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| **FT/CHQP/1223/A 05-JUN-2023** | | | | | |
| **FIRST TERM EXAMINATION (2023-24)** | | | | | |
| **Subject: CHEMISTRY**  **Grade: XII** | | **Max. Marks:70 Time: 3Hrs** | | | |
| **Name:** | | | **Section:** | **Roll No:** | |
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|  | **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 | Gem-dibromide is-   1. CH3CH(Br)CH2Br 2. CH3C(Br)2CH3 3. CH2(Br)CH2CH2Br 4. CH2(Br)CH2Br | | | | 1 |
| 2 | The major product of acid-catalysed dehydration of 1-methylcyclohexanol is:   1. 1-methylcyclohexane 2. 1-methylcyclohexene 3. 1-cyclohexylmethanol 4. 1-methylenecyclohexane | | | | 1 |
| 3 | Which one of the following compounds is more reactive towards SN1 reaction?   1. CH2=CHCH2Br 2. C6H5CH2Br 3. C6H5CH(C6H5)Br 4. C6H5CH(CH3)Br | | | | 1 |
| 4 | The compound which reacts fastest with Lucas reagent at room temperature is-   1. Butan-1-ol 2. Butan-2-ol 3. 2-Methyl propan-1-ol 4. 2-Methylpropan-2-ol | | | | 1 |
| 5 | Ketones can be obtained in one step by   1. hydrolysis of esters 2. oxidation of primary alcohols 3. oxidation of secondary alcohols 4. the reaction of alkyl halides with alcohol | | | | 1 |
| 6 | Which of the following tests/ reactions is given by aldehydes as well as ketones?   1. Fehling’s test 2. Tollen’s test 3. 2,4 DNP test 4. Cannizzaro reaction | | | | 1 |
| 7 | The osmotic pressure of a 5 % aqueous solution of glucose (𝜋1) is related to that of a 5 % aqueous solution of urea (𝜋2) as   1. 𝜋1 = 𝜋2 2. 𝜋1 < 𝜋2 3. 𝜋1 > 𝜋2 4. 𝜋1 = 𝜋2/2 | | | | 1 |
| 8 | The oxidation of toluene to benzaldehyde by chromyl chloride is called:   1. Etard reaction 2. Riemer-Tiemann reaction 3. Stephen’s reaction 4. Cannizzaro’s reaction | | | | 1 |
| 9 | Which of the following cannot be prepared by using Williamson Synthesis:   1. Ditert. butyl ether 2. Methoxybenzene 3. Benzyl p-nitrophenyl ether 4. Tert. butyl methyl ether | | | | 1 |
| 10 | Molal depression constant depends upon:   1. nature of the solute 2. nature of the solvent 3. vapour pressure of the solution 4. heat of solution | | | | 1 |
| 11 | Which of the following substances has the highest melting point?   1. Chloromethane 2. Tetrachloromethane 3. Trichloromethane 4. Dichloromethane | | | | 1 |
| 12 | The empirical formula of a non-electrolyte is CH2O. A solution containing 6 g of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution at the same temperature. The molecular formula of the compound is:   1. C2H4O2 2. C3H6O3 3. C5H10O5 4. C4H8O4 | | | | 1 |
| 13 | Given below are two statements labelled as Assertion (A) and Reason (R)  **Assertion**: SN2 reaction of an optically active aryl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.  **Reason**: SN2 reactions always proceed with inversion of configuration.  Select the most appropriate answer from the options given below:  (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 |
| 14 | **Assertion**: The boiling points of aldehydes and ketones are higher than hydrocarbons and ethers of comparable molecular masses.  **Reason**: There is a weak molecular association in aldehydes and ketones arising out of the dipole-dipole interactions. | | | | 1 |
| 15 | **Assertion**: An ether is more volatile than an alcohol of comparable molecular mass.  **Reason**: Ethers are polar in nature | | | | 1 |
| 16 | **Assertion:** Aldehydes and ketones, both react with Tollens’ reagent to form silver mirror.  **Reason**: Both, aldehydes and ketones contain a carbonyl group. | | | | 1 |
|  | **SECTION B**  ***This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.*** | | | |  |
| 17 | Which compound in the following pairs will react faster in SN2 displacement and why?   1. 1-Bromopentane or 2-Bromopentane 2. 1-Bromo-2-methylbutane or 2-Bromo-2-methylbutane. | | | | 2 |
| 18 | Arrange the following sets of compounds in order of their increasing boiling points:   1. Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol. 2. Pentan-1-ol, n-butane, pentanal, ethoxyethane. | | | | 2 |
| 19 | What happens when:  a) Butanone is treated with methyl magnesium bromide and then hydrolysed, and  b) Sodium benzoate is heated with soda lime.  (Write chemical equations) | | | | 2 |
| 20 | H2S, a toxic gas with a rotten egg-like smell, is used for the qualitative analysis. If the solubility of H2S in water at STP is 0.195 m, calculate Henry’s law constant.\ | | | | 2 |
| 21 | Give a reason for the following:  a. During the electrophilic substitution reaction of haloarenes, the para-substituted derivative is the major product.  b. The product formed during the SN1 reaction is a racemic mixture.  **OR**  a). Name the suitable alcohol and reagent, from which 2-Chloro-2-methyl propane can be prepared.  b). Out of the Chloromethane and Fluoromethane, which one is has a higher dipole moment and why? | | | | 2 |
|  | **SECTION-C**  ***This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.*** | | | |  |
| 22 | Give reasons why:   1. Ketones are less reactive than aldehydes towards nucleophilic additions. 2. Formaldehyde does not undergo aldol condensation. 3. Reaction of benzaldehyde with concentrated sodium hydroxide is a disproportionation reaction. | | | | 2 |
| 23 | Give the chemical tests to distinguish between the following pairs of compounds:   1. Pentan-2-one and Pentan-3-one. 2. Benzaldehyde and Acetaldehyde 3. Propanal and propanone | | | | 2 |
| 24 | 18 g of glucose, C6H12O6 (Molar mass =180 g mol-1) is dissolved in 1 kg of water in a saucepan. At what temperature will this solution boil?  (Kb for water = 0.52 K kg mol-1, boiling point of pure water = 373.15 K) | | | | 3 |
| 25 | Account for the following:   1. Nitric acid is added during the iodination of benzene. 2. Allyl chloride is hydrolysed more readily than n-propyl chloride. 3. Haloalkanes are more reactive towards nucleophilic substitution reactions than haloarenes and vinylic halides | | | | 3 |
| 26 | Complete each synthesis by giving the missing starting material, reagent or products-    a)  b)  c)    **OR**  a)  b)  c) | | | | 3 |
| 27 | An alkene ‘A’ (Mol. formula C5H10) on ozonolysis gives a mixture of two compounds, ‘B’ and ‘C’. Compound B’ gives positive Fehling’s test and forms iodoform on treatment with I2 and NaOH. Compound C’ does not give Fehling’s test but forms iodoform. Identify the compounds A, B, and C. | | | | 3 |
| 28 | Give reasons for the following:   1. Phenol is more acidic than ethanol. 2. Boiling point of ethanol is higher in comparison to methoxymethane. 3. (CH3)3C − O − CH3 on reaction with HI gives CH3OH and (CH3)3C − I as the main products and not (CH3)3C-OH and CH3I. | | | | 3 |
|  | **SECTION D**  ***The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each.*** | | | |  |
| 29 | **Read the passage given below and answer the questions that follow**:  Haloalkanes are colourless (when pure), sweet-smelling liquids. CH3Cl, CH3Br and C2H5Cl and freons are gases. The boiling point increases with an increase in molecular weight and increase in carbon chain length and decreases with branching. They are insoluble in water due to their inability to form H-bonds with water. Dipole moment increases with polarity, density increases with an increase in molar mass. They are non-inflammable, therefore, CCl4 is used as a fire extinguisher under the name pyrene. p-dichloro benzene has zero dipole moment, a higher melting point than o-dichloro benzene due to symmetry, fits into crystal lattice readily. Haloalkanes undergo nucleophilic substitution reaction by SN2 mechanism, 1° > 2° > 3°, SN1, if carbocation formed, is stable. They also undergo nucleophilic elimination reactions with alcoholic KOH. Haloarenes are less reactive than haloalkanes towards nucleophilic substitution due to resonance. Haloarenes undergo electrophilic substitution reactions like nitration, sulphonation, Friedel-Crafts alkylation, and acylation.  (i) The order of reactivity of the given haloalkanes towards nucleophiles is :   1. RI > RBr > RCl 2. RCl > RBr > RI 3. RBr > RCl > RI 4. RBr > RI > RCl   (ii) The major acylation product of chlorobenzene is-:   1. 1-Chloro-2-methylbenzene 2. 1-Chloro-4-ethylbenzene 3. 2-Chloroacetophenone 4. 4-Chloroacetophenone   (iii) How is chlorobenzene prepared by (a)  direct chlorination (b)  diazotization method? | | | | 4 |
| 30 | **Read the passage given below and answer the questions that follow**:  Dilute solutions containing non-volatile solutes exhibit some properties which depend only on the number of solute particles present and not on the type of solute present. These properties are called colligative properties. These properties are mostly seen in dilute solutions. We can further consider colligative properties as those properties that are obtained by the dissolution of a non-volatile solute in a volatile solvent. Generally, the solvent properties are changed by the solute where its particles remove some of the solvent molecules in the liquid phase. This also results in the reduction of the concentration of the solvent.  We can observe the colligative properties of solutions by going through the following examples. If we add a pinch of salt to a glass full of water its freezing temperature is lowered considerably than the normal temperature. Alternatively, its boiling temperature is also increased and the solution will have a lower vapour pressure. There are changes in its osmotic pressure as well.  Similarly, if we add alcohol to water, the solution’s freezing point goes down below the normal temperature that is observed for either pure water or alcohol.   1. Why is a person suffering from high blood pressure advised to take a minimum quantity of common salt? 2. What will happen to the freezing point of a potassium iodide aqueous solution when mercuric iodide is added to the solution? 3. The molal elevation constant for water is 0.513o C kg mol–. When 0.2 mole of sugar is dissolved in 250g of water, calculate the temperature at which the solution boils under atmospheric pressure. | | | | 4 |
|  | . **SECTION E**  ***The following questions are long answer type and carry 5 marks each. All questions have an internal choice*** | | | |  |
| 31 | A compound A with the molecular formula C5H12O on oxidation forms compound B with the molecular formula C5H10O. The compound B gives an iodoform test but does not reduce ammoniacal silver nitrate. The compound B on reduction with Zn – Hg/ HCl gives compound C with the molecular formula C5H12. Identify A, B, and C and give the chemical reactions involved.  **OR**  A compound ‘A’ with formula C5H10O gives a positive 2, 4 –DNP test but a negative Tollen’s test It can be oxidized to carboxylic acid ‘B’ of molecular formula,C3H6O2 when treated with alkaline KMnO4 under vigorous conditions. The salt of ‘B’ gives a hydrocarbon ‘C’ on Kolbe’s electrolytic decarboxylation. Identify A, B.C & write chemical equations. | | | | 5 |
| 32 | a) Determine the osmotic pressure of a solution prepared by dissolving 2.5 × 10-2 g of K2SO4 in 2L of water at 25° C, assuming that it is completely dissociated.  (R = 0.0821 L atm K-1 mol-1, Molar mass of K2SO4 = 174 g mol-1).  b) State Raoult’s law. Explain positive and negative deviations from Raoult’s law with suitable examples.  **OR**  a) Calculate the freezing point of an aqueous solution containing 10.50 g of MgBr2 in 200 g of water. (Molar mass of MgBr2 = 184 g) (Kf for water = 1.86 K kg mol-1)  b) State Henry’s law of partial pressure of a gas in a mixture. State one application and one limitation of Henry’s law. | | | | 5 |
| 33 | Attempt ***any five*** of the following:  Give complete equations of the following reactions with appropriate reagents:   1. Oxidation of propan-1-ol in an alkaline solution. 2. Bromine in CS2 with phenol. 3. Sodium ethoxide with tertiary butyl chloride. 4. Phenol with chloroform in the presence of aqueous NaOH. 5. Benzyl alcohol to benzoic acid. 6. Nitration of phenol to Picric acid 7. Butan-2-one to butan-2-ol. | | | | 5 |

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