

Solved Paper 2020

CHEMISTRY

Class-XII

Time : 3 Hours

Max. Marks : 70

General Instructions :

- Question paper comprises four sections – A, B, C and D.
- There are 37 questions in questions paper. All questions are compulsory.
- Section A :** Question number 1 to 20 are very short answer type questions carrying **one** mark each. Answer these questions in one word or one sentence.
- Section B :** Question number 21 to 27 are short answer type questions carrying **two** marks each.
- Section C :** Question number 28 to 34 are long answer type-I questions carrying **three** marks each.
- Section D :** Question number 35 to 37 are long answer type-II questions carrying **five** marks each.
- There is **NO** overall choice in the question paper. However, an internal choice has been provided in 2 questions of **two** marks, 2 questions of **three** marks and all the 3 questions of **five** marks. You have to attempt only one of the choices in such questions.
- However, separate instructions are given with each section and question, wherever necessary.
- Use of calculators and log tables is not permitted.

Delhi Set I

Code No. 56/5/1

SECTION -A

Read the given passage and answer the questions that follow:

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit -1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electronegativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX' , XX'_3 , XX'_5 and XX'_7 called inter-halogens.

1. **Why halogens have maximum negative electron gain enthalpy?**

Ans. Halogens have only seven electrons in their valence shell. So they require only one electron to attain a noble gas configuration. Hence, they have maximum electron gain enthalpy.

2. **Why fluorine shows anomalous behaviour as compared to other halogens?**

- Ans.**
- It has smallest in size.
 - Very high electronegativity.
 - Absence of d -orbitals.
 - dissociation enthalpy in molecular form is least . (Any one)

3. **Arrange the hydrogen halides (HF to HI) in the decreasing order of their reducing character.**

Ans. $HI > HBr > HCl > HF$

4. **Why fluorine is a stronger oxidizing agent than chlorine?**

Ans. Because fluorine has greater E° value (2.87V) than chlorine (1.36V).

5. **What are the sizes of X and X' in the interhalogen compounds?**

Ans. Size of X is greater than X'.

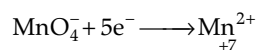
Questions 6 to 10 are one word answers.

6. **Name the cell used in hearing aids and watches.**

Ans. Primary cell.

7. **How much charge in terms of Faraday is required to reduce one mol of MnO_4^- to Mn^{2+} ?**

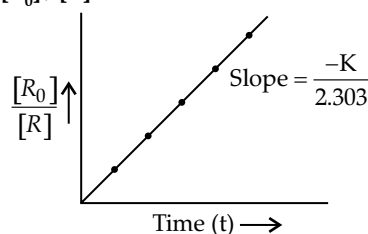
Ans. $4.825 \times 10^5 C$



$$\text{Charge} = 5 \times F = 5 \times 96500 C = 4.825 \times 10^5 C$$

8. **Write the slope value obtained in the plot of $\log \frac{[R_0]}{[R]}$ vs. time for a first order reaction.**

Ans.



$$\text{Slope value} = \frac{-K}{2.303}$$

- * 9. Name the sweetening agent used in the cooking of sweets for a diabetic patient.
- * 10. Name the polymer which is used for making electrical switches and combs.

Questions 11 to 15 are multiple choice questions.

- * 11. In the Mond's process the gas used for the refining of a metal is

- (a) H_2 (b) CO_2
(c) CO (d) N_2

12. The conversion of an alkyl halide into an alcohol by aqueous $NaOH$ is classified as

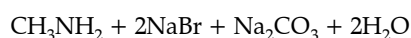
- (a) a dehydrohalogenation reaction
(b) a substitution reaction
(c) an addition reaction
(d) a dehydration reaction

Ans. (b) $R-X + NaOH \rightarrow R-OH + NaX$

13. CH_3CONH_2 on reaction with $NaOH$ and Br_2 in alcoholic medium gives

- (a) $CH_3CH_2NH_2$ (b) CH_3CH_2Br
(c) CH_3NH_2 (d) CH_3COONa

Ans. (c) $CH_3CONH_2 + Br_2 + 4NaOH \xrightarrow{\Delta}$



14. The oxidation state of Ni in $[Ni(CO)_4]$ is

- (a) 0 (b) 2
(c) 3 (d) 4

Ans. (a) 0

15. Amino acids are

- (a) acidic (b) basic
(c) amphoteric (d) neutral

Ans. (c) (Presence of basic NH_2 and acidic $COOH$ groups)

Questions 16 to 20

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (c) Assertion (A) is correct, but Reason (R) is wrong statement.
- (d) Assertion (A) is wrong, but Reason (R) is correct statement.

16. Assertion (A) : Conductivity of an electrolyte increases with decrease in concentration.

Reason (R) : Number of ions per unit volume decreases on dilution.

Ans. (d)

17. Assertion (A) : The $C-O-C$ bond angle in ethers is slightly less than tetrahedral angle.

Reason (R) : Due to the repulsive interaction between the two alkyl groups in ethers.

Ans. (a)

18. Assertion (A) : Low spin tetrahedral complexes are rarely observed.

Reason (R) : Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

Ans. (a)

19. Assertion (A) : Elevation in boiling point is a colligative property.

Reason (R) : Elevation in boiling point is directly proportional to molarity.

Ans. (a) $\Delta T_b = K_b \times m$

20. Assertion (A) : Oxidation of ketones is easier than aldehydes.

Reason (R) : $C-C$ bond of ketones is stronger than $C-H$ bond of aldehydes. $20 \times 1 = 20$

Ans. (d)

SECTION - B

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

Ans. Raoult's law for a solution containing volatile components states that the partial pressure of a volatile component present in a solution is directly proportional to the mole fraction of that component at a given temperature.

$$P_A \propto \chi_A \text{ or } P_A = K\chi_A$$

Raoult's law and Henry's law are similar as both gives equation to find partial pressure of gases.

$$P_A = K\chi_A \quad P_A = K_H\chi_A$$

(Raoult's law) (Henry's law)

- * 22. Write the role of

(a) Dilute $NaCN$ in the extraction of Gold.

(b) CO in the extraction of Iron. $1+1 = 2$

OR

How is leaching carried out in the case of low grade copper ores? Name the method used for refining of copper metal. 2

- * 23. Define adsorption with an example. What is the role of adsorption in heterogeneous catalysis? 2

OR

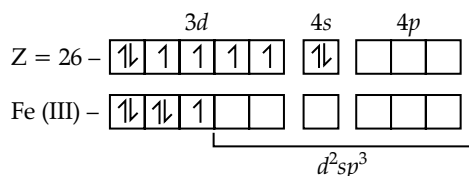
Define Brownian movement. What is the cause of Brownian movement in colloidal particles? How is it responsible for the stability of Colloidal sol? 2

24. (a) Write the IUPAC name and hybridisation of the complex $[Fe(CN)_6]^{3-}$.

(Given : Atomic number of Fe = 26)

(b) What is the difference between an ambidentate ligand and a chelating ligand? $1+1 = 2$

Ans. (a) $[Fe(CN)_6]^{3-}$ - hexacyanoferrate (III) ion
hybridization - d^2sp^3

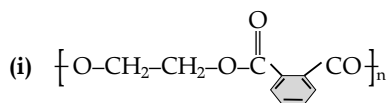


six pairs of e^- from CN^- ions

- (b) **Ambidentate** ligand can bond through different atoms to form different coordination compounds. e.g. NO_2^- can bind to the central atom or ion at either the nitrogen atom or one of the oxygen atom.

Chelating ligand : If the ligands with two or more electron donor groups positioned in such a way that they form five or six membered ring with central metal ion are called chelating ligands. e.g. ethane - 1, 2-diamine (en)

- *25. How do antiseptics differ from disinfectants? Name a substance which can be used as a disinfectant as well as an antiseptic. 2
- *26. Identify the monomers in the following polymers:



- *27. Draw the structures of the following:

- (i) $\text{H}_2\text{S}_2\text{O}_8$
(ii) XeF_6

SECTION - C

28. A 0.01 m aqueous solution of AlCl_3 freezes at -0.068°C . Calculate the percentage of dissociation. [Given : K_f for Water = $1.68 \text{ K kg mol}^{-1}$] 3

Ans. Given, $m = 0.01 \text{ m}$

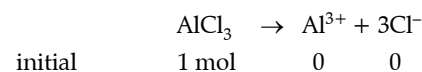
$$\Delta T_f(s) = -0.068^\circ\text{C}$$

$$K_f(\text{aq}) = 1.86 \text{ K kg mol}^{-1}$$

$$\Delta T_f = i K_f m$$

$$i = \frac{\Delta T_f}{K_f} \times m$$

$$i = \frac{0.068}{1.86} \times 0.01 \text{ m} = 3.65$$



Total number of moles at equilibrium

$$= 1 - \alpha + \alpha + 3\alpha = 1 + 3\alpha$$

$$l = \frac{\text{Total no. of moles at equilibrium}}{\text{Initial no. of moles}}$$

$$= \frac{1 + 3\alpha}{1}$$

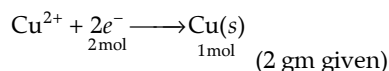
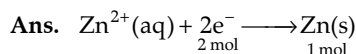
$$3.65 = 1 + 3\alpha$$

$$\alpha = \frac{3.65 - 1}{3}$$

Percentage dissociation = 0.88%.

29. When a steady current of 2A was passed through two electrolytic cells A and B containing electrolytes ZnSO_4 and CuSO_4 connected in series, 2 g of Cu were deposited at the cathode of cell B. How long did the current flow? What mass of Zn was deposited at cathode of cell A?

[Atomic mass: Cu = 63.5 g mol^{-1} , Zn = 65 g mol^{-1} ; $1\text{F} = 96500 \text{ C mol}^{-1}$] 3



The charge Q on a mole of electrons, $Q = nF$

Calculation of time for the flow of current:

$$n = 1 \text{ mol}$$

$$Q = 1 \times 96500 \text{ C mol}^{-1} = 96500 \text{ C}$$

$$\text{Molar mass of Cu} = 63.5 \text{ g mol}^{-1}$$

$$\therefore 63.5 \text{ gm of Cu is deposited by electric charge} = 96500\text{C}$$

$$\therefore 2 \text{ gm of Cu is deposited by electric charge}$$

$$= \frac{96500}{63.5} \times 2 = 3039.37 \text{ C}$$

Let 2 A of current be passed for time t , quantity of electricity used = $2\text{A} \times t = 3039.37 \text{ C}$

$$\text{or, } t = \frac{3039.37\text{C}}{2} = 1519.68 \text{ s.}$$

$$= 25 \text{ min. } 33 \text{ s}$$

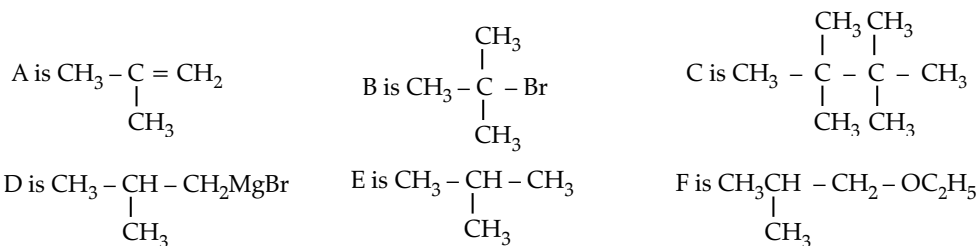
Calculation of mass of Zn deposited:

$$\frac{W_1}{W_2} = \frac{E_1}{E_2} = \frac{\text{Mass of Zn}}{\text{Mass of Cu}}$$

$$= \frac{\text{Molar mass of Zn / Charge on Cu}}{\text{Molar mass of Cu / Charge on Cu}}$$

Amount of Zn deposited:

$$= 2 \times \frac{\frac{65}{2}}{\frac{63.5}{2}} = 2.0472 \text{ gm}$$



32. Give the structures of final products expected from the following reactions :

(i) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium.

(ii) Dehydration of $(\text{CH}_3)_3\text{C-OH}$ by heating it with 20% H_3PO_4 at 358K.

(iii) Heating of  with HI. 3×1 = 3

OR

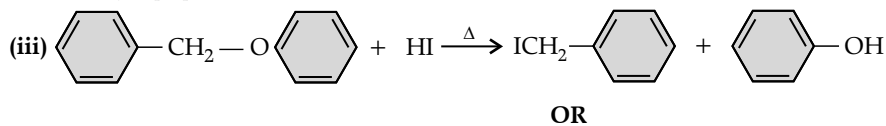
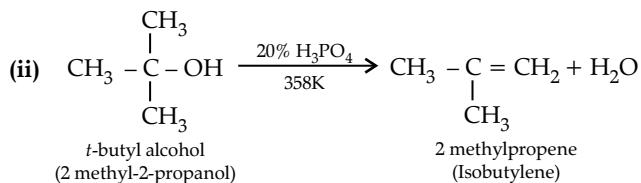
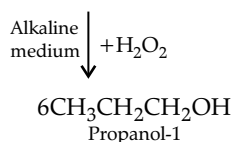
How can you convert the following?

(i) Phenol to *o*-hydroxybenzaldehyde

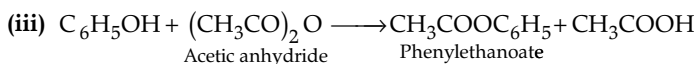
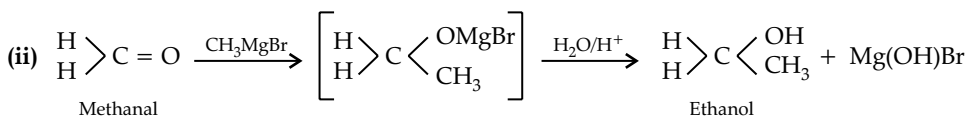
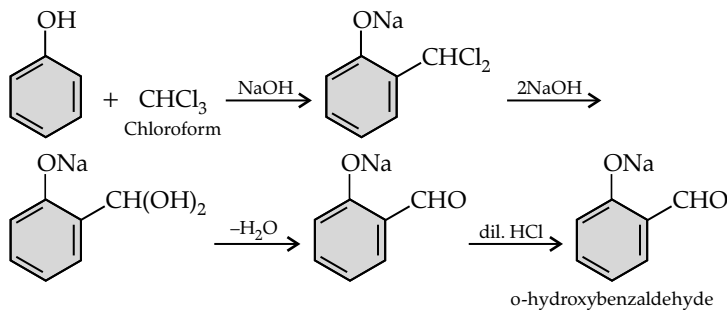
(ii) Methanal to ethanol

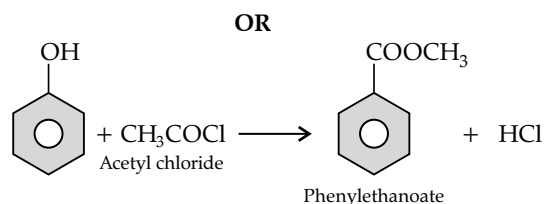
(iii) Phenol to phenyl ethanoate 1+1+1 = 3

Ans. (i) $6\text{CH}_3\text{CH}=\text{CH}_2 + (\text{BH}_3)_2 \longrightarrow 2(\text{CH}_3\text{CH}_2\text{CH}_2)_3\text{B}$



(i) By Reimer-Tiemann reaction:

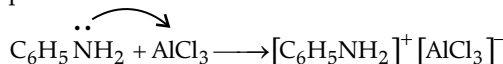




33. Give reasons:

- (i) Aniline does not undergo Friedal-Crafts reaction.
- (ii) Aromatic primary amines cannot be prepared by Gabriel's phthalimide synthesis.
- (iii) Aliphatic amines are stronger base than ammonia. 3×1 = 3

Ans. (i) Aniline does not undergo Friedal-Crafts reaction because aniline being a Lewis base forms a complex with AlCl_3 which is a Lewis acid. The amino group is not in a position to activate the benzene ring towards electrophilic substitution. Therefore the reaction is not possible.



- (ii) Aromatic primary amines can not be prepared by Gabriel's phthalimide synthesis because haloarenes have to react with potassium phthalimide and they are little reactive. So the bond cleavage does not take place.
- (iii) Aliphatic amines are stronger bases than ammonia because the alkyl group in aliphatic amines has +I effect. So the alkyl group tends to increase the electron density on the nitrogen atom whereas the electron releasing tendency of amines becomes more than that of ammonia.

*34. Write three differences between lyophobic sol and lyophilic sol.

OR

Define the following terms:

- (i) Protective colloid
- (ii) Zeta potential
- (iii) Emulsifying agent 1+1+1 = 3

SECTION -D

35. (a) Give reasons:

- (i) Transition metals and their compounds show catalytic activities.
- (ii) Separation of a mixture of Lanthanoid elements is difficult.
- (iii) Zn, Cd and Hg are soft and have low melting point.

(b) Write the preparation of the following :

- (i) $\text{Na}_2\text{Cr}_2\text{O}_7$ from Na_2CrO_4
- (ii) K_2MnO_4 from MnO_2 3+2 = 5

OR

(a) Account for the following:

- (i) Ti^{3+} is coloured whereas Sc^{3+} is colourless in aqueous solution.

(ii) Cr^{2+} is a strong reducing agent.

(b) Write two similarities between chemistry of lanthanoids and actinoids.

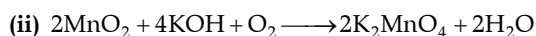
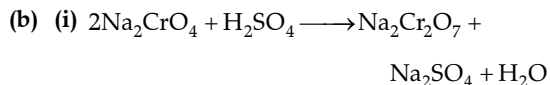
(c) Complete the following ionic equation:



Ans. (a) (i) The catalytic activities of transition metals and their compounds is due to the ability of adopt variable oxidation states and to form complexes. It can also provide a large surface area for the reactants to be adsorbed. (Any one)

(ii) Separation of lanthanoid elements is difficult because all lanthanoid elements have almost similar physical as well as chemical properties. Due to the lanthanoid contraction the change in the atomic or ionic radii is very small.

(iii) Zn, Cd and Mg are soft and have low melting point because no *d*-orbitals are available for metallic bond formation and bonds formed are very weak.



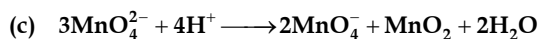
OR

(a) (i) Ti^{3+} has incomplete *d* ($3d^1$) orbital whereas Sc^{3+} has empty ($3d^0$) *d*-orbital.

(ii) Cr^{2+} ion can lose electron to form Cr^{3+} , so acts as a strong reducing agent.

(b) Similarities between chemistry of lanthanoids and actinoids:

- (i) Both show +3 oxidation state.
- (ii) Both are strong reducing agents.



36. (a) Write the products formed when benzaldehyde reacts with the following reagents :

(i) CH_3CHO in presence of dilute NaOH

(ii) $\text{H}_2\text{N}-\text{NH}-$

(iii) Conc. NaOH

(b) Distinguish between following:

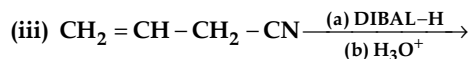
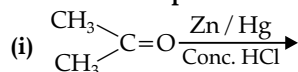
(i) $\text{CH}_3-\text{CH}=\text{CH}-\text{CO}-\text{CH}_3$ and $\text{CH}_3-\text{CH}_2-\text{CO}-\text{CH}=\text{CH}_2$

(ii) Benzaldehyde and Benzoic acid

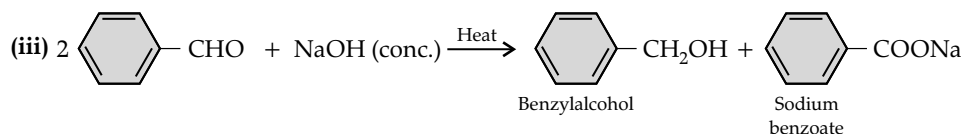
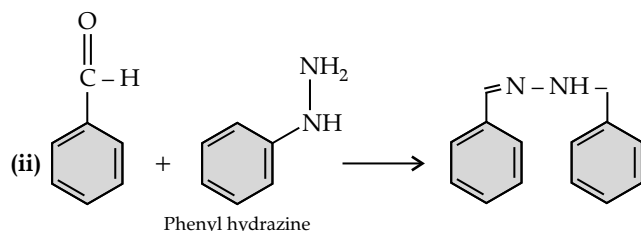
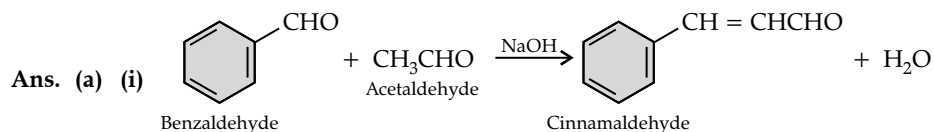
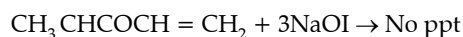
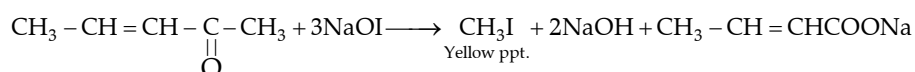
3 + (1 + 1) = 5

OR

(a) Write the final products in the following :

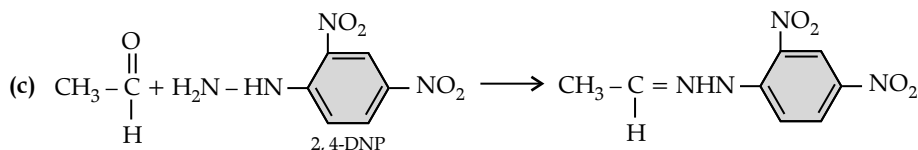
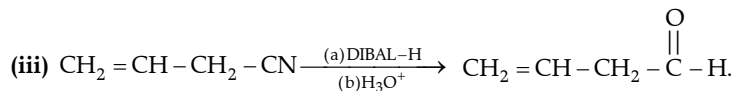
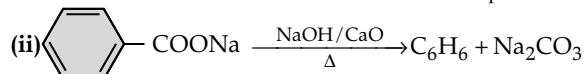
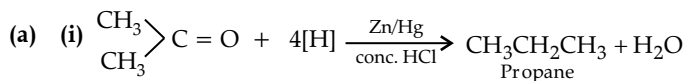


(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction:

(c) Draw the structure of 2, 4 DNP derivative of acetaldehyde. 3 + 1 + 1 = 5(b) (i) $\text{CH}_3-\text{CH}=\text{CH}-\text{CO}-\text{CH}_3$ gives iodoform test while $\text{CH}_3-\text{CH}_2-\text{CO}-\text{CH}=\text{CH}_2$ does not give.

- (ii) • Benzaldehyde reacts with tollen's reagent to form silver mirror. Benzoic acid does not give this reaction.
• With NaHCO_3 benzaldehyde does not react while benzoic acid produces brisk effervescences.

OR



37. (a) A first order reaction is 25% complete in 40 minutes. Calculate the value of rate constant. In what time will the reaction be 80% completed?

(b) Define order of reaction. Write the condition under which a bimolecular reaction follows first order kinetics. 3 + 2 = 5

OR

(a) A first order reaction is 50% completed in 30 minutes at 300 K and in 10 minutes at 320 K. Calculate activation energy (E_a) for the reaction. (R = 8.314 J K⁻¹ mol⁻¹)

- (b) Write the two conditions for collisions to be effective collisions.
 (c) How order of reaction and molecularity differ towards a complex reaction?

[Given : $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6991$ $3 + 1 + 1 = 5$]

Ans. (a) $t = \frac{2303}{k} \log \frac{[A]_0}{[A]}$

(i) $40 \text{ min} = \frac{2.303}{k} \log \frac{100}{75}$... (i)

(ii) $t = \frac{2.303}{k} \log \frac{100}{20}$... (ii)

Dividing (i) by (ii)

$$\frac{40}{t} = \frac{2.303}{k} \log \frac{100}{75} / \frac{2.303}{k} \log \frac{100}{20}$$

$$\frac{40}{t} = \frac{2.303}{k} \log \frac{4}{3}$$

$$\frac{40}{t} = \frac{0.6021 / 4.771}{0.6991}$$

$$\frac{40}{t} = \frac{0.1250}{0.6991}$$

$$t = \frac{0.6691 \times 40}{0.1250} = 223.712 \text{ min.}$$

$$k = \frac{2.303}{t} \log \frac{100}{100 - 0.25} = \frac{2.303}{40} \log \frac{100}{75}$$

$$= \frac{2.303}{40} (\log 4 - \log 3)$$

$$= \frac{2.303}{40} (0.6021 - 0.4771)$$

$$= \frac{2.303}{40} \times 0.125 = 0.007196$$

$$= 7.196 \times 10^{-3} \text{ min}^{-1}$$

- (b) **Order of reaction:** The sum of the coefficients of the reacting species that are involved in the rate equation for the reaction, is called order of reaction.

The condition under which a bimolecular reaction follows first order kinetics is when one of the reactants is taken in large excess that its concentration changes hardly.

OR

(a) At 300K, $t_{1/2} = 30 \text{ min.}$
 $t_{1/2} = \frac{0.693}{k}$ or $k = \frac{0.693}{t_{1/2}}$

$$k_1 = \frac{0.693}{30} = 0.0231 \text{ min}^{-1}$$

At 320K, $t_{1/2} = 10 \text{ min}$

$$t_{1/2} = \frac{0.693}{k}$$
 or $k = \frac{0.693}{t_{1/2}}$

$$k_2 = \frac{0.693}{10} = 0.0693 \text{ min}^{-1}$$

According to Arrhenius equation:

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$= \log \frac{0.0693}{0.0231} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$$

$$= \log \frac{0.0693}{0.0231} = \frac{E_a}{2.303 \times 8.314} \left[\frac{320 - 300}{300 \times 320} \right]$$

$$\left[\because R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1} \right]$$

$$= \log 3 = \frac{E_a \times 20}{2.303 \times 8.314 \times 300 \times 320}$$

$$E_a = \frac{\log 3 \times 2.303 \times 8.314 \times 300 \times 320}{20}$$

$$= \frac{0.4771 \times 2.303 \times 8.314 \times 300 \times 320}{20} \quad [\because \log 3 = 0.4771]$$

$$= 43848.5 \text{ J mol}^{-1} = 43.85 \text{ kJ mol}^{-1}$$

- (b) Two conditions for collisions to be effective collision are :

- (i) The reactant molecules must have attained sufficient energy to break chemical bonds
 (ii) The reactant molecules must have the proper orientation.

- (c) The number of the reacting species that collide simultaneously in a chemical reaction is called as molecularity of a reaction. The sum of the coefficients of the reacting species is the order of reaction.

For complex reactions, molecularity has no significance while the order of reaction is applicable.

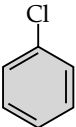
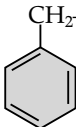
Delhi Set-II

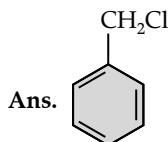
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Note: Except these questions, other questions are from Delhi Set-I

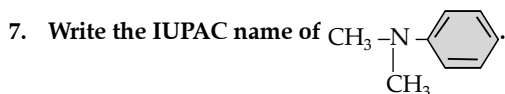
SECTION -A

Questions 6 to 10 are one word answers:

6. Out of  and , which will undergo S_N1 reaction faster with OH^- ?



Because conjunction between positive charge and double bond, resonance is possible.



Ans. N, N – dimethylbenzenamine

8. What type of linkage is present in polysaccharides?

Ans. Glycosidic linkage

* 9. Name an artificial sweetener whose use is limited to cold drinks.

*10. Name the polymer which is used for making non-stick utensils.

Questions 11 to 15 are multiple choice questions:

11. Kohlrausch given the following relation for strong electrolytes:

$$\wedge = \wedge_0 - A\sqrt{C}$$

Which of the following equality holds?

(a) $\wedge = \wedge_0$ as $C \longrightarrow \sqrt{A}$.

(b) $\wedge = \wedge_0$ as $C \longrightarrow \infty$

(c) $\wedge = \wedge_0$ as $C \longrightarrow 0$

(d) $\wedge = \wedge_0$ as $C \longrightarrow 1$

Ans. (b)

12. In an electrochemical process, a salt bridge is used

- (a) as a reducing agent
 (b) as an oxidizing agent
 (c) to complete the circuit so that current can flow
 (d) None of these

Ans. (c)

13. In a chemical reaction $X \rightarrow Y$, it is found that the rate of reaction doubles when the concentration of X is increased four times. The order of the reaction with respect to X is

- (a) 1 (b) 0
 (c) 2 (d) 1/2

Ans. (d)

14. Which of the following will give a white precipitate upon reacting with AgNO_3 ?

- (a) $\text{K}_2[\text{Pt}(\text{en})_2\text{Cl}_2]$ (b) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
 (c) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ (d) $[\text{Fe}(\text{H}_2\text{O})_3\text{Cl}_3]$

Ans. (c)

*15. Copper matte contains

- (a) Cu_2S , Cu_2O and silica
 (b) Cu_2S , CuO and silica
 (c) Cu_2S , FeO and silica
 (d) Cu_2S , FeS and silica

* Out of Syllabus

Questions 16 to 20

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
 (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
 (c) Assertion (A) is correct, but Reason (R) is wrong statement.
 (d) Assertion (A) is wrong, but Reason (R) is correct statement.
16. Assertion (A): 0.1 M solution of KCl has greater osmotic pressure than 0.1 M solution of glucose at same temperature.

Reason (R): In solution, KCl dissociates to produce more number of particles.

Ans. (a) KCl is ionic compound, hence dissociates into ions but glucose is a covalent compound which does not dissociate into ions.

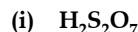
18. Assertion (A): Ortho and para-nitrophenols can be separated by steam distillation.

Reason (R): Ortho isomer associates through intermolecular hydrogen bonding while para isomer associates through intramolecular hydrogen bonding.

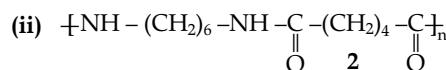
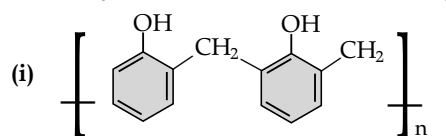
Ans. (c) Ortho isomer has intramolecular H-bonding while para isomer has intermolecular hydrogen bonding.

SECTION -B

*23. Draw the structures of the following:



*25. Identify the monomers in the following polymers:



*26. Discuss the nature of bonding in metal carbonyls. 2

SECTION -C

30. Define the following terms with a suitable example in each:

- (a) Polysaccharides (b) Denatured protein
 (c) Fibrous protein 1 + 1 + 1 = 3

Ans. (a) **Polysaccharides:** These are complex long chains of monosaccharides linked by glycosidic bonds e.g. starch, cellulose etc.

(b) **Denatured protein:** When native protein is subjected to physical change like change in

temperature or change in pH, the hydrogen bonds are disturbed. Due to this, helix get uncoiled and protein loses its biological activity. This is called denaturation and protein is called denatured protein. e.g. coagulation of egg.

(c) **Fibrous protein:** When polypeptide chains run parallel and are held together by hydrogen and disulphide bonds are called fibrous proteins. e.g. Keratin, myosin.

Delhi Set-III

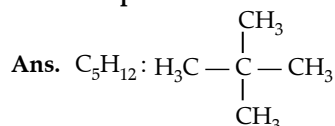
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Note: Except these questions, other questions are from Delhi Set-I and II

SECTION -A

Questions 6 to 10 are one word answers:

6. A hydrocarbon C_5H_{12} gives only one monochloride on photochemical chlorination. Identify the compound.



(All the hydrogen atoms are equivalent and replacement of any one hydrogen give monohalo derivative.)

7. Out of $(CH_3)_3N$ and $(CH_3)_2NH$, which one is more basic in aqueous solution?

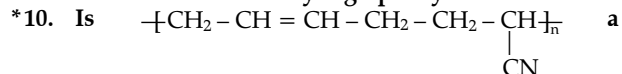
Ans. $(CH_3)_2NH$

(Due to steric factor secondary amines are stronger base.)

8. Out of $Cis-[Pt(en)_2Cl_2]^{2+}$ and $Trans-[Pt(en)_2Cl_2]^{2+}$, which one is optically active?

Ans. $cis [Pt(en)_2Cl_2]^{2+}$.

- * 9. Name the method of refining used to obtain semiconductor of very high purity.



homopolymer or copolymer?

Questions 11 to 15 are multiple choice questions:

11. The amount of electricity required to produce one mole of Zn from $ZnSO_4$ solution will be

- (a) 3F (b) 2F
(c) 1F (d) 4F

Ans. (b) $ZnSO_4 \rightleftharpoons \underset{1 \text{ mol}}{Zn^{2+}} + \underset{1 \text{ mol}}{SO_4^{2-}}; Zn^{2+} + 2e^- \rightarrow Zn(2F)$

12. Zinc is coated over iron to prevent rusting of iron because

- (a) $E_{Zn^{2+}/Zn}^{\circ} = E_{Fe^{2+}/Fe}^{\circ}$
(b) $E_{Zn^{2+}/Zn}^{\circ} < E_{Fe^{2+}/Fe}^{\circ}$
(c) $E_{Zn^{2+}/Zn}^{\circ} > E_{Fe^{2+}/Fe}^{\circ}$

(d) None of these

Ans. (b)

13. The unit of rate constant depends upon the

- (a) molecularity of the reaction
(b) activation energy of the reaction
(c) order of the reaction
(d) temperature of the reaction

Ans. (c) Order of the reaction

14. The formula of the complex triamminetri(nitrito-O) Cobalt (III) is

- (a) $[Co(ONO)_3(NH_3)_3]$
(b) $[Co(NO_2)_3(NH_3)_3]$
(c) $[Co(ONO_2)_3(NH_3)_3]$
(d) $[Co(NO_2)(NH_3)_3]$

Ans. (a) $[Co(ONO)_3(NH_3)_3]$

15. Which of the following is a disaccharide?

- (a) Glucose (b) Starch
(c) Cellulose (d) Lactose

Ans. (d) Lactose.

Questions 16 to 20

(a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is correct, but Reason (R) is wrong statement.

(d) Assertion (A) is wrong, but Reason (R) is correct statement.

16. Assertion (A): An ideal solution obeys Henry's law.

Reason (R): In an ideal solution, solute-solute as well as solvent-solvent interactions are similar to solute-solvent interaction.

Ans. (d) An ideal solution obeys Raoult's law

18. Assertion (A): Benzaldehyde is less reactive than ethanal towards nucleophilic addition reactions.

Reason (R): Ethanal is more sterically hindered.

Ans. (b)

SECTION -B

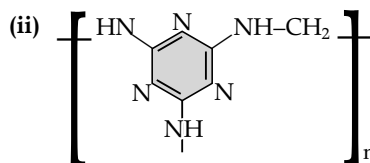
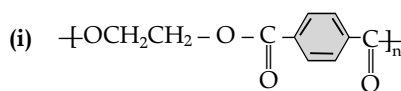
*22. Draw the structures of the following:

(i) $HClO_4$

(ii) $XeOF_4$

1 + 1 = 2

*24. Identify the monomers in the following polymers:



1+1 = 2

*27. Define the following terms with a suitable example in each:

(i) Bacteriocidal antibiotics

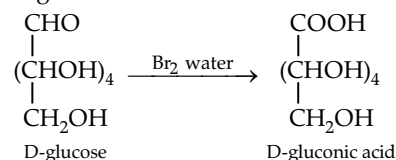
(ii) Food preservatives 1 + 1 = 2

SECTION -C

31. (i) What are the hydrolysis products of DNA?
 (ii) What happens when D-glucose is treated with Bromine water?
 (iii) What is the effect of denaturation on the structure of proteins? 1 + 1 + 1 = 3

Ans. (i) On hydrolysis of DNA, the products are pentose sugar, phosphoric acid and bases.

(ii) When D-glucose is treated with bromine water D-gluconic acid is formed.



(iii) On denaturation secondary and tertiary proteins get converted into primary proteins. Denaturation disrupts the normal alpha-helix and beta sheets in a protein and uncoils it into a random shape.

Outside Delhi Set-I

Code No. 56/4/1

SECTION -A

* Read the given passage and answer the questions 1 to 5 that follow:


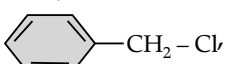
Colloidal particles always carry an electric charge which may be either positive or negative. For example, when AgNO_3 solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compared to lyophilic sols.




- * 1. What is the reason for the charge on sol particles?
 * 2. Why the presence of equal and similar charges on colloidal particles provide stability?
 * 3. Why a negatively charged sol is obtained on adding AgNO_3 solution to KI solution?
 * 4. Name one method by which coagulation of lyophobic sol can be carried out.
 * 5. Out of KI or K_2SO_4 , which electrolyte is better in the coagulation of positive sol?

Questions 6 to 10 are one word answers:

* 6. Name the method applied for the concentration of Bauxite ore in the extraction of Aluminium.

Ans. Bayer process (In this process the impurities like iron oxide and silica are removed.)

7. Out of -Cl and -Cl, which one is more reactive towards $\text{S}_{\text{N}}1$ reaction?

Ans. -Cl because cyclohexyl chloride (-Cl) is a secondary halide and it is more reactive towards $\text{S}_{\text{N}}1$ reaction than primary halide (- CH_2Cl).

8. Write an isomer of $\text{C}_3\text{H}_9\text{N}$ which gives foul smell of isocyanide when treated with chloroform and ethanolic NaOH.

Ans. Isomer of $\text{C}_3\text{H}_9\text{N}$ is $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$, gives foul smell of isocyanides. (because primary amine gives carbylamine reaction.)

* 9. Which one of the following is an antidepressant drug?
 Chloramphenicol, Luminal, Bithional

10. Write the name of component of starch which is water soluble.

Ans. Amylose is water soluble component.

Questions 11 to 15 are multiple choice questions :

11. How many ions are produced from the complex $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ in solution?

- (a) 4 (b) 2
 (c) 3 (d) 5

Ans. (c) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2 \rightarrow \text{Co}(\text{NH}_3)_5\text{Cl}_{(\text{aq})} + 2\text{Cl}^{-}(\text{aq})$

12. In a lead storage battery:

- (a) PbO_2 is reduced to PbSO_4 at the cathode.
 (b) Pb is oxidised to PbSO_4 at the anode.
 (c) Both electrodes are immersed in the same aqueous solution of H_2SO_4 .
 (d) All the above are true.

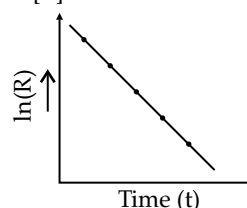
Ans. (d)

13. The slope in the plot of $\ln[R]$ vs. time gives

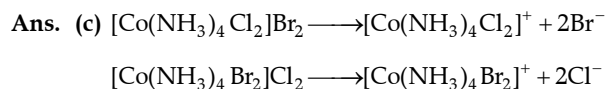
- (a) $+k$ (b) $\frac{+k}{2.303}$
 (c) $-k$ (d) $\frac{-k}{2.303}$

(where $[R]$ is the final concentration of reactant.)

Ans. (c)



14. The pair $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Br}_2$ and $[\text{Co}(\text{NH}_3)_4\text{Br}_2]\text{Cl}_2$ will show
- Linkage isomerism
 - Hydrate isomerism
 - Ionization isomerism
 - Coordinate isomerism



15. An α -helix is a structural feature of
- Sucrose
 - Polypeptides
 - Nucleotides
 - Starch
- Ans. (b) α -helix is a common structure of proteins (polypeptide chains).

Questions 16 to 20 20 × 1 = 20

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (c) Assertion (A) is correct, but Reason (R) is wrong statement.
- (d) Assertion (A) is wrong, but Reason (R) is correct statement.

- *16. Assertion (A): F_2 is a strong oxidising agent.
Reason (R): Electron gain enthalpy of fluorine is less negative.
17. Assertion (A): $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$ gives $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3OH on treatment with HI.
Reason (R): The reaction occurs by $\text{S}_{\text{N}}1$ mechanism.

- Ans. (a)
18. Assertion (A): Transition metals have low melting points.
Reason (R): The involvement of greater number of $(n-1)d$ and ns electrons in the interatomic metallic bonding.

- Ans. (d)
19. Assertion (A): Hydrolysis of an ester follows first order kinetics.
Reason (R): Concentration of water remains nearly constant during the course of the reaction.

- Ans. (a)
20. Assertion (A): Benzoic acid does not undergo Friedal-Crafts reaction.
Reason (R): The carboxyl group is activating and undergo electrophilic substitution reaction.

Ans. (c)

SECTION - B

21. What happens when
- a pressure greater than osmotic pressure is applied on the solution side separated from solvent by a semipermeable membrane?
 - acetone is added to pure ethanol?

1+1 = 2

- Ans. (i) Reverse osmosis will take place and the level of solution will decrease.
- (ii) Acetone reacts with alcohol to form a hemiacetal.

*22. Write the principal of the following refining methods:

- vapour phase refining
- chromatography. 1+1 = 2

OR

Write chemical equations involved to obtain:

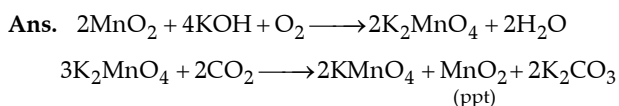
- Cu from Cu_2S
- Ag from $[\text{Ag}(\text{CN})_2]^-$ complex 1+1 = 2

23. Write the balanced chemical equations involved in the preparation of KMnO_4 from pyrolusite ore (MnO_2). 2

OR

Write the balanced ionic equations showing the oxidising action of acidified dichromate ($\text{Cr}_2\text{O}_7^{2-}$) solution with

- Iron (II) ion and
- Tin (II) ion. 1 + 1 = 2



OR

- $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{Fe}^{2+} \longrightarrow 2\text{Cr}^{3+} + 6\text{Fe}^{3+} + 7\text{H}_2\text{O}$
- $\text{Cr}_2\text{O}_7^{2-} + 3\text{Sn}^{2+} + 14\text{H}^+ \longrightarrow 2\text{Cr}^{3+} + 3\text{Sn}^{4+} + 7\text{H}_2\text{O}$

24. Write the IUPAC name and hybridization of the following complexes:

- $[\text{Ni}(\text{CN})_4]^{2-}$.
- $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$.

(Given: Atomic number of Ni = 28, Fe = 26)

1 + 1 = 2

- Ans. (i) $[\text{Ni}(\text{CN})_4]^{2-}$ – tetracyanonickelate (II)
hybridization – dsp^2
- (ii) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ – hexaquairon (II)
hybridization – sp^3d^2

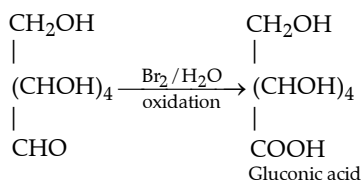
*25. Define the following terms with a suitable example in each:

- Antibiotics
- Antiseptics 1 + 1 = 2

26. Write the reactions showing the presence of following in the open structure of glucose:

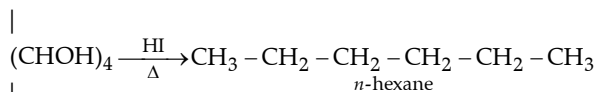
- a carbonyl group
- Straight chain with six carbon atoms 1 + 1 = 2

Ans. (i) Reaction of glucose (a carbonyl group)



(ii) Straight chain with six carbon atoms

CHO

CH₂OH

27. State Henry's law. Calculate the solubility of CO₂ in water at 298K under 760 mm Hg.

(K_H for CO₂ in water at 298 K is 1.25 × 10⁶ mm Hg)

2

Ans. Henry's law: The mass of a gas dissolved in a given volume of the liquid at a constant temperature depends upon the pressure which is applied.

K_H for CO₂ = 1.25 × 10⁶ mm Hg

$$x_{\text{CO}_2} = \frac{\text{Partial pressure of CO}_2}{K_{\text{H}} \text{ for CO}_2} = \frac{760 \text{ mm Hg}}{1.25 \times 10^6 \text{ mm Hg}}$$

$$= 608 \times 10^{-6}$$

Mole fraction represents the solubility of CO₂ in water.

SECTION -C

28. The freezing point of a solution containing 5g of benzoic acid (M = 122 g mol⁻¹) in 35g of benzene is depressed by 2.94 K. What is the percentage association of benzoic acid if it forms a dimer in solution?

(K_f for benzene = 4.9 K kg mol⁻¹)

3

Ans. Observed molar mass of benzoic acid :

$$M_B = \frac{K_f \times W_B}{W_A \times \Delta T_f} \quad W_B = 5 \text{ gm}$$

$$W_A = 0.035 \text{ kg}$$

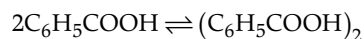
$$M_B = \frac{4.9 \times 5}{0.035 \times 2.94} = \frac{24.5}{0.1029} \quad K_f = 4.9 \text{ K kg mol}^{-1}$$

$$= 238 \text{ g mol}^{-1} \quad \Delta T_f = 2.94$$

$$\text{Normal molar mass of C}_6\text{H}_5\text{COOH} = 122 \text{ g mol}^{-1}$$

$$i = \frac{\text{normal molar mass}}{\text{observed molar mass}} = \frac{122}{238} = 0.513$$

% of association of acid (α)



$$n = 2\alpha = \frac{i-1}{1/n-1} = \frac{0.513-1}{\frac{1}{2}-1} = \frac{(-0.487)}{(-0.5)} = 0.974$$

Percentage association of acid = 0.974 × 100 = 97.4%

29. The rate constant for the first order decomposition of N₂O₅ is given by the following equation :

$$k = (2.5 \times 10^{14} \text{ s}^{-1}) e^{(-25000\text{K})/T}$$

Calculate E_a for this reaction and rate constant if its half-life period be 300 minutes. 3

Ans. $k = (2.5 \times 10^{14} \text{ l}^{-1}) e^{(-25000\text{K})/T}$

$$t_{1/2} = 300 \text{ minutes}$$

$$\frac{E_a}{R} = 25000 \text{ K}$$

$$E_a = 25000 \times R \times K$$

$$= 25000 \times 8.314 \text{ J K}^{-1} \text{ mol}^{-1} \times K$$

$$= 207850 \text{ J mol}^{-1} = 207.850 \text{ KJ mol}^{-1}$$

$$t_{1/2} = \frac{0.693}{K} \Rightarrow K = \frac{0.693}{300} \text{ min}^{-1}$$

$$= 0.231 \times 10^{-2}$$

$$= 2.31 \times 10^{-3} \text{ min}^{-1}$$

*30. Write the name and structures of monomer(s) in the following polymers:

(i) Nylon-6

(ii) PVC

(iii) Neoprene

1 + 1 + 1 = 3

31. Following ions are given:

Cr²⁺, Cu²⁺, Cu⁺, Fe²⁺, Fe³⁺, Mn³⁺

Identify the ion which is

(i) a strong reducing agent.

(ii) unstable in aqueous solution.

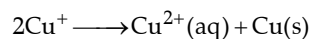
(iii) a strong oxidising agent.

Give suitable reason in each.

1 + 1 + 1 = 3

Ans. (i) Cr²⁺, because its configuration changes from d⁴ to d³ and having a half-filled t_{2g} level.

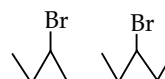
(ii) Cu⁺ in an aqueous medium energy is required to remove one electron from Cu⁺ to Cu²⁺, high hydration energy of Cu²⁺ compensates for it. Therefore Cu⁺ ion in an aqueous solution is unstable.



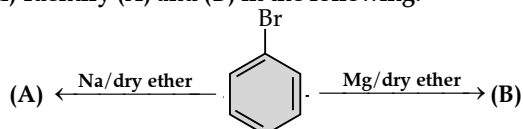
(iii) Mn³⁺, because its configuration changes from Mn³⁺ to Mn²⁺ results in the half filled d⁵ configuration, which has extra stability.

32. (i) Write the structure of major alkene formed by β-elimination of 2, 2, 3-trimethyl-3-bromopentane with sodium ethoxide in ethanol.

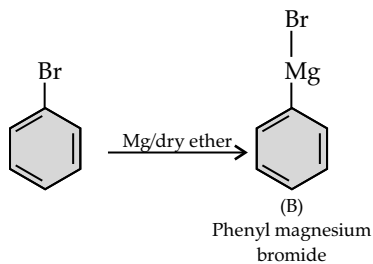
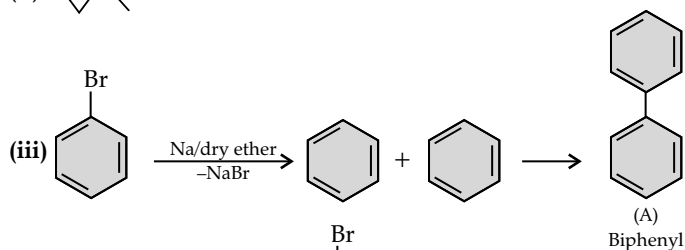
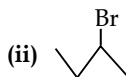
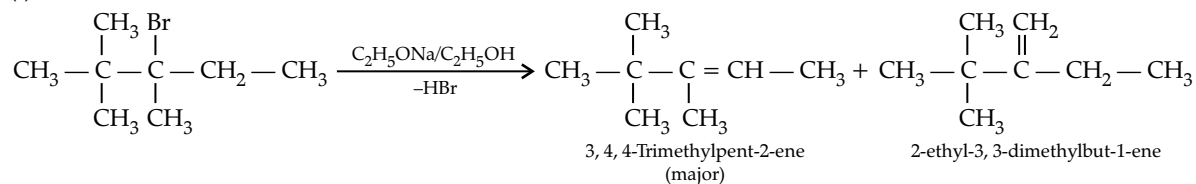
(ii) Which one of the compounds in the following pairs is chiral?



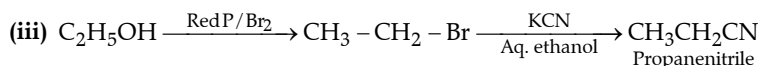
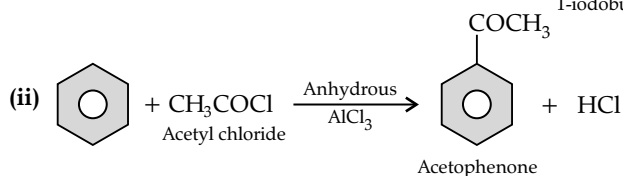
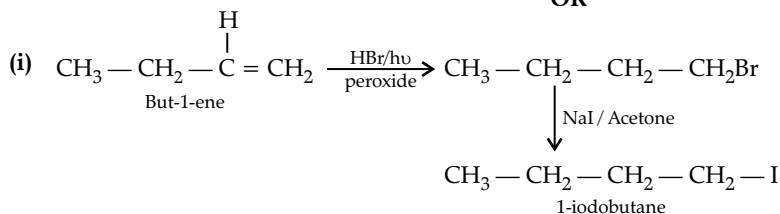
(iii) Identify (A) and (B) in the following:



Ans. (i)

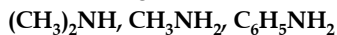


OR

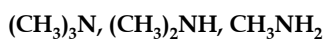


33. Arrange the following compounds as directed:

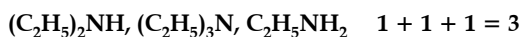
(i) In increasing order of solubility in water:



(ii) In decreasing order of basic strength in aqueous solution :



(iii) In increasing order of boiling point:



OR

How can you convert the following?

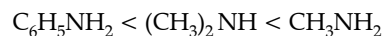
(i) But-1-ene to 1-iodobutane

(ii) Benzene to acetophenone

(iii) Ethanol to propanenitrile

1 + 1 + 1 = 3

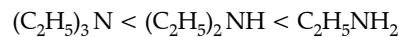
Ans. (i) Increasing order of solubility:



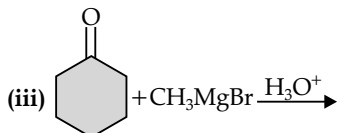
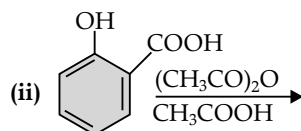
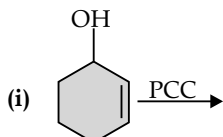
(ii) Decreasing order of basic strength in aqueous solution:



(iii) Increasing order of boiling point:



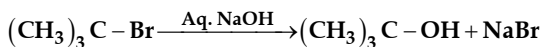
34. Write the product(s) of the following reactions:



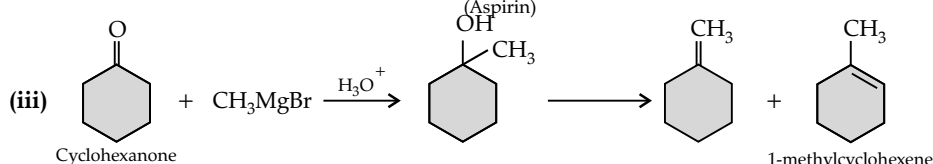
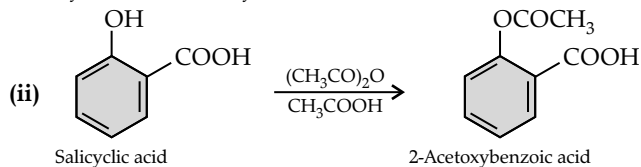
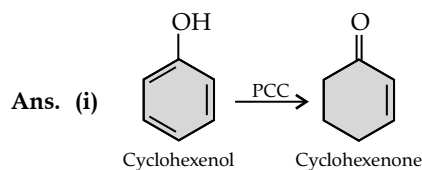
1 + 1 + 1 = 3

OR

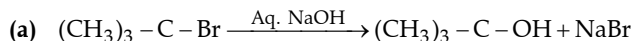
(a) Write the mechanism of the following S_N1 reaction:



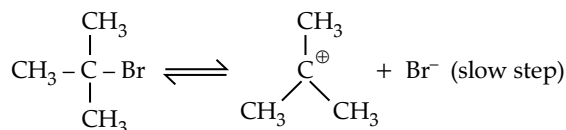
(b) Write the equation for the preparation of 2-methyl-2-methoxypropane by Williamson synthesis. 2 + 1 = 3



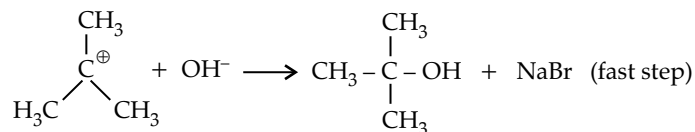
OR



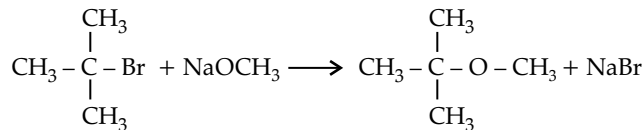
Step-I:



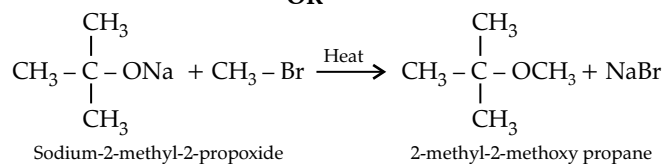
Step-II:



(b) Williamson synthesis:



OR



SECTION -D

35. (a) The electrical resistance of a column of 0.05 M KOH solution of length 50 cm and area of cross-section 0.625 cm^2 is $5 \times 10^3 \text{ ohm}$. Calculate its resistivity, conductivity and molar conductivity.

(b) Predict the products of electrolysis of an aqueous solution of CuCl_2 with platinum electrodes.

(Given : $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$, $E^\circ_{(\frac{1}{2} \text{Cl}_2/\text{Cl}^-)} = +1.36 \text{ V}$;

$$E^\circ_{\text{H}^+/\text{H}_2(\text{g}), \text{Pt}} = 0.00 \text{ V}, E^\circ_{(\frac{1}{2} \text{O}_2/\text{H}_2\text{O})} = +1.23 \text{ V}$$

$$3 + 2 = 5$$

OR

(a) Calculate e.m.f. of the following cell :



Given : $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$, $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$

[Given : $\log 10 = 1$]

(b) X and Y are two electrolytes. On dilution molar conductivity of 'X' increases 2.5 times while that Y increases 25 times. Which of the two is a weak electrolyte and why? $3 + 2 = 5$

Ans. (a) Given : $A = 0.625 \text{ cm}^2$, $l = 50 \text{ cm}$

$$R = 5 \times 10^3 \text{ ohm}, \rho = ?$$

$$m = 0.05 \text{ m}, K = ?$$

$$\Lambda_m = ?$$

$$\text{Cell constant} = \frac{l}{A} = \frac{50 \text{ cm}}{0.625 \text{ cm}^2} = 80 \text{ cm}^{-1}.$$

$$\text{Resistivity} = \frac{R}{\text{cell constant}} \text{ or } \frac{R \times A}{l}$$

$$\Rightarrow \frac{5 \times 10^3 \times 0.625}{50}$$

$$\Rightarrow \frac{5 \times 10^3 \text{ ohm}}{80 \text{ cm}^{-1}} \Rightarrow 62.5 \text{ ohm cm.}$$

$$\Rightarrow 62.5 \text{ ohm cm.}$$

$$\text{Conductivity} = \frac{1}{\text{Resistivity}} \times \frac{l}{A}$$

$$\frac{1}{5 \times 10^3} \times \frac{50}{0.625} = \frac{50}{5 \times 10^3 \times 625 \times 10^{-3}}$$

$$= \frac{10}{625} = 0.016 \text{ scm}^{-1}$$

$$\text{Molar conductivity } (\Lambda_m) = \frac{10^3 K}{M}$$

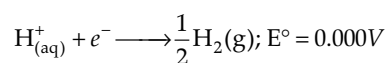
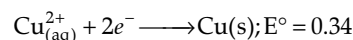
$$\Lambda_m = \frac{K}{M} \times 1000 = \frac{10 \times 1000}{625 \times 0.05} = 320 \text{ sm}^2 \text{ mol}$$

(b) Given: $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$

$$E^\circ_{(\frac{1}{2} \text{Cl}_2/\text{Cl}^-)} = +1.36 \text{ V}$$

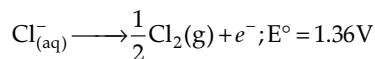
$$E^\circ_{\text{H}^+/\text{H}_2(\text{g}), \text{Pt}} = 0.00 \text{ V}, E^\circ_{(\frac{1}{2} \text{O}_2/\text{H}_2\text{O})} = +1.23 \text{ V}$$

At cathode:



The reaction with a higher value of E° takes place at the cathode, so deposition of copper will take place at the cathode.

At anode: The oxidation reactions are possible at the anode.



At the anode the reaction with a lower value of E° is preferred. But due to the over potential of oxygen, Cl^- gets oxidised at anode to produce Cl_2 gas.

OR

(a) $\text{Zn(s)}/\text{Zn}^{2+} (0.1 \text{ M}) \parallel (0.01 \text{ M}) \text{Ag}^+/\text{Ag(s)}$

$$E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$$

$$E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V} \quad \text{emf} = ?$$

$$E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.0591}{n} \log \frac{[\text{Anode}]}{[\text{Cathode}]}$$

$$E_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}}$$

$$= E^\circ_{\text{Ag}^+/\text{Ag}} - E^\circ_{\text{Zn}^{2+}/\text{Zn}}$$

$$= 0.80 - (-0.76) = 1.56 \text{ V}$$

$$E_{\text{cell}} = 1.56 - \frac{0.0591}{2} \log \frac{[\text{Zn}^{2+}]}{[\text{Ag}^+]^2}$$

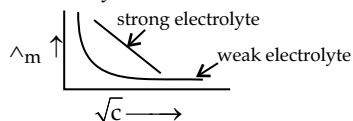
$$= 1.56 - \frac{0.0591}{2} \log \frac{[0.1]}{[0.01]^2}$$

$$= 1.56 - 0.0295 \log 1000$$

$$= 1.56 - 3(0.0295)$$

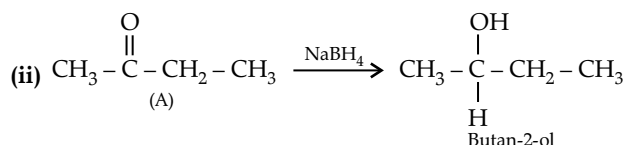
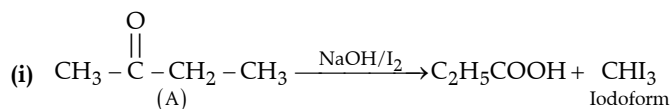
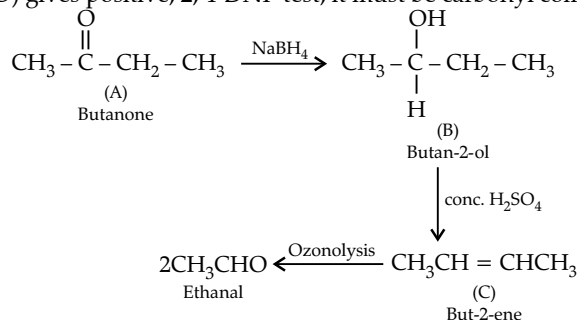
$$= 1.56 - 0.09 = 1.4715$$

- (b) Y is a weak electrolyte as on dilution complete dissociation of weak electrolyte takes place and thus a sharp increase in molar conductivity while in strong electrolyte it has already dissociated completely. So on dilution molar conductivity does not rise much.

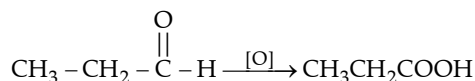
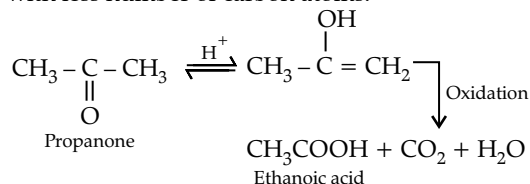


36. (a) An organic compound (A) having molecular formula C_4H_8O gives orange red precipitate with 2, 4-DNP reagent. It does not reduce Tollens' reagent but gives yellow precipitate of iodoform on heating with $NaOH$ and I_2 . Compound (A) on reduction with $NaBH_4$ gives compound (B) which undergoes dehydration reaction on heating with conc. H_2SO_4 to form compound (C). Compound (C) on ozonolysis gives two molecules of ethanal.

Ans. (a) Compound A (C_4H_8O) gives positive, 2, 4-DNP test, it must be carbonyl compound. It gives iodoform test.



- (b) (i) Oxidation of propanal is easier than propanone because aldehydes have one hydrogen atom attached to the carbonyl group while ketones have two alkyl or aryl groups attached to the carbonyl group. Propanal easily oxidised to form acid with same number of carbon atoms whereas propanone is difficult to be oxidised and form acids with less number of carbon atoms.



- (ii) α -hydrogen of aldehydes and ketones is acidic in nature. They can be easily abstracted by suitable bases. Two molecules condense to form a β -hydroxyaldehyde or β -hydroxyketone which gets dehydrated in presence of acid upon heating to form α, β -unsaturated compound.

Identify (A), (B) and (C) and write their structures. Write the reactions of compound (A) with (i) $NaOH/I_2$ and (ii) $NaBH_4$.

- (b) Give reasons:

(i) Oxidation of propanal is easier than propanone.

(ii) α -hydrogen of aldehydes and ketones is acidic in nature. 3 + 2 = 5

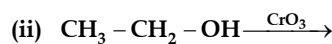
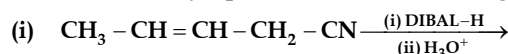
OR

- (a) Draw structures of the following derivatives:

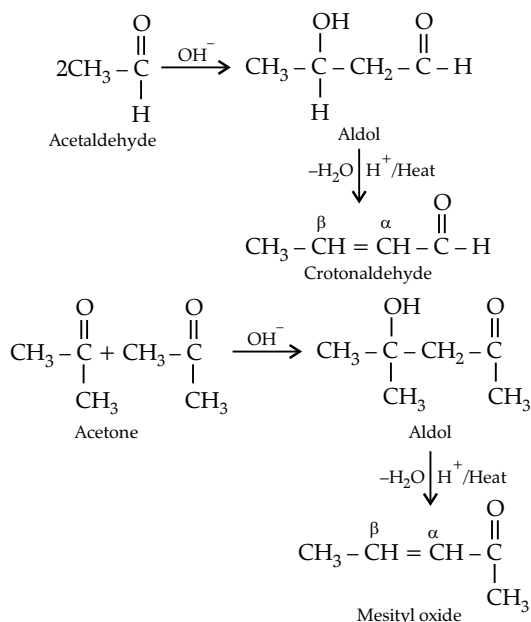
(i) Cyanohydrin of cyclobutanone

(ii) Hemiacetal of ethanal

- (b) Write the major product(s) in the following :

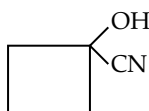


- (c) How can you distinguish between propanal and propanone? 2 + 2 + 1 = 5

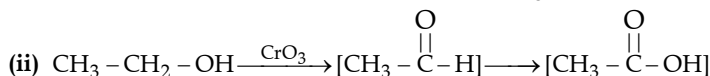
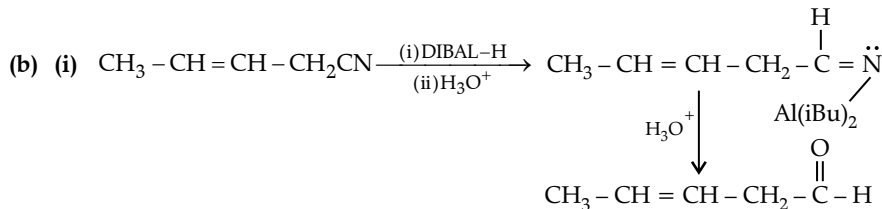
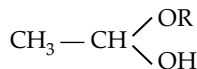


OR

- (a) (i) Cyanohydrin of cyclobutanone



- (ii) Hemiacetal of ethanol



- (c) By iodoform test : Propanone on treatment with
- I_2/NaOH
- undergoes iodoform test to give a yellow ppt. of iodoform.



Propanal does not give this test.

- *37. (a) Account for the following:

- Tendency to show -2 oxidation state decreases from oxygen to tellurium.
- Acidic character increases from HF to HI.
- Moist SO_2 gas acts as a reducing agent.

- (b) Draw the structure of an oxoacid of sulphur containing S-O-S linkage.

- (c) Complex the following equation:



OR

- (a) Among the hydrides of group 16, write the hydride

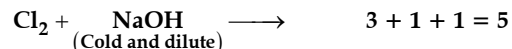
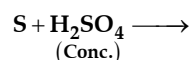
- (i) Which is a strong reducing agent.

- (ii) Which has maximum bond angle.

- (iii) Which most thermally stable.

Give suitable reason in each.

- (b) Complete the following equations:



Outside Delhi Set-II




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Note: Except these questions, other questions are from Outside Delhi Set-I

SECTION -A

Question 6 to 10 are one word answers:

* 6. Name the depressant which is used to separate PbS and ZnS containing ore in froth floatation process.

7. Out of  and  - Clwhich will react faster in S_N1 reaction with OH⁻?Ans.  - Cl8. Out of CH₃NH₂ and CH₃OH, which has higher boiling point?Ans. CH₃NH₂

* 9. Which one of the following is a narcotic analgesic? Penicillin, Codeine, Ranitidine

10. Write the name of linkage joining two monosaccharides.

Ans. Glycosidic linkage.

Questions 11 to 15 are multiple choice questions:

11. The coordination number of 'Co' in the complex [Co(en)₃]³⁺ is

- (a) 3 (b) 6
-
- (c) 4 (d) 5

Ans. (b)

12. An electrochemical cell behaves like an electrolytic cell when

- (a) E
- _{cell}
- = E
- _{external}
- (b) E
- _{cell}
- = 0
-
- (c) E
- _{external}
- > E
- _{cell}
- (d) E
- _{external}
- < E
- _{cell}

Ans. (c) E_{ext.} > E_{cell}

13. The half-life period for a zero order reaction is equal to

- (a)
- $\frac{0.693}{k}$
- (b)
- $\frac{2k}{[R]_0}$
-
- (c)
- $\frac{2.303}{k}$
- (d)
- $\frac{[R]_0}{2k}$

(where [R]₀ is initial concentration of reactant and k is rate constant.)Ans. (d) $\frac{[R]_0}{2k}$ 14. The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related as

- (a) Δ
- _t
- =
- $\frac{2}{9}$
- Δ
- _o
- (b) Δ
- _t
- =
- $\frac{5}{9}$
- Δ
- _o
-
- (c) Δ
- _t
- =
- $\frac{4}{9}$
- Δ
- _o
- (d) Δ
- _t
- = 2Δ
- _o

Ans. (c) Δ_t = $\frac{4}{9}$ Δ_o

15. α-D(+)-glucose and β-D(+)-glucose are

- (a) Geometrical isomers (b) Enantiomers
-
- (c) Anomers (d) Optical isomers

Ans. (b) Enantiomers

Questions 16 to 20

(a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is correct, but Reason (R) is wrong statement.

(d) Assertion (A) is wrong, but Reason (R) is correct statement.

*16. Assertion (A): F₂ has lower bond dissociation enthalpy than Cl₂.

Reason (R): Fluorine is more electronegative than chlorine.

18. Assertion (A): Transition metals have high melting point.

Reason (R): Transition metals have completely filled d-orbitals.

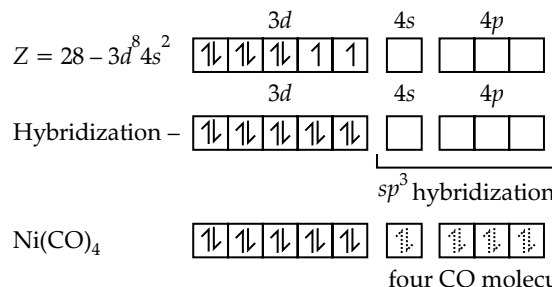
Ans. (c)

SECTION -B

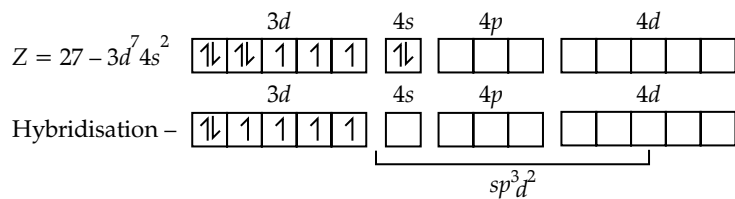
23. Write IUPAC name and hybridization of the following complexes:

(i) [Ni(CO)₄], (ii) [CoF₆]³⁻ (Atomic number Ni = 28, Co = 27)

1 + 1 = 2

Ans. (i) [Ni(CO)₄] – TetracarbonylnickelHybridization - sp³

- (ii) $[\text{CoF}_6]^{3-}$ – Hexafluorocobaltate (III)
Hybridization - sp^3d^2



sp^3d^2
six pairs of e^- from six fluoride ions

- *25. Define the following terms with a suitable example in each:

(i) Tranquilizers

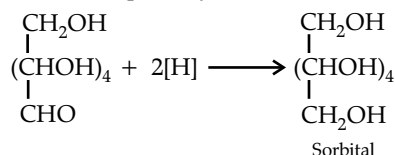
(ii) Anionic detergent 1 + 1 = 2

26. Write the reactions showing the presence of following in the open structure of glucose:

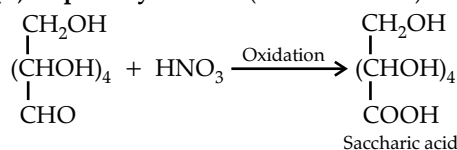
(i) an aldehyde group

(ii) a primary alcohol 1 + 1 = 2

- Ans. (i) **An aldehyde group:** On reduction with sodium amalgam and water, the aldehydic group is reduced to primary alcohol.



- (ii) **A primary alcohol:** (with nitric acid)



SECTION - C

- *31. Write the name and structures of monomers in the following polymers:

(i) Nylon-6, 6

(ii) Terylene

(iii) PHBV 1 + 1 + 1 = 3

Outside Delhi Set-III

Code No. 56/4/3

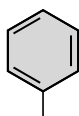
Note: Except these questions, other questions are from Outside Delhi Set-I and II

SECTION - A

Questions 6 to 10 are one word answers:

- * 6. Name the method used for the refining of Zinc.
7. Out of $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ and $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Cl}$, which one is more reactive towards $\text{S}_{\text{N}}1$ reaction?

Ans. $\text{CH}_2 = \text{CH} - \text{CH}_2\text{Cl}$



- * 8. Write an isomer of $\text{C}_3\text{H}_9\text{N}$ which does not react with Hinsberg reagent.

9. What type of protein is present in keratin?

Ans. Fibrous protein.

- *10. Name the compound which is added to soap to provide antiseptic properties.

Questions 11 to 15 are multiple choice questions:

11. Which of the following is the most stable complex?

- (a) $[\text{Fe}(\text{CO})_5]$ (b) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
(c) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$ (d) $[\text{Fe}(\text{CN})_6]^{3-}$

Ans. (c) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$ acts as the chelating ligands.

12. Which of the following is correct for spontaneity of a cell?

- (a) $\Delta G = -ve$, $E^\circ = +ve$
(b) $\Delta G = +ve$, $E^\circ = 0$

* Out of Syllabus

(c) $\Delta G = -ve$, $E^\circ = 0$

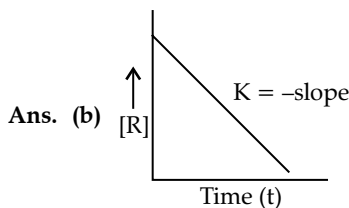
(d) $\Delta G = +ve$, $E^\circ = -ve$

Ans. (a) $\Delta G = -ve$, $E^\circ = +ve$

13. For a zero order reaction, the slope in the plot of [R] vs. time is

- (a) $\frac{-k}{2.303}$ (b) $-k$
(c) $\frac{+k}{2.303}$ (d) $+k$

(where [R] is the final concentration of reactant)



14. What type of isomerism is shown by the pair $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$?

- (a) Ionisation isomerism
(b) Coordination isomerism
(c) Solvate isomerism
(d) Linkage isomerism

Ans. (c) Solvate / Hydrate isomerism

15. Which one is the complementary base of cytosine in one strand to that in other strand of DNA?

- (a) Adenine
(c) Thymine

- (b) Guanine
(d) Uracil

- (c) Assertion (A) is correct, but Reason (R) is wrong statement.
(d) Assertion (A) is wrong, but Reason (R) is correct statement.

Ans. (b) Guanine.

Questions 16 to 20

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
(b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

*16. Assertion (A): F₂ has lower reactivity.

Reason (R): F-F bond has low $\Delta_{\text{bond}} H^\circ$.

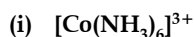
20. Assertion (A): For complex reactions molecularity and order are not same.

Reason (R): Order of reaction may be zero.

Ans. (b)

SECTION -B

23. Write IUPAC name and hybridization of the following complexes:

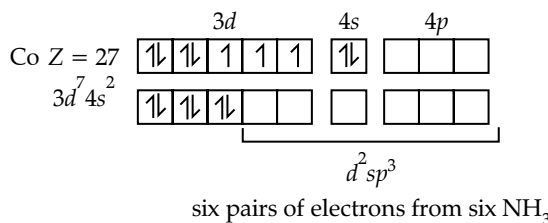


(Atomic number Ni = 28, Co = 27)

1 + 1 = 2

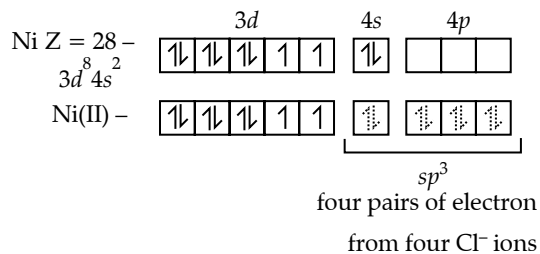
Ans. (i) [Co(NH₃)₆]³⁺: Hexamminecobalt (III)

Hybridization - d^2sp^3



(ii) [NiCl₄]²⁻: Tetrachloronickelate (II)

Hybridization - sp^3

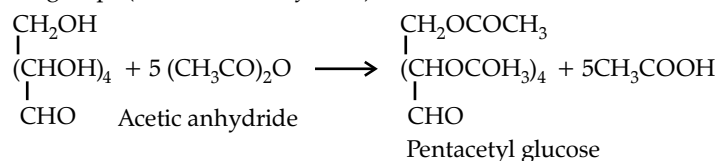


25. Write the reactions showing the presence of following in the open structure of glucose:

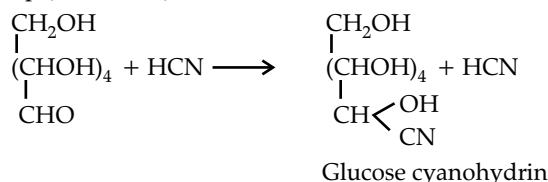
- (i) five -OH groups (ii) a carbonyl group

1 + 1 = 2

Ans. (i) Presence of five -OH groups (with acetic anhydride)



(ii) Presence of a carbonyl group (with HCN)



*27. Define the following terms with a suitable example in each:

- (i) Antacids (ii) Artificial Sweetener

1 + 1 = 2

