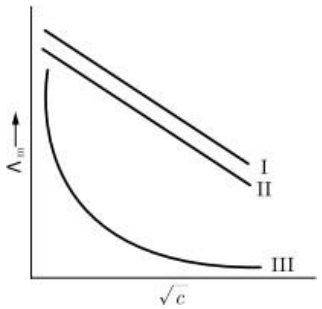
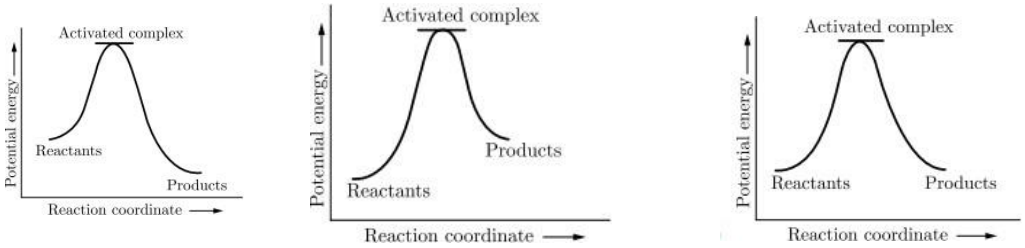
THE VILLAGE INTERNATIONAL SCHOOL
"We Nurture Dreams"

Date:08/12/2022	**Model Examination - 1 (2022-23)**	**Max marks: 70**
GRADE: XII	**CHEMISTRY (043)**	**Time: 3Hour**

General Instructions:
(i) All questions are compulsory.
(ii) The question paper has five sections and 35 questions. All questions are compulsory.
(iii) Section–A has 18 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

	SECTION A	
Q. No:	**Questions**	**Mark**
1	During dehydration of alcohols to alkenes by heating with concentrated H2 SO4, the initiation step is: A) Elimination of water B) Formation of an ester C) Protonation of alcohol molecule D) Formation of carbocation	1
2	In SN 2 reactions, the correct order of reactivity for the following compounds. CH_3Cl, CH_3CH_2Cl, $(CH_3)_2CHCl$, $(CH_3)_3CCl_3$ A) $CH_3CH_2Cl > CH_3Cl > (CH_3)_2CHCl > (CH_3)_3CCl_3$ B) $(CH_3)_2CHCl > CH_3CH_2Cl > CH_3Cl > (CH_3)_3CCl_3$ C) $CH_3Cl > (CH_3)_2CHCl > CH_3CH_2Cl > (CH_3)_3CCl_3$ D) $CH_3Cl > CH_3CH_2Cl > (CH_3)_2CHCl > (CH_3)_3CCl_3$	1
3	Why is $[(Ni\ CN_4)]^{2-}$ diamagnetic while $[\ NiCl_4]^{2-}$ is paramagnetic in nature: A) In $[(Ni\ CN_4)\ ]^{2-}$, no unpaired electrons are present while in $[\ NiCl_4\ ]^{2-}$ two unpaired electrons are present. B) $[NiCl_4]^{2-}$ shows sp^2 hybridisation, hence it is paramagnetic. C) $[(Ni\ CN_4)]^{2-}$ shows sp^3 hybridisation, hence it is diamagnetic. D) In $[\ NiCl_4]^{2-}$, no unpaired electrons are present while in $[(Ni\ CN)_4]^{2-}$ two unpaired electrons are present.	1
4	For the reaction $2H_2O_2 \longrightarrow 2H_2O + O_2$ .The reaction is of : A) First order B) Second order C) Third order D) zero order	1

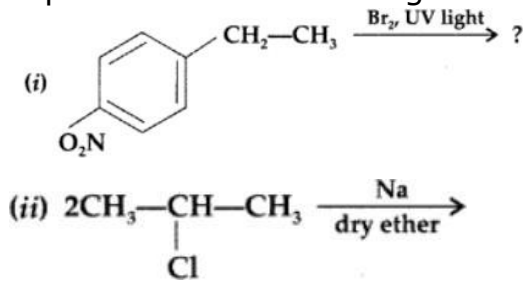
5	A graph was plotted between the molar conductivity of various electrolytes (NaCl, HCl and NH_4 OH) and c (in mol L^{-1}). Which of the following is the correct set?  A) I (NH4 OH), II (HCl), III (NaCl) B) I (NaCl), II (HCl), (III) (NH_4 OH) C) I (HCl), II (NaCl), III (NH_4 OH) D) I (NH_4 OH), II (NaCl), III (HCl)	1
6	In a chemical reaction X $\longrightarrow$ Y, it is found that the rate of reaction doubles when the concentration of X is increased four times. The order of the reaction with respect to X is: A) 1 B) 2 C) 0 D) ½	1
7	The value of K_H for Ar(g), CO_2 (g), HCHO(g) and CH_4 (g) are 40.39, 1.67, 1 8. 3 $\times 10^{-5}$ and 0.413 respectively. Arrange these gases in increasing order of solubility. A) Ar < CO_2 < CH_4 < HCHO B) Ar < CH_4 < CO_2 < HCHO C) HCHO < CH_4 < CO_2 < Ar D) HCHO < CO_2 < CH_4 < Ar	1
8	The magnitude of CFSE (crystal field splitting energy, Δ_0) can be related to the configuration of d -orbital in a coordination entity as: A) If Δ_0 < P, the configuration is t_{2g}^3 eg^1 = weak field ligand and high spin complex B) If Δ_0> P, the configuration is t_{2g}^4 eg^0 = strong field ligand and high spin complex C) If Δ_0> P, the configuration is t_{2g}^3 eg^1 = strong field ligand and low spin complex D) If Δ = P, the configuration is $t_{2g}^4 eg^1$ = strong field ligand and high spin complex	1
9	Major product obtained on reaction of 3-phenyl propene with HBr in presence of organic peroxide is: A) 3-phenyl-2-bromopropane B) 3-phenyl-1-bromopropane C) 1-phenyl-3-bromopropane D) 1-phenyl-2-bromopropane	1

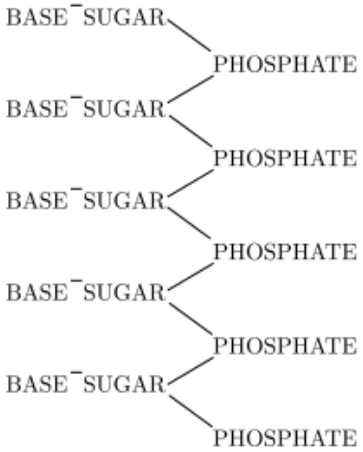
10	Hinserberg's reagent which is used to test amine is A) Benzene sulphonamide B) Benzene diazonium chloride C) Benzene sulphonyl chloride D) Acetanilide	1
11	The reagent which does not react with both, acetaldehyde and benzaldehyde. A) Sodium hydrogen sulphite B) Phenyl hydrazine C) Fehling's solution D) Grignard reagent	1
12	Which of the following graphs represents exothermic reaction?  (I) (II) (III) A) (ii) only B) (i) only C) (iii) only D) (i) and (ii)	1
13	How many ions per mole of the following complex are present in their solution? $[COCl(NH_3)_5]Cl$ A) 3 mol of ions B) 2 mol of ions C) 2 mol of ions D) 5 mol of ions	
14	The best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is : A) Hoffmann Bromamide reaction B) Gabriel Phthalimide synthesis C) Sandmeyer reaction D) Reaction with HNO_3	

Question number 15 to 18 consist of two statements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses.

A) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.
B) If both Assertion and Reason are true but the Reason is not a correct explanation of the Assertion.
C) If Assertion is true but the Reason is false.
D) If both Assertion and Reason are false

15	**Assertion (A):** Carboxylic acids are more acidic than phenols **Reason (R) :** Phenols are ortho and para directing	1
16	**Assertion (A):** The two strands of DNA are complementary to each other. **Reason (R) :** The hydrogen bonds are formed between specific pairs of bases	1
17	**Assertion (A):** The transition metals and their compounds are usually paramagnetic. **Reason (R) :** Transition elements have unpaired electrons in the d-orbital.	1
18	**Assertion (A):** Acetanilide is less basic than aniline. **Reason (R) :** Acetylation of aniline results in decrease of electron density on nitrogen.	1
	SECTION - B	
19	Show that for a first order reaction, time required for completion of 99% of reaction is twice the time required for completion of 90% of reaction.	2
20	Give the possible explanation for the following: A) Glucose doesn't 2, 4-DNP test. B) The two strands in DNA are not identical but are complementary. **OR** What happens when D-glucose is treated with the following? Give equation to support your answer. A) HI B) HNO3	2
21	Give reasons : A) Electrophilic substitution reactions in haloarenes occur slowly. B) SN_1 reactions are accompanied by racemization in optically active alkyl halides. **OR** A) Out of SN1 and SN2 , which reaction occur with inversion of configuration and racemisation. B) Alkyl halide can be distinguished from vinyl chloride by NaOH and silver nitrate test. Comment.	2
22	Write all the geometrical isomers of [(Pt NH3) (Br) (Cl) (Py)] and how many of these will exhibit optical isomers?	2
23	A zinc rod is dipped in 0.1 M solution of ZnSO4 . The salt is 95% dissociated at this dilution at 298K. Calculate the electrode potential. [$E^0_{(Zn2+/Zn)} = -0.76$ V]	2
24	Explain how and why will the rate of reaction for a given reaction be affected when a. a catalyst is added b. the temperature at which the reaction was taking place is decreased.	

25	(i)How will you convert methyl bromide into methyl iodide? (ii) Grignard reagents should be prepared under anhydrous conditions. Explain.	
	SECTION - C	
26	What happens when : A) N-ethylethanamine reacts with benzenesulphonyl chloride. B) Benzylchloride is treated with ammonia followed by the reaction with Chloromethane. C) Aniline reacts with chloroform in the presence of alcoholic potassium hydroxide.	3
27	Determine the structure and magnetic behaviour of $[Fe(CN)_6]^{4-}$ ion on the basis of valence bond theory.	3
28	A) State Henry's Law. Calculate the solubility of CO2 in water at 298K under 760mm Hg. (K_H for CO2 in water at 298K is 1.25 $\times 10^6$ mm Hg) B) 30g of urea (M=60g/mol) is dissolved in 846g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298k is 23.8mm Hg.	3
29	Give reasons for any 3 of the following observations: A) Aniline cannot be prepared by the ammonolysis of chlorobenzene under normal conditions. B) N-ethylethanamine boils at 329.3K and butanamine boils at 350.8K, although both are isomeric in nature. C) Acylation of aniline is carried out in the presence of pyridine. D) Acetylation of aniline reduces its activation effect.	3
30	A) Write the major product in the following:  B) Account for the following : I. Electrophilic substitution reactions in haloarenes occur slowly. II. Haloalkanes, though polar, are insoluble in water. **OR** What happens when: (Any three) A) formic acid reacts with conc. H2 SO4 . B) acetic acid reacts with Cl2 in the presence of red P? C) calcium acetate is heated? D) CH3 3 - - O CH is heated with HI.	3

	SECTION - D	
The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.		
31	The basic chemical formula of DNA is now well established. As shown in figure, it consists of a very long chain, the backbone of which is made up of alternate sugar and phosphate groups, joined together in regular 3' 5' phosphate di-ester linkages. To each sugar is attached a nitrogenous base, only four different kinds of which are commonly found in DNA.  Two of these–adenine and guanine are purines, and the other two thymine and cytosine are pyrimidines. A fifth base, 5-methyl cytosine, occurs in smaller amounts in certain organisms, and a sixth, 5-hydroxy-methyl-cytosine, is found instead of cytosine in the T even phages. It should be noted that the chain is unbranched, a consequence of the regular internucleotide linkage. On the other hand the sequence of the different nucleotides is, as far as can be ascertained, completely irregular. Thus, DNA has some features which are regular, and some which are irregular. A similar conception of the DNA molecule as a long thin fibre is obtained from physicochemical analysis involving sedimentation, diffusion, light scattering, and viscosity measurements. These techniques indicated that DNA is a very asymmetrical structure approximately 20. A wide and many thousands of angstorms long. Estimates of its molecular weight currently center between 5×10^6 and 10^7 (approximately 3×10^4 nucleotides). Surprisingly each of these measurements tend to suggest that the DNA is relatively rigid, a puzzling finding in view of the large number of single bonds (5 per nucleotide) in the phosphate-sugar back bone. Recently these indirect inferences have been confirmed by electron microscopy. Based on the above passage answer the following questions: A) A nitrogenous based is attached to each sugar and only four of its kinds are commonly found in DNA. Name the	4

	purines present in DNA. B) Which of the four kinds of nitrogenous bases commonly found in DNA has been replaced in some organisms? C) As shown in figure, DNA has a long chain. What is the backbone of DNA made up of and how is it joined? **OR** C) As given, DNA has some regular and some irregular features. Which features of DNA are regular and which are irregular? Which analysis provide the same concept of DNA?	
32	Molar conductivity of a solution is the conductance of solution containing one mole of electrolyte, kept between two electrodes having unit length between them and large cross -sectional area, so as to contain the electrolyte. In other words, molar conductivity is the conductance of the electrolytic solution kept between the electrodes of a conductivity cell at unit distance but having area of cross-section large enough to accommodate sufficient volume of solution that contains one mole of the electrolyte. It is denoted by Λ m . The molar conductivity is related to conductivity as: $\Lambda m = k \times V = \frac{1000}{C} \times K = K \times \frac{1000}{molarity}$ Unity of Λ m (molar conductivity) shall be ohm−1 cm−1 mol−1 or S cm2 mol−1 . Thus, knowing molar concentration (C) and conductivity (k), Λ m can be calculated. Λ cm is called molar conductivity at infinite dilution. The molar conductivity of strong electrolytes is found to vary with concentration according to the equation, $\Lambda = \Lambda^0 cm - A\sqrt{C}$ This equation is called Debye-Huckel Onsager equation. Here, A is constant depending upon the type of electrolyte taken and nature of solvent and temperature. In the context of given passage, answer the following questions: A) The molar conductivity of HCl increases with dilution. Can you suggest what may be the reason for this? B) Here are given the different molarities of NaCl. Which of them will exhibit the highest molar conductivity? 0.005 M NaCl, 0.1 M NaCl, 0.5 M NaCl, 0 0. M1 NaCl. C) Molar conductivity of a solution is $1.26 \times 10^{2} \Omega^{-1}\ cm^2 mol^{-1}$. Its molarity is 0.01. What will be its specific conductivity? **OR** D) The conductivity of 0.00241 M acetic acid is 7. S 896× 10^{-5}S $cm^{-1}mol^{-1}$. What shall be the molar conductivity of the solution in S cm^{-1} mol^{-1} ?	4

	SECTION - E	
33	A) Calculate the mass of Ag deposited at cathode when a current of 2 amperes was passed through a solution of AgNO3 for 15 minutes. (Given: Molar mass of Ag 108 g /mol 1, 1F 96500 C/mol) B) What do you mean by fuel cell? C) Write Cu, Na, Mg and Ag in the decreasing order of electrochemical series with the help of the following reactions: $Cu + 2Ag^{+} \longrightarrow Cu^{2+} + 2Ag$ $2Na + Mg^{2+} \longrightarrow 2Na^{+} + Mg$ $Mg + Cu^{2+} \longrightarrow Mg^{2+} + Cu$ **OR** A) Molar conductivity of substance "A" is 5.9×10^{3} S/m and "B" is 1 x 10^{-16} S/m. Which of the two is most likely to be copper metal and why? B) What is the quantity of electricity in Coulombs required to produce 4.8 g of Mg from molten MgCl2? How much Ca will be produced if the same amount of electricity was passed through molten CaCl2? (Atomic mass of Mg = 24 u, atomic mass of Ca = 40 u). C) What is the standard free energy change for the following reaction at room temperature? Is the reaction spontaneous? Sn(s) + 2Cu2+ (aq) à Sn2+ (aq) + 2Cu+ (s)	5
34	A) Write the reaction involved in the following : (a) Etard reaction (b) Stephan reduction B) How will you convert the following in not more than two steps : I. Benzoic acid to Benzaldehyde II. Acetophenone to Benzoic acid III. Ethanoic acid to 2-hydroxyethanoic acid. **OR** Give the mechanism for the formation of ethanol from ethene. Predict the reagent for carrying out the following conversions: I. Phenol to benzoquinone. II. Anisole to p-bromoanisole. III. Phenol to 2, 4, 6-tribromophenol.	5
35	A) Give a chemical test to distinguish between benzoic acid and phenol. B) What type of aldehydes undergo Cannizaro reaction? C) Write the equations involved in the following reactions: a. Wolff-Kishner reduction b. Etard reaction **OR** A) Write the reactions involved in the following: A) Hell-Volhard Zelinsky reaction B) Decarboxylation reaction B) Write the reactions involved in the following reactions: I. Clemmensen reduction II. Cannizzaro reaction	5
THE END		