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| **HY/SC/1220/A 21/11/2020** | | | | | |
| **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)**  An important class of organo-metallic compounds discovered by Victor Grignard in 1900 is alkyl magnesium halide, RMgX, referred as **Grignard Reagents**. These reagents are obtained by the reaction of haloalkanes with magnesium metal in dry ether.  It is an efficient reagent used for the transformation of carbonyl compounds into different types of alcohols- primary, secondary and tertiary. Grignard reagent is also used to prepare carboxylic acid with the help of dry ice. Nitriles can be converted to carbonyl compounds with the help of Grignard reagent. Treatment of acyl chlorides with dialkylcadmium, prepared by the reaction of cadmium chloride with Grignard reagent, gives ketones.  Grignard reagents are highly reactive and react with any source of proton to give hydrocarbons. Even water, alcohols, amines are sufficiently acidic to convert them to corresponding hydrocarbons.  It is therefore necessary to avoid even traces of moisture from a Grignard reagent. On the other hand, this could be considered as one of the methods for converting halides to hydrocarbons.  **The following questions are multiple choice questions. Choose the most appropriate answer:** | | | | 4 |
| (i) | Which alkane nitrile gives aldehyde only with Grignard reagent?  a) Formaldehyde  b) methane nitrile  c) Ethyl alcohol  d) Methyl iodide | | | |  |
| (ii) | The conversion PhCN → PhCOCH3, can be achieved most conveniently by reaction with  a) CH3MgBr followed by hydrolysis  b) I2 – NaOH, CH3I  c) Dil. H2SO4 followed by reaction with CH2N2  d) LiAlH4 followed by reaction with CH3I  **Or**  A simple compound with molecular formula (C3H8O) on oxidation with CrO3 gives ’B’ and when ‘B’ reacts with ethyl magnesium bromide gives a tertiary alcohol. The alcohol is  a) 2-Methyl butan-2-ol  b) 2-Methyl propan-2-ol  c) 2-Ethyl Propan-2-ol  d) 2-Ethyl pentan-2-ol | | | |  |
| (iii). | Which of the following products is formed when benzaldehyde is treated with CH3MgBr and the addition product so obtained is subjected to acid hydrolysis?  a) A secondary alcohol  b) A primary alcohol  c) Phenol  d) tert-Butyl alcohol | | | |  |
| (iv). | From which of the following tertiary butyl alcohol is obtained by the action of methyl magnesium iodide  a) HCHO  b) CH3CHO  c) CH3COCH3  d) CO2 | | | |  |
| 2. | **Read the passage given below and answer the following questions: (1x4=4)**  Composition of a solution can be described by expressing its concentration. Each method of expressing concentration of the solutions has its own merits and demerits. Mass %, ppm, mole fraction and molality are independent of temperature, whereas molarity is a function of  temperature. This is because volume depends on temperature and the mass does not.  Solubility of a substance is its maximum amount that can be dissolved in a specified amount of solvent at a specified temperature. It depends upon the nature of solute and solvent as well as temperature and pressure.  If the solute is volatile (liquid solute) then vapour pressure of the solution at a given temperature is found to be higher than the vapour pressure of the pure solvent at the same temperature.  If the solute is nonvolatile(solid) then vapour pressure of the solution at a given temperature is found to be lower than the vapour pressure of the pure solvent at the same temperature. In the solution, the surface has both solute and solvent molecules; thereby the fraction of the surface covered by the solvent molecules gets reduced. Consequently, the number of solvent molecules escaping from the surface is correspondingly reduced, thus, the vapour pressure is also reduced.  **Note : In these questions (Q. No 5-8 , a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.**  (i) Assertion and reason both are correct statements and reason is correct explanation for assertion.  (ii) Assertion and reason both are correct statements but reason is not correct explanation for assertion.  (iii) Assertion is correct statement, but reason is wrong statement.  (iv) Assertion and reason both are incorrect statements.  (v) Assertion is wrong statement, but reason is correct statement. | | | | 4 |
| (i) | **Assertion :** Molarity of a solution in liquid state changes with temperature.  **Reason :** The volume of a solution changes with change in temperature. | | | |  |
| (ii) | **Assertion :** When methyl alcohol is added to water, boiling point of water increases.  **Reason :** When a volatile solute is added to a volatile solvent elevation in boiling point is observed. | | | |  |
| (iii). | **Assertion :** When NaCl is added to water a depression in freezing point is observed.  **Reason :** The lowering of vapour pressure of a solution causes depression in the freezing point. | | | |  |
| (iv). | **Assertion :** When a solution is separated from the pure solvent by a semipermeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.  **Reason :** Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution.  **Or**  **Assertion :** Vapour pressure of solvent is affected when a non-volatile solute is dissolved in it  **Reason :** Vapour pressure of solution decreases because surface consists of both solute and solvent molecules and the escaping tendency of solvent into vapours decreases. | | | |  |
|  | **Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:** | | | |  |
| 3. | Reduction potentials of some ions are given below. Arrange them in decreasing order of oxidising power.    (i) ClO4 – > IO4 – > BrO4 –  (ii) IO4– > BrO4– > ClO4–  (iii) BrO4– > IO4– > ClO4–  (iv) BrO4– > ClO4–  > IO4─ | | | | 1 |
| 4. | In Freundlich Adsorption isotherm, the value of 1/n is  (i) 1 in case of physical adsorption  (ii) 1 in case of chemisorption  (iii) Between 0 and 1 in all cases  (iv) Between 2 and 4 in all cases  **Or**  Which of the following is correct for lyophilic sols?  (i) They are irreversible  (ii) They are formed by inorganic substances  (iii) They are readily coagulated by addition of electrolytes  (iv) They are self stabilized | | | | 1 |
| 5. | The electronic configuration of Cu(II) is *3d*9 whereas that of Cu(I) is *3d*10. Which of the following is correct?  (i) Cu(II) is more stable  (ii) Cu(II) is less stable  (iii) Cu(I) and Cu(II) are equally stable  (iv) Stability of Cu(I) and Cu(II) depends on nature of copper salts. | | | | 1 |
| 6. | Resistance of 0.2 M solution of an electrolyte is 50 ohm. The specific conductance of the solution is 1.3 S m–1. If resistance of the 0.4 M solution of the same electrolyte is 260 ohm, its molar conductivity is  (i) 62.5 S m2 mol–1  (ii) 6250 S m2 mol–1  (iii) 6.25 × 10–4 S m2 mol–1  (iv) 625 × 10–4 S m2 mol–1 | | | | 1 |
| 7. | The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment.  (i) 3d7  (ii) 3d5  (iii) 3d8  (iv) 3d2  **Or**  The catalytic activity of transition metals and their compounds is mainly due to:  (a) their magnetic behaviour  (b) their unfilled *d*-orbitals  (c) their ability to adopt variable oxidation state  (d) their chemical reactivity | | | | 1 |
| 8. | The correct IUPAC name for CH2==CHCH2 NHCH3 is  (i) Allylmethylamine  (ii) 2-amino-4-pentene  (iii) 4-aminopent-1-ene  (iv) N-methylprop-2-en-1-amine | | | | 1 |
| 9. | Which of the following statements is **not** correct?  (i) Copper liberates hydrogen from acids.  (ii) In its higher oxidation states, manganese forms stable compounds with oxygen and fluorine.  (iii) Mn3+ and Co3+ are oxidising agents in aqueous solution.  (iv) Ti2+ and Cr2+ are reducing agents in aqueous solution. | | | | 1 |
| 10. | Solution A contains 7g/L of MgCl2 and solution B contains 7g/L of NaCl. At room temperature, the osmotic pressure of:  (i) solution B is greater than A  (ii) both have same osmotic pressure  (iii) solution A is greater than B  (iv) cannot determine | | | | 1 |
| 11. | Structure of ‘A’ and type of isomerism in the above reaction are respectively.  (i) Prop–1–en–2–ol, metamerism  (ii) Prop-1-en-1-ol, tautomerism  (iii) Prop-2-en-2-ol, geometrical isomerism  (iv) Prop-1-en-2-ol, tautomerism | | | | 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.** | | | |  |
|  | (i) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.  (ii) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.  (iii) Assertion is correct, but reason is wrong statement.  (iv) Assertion is wrong but reason is correct statement.  (v) Both assertion and reason are wrong statements. | | | |  |
| 12. | **Assertion :** For measuring resistance of an ionic solution an AC source is used.  **Reason :** Concentration of ionic solution will change if DC source is used. | | | | 1 |
| 13. | **Assertion :** Hoffmann’s bromamide reaction is given by primary amines.  **Reason :** Primary amines are more basic than secondary amines. | | | | 1 |
| 14. | **Assertion :** Both rhombic and monoclinic sulphur exist as S8 but oxygen exists as O2.  **Reason :** Oxygen forms pπ – pπ multiple bond due to small size and small bond length but  pπ – pπ bonding is not possible in sulphur.  **Or**  **Assertion:** Oxygen is paramagnetic in gaseous state.  Reason: Oxygen is small and second most electronegative element. | | | | 1 |
| 15. | **Assertion :** Coagulation power of Al3+ is more than Na+.  **Reason :** Greater the valency of the flocculating ion added, greater is its power to cause precipitation (Hardy Schulze rule). | | | | 1 |
| 16. | **Assertion:**Cu2+ iodide is not known. **Reason:**Cu2+ oxidises I- to iodine. | | | | 1 |
|  | **Section-B**  **The following questions, Q.No 17 – 25 are short answer type and carry 2 marks each.** | | | |  |
| 17. | Arrange the following in the increasing order of : (i) boiling point (ii) freezing point  1M glucose , 1M Al2(SO4)3, 1M PbCl2  **Or**  The osmotic pressure of blood is 8.21 atm at 37oC. How much glucose would be used for an injection that is at the same osmotic pressure as blood? | | | | 2 |
| 18. | Explain the following:   1. Why Eo values for Mn, Ni and Zn are more negative than expected? 2. Why do the transition elements exhibit higher enthalpies of atomisation? | | | | 2 |
| 19. | What types of colloidal sols are formed in the following?  a) Sulphur vapours are passed through cold water:  b) White of an egg is mixed with water.  **Or**  Explain the following:  a) What are irreversible sols? Explain.  b) Why is Ferric chloride preferred over potassium chloride in case of a cut leading to  bleeding? | | | | 2 |
| 20. | a) Although amino group is *o–* and *p–* directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of *m*-nitroaniline.  b) How can we distinguish between aniline and Ethyl amine.  **Or**  Give the structures of A, B,C and D in the following reactions:  CH3COOH  (A)  (B)  (C)  (D) | | | | 2 |
| 21. | Explain the following:   1. Why the melting point of Mn and Tc are abnormally low? 2. Why in group 6, Mo(VI) and W(VI) are found to be more stable than Cr(VI). | | | | 2 |
| 22. | The half-life for radioactive decay of 14C is 5730 years. An archaeological artifact containing wood had only 80% of the 14C found in a living tree. Estimate the age of the sample. | | | | 2 |
| 23. | a) Solutions of two electrolytes ‘A’ and ‘B’ are diluted. The Λ*m* of ‘B’ increases 1.5 times while that of A increases 25 times. Which of the two is a strong electrolyte? Justify your answer.  b) A galvanic cell has electrical potential of 1.1V. If an opposing potential of 1.1V is applied to this cell, what will happen to the cell reaction and current flowing through the cell? | | | | 2 |
| 24. | Give reason:   1. Why does ClF3 exists but FCl3 does not? 2. Why is SF6 known but SCl6 is not? | | | | 2 |
| 25. | Define pseudo unimolecular reaction. Give an example. | | | | 2 |
|  | **Section-C**  **Q.No 26 -30 are Short Answer Type II carrying 3 mark each.** | | | |  |
| 26. | a) Distinguish between the following compounds:  (i) Benzaldehyde and Acetophenone  (ii) Methanoic acid and Acetic acid  b) Arrange the given compounds according to their decreasing acidic nature:  C6H5-COOH, Br-CH2-COOH, HCOOH, Cl-CH2CH2COOH  **Or**  An organic compound A, having the formula C3H8O, on treatment with copper at 573K, gives B. B does not reduce Fehling`s solution but gives a yellow precipitate of the compound C with I2 / NaOH. Deduce the structure of A, B, and C. | | | | 3 |
| 27. | Explain the following:  a) What does Cottrell’s smoke precipitator do in the chimney of factories?  b) Why is Fe(OH)3 colloid positively charged, when prepared by adding FeCl3 to hot water?  c) Why do physisorption and chemisorption behave differently with rise in temperature?  **Or**  Explain the following:  a) What happens when electric field is applied to colloidal solution?  b) Why are some medicines more effective in the colloidal form?  c) What happens when dialysis is prolonged? | | | | 3 |
| 28. | a) Following reaction occurs at cathode during the electrolysis of Aq. NaCℓ solution:    On the basis of their standard reduction electrode potential (Eo) values, which reaction is feasible at the cathode and why?  b)The cell in which the following reaction occurs: 2Fe3+(aq)+ 2I─(aq)→ 2Fe2+(aq) + I2(s)  Eo**cell** = 0.236 V at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction. | | | | 3 |
| 29. | a) Explain why the stability of oxoacids of chlorine increases in the order given below:  HClO < HClO2 < HClO3 < HClO4  b) Which of the following orders are correct as per the properties mentioned against each?   1. HCℓ , HBr , HF , HI (Increasing melting point) 2. H2O, H2S, H2Te, H2Se (Boiling point) | | | | 3 |
| 30. | For a general reaction A → B, plot of concentration of A vs time is given in Fig. Answer the following question based on this graph.  (i) What is the order of the reaction?  (ii) What is the slope of the curve?  (iii) What are the units of rate constant? | | | | 3 |
|  | **Section-D**  **Q.No 31 to 33 are long answer type carrying 5 marks each.** | | | |  |
| 31. | a) How will you bring about the following conversions in not more than two steps?  (i) Ethanol to 3-Hydroxybutanal  (ii) Benzaldehyde to 3-Phenylpropan-1-ol  (b) Describe Hell–Volhard–Zelinsky reaction.  (c) Why we are adding a base in formation of cyanohydrin?  (d) Write chemical tests to distinguish the following pair of compounds:    **Or**  (a) Explain the following name reaction:  (i) Etard reacton  (ii) Rosenmund reduction  (b) Give reason for the following  (i)Aldehydes are more reactive than ketones towards nucleophilic reactions. Why***?***  (ii)What is the role of dry HCI in the formation of Hemiacetal, Acetal and Ketal***?***  (iii) 2,2-Dimethyl propane undergo Cannizzaro reaction. | | | | 5 |
| 32. | (a) Explain why  (i) HF is stored in wax coated glass bottles.  (ii) CℓF3 exists but FCℓ3 does not.  (iii) Sulphur hexafluoride is used as gaseous electrical insulator.  (b) Complete the following (Reaction should be balanced):  (i) NaCℓ + MnO2 + H2SO4 →  (ii) XeF6 + 2H2O →  **Or**  (a) Explain why  (i) ICℓ is more reactive than I2.  (ii) Fluorine is stronger oxidizing agent than chlorine though it has lower electron gain  Enthalpy.  (iii) Xenon is reactive to form compounds.  (b) Complete the following (Reaction should be balanced):  (i) 2KI + H2O + O3 →  (ii) XeF6 + 3H2O → | | | | 5 |
| 33. | (a) Why pKb value of Aniline is higher than Ethanamine?  (b) An aromatic compound ‘A’ on treatment with aqueous ammonia and heating forms compound ‘B’ which on heating with Br2 and KOH forms a compound ‘C’ of molecular formula C6H7N. Write the structures and IUPAC names of compounds A, B and C.  **Or**  (a) Assign a reason for each of the following statements:  (i) The direct reaction of a carboxylic acid with an amine would be expected to be  difficult?  (ii) Aniline does not undergo Friedel Crafts reaction.  (b) Arrange the following:  (i) In increasing order of basic strength:  C6H5NH2, C6H5N(CH3)2, CH3NH2, (C2H5)2NH, NH3, C6H5CH2NH2  (ii) In decreasing order of boiling point:  C2H5NH2, (CH3)2NH, C2H5OH  (c) What is the limitation of Gabriel phthalimide synthesis? | | | | 5 |

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