2.34.V.

ARMY PUBLIC SCHOOL BARRACKPORE
HALF YEARLY EXAMINATION
SESSION-2024-25
CLASS-XII
CHEMISTRY (043)
SET B

14 SEP 2024

TIME-3 HRS **MAX MARKS-70**

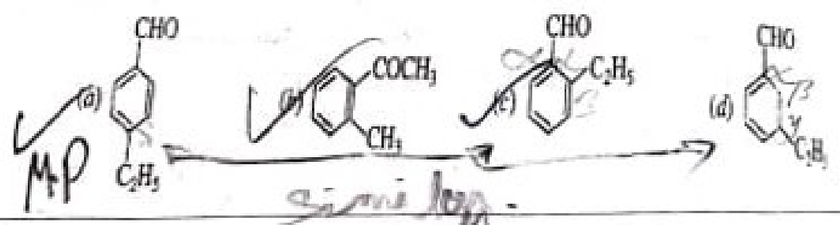
General Instructions

(a) There are **33** questions in this question paper with internal choice.
(b) **Section A** consists of 16 multiple-choice questions carrying 1 mark each.
(c) **Section B** consists of 5 very 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 each.
(f) **Section E** consists of 3 long answer questions carrying 5 marks each.
(g) **All questions are compulsory.**
(h) **Use of log tables and calculators is not allowed.**

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.	Which of the following will not form a yellow precipitate on heating with an alkaline solution of iodine: (a) $CH_3CH(OH)CH_3$ (b) $CH_3CH_2CH(OH)CH_3$ (c) CH_3OH (d) CH_3CH_2OH	1
2.	Identify 'Z' in the following sequence of reactions: $\text{Phenol} \xrightarrow[\text{dust}]{Zn} X \xrightarrow[\text{anhydrous } AlCl_3]{CH_3Cl} Y \xrightarrow[KMnO_4]{\text{alkaline}} Z$ (a) Benzene (b) Toluene (c) Benzaldehyde (d) Benzoic acid	1
3.	Identify the product 'P': $R-\underset{\underset{O}{\|}}{C}-Cl \xrightarrow[Pd\text{-}BaSO_4]{H_2} P$ (a) RCH_2OH (b) RCOOH (c) RCHO (d) RCH_3	1
4.	Propanoic acid reacts with Br_2/P to yield a dibromo product. The structure is: (1) $CH_3-\underset{\underset{Br}{\|}}{\overset{\overset{Br}{\|}}{C}}-COOH$ (2) $CH_2Br-CHBr-COOH$ (3) $H-\underset{\underset{Br}{\|}}{\overset{\overset{Br}{\|}}{C}}-CH_2COOH$ (4) CH_2Br-CH_2-COBr	1

5.	On a hill station water boils at 98°C, amount of salt (NaCl) which should be added to make its boiling point 100°C is (K_b=0.52 Kkg/mole): (a) 112.5 g/L (b) 281.2 g/L (c) 225 g/L (d) 140.6 g/L	1
6.	Antifreeze are the substances which: (a) Stop freezing (b) Decreases freezing point (c) Increases freezing point (d) Melt the ice	1
7.	Monobromination of 2-methylbutane gives how many distinct isomers: (a) 1 (b) 2 (c) 3 (d) 4	1
8.	When the concentration of reactant in a reaction A ⟶ B is increased to 8 times, the rate increases to 2 times. The order is: (a) 2 (b) 1/3 (c) -3 (d) 3	1
9.	For a first order reaction, the half-life is independent of: (a) Catalyst (b) Temperature (c) Both catalyst and temperature (d) Initial concentration of reactants	1
10.	An aromatic compound 'X' with molecular formula $C_9H_{10}O$ gives the following chemical tests- (i) Forms 2,4- DNP derivative (ii) Reduces Tollens reagent (iii) Undergoes Cannizzaro reaction (iv) On vigorous oxidation, 1,2-benzenedicarboxylic acid is obtained. Identify 'X' 	1
11.	Correct order of reactivity of CH_3CHO, $C_2H_5COCH_3$ and CH_3COCH_3 with HCN (1) $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$ (2) $C_2H_5COCH_3 > CH_3COCH_3 > CH_3CHO$ (3) $CH_3COCH_3 > CH_3CHO > C_2H_5COCH_3$ (4) $CH_3COCH_3 > C_2H_5COCH_3 > CH_3CHO$	1

12.	Which of the following compound will exhibit positive Fehling test as well as iodoform test: (a) Methanal (b) Ethanol (c) Propanone (d) Ethanal	1

These questions have two statements each:
Statement 1 (assertion) and Statement 2 (reason). Each question has choices A, B, C, D of which only one is correct. Choose the correct option.

(A) Both assertion and reason are correct statements and reason is the correct explanation of the assertion.

(B) Both assertion and reason are correct statements but the reason is not the correct explanation of the assertion.

(C) Assertion is correct, but reason is wrong statement.

(D) Assertion is wrong, but reason is correct statement.

13.	**Assertion :** Conductivity decreases for weak electrolyte and increases for strong electrolyte with decrease in concentration. **Reason :** On dilution, the number of ions per unit volume that carry the current decreases.	1
14.	**Assertion :** The enthalpy of reaction remains constant in the presence of a catalyst. **Reason :** A catalyst participating in the reaction, forms different activated complex and lowers down the activation energy but the difference in energy of reactant and product remains the same.	1
15.	**Assertion :** All naturally occurring α- amino acids except glycine are optically active. **Reason :** Most naturally occurring amino acids have L-configuration	1
16.	**Assertion :** $(CH_3)_3COCH_3$ on reaction with conc. HI gives $(CH_3)_3Cl$ and CH_3OH as major product. **Reason :** This reaction proceeds by S_N1 mechanism.	1

SECTION: B

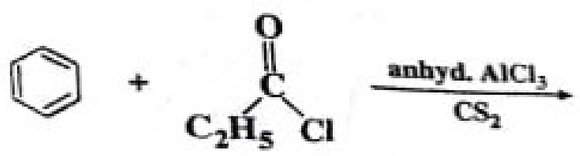
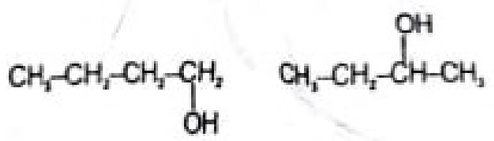
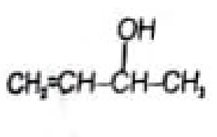
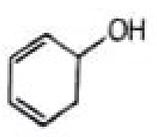
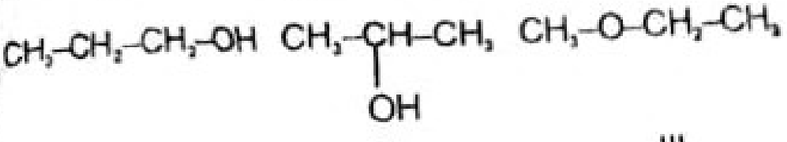
This section contains 5 questions with internal choice in one of them. The following questions are very short answer type and carry 2 marks each.

17.	When 1.5 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point of benzene raised from 353.23 K to 353.93 K. Calculate the molar mass of the solute. (K_b for benzene= 2.52 K kg/mol)	2
18.	Give reasons: (a) The presence of nitro group at o/p- positions increases the reactivity of haloarenes towards nucleophilic substitution reactions. (b) p-dichlorobenzene has higher melting point than those of o-and m-isomers .	2
19.	The activation energy of a reaction is 75.2 kJ/mol in the absence of a catalyst and it lowers to 50.14 kJ/mol with a catalyst. How many times will the rate of reaction grow in the presence of a catalyst if the reaction proceeds at 25°C?	2
20.	Draw the structures of : (a) Di-sec. butyl ketone (b) Semicarbazone derivative of cyclobutanone **OR** Predict the products formed when cyclohexanecarbaldehyde reacts with the following reagents (structure required): (b) PhMgBr and then H_3O^+ (c) Excess ethanol and acid	2 2

21.	Predict the structures of the products that will be obtained when D-glucose is treated with the following reagents: (a) HCN (b) Bromine water Gluconic acid	2

SECTION: C

This section contains 7 questions with internal choice in one of them. The following questions are short answer type and carry 3 marks each.

22.	(a) How can you prepare p-Nitrobenzoic acid from benzene? (b) Distinguish Pentan-2-one and Pentan-3-one by chemical test. (c) What happens when 2,2-Dimethylpropanal is treated with conc. NaOH?	3
23.	A student titrates a solution of H_2O_2 against $KMnO_4$ solution at different intervals of time and gave the following results: Time (mins): 0 | 10 | 20 Vol of $KMnO_4$ (mL): 23.8 | 14.7 | 9.1 Show that the above data correspond to a first order reaction. (log 1.653= 0.2093, log 2.615= 0.4176)	3
24.	Write structures of the major products: (i)  (ii) $(C_6H_5CH_2)_2Cd + 2CH_3COCl \longrightarrow$ (iii) $H_3C-C\equiv C-H \xrightarrow{Hg^{2+},\ H_2SO_4}$	3
25.	(a) What weight of solute (Molar mass= 60 g/mol) is required to dissolve in 180 g of water to reduce the vapour pressure to 4/5th of pure water? (b) Out of the following has highest boiling point: 1 M glucose 1 M $Al(NO_3)_3$	3 (2+1)
26.	(a) Arrange the following in decreasing order of ease of dehydration:  I II  III  IV (b) Arrange the following in increasing order of boiling point:  I II III (c) Illustrate Reimer Tiemann Reaction	3

	(a) Write one point of difference between electrochemical cell and electrolytic cell. (b) If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons flow through the wire? **OR** (a) State Kohlrausch's law of independent migration of ions. (b) The conductivity of 0.25 M solution of KCl at 300 K is 0.0275 S/cm. Calculate molar conductivity.	3 (1+2) (1+2)
28.	(a) Mention the hydrolysis products of lactose. (b) Give reason: (i) Sucrose is known as invert sugar. (ii) The melting points and solubility of amino acids in water are generally higher than that of the corresponding halo acids.	3 (1+2)

SECTION: D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks. Read the passage carefully and answer the questions that follow.

29. **Read the given passage and answer the questions based on passage and related studied concepts.** (1+1+2)

Rahul set-up an experiment to find resistance of aqueous KCl solution for different concentrations at 298K using a conductivity cell connected to a Wheatstone bridge. He fed the Wheatstone bridge with 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 K and molar conductivity Λ_m and recorded his readings

S.No	Conc (M)	K (S/cm)	Λ_m (Scm^2mol^{-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

(a) If Rahul had used HCl instead of KCl, then would you expect the values of Λ_m to be more or less than those per KCl for a given concentration? Justify

OR

Amit a classmate of Rahul repeated the same experiment with CH_3COOH solution instead of KCl solution. Give one point that would be similar and one that would be different in his observations as compared to Rahul.

(b) Why does conductivity decrease with dilution?

(c) If Λ_m^0 of KCl is 150.0 Scm^2mol^{-1}, calculate the degree of dissociation of 0.01 M KCl.

30. **Read the given passage and answer the questions that follow:** (1+1+2)

Carbohydrates are optically active polyhydroxy aldehydes and ketones. They are also called saccharides. All those carbohydrates which reduce Fehling's solution and Tollen's reagent are referred to as reducing sugars. Glucose, the most important source of energy for mammals, is obtained by the hydrolysis of starch. Vitamins are accessory food factors required in the diet. Proteins are the polymers of α-amino acids and perform various structural and dynamic functions in the organisms. Deficiency of vitamins lead to many diseases.

(a) The penta-acetate of glucose does not react with Hydroxylamine: Justify.

(b) Why cannot vitamin C be stored in our body?

(c) Explain:

Peptide linkage and Denaturation.

OR

	Glycosidic linkage and Anomers.	

SECTION: E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

31.	(a) For a reaction A to B, the rate of the reaction becomes 3 times when the concentration of A is increased by 9 times. What is the order of reaction? (b) The rate constant for a first order reaction is 60 /s. How much time will it take to reduce the initial concentration of the reactant to $1/10^{th}$ of its initial value?	5 (2+3)
32.	An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent nor does it decolourise bromine water or Baever's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$. Identify compounds (A) and (B) and write the reactions involved. **OR** (a) How can you convert the following to benzoic acid: (i) Bromobenzene (ii) Styrene (b) Give reason: (i) Benzoic acid do not undergo Friedel-Craft's reaction. (ii) $CH_2FCH_2CH_2COOH$ is less acidic than CH_3CHFCH_2COOH (c) Illustrate: HVZ reaction	5 (2+2+1)
33.	(a) Write the mechanism of the reaction of HI with methoxymethane. (b) How can you obtain tert-butyl ethyl ether by Williamson's synthesis? **OR** (a) How can you obtain: (i) Toluene from phenol (ii) Phenol from Cumene (b) Give mechanism for the preparation of diethyl ether from 2 moles of ethanol.	3 2 2 3