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| **B** | | | | | | | |
| **HY/CH/1220/B 22/11/2020** | | | | | | | |
| **HALF YEARLY EXAMINATION (2020-21)** | | | | | | | |
| **Subject: CHEMISTRY**  **Grade: XII** | | | Max. Marks: 70Time: 3 Hrs | | | | |
| **Name:** | | | | **Section:** | **Roll No:** | | |
| 1. **Read the following instructions carefully.** 2. **There are 33 questions in this question paper. All questions are compulsory.** 3. **Section A: Q. No. 1 to 2 are case-based questions having four MCQs or Reason Assertion type based on given passage each carrying 1 mark.** 4. **Section A: Question 3 to 16 are MCQs and Reason Assertion type questions carrying 1 mark each** 5. **Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.** 6. **Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.** 7. **Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.** 8. **There is no overall choice. However, internal choices have been provided.** 9. **Use log tables if necessary, use of calculators is not permitted.** | | | | | | | |
|  | | **SECTION - A** | | | | |  |
| 1. | | Read the passage given below and answer the following questions: | | | | 1x4=4 | |
|  | | A comparison of the properties and reactivity of aldehydes and ketones with those of the alkenes is warranted, since both have a double bond functional group. Because of the greater electronegativity of oxygen, the carbonyl group is polar, and aldehydes and ketones have larger molecular dipole moments (D) than do alkenes. The resonance structures below illustrate this polarity | | | | |  |
|  | | The following questions are multiple choice questions. Choose the most appropriate answer: | | | | |  |
| (i) | | The dipole moments of formaldehyde, other aldehydes and ketones indicate?   1. The stabilizing influence that alkyl substituents have on carbanions 2. The destabilizing influence that alkyl substituents have on carbanions 3. The stabilizing influence that alkyl substituents have on carbocations 4. The destabilizing influence that alkyl substituents have on carbocations | | | | |  |
| (ii). | | How do the boiling points of aldehydes and ketones compare with that of similar sized alkenes?   1. Aldehydes and ketones will have higher boiling points than similar sized alkenes. 2. Aldehydes and ketones will have similar boiling points to similar sized alkenes. 3. Aldehydes and ketones will have lower boiling points than similar sized alkenes. 4. Alkenes will have higher boiling points than similar sized aldehydes and ketones. | | | | |  |
|  | | OR | | | | |  |
|  | | How does the presence of oxygen with its non-bonding electron pairs influence the water solubility of aldehydes and ketones relative to hydrocarbons?   1. It makes aldehydes and ketones hydrogen-bond acceptors, and decreases their water solubility 2. It makes aldehydes and ketones hydrogen-bond acceptors, and increases their water solubility 3. aldehydes and ketones repel hydrogen and are immiscible in water 4. aldehydes and ketones repel hydrogen and are miscible in water | | | | |  |
| (iii) | | Reversible addition of water to the carbonyl function is:   1. faster than in case of alkenes 2. slower than in case of alkenes 3. both proceed at the same rate 4. immeasurably slow in the absence of a strong acid catalyst. | | | | |  |
| (iv) | | An organic compound ‘X’ with molecular formula C7H6O which reduces Tollen’s reagent on reaction with an alcohol with molecular formula C2H6O ‘Y’ gives ‘Z’ . Compounds ‘X’, ‘Y’ and ‘Z’ respectively are:   1. Benzaldehyde, Benzyl alcohol, ethylene glycol 2. Propanone, propanol, ketal 3. Benzaldehyde, Benzyl alcohol, acetal 4. Benzaldehyde, ethanol, acetal | | | | |  |
| 2. | | Read the passage given below and answer the following questions:  The binary solution of two volatile liquids following Raoult’s law at all concentration and at all temperatures is termed as ' Ideal solution '  If the intermolecular attractive forces between the solute(A) - solvent (B) (ie.A-B interaction) are nearly equal to those between the solvent- solvent (A-A) and solute-solute (B-B) it forms ideal solutions.  In such an ideal solution, enthalpy of mixing, mixH =0. Volume change on mixing, mixV=0.  Examples: n- hexane and n-heptane.   These are binary solutions of two volatile liquids which do not obey Raoult’s law at all concentration and at all temperature are called **Non Ideal solutions.** | | | | |  |
|  | | In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.  a) Assertion and reason both are correct statements and reason is correct explanation for assertion.  b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.  c) Assertion is correct statement but reason is wrong statement.  d) Assertion is wrong statement but reason is correct statement. | | | | |  |
| (i) | | **Assertion:** When methyl alcohol is added to water, boiling point of water decreases. **Reason:**When a volatile solute is added to a volatile solvent elevation in boiling point is observed. | | | | | 1 |
| (ii) | | **Assertion:** Water-Nitric acid **will have same composition in liquid and vapour phase.** **Reason:**At a particular composition, water-nitric acid forms azeotropic mixture which have same composition in vapour phase and liquid phase. | | | | | 1 |
| (iii) | | **Assertion:**  **Intermolecular forces between two benzene molecules are greater than those between two toluene molecules.** **Reason:**The solution forms an ideal solution  & obeys Raoult’s law . | | | | | 1 |
| (iv) | | **Assertion:** **On adding acetone to methanol some of the hydrogen bonds between methanol molecules break. Reason:**At specific composition methanol-acetone mixture will form minimum boiling azeotrope and will show positive deviation from Raoult’s law.  **OR**  **Assertion:** A–B interactions are weaker than those between A–A or B–B.  **Reason: The two liquids A and B form minimum boiling azeotrope at some specific composition.** | | | | | 1 |
|  | | **Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:** | | | | |  |
| 3. | | **Order of increasing bond dissociation enthalpy for F2, Cl2, Br2, I2 is:**   1. F2<Cl2<Br2<I2 2. F2<Br2<Cl2<I2 3. I2<Cl2<Br2<F2 4. I2<F2<Br2<Cl2 | | | | | 1 |
| 4. | | On the basis of data given below predict which of the following gases shows least adsorption on a definite amount of charcoal?   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Gas | CO2 | SO2 | CH4 | H2 | | Critical temp./K | 304 | 630 | 190 | 33 |  1. CO2 2. SO2 3. CH4 4. H2 | | | | | 1 |
|  | | OR | | | | |  |
|  | | Which of the following process is responsible for the formation of delta at a place where rivers meet the sea?  a) Emulsification b) Colloid formation c) Coagulation d) Peptisation | | | | |  |
| 5. | | The CFSE for octahedral [CoCl6]4– is 18,000 cm–1. The CFSE for tetrahedral [CoCl4]2– will be  a) 18,000 cm–1  b) 16,000 cm–1  c) 8,000 cm–1  d) 20,000 cm–1 | | | | | 1 |
| 6. | | Using the data given below find out the strongest oxidising agent.    a) Cl–  b) MnO4-  c) Cr3+  d) Mn2+ | | | | | 1 |
| 7 | | Transition elements show magnetic moment due to spin and orbital motion of electrons. Which of the following metallic ions have almost same spin only magnetic moment?  (i) Co2+ (ii) Cr2+ (iii) Mn2+ (iv) Cr3+  a) (i) and (ii)  b) (ii) and (iii)  c) (i) and (iii)  d) (i) and (iv) | | | | | 1 |
|  | | **OR** | | | | |  |
|  | | Which of the following statements is not correct?  a) Copper liberates hydrogen from acids. b) In its higher oxidation states, manganese forms stable compounds with oxygen and fluorine. c) Mn3+ and Co3+ are oxidising agents in aqueous solution. d) Ti2+ and Cr2+ are reducing agents in aqueous solution. | | | | |  |
| 8 | | The correct IUPAC name for CH2=CHCH2NHCH3 is  a) Allylmethylamine b) 2-amino-4-pentene c) 4-aminopent-1-ene d) N-methylprop-2-en-1-amine | | | | | 1 |
| 9 | | Which of the following elements does not belong to the actinoid series?  a) U  b) Np  c) Tm  d) Fm | | | | | 1 |
| 10 | | **Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon \_\_\_\_\_\_\_\_\_\_\_\_.**  a) Temperature b) Nature of solute c) Pressure d) Nature of solvent | | | | | 1 |
| 11 | | In Clemmensen Reduction carbonyl compound is treated with \_\_\_\_\_\_\_\_\_\_\_\_\_.  a) Zinc amalgam + HCl b) Sodium amalgam + HCl c) Zinc amalgam + nitric acid d) Sodium amalgam + HNO3 | | | | | 1 |
|  | | In the following questions (Q. No. 12 - 16) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.  a) Assertion and reason both are correct statements and reason is correct explanation for assertion.  b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.  c) Assertion is correct statement but reason is wrong statement.  d) Assertion is wrong statement but reason is correct statement. | | | | |  |
| 12 | | **Assertion:** Conductivity of all electrolytes decreases on dilution. **Reason:** On dilution number of ions per unit volume decreases. | | | | | 1 |
| 13 | | **Assertion**: Aniline can be prepared by Gabriel synthesis.  **Reason**: Aniline is a primary amine | | | | | 1 |
| 14 | | **Assertion**. Ozone is a powerful oxidising agent.  **Reason**: Ozone easily decomposes to oxygen. | | | | | 1 |
|  | | **OR** | | | | |  |
|  | | **Assertion:** SF6 cannot be hydrolysed but SF4 can be. **Reason:** Six F atoms in SF6 prevent the attack of H2O on sulphur atom of SF6. | | | | |  |
| 15 | | **Assertion:** An ordinary filter paper impregnated with collodion solution stops the flow of colloidal particles.  **Reason:** Pore size of the filter paper becomes more than the size of colloidal particle. | | | | | 1 |
| 16 | | **Assertion**: Cobalt (II) readily oxidises to Co (III) while forming complexes.  **Reason**: Co(III) has a stable t2g3 configuration in complexes. | | | | | 1 |
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|  | | **SECTION – B**  The following questions, Q.No 17 – 25 are short answer type and carry 2 marks each. | | | | |  |
| 17 | | On dissolving 3.24 g of sulphur in 40g of benzene, boiling point of the solution was higher than that of benzene by 0.81K, Kb value for benzene is 2.53 K Kg mol-1. What is the molecular formula of sulphur? | | | | | 2 |
|  | | **OR** | | | | |  |
|  | | H2S **a toxic gas with 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.** | | | | |  |
| 18. | | Give reason:   1. Cr2+ is a strong reducing agent whereas Mn2+ is not (Cr = 24, Mn = 25) 2. **Although Zr belongs to 4**d **and Hf belongs to 5**d **transition series but it is quite difficult to separate them.** | | | | | 2 |
| 19 | | Explain Freundlich’s isotherm. | | | | | 2 |
|  | | **OR** | | | | |  |
|  | | State what you will observe when:  a) an electrolyte is added to a colloidal solution.  b) an electric current is passed through a colloidal solution. | | | | |  |
| 20 | | What is the role of pyridine in the acylation reaction of amines? Explain with the help of an example. | | | | | 2 |
|  | | **OR** | | | | |  |
|  | | 1. Starting from ethane nitrile, how can butanone be prepared? 2. Why do primary amines have higher boiling points than tertiary amines? | | | | |  |
| 21 | | 1. How is the variability in oxidation states of transition metals different from that of the non-transition metals? Illustrate with examples. 2. Predict which of the following will be colourless in aqueous solution: Ti3+, V3+, Cu+, Sc3+. Mn2+, Fe3+andCo2+. Give reason. | | | | | 2 |
| 22. | | For the reaction A+B -----🡪 C+D, the rate of reaction doubles when the concentration of A doubles, provided the concentration of B is constant. To what order does A enter in the rate expression? | | | | | 2 |
| 23 | | Calculate the potential of the following cell :  Sn4+ (1.5 M) + Zn → Sn2+ (0.5 M) + Zn2+ (2M).  Given :  Will the cell potential increase or decrease if the concentration of Sn4+ is increased? | | | | | 2 |
| 24 | | Complete and balance the following equations:   1. NaCl + MnO2 + H2SO4 🡪 2. Ca(OH) 2 + Cl2 🡪 | | | | | 2 |
| 25 | | Differentiate between order and molecularity of a reaction. (Any 2 points) | | | | | 2 |
|  | | **SECTION – C** | | | | |  |
| 26. | | How can the following conversions take place?   1. Ethanol → Acetone 2. Cyclohexene → Hexane-1, 6 dioic acid 3. Benzoic acid → Benzaldehyde | | | | | 3 |
|  | | **OR** | | | | |  |
|  | | An organic compound (A) has molecular formula (C5H10O). It does not reduce Tollen’s reagent but forms an orange precipitate with 2,4-DNP reagent. It forms a carboxylic acid (B) with molecular formula (C3H6O2). When treated with alkaline KMnO4, Sodium salt of (B) gave a hydrocarbon (C) in Kolbe’s electrolytic reduction. Identify (A), (B) and (C) and write the reactions involved. | | | | |  |
| 27 | | 1. Differentiate between lyophobic and lyophillic sol? (Any 2 points) 2. Explain what is observed when a beam of light is passed through a colloidal sol. | | | | | 3 |
|  | | **OR** | | | | |  |
|  | | 1. Alum is used for purification of water. Why? 2. Write the equation for formation of Sulphur sol. 3. What are associated colloids? Give an example? | | | | |  |
| 28 | | The molar conductivity of 0.025 mol L-1 methanoic acid is 46.1 S cm2 mol-1 . Calculate its degree of dissociation and dissociation constant. Given Λº (H+ ) = 349.6 S cm2 mol-1 , Λº (HCOO− ) = 54.6 S cm2 mol-1 . | | | | | 3 |
| 29 | | How is XeO3 obtained? Write the related chemical equations. Draw the structure of XeO3. | | | | | 3 |
| 30. | | a)  The reaction between A and B is first order with respect to A and zero order with respect to B. Calculate the concentrations of A inExperiments II and IV and the initial rate inExperiment III**:**   |  |  |  |  | | --- | --- | --- | --- | | Experiment |  |  | Initial rate / | | I | 0.1 | 0.1 |  | | II | – | 0.2 |  | | III | 0.4 | 0.4 | – | | IV | – | 0.2 |  |   b) For a certain chemical reaction variation in concentration [R] vs. time (s) plot is given below:  What will be the unit of rate constant for the reaction? | | | | | 3 |
|  | | **SECTION - D** | | | | |  |
| 31 | | 1. What product will be formed on reaction of propanal with 2-methylpropanal in the presence of NaOH? Write the name of the reaction and also the equations involved. 2. Arrange the following compounds in increasing order of their acid strengths:   (CH3)2CHCOOH, CH3CH2CH(Br)COOH, CH3CH(Br)CH2COOH   1. An organic compound X has molecular formula C5H10O. It does not reduce Fehling’s solution but forms a bisulphate compound. It also gives positive Iodoform test. What are possible structures of X?   **OR**   1. How will you prepare (a) acetic anhydride and (b) acetyl chloride from CH3COOH? Write the equation involved in each case. 2. Why is the boiling point of acid anhydride higher than the acid from which it is obtained? 3. Give reasons for: Carboxylic acids are stronger acids than phenols. 4. Identify the reactant undergoing the following reaction: | | | | |  |
| 32. | | An element A exists as a yellow solid in a standard state. It forms a volatile hydride B which is a foul-smelling gas and is extensively used in qualitative analysis of salts. When treated with oxygen B forms an oxide C which is a colourless, pungent smelling gas. This gas when passed through acidified KMnO4 solution, decolourises it. C gets oxidized to another oxide D in the presence of heterogeneous catalyst.   1. Identify A, B, C, and D and also give the chemical equation of reaction 2. Give an equation for the reaction that occurs when C is passed through an aqueous solution of Fe(III) salt.   **OR**  Two gases A and B are allotropes. A is paramagnetic and B is diamagnetic. B is a powerful oxidizing agent than A. A is converted to B by silent electrical discharge. A is colorless while B is a pale blue gas. B reacts with blackened lead paintings to make them white. B converts colorless NO gas to brown gas C and A is also formed.   1. Identify A, B and C and write the reactions involved. 2. How does B protect the environment? 3. How is B estimated quantitatively? | | | | | 5 |
| 33 | | A colourless substance ‘A’ (C6H7N) is sparingly soluble in water and gives a water-soluble compound ‘B’ on treating with mineral acid. On reacting with CHCl3 and alcoholic potash ‘A’ produces an obnoxious smell due to the formation of compound ‘C’. Reaction of ‘A’ with benzenesulphonyl chloride gives compound ‘D’ which is soluble in alkali.  a)Identify compounds ‘A’ to ‘D’ and write the equations involved.  b) How will you convert?  (i) Benzene into aniline  (ii)  Cl-(CH2)4-Cl into Hexane-1, 6-diamine?  **OR**   1. A compound ‘A’ having molecular formula C3H7ON reacts with Br2 in presence of NaOH to give compound ‘B’. This compound ‘B’ reacts with HNO2 to form alcohol and N2 gas. Identify compound ‘A’ and ‘B’ and write the reaction involved. 2. Explain with the help of an equation how will you test the presence of primary amine? 3. How will you convert: 4. Nitromethane → Dimethylamine 5. Ethanamine into methanamine | | | | |  |

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