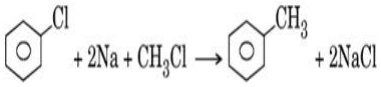
DELHI PUBLIC SCHOOL JAMMU
CLASS - XII
SESSION - 2024 - 2025
HY SAMPLE PAPER

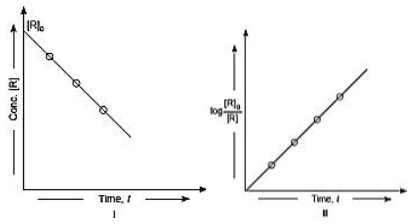
Sub: CHEMISTRY (043) **Time Allowed : 3 hrs**
Maximum Marks : 70

General Instructions:
1.There are 31 questions in total. All questions are compulsory.
2 .There are 5 sections - A, B, C, D & E. All questions of 5 sections are to be attempted separately
3.Section - A has 14 MCQs (Q1 - Q14) & 4 Assertion –Reasoning (Q15- 18) each of 1 mark.
4.Section B has 3 Case study based Questions of 5 marks each and three source based Questions of 5 marks each.
5.Section C has 3 Short answer type questions of 2 marks each.
6.Section D has 2 Short Answer type Questions of 3 marks each .
7.Section E has 2 Long answer type questions of 5 marks each.
8.Internal choice has been provided in one question of 2marks, one question of 3marks and in all questions of 5 marks. You are required to attempt questions from any one of the choices .

	Section A	
1	An azeotropic mixture of two liquids will have a boiling point lower than either of the two liquids when it a) shows a positive deviation from Raoult's law b) forms an ideal solution c) is saturated d) shows a negative deviation from Raoult's law	**[1]**
2	If molality of a dilute solution is doubled, the value of the molal elevation constant (K_b) will be a) doubled b) unchanged c) halved d) tripled	**[1]**
3	The passage of electricity in the Daniell cell when Zn and Cu electrodes are connected: a) from Cu to Zn outside the cell b) from Zn to Cu inside the cell c) from Zn to Cu outside the cell d) from Cu to Zn inside the cell	**[1]**
4	Which of the following cell was used in Apollo space programme? a) Daniel cell b) Dry cell c) H_2 - O_2 Fuel cell d) Mercury cell	**[1]**
5	If the initial concentration is reduced to $\frac{1}{4}^{th}$ in a zero order reaction, then the time taken for half the reaction to complete: a) remains the same b) doubles c) increases four times d) reduces to one - fourth	**[1]**
6	The half - life period for a zero order reaction is equal to (where $[R]_0$ is initial concentration of reactant and k is rate constant.) a) $\frac{0.693}{k}$ b) $\frac{2.303}{k}$	**[1]**

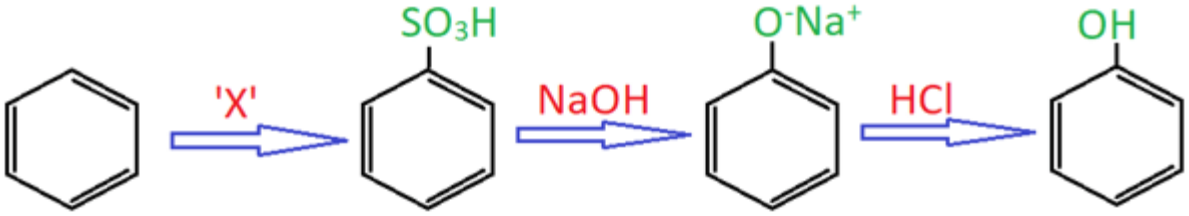
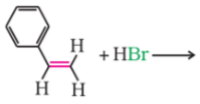
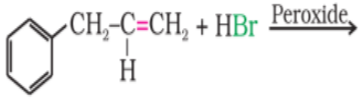
	c) $\frac{2k}{[R]_0}$ d) $\frac{[R]_0}{2k}$	
7	Which of the following relations is incorrect? a) $G = k\left(\frac{a}{l}\right)$ b) $G = k\left(\frac{l}{a}\right)$ c) $\Lambda_m = \frac{k}{c}$ d) $R = \frac{1}{k}\left(\frac{l}{a}\right)$	**[1]**
8	Lanthanoid contraction is: a) decrease in stability of higher oxidation states of lanthanides. b) the filling of 4f before 5d orbital resultingin a regular decrease in atomic radii. c) ions of the same charge in a given series showing a progressive decrease in radius with increasing atomic number. d) the decrease in the ionic character of lanthanides with an increase in the oxidation state.	**[1]**
9	Which property of transition metals enables them to behave as catalysts? a) Alloy formation b) High melting point c) Variable oxidation states d) High ionisation enthalpy	**[1]**
10	Which of the following belongs to the class of Vinyl halides? a) $CH_2 = \underset{\underset{Br}{\vert}}{C} - CH_3$ b) CH≡ C - Br c) CH_2 = CHCH $_2$ CH $_2$ Cl d) CH_2 = CH - CH $_2$– Br	**[1]**
11	The reaction given below:  is called: a) Gattermann reaction b) Wurtz - Fittig reaction c) Wurtz reaction d) Fittig reaction	**[1]**
12	The IUPAC name of anisole is: a) Methyl phenyl ether b) Methoxybenzene c) Ethoxybenzene d) 2 - methyltoluene	**[1]**
13	The conversion of an alkyl halide into alcohol by aqueous NaOH is classified as a) a dehydrohalogenation reaction b) a substitution reaction c) an addition reaction d) a dehydration reaction	**[1]**
14	When diethyl ether is heated with excess of HI, it produces : a) ethyl iodide b) ethanol c) methyl iodide	**[1]**

	d) iodoform	
15	**Assertion (A):** When a concentrated solution is diluted by adding more water, the number of moles of solute in the solution remains unchanged. **Reason (R):** The number of moles of a solute is equal to the product of molarity and volume of solution in litres. 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.	**[1]**
16	**Assertion (A):** Limiting molar conductivity (Λ_m°) is obtained by the extrapolation of the Λ_m versus $C^{1/2}$ curve of strong electrolyte. **Reason (R):** Λ_m° for weak electrolytes is obtained by using Kohlrausch's law. 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.	**[1]**
17	**Assertion (A):** Zr and Hf have almost identical radii. **Reason (R):** Both Zr and Hf exhibit similar properties. 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.	**[1]**
18	**Assertion (A):** Chlorobenzene is resistant to electrophilic substitution reaction. **Reason (R):** C - Cl bond in chlorobenzene acquires partial double bond characters due to resonance. 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.	**[1]**
	Section B	
19	**Read the following text carefully and answer the questions that follow:** Aariv Sharma is very fond of a special drink made by his grandmother using different fruits available in their hometown. It has an outstanding taste and also provide great health benefits of natural fruits. He thought of utilizing his grand mother recipe to create a new product in the beverage market that provide health benefits and also contain fizziness of various soft drinks available in the market. 1. How he can add fizz to the special drink made by his grandmother? (1) **OR** 2. What is the law stated in the chapter that can help Aariv to make his drink fizzy? (1) 3. What precautions he should take while bottling so that his product does not lose fizz during storage and handling across long distances? (2)	**[4]**

	4. The mole fraction of helium in a saturated solution at 20 ^{o} C is 1.2 × 10 - 6. Find the pressure of helium above the solution. Given Henry's constant at 20 ^{o} C is 144.97 kbar. (2)	
20	**Read the following text carefully and answer the questions that follow:** Conductors allow the passage of electric current through them. Metallic and electrolytic are the two types of conductors. Current carriers in metallic and electrolytic conductors are free electrons and free ions respectively. Specific conductance or conductivity of the electrolyte solution is given by the following relation: $k = c \times \frac{l}{A}$ where c = $\frac{1}{R}$ is the conductance and $\frac{l}{A}$ is the cell constant. Molar conductance (Λ_m) and equivalence conductance (Λ_e) of an electrolyte solution are calculated using the following similar relations: $\Lambda_m = k \times \frac{1000}{M}$, $\Lambda_e = k \times \frac{1000}{N}$ where M and N are the molarity and normality of the solution respectively. Molar conductance of strong electrolyte depends on concentration: $\Lambda_m = \Lambda_m^\circ - b\sqrt{c}$ where Λ_m° = molar conductance at infinite dilution c = concentration of the solution b = constant The degrees of dissociation of weak electrolytes are calculated as: $\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{\Lambda_e}{\Lambda_e^\circ}$ 1. Out of specific conductance and molar conductance, which one of the following decreases on dilution of electrolyte solution? (1) **OR** 2. What is the correct order of equivalent conductance at infinite dilution for LiCl, NaCl and KCl? (1) 3. Out of $BaCl_2$ and KCl for which electrolyte solutions Λ_m and Λ_e are equal? (2) 4. What is equal to the cell constant of the conductivity cell when the conductance of a solution of an electrolyte is equal to that of its specific conductance? (2)	**[4]**
21	**Read the following text carefully and answer the questions that follow:** Observe the following graphs  1. What is order of reaction shown in graph I? (1) **OR** 2. What is slope in graph II? (1)	**[4]**

	3. How does $t_{1/2}$ varies with initial concentration in zero order reaction? (2) 4. If $t_{1/2}$ of first order reaction is 40 minute, what will be $t_{99.9\%}$ for first order reaction? (2)	
22	**Read the following text carefully and answer the questions that follow:** The transition metals when exposed to oxygen at low and intermediate temperatures form thin, protective oxide films of up to some thousands of Angstroms in thickness. Transition metal oxides lie between the extremes of ionic and covalent binary compounds formed by elements from the left or right side of the periodic table. They rangefrom metallic to semiconducting and deviate by both large and small degrees from stoichiometry. Since d - electron bonding levels are involved, the cations - exist in various valence states and hence give rise to a large number of oxides. The crystal structures are often classified by considering a cubic or hexagonal close - packed lattice of one set of ions with the other set of ions filling the octahedral or tetrahedral interstices. The actual oxide structures, however, generally show departures from such regular arrays due in part to distortions caused by packing of ions of different size and to ligand field effects. These distortions depend not only on the number of d - electrons but also on the valence and the position of the transition metal in a period or group. 1. Baeyer's reagent is which of the following? a) Acidified $KMnO_4$ b) Aqueous $KMnO_4$ c) Acidified $K_2Cr_2O_7$ d) Alkaline $KMnO_4$ 2. Lanthanide contraction is caused by an increase in (a) atomic number (b) effective nuclear charge (c) atomic radius (d) valence electrons 3. Which of the following is a diamagnetic ion? (a) Co^{2+} (b) Ni^{2+} (c) Cu^{2+} (d) Zn^{2+} 4. Which of the following is not a part of the first transition series? (a) Iron (b) Chromium (c) Magnesium (d) Nickel 5. What is the correct order of EM^{2+}/M° values with a negative sign for the four elements Cr, Mn, Fe, and Co? (a) Fe > Mn > Cr > Co (b) Cr > Mn > Fe > Co (c) Mn > Cr > Fe > Co (d) Cr > Fe > Mn > Co	**[4]**
23	**Read the following text carefully and answer the questions that follow:** The polarity of C - X bond of alkyl halides is responsible for their nucleophilic substitution, elimination and their reaction with metal atoms to form organometallic compounds. Alkyl halides are prepared by the free radical halogenation of alkanes, addition of halogen acids to alkenes, replacement of - OH group of alcohols with halogens using phosphorushalides, thionyl chloride or	**[4]**

	halogen acids. Aryl halides are prepared by electrophilic substitution of arenes. Nucleophilic substitution reactions are categorised into SN^1 and SN^2 on the basis of their kinetic properties. Chirality has a profound role in understanding the SN^1 and SN^2 mechanism. 1.Which of the following is most reactive towards nucleophilic substitution reaction? (a) C_6H_5Cl (b) CH_2=CHCl (c) $ClCH_2CH=CH_2$ (d) CH_3CH=CHCl 2.Which of the following haloalkanes is optically active? (a) 1-Chloropropane (b) 1-Bromopropane (c) 1-Iodopropane (d) 1-Fluoropropane 3.Chlorobenzene on reaction with NaOH at 300K followed by acidic hydrolysis produces (a) Phenol (b) Sodium phenoxide (c) Benzaldehyde (d) Benzoic acid 4.Aryl halides are less reactive towards nucleophilic substitution reactions as compared to alkyl halides due to (a) formation of a less stable carbonium ion in aryl halides (b) resonance stabilization in aryl halides (c) presence of double bonds in alkyl halides (d) inductive effect in aryl halides 5. What is the correct order of reactivity of haloalkanes towards β-elimination reactions? a) 1°>2°>3° b) 3°>2°>1° c) 1°>3°>2° d) 3°>1°>2°	
24	**Read the following text carefully and answer the questions that follow:** An owner of a paint company who was using ethanol as solvent noted that his stock of ethanol was misused by his employees. To prevent this, he decided to add small amount of blue colored compound (A) and another nitrogen - containing heterocyclic base (B) which gives a foul smell to alcohol. 1. Phenol can be obtained by _____ of sodium phenoxide. a) acidification b) oxidation c) sulphonation d) hydrolysis 2. Cumene hydroperoxide on hydrolysis with dilute H_2SO_4 gives _____ a) alcohol and phenol b) only phenol c) phenol and acetone d) alcohol and acetone 3. How is carbolic acid prepared from benzene diazonium chloride? a) Treating it with nitrous acid at 275K b) Preparing an aqueous solution and warming it c) Treating it with sodium hydroxide d) Freezing it	**[4]**

	4.Identify the compound 'X'.  a) Oleum b) Sulphuric acid c) Nitrous acid d) Sodium sulphate 5. Which of the following isomeric alcohols is the most soluble in water? a) n-Butyl alcohol b) Isobutyl alcohol c) sec-Butyl alcohol d) tert-Butyl alcohol	
	Section C	
25	When 20 g of a non - volatile solid is added to 250 ml of water, the freezing point of water becomes -0.9^0C . Calculate molecular mass of the solid if kf of water is $1.86^0Ckg/mol$. **OR** 1. What will be the van't Hoff factor for a dilute solution of K_2SO_4 , assuming complete dissociation? 2. 1.00 g of non - electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. Find the molar mass of the solute. (K_f for benzene = 5.12 K kg mol $^{-1}$)	**[2]**
26	Give reasons for the following: 1. Transition metals show variable oxidation states. 2. E^o value for (Zn^{2+}/Zn) is negative while that of (Cu^{2+}/Cu) is positive. 3. Higher oxidation state of Mn with fluorine is +4 whereas with oxygen is +7.	**[2]**
27	Write the products of the following reactions: 1.  2. $CH_3 - CH_2 - CH = CH_2 + HCl \rightarrow$ 3. 	**[2]**
	Section D	
28	For the first order thermal decomposition reaction, the following data obtained:	**[3]**

	$C_2H_5CI(g) \rightarrow C_2H_4(g) + HCI(g)$ | Time/s	Total pressure/atm
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0	0.30
300	0.50 | Calculate the rate constant. (Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)	
29	One litre of sea water weight 1030 g and contains about $6 \times 10^{-3} g$ of dissolved. Calculate the concentration of dissolved oxygen in ppm? **OR** 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0°C. Calculate the Van't Hoff factor and dissociation constant of fluoroacetic acid.	**[3]**
	Section E	
30	1. State Kohlrausch's law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch's law. 2. Calculate the maximum work and log K_c for the given reaction at 298 K: $Ni(s) + 2Ag^+(aq) \rightleftharpoons Ni^{2+}(aq) + 2Ag(s)$ Given: $E^o_{Ni^{2+}/Ni} = -0.25$ V, $E^o_{Ag^+/Ag} = 0.80$ V $1 F = 96500 C mol^{-1}$ **OR** 1. Explain with one example each the terms weak and strong electrolytes. 2. Write the Nernst equation and calculate the emf of the following cell. $Fe(s) \| Fe^{2+}(0.001 M) \| H^+(1M)\|H_2(g)\|Pt(s)(1 bar)$ $E^0(Fe^{2+}/Fe) = -0.44V$	**[5]**
31	How are the following conversions carried out? 1. Propene toPropan - 2 - ol 2. Benzyl chloride to Benzyl alcohol 3. Ethyl magnesium chloride to Propan - 1 - ol. 4. Methyl magnesium bromide to 2 - Methylpropan - 2 - ol. **OR** 1. Account for the following : a. O - nitrophenol is more steam volatile than P - nitrophenol. b. t - butyl chloride on heating with sodium methoxide gives 2 - methylpropene instead of t - butymethylether. 2. Write the reaction involved in the following : a. Reimer - Tiemann reaction 3. Give simple chemical test to distinguish between Ethanol and Phenol.	**[5]**