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| **PB/CH/1220 04/01/2021** | | | | | |
| **PRE-BOARD EXAMINATION (2020-2021)** | | | | | |
| **SUBJECT: CHEMISTRY**  **GRADE: XII** | | MAX. MARKS: 70TIME: 3 Hrs | | | |
| **Name:** | | | **Section:** | **Roll No:** | |
| **General Instructions. Read the following instructions carefully.**   1. There are 33 questions in this question paper. All questions are compulsory. 2. 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. 3. Section A: Question 3 to 16 are MCQs and Reason Assertion type questions carrying 1 mark each 4. Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each. 5. Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each. 6. Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each. 7. There is no overall choice. However, internal choices have been provided. 8. Use of calculators and log tables is not permitted. | | | | | |
|  | **SECTION A (OBJECTIVE TYPE)** | | | |  |
| 1. | **Read the passage given below and answer the following questions: (1x4=4)**  The C-O bonds in ethers are polar and thus, ethers have a net dipole moment. The weak polarity of ethers do not appreciably affect their boiling points which are comparable to those of the alkanes of comparable molecular masses but are much lower than the boiling points of alcohols as shown in the following cases:    The large difference in boiling points of alcohols and ethers is due to the presence of hydrogen bonding in alcohols. The miscibility of ethers with water resembles those of alcohols of the same molecular mass. Both ethoxyethane and butan-1-ol are miscible to almost the same extent i.e., 7.5 and 9 g per 100 mL water, respectively while pentane is essentially immiscible with water. This is because just like alcohols, oxygen of ether can also form hydrogen bonds with water molecule. Ethers are the least reactive of the functional groups. The cleavage of C-O bond in ethers takes place under drastic conditions. | | | |  |
| (i) | Formation of diethyl ether from ethanol is based on:  (a) Dehydrogenation reaction  (b) Hydrogenation reaction  (c) Dehydration reaction  (d) Heterolytic fission reaction | | | |  |
| (ii) | Number of metamers represented by molecular formula C4H10O is  (a) 4  (b) 3  (c) 2  (d) 1 | | | |  |
| (iii). | A compound of the formula C4H10O reacts with sodium and undergoes oxidation to give a carbonyl compound which does not reduce Tollen’s reagent, the original compound is  (a) Diethyl ether  (b) *n*-Butyl alcohol  (c) Isobutyl alcohol  (d) *sec*-Butyl alcohol | | | |  |
| (iv). | An organic compound A reacts with sodium metal and forms B. On heating with conc. H2SO4, A gives diethyl ether. A and B are respectively  (a) C2H5 OH and C2H5ONa  (b) C3H7OH and C3H7ONa  (c) CH3OH and CH3ONa  (d) C4H9OH and C4H9ONa | | | |  |
| 2. | **Read the passage given below and answer the following questions: (1x4=4)**  A colloid is a heterogeneous system in which one substance is dispersed (dispersed phase) as very fine particles in another substance called dispersion medium.  The essential difference between a solution and a colloid is that of particle size. While in a solution, the constituent particles are ions or small molecules, in a colloid, the dispersed phase may consist of particles of a single macromolecule (such as protein or synthetic  polymer) or an aggregate of many atoms, ions or molecules. Colloidal particles are larger than simple molecules but small enough to remain suspended. Their range of diameters is between 1 and 1000 nm (10–9 to 10–6 m).  Colloidal particles have an enormous surface area per unit mass because of their small size. Consider a cube with 1 cm side. It has a total surface area of 6 cm2. If it were divided equally into 1012 cubes, the cubes would be the size of large colloidal particles and have a total surface area of 60,000 cm2 or 6 m2.  **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. | | | |  |
| (i) | **Assertion :** Solution is a homogeneous mixture whereas colloidal solution is a heterogeneous mixture.  **Reason :** Difference between a solution and a colloid is that of particle size. | | | |  |
| (ii) | **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. | | | |  |
| (iii). | **Assertion :** Colloidal solutions show colligative properties.  **Reason :** Colloidal particles are large in size. | | | |  |
| (iv). | **Assertion :** Colloidal solutions do not show brownian motion.  **Reason :** Brownian motion is responsible for stability of sols.  **OR**  **Assertion :** Detergents with low CMC are more economical to use.  **Reason :** Cleansing action of detergents involves the formation of micelles. These are formed when the concentration of detergents becomes equal to CMC. | | | |  |
|  | **Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:** | | | |  |
| 3. | The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called \_\_\_\_\_\_\_\_\_\_\_.  (a) Cell potential  (b) Cell emf  (c) Potential difference  (d) Cell voltage | | | |  |
| 4. | Which of the following reagents cannot distinguish between glucose and fructose?  (a) Tollen’s regent  (b) Fehling’s solution  (c) Benedict’s solution  (d) All of these  **OR**  In polysaccharides, the linkage connecting monosaccharides is called  (a) glycoside linkage  (b) nucleoside linkage  (c) glycogen linkage  (d) peptide linkage | | | |  |
| **5.** | Low concentration of oxygen in the blood and tissues of people living at high altitude is due to \_\_\_\_\_\_\_\_\_\_\_\_.   1. low temperature 2. low atmospheric pressure 3. high atmospheric pressure 4. both low temperature and high atmospheric pressure | | | |  |
| **6.** | Electronic configuration of a transition element X in +3 oxidation state is [Ar] *3d*5. What is its atomic number?   1. 25 2. 26 3. 27 4. 24   **OR**  Which of the following oxidation state is common for all lanthanoids?   1. +2 2. +3 3. +4 4. +5 | | | |  |
| **7.** | The source of nitrogen in Gabriel synthesis of amines is \_\_\_\_\_\_\_\_\_\_\_\_\_.   1. Sodium azide, NaN3 2. Sodium nitrite, NaNO2 3. Potassium cyanide, KCN 4. Potassium phthalimide, C6H4(CO)2N–K+   **OR**  Hoffmann Bromamide Degradation reaction is shown by \_\_\_\_\_\_\_\_\_\_.   1. ArNH2 2. ArCONH2 3. ArNO2 4. ArCH2NH2 | | | |  |
| **8.** | The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, [Co(NH3)6]3+ , [Co(CN)6]3– , [Co(H2O)6]3+   1. [Co(CN)6]3– > [Co(NH3)6]3+ > [Co(H2O)6]3+ 2. [Co(NH3)6]3+ > [Co(H2O)6]3+ > [Co(CN)6]3– 3. [Co(H2O)6]3+ > [Co(NH3)6]3+ > [Co(CN)6]3– 4. [Co(CN)6]3– > [Co(NH3)6]3+ > [Co(H2O)6]3+   **OR**  When 1 mol CrCl3. 6H2O is treated with excess of AgNO3, 3 mol of AgCl are obtained. The formula of the complex is:   1. [CrCl3 (H2O)3]. 3H2O 2. [CrCl2(H2O)4]Cl. 2H2O 3. [CrCl(H2O)5]Cl2. H2O 4. [Cr(H2O)6]Cl3 | | | |  |
| 9. | Which of the following arrangements does not represent the correct order of the property stated against it?  (a) V2+ < Cr2+ < Mn2+ < Fe2+ : paramagnetic behaviour  (b) Ni2+ < Co2+ < Fe2+ < Mn2+ : ionic size  (c) Co3+ < Fe3+ < Cr3+ < Sc3+ : stability in aqueous solution  (d) Sc < Ti < Cr < Mn : number of oxidation states | | | |  |
| 10. | The addition of HBr on 2−butene in presence of peroxide follows  (a) Electrophilic addition  (b) Free radical addition  (c) Nucleophilic addition  (d) None of these  **OR**  For the reaction,    (a) CH3−CH=CH−CH3 predominates  (b) CH2=CH−CH2−CH3 predominates  (c) Both are formed in equal amounts  (d) The product ratio is dependent on the halogen X. | | | |  |
| 11. | In a solid AB having the NaCl type structure, ‘A’ atoms occupy the corners of the cubic unit cell. If all the face centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is  (a) AB2  (b) A2B  (c) A4B3  (d) A3B4 | | | |  |
|  | **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 :** D (+) – Glucose is dextrorotatory in nature.  **Reason : ‘**D’ represents its dextrorotatory nature. | | | |  |
| 13. | **Assertion :** HNO3 makes iron passive.  **Reason :** HNO3 forms a protective layer of ferric nitrate on the surface of iron. | | | |  |
| 14. | **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.  **OR**  **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. | | | |  |
| 15. | **Assertion :** Aromatic aldehydes and formaldehyde undergo Cannizaro reaction.  **Reason :** Aromatic aldehydes are almost as reactive as formaldehyde. | | | |  |
| 16. | **Assertion :** *p*-nitrophenol is more acidic than phenol.  **Reason :** Nitro group helps in the stabilisation of the phenoxide ion by dispersal of negative charge due to resonance. | | | |  |
|  | **Section-B**  **The following questions, Q. No 17 – 25 are short answer type and carry 2 marks each.** | | | |  |
| 17. | (i) Complete the following:    (ii) Out of allyl, vinyl and alkyl halide which is more reactive and why?  **OR**  (i) Complete the following:    (ii) The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain. | | | | 2 |
| 18. | A glucose solution which boils at 101.04oC at 1 atm. What will be relative lowering of vapour pressure of an aqueous solution of urea which is equimolar to given glucose solution?  (Given: *K*b for water is 0.52 K kg mol-1) | | | | 2 |
| 19. | (i) Write the formulas for the given coordination compounds:  Dichloridobis(ethane-1,2-diamine)cobalt(III)  (ii) Discuss the nature of bonding in the given coordination entities based on valence bond theory: [Co(C2O4)3]3–  **OR**  (i) Write the formula for the given coordination compound:  Tetraammineaquachloridocobalt(III) chloride  (ii) Discuss the nature of bonding in the following coordination entities based on valence bond theory: [Fe(CN)6]4– | | | | 2 |
| 20. | The decomposition of A into product has value of k as at 100C and activation energy is 60 kJ mol-1. Calculate the temperature at which the value of k is  **OR**  Define rate constant (k). Write the unit of rate constant for the following:   1. First order reaction 2. Second order reaction. | | | | 2 |
| 21. | The following data were obtained during the first order thermal decomposition of SO2Cl2 at constant volume.     |  |  |  | | --- | --- | --- | | Experiment | Time/s | Total pressure/atm | | 1 | 0 | 0.5 | | 2 | 100 | 0.6 |   Calculate the rate of reaction when total pressure is 0.65 atm. | | | | 2 |
| 22. | Explain why alcohols and ethers of comparable molecular mass have different boiling points? | | | | 2 |
| 23. | Give an example to show the effect of concentration of nitric acid on the formation of oxidation product. | | | | 2 |
| 24. | (i) Why thionyl chloride is more preferred over concentrated halogen acid for the formation of alkyl halide from alcohol?  (ii) Why is sulphuric acid not used during the reaction of alcohols with KI? | | | | 2 |
| 25. | In a compound, nitrogen atoms (N) make cubic close packed lattice and metal atoms (M) occupy one-third of the tetrahedral voids present. Determine the formula of the compound formed by M and N? | | | | 2 |
|  | **Section-C**  **Q. No 26 -30 are Short Answer Type II carrying 3 mark each.** | | | |  |
| 26. | (i) In the above figure irregularity in ionization enthalpies are their how would your account for the irregular variation of ionization enthalpies (first and second) in the first series of the transition elements.  (ii) Why it is difficult for Cu, Ni and Zn to obtain oxidation state greater than two for these elements?  (iii) Why the third ionization enthalpy in Zn is so high?  **OR**  (i) Why in group 6, Mo(VI) and W(VI) are found to be more stable than Cr(VI)?  (ii) In the following ions: Mn3+, V3+, Cr3+ and Ti4+   1. which ion is more stable in aqueous solution? 2. which is the better oxidizing agent? | | | | 3 |
| 27. | (i) Arrange the following in increasing order of property specified:  a) Aniline, ethanamine, 2-ethylethanamine (solubility in water)  b) N,N-Dimethyl ethanamine, Butanamine, N-Ethylethanamine(boiling point)  c) Methanamine, N, N dimethylmethanamine and N- methylmethanamine (basic strength in  aqueous phase)  **OR**  (i) Give a chemical test to distinguish between N-methylethanamine and N,N-dimethyl  ethanamine.  (ii) Explain the Gabriel Phthalimide synthesis. Why it is not used for the synthesis of aromatic  primary amines? | | | | 3 |
| 28. | A sample of ferrous oxide has actual formula Fe0.93O1.00. In this sample what fraction of metal ions are Fe2+ ions? What type of nonstoichiometric defect is present in this sample? | | | | 3 |
| 29. | Write the reactions of D-glucose which cannot be explained by its open-chain structure. How can cyclic structure of glucose explain these reactions? | | | | 3 |
| 30. | An amorphous solid “A” burns in air to form a gas “B” which turns lime water milky. The gas is also produced as a by-product during roasting of sulphide ore. This gas decolourises acidified aqueous KMnO4 solution and reduces Fe3+ to Fe2+. Identify the solid “A” and the gas “B” and write the reactions involved. | | | | 3 |
|  | **Section-D**  **Q. No 31 to 33 are long answer type carrying 5 marks each.** | | | |  |
| 31. | Give reason for the following:   1. Bleaching action of chlorine is permanent whereas SO2 is temporary. 2. Fluorine exhibits only – 1 oxidation state in its compounds whereas other halogens exhibits many other oxidation states, why? 3. F2 is more reactive than ClF3 but ClF3 is more reactive than Cl2 4. Write the balanced equations for obtaining XeO3 and XeOF4 from XeF6.   **OR**  Account for the following   1. Decomposition of O3 is a spontaneous process 2. SF6 is inert towards hydrolysis 3. H2S is less acidic than H2Te 4. Structures of xenon fluorides cannot be explained by valence bond approach. 5. Yellow color of chlorine water fade on long standing? | | | | 5 |
| 32. | (i) Describe the Etard reaction with chemical equation?  (ii) Arrange the following according to mentioned properties against them:  (a) HCOOH , C6H5-COOH, Cl-CH2-COOH (Acidic nature)  (b) Benzaldehyde , *p*-Tolualdehyde , *p*-Nitrobenzaldehyde , Acetophenone(Reactivity)  (iii)How will you carry out the following conversions:  a) Pent-1-yne to pentan-2-one  b) Toluene to m-Nitrobenzaldehyde  **OR**  (i) Distinguish the following pairs:  a) Formic acid and Acetic acid  b) Acetophenone and Benzophenone  (ii) An organic compound (A) with molecular formula C8H8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of NaOH. It neither reduces Tollens’ or Fehlings’ reagent, nor does it decolourise bromine water or Baeyer’s reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula C7H6O2. Identify the compounds (A) and (B) and explain the reactions involved. | | | | 5 |
| 33. | (i) State Kohlrausch law.  (ii) Calculate the emf of the following cell at 298 K: Al(s)/Al3+ (0.15M)//Cu2+(0.025M) /Cu(s)  (Given Eo(Al3+/Al) = -1.66 V, Eo(Cu2+/Cu) = 0.34V,  log 0.15 = -0.8239, log 0.025 = -1.6020)  **OR**   1. Calculate for the reaction Mg + Cu2+ → Mg2+ + Cu   (Given E0cell = +2.71V, 1F = 96500C mol -1)   1. Solutions of two electrolytes ‘A’ and ‘B’ are diluted. The Λm of ‘B’ increases 1.5 times while that of A increases 25 times. Which of the two is a strong electrolyte? Justify your answer. 2. Why on dilution the Λm of CH3COOH increases drastically, while that ofCH3COONa increases gradually? | | | | 5 |

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