OSDAV Public School, Kaithal
Pre-Board Exams (2024-25)
Class : XII
Subject : CHEMISTRY

SET- A

Time: 3 Hrs .

M.M. : 70

General Instructions:-

All questions are compulsory.

(a) There are 33 questions in this question paper.

(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 7 short answer questions carrying 3 marks each.

(e) SECTION D consists of 2 case - based questions carrying 4 marks.

(f) SECTION E consists of 3 long answer questions carrying 5 marks.

(g) Use of log tables and calculators is not allowed.

Q.N.	Questions	Marks
	SECTION -A **The following questions are multiple choice questions with one correct answer.** **Each question carries 1 mark. There is no internal choice in this section.**	
1	Identify the order of reaction if k = 3 x 10 $^{-4}$ sec^{-1} a. first order b. pseudo first order c. second order d. third order	1
2	Which one of the following pairs will not form an ideal solution? a. benzene and toluene b. Nitric acid and water c. hexane and heptane d. Ethyl chloride and ethyl bromide	1
3	Which of the following purines (nitrogenous bases with two ring structure) are common to RNA and DNA? a. Adenine , Thymine b. Guanine, Thymine c. Thymine, Cytosine a. Adenine, Guanine	1
4	Which of the following does not give aldol condensation? a. Ethanal b. Benzaldehyde c. Propane-2-one d. cyclohexane carbaldehyde	1
5	Match Column I with Column II:	1

Match Column I with Column II:

Column I	Column II
p) Alkyl group R attached to halogen atom (R-X)	i) Haloarenes
q) sp^2 hybridisation	ii) Haloalkanes
r) Inversion of configuration occurs	iii) S$_N$2

a) P-(ii) q-(i) r-(iii)
b) P-(iii) q-(ii) r-(i)
c) P-(i) q-(ii) r-(iii)
d) None of these

Q.N.	Questions	Marks
6	Which of the following is reducing sugar? a. Fructose b. Starch c. Cellulose d. Sucrose	1
7	How many Faradays are required to reduce 1 mol of MnO_4^- to Mn^{2+}? a.3 b.4 c.5 d.6	1
8	Which of the following alcohols will not undergo oxidation? a. Butanol b. Butan-2-ol c. 2-methylbutan-2-ol d. 3 -Methylbutan-2-ol	1
9	The IUPAC name of anisole is:	1

	a. 2-methyltoluene b. Methyl phenyl ether c. Methoxybenzene d. Ethoxybenzene	
10	Which of the following is most reactive in nucleophilic addition reaction; a. HCHO b. CH_3CHO c. CH_3COCH_3 d. $CH_3COC_2H_5$	1
11	Which of the following would be among the products of the reactions when ammonia reacts with bromoethane 1. $CH_3CH_2NH_2$ 2. $(CH_3CH_2)_2NH$ 3. $(CH_3CH_2)_3N^-$ 4. $(CH_3CH_2)_4N^+Br^-$ a. Only 1 b. Only 1 and 2 c. Only 1, 2 and 3 d. All 1,2,3 and 4	1
12	What is the oxidation state of Cobalt in $[Co(en)_2 Cl_2]Br$? a.+1 b. +2 c.+3 d.+6	1

13	In the following questions (Q.13-16) a statement of assertion followed by a statementof reason is given. Choose the correct out of following:
	    a. Both A and R are true and R is the correct explanation of A
	    b. Both A and R are true but R is not the correct explanation of A
	    c. A is true but R is false
	    d. A is false but R is true
	Assertion: The Boiling point of propanol is much higher than that of butane
	Reason: Propanol exhibits intramolecular hydrogen bonding.
		1

14	Assertion: Acetic acid but not formic acid can be halogenated in the presence of red P and Cl_2 Reason: Acetic acid is weaker than formic acid.	1
15	Assertion: Proteins are polymers of amino acids connected by peptide bond. Reason: A tetrapeptide contains 4 amino acids linked by 4 peptide bond	1
16	Assertion: Conductivity of an electrolyte increases with decrease in concentration. Reason: Number of ions per unit volume decreases on dilution	1
	SECTION-B **This section contains 5 questions .Thefollowing questions are very short answer type and carry 2 marks each**	
17	A first order reaction takes 69.3 min for 50% completion. What is the time required for 80% of the reaction to get completed (log 5= 0.6990, log 8= 0.9030 , log 2= 0.3010)	2
18	The vapour pressure of pure liquid X and pure liquid Y at 298K are 120 mmHg and 160 mmHg respectively. If equal moles of X and Y are mixed to form ideal solution. Calculate vapour pressure of solution.	2
19	Why is boiling point of o-dichlorobenzene higher than p-dichlorobenzene but melting point of para isomer is higher than ortho isomer?	2

20	How will you convert the following:
	    a. Toluene to benzoic acid
	    b. Ethanol to 3-Hydroxybutanal
		1
		
		1

21	Account for the following: a. There are 5 -OH groups in glucose b. Glucose contains 6 carbon atoms in straight chain	2
22	**SECTION-C** **This section contains 7 questions .Thefollowing questions are short answer type and carry 3 marks each.** a) On the basis of crystal field theory write the electronic configuration for d^4 ion with a strong field ligand for which $\Delta o > P$.	1

	(b) [Ni(CO)$_4$] has tetrahedral geometry while [Ni(CN)$_4$]$^{2-}$ has square planar yet both exhibit diamagnetism. Explain. (Atomic number: Ni = 28]	2
23	Represent the cell in which the following reaction takes place. The value of E° for the cell is 1.260 V. What is the value of E$_{cell}$? 2Al(s) + 3Cd^{+2}(0.1M) → 3Cd(s) + 2Al^{+3} (0.01M)	3
24	(a) Why is the C - O bond length in phenols less than that in methanol? (b) Arrange the following in order of increasing boiling point: Ethoxyethane, Butanal, Butanol, n-butane (c) How can phenol be prepared from anisole? Give reaction.	1 1 1
25	a. Complete the following reactions: 1. C$_6$H$_5$COOH $\xrightarrow{PCl_5}$ A $\xrightarrow{H_2/Pd\text{-}BaSO_4}$ B 2. CH$_3$CN $\xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) CH}_3\text{MgBr}}$ A $\xrightarrow{Zn(Hg)/HCl}$ B b. State the position on the ring at which electrophilic substitution is likely to predominate in benzaldehyde. Explain why?	1 1 1
26	a. Name the vitamin which is responsible for coagulation of blood. b. What type of linkage is present in nucleic acids? c. What is the difference between structure of glucose and fructose	1 1 1
27	Write the mechanism of the following reaction (mentioning all the steps) CH$_3$CH$_2$OH $\xrightarrow{\text{conc. H}_2\text{SO}_4}$ CH$_2$=CH$_2$ + H$_2$O	3
28	The rate of reaction at 700K is 4 times faster than the rate at a lower temperature T. The energy of activation is 20.19 x 10^3 J/mol and the rate constant at 700K is 0.08 sec^{-1} 1) Calculate the rate constant at temperature T 2) Find Temperature T (use R = 8.31 J/mol) , (log 4 = 0.6021)	3
29	**Section-D** **The following questions are case-based questions. Each question carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow** Crystal field theory is an electrostatic model which considers metal ligand bond to be ionic arising purely from electrostatic interaction between the metal ion and ligand. Ligands are treated as point charges in case of anions or dipoles in case of neutral molecules. The five d orbitals in an isolated gaseous metal atom/ion have same energy, that is they are degenerate. This degeneracy is maintained if a spherically symmetrical field of negative charges surrounds the metal atom/ion. However when this negative field is due to ligands in a complex, it becomes asymmetrical and the degeneracy of the d orbitals is lifted.It results in splitting of d orbitals. a. The CFSE for [CoCl$_6$]$^{4-}$ is 18,000 cm^{-1}. Calculate the CFSE for [CoCl$_4$]$^{-2}$ b. What kind of isomerism exists in [Cr (H$_2$O)$_6$]Cl$_3$ and [Cr (H$_2$O)$_5$Cl]Cl$_2$.H$_2$O c. Write Hybridisation and magnetic character of [Fe (H$_2$O$_6$]$^{+2}$	 1 1 2
30	**Read the passage carefully and answer the questions that follow:** Electrochemical cells are of two types : primary cells and secondary cells. Primary cells include dry cells , mercury cells etc. The lead acid battery represents the oldest rechargeable battery. Lead acid batteries can be found in wide variety of applications including small scale power storage such as UPS systems, ignition power sources for automobiles , along with large grid scale power systems. The spongy lead act as anode and lead dioxide act as cathode. a. What are secondary cells? b. Write the reactions which occur at anode and cathode during recharging of lead storage battery. c. Name the cell which is used in transistors?	 1 2 1

		Section-E	
		The following questions are long answer type and carry 5 marks each.	
31		Account for the following:	
		(i) Transition elements form interstitial compounds.	**1**
		(ii)Mn^{+3} is strongly oxidising whereas Cr^{+2} is strongly reducing.	**1**
		(iii) Transition metals have high melting point.	**1**
		(iv) Why Mn_2O_3 is basic but Mn_2O_7 is acidic	**1**
		(v) Write the equation showing the effect of pH on dichromate ion solution?	**1**
32		An organic compound A with molecular formula C_7H_7NO reacts with Br_2/aq.KOH to give compound B, which on reaction with $NaNO_2$ and HCl at 0^0C gives C. Compound C on heating with C_2H_5OH gives a hydrocarbon D. Compound B on further reaction with Br_2 water gives white precipitate of compound E . Identify A,B,C,D and E and also justify your answer by giving relevant chemical equation.	**5**
		Or	
		a. Write the reactions involved in:	**2**
		1. Carbyl amine test	
		2. Gabriel phthalimide synthesis	
		b. Give reasons:	
		1. Aniline on nitration gives good amount of m- nitroaniline, though -NH_2 is o/p directing in electrophilic substitution reactions.	**3**
		2. $(CH_3)_2NH$ is more basic than ($CH_3)_3N$ in an aqueous solution.	
		3. Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.	
33		a. Why is boiling point of 1M NaCl solution more than that of 1M glucose solution?	**1**
		b. Calculate the boiling point elevation for a solution prepared by adding 10g of $MgCl_2$ to 200g of water assuming $MgCl_2$ is completely dissociated.	**2**
		c. Write two differences between ideal and non ideal solutions.	**2**

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SET- B

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(g) Use of log tables and calculators is not allowed.

Q.N.	Questions	Marks
	SECTION -A **The following questions are multiple choice questions with one correct answer.** **Each question carries 1 mark. There is no internal choice in this section.**	
1	The unit of rate constant for the reaction $2A + 2B \longrightarrow A_2B_2$ which has rate = $[A]^2[B]$ a. $Mol\ L^{-1}\ sec^{-1}$ b. Sec^{-1} c. $Mol\ L^{-1}$ d. $Mol^{-2}\ L^2\ sec^{-1}$	1
2	Which one of the following aq. Solutions have highest boiling point? a. 1 M NaOH b. 1 M Na_2SO_4 c. 1 M NH_4NO_3 d. 1 M KNO_3	1
3	$KMnO_4$ is coloured due to: a. d-d transitions b. charge transfer from ligand to metal c. charge transfer from metal to ligand d. unpaired electrons in d orbitals of Mn	1
4	Which kind of compounds undergo Cannizaro reactions? a. Ketones with no alpha hydrogen b. Aldehydes with alpha hydrogen c. Carboxylic acids with alpha hydrogen d. Aldehydes with no alpha hydrogen	1
5	Match Column I with Column II: <table><tr><td>Column I</td><td>Column II</td></tr><tr><td>p) Alkyl group R attached to halogen atom (R-X)</td><td>i) Haloarenes</td></tr><tr><td>q) sp² hybridisation</td><td>ii) Haloalkanes</td></tr><tr><td>r) Inversion of configuration occurs</td><td>iii) S_N2</td></tr></table> a) P-(ii) q-(i) r-(iii) b) P-(iii) q-(ii) r-(i)	1

	c) P-(i) q-(ii) r-(iii) d) None of these	
6	Which of the following is non reducing sugar? a. Fructose b. Maltose c. glucose d. Sucrose	1
7	How many Faradays are required to reduce 1 mol of MnO_4^- to Mn^{2+}? a.3 b.4 c.5 d.6	1
8	Which of the following alcohols will not undergo oxidation? a. Butanol b. Butan-2-ol c. 2-methylbutan-2-ol d. 3 -Methylbutan-2-ol	1
9	What is the mixture of D (+) glucose and D (-) fructose known as: a. Anomers b. Invert sugars c. Racemic Mixtures d. Optical mixture	1
10	Which of the following is least reactive in nucleophilic addition reaction; a. HCHO b. CH_3CHO c. $C_6H_5COC_6H_5$ d. $CH_3COC_2H_5$	1
11	Which of the following would be among the products of the reactions when ammonia reacts with bromoethane 1. $CH_3CH_2NH_2$ 2. $(CH_3CH_2)_2NH$ 3. $(CH_3CH_2)_3N^-$ 4.$(CH_3CH_2)_4N^+Br^-$ a. Only 1 b. Only 1 and 2 c. Only 1, 2 and 3 d. All 1,2,3 and 4	1
12	What is the oxidation state of Fe in $[Fe(CO)_5]$? a.+1 b. +2 c.+3 d. 0	1

	In the following questions (Q.13-16) a statement of assertion followed by a statementof reason is given. Choose the correct out of following:
	    a. Both A and R are true and R is the correct explanation of A
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	    c. A is true but R is false
	    d. A is false but R is true	

13	Assertion: Linkage isomerism arises in co ordination compounds containing ambidentate ligand Reason: Ambidentate ligand has two different donor atoms	1
14	Assertion: Benzoic acids does not undergo Friedel craft reaction Reason: The carboxyl group is activating group and undergo electrophilic substitution reaction	1
15	Assertion: Proteins are polymers of amino acids connected by peptide bond. Reason: A tetrapeptide contains 4 amino acids linked by 4 peptide bond	1
16	Assertion: Conductivity of an electrolyte increases with decrease in concentration. Reason: Number of ions per unit volume decreases on dilution	1
	SECTION-B **This section contains 5 questions .Thefollowing questions are very short answer type and carry 2 marks each**	
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18	The vapour pressure of pure liquid X and pure liquid Y at 298K are 120 mmHg and 160 mmHg respectively. If equal moles of X and Y are mixed to form ideal solution. Calculate vapour pressure of solution.	2
19	A first order reaction takes 69.3 min for 50% completion. What is the time required for 80% of the reaction to get completed (log 5= 0.6990, log 8= 0.9030 , log 2= 0.3010)	2
20	How will you convert the following: a. Toluene to benzoic acid	1

		b. Ethanol to 3-Hydroxybutanal	1
21	Account for the following: a. There are 5 -OH groups in glucose b. Glucose contains 6 carbon atoms in straight chain		2

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This section contains 7 questions .Thefollowing questions are short answer type and carry 3 marks each.</td></tr>
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22	a) On the basis of crystal field theory write the electronic configuration for d^6 ion with a weak field ligand for which $\Delta o < P$. (b) [Ni(CO)$_4$] has tetrahedral geometry while [Ni(CN)$_4$]$^{2-}$ has square planar yet both exhibit diamagnetism.Explain. (Atomic number: Ni = 28)	1 2
23	Represent the cell in which the following reaction takes place. The value of E° for the cell is 1.260 V. What is the value of E_{cell}? $2Al(s) + 3Cd^{+2}(0.1M) \rightarrow 3Cd(s) + 2Al^{+3}(0.01M)$	3
24	a. Name the vitamin whose deficiency causes night blindness b. What type of linkage is present in proteins? c. What is the difference between structure of DNA and RNA.	1 1 1
25	a. Complete the following reactions: 1. C_6H_5COOH $\xrightarrow{PCl_5}$ A $\xrightarrow{H_2/Pd\text{-}BaSO_4}$ B 2. CH_3CN $\xrightarrow[\text{ii) } H_3O^+]{\text{i) } CH_3MgBr}$ A $\xrightarrow{Zn(Hg)/HCl}$ B b. State the position on the ring at which electrophilic substitution is likely to predominate in benzaldehyde. Explain why?	1 1 1
26	(a) Why is the C - O bond length in phenols less than that in methanol? (b) Arrange the following in order of increasing boiling point: Ethoxyethane, Butanal, Butanol, n-butane (c) How can phenol be prepared from anisole? Give reaction	1 1 1
27	Write the mechanism of the acid catalysed hydration of alkenes to yield alcohols.(Mention all the steps).	3
28	The rate of reaction at 700K is 4 times faster than the rate at a lower temperature T. The energy of activation is 20.19 x 10^3 J/mol and the rate constant at 700K is 0.08 sec^{-1} 1) Calculate the rate constant at temperature T 2) Find Temperature T (use R = 8.31 J/mol) , (log 4 = 0.6021)	3

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The following questions are case-based questions. Each question carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow</td></tr>
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29	Crystal field theory is an electrostatic model which considers metal ligand bond to be ionic arising purely from electrostatic interaction between the metal ion and ligand. Ligands are treated as point charges in case of anions or dipoles in case of neutral molecules. The five d orbitals in an isolated gaseous metal atom/ion have same energy, that is they are degenerate. This degeneracy is maintained if a spherically symmetrical field of negative charges surrounds the metal atom/ion. However when this negative field is due to ligands in a complex, it becomes asymmetrical and the degeneracy of the d orbitals is lifted.It results in splitting of d orbitals. a. The CFSE for [CoCl$_6$]$^{4-}$ is 18,000 cm^{-1}. Calculate the CFSE for [CoCl$_4$]$^{-2}$ b. What kind of isomerism exists in [Cr (H$_2$O)$_6$]Cl$_3$ and [Cr (H$_2$O)$_5$Cl]Cl$_2$.H$_2$O c. Write Hybridisation and magnetic character of [Fe (H$_2$O$_6$]$^{+2}$	 1 1 2

30	**Read the passage carefully and answer the questions that follow:**
	Electrochemical cells are of two types : primary cells and secondary cells. Primary cells include dry cells , mercury cells etc. The lead acid battery represents the oldest rechargeable battery. Lead acid batteries can be found in wide variety of applications including small scale power storage such as UPS systems, ignition power sources for automobiles , along with large grid scale power systems. The spongy lead act as anode and lead dioxide act as cathode.
	   a. What are secondary cells?
	   b. Write the reactions which occur at anode and cathode during discharging of lead storage battery.
	   c. Name the cell which is used in wrist watch?
		
		1
		2
		
		1

Section-E
The following questions are long answer type and carry 5 marks each.

31	An organic compound A with molecular formula C_7H_7NO reacts with Br_2/aq.KOH to give compound B, which on reaction with $NaNO_2$ and HCl at 0^0C gives C. Compound C on heating with C_2H_5OH gives a hydrocarbon D. Compound B on further reaction with Br_2 water gives white precipitate of compound E . Identify A,B,C,D and E and also justify your answer by giving relevant chemical equation.
	 Or a. Write the reactions involved in:
	    1. Hoffmann Bromamide degradation
	    2. Gabriel phthalimide synthesis
	b. Give reasons:
	    1. Aniline on nitration gives good amount of m- nitroaniline, though $-NH_2$ is o/p directing in electrophilic substitution reactions.
	    2. $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.
	    3. Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.
		5
		
		2
		
		3

32	Account for the following: (i) Why Zn,Cd and Hg are soft and have low melting point. (ii)Mn^{+3} is strongly oxidising whereas Cr^{+2} is strongly reducing. (iii) Zr and Hf have almost identical radii. (iv) Why Transition metals can behave as alloys (v) Write the equation showing the effect of pH on dichromate ion solution?	5
33	a. Why is boiling point of 1M NaCl solution more than that of 1M glucose solution? b. Calculate the boiling point elevation for a solution prepared by adding 10g of $MgCl_2$ to 200g of water assuming $MgCl_2$ is completely dissociated. c. State Raoult's law for a solution containing volatile components. Write two characteristics of the solution which obey Raoult's law.	1 2 2

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Answer-Key
Section-A

1. (a) First order

2. (b) Nitric acid and water

3. (d) Adenine, Guanine

4. (b) Benzaldehyde

5. (a) P-(ii), Q-(i), R-(iii)

6. (a) Fructose

7. (c) 5

8. (c) 2-Methylbutan-2-ol

9. (c) Methoxybenzene

10. (a) HCHO

11. (d) All 1, 2, 3, and 4

12. (c) +3

13. (c) A is true but R is false

14. (c) A is true but R is false

15. (c) A is true but R is false

16. (c) A is true but R is false

Section-B

Q18.

At 25°C, Pure vapour pressure of liquid X and Y are

$P^0_X = 120$ mm Hg and $P^0_Y = 160$ mm Hg

Let the number of moles of liquid X and Y be 'n'

$$X_X = \frac{n}{n+n}$$

then, $X_X = X_Y = \dfrac{1}{2} = 0.5$

Total vapour pressure of solution will be,

$$P_T = P^0_X X_X + P^0_Y X_Y$$

$$= 120 \times 0.5 + 160 \times 0.5$$

$$= 60 + 80$$

$$= 140 \text{ mm of Hg}$$

Q19. O-Dichlorobenzene has a bit higher boiling point due to Resonance and inductive effects which are slightly lower in para and resonance absent in meta but para isomer has more melting point because it has symmetric structure due to which it has strong bonding .

Q20.A

B.

$$CH_3CH_2OH \xrightarrow[\substack{CrO_3 \text{In anhy medium}}]{\text{Oxidation}} \underset{\text{Ethanal}}{CH_3CHO}$$

$$\xrightarrow[\substack{\text{Condensation}}]{\text{Aldol}} CH_3\underset{\substack{|\\OH}}{CH}CH_2CHO$$

3-hydroxy butanal

Q21.A

B.

CHO
|
(CHOH)$_4$ $\xrightarrow[\text{Heat}]{\text{HI}}$
|
CH$_2$OH   n-hexane

Glucose
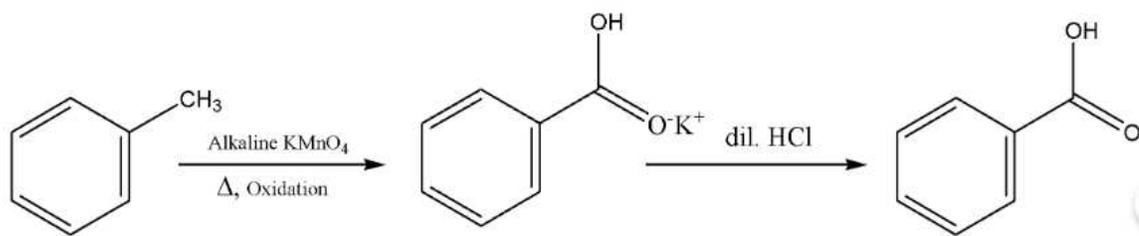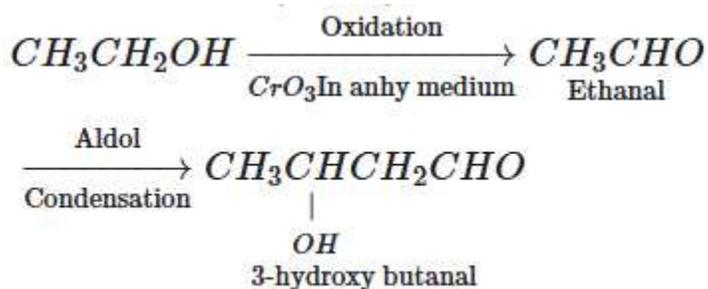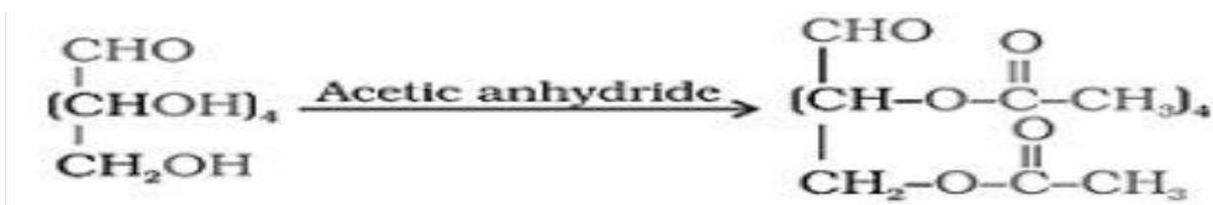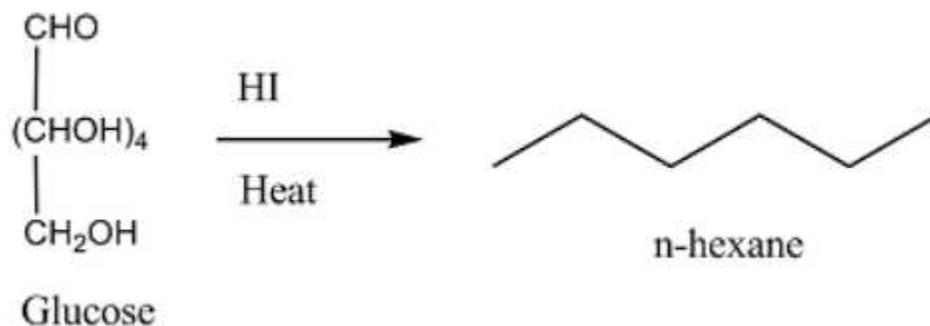
Section-C

Q22.A

Electronic configuration for d^4 ion, if $\Delta_0 > P$

$$t_{2g}^4 e_g^0$$
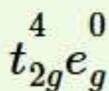
B.

In $[Ni(CN)_4]^{2-}$, nickel is in a +2 oxidation state and the ion has the electronic configuration $3d^8$. The hybridisation scheme is shown in the diagram.
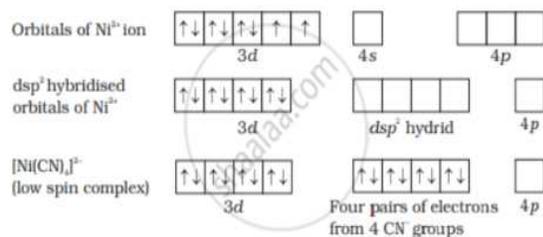
Whereas in $[Ni(CO)_4]$, Ni is in a +2 oxidation state and shows sp^2 hybridisation due to which its geometry is tetrahedral.

Q23.

Al(s) /Cd^{2+} (0.1M) // Al^{3+} (0.01M) /Cd(s)

$2\,Al(s) + 3\,Cd^{2+}\,(0.1\,M) \longrightarrow 3\,Cd\,(s) + 2\,Al^{3+}\,(0.01\,M)$
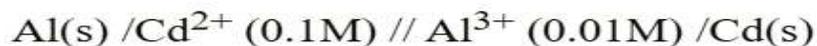
$Ecell = E°cell\ \dfrac{-0.059}{n}\log\dfrac{\left[Al^{3+}\right]^2}{\left[Cd^{2+}\right]^3}$

$Ecell = 1.26 - \dfrac{0.059}{6}\log\dfrac{(0.01)^2}{(0.1)^3}$

$= 1.26 - \dfrac{0.059}{6}(-1)$

$= 1.26 + 0.009$

$= 1.269\,V$

Q24.A

The carbon-oxygen bond length in phenol (136 pm) is somewhat shorter than that in methanol. This is owing to the partial double bond character of the unshared electron pair of oxygen conjugated with the aromatic ring and the sp^2 hybridised state of carbon to which oxygen is connected

B. n-butane < ethoxyethane < butanal <butanol

C.

When anisole reacts with HI, the primary products are phenol and CH$_3$I.

Q25.A.1

$$C_6H_5COOH \xrightarrow{PCl_5} \underset{A}{C_6H_5COCl} \xrightarrow{H_z-Pd/BaSO_4} \underset{B}{C_6H_5CHO}$$

2.

Ketimine
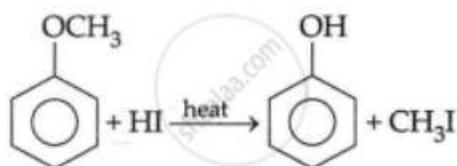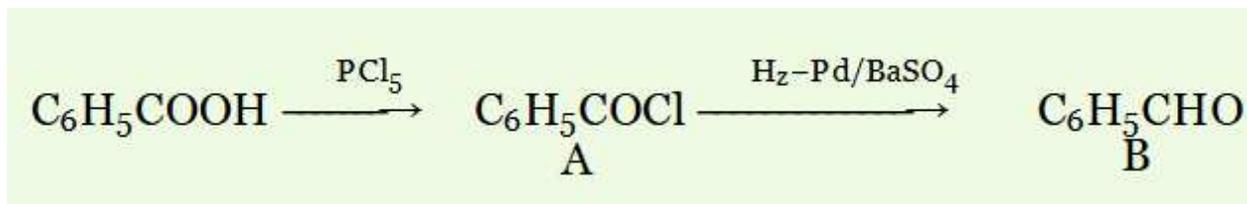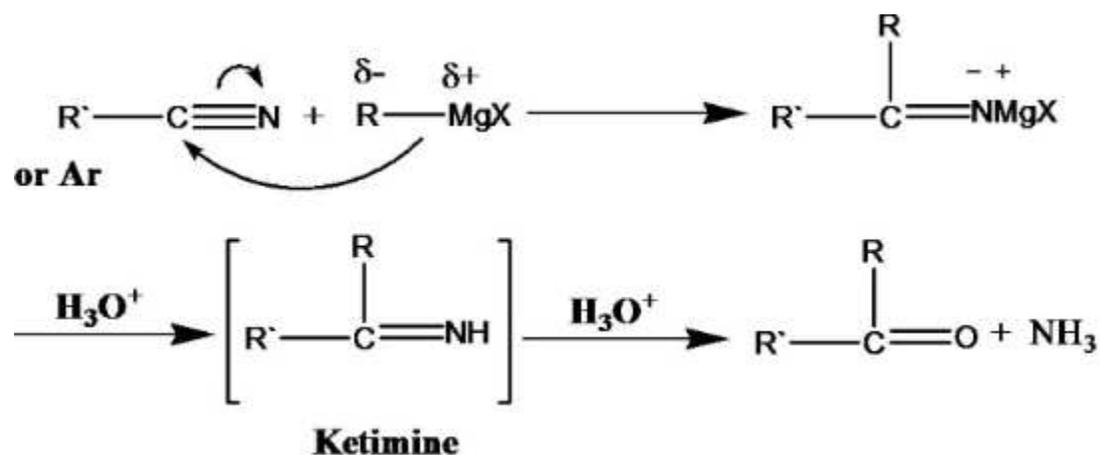
B. Thus electrphilic substitutions in benzaldehyde occur under drastic condition. In other words -CHO group is deactivating in nature. Further the decrease in electron density is more at the o and p-positions therefore electrophilic substitution occurs only at m-position.

Q26.A) Vitamin-K

B. Phosphodiester linkage

C.

Both Glucose and Fructose are hexose sugars with six carbon atoms but Glucose is an aldohexose and fructose is ketohexose which means the functional group present in glucose is an aldehyde and the functional group in fructose is a ketone.

```
         O  H OH OH
         ||  |  |  |
CH₂OH—C—C—C—C—CH₂OH
            |  |  |
            HO H  H
         D-fructose
      OH  H OH OH
       |  |  |  |
CHO—C—C—C—C—CH₂OH
       |  |  |  |
       H HO H  H
         D-glucose
```
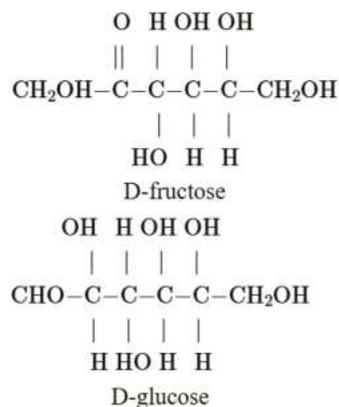
Q27.

## Mechanism: Dehydration of ethanol

Step 1: Formation of Protonated alcohol
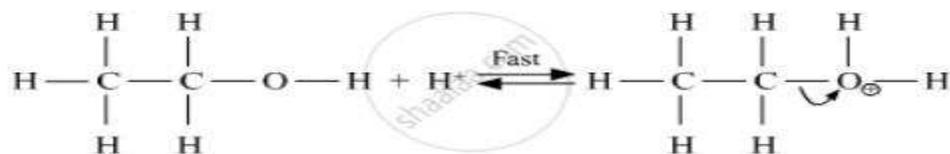
Step 2: Formation of carbocation(slow step)

Step 3: Formation of ethane
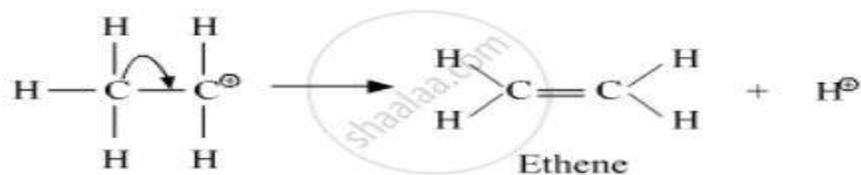
Q29.A

$$CFSE_{tetrahedral} = \frac{4}{9} \times CFSE_{octahedral}$$

$$CFSE_{tetrahedral} = \frac{4}{9} \times 18,000\,cm^{-1}$$

$$CFSE_{tetrahedral} = 8,000\,cm^{-1}$$

B. Solvate isomerism

C.

Hybridisation - sp^3d^2

Magnetic character- Strongly paramagnetic

$[Fe(H_2O)_6]^{2+}$
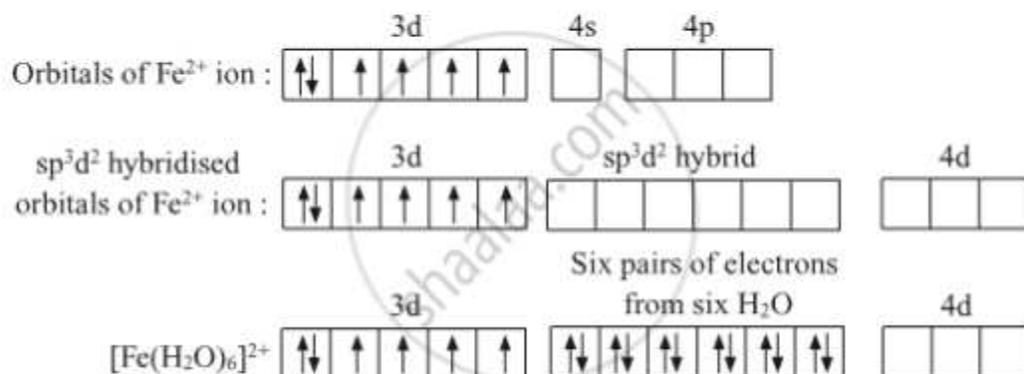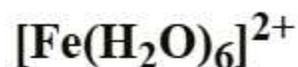
Q30.A-

An electric cell that can be rechargeable and can therefore be used to store electrical energy in the form of chemical energy is called secondary cell.

B.

- Reaction involved during the recharging of the battery:

Anode: $PbSO_4(s) + 2H_2O(l) \rightarrow PbO_2(s) + 4H^+(aq) + 2SO_4^{2-}(aq) + 2e^-$
Cathode: $PbSO_4(s) + 2e^- \rightarrow Pb(s) + SO_4^{2-}(aq)$

C. Dry Cell

Section-E

Q31.(I)-

Most of the transition metals exists as CCP and HCP in which we can observe many vacant places (holes), these holes are occupied by elements like oxygen nitrogen hydrogen carbon etc., leading to the formation of interstitial compounds.

(II)

Cr^{2+} has the configuration $3d^4$. It can lose electron to form $3d^3$ which has stable configuration (as it has half-filled $t_{2}g$ level). Hence, it is reducing. On the other hand, Mn^{3+} also has $3d^4$. configuration but it can gain electron to form Mn^{2+} which has stable $3d^5$. configuration (as it is exactly half-filled). Hence oxidising.

(III) Due to presence of unpaired electron in their atoms, transition elements in general, have stronger interatomic interaction and hence stronger bonding between atoms.

(IV) Mn2O3 is basic due to the presence of d-electrons that can be donated, while Mn2O7 is acidic because it has a higher oxidation state, leading to a deficiency of electrons and a tendency to accept electron pairs.

(V)

The chromates and dichromates are interconvertible in aqueous solution depending upon pH of the solution. Increasing the pH (in basic solution) of dichromate ions a colour change from orange to yellow is observed as dichromate ions change to chromate ions.

Q32.

A: Benzamide $(C_6H_5C(=O)NH_2)$

B: Aniline $(C_6H_5NH_2)$

C: Benzene diazonium chloride $(C_6H_5N_2Cl)$

D: Ethylbenzene $(C_6H_5C_2H_5)$

E: 2,4,5–Tribromoaniline $(C_6H_2Br_3NH_2)$

OR

A.1-

$$\underset{\text{Primary amine}}{R-NH_2} + \underset{\text{Chloroform}}{CHCl_3} + \underset{\text{Potassium hydroxide}}{3KOH} \rightarrow \underset{\text{Carbylamine}}{R-NC} + 3KCl + 3H_2O$$

2.

Phthalimide

N-Alkylphthalimide

+ $R - NH_2$

(1° amine)
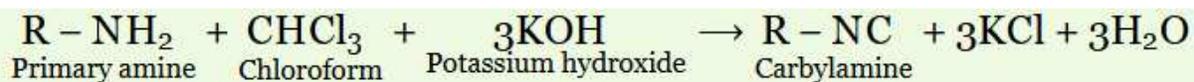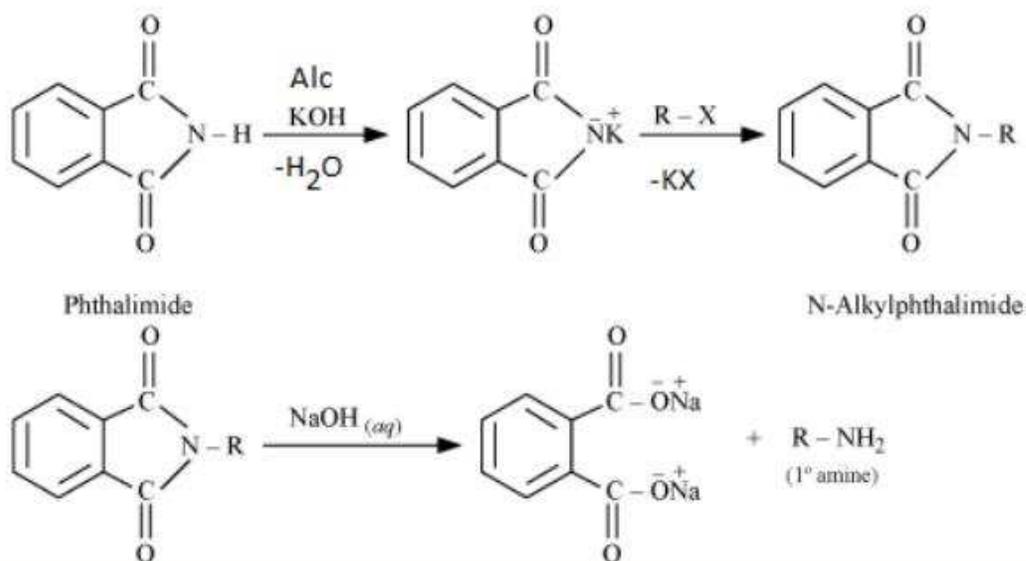
B.1- Nitration is carried out in an acidic medium. In a strongly acidic medium, aniline is protonated to give anilinium ion (which is meta-directing). For this reason, aniline on nitration gives a substantial amount of m-nitroaniline.

2.

$(CH_3)_2NH_2^+$ is hydrated to a greater extent than $(CH_3)_3NH^+$. As the number of methyl groups increases, the extent of hydration decreases due to steric hindrance. Greater is the extent of hydration, greater is the stability of ion and greater is the basic strength of amine.

3. The process of ammonolysis yields a mixture of primary secondary tertiary amines and quaternary salts. The separation of this amines is a very complicated process and difficult. Therefore it is difficult to prepare pure amines by ammonolysis of alkyl halides.

Q33.A-

Because the van't Hoff factor of 1 M NaCl (2) solution is bigger than that of 1 M glucose (1) solution, boiling point is directly proportional to molality and van't Hoff factor. As a result, the boiling point of 1 M NaCl is higher than that of 1 M glucose solution.

B.

We know that

$$\Delta T_b = iK_b m$$

$$MgCl_2 \longrightarrow \underset{1+2}{Mg^{2+} + 2\,Cl^-}$$
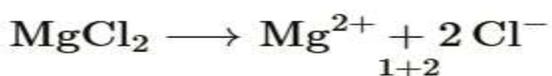
$$i = 3$$

$$\text{Here, } m = \frac{W_B \times 1000}{M_B \times W_A} = 0.526$$

$$\Delta T_b = iK_b m$$

$$= 3 \times 0.512 \times 0.526$$

$$= 0.808 \text{ K}$$

C.

	Ideal solutions	Nonideal solutions
1.	Ideal solutions obey Raoult's law over entire range of concentrations.	Nonideal solutions do not obey Raoult's law over the entire range of concentrations.
2.	The vapour pressure of ideal solution always lies between vapour pressures of pure components.	The vapour pressures of these solutions can be higher or lower than those of pure components.
3.	Solvent-solute, solute-solute and solvent-solvent molecular interactions are comparable.	Solute-solvent intermolecular attractions may be weaker or stronger than those between solute-solute molecules and solvent-solvent molecules.
4.	**e.g.** Benzene + toluene	**e.g.** Ethanol + acetone Carbon disulphide + acetone Phenol + aniline Chloroform + acetone

Set-B

(Different Questions)

1 . D

2. B

3. B

4. D

6. D

8. C

9. B

10. A

12. D

13. A

14. C

15. C

16. D

22. t2g(4) eg(2)

24.a. Vitamin A causes night blindness

   b.peptide linkage is present in proteins

   c. DNA is double stranded and has deoxyribose sugar present in it whereas RNA is single stranded and has ribose sugar present in it

30. c The cell used in wrist watch is mercury cell (also called as button cell)

32 a. Zn,Cd and Hg have completely filled d orbitals therefore their metallic bond is quite weak as a result of which they have low melting point

c. Zr and Hf have identical size due to lanthanoid contraction

d. Transition elements have almost identical radii as a result of which they exist as alloys .

33. c. According to Raoult law the partial vapour pressure of a solution in a solution is directly proportional to its mole fraction in the solution.