



Time: 3Hours

M.M. 70

General Instructions:-

- I. All questions are compulsory.
- II. There are 33 questions in this question paper with internal choice.
- III. SECTION A consists of 16 multiple choice questions carrying 1 mark each.
- IV. SECTION B consists of 5 short answer questions carrying 2 marks each.
- V. SECTION C consists of 7 short answer questions carrying 3 marks each.
- VI. SECTION D consists of 2 case-based questions carrying 4 marks each.
- VII. SECTION E consists of 3 long answer questions carrying 5 marks each.
- VIII. Use of lag tables and calculators is not allowed.

Q.No	Questions	Mark s												
SECTION A														
1	In a Leclanche dry cell, the cathode is: a.Zn Container. b.MnO ₂ c.Graphite rod. d.NH ₄ Cl	1												
2	The reagent that can be used to distinguish acetophenone and benzophenone is: a.2,4DNP b.I ₂ and NaOH c.Fehling solution d. Aq.NaHSO ₃	1												
3	The deficiency of which of the vitamin causes Rickets? a. A b. B c. C d. D	1												
4	Which of the following is most reactive towards nucleophilic addition reactions? a.HCHO b. CH ₃ CHO c. CH ₃ COCH ₃ d. CH ₃ COCH ₂ CH ₃	1												
5	Auto oxidation of chloroform in air and sunlight produces a poisonous gas: a.Tear gas. b. Phosgene gas. c. Mustard gas. d.Chlorine gas	1												
6	Which property of transition metals enable them to behave as catalyst? a.High melting point. b.High ionisation enthalpy c.Alloy formation. d.Variable oxidation state	1												
7	The slope in the plot of [R] vs time for a zero order reaction is : a. +k/2.303 b. -k c. -k/2.303 d. +k	1												
8	Amides can be converted into amines by the reaction named: a.Ammonolysis b.Hoffmann degradation c.Carbylamine d. Diazotisation	1												
9	Match the following: <table><tr><th>I</th><th>II</th></tr><tr><td>(i) Salicylaldehyde</td><td>A. Kolbe's reaction</td></tr><tr><td>(ii) o-nitrophenol</td><td>B. Williamson's synthesis</td></tr><tr><td>(iii) Salicylic acid</td><td>C. Intramolecular Hydrogen bonding</td></tr><tr><td>(iv) p-nitrophenol</td><td>D. Reimer-Tiemann reaction</td></tr><tr><td>(v) Unsymmetrical ethers</td><td></td></tr></table> Which of the following is the best matched option? (a) i-A, ii-C, iii-D, iv-B (b) i-D, v-B, iii-C, iv-A (c) i-D, ii-C, iii-A, v-B (d) i-B, ii-C, iii-A, iv-D	I	II	(i) Salicylaldehyde	A. Kolbe's reaction	(ii) o-nitrophenol	B. Williamson's synthesis	(iii) Salicylic acid	C. Intramolecular Hydrogen bonding	(iv) p-nitrophenol	D. Reimer-Tiemann reaction	(v) Unsymmetrical ethers		1
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(v) Unsymmetrical ethers														
10	The unit of rate constant depend upon the : a. Molecularity of reaction b. Activation Energy of reaction c. Order of reaction. d. Temperature of the reaction	1												
11	When diethyl ether is heated with excess HI, it produces: a. Ethanol. b. Iodoform. c. Methyl iodide. d. Ethyl iodide	1												



12	Which one of the following metals of 3d series has the lowest melting point? a. Fe. b. Mn. c. Zn d. Cu	1																				
13	Given below are two statements labelled as Assertion(A) and Reason(R) Select the most appropriate answer from the options given below: a. Both A and R are true and R is correct explanation of A . b. Both A and R are true but R is not correct explanation of A . c. A is true but R is false. d. A is false but R is true Assertion (A) : o- nitrophenol is a weaker acid than p-nitrophenol. Reason(R) : Intra molecular hydrogen bonding makes ortho isomer weaker than para isomer	1																				
14	Assertion (A) : Benzoic acid does not undergo Friedel craft reaction. Reason(R) : The carboxyl group is activating and undergo electrophilic substitution reactions.	1																				
15	Assertion (A) : All enzymes are made up of proteins and all proteins have three dimensional structure. Reason(R) : Secondary structure of proteins is a sequence of amino acids.	1																				
16	Assertion (A) : Electrolysis of aqueous solution of NaCl gives chlorine gas at anode instead of O ₂ . Reason(R) : Formation of O ₂ gas at anode requires over potential.	1																				
SECTION- B																						
17	The following data were obtained for the reaction: 2NO+ O ₂ -----> 2NO ₂																					
	<table><tr><th>Exp.</th><th>[NO]/M</th><th>[O₂]/M</th><th>Initial rate of formation of NO₂/M min⁻¹</th></tr><tr><td>1</td><td>0.3</td><td>0.2</td><td>7.2 × 10⁻²</td></tr><tr><td>2</td><td>0.1</td><td>0.1</td><td>6.0 × 10⁻³</td></tr><tr><td>3</td><td>0.3</td><td>0.4</td><td>2.88 × 10⁻¹</td></tr><tr><td>4</td><td>0.4</td><td>0.1</td><td>2.40 × 10⁻²</td></tr></table>	Exp.	[NO]/M	[O ₂]/M	Initial rate of formation of NO ₂ /M min ⁻¹	1	0.3	0.2	7.2 × 10 ⁻²	2	0.1	0.1	6.0 × 10 ⁻³	3	0.3	0.4	2.88 × 10 ⁻¹	4	0.4	0.1	2.40 × 10 ⁻²	
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	(a) Find the order of reaction with respect to NO and O ₂ . (b) Write the rate law and overall order of reaction.	1 1																				
18	A 0.01 m aqueous solution of AlCl ₃ freezes at -0.068°C. Calculate the percentage of dissociation. Given that K _f for water= 1.86 K Kg/mol.	1+1																				
19	What happens when: (a) n- Butyl Chloride is treated with alcohol KOH. (b) 2,4,6 Trinitrochlorobenzene is subjected to hydrolysis.	1 1																				
20	(a) Why is pK _a of ClCH ₂ COOH lower than the pK _a value of CH ₃ COOOH? (b) Write the chemical equation for Hell Volhard-Zelinsky reaction. OR Convert the following:(a) Benzene into m-nitrobenzaldehyde. (b) Bromobenzene to benzoic acid.	1 1 1+1																				
21	Differentiate between: (i) Peptide linkage and Glycosidic linkage (ii) Nucleoside and Nucleotide.	1 1																				
SECTION- C																						
22	(a) [Fe(CN) ₆] ⁴⁻ and [Fe(H ₂ O) ₆] ²⁺ are of different colours in dilute solutions. Why? (b) Discuss briefly giving example in each case the role of coordination compounds	1																				



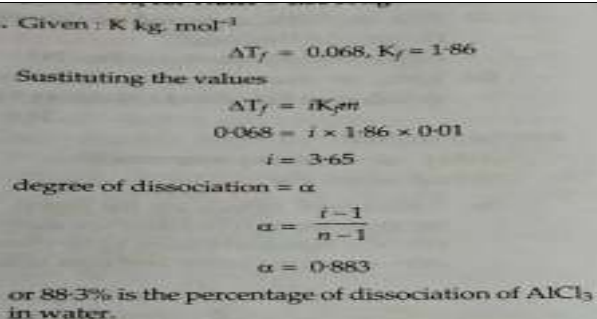
	in : (i) Analytical chemistry. (ii) Biological systems	1+1																
23	Write down cell reaction and calculate the emf of the following cell at 298 K: $\text{Al(s)}/\text{Al}^{3+}(0.001\text{M}) // \text{Ni}^{2+}(0.1\text{M})/\text{Ni(s)}$ Given : $E^\circ \text{Al}^{3+}/\text{Al} = -1.66\text{V}$, $E^\circ \text{Ni}^{2+}/\text{Ni} = -0.25\text{V}$. $\text{Log}(10)=1$	1 2																
24	How can you convert the following: (a) Phenol to o-Hydroxybenzaldehyde (b) Propanamide to Ethanamine(c) Aniline to Phenol	1+1 1																
25	Write the chemical reactions for : (a)Cross aldol condensation (b) Cannizzaro Reaction (c) Clemmensen Reduction	1+1+ 1																
26	Give reasons for the following observations: (a) Amino acids behave like salts. (b) Pentaacetate of glucose does not react with Hydroxyl amine. (c) The two strands of DNA are complementary to each other.	1 1 1																
27	Account for the following: (a) Benzyl chloride is highly reactive towards SN1 reaction. (b) (+ ₂) Butan-2-ol is optically inactive, though contains a chiral carbon. (c) Chloroform is stored in dark colored bottles.	1 1 1																
28	The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308K. Calculate activation energy. $\text{Log}3=0.47$ $\text{Log}4=0.60$ $\text{Log}9= 0.95$ $\text{Log } 10= 1$ $\text{Log}(2.72)= 0.436$ $R=8.314 \text{ JK}^{-1} \text{ mol}^{-1}$	3																
SECTION -D																		
29	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 follows. In coordination compounds, metals show two types of linkages, primary and secondary. Primary valencies are ionisable and are satisfied by negatively charged ions. Secondary valencies are non ionisable and are satisfied by neutral or negative ions having lone pair of electrons. Primary valencies are no directional while secondary valencies decide the shape of the complex.																	
	Answer the following questions (i) If $\text{PtCl}_2 \cdot 2\text{NH}_3$ does not react with AgNO_3 what will be its formula? (ii) What is secondary valency of $[\text{Co(en)}_3]^{3+}$? (iii) Write the hybridization and magnetic behaviour of $[\text{Ni}(\text{CN})_4]^{2-}$	1 1 2																
30	Rahul set up an experiment to find resistance of aqueous KCl solution for different concentrations at 298 K using a conductivity cell connected to a wheatstone bridge with the a.c. power in the audio frequency range 550 to 5000 cycles per second. Once the resistance was calculated from null point he also calculated the conductivity and molar conductivity and recorded his readings in tabular form.																	
	<table><tr><th>S.No.</th><th>Conc. (M)</th><th>κ (S cm^{-1})</th><th>Λ_m ($\text{S cm}^2 \text{mol}^{-1}$)</th></tr><tr><td>1.</td><td>1.00</td><td>111.3×10^{-3}</td><td>111.3</td></tr><tr><td>2.</td><td>0.10</td><td>12.9×10^{-3}</td><td>129.0</td></tr><tr><td>3.</td><td>0.01</td><td>1.41×10^{-3}</td><td>141.0</td></tr></table> Answer the following questions: (a) Why does conductivity decrease with dilution? (b) If $\Lambda_m^\circ \text{KCl}$ is $150.0 \text{ S cm}^2 \text{mol}^{-1}$, calculate the degree of dissociation of 0.01 M KCl. (c) If Rahul had used HCl instead of KCl then would you expect the Λ_m values to be more or less than those per KCl for a given concentration. Justify.	S.No.	Conc. (M)	κ (S cm^{-1})	Λ_m ($\text{S cm}^2 \text{mol}^{-1}$)	1.	1.00	111.3×10^{-3}	111.3	2.	0.10	12.9×10^{-3}	129.0	3.	0.01	1.41×10^{-3}	141.0	1 1 2
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SECTION-E																		



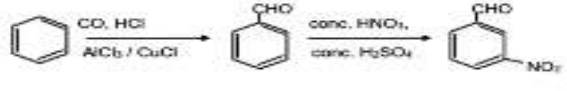
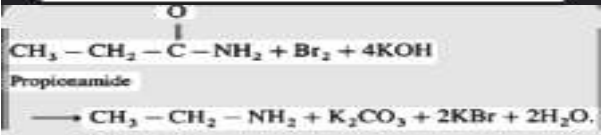
	molecular formula C ₆ H ₇ N. Give the structures and IUPAC names of 'A' , 'B' and 'C'	1
(b)	Distinguish between the following pairs by suitable chemical test: (i) Aniline and ethyl amine (ii) Aniline and Benzyl amine	1+1



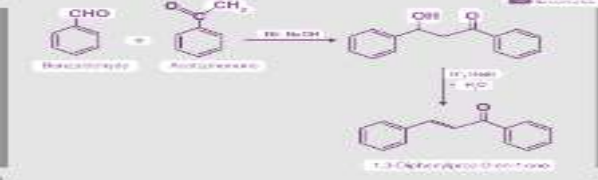
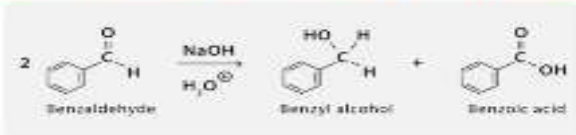
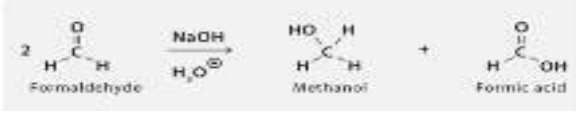
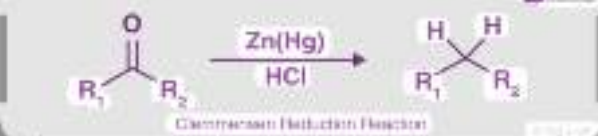
OSDAV Public School, Kaithal
Marking Scheme
December Exams (2024-25)
Subject: CHEMISTRY(043)
Class:XII
Set-A

1	C	
2	B	1
3	D	1
4	A	1
5	B	1
6	D	1
7	B	1
8.	B	1
9	C	1
10	C	1
11	D	1
12	C	1
13	A	1
14	C	1
15	C	1
16	A	1
17	Order wrt NO is 1 and order wrt O2 is 2. Rate law: Rate =K[NO][O2]2. Overall order of reaction is 3	1 1
18	 Given : $K \text{ kg. mol}^{-1}$ $\Delta T_f = 0.068, K_f = 1.86$ Sustituting the values $\Delta T_f = iK_f m$ $0.068 = i \times 1.86 \times 0.01$ $i = 3.65$ degree of dissociation = α $\alpha = \frac{i-1}{n-1}$ $\alpha = 0.883$ or 88.3% is the percentage of dissociation of AlCl_3 in water.	1 1
19	(a) But-1-ene will be formed. (b) 2,4,6 trinitrophenol will be formed.	1 1
20	(a) ClCH_2COOH is stronger acid due to -I effect of Cl, than CH_3COOH . (b) $\text{CH}_3\text{COOH} + \text{Cl}_2 \xrightarrow{\text{RedP}} \text{ClCH}_2\text{COOH}$.	1 1



	The Benzene to m-nitrobenzaldehyde. (a)  (b)  Bromobenzene Phenyl magnesium bromide Benzoic acid	1
21	(a) Peptide Linkage : The bond formed two or more amino acids by the loss of water molecule. Glycosidic Linkage: The etheral linkage formed between two or more monosaccharides units , by the loss of water molecule. (b) Nucleoside: Consist only Pentose Sugar and nitrogeneous base. Nucleotide: Consist of Pentose Sugar , nitrogeneous base and phosphoric acid.	1 1
22	(a) They have different ligands and have different CFSE values. So will absorb different radiation of different wavelengths. (b) Analytical Chemistry: Qualitative analysis of basic radicals. Hardness of water. Biological Systems: Haemoglobin is coordination compound of Fe and Chlorophyll is coordination compound of Mg.	1 1 1
23	$\text{Al}^{3+} + 3\text{e}^{-} \rightarrow \text{Al}$ $E_{\text{Al}} = -1.66\text{V}$ $\text{Ni}^{2+} + 2\text{e}^{-} \rightarrow \text{Ni}$ $E_{\text{Ni}} = -0.25\text{V}$ $E_{\text{cell}}^{\circ} = -0.25 - (-1.66) = 1.41\text{V}$ Thus, aluminium electrode is anode and nickel electrode is cathode reaction. $3\text{Ni}^{2+} + 2\text{Al} \rightarrow 3\text{Ni} + 2\text{Al}^{3+}$ $E^{\circ} = E_{\text{cell}}^{\circ} - \frac{0.0591}{6} \log \frac{(1 \times 10^{-3})^2}{(5 \times 10^{-1})^3}$ $= 1.41 + 0.005319 = 1.415\text{V}$	1 1 1
24	Reimer-Tiemann Reaction - Phenol to Salicylaldehyd...  Salicylaldehyde  Propionamide Ethylamine  Aniline Benzenediazonium chloride Phenol	1 1 1



25	(a)  Cannizzaro Reaction Examples   (b)  (c)	1 1 1
26	(a) Amino acids behave like salts rather than simple amines or carboxylic acids. This behavior is due to the presence of both acidic and basic groups in the same molecule. In aqueous solution, the carboxyl group can lose a proton, an amino group can accept a proton, giving rise to a dipolar ion known as a zwitter ion. (b) Due to absence of free aldehyde group it does not react with hydroxyl group. (c) Cytosine forms hydrogen bond with guanine, while adenine forms hydrogen bond with thymine. As a result, the two strands are complementary to each other.	1 1 1
27	(a) Benzyl carbocation is highly stable due to resonance. (b) It is racemic mixture. It consists of equal amount of dextrorotatory and leavorotatory isomers. (c) In the presence of sunlight it convert into poisonous gas phosgene.	1 1 1
28	For 10% completion of the reaction, we have $k(298) = \frac{2.303}{t} \log \frac{100}{90}$ For 25% completion of the reaction, we have $k(308) = \frac{2.303}{t} \log \frac{100}{75}$ $\frac{k(308)}{k(298)} = \frac{\frac{2.303}{t} \log \frac{100}{75}}{\frac{2.303}{t} \log \frac{100}{90}} = 2.73$ But, $\log \frac{k(308)}{k(298)} = \frac{E_a}{2.303R \left[\frac{T'}{TT'} - 1 \right]}$ $\log 2.73 = \frac{E_a}{2.303 \times 8.314} \times \frac{308 - 298}{308 \times 298}$ $E_a = 76623 \text{ J/mol} = 76.623 \text{ kJ/mol}$	1 1 1
29	(i) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (ii) 6 (iii) dsp^2, square planar and diamagnetic.	1 1



33	(a) A= Benzamide, B= Aniline, C= Phenylisocyanide.	3
	(b)(i) p-Nitroaniline > Aniline > p-toluidine.	1
	(ii) $C_2H_5NH_2 > (C_2H_5)_3N > (C_2H_5)_2NH$	1
	OR	
	(a) A= Benzoic acid. B= Benzamide C= Aniline.	3
	(b) (i) Nitrous acid test: Ethyl amine give N_2 and ethyl alcohol will be formed. Aniline will form diazonium salt.	1
	(ii) Isocyanide test: Aniline give foul smell with chloroform and NaOH. N-Methylaniline will not give this smell.	1



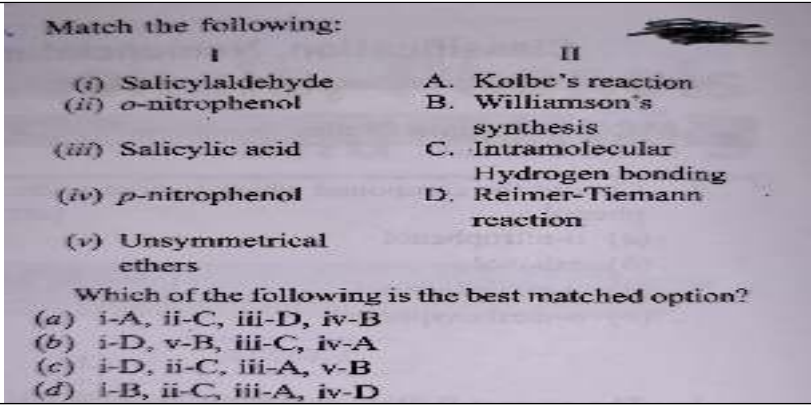


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Q.No	Questions	Marks
SECTION A		
1	Which of the following was used in Apollo space program? a. Mercury cell b. Daniel cell c. Dry cell d. H ₂ -O ₂ Fuel cell	1
2	Acetyl chloride is treated with H ₂ in presence of Pd-BaSO ₄ . The product is: a. CH ₃ CHO b. C ₂ H ₅ OH c. CH ₃ COOH d. CH ₃ COCH ₃	1
3	The deficiency of which of the vitamin causes pernicious anaemia? a. B ₁ b. B ₂ c. B ₆ d. B ₁₂	1
4	Which of the following is most reactive towards nucleophilic addition reactions? a. C ₂ H ₅ CHO b. CH ₃ CHO c. CH ₃ COCH ₃ d. C ₆ H ₅ COC ₆ H ₅	1
5	Which of the following is chiral in nature? a. 2-Bromobutane b. 1- Bromobutane c. 2-Bromopropane d. 2-Bromopropan-2-ol	1
6	Which of the following is strongest oxidising agent? a. Zn ²⁺ b. Sc ³⁺ c. Cr ³⁺ d. Mn ³⁺	1
7	A first order reaction is 50 % completed in 206 s. How much time would it take for 100 % completion? a. 412 s b. 103 s c. Infinite d. 618 s	1
8	Which of the following reagents would not be a good choice for reducing an aryl Nitro compound to an amine a. H ₂ (excess) / Pt b. LiAlH ₄ in ether c. Fe and HCl d. Sn and HCl	1
9		1
10	In the presence of a catalyst, the heat evolved or absorbed during the reaction a. Increases. b. decreases. c. May increase or decrease d. remains unchanged	1
11	Which of the following is most acidic?	



	a. Benzyl alcohol b. Cyclohexanol. c. Phenol d. m-Chlorophenol	1																				
12	Which one of the following metals ions of 3d series is diamagnetic ? a. Fe^{3+} b. Mn^{2+} c. Zn^{2+} d. Cu^{2+}	1																				
13	Given below are two statements labelled as Assertion(A) and Reason(R) Select the most appropriate answer from the options given below: a. Both A and R are true and R is correct explanation of A. b. Both A and R are true but R is not correct explanation of A. c. A is true but R is false. d. A is false but R is true Assertion (A): Like bromination of benzene, bromination of phenol is also carried out in the presence of Lewis acid. Reason(R): Lewis acid polarises the bromine molecule.	1																				
14	Assertion (A): Compounds containing -CHO group are easily oxidised to corresponding carboxylic acids. Reason(R): The carboxylic acids can be reduced to alcohols by treatment with LiAlH_4	1																				
15	Assertion (A): Vitamin D can be stored in our body. Reason(R): Vitamin D is fat soluble vitamin.	1																				
16	Assertion (A): Copper sulphate can be stored in zinc vessel. Reason(R): Zinc is more reactive than copper.	1																				
SECTION- B																						
17	The following data were obtained for the reaction: $2\text{NO} + \text{O}_2 \longrightarrow 2\text{NO}_2$																					
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	(a) Find the order of reaction with respect to NO and O ₂ . (b) Write the rate law and overall order of reaction.	1 1																				
18	200 cm ³ of an aqueous solution of a protein contains 1.26 g of protein. The osmotic pressure of this solution at 300 K is found to be 2.57×10^{-3} bar. Calculate the molar mass of the protein.	2																				
19	Arrange the compounds of each set in increasing order of reactivity towards S_N^2 displacement: (a) 2- Bromo-2- methylbutane , 1- Bromopentane, 2-Bromopentane (b) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 2-Bromo-3-methylbutane.	1 1																				
20	Distiguish between Fibrous proteins and Globular proteins.	2																				
21	(a) Why is pKa of ClCH_2COOH lower than the pKa value of CH_3COOOH ? (b) Write the chemical equation for Hell Volhard-Zelinsky reaction.	1 1																				
OR																						
	Convert the following. (a) Benzene into m-nitrobenzaldehyde. (b) Bromobenzene to benzoic acid.	1+1																				



SECTION- C		
22	The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308K. Calculate activation energy. $\text{Log}3=0.47$ $\text{Log}4=0.60$ $\text{Log}9= 0.95$ $\text{Log} 10= 1$ $\text{Log}(2.72)= 0.436$ $R=8.314 \text{ JK}^{-1} \text{ mol}^{-1}$	3
23	Account for the following: (a) Benzyl chloride is highly reactive towards SN^1 reaction. (b) (+/-) Butan-2-ol is optically inactive, though contains a chiral carbon. (c) Chloroform is stored in dark colored bottle.	1 1 1
24	How can you convert the following:(a) Phenol to Salicylic Acid (b) 1-Chloropropane to Butan-1 amine. (c) Aniline to Benzene	1+1+1
25	Write the chemical reactions for : (a) Etard Reaction (b) Stephen (c) Gattermann Koch	1+1+1
26	Explain in detail watson crick model of DNA.	3
27	Write down cell reaction and calculate the emf of the following cell at 298 K: $\text{Al(s)}/\text{Al}^{3+}(0.001\text{M}) // \text{Ni}^{2+}(0.1\text{M})/\text{Ni(s)}$ Given : $E^\circ \text{Al}^{3+}/\text{Al} = -1.66\text{V}$, $E^\circ \text{Ni}^{2+}/\text{Ni} = -0.25 \text{ V}$. $\text{Log}(10)=1$	1 1 1
28	a) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ are of different colours in dilute solutions. Why? (b) Discuss briefly giving example in each case the role of coordination compounds in : (i) Analytical chemistry. (ii) Biological systems	1 1+1
SECTION -D		
29	The following questions are case -based questions.Read the passage carefully and answer the questions that follows. In coordination compounds, metals show two types of linkages, primary and secondary. Primary valencies are ionisable and are satisfied by negatively charged ions. Secondary valencies are non ionisable and are satisfied by neutral or negative ions having lone pair of electrons. Primary valencies are no directional while secondary valencies decide the shape of the complex.	
	Answer the following questions (i) If $\text{PtCl}_2 \cdot 2\text{NH}_3$ does not react with AgNO_3 what will be its formula? (ii) What is secondary valency of $[\text{Co}(\text{en})_3]^{3+}$? (iii) Write the hybridization and magnetic behaviour of $[\text{Ni}(\text{CN})_4]^{2-}$	1 1 2
30	Rahul set up an experiment to find resistance of aqueous KCl solution for different concentrations at 298 K using a conductivity cell connected to a wheatstone bridge with the a.c. power in the audio frequency range 550 to 5000 cycles per second. Once the resistance was calculated from null point he also calculated the conductivity and molar conductivity and recorded his readings in tabular form.	



S.No.	Conc. (M)	κ (S cm^{-1})	Λ_m ($\text{S cm}^2 \text{mol}^{-1}$)
1.	1.00	111.3×10^{-3}	111.3
2.	0.10	12.9×10^{-3}	129.0
3.	0.01	1.41×10^{-3}	141.0

Answer the following questions:

- Why does conductivity decrease with dilution?
- If Λ_m° KCl is $150.0 \text{ S cm}^2 \text{mol}^{-1}$, calculate the degree of dissociation of 0.01 M KCl.
- If Rahul had used HCl instead of KCl then would you expect the Λ_m values to be more or less than those per KCl for a given concentration. Justify.

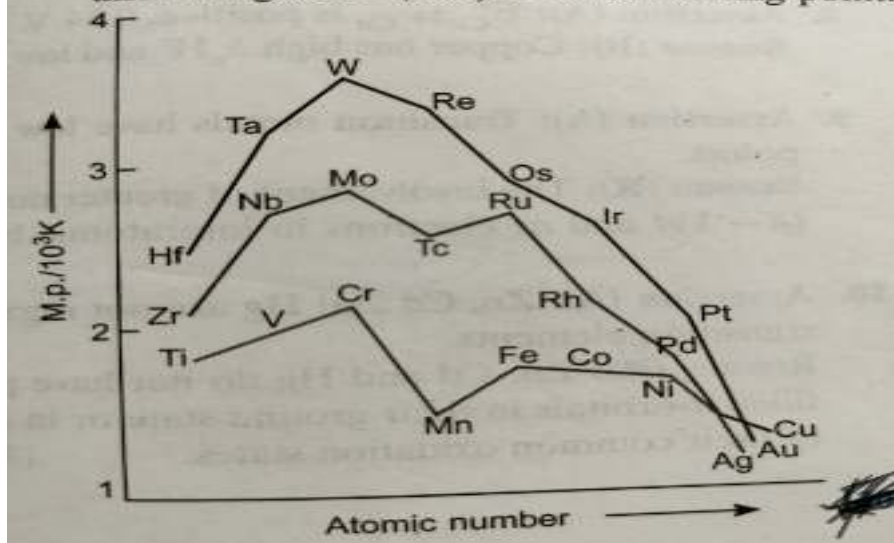
1
1
2

SECTION-E

- 31 (a) Why is chemistry of actinoids is complicated as compared to lanthanoids?
 (b) Complete the following reaction and justify that it is a disproportionation reaction.
 $3 \text{MnO}_4^{2-} + 4 \text{H}^+ \longrightarrow \dots + \dots + 2\text{H}_2\text{O}$

1
1
1

- (c) The given graph shows the trends in the melting points of transition metals. Explain the reason why Cr has highest melting point and manganese (Mn) a lower melting point.



Q.31(d) Write Balanced Ionic equations when Acidified $\text{K}_2\text{Cr}_2\text{O}_7$ react with:
 (i) KI. (ii) H_2S

2

- 32 (a) On mixing Liquid X and Liquid Y, Volume of the resulting solution decreases. What type of deviation from Raoult's Law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?
 (b) A non volatile solute X (molar mass=50 g/mol) when dissolved in 78 g of benzene reduced the vapour pressure to 90%, calculate the mass of X dissolved in the solution.
 (c) How is solubility of gases in water related with their Henry's constants at the same pressure and temperature? OR

2
2
1

- (a) What type of deviation from Raoult's Law is expected when ethyl alcohol and water are mixed with each other? What change in net volume of the mixture is expected? Graphically represent the deviation.
 (b) Calculate the boiling point of a solution containing 0.61 g of benzoic acid in 50 g of carbon disulphide assuming 84 % dimerisation of the acid. The boiling point of CS_2 is 47.2°C . [Given K_b for $\text{CS}_2 = 2.3 \text{ K Kg/mol}$]

$\frac{1}{2} + \frac{1}{2}$
+1
3



33	(a) An aromatic compound 'A' on heating with Br_2 and KOH forms a compound 'B' of molecular formula $\text{C}_6\text{H}_7\text{N}$ which on reacting with CHCl_3 and alcoholic KOH produces a foul smelling compound 'C'. Write the structures and IUPAC names of compounds 'A' 'B' and 'C'. (b) Arrange the following in the decreasing order of pK_b giving reason (i) Aniline, p-nitro aniline, and p-toluidine (ii) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$ and $(\text{C}_2\text{H}_5)_3\text{N}$ in aqueous medium. OR (a) An aromatic compound 'A' on treatment with NH_3 followed by heating forms compound 'B' which on heating with Br_2 and KOH forms compound 'C' having molecular formula $\text{C}_6\text{H}_7\text{N}$. Give the structures and IUPAC names of 'A' , 'B' and 'C' (b) Distinguish between the following pairs by suitable chemical test: (i) Aniline and ethyl amine (ii) Aniline and N-Methylaniline.	1+1+1 1 1 1+1+1 1+1
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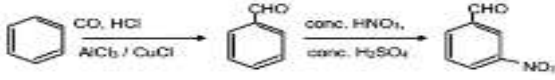
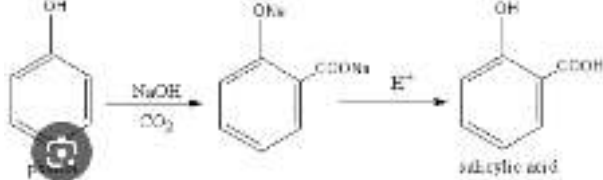
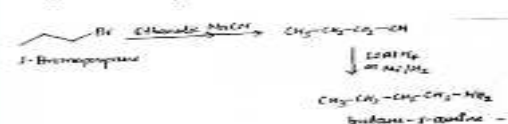




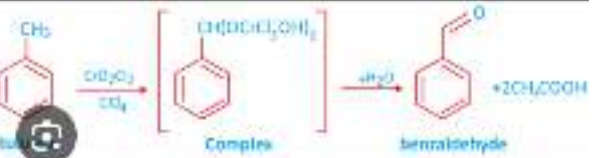
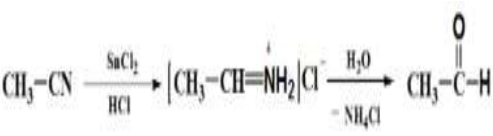
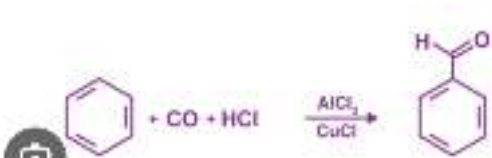
OSDAV Public School, Kaithal
Marking Scheme
December Exams (2024-25)
Subject: CHEMISTRY(043)
Class:XII
Set-B

1	D	
2	A	1
3	D	1
4	B	1
5	A	1
6	D	1
7	C	1
8.	A	1
9	C	1
10	D	1
11	D	1
12	C	1
13	D	1
14	B	1
15	A	1
16	D	1
17	Order wrt NO is 1 and order wrt O2 is 2. Rate law: Rate =K[NO][O2]2. Overall order of reaction is 3	1 1
18	$\pi = \frac{W_B RT}{M_B V}$ $M_B = \frac{W_B RT}{\pi V}$ $= \frac{1.26 \text{ g} \times 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1} \times 300 \text{ K}}{2.57 \times 10^{-3} \text{ bar} \times 0.2 \text{ L}}$ $= 61,039 \text{ g mol}^{-1}$	1 1
19	(a) 2-Bromo-2-methylbutane<2-Bromobutane<1-Bromobutane. (b) 2-Bromo-2-methylbutane<2-Bromo-3-methylbutane<1-Bromo-3-methylbutane Less steric hindrance more reactivity towards SN2.	1 1
21	(a) ClCH2COOH is stronger acid due to -I effect of Cl, than CH3COOH. (b) CH3COOH + Cl2 -----> (RedP) -----> ClCH2COOH.	1 1 1

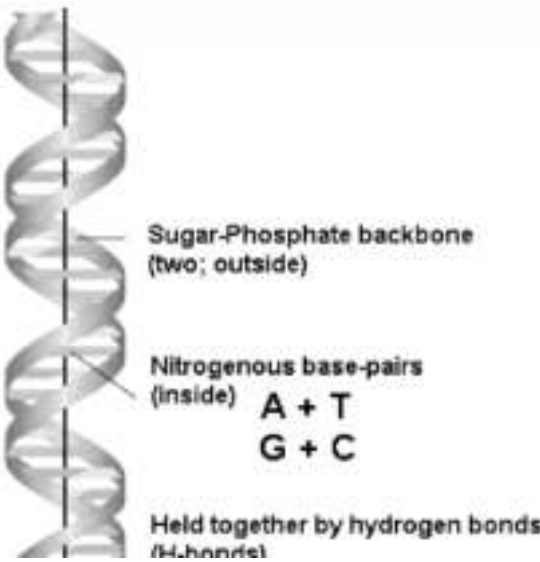
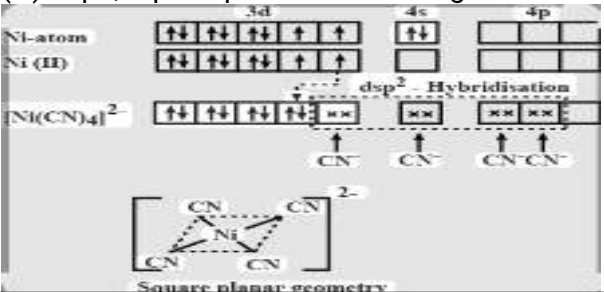


	The Benzene to m-nitrobenzaldehyde.  (a)  (b)	1															
20	<table border="1"> <thead> <tr> <th></th><th>Phenols</th><th>Globulins</th></tr> </thead> <tbody> <tr> <td>Molecules</td><td>Long, thin Lie side by side to form fibres.</td><td>Fold into spherical 3-D shape.</td></tr> <tr> <td>Examples</td><td>- Keratin (in hair) - Collagen (in skin and bone).</td><td>- Haemoglobin - Insulin - Enzymes</td></tr> <tr> <td>Solubility in water</td><td>Insoluble</td><td>Soluble</td></tr> <tr> <td>Role</td><td>Structural: - Collagen in bone and cartilage - Keratin in fingernails and hair.</td><td>Metabolic: - Enzymes in all organisms. - Plasma proteins, antibodies in</td></tr> </tbody> </table>		Phenols	Globulins	Molecules	Long, thin Lie side by side to form fibres.	Fold into spherical 3-D shape.	Examples	- Keratin (in hair) - Collagen (in skin and bone).	- Haemoglobin - Insulin - Enzymes	Solubility in water	Insoluble	Soluble	Role	Structural: - Collagen in bone and cartilage - Keratin in fingernails and hair.	Metabolic: - Enzymes in all organisms. - Plasma proteins, antibodies in	1 1
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28	(a) They have different ligands and have different CFSE values. So will absorb different radiation of different wavelengths. (b) Analytical Chemistry: Qualitative analysis of basic radicals. Hardness of water. Biological Systems: Haemoglobin is coordination compound of Fe and Chlorophyll is coordination compound of Mg.	1 1 1															
27	$\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ $E^\circ = -1.66\text{V}$ $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$ $E^\circ = -0.25\text{V}$ $E^\circ_{\text{cell}} = -0.25 - (-1.66) = 1.41\text{ V}$ Thus, aluminium electrode is anode and nickel electrode is cathode reaction. $3\text{Ni}^{2+} + 2\text{Al} \rightarrow 3\text{Ni} + 2\text{Al}^{3+}$ $E^\circ = E^\circ_{\text{cell}} - \frac{0.0591}{6} \log \frac{(1 \times 10^{-3})^2}{(5 \times 10^{-1})^3}$ $= 1.41 + 0.005319 = 1.415\text{ V}$	1 1 1															
24	 (a)  (b)	1 1 1															



	 (c)	
25	 (a)  (b)  (c)	1 1 1
26	• Watson and Crick presented a model for the DNA's double-helix structure. • A nucleotide polymer makes up the DNA molecule. • A nitrogenous base, a five-carbon sugar (deoxyribose), and a phosphate group are found in each nucleotide. • There are two purines (adenine and guanine) and two pyrimidines in the DNA (cytosine and thymine). • Two strands of DNA make up a DNA molecule. • Each strand is made up of nucleotides that are covalently linked by their phosphate groups and deoxyribose sugars. • The bases grow out of this backbone. • Hydrogen bonds connect the bases of strands. • Adenine is always linked with thymine, while cytosine is always linked with guanine.	3



		
23	(a) Benzyl carbocation is highly stable due to resonance. (b) It is racemic mixture. It consists of equal amount of dextrorotatory and leavorotatory isomers. (c) In the presence of sunlight it convert into poisonous gas phosgene.	1 1 1
22	For 10% completion of the reaction, we have $k(298) = \frac{2.303}{t} \log \frac{100}{90}$ For 25% completion of the reaction, we have $k(308) = \frac{2.303}{t} \log \frac{100}{75}$ $\frac{k(308)}{k(298)} = \frac{\frac{2.303}{t} \log \frac{100}{75}}{\frac{2.303}{t} \log \frac{100}{90}} = 2.73$ But, $\log \frac{k(308)}{k(298)} = \frac{E_a}{2.303R \left[\frac{T}{T_1} - \frac{T}{T_2} \right]}$ $\log 2.73 = \frac{E_a}{2.303 \times 8.314 \times \left[\frac{308}{298} - 1 \right]}$ $E_a = 76623 \text{ J/mol} = 76.623 \text{ kJ/mol}$	1 1 1
29	(i) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (ii) 6 (iii) dsp^2, square planar and diamagnetic. 	1 1 1



		1
30	(a) On dilution no. Of ions per unit volume decreases. (b) Degree of dissociation= $141/150 = 0.94$ (c) Molar conductivity will be more. Reason : In HCl , H⁺ ion has smaller size than K⁺ , smaller ion has more mobility in solution so more will be molar conductivity.	1 1 1 1
31	(a) Actinoids are radioactive and shows more no. Of oxidation states. (b) $3 \text{MnO}_4^{2-} + 4\text{H}^+ \longrightarrow 2 \text{MnO}_2 + \text{MnO}_4^- + 2\text{H}_2\text{O}$ In this reaction Mn undergo oxidation as well as reduction. Therefore it is disproportionation reaction. (c) Cr has highest number of unpaired electrons, strong interatomic metal bonding, hence no delocalisation of electrons. In Mn electrons are more tightly held by the nucleus, the electrons are not available for bonding resulting weaker metallic bonding in manganese compared to chromium. (d) $\text{Cr}_2\text{O}_7^{2-} + 6\text{I}^- + 14\text{H}^+ \rightleftharpoons 2\text{Cr}^{3+} + 3\text{I}_2 + 7\text{H}_2\text{O}$ Thus, the balanced equation in acidic solution is: $3\text{H}_2\text{S} + 2\text{Cr}_2\text{O}_7^{2-} + 12\text{H}^+ \rightarrow 3\text{S} + 4\text{Cr}^{3+} + 20\text{H}_2\text{O}$ (ii)	1 1 1 1 1
32	(a) -ve deviation. Temperature will increase because heat energy will be released. Relative lowering of vapour pressure: $\frac{P^0 - P_s}{P_s} = \frac{n_B}{n_A}$ $\frac{P^0 - 0.9 P^0}{0.9 P^0} = \frac{W_B}{50} \times \frac{78}{78}$ $\rightarrow W_B = \frac{0.1}{0.9} \times 50$ $= \frac{50}{9}$ $= 5.5 \text{ g}$ (b) (c) Solubility of gas is inversely proportional to Henry constant. OR (a) +Ve deviation. ΔV_{mix} +ve. (b) Degree of association= $n(1-i)/(n-1)$ $0.84 = 2(i-1)/2-1. \quad i = 0.58$ $\Delta T_b = T_b - T_b^0 = i \times K_b \times w_2/M_2 \times 1000/w_1$ $T_b - 47.2^\circ\text{C} = 0.58 \times 2.3 \times 0.61 \times 1000 / 122 \times 50 = 0.13$ $T_b = 47.3^\circ\text{C}$	1 1 1 1 1 1 1 1 1 1
33	(a) A= Benzamide, B= Aniline, C= Phenylisocyanide. (b)(i) p-Nitroaniline > Aniline > p-toluidine. (ii) $\text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_3\text{N} > (\text{C}_2\text{H}_5)_2\text{NH}$ OR (a) A= Benzoic acid. B= Benzamide C= Aniline. (b) (i) Nitrous acid test: Ethyl amine give N₂ and ethyl alcohol will be formed. Aniline will form diazonium salt. (ii) Isocyanide test: Aniline give foul smell with chloroform and NaOH.	3 1 1 3 1



	N- Metylaniline will not give this smell.	1
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