. Such mixtures are created by combining two substances that have almost identical particle sizes, configurations, and intermolecular forces.

(i) Ideal solutions must adhere to Raoult's law.

(ii) There should be no enthalpy of mixing.

13. Write two differences between 'order of reaction' and 'molecularity of reaction'. 2

Ans.

	Molecularity of reaction	Order of reaction
(i)	It is referred to as the entire amount of reactant molecules.	It is defined as the sum of power of concentration terms.
(ii)	It is a theoretical concept and can be calculated by simple adding the mole	It can only be obtained analytically and not through computation.

*** 14. Outline the principles behind the refining of metals by the following methods: 2**

(i) Zone refining method

(ii) Chromatographic method

*** 15. Complete the following chemical equations: 2**

(i) $Ca_3P_2 + H_2O \rightarrow$

(ii) $Cu + H_2SO_4$ (conc.) $\rightarrow$

OR

Arrange the following in order of property indicated against each set:

(i) HF, HCl, HBr, HI: increasing bond dissociation enthalpy

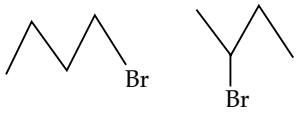
(ii) H_2O, H_2S, H_2Se, H_2Te,: increasing acidic character.

16. Write the IUPAC name of the complex $[Cr(NH_3)_4Cl_2]^+$. What type of isomerism does it exhibit? 2

Ans. IUPAC name of complex $[Cr(NH_3)_4Cl_2]^+$ is Tetraamminedichlorochromium(III) ion.

It exhibits geometrical isomerism, i.e, cis and trans

17. (i) Which alkyl halide from the following pair is chiral and undergoes faster S_N2 reaction? 2



(a) **(b)**

(ii) Out of S_N1 and S_N2, which reaction occurs with

(a) Inversion of configuration

(b) Racemisation

Ans. (i) S_N2 reaction occurs more quickly in primary alkyl halides than in secondary and tertiary alkyl halides.

(a) is primary alkyl halide and (b) is secondary alkyl halide.

So, (a) undergoes S_N2 reaction faster than (b).

(ii) Out of S_N1 and S_N2, which reaction occurs with:

(a) Inversion of configuration: S_N2,because the incoming nucleophile attacks from the backside resulting in inversion of configuration.

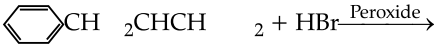
* *Out of Syllabus*

(b) Racemisation: S_N1, in this first carbocation is formed.

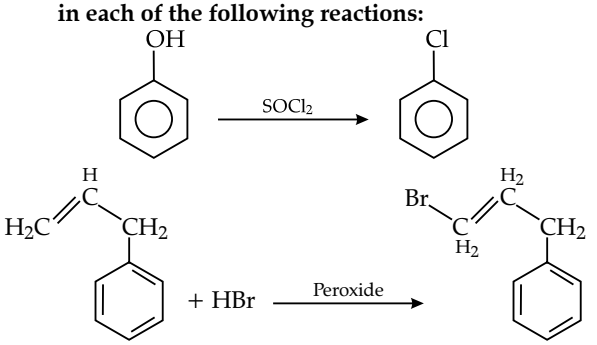
The incoming nucleophile can attack from either side resulting in racemic mixture.

18. Draw the structure of major monohalo product in each of the following reactions:

(i) 

(ii)  **2**

Ans. Draw the structure of the major monohalo product in each of the following reactions:



*** 19. (a) In reference to Freundlich adsorption isotherm, write the expression for adsorption of gases on solids in the form of an equation.**

(b) Write an important characteristic of lyophilic sols.

(c) Based on type of particles of dispersed phase, give one example each of associated colloid and multimolecular colloid. 3

*** 20. (a) Draw the structures of the following molecules:**

(i) $XeOF_4$

(ii) H_3SO_4

(b) Write the structural difference between white phosphorus and red phosphorus. 3

*** 21. Account for the following:**

(i) PCl_5 is more covalent than PCl_3.

(ii) Iron on reaction with HCl forms FeC_2 and not $FeCl_3$.

(iii) The two O-O bond lengths in the ozone molecule are equal. 3

22. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume: 3

$$SO_2Cl_2(g) \longrightarrow SO_2(g) + Cl_2(g)$$

Experiment	Time/s^{-1}	Total pressure/atm
1	0	0.4
2	100	0.7

Calculate the rate constant.

(Given: long 4 = 0.6021, log 2 = 0.3010)

Ans. The given reaction is, $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$

$P_i = 0.4$ atm, P = 0.7 atm, $t = 100$s

Thus, according to the integrated rate law for gas phase

$$K = \frac{2.303}{t} \times \log_{10} \frac{P_i}{2P_i - P}$$

$$K = 2.303 \times 10^{-2} \times \log_{10} \frac{0.4}{0.1}$$

$$K = 2.303 \times 10^{-2} \times \log_{10}(4)$$

$$K = 2.303 \times 10^{-2} \times 0.6021$$

$$K = 1.3866 \times 10^{-2} s^{-1}$$

Thus, the rate constant for the above reaction is $1.3866 \times 10^{-2} s^{-1}$.

*** 23. (i) Give two examples of macromolecules that are chosen as drug targets. 3**

(ii) What are antiseptics? Give an example.

(iii) Why is use of aspartame limited to cold foods and soft drinks?

24. (i) Deficiency of which vitamin causes night-blindness?

(ii) Name the base that is found in nucleotide of RNA only.

(iii) Glucose on reaction with HI gives n-hexane. What does it suggest about the structure of glucose?

Ans. (i) Vitamin A

(ii) Uracil

(iii) Glucose reaction with HI produces *n*-hexane which suggests that all the six carbon atoms are linked together in a straight chain.

*** 25. After the ban on plastic bags, students of a school decided to make the people aware of the harmful effects of plastic bags on the environment and Yamuna River. To make the awareness more impactful, they organized rally by joining hands with other schools and distributed paper bags to vegetable vendors, shopkeepers and departmental stores. All the students pledged not to use polythene bags in the future to save the Yamuna River. 3**

After reading the above passage, answer the following questions:

(i) What values are shown by the students?

(ii) What are bio-degradable polymers? Give one example.

(iii) Is polythene a condensation or the addition polymer?

26. (a) Write the mechanism of the following reaction: 3

$$CH_3CH_2OH \xrightarrow{HBr} CH_3CH_2Br + H_2O$$

(b) Write the equation involved in Reimer-Tiemann reaction.

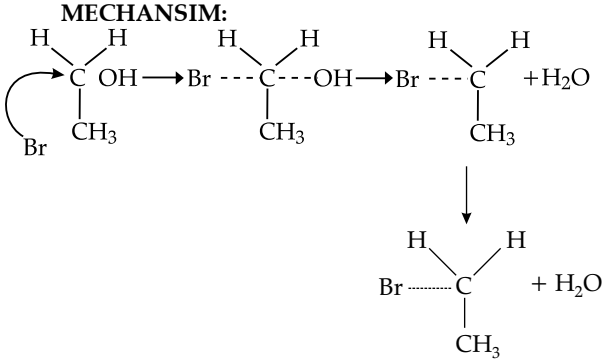
Ans. (a) $CH_3CH_2OH \xrightarrow{HBr} CH_3CH_2Br + H_2O$

The reaction follows SN^2 mechanism.

It is a single step mechanism which proceeds via the formation of transition state.

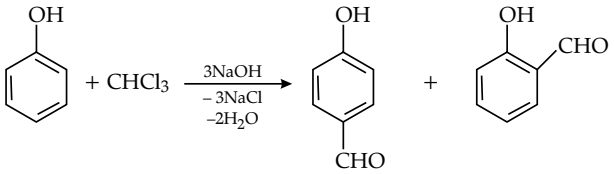
* *Out of Syllabus*

MECHANSIM:



The nucleophile attacks the electrophilic carbon on the backside, resulting in the inversion of configuration.

(b) The equation involved in the Reimer-Tieman reaction.



Phenol — salicaldehyde (major) — 4-hydroxy benzaldehyde (minor)

27. Give the structures of A, B and C in the following reactions:

(i) $CH_3Br \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow{HNO_2} C$

(ii) $CH_3COOH \xrightarrow{NH_3} A \xrightarrow{Br_2+KOH} B \xrightarrow{CHCl_3+NaOH} C$

OR

How will you convert the following?

(i) Nitrobenzene into aniline.

(ii) Ethanoic acid into methanamine.

(iii) Aniline into N-phenylethanamide.

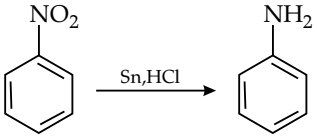
(Write the chemical equations involved.) **3**

Ans. (i) $CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{LiAlH_4} CH_3CH_2NH_2 \xrightarrow{HNO_2} CH_3CH_2OH$

(ii) $CH_3COOH \xrightarrow{NH_3} CH_3CONH_2 \xrightarrow{Br_2+KOH} CH_3NH_2 \xrightarrow{CHCl_3+NaOH} CH_3N \equiv C$

OR

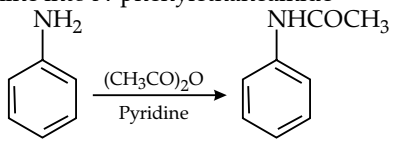
(i) Nitrobenzene into aniline



(ii) Ethanoic acid to methenamine

$CH_3COOH \xrightarrow{NH_3} CH_3CONH_2 \xrightarrow{Br_2+KOH} CH_3NH_2$

(iii) Aniline into N-phenylethaneamide



28. (a) Define the following terms:

(b) Resistance of a conductivity cell filled with 0.1 mol L^1 KCl solution is 100 W. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution. The conductivity of 0.1 mol L^{-1} KCl solution is $1.29 \times 10^{-2}\Omega^{-1}$ cm^{-1}. **5**

OR

(a) State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu.

(b) Calculate *emf* of the following cell at 298 K:

Mg(s) $|Mg^{2+}(0.1\ M)|$ $|Cu^{2+}(0.01\ M)|$ Cu(s)

[Give $E^0_{cell} = \pm +2.71$ V, F = 96500 C mol^{-1}]

Ans. (a) (i) When the concentration of the electrolyte approaches zero, the molar conductivity is termed as limiting molar conductivity. It is represented by Λ_m^0.

(ii) Fuel cell: Fuel cells are the galvanic cells or electrochemical cells that transform the chemical energy into electrical energy from fuel combustion by redox reaction, such as hydrogen, methanol, etc

(b) Given,

For 0.1 mol L^{-1} KCl solution

Resistance (R) = 100 Ω

Conductivity (k) = $1.29 \times 10^{-2}\ \Omega^{-1}\ cm^{-1}$

Cell constant (G*) = k × R

$= 1.29 \times 10^{-2}\ \Omega^{-1}\ cm^{-1} \times 100\ \Omega$

$= 1.29\ cm^{-1}$

For 0.02 mol L^{-1} KCl solution

Resistance (R) = 520 Ω

$$\text{Conductivity} = \frac{\text{Cell constant } (k)}{\text{Concentration (C)}}$$

$$K = \frac{1.29\ cm^{-1}}{520\ \Omega}$$

$K = 2.48 \times 10^{-3}\ \Omega^{-1}\ cm^{-1}$

Concentration (C) = 0.02 mol L^{-1}

$= 0.02 \times 10^{-3}$ mol cm^{-3}

Molar conductivity (Λ_m)

$$= \frac{\text{Conductivity } (k)}{\text{Concentration (C)}}$$

$$= \frac{2.48 \times 10^{-3}\Omega^{-1}\ cm^{-1}}{0.02 \times 10^{-3}\ \text{mol}\ cm^{-3}}$$

$\Lambda_m = 124\ \Omega^{-1}\ cm^2\ mol^{-1}$

OR

(a) Faraday's first law of electrolysis states that "The mass of a substance deposited at any electrode is directly proportional to the amount of charge passed."

$$m = Z \times Q$$

where, m = mass of a substance deposited or liberated at an electrode.

Q = amount of charge passed through it and

Z = electrochemical equivalent

The reduction of one mol of Cu^{2+} to Cu can be represented as:

$$Cu^{2+} + 2e^- \rightarrow Cu$$

Since, 2 mol of electrons are involved in the reduction, so the amount of charge required is 2F.

(b) The given cell reaction can be represented as

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

$$E_{cell} = E^\circ - \frac{2.303\ RT}{nF}\log\frac{Mg^{2+}}{Cu^{2+}}$$

$$E_{cell} = 2.71 - \frac{2.303 \times 0.0831 \times 298}{2 \times 96500}\log\frac{0.1}{0.01}$$

$$E_{cell} = 2.71 - \frac{0.0591}{2}\log 10$$

$$E_{cell} = 2.68V$$

29. (a) How do you prepare:

(i) $KMnO_4$ from MnO_2

(ii) $Na_2Cr_2O_7$ from Na_2CrO_4

(b) Account for the following:

(i) Mn^{2+} is more stable than Fe^{2+} towards oxidation to +3 state.

(ii) The enthalpy of atomization is lowest for Zn in 3*d* series of the transition elements.

(iii) Actionoid elements show wide range of oxidation states. **5**

OR

(i) Name the elements of 3*d* transition series which shows maximum number of oxidation states. Why does it show so?

(ii) Which transition metal of 3*d* series has positive $E^\circ_{(M^{2+}/M)}$ value and why?

(iii) Out of Cr^{3+} and Mn^{3+}, which is a stronger oxidizing agent and why?

(iv) Name a member of the Lanthanoid series which is well known to exhibit +2 oxidation state.

(v) Complete the following equation

$MnO_4^- + 8H^+ + 5e^- \longrightarrow$

Ans. **(i)** $KMnO_4$ can be prepared from pyrolusite (MnO_2). MnO_2 is ignited with KOH in the presence of catalysts agents, such as oxygen from the air or KNO_3 or $KClO_4$ to give K MnO_4.

$$2MnO_2 + 4KOH + O_2 \longrightarrow KMnO_4 \text{ (green)} + 2H_2O$$

(ii) For the preparation of $Na_2Cr_2O_7$, the yellow solution of sodium chromate (Na_2CrO_4) is acidified with sulphuric acid to give a solution from which orange sodium dichromate, $Na_2Cr_2O_7$. $2H_2O$ can be crystallized.

$$2Na_2CrO_4 \text{ (yellow)} + 2H^+ \xrightarrow[\Delta]{} Na_2Cr_2O_7 \text{ (orange)} + 2Na^+ + H_2O$$

(b) (i) Electronic configuration of Mn^{2+} is [Ar]$3d^5$

Electronic configuration of Fe^{2+} is [Ar]$3d^6$

It is known that the half-filled orbitals are more stable.

Therefore, Mn in +2 state has a stable d^5 configuration, shows resistance to the oxidation to Mn^{3+}.

Fe^{2+} has $3d^6$ configuration and by losing one electron, its configuration changes to a more stable $3d^5$ configuration and it gets oxidised to Fe^{3+} easily.

(ii) In all transition metals (except Zn, electronic configuration: $3d^{10}4s^2$), there are some unpaired electrons that account for their stronger metallic bonding.

Zn has the least enthalpy of atomization because it lacks these unpaired electrons, which makes its inter-atomic electronic bonding the weakest.

(iii) Actinides exhibit larger oxidation states because of very small energy gap between 5*f*, 6*d* and 7*s* sub-shells.

Since, all these sub-shells have similar $(n + l)$ value, therefore all can be involved in bonding resulting in a larger oxidation number for actinoids.

OR

(i) Manganese ([Ar] $3d^5\ 4s^2$) shows maximum number of oxidation state as its atoms have five unpaired electrons in 3*d* orbitals. It shows all the oxidation state from +2 to +7.

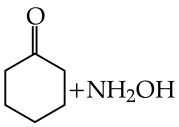
(ii) Cu has positive $E_o\frac{M^{2+}}{M}$ value, because the sum of enthalpies of sublimation and ionization is not balanced by hydration enthalpy.

(iii) Mn^{3+} is stronger oxidising agent as the charge from Mn^{3+} to Mn^{2+} results in half filled, d^5 configuration which has extra stability.

(iv) Europium, (Eu^{2+}) is formed by losing the two 5*s* electrons and its electronic configuration becomes [Xe]$4f^7$ which is quite stable configuration.

(v) $MnO_4^- + 8H^+ + 8e^- \rightarrow Mn^{2+} + 4H_2O$

30. (a) Write the products of the following reactions: **2+3**

(i) 

(ii) $2C_6H_5CHO$ + Conc. NaOH $\longrightarrow$

(iii) $CH_3COOH \xrightarrow{Cl_2/P}$

OR

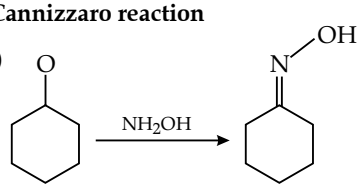
(a) Account for the following:

(i) CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN.

(ii) Carboxylic acid is a stronger acid than phenol.

(b) Write the chemical equations to illustrate the following name reactions:
(i) Wolff-Kishner reduction
(ii) Aldol condesnation
(iii) Cannizzaro reaction

Ans. (a) (i)



(ii) $C_6H_5 - CHO + \text{conc. } NaOH \rightarrow C_6H_5COONa$
Benzaldehyde — Sodium benzoate

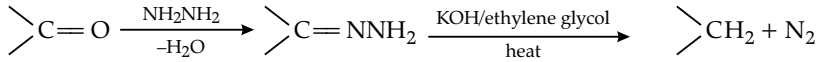
(iii) $CH_3 - COOH \xrightarrow{Cl_2/P} Cl - CH_2 - COOH + HCl$

OR

(a) (i) In acetone alkyl chain is present on both side of carbonyl group that cause steric hinderance and make them less reactive towards nucleophilic attack because both alkyl group shows the -I effect while all this not occur in acetaldehyde which make it more reactive towards the nucleophilic attack.

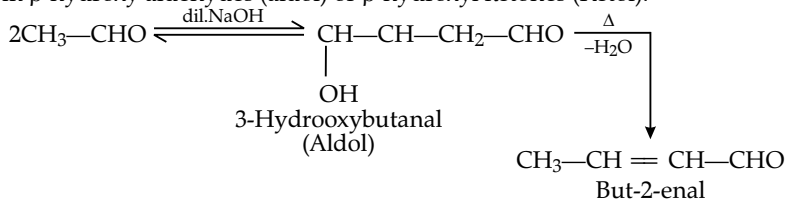
(ii) Carboxylic acid is more acidic because of its stabilising resonating structure which make carboxylate ions. Carboxylic acid have two oxygen atoms which are highly electronegative in nature and while in phenols acidic character is due to presence of phenoxide ions means one oxygen atom is present in the structure.

(b) (i) Wolff-Kishner Reduction:

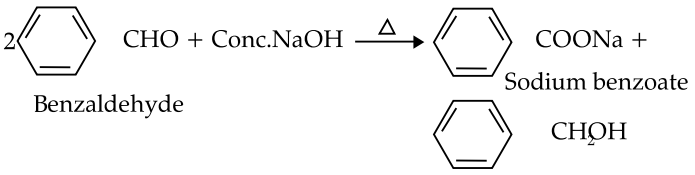


(Wolff-Kishner reduction)

(ii) Aldol condensation: Aldehydes and ketones having at least one α-hydrogen react in the presence of dilute alkali to form β-hydroxy aldehydes (aldol) or β-hydroxyl ketones (Ketol).



(iii) Cannizaro reaction:



Delhi Set II — Code No. 2/1/2

Note: Except for the following questions, all the remaining questions have been asked in previous set.

*** 1. Give one example each of sol and gel. 1**

2. Write the IUPAC name of the compound 1

$CH_3 - CH(NH_2) - CH_2 - CHO$

Ans. $CH_3—CH(NH_2)—CH2—CHO$

The IUPAC name of the given compound is 3-aminobutan-1-al.

While naming the compounds priority of the functional group is taken care of. Here, the aldehyde functional group is of higher priority than the amine functional group, so is the numbering.

5. Some liquids on mixing form 'azeotropes'. What are 'azeotropes'? 1

Ans. An azeotrope, also known as constant boiling mixture, is defined as a mixture of two or more liquids that display the same composition in the liquid and vapor phases.

They are of two types:

(i) Minimum boiling azeotrope

(ii) Maximum boiling azeotrope

7. Which component of starch is a branched polymer of α-glucose and insoluble in water? 1

Ans. Amylopectin component of starch is branched and insoluble in water.

9. Sate Henry's law. What is the effect of temperature on the solubility of a gas in a liquid? 2

Ans. Henry's law states that a gas's weight in a liquid is inversely correlated with the gas's pressure on the liquid. Only diluted solutions and low gas pressures are subject to the law. Since, the solubility of a gas in a liquid is inversely related to temperature, for all gases, solubility declines as temperature rises.

10. Define the following terms: 2

(i) Pseudo first-order reaction

(ii) Half-life period of reaction ($t_{1/2}$).

Ans. (i) A second-order or bimolecular reaction that mimics the behaviour of a first-order reaction is known as a pseudo first-order reaction. When one of the reactive materials is present in extreme excess or is kept at a constant concentration in relation to the other substance, the reaction takes place.

* *Out of Syllabus*

(ii) The amount of time needed for a reactant to achieve half of its starting concentration or pressure is known as the half-life of a reaction. A first-order reaction's half-life is stable over time and concentration-independent.

*** 11. Write the principle behind the following methods of refining: 2**

(i) Hydraulic washing

(ii) Vapour-phase refining

*** 22. (a) Draw the structures of the following: 3**

(i) XeF_2

(ii) BrF_3

(b) Write the structural difference between white phosphorus and red phosphorus.

*** 23. Account for the following:**

(i) Bi(V) is a stronger oxidizing agent than Sb(V).

(ii) N – N single bond is weaker than P – P single bond.

(iii) Noble gases have very low boiling points.

*** 24. (i) Name the sweetening agents used in the preparation of sweets for a diabetic patient.**

(ii) What are antibiodies? Give an example.

(iii) Give two example of macromolecules that are chosen as drug targets. 3

27. (i) Deficiency of which vitamin causes rickets?

(ii) Give an example for each of fibrous protein and globular protein.

(iii) Write the product formed on reaction of D-Glucose with Br_2 water.

Ans. (a) The deficiency of vitamin D and lack of calcium in any child's diet causes rickets. As both vitamin D and calcium is important for healthy bones.

(b) Example of fibrous protein is α-keratin. Hairs, nails and collagens majorly contains this protein.

Example of globular protein is haemoglobin; it plays the main role in carrying oxygen in the blood.

(c) Gluconic acid ($C_6H_{12}O_7$)

On reacting glucose with bromine water, glucose undergoes oxidation reaction to form gluconic acid as a product.

Delhi Set III — Code No. 2/1/2

Note: Except for the following questions, all the remaining questions have been asked in previous set.

*** 1. Give one example each of lyophobic sol and lyophobic sol and lyophillic sol. 1**

2. Write the IUPAC name the compound. 1

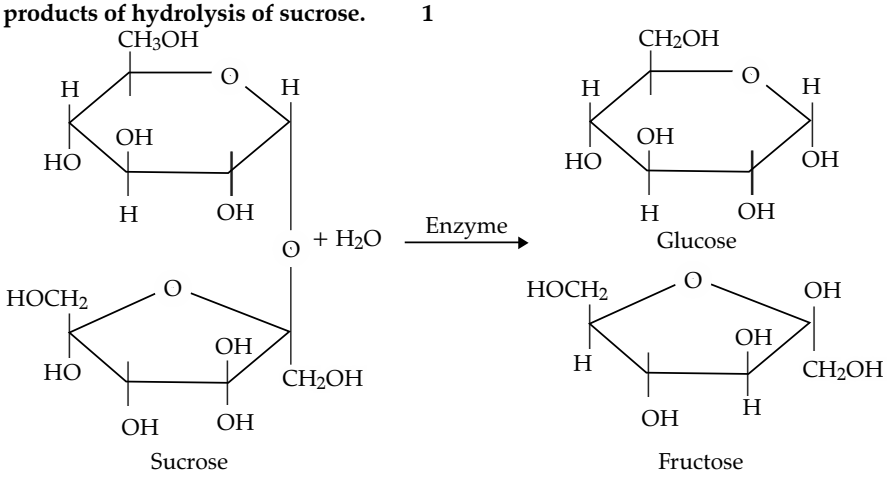
$CH_3 – CH – CH_2 – C – CH_3$
OH O

Ans. $CH_3 – CH – CH_2 – C – CH_3$
OH O

IUPAC name is 4-hydroxy-2-pentanone
or 4-hydroxypent-2-one

*** 3. What type of intermolecular attractive interaction exists in the pair of methanol and acetone? 1**

6. Name the products of hydrolysis of sucrose. 1



The enzyme to be used here is invertase.

Ans. Hydrolysis is the reaction of water with another compound to form two or multiple products. Water molecules felicitate the breaking of the other compound or reactant. It might be acid or base catalysed.

The hydrolysis of sucrose leads to the formation of glucose and fructose. It should be noted that sucrose is a non-reducing sugar as it does not contain free aldehyde or keto group. The typical table sugar we use on a regular basis is called sucrose. It is a disaccharide, meaning that two sugars are linked together by a glycosidic bond. [–C–O–C–] linkage is called glycosidic bond.

Glucose is an aldehyde, which forms a six-carbon ring. Contrarily, fructose is a ketone that forms a ring with five members (hence, a furan). Sucrose will therefore separate into its monomeric sugars during hydrolysis.

* *Out of Syllabus*

9. State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law ? 2

Ans. According to Raoult's Law, "the partial pressure of each component in a mixture of volatile liquids equals the product of its vapour pressure at pure state and its mole fraction in the solution."

Both Raoult's law and Henry's law say that the partial pressure of the volatile component is precisely proportional to its mole fraction in the solution, which is where they have similarities. It is a liquid in the case of Raoult's law and a gas in the case of Henry's law.

10. Explain the following terms: 2

(i) Rate constant (*k*)

(ii) Half life period of reaction ($t_{½}$).

Ans. (i) The proportionality constant (*k*) that links the pace of the reaction to the concentrations of reactants is known as the specific rate constant. For any chemical reaction, the rate law and the particular rate constant must be ascertained through experimentation. Temperature affects the rate constant's value.

(ii) The amount of time needed for a reactant to achieve half of its starting concentration or pressure is known as the half-life of a reaction. The half-life for a first-order reaction is concentration-independent and stable over time.

*** 11. Write the principles of the following methods: 2**

(i) Froth floatation method

(ii) Electrolytic refining

*** 20. (a) Draw structure of the following compounds:**

(i) XeF_4

(ii) N_2O_5

(b) Write the structural difference between white phosphorus and red phosphorus. 3

*** 22. Account for the following: 3**

(i) Sulphur in vapour form exhibit paramagnetic behaviour.

(ii) $SnCl_4$ is more covalent than $SnCl_2$.

(iii) H_3PO_2 is stronger reducing agent than H_3PO_3.

*** 23. (i) What are disinfectants? Give an example.**

(ii) Give two examples of macromolecules that are chosen as drug targets.

(iii) What are anionic detergents? Give an example. 3

24. (i) Deficiency of which vitamin causes scurvy?

(ii) What type of linkage is responsible for the formation of proteins?

(iii) Write the products formed when glucose is treated with HI. 3

Ans. (i) Scurvy is caused due to the deficiency of Vitamin C in the body.

(ii) Peptide linkage or bond is responsible for the formation of proteins.

(iii) *n*-hexane is formed when glucose reacts with HI.

Outside Delhi Set I — Code No. 2/1/1

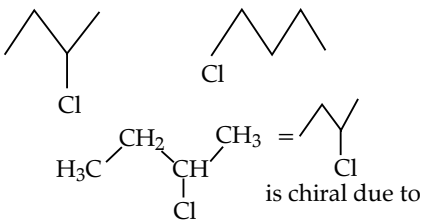
*** 1. What is the effect of temperature on chemisorption? 1**

*** 2. What is the role of zinc metal in the extraction of silver? 1**

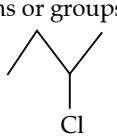
3. What is the basicity of H_3PO_3? 1

Ans. H_3PO_3 is dibasic as it has 2 hydrogen atoms that can be replaced.

4. Identify the chiral molecule in the following pair: 1



Ans. Chiral C atoms are carbon atoms that are joined to four distinct atoms or groups of atoms.



*** 5. Which of the following is a natural polymer?**
Buna-S, Proteins, PVC Economics type

6. The conversion of primary aromatic amines into diazonium salts is known as _____ .

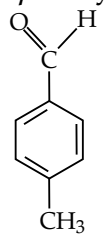
Ans. Diazotization is the process of turning primary aromatic amines into diazonium ions.

7. What are the products of hydrolysis of sucrose? 1

Ans. An equimolar mixture of fructose and glucose is produced during the hydrolysis of sucrose, which is known as invert sugar in the food industry.

8. Write the structure of *p*-methylbenzaldehyde. 1

Ans.



*** 9. An element with density 2.8 g cm^{-3} forms a *f.c.c.* unit cell with edge length 4×10^{-8} cm. Calculate the molar mass of the element. (Given $N_A = 6.022 \times 10^{23}$ mol^{-1}) 2**

*** 10. (i) What type of non-stoichiometric point defect is responsible for the pink colour of LiCl?**

(ii) What type of stoichiometric defect is shown by NaCl? 2

* *Out of Syllabus*

OR

*** How will you distinguish between the following pairs of terms?**

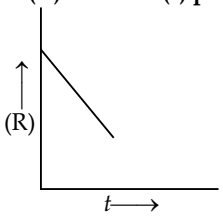
(i) Tetrahedral and octahedral voids

(ii) Crystal lattice and unit cell

11. Sate the kohlrausch law of independent migration of ions. Why does the conductivity of a solution decreases with dilution? 2

Ans. According to Kohlrausch's law of independent ion migration, an electrolyte's limiting molar conductivity can be thought of as the total of the individual contributions made by its cations and anions. Because there are fewer ions available for conduction, a solution's conductivity decreases with dilution.

12. For a chemical reaction R → P, the variation in the concentration (R) Vs. time (*t*) plot is given as 2



(i) Predict the order of the reaction.

(ii) What is the slope of the curve?

Ans. (i) The change in the concentration (R) vs. time (*t*) figure illustrated here shows a zero order reaction, for which the reaction's rate is proportional to the reactant concentration's zero power.

(ii) The rate constant for a reaction with zero orders is given as, $[R] = [R]^0 - kt$

Therefore, the slope of the curve representing the fluctuation in the concentration (R) vs. time (*t*) plot is opposite the reaction's rate constant.

*** 13. Explain the principle of the method of electrolytic refining of metals. Give one example. 2**

*** 14. Complete the following equations: 2**

(i) $P_4 + H_2O \longrightarrow$

(i) $XeF_4 + O_2F_2 \longrightarrow$

*** 15. Draw the structures of the following:**

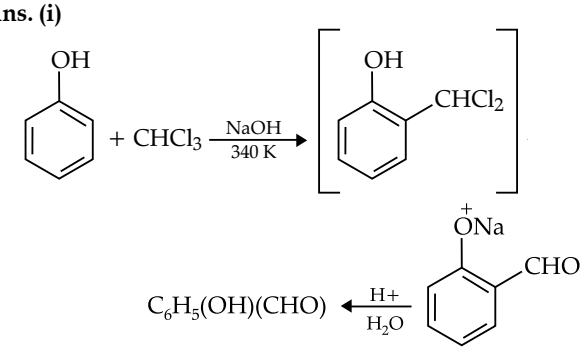
(i) XeF_2 (ii) BrF_3 2

16. Write the equations involved in the following reactions: 2

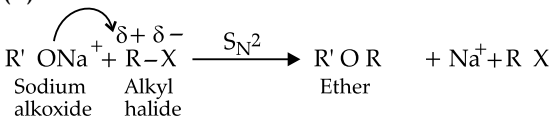
(i) Reimer-Tiemann reaction

(ii) Williamson synthesis

Ans. (i)



(ii)

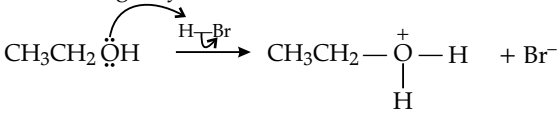


17. Write the mechanism of the following reaction:

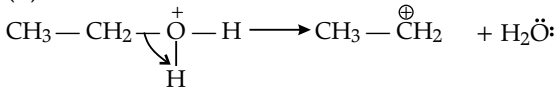
$$CH_3CH_2OH \xrightarrow{HBr} CH_3CH_2Br + H_2O$$ **2**

Ans. Mechanism:

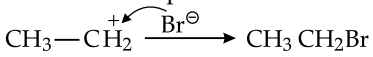
(i) The oxygen lone pair attacks the H-Br molecule, creating a hydronium ion.



(ii) Carbocation formation.



(iii) Attack of the Nucleophile Br^-.



*** 18. Write the name of monomers used for getting the following polymers: 2**

(i) Bakelite

(ii) Neoprene

19. (a) Calculate ΔG^0 for the reaction

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

Given: $E^0_{cell} = 2.71$ V, 1 F = 96500 C mol^{-1}

(b) Name the type of cell that was used in Apollo space program for providing electrical power. 3

Ans. (i) For the reaction,

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

$$\Delta G^0 = -nFE^0 = -2 \times 96500 \times 2.71$$

$$= -523030 \text{ J mol}^{-1}$$

(ii) During the Apollo space programme, the fuel cell, which harnesses the interaction between hydrogen and oxygen to create water, was employed to generate electricity.

20. The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume:

$SO_2Cl_2(g) \longrightarrow SO_2(g) + Cl_2(g)$

Experiment	Time (s^{-1})	Total pressure (atm)
1	0	0.4
2	100	0.7

Calculate the rate constant. (Given: log 4 = 0.6021, log 2 = 0.3010) 3

Ans. $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$

At $t = 0$ P^0 o o

At $t = 100$ sec $P^0 - P$ P P

$$P^0 = 0.4 \text{ atm}$$

$$P^0 - P + P + P = 0.7 \text{ atm}$$

$$P^0 + P = 0.7 \text{ atm}$$

$$P = 0.3 \text{ atm}$$

It's a first order reaction.

* *Out of Syllabus*

$$K = \frac{2.303}{t}\log\frac{P^0}{P^0 - P}$$

$$K = \frac{2.303}{t}\log\frac{0.4}{0.1}$$

So, the rate constant, $K = 1.39 \times 10^{-2}\ sec^{-1}$

*** 21. What are emulsions? What are their different types? Given one example of each type. 3**

*** 22. Give reasons for the following:**

(i) $(CH_3)_3$ P = 0 exists but $(CH_3)_3N$ = O does not.

(ii) Oxygen has less electron gain enthalpy with negative sign than sulphur.

(iii) H_3PO_2 is a stronger reducing agent than H_3PO_3.

23. (i) Write the IUPAC name of the complex $[Cr(NH_3)_4Cl_2]Cl$.

(ii) What type of isomerism is exhibited by the complex $[Co(en)_3]^{3+}$?

(en = ethane-1, 2-diamine)

(iii) Why is $[NiCl_4]^{2-}$ paramgnetic but $[Ni(CO)_4]$ is diamagnetic 3

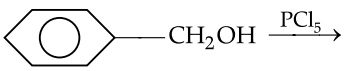
(At. nos.: Cr = 24, Co = 27, Ni = 28)

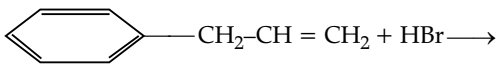
Ans. (i) The IUPAC name of $[Cr(NH_3)_4\ Cl_2]Cl$ is Tetraam minedichlorochromium(III) chloride.

(ii) The isomerism exhibited by this complex is the optical isomerism.

(iii) The oxidation state of Ni in $[NiCl_4]^{2-}$ is +2. Since chloride is a weak field ligand, it does not cause electron pairing up in opposition to Hund's maximum multiplicity rule. As a result, Ni's valence *d*-orbitals contain two unpaired electrons, giving the complex its paramagnetic properties. On the other hand, carbonyl is a strong field ligand and causes electron partnering up in opposition to Hund's maximisation rule. As a result, there are no unpaired electrons and the complex is hence diamagnetic.

24. (a) Draw the structure of major monohalo products in each of the following reactions:

(i) 

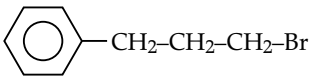
(ii) 

(b) Which halogen compound in each of the following pairs will react faster in S_N2 reaction:

(i) CH_3Br or CH_3I

(ii) $(CH_3)_3C$ – Cl or CH_3 – Cl 3

Ans. (a) (i) $C_6H_5 - CH_2 - Cl$

(ii) 

(b) (i) The steric barrier surrounding the target atom affects the rate of the S_N2 reaction. As CH_3I presents less of a barrier, it will undergo the S_N2 reaction more quickly than CH_3Br.

(ii) Since CH_3Cl is the major halide, it hinders OH^- stability to act less, allowing it to react with S_N2 more readily than $(CH_3)_3$ CCl.

25. Account for the following:

(i) Primary amines (R-NH_2) have higher boiling point than tertiary amines (R_3N).

(ii) Aniline does not undergo Friedel-Crafts reaction.

(iii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution. 3

OR

Give the structures of A, B and C in the following reactions:

(i) $C_6H_5NO_2 \xrightarrow{Sn+HCl} A \xrightarrow{NaNO_2+HCl} B \xrightarrow{H_2O} C$

(ii) $CH_3CN \xrightarrow{H_2O/H^+} A \xrightarrow{NH_3} B \xrightarrow{Br_2+KOH} C$

Ans. (i) Primary and secondary amines are engaged in intermolecular association due to hydrogen bonding between nitrogen of one and hydrogen of another molecule. This intermolecular association is more in primary amines than in secondary amines as there are two hydrogen atoms available for hydrogen bond formation in it. Tertiary amines do not have intermolecular association due to the absence of hydrogen atom available for hydrogen bond formation. Therefore, the order of boiling points of isomeric amines is as follows:

Primary > Secondary > Tertiary

(ii) Aniline does not undergo Friedel-Crafts reaction (alkylation and acetylation) due to salt formation with aluminium chloride, the Lewis acid, which is used as a catalyst. Due to this, nitrogen of aniline acquires positive charge and hence acts as a strong deactivating group for further reaction

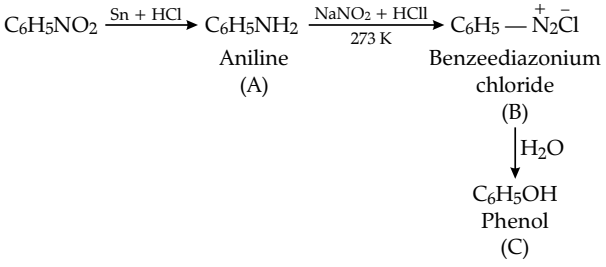
(iii) In the aqueous phase, the substituted ammonium cations get stabilised not only by electron releasing effect of the alkyl group (+I) but also by solvation with water molecules. The greater the size of the ion, lesser will be the solvation and the less stabilised is the ion. Greater is the stability of the substituted ammonium cation, stronger should be the corresponding amine as a base. Thus, the order of basicity of aliphatic amines should be:

primary > secondary > tertiary.

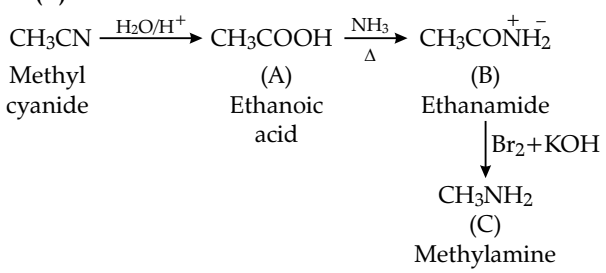
* *Out of Syllabus*

OR

(i)



(ii)



26. Define the following terms related to proteins: 3

(i) Peptide linkage

(ii) Primary structure

(iii) Denaturation

Ans. (i) A peptide bond is created when two amino acids come together between the amino group of one molecule and the carboxylic acid group of another molecule, a covalent link is created and water is removed.

(ii) The linear arrangement of a protein's amino acid structural building blocks constitutes the fundamental structure of a peptide. From the amino-terminal (N) end to the carboxyl-terminal (C) end, a protein's main structure is described.

(iii) Denaturation, the process by which proteins or nucleic acids lose the quaternary, tertiary, and secondary structures that are present in their natural condition through the application of some external stress or substance, such as a potent acid or base, an inorganic salt that has been concentrated, or an organic sol.

*** 27. On the occasion of World Health Day.**

Dr. Satpal organized a 'health camp' for the poor farmers living in a nearby village. After check-up, he was shocked to see that most of the farmers suffered from cancer due to regular exposure to pesticides and many were diabetic. They distributed free medicines to them. Dr. Satpal immediately reported the matter to the National Human Rights Commission (NHRC). On the suggestions of NHRC, the government decided to provide medical care, financial assistance, setting up of super-speciality hospitals for treatment and prevention of the deadly disease in the affected villages all over India.

(i) Write the values shown by (a) Dr. Satpal (b) NHRC?

(ii) What type of analgesics are chiefly used for the relief of pains of terminal cancer?

(iii) Give an example of artificial sweetener that could have been recommended to diabetic patients. 3

28. (a) Define the following terms:

(i) Molarity

(ii) Molal elevation constant (k_b)

(b) A solution containing 15 g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 190 g mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution. 2+3

OR

(a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason.

(b) A solution of glucose (molar mass = 180 g mol^{-1}) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution = 1.2 g mL^{-1})

Ans. (a) (i) Molarity of a solution is defined as the number of moles of solute present in one litre of the solution.

(ii) Molal elevation constant (K_b) is defined as the elevation of the boiling point of a solution when one mole of a non-volatile solute is dissolved in one kilogram of a volatile solvent.

(b) Given; Mass of urea, $W_B = 15$ g

Molar mass of urea, $M_{urea} = 60$ g

The solution of urea in water is isotonic to that of glucose solution.

$$\pi_{urea} = \pi_{glucose}$$

$$C_{urea}\,RT = C_{glucose}\,RT$$

$$\frac{n_{urea}}{V}RT = \frac{n_{glucose}}{V}RT$$

$$\frac{15}{60} = \frac{W_{glucose}}{180}$$

$$W_{glucose} = \frac{15\times180}{60}$$

$$W_{glucose} = 45\text{ g}$$

* *Out of Syllabus*

OR

(a) According to Raoult's law, the partial pressure of a component is the product of vapour pressure of pure solvent and mole fraction of that component.

When a solution shows deviation from Raoult's law over the complete range of concentration, the solution is known as a non-ideal solution.

The vapour pressure of the non-ideal solution can be higher or lower than the vapour pressure predicted by Raoult's law.

If the vapour pressure of the non-ideal solution is higher than the vapour pressure predicted by Raoult's law, the deviation is known as positive deviation.

If the vapour pressure of the non-ideal solution is lower than the vapour pressure predicted by Raoult's law, the deviation is known as negative deviation.

The reason for the deviation is molecular interactions, A – B < A – A, B – B for positive deviation

Here, A is the solute and B is the solvent so, A – B shows the interaction between solute and solvent.

(b) The number of moles of glucose

$$= \frac{10}{180} = 0.056 \text{ mol}$$

$$\text{Molality of solution} = \frac{0.056 \text{ mol}}{0.09 \text{ kg}} = 0.62 \text{ m}$$

If the density of the solution is 1.2 gmL^{-1}, then the volume of the 100g solution can be given as,

$$\frac{100\text{g}}{1.2 \text{ mL}^{-1}} = 83.3 \text{ mL}$$

$$= 83.33 \times 10^{-3} \text{ L}$$

$$\text{Molarity of solution} = \frac{0.056 \text{ mol}}{83.33 \times 10^{-3} \text{ L}} = 0.67 \text{ M}$$

29. (a) Complete the following equations:

(i) $\mathbf{Cr_2O_7^{2-} + 2OH^- \rightarrow}$

(ii) $\mathbf{MnO_4^- + 4H^+ + 3e^- \rightarrow}$

(b) Account for the following:

(i) Zn is not considered as a transition element.

(ii) Transition metals form a larger number of complexes.

(iii) The E value for the Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+} couple. **2+3**

OR

(i) With reference to structural variability and chemical reactivity, write the difference between lanthanoids and actionoids.

(ii) Name a member of the lanthanoid series which is well known to exhibit +4 oxidation state.

(iii) Complete the following equation:

$$\mathbf{MnO_4^- + 8H^+ + 5e^- \rightarrow}$$

(vi) Out of Mn^{3+} and Cr^{3+}, which is more paramagnetic and why? (atomic nos: Mn = 25, Cr = 24) **5**

Ans. (a) (i) $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$

(ii) $MnO_4^- + 4H^+ + 3e^- \longrightarrow MnO_2 + 2H_2O$

(b) (i) The transition metals are compounds that form at least 1 stable ion, where the compound has an incomplete *d* subshell. Zn is not a transition metal because it forms only ions with all the 3*d* electrons present.

(ii) Transition metal shows a variable oxidation state, so they form a large number of complexes.

(iii) It is because Mn^{2+} is more stable than Mn^{3+} due to stable half filled $3d^5$ configuration, whereas Cr^{3+} (t_{2g}) ($3d^5$) are more stable than Cr^{2+}.

OR

(i) The differences between lanthanoids and actinoids with respect to their structural variability and chemical reactivity are as follows:

(a) Actinoids are radioactive, while lanthanoids are not radioactive.

(b) The ionisation enthalpies of the early actinoids are lower than those of the early lanthanoids. Actinoids show the oxidation state from +3 (most common) to +7, while lanthanoids show the oxidation state from +3 up to +7.

(c) Actinoids are more reactive and have more complex magnetic properties than lanthanoids.

(ii) Cerium is a lanthanide element that is known to exhibit the oxidation state of 4

(iii) The complete equation is as follows:

$MnO^{4-} + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$

(iv) Mn^{2+} is more paramagnetic because it has more number of unpaired electrons than Cr^{3+}.

30. (a) Write the products formed when CH_3CHO reacts with the following reagents:

(i) HCN

(ii) H_2N–OH

(iii) CH_3CHO in the presence of dilute NaOH

(b) Give simple chemical tests to distinguish between the following pairs of compounds.

(i) Benzoic acid and Phenol

(ii) Propanal and Propanone. **3+2**

OR

(a) Account for the following: **2+2+1**

(i) Cl–CH_2COOH is a stronger acid than CH_3COOH.

(ii) Carboxylic acids do not give reactions of carbonyl group.

(b) Write the chemical equations to illustrate the following name reactions:

(i) Rosenmund reduction

(ii) Cannizzaro's reaction

(c) Out of CH_3CH_2–CO–CH_3 and CH_3CH_2–CH_2–CO–CH_3, which gives iodoform test?

Ans. (a) (i) Acetaldehyde (CH_3CHO) reacts with hydrogen cyanide HCN to give 2–hydroxypropapanenitrile as product.

$CH_3CHO + HCN \rightarrow CN_3 - CH(OH) - CN$

Acetaldehyde 2hydroxypropapanenitrile

(ii) Acetaldehyde (CH_3CHO) reacts with Hydroxylamine (NH_2OH) to give acetaldoxime as a product.

$CH_3CHO + NH_2OH \rightarrow CH_3 - CH = NOH + H_2O$

Acetaldehyde Hydroxylamine

(iii) Reaction of acetaldehyde in the presence of dilute NaOH, this is the kind of Aldol reaction by which obtained 3-hydroxybutanal as product. Further proceed reaction when using heat in the reaction, its gives aldol condensation product which is But-2-enal.

$2CH_3 - CHO \xrightarrow{NaOH} CH_3 - CH(OH) - CH_2 - CHO$

Acetaldehyde 3-hydroxybutanal

$\xrightarrow{Heat, -H_2O} CH_2 - CH = CH - CHO$

But-2-en-al

(b) Chemical tests to distinguish the following compounds:

(i) Ferric chloride test: When phenol react with Ferric chloride, it form an Iron phenol complex which give violet colour to the solution, while Benzoic acid do not give any colour.

(ii) Propanal and propanone: These two are distinguished by the iodoform when it reacts with I_2 in the presence of NaOH while propanone give iodoform test when reacts with I_2 in the presence of NaOH.

$CH_3COCH_3 + 3NaOI \rightarrow CHI_3 + CH_3COONa$

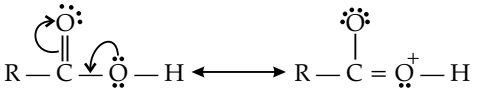
CHI_3+ 2NaOH (Yellow ppt)

$CH_3CH_2CHO + NaOI \rightarrow$ No ppt of CHI_3 formed

OR

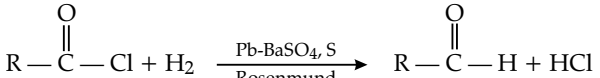
(a) (i) Chloroacetic acid is stronger acid than Acetic acid because –Cl is an electron withdrawing group which increase the acidic character by dispersing electron due to presence of inductive effect. Cl, as a result of the –I effect, removes electrons from the O–H bond and reduces its electron density. Weakening the O–H bond makes it easier for H^+ to be released. CH_3 group has a positive impact. It makes the release of H^+ from acetic acid more challenging than from chloroacetic acid by increasing the electron density in the O–H bond. Consequently, $ClCH_2COOH$ is a more potent acid than CH_3COOH.

(ii) Carboxylic acid contains carbonyl group and do not undergo nucleophilic addition reaction because oxygen atom in -OH contain lone pair of electrons. That's why, electrophilic character decreases because of resonance and it gives stability to the structure



I II

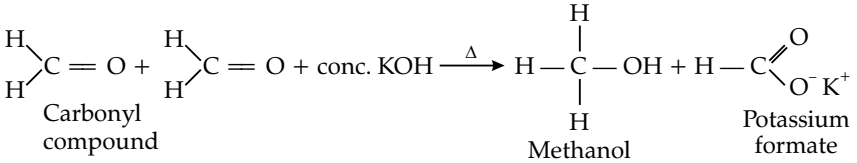
(b) (i) From acid chloride (Rosenmund's reduction):



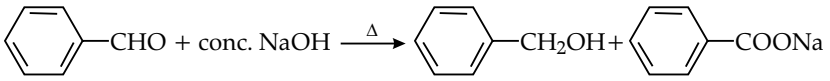
Acid chloride Rosenmund Reduction Aldehyde

Formaldehyde cannot be prepared by this method as HOCl is highly unstable.

(ii) Cannizzaro Reaction: Aldehydes undergo self -oxidation and reduction on heating with conc. alkali. The aldehydes which do not have α-hydrogen undergo this reaction.



Carbonyl compound Methanol Potassium formate



Benzaldehyde Benzaldehyde Sodium benzoate

(C) Both give positive Iodoform test as they contain CO – CH_3 group in their structure.

Outside Delhi Set II — Code No. 2/1/2

Note : Except for the following questions, all the remaining questions have been asked in previous set.

*** 1. Why is adsorption always exothermic? 1**

*** 2. Name the method used for refining of Nickel. 1**

*** 3. Why does NO_2 dimerise? 1**

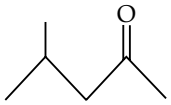
*** 4. Based on molecular forces, what type of polymer in neoprene? 1**

5. What are the products of hydrolysis of maltose?

Ans. α D-glucose is produced in two molecules as a result of the hydrolysis reaction of maltose in the presence of an acid catalyst.

6. Write the structure of 4-chloropentan-2-one. 1

Ans. Structure of 4-Chloropentan-2-one:



*** 9. Write the name of monomers used for getting the following polymers: 2**

(i) Terelyne (ii) Nylon-6, 6

*** 10. Describe the role of the following: 2**

(i) SiO_2 in the extraction of copper from copper matte.

(ii) NaCN in froth floatation process.

11. Complete the following equations: 2

(i) $Ag + PCl_5$.

(ii) $CaF_2 + H_2SO_4$.

Ans. (i) $2Ag + PCl_5 \rightarrow 2AgCl + PCl_3$

(ii) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

*** 12. Draw the structures of the following:**

(i) XeF_4

(ii) $HClO_4$

*** 13. (i) Write the type of magnetism observed when the magnetic moment are oppositely aligned and cancel out each other.**

(ii) Which stoichiometric defect does not change the density of the crystal? 2

14. Define the following terms:

(i) Fuel cell

(ii) Limiting molar conductivity (Λ°m)

Ans. (i) Fuel cells: Fuel cells are the galvanic cells or electrochemical cells that transform the chemical energy into electrical energy from fuel combustion by redox reaction, such as hydrogen, methanol, etc.,

(ii) An electrolyte's molar conductivity is said to be limiting when its concentration gets close to zero.

19. Define the following terms: 3

(i) Glycosidic linkage

(ii) Invert sugar

(iii) Oligo saccharides

Ans. (i) Glycosidic bond or glycosidic linkage connects a sugar molecule to another molecule by losing one water molecule.

OR

The linkage which holds the two monosaccharide units through oxygen atom is called glycosidic linkage.

(ii) A product of the hydrolysis of sucrose that contains a combination of glucose and fructose in a fixed ratio. It can be obtained artificially for use in the food sector or found naturally in fruits and honey.

(iii) A saccharide polymer known as an oligosaccharide contains a few (usually three to ten) simple sugars (monosaccharides). Numerous oligosaccharide-based processes, such as cell binding and recognition, are possible.

Outside Delhi Set III — Code No. 2/1/2

Note : Except for the following questions, all the remaining questions have been asked in previous set.

*** 1. What are the dispersed phase and dispersion medium in milk? 1**

*** 2. Name the method used for refining of copper metal.**

3. Why does NH_3 act as a Lewis base? 1

Ans. Ammonia can function as a Lewis base because the nitrogen atom contains a single pair of electrons that can be readily given to an appropriate Lewis acid.

*** 5. Which of the following is a fiber?**

Nylon, Neoprene, PVC 1

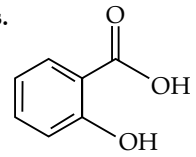
6. Write the products of hydrolysis of lactose. 1

Ans. Both D-Glucose and D-Galactose are byproducts of lactose breakdown.

8. Write the structure of 2-hydroxybenzoic acid. 1

* *Out of Syllabus*

Ans.



*** 9. Complete the following equations:** **2**

(i) $Cu + 2H_2SO_4(Conc.) \rightarrow$

(ii) $XeF_2 + H_2O \rightarrow$

*** 10. Draw the structure of the following:**

(i) XeO_3

(ii) H_2SO_4 **2**

*** 11. Write the name of monomers used for getting the following polymers:** **2**

(i) Teflon

(ii) Buna-N

*** 13. (i) Write the type of magnetism observed when the magnetic moment are aligned in parallel and anti-parallel directions in unequal numbers.** **2**

(ii) Which stoichiometric defect decreases the density of the crystal?

14. Define the following terms:

(i) Molar conductivity (Λ_m)

(ii) Secondary batteries **2**

Ans. (i) The efficiency with which a specific electrolyte conducts electricity in solution is measured by molar conductivity, which is defined as the conductivity of an electrolyte solution divided by the molar concentration of the electrolyte.

(ii) These are the secondary cell which can be recharged by passing current through it in the opposite direction so that it can be used again. For example lead storage battery.

*** 17. Write the principle behind the froth floatation process. What is the role of collectors in this process?** **2**

23. Define the following terms:

(i) Nucleotide

(ii) Anomers

(iii) Essential amino acids **3**

Ans. (i) A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside. In nucleosides, the sugar carbons are numbered as 1', 2', 3', etc. in order to distinguish these from the bases. When nucleoside is linked to phosphoric acid at 5'-position of sugar moiety, it forms a nucleotide.

(ii) These are the cyclic monosaccharides which are differ at C-1 in aldose and C-2 in ketose also known as epimers or stereoisomers.

(iii) An amino acid that cannot be produced by the organism and must thus be given in the food is known as an essential amino acid or indispensable amino acid.

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