CBSE Board
Class XII Chemistry

Time: 3 Hrs Total Marks: 70

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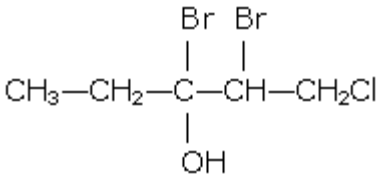
1. All questions are compulsory.
2. Question nos. **1 to 8** are very short answer questions and carry 1 mark each
3. Question nos. **9 to 18** are short answer questions and carry 2 marks each. Use of calculator is not permitted.
4. Question nos. **19 to 27** are also short answer questions and carry 3 marks each
5. Question nos**. 28 to 30** are long answer questions and carry 5 marks each
6. Use log tables if necessary, use of calculators is not allowed.

Q1:State the condition resulting in reverse osmosis.

Q2:Name an ionization isomer of $[Cr(H_2O)_5 Br]SO_4$.

Q3:Give IUPAC name of



Q4:Complete the reaction equation:

$$C_6H_6 + RCOCl \xrightarrow[(\text{anhydrous})]{AlCl_3}$$

Q5:Why do primary amines have higher boiling point than tertiary amines?

Q6:Mention two classes of nitrogen containing bases found in nucleotides.

Q7:Write formulae of the monomers of polythene and Teflon.

Q8:Write the structural formula for sulphanilic acid and mention any one of its uses.

Q9:A metal (atomic mass = 50) has a body–centered cubic lattice. The density of metal is 5.91 g cm^{-3}. Find out the volume of unit cell?

Q10:In terms of band theory, what is the difference between

(i) A conductor and an insulator

(ii) A conductor and a semiconductor

Q11:Calculate the freezing point of a solution containing 0.520 g of glucose ($C_6H_{12}O_6$) dissolved in 80.20 g of water.
[For water K_f = 1.86 K kg mol^{-1}]

Q12:How much charge is required for the reduction of
(i) 1 mol of Al^{3+} to Al
(ii) 1 mol of Cu^{2+} to Cu

Q13:How would you account for the following?
(i) Scandium the first member of first transition series does not exhibit variable oxidation state.
(ii) Only transition metals form complex compounds with ligands such as CO.

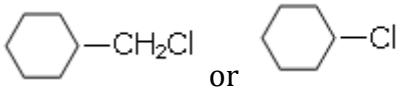
Q14: Write the formulae for the following coordination compounds:
(i) Tetraamminediaquacobalt (III) chloride
(ii) Potassium tetracyanonickelate (II)

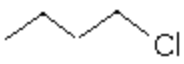
OR

Q14: Draw the structures of geometrical isomers of $[Fe(NH_3)_2(CN)_4]^-$.

Q15: What is Saytzeff's rule? Illustrate with a suitable example.

Q16:In the following pairs of halogen compounds which is faster undergoing S_N2 reaction?

i.  or

ii.  or 

Q17:How can you differentiate between addition and condensation polymerization?

Q18:
(a) Why are cimetidine and ranitidine better antacids than sodium hydrogen carbonate or magnesium or aluminum hydroxide?
(b) What is tincture of iodine? What is its use?

Q19:What are paramagnetic and ferromagnetic substances? Account for the paramagnetic character of transition metal compounds. How does the

paramagnetic character of the bivalent ions of first transition metal series vary from Ti (Z = 22) to Cu (Z = 29)?

Q20:Vapour pressure of pure water at 298 K is 23.8 mm Hg. 50 g of urea (NH_2CONH_2) is dissolved in 850 g of water. Calculate the vapour pressure of water for this solution and its relative lowering.

Q21:

$Cu^{2+} + 2e^- \rightarrow Cu, E^0 = +0.34\,V$

$Ag^+ + e^- \rightarrow Ag, E^0 = +0.80\,V$

(i) Construct a galvanic cell using the above data.

(ii) For what concentration of Ag^+ ions will the emf of the cell be zero at 25°C, if the concentration of Cu^{2+} is 0.01 M?

Q 22: Explain Freundlich adsorption isotherm. Plot a graph between log (x/m) and log P.

Q23:

(a) Why is the reduction of a metal oxide easier if the metal formed is in liquid state at the temperature of reduction?

(b) Why is the extraction of copper from pyrite difficult than that from its oxide ore through reduction?

(c) Differentiate between minerals and ores?

Q24:At an exhibition a FORTUNE TELLER predicts your future. Ram and Shyam ran to get their fortune read. The fortune teller asked them to take a paper from the lot. He put the paper into a trough of water. Both the children read what was given in the paper.

(a) Give a plausible reason for this.

(b) What value do you get from this?

Q25:Write one chemical equation each to exemplify the following reaction:

(i) Carbylamine reaction

(ii) Hoffmann bromamide degradation reaction

OR

Q 25.Write structures and IUPAC names of:

(i) the amide which gives propanamine by Hoffmann bromamide degradation reaction.

(ii) the amine produced by the Hoffmann bromomamide degradation of benzamide.

Q26:

(a) State two main differences between globular protein and fibrous proteins.

(b) What are essential and non – essential amino acids? Give two examples of each.

Q27: Give reaction of glucose with HI, Br_2 water and acetic anhydride.

Q28:

(i) Calculate the overall order of a reaction which has the rate expression

(a) Rate = $k[A]^{\frac{1}{2}}[B]^{\frac{3}{2}}$

(b) Rate = $k\,[A]^{\frac{3}{2}}[B]^{-1}$

(ii) Identity the reaction order from each of the following rate constants:

(a) $k = 2.3 \times 10^{-5}$ L mol^{-1} s^{-1}

(b) $k = 3 \times 10^{-4}$ s^{-1}

(iii) What is the order of radioactivity decay?

(iv) What will be the effect of temperature on the rate constant?

(v) Nitric oxide reacts with H_2 to give N_2 and water

$$2NO + 2H_2 \rightarrow N_2 + H_2O$$

The kinetics of this reaction is explained by following steps:

(a) $2NO + H_2 \rightarrow N_2 + H_2O$ (slow)

(b) $H_2O_2 + H_2 \rightarrow 2H_2O$ (fast)

What is the predicted rate law?

OR

Q28:

(i) At 300 K a certain reaction is 50% completed in 20 minutes. At 350 K, the same reaction is 50% completed in 5 minutes. Calculate the activation energy for the reaction.

(ii) Plot a graph between ln k and 1/T. What is the slope and intercept?

Q29:X_2 is greenish yellow gas with an offensive smell used in water purification. It partially dissolves in water to give a solution which turns blue litmus red. When X_2 is passed through NaBr Solution, Br_2 is obtained.

(a) Identify X_2

(b) Name the group to which it belong

(c) Write general electronic configuration of this group

(d) What are products obtained when X_2 reacts with H_2O? Write chemical equation.

(e) What happens when X_2 reacts with hot and conc. NaOH? Give equations.

OR

Q29:

(i) Draw the structure of $XeOF_4$

(ii) Concentrated HNO_3 can be stored in an aluminium container but cannot be stored in a zinc container. Why?

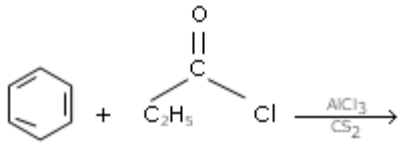
(iii) Does the hydrolysis of XeF_6 lead to a redox reaction?

(iv) Burning magnesium continues to burn whereas burning sulphur gets extinguished when dropped in gas containing NO. Explain.

(v) Sulphur disappears when boiled with sodium sulphite. Why?

Q30:Write the structures of the major products of the following reactions:

(a)

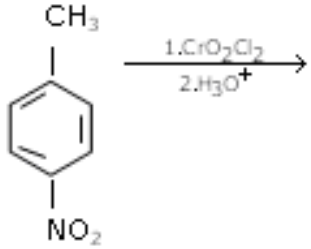


(b)

(c) b. $(C_6H_5CH_2)_2\,Cd + 2CH_3COCl \longrightarrow$

(d) c. $H_3C - C \equiv C - H \xrightarrow[HgSO_4]{dil.\,H_2SO_4}$

(e) d.



(f)

(e) . $RCOR' \xrightarrow{LiAlH_4}$

OR

Q30. Write chemical reactions to affect the following transformations:

(i) Butan-1-ol to butanoic acid

(ii) 3-Nitrobromobenzene to 3-nitrobenzoic acid

(iii) 4-Methylacetophenone to benzene-1, 4-dicarboxylic acid

(iv) Cyclohexene to hexane-1,6-dioic acid

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Class XII Chemistry
Solution

Time : 3 Hrs Total Marks: 70

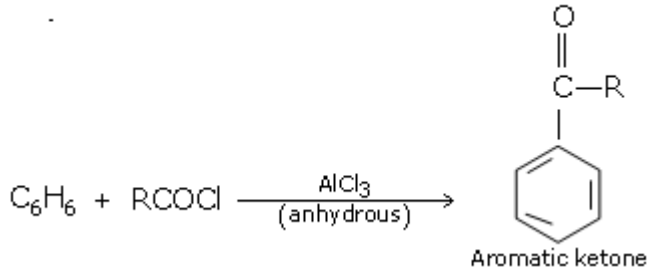
Solution

Ans1: When pressure on higher concentration solution side is made larger than osmotic pressure, reverse osmosis will take place. (1)

Ans 2: The ionization isomer is $[Cr(H_2O)_5SO_4]Br$. Its IUPAC name is pentaaquasulphato–O–chromium (III) bromide. (1)

Ans 3: 2, 3–Dibromo–1–chloropentan -3– ol (1)

Ans 4:



(1)

Ans 5: Primary amines are associated with intermolecular H-bonding whereas tertiary amines are not. Due to intermolecular H-bonding, primary amines have higher boiling point as compared to tertiary amines. (1)

Ans 6: Purines and Pyrimidines are two classes of nitrogen containing bases in nucleotides. (1)

Ans 7:

(i) Monomers of polythene: $CH_2=$ $(\frac{1}{2})$

(ii) Monomers of Teflon: $CF_2 = CF_2$ $(\frac{1}{2})$

Ans 8:

Structural formula sulphanilic acid:

$(\frac{1}{2})$

Uses: It is used in manufacture of dyes and drugs. $(\frac{1}{2})$

Ans 9 :

Atomic mass M = 50 g mol^{-1}

No. of atoms per unit cell, z = 2

Density d = 5.91 g cm^{-3}

$N_A = 6.023 \times 10^{23}$

$V = a^3$ =?

$$d = \frac{z \times M}{N_A \times a^3} \qquad (1)$$

$$\therefore a^3 = \frac{z \times M}{d \times N_A}$$

$$\therefore a^3 = \frac{2 \times 50}{5.91 \times 6.023 \times 10^{23}} \qquad (\frac{1}{2})$$

$$= 2.809 \times 10^{-23} \text{ cm}^3$$

Volume = $a^3 = 2.809 \times 10^{-23}$ cm^3 $(\frac{1}{2})$

Ans10:

(i) In conductor, there is partially filled valence band or there is overlapping between valence band and conduction band. In an insulator, there is large energy gap between conduction band and valence band. (1)

(ii) In semiconductor, there is small energy gap between the valence band and conduction band whereas in conductors, either there is partially filled valence band or there is overlapping between the valence band and conduction band. (1)

Ans 11:

$$\Delta T_f = K_f \times m$$

$$= K_f \times \frac{w_B}{M_B} \times \frac{1000}{w_A} \qquad (\frac{1}{2})$$

$$\therefore \Delta T_f = 1.86 \times \frac{0.52}{180} \times \frac{1000}{80.2}$$

$$= 0.0669 \qquad (\frac{1}{2})$$

$$\text{Now, } \Delta T = T_f^0 - T_f \qquad (\frac{1}{2})$$

$$\therefore 0.0669 = T_f^0 - T_f$$

$$\therefore T_f = 273 - 0.0669$$

$$= 272.933 \text{ K} \qquad (\frac{1}{2})$$

Ans 12:

Charge on n moles of electrons (Q) is given by Q=nF

(i) $Al^{3+}(aq) + 3e^- \rightarrow Al(s)$

Q=3 F $(\frac{1}{2})$

= 3 x 96500 C

= 289500 C $(\frac{1}{2})$

(ii) $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

Q = 2 F $(\frac{1}{2})$

= 2 x 96500 C

= 193000 C $(\frac{1}{2})$

Ans13:

(i) Scandium can lose electrons from both s and d orbitals to show +3 oxidation state which has a stable electronic configuration. (1)

(ii) Transition metals are smaller in size and have vacant d – orbitals of suitable energy which can accept lone pair of electrons from CO to form coordinate bond. (1)

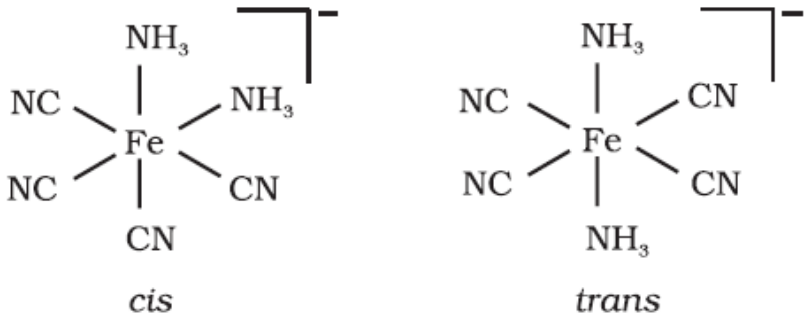
Ans14:

(i) $[Co(NH_3)_4(H_2O)_2]Cl_3$ (1)

(ii) $K_2[Ni(CN)_4]$ (1)

OR

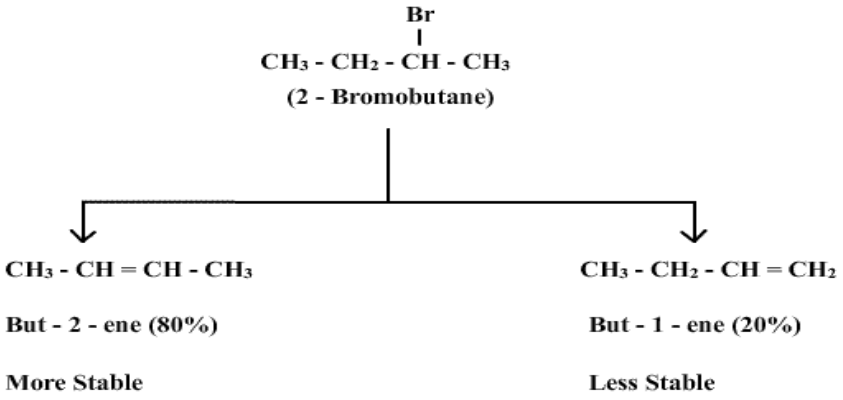
Ans 14: Geometrical isomers of $[Fe(NH_3)_2(CN)_4]^-$



(2)

Ans15: Saytzeff's rule :In dehydrohalogenation reactions of haloalkanes, the preferred alkene is that alkene which has greater number of alkyl groups attached to the doubly bonded carbon atoms. (1)

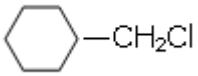
For example: Dehydrohalogenation of 2-bromo butane yields two products but-1-ene and but-2-ene. Out of these, but-2-ene is the major product as it is more highly substituted and it is more stable.



(1)

Ans.16

(a)



It is a primary halide and therefore undergoes S_N2 reaction faster. (1)

(b)

As iodide is a good leaving group because of its large size, it will be released at a faster rate in the presence of incoming nucleophile. (1)

Ans17:

Addition polymerization	Condensation polymerization
The addition polymers are formed by the repeated addition of monomer molecules possessing double or triple bonds. $\left(\frac{1}{2}\text{mark}\right)$	The condensation polymers are formed by repeated condensation reaction between two different bi-functional or tri-functional monomeric units. $\left(\frac{1}{2}\text{mark}\right)$
Loss of small molecules like H_2O, alcohol, hydrogen chloride etc., does not take place. $\left(\frac{1}{2}\text{mark}\right)$	Loss of small molecules like H_2O, alcohol, hydrogen chloride etc. takes place. $\left(\frac{1}{2}\text{mark}\right)$

Ans 18:

(a) Sodium bicarbonate or magnesium or aluminum hydroxide can make the stomach alkaline and trigger the production of even more acid which may cause serious ulcers. Cimetidine and Ranitidine are drugs which prevent the interaction of histamine (which stimulates secretion of HCl) with receptors present in stomach wall. This results in release of lesser amount of acid. (1)

(b) 2 to 3% solution of iodine dissolved in alcohol – water mixture is called tincture of iodine which acts as antiseptic. (1)

Ans19: Paramagnetic substances are those substances which are weakly attracted by a magnetic field. They lose their magnetism in the absence of magnetic field. (1)

Ferromagnetic substances are those substances which are attracted very strongly by a magnetic field. Besides strong attractions, these substances can be permanently magnetized. (1)

Transition metals have unpaired electron and therefore, they are paramagnetic. Paramagnetic character increases from Ti to Cr because number of unpaired electrons increase and then decreases due to the decrease in the number of unpaired electrons. Mn has 5 unpaired electrons therefore it is less paramagnetic than Cr which has 6 unpaired electrons. (1)

Ans20:

Relative lowering of vapour pressure is given by $\frac{p_A^\circ - p_A}{p_A^\circ} = x_B$ (1)

$$\therefore 1 - \frac{p_A}{P^o_A} = \frac{\frac{w_B}{M_B}}{\frac{w_A}{M_A}}$$

$$\Rightarrow 1 - \frac{p_A}{23.8} = \frac{\frac{50}{60}}{\frac{850}{18}}$$

$$\Rightarrow 1 - \frac{p_A}{23.8} = \frac{50}{60} \times \frac{18}{850}$$

$$\Rightarrow 1 - \frac{p_A}{23.8} = 0.017\,\text{mmHg}$$

$$\Rightarrow \frac{p_A}{23.8} = 0.98$$

$$\Rightarrow p_A = 23.38\,\text{mmHg} \quad (1)$$

Relative lowering of vapour pressure is

$$\frac{p_A^\circ - p_A}{p_A^\circ} = \frac{23.80 - 23.38}{23.80} = \frac{0.42}{23.80} = 0.018 \quad (1)$$

Ans 21:

(i) $Cu(s)|Cu^{2+}(aq)||Ag^{+}(aq)|Ag(s)$ (1)

(ii)

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

$$2Ag^{+}(aq) + 2e^{-} \rightarrow 2Ag(s)$$

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

$E_{cell} = E^{\theta}_{Ag^{+}/Ag} - E^{\theta}_{Cu^{2+}/Cu}$ $\left(\frac{1}{2}\right)$

$= +0.80\,V - 0.34\,V$

$= 0.46\,V$ $\left(\frac{1}{2}\right)$

$$E_{cell} = E^{\theta}_{cell} - \frac{0.059}{2}\log\frac{\left[Cu^{2+}\right]}{\left[Ag^{+}\right]^{2}}$$ $\left(\frac{1}{2}\right)$

$$\backslash 0 = 0.46\ V - \frac{0.059}{2}\log\frac{0.01}{\left[Ag^{+}\right]^{2}}$$

$$\therefore \log\frac{0.01}{\left[Ag^{+}\right]^{2}} = \frac{+0.46\ V \times 2}{0.059} = \frac{0.92}{0.059} = 15.593$$

$$\therefore \frac{0.01}{\left[Ag^{+}\right]^{2}} = \text{Antilog}\ (15.593) = 3.919 \times 10^{15}$$

$$\left[Ag^{+}\right]^{2} = \frac{0.01}{3.919 \times 10^{15}} = \frac{1}{3.919} \times 10^{-17} = 0.255 \times 10^{-17} = 2.55 \times 10^{-18}$$

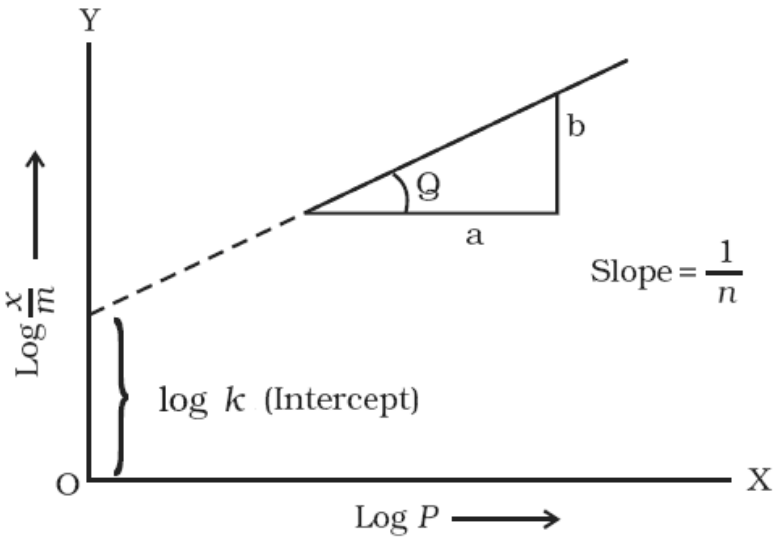
$\left[Ag^{+}\right] = 1.60 \times 10^{-9}\ mol\ L^{-1}$ $\left(\frac{1}{2}\right)$

Ans22:

Freundlich adsorption isotherm*:* Freundlich, in 1909, gave an empirical relationship between the quantity of gas adsorbed by unit mass of solid adsorbent and pressure at a particular temperature. The relationship can be expressed by the following equation:

$$\frac{x}{m} = k.P^{1/n}\ (n > 1)$$

Where *x* is the mass of the gas adsorbed on mass *m* of the adsorbent at pressure *P*, *k* and n are constants which depend on the nature of the adsorbent and the gas at a particular temperature. (1)



(1 for graph + ½ mark for intercept + ½ mark for slope)

Ans 23:

a) The entropy is higher in liquid state than in solid state. Therefore TΔS exceeds ΔH and ΔG becomes more negative and reduction becomes easier. (1)

b) Copper pyrites contain FeS which needs to be oxidized to FeO and then removed as $FeSiO_3$ (slag) whereas in oxide ore, such impurities are not present. Further carbon is a poor reducing agent for sulphide ores whereas it is a good reducing agent for oxide ores. (1)

c) Minerals are naturally occurring substances from which metals may or may not be extracted profitably. Ores contain sufficient quantity of minerals from which metal can be extracted profitably. (1)

Ans 24:

(a) The writing was done using solution of lead acetate. This had become invisible after drying. The trough contained a solution of H_2S. Reaction of H_2S with water gave a black precipitate of lead sulphide. Hence the writing became visible in water. (2)

(b) Knowledge is the antidote to fear and blind belief. (1)

Ans 25:

(i) Carbylamine reaction: When aliphatic and aromatic primary amine reacts with $CHCl_3$ and ethanolic KOH solution, offensive smelling compounds isocyanides are formed. This reaction is known as carbylamine reaction or isocyanide test and is used as a test for primary amines. $\left(\frac{1}{2}\right)$

$$C_2H_5NH_2 + CHCl_3 + 3KOH \xrightarrow[\text{ethanolic}]{} C_2H_5NC + 3KCl + 3H_2O$$ (1)

(ii) Hoffmann bromamide degradation reaction: Reaction for preparation of primary amines by treating an amide with bromine in an aqueous or ethanolic solution of sodium hydroxide is called Hoffmann bromamide degradation reaction. $\left(\frac{1}{2}\right)$

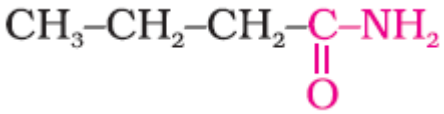
$$CH_3 - \overset{\overset{O}{\|}}{C} - NH_2 + Br_2 + 4NaOH \rightarrow CH_3NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$ (1)

OR

Ans 25.

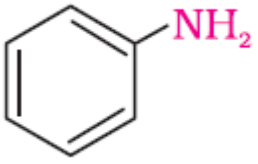
(i) Propanamine contains three carbons. Hence, the amide molecule must contain four carbon atoms. $\left(\frac{1}{2}\right)$

Structure and IUPAC name of the starting amide with four carbon atoms are given below:



Butanamide (1)

(ii) Benzamide is an aromatic amide containing seven carbon atoms. Hence, the amine formed from benzamide is aromatic primary amine containing six carbon atoms is: $\left(\frac{1}{2}\right)$



Aniline (1)

Ans26:

(a)

Globular Proteins	Fibrous Proteins
They are formed when the chains of polypeptides coil around to give a spherical shape. $\left(\frac{1}{2}\text{mark}\right)$	They are formed when the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds leading to a fibre like structure. $\left(\frac{1}{2}\text{mark}\right)$
They are usually soluble is water. $\left(\frac{1}{2}\text{mark}\right)$	They are usually insoluble is water. $\left(\frac{1}{2}\text{mark}\right)$

(b) Essential amino acids are those which are not produced in our body and they must be a part of our diet.

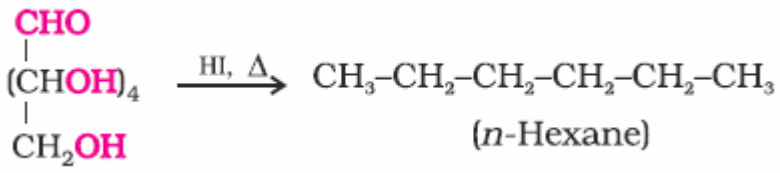
Examples: Valine, leucine, etc. $\left(\frac{1}{2}\right)$

Non- essential amino acids are those which are produced by our body.

Examples: Glycine and alanine. $\left(\frac{1}{2}\right)$

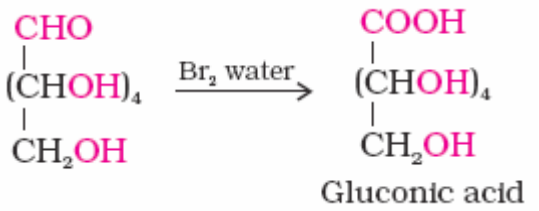
Ans.27

(i)



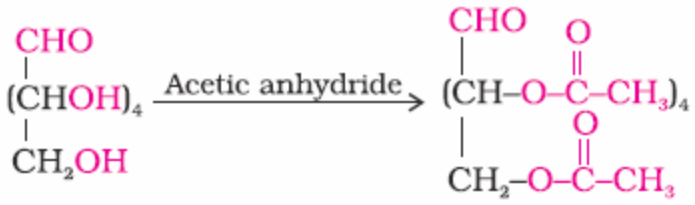
(1)

(ii)



(1)

(iii)



(1)

Ans 28:

(i)

(a) $\frac{1}{2}+\frac{3}{2}=2$ $\left(\frac{1}{2}\right)$

(b) $\frac{3}{2}-1=\frac{1}{2}$ $\left(\frac{1}{2}\right)$

(ii)

(a) The unit of second order reaction is $Lmol^{-1}s^{-1}$ therefore it represents second order reaction. $\left(\frac{1}{2}\right)$

(b) The unit of first order reaction is s^{-1} therefore it is first order reaction. $\left(\frac{1}{2}\right)$

(iii) Radioactivity decay follows first order kinetics. (1)

(iv) Rate constant k; generally increase with the increase in temperature. (1)

(v) Rate law $\frac{dx}{dt}=\left[NO\right]^2\left[H_2\right]^1$ (from the slow step) (1)

OR

Ans 28:

(i)

$t_{1/2}=\frac{0.693}{k}\Rightarrow k_1=\frac{0.693}{20}$ at 300 K,

$t_{1/2}=\frac{0.693}{k}\Rightarrow k_2=\frac{0.693}{5}$ at 350 K

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

$\Rightarrow \log\left(\frac{0.693}{5}\times\frac{20}{0.693}\right)=\frac{E_a}{2.303\ R}\left(\frac{T_2-T_1}{T_1T_2}\right)$

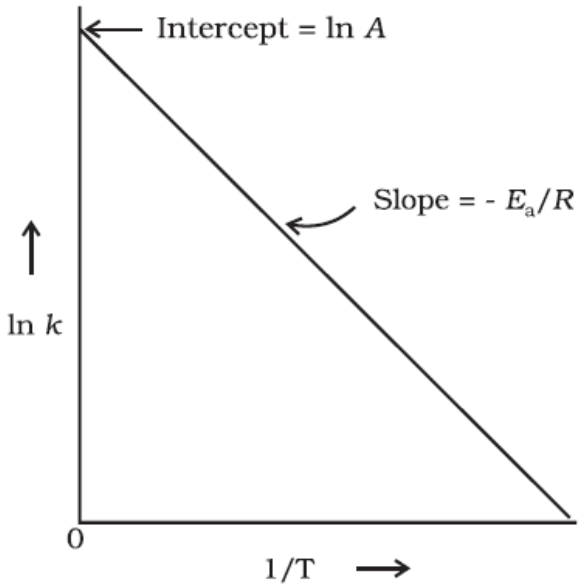
$\therefore E_a=2.303\times8.314\times\left(\frac{350\times300}{50}\right)\log4$

$=\frac{19.147\times350\times300}{50}\times0.6021$

$=24.21\ kJ\ mol^{-1}$

$\begin{pmatrix}2\,marks\\1\,mark: Correct\ calculation\\1\,mark: Correct\ answer+correct\ unit\end{pmatrix}$

(ii) The plot of ln k vs 1/T is a straight line.



(1 for graph + ½ mark for intercept + ½ mark for slope)

Ans 29:

Chlorine is yellowish green gas. It dissolves in water forming HCl and HOCl.

$Cl_2 + H_2O \rightarrow HCl + HOCl$. HCl turns blue litmus red.

$Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$

a. X_2 is chlorine. (1)

b. It belongs to group 17. (1)

c. General electronic configuration of Group 17: ns^2np^5 (1)

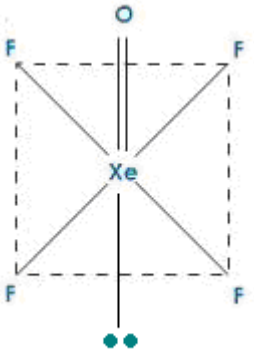
d. $Cl_2 + H_2O \rightarrow HCl + HClO$ (1)

e. $3Cl_2 + 6\ NaOH$ (hot and conc.) $\rightarrow 5NaCl + NaClO_3 + 3H_2O$ (1)

OR

Ans 29.

(i) It has square pyramidal structure



(1)

(ii) In the presence of conc. HNO_3, Al becomes passive, due to a thin protective layer of its oxide (Al_2O_3), which is formed on its surface and prevents further action between the metal and the acid. Therefore Al containers can be used for storing conc. HNO_3. It cannot be stored in zinc vessels because zinc reacts with HNO_3. (1)

(iii) No, the products of hydrolysis are $XeOF_4$ and XeO_2F_2 where the oxidation states of all the elements remain the same as it was in the reacting state. (1)

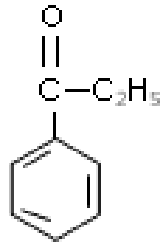
(iv) The heat evolved during the burning of magnesium is enough to decompose NO to N_2 and O_2. The O_2 thus produced supports combustion of Mg whereas the heat produced during burning of S is not quite sufficient to decompose NO. As a result sulphur stops burning when dropped in gas containing NO. (1)

(v) When sodium sulphite is heated with sulphur, we get sodium thiosulphate which is soluble in water that is why sulphur disappears.

$$Na_2SO_3 + S \xrightarrow{heat} Na_2S_2O_3 \text{ (sodium thiosulphate)}$$ (1)

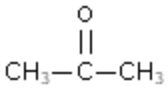
Ans30:

(a)

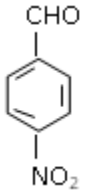


(b) $C_6H_5CH_2COCH_3$

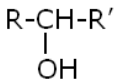
(c)



(d)



(e)

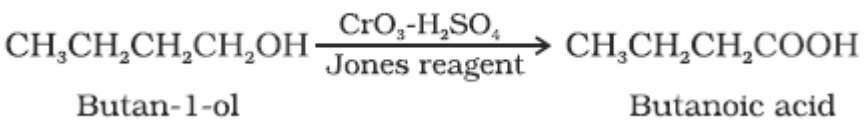


(5 x 1 = 5)

OR

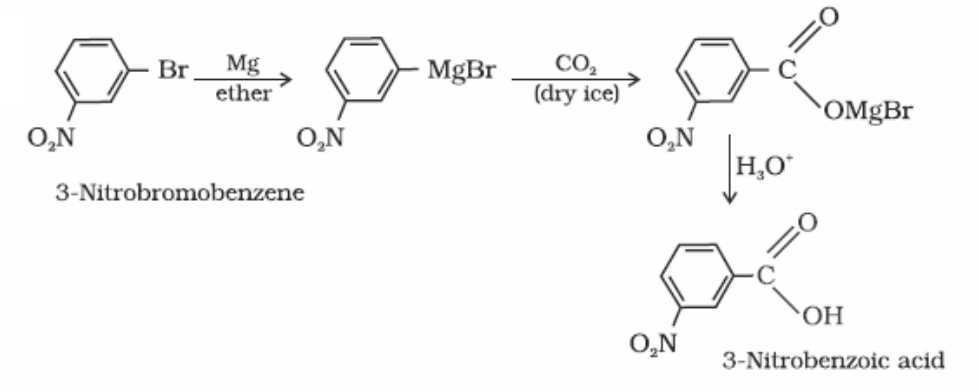
Ans 30:

(i) Butan-1-ol to butanoic acid



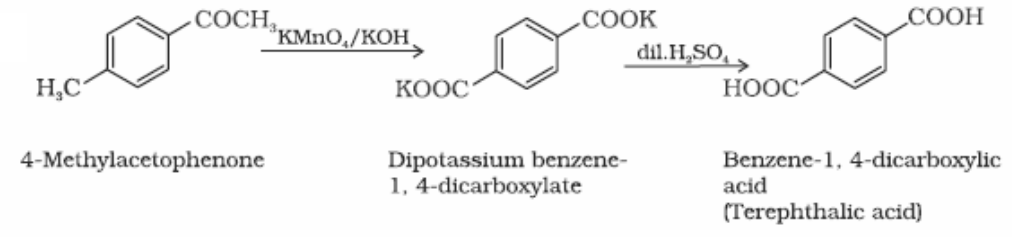
(1)

(ii) 3-Nitrobromobenzene to 3-nitrobenzoic acid



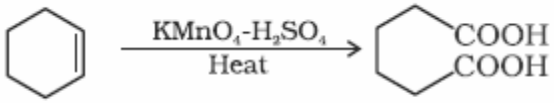
(2)

(iii) 4-Methylacetophenone to benzene-1, 4-dicarboxylic acid



(1)

(iv) Cyclohexene to hexane-1, 6-dioic acid



(1)