

PB2/CHQP/1222/B 03-JAN-2023

PRE-BOARD (EEE CONSORTIUM) EXAMINATION, 2022 – 23

**SET- 2**

# CHEMISTRY THEORY

**CLASS**: **XII**  **MAX.MARKS**: **70**

**TIME** : **3 HOURS**

**General Instructions. Read the following instructions carefully.**

**There are 35 questions in this question paper with internal choice**.

1. **SECTION A consists of 18 multiple-choice questions carrying 1 mark each.**
2. **SECTION B consists of 7 very short answer questions carrying 2 marks each.**
3. **SECTION C consists of 5 short answer questions carrying 3 marks each.**
4. **SECTION D consists of 2 case- based questions carrying 4 marks each.**
5. **SECTION E consists of 3 long answer questions carrying 5 marks each.**

**Use of log tables and calculators is not allowed**

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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 | 1. A graph was plotted between the molar conductivity of various electrolytes   (NaCl, HCl and NH4OH) and c (in mol L-1 ). Which of the following is the correct set?    (a) I (NH4OH), II (HCl), III (NaCl)  (b) I (NaCl), II (HCl), (III) (NH4OH)  (c) I (HCl), II (NaCl), III (NH4OH)  (d) I (NH4OH), II (NaCl), III (HCl) | 1 |
| 2 | Given that:  Ag+(aq) + e – → Ag(s) E° = + 0.80 V  Fe2+(aq)+ + 2e– → Fe(s) E° = – 0.44 V  What is the emf of Fe(s) + 2Ag+(aq) → Fe2+(aq) + 2Ag(s)  (a) 1.16 V  (b) 1.24 V  (c) 2.04 V  (d) -1.16 V | 1 |
|  |  |  |
| 3 | For the reaction, 2X + Y 🡪 X2Y  What will be the expression for instantaneous rate of the reaction? | 1 |
| 4 | **Consider the reaction, 2A + B → products. When concentration of B alone was doubled, the half-life did not change. When the concentration of A alone was doubled, the rate increased by two times.The unit of rate constant for this reaction is**  (a) s–1  (b) L mol–1 s–1  (c) no unit  (d) mol L–1 s–1. | 1 |
| 5 | 1. According to Arrhenius equation, rate constant  k = A e−Ea​/RT. Which of the following options represent the graph of ln k vs 1/T​? | 1 |
| 6 | Which of the following is amphoteric oxide? Mn2O7, CrO3, Cr2O3, CrO, V2O5, V2O4 | 1 |
| 7 | 1. Which of the following energy level diagram for [FeF6 ]3– is correct on the basis of the crystal field theory? | 1 |
| 8 |  | 1 |
| 9 | Which of the following isomer has the highest melting point?  (a) 1, 4-dichlorobenzene  (b) 1, 2-dichlorobenzene  (c) 1, 3-dichlorobenzene  (d) All isomers have same melting points | 1 |
| 10 | Which of the following will not give aldol condensation?  (a)Phenylacetaldehyde  (b)2-Methylpentanal  (c)Benzaldehyde  (d) 1-Phenylpropanone | 1 |
| 11 |  | 1 |
| 12 | Which of the following reagents are not correctly matched with the reaction?  (a) CH3CH = CHCHO → CH3CH = CHCOOH : Ammoniacal AgNO3  (b) CH3CH = CHCHO → CH3CH = CHCH2OH : H2/Pt  (c) R-COOH → R-CH2OH : NaBH4  (d) CH3CH2COCl → CH3CH2CHO : H2Pd/BaSO4 | 1 |
| 13 | Identify the products (X) and (Y) in the given reaction  MCQ Questions for Class 12 Chemistry Chapter 12 Aldehydes, Ketones and Carboxylic Acids with Answers 11  (a) X = Acetophenone, Y = m-Nitroacetophenone  (b) X = Toluene, Y = m-Nitroacetotoluene  (c) X = Acetophenone, Y = o- and p-Dinitroacetophenone  (d) X = Benzaldehyde, Y = m-Nitrobenzaldehyde | 1 |
| 14 | The reaction between RNH2 + CHCl3 + KOH (alc.) is known as:  (a) Coupling reaction  (b) Carbylamine reaction  (c) Hoffmann bromamide reaction  (d) Schmidt reaction | 1 |
|  | **Note : In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.** |  |
| 15 | **Assertion :**Transition metals show variable valency**. Reason :**Transition metals have a large energy difference between the  ns2 and (n – 1)d electrons.  (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion .  (b) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.  (c) Assertion is true but Reason is false.  (d) Assertion is false but Reason is true. | 1 |
| 16 | **Assertion :**With HI at 373 K, ter-butyl methyl ether gives ter-butyl iodide and methanol. Reason : The reaction occurs by SN2 mechanism.  (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion  (b) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.  (c) Assertion is true but Reason is false.  (d) Assertion is false but Reason is true. | 1 |
| 17 | Assertion : N, N-Diethylbenzene sulphonamide is insoluble in alkali.  Reason: Sulphonyl group attached to nitrogen atom is strong electron withdrawing group.  (a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion  (b) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.  (c) Assertion is true but Reason is false.  (d) Assertion is false but Reason is true. | 1 |
| 18 | Assertion : All naturally occurring α -amino acids except glycine are optically inactive. Reason : Most naturally occurring amino acids have L-configuration.  (a) Both Assertion and Reason are true and Reason is the correct explanation of assertion  (b) Both Assertion and Reason are true but Reason is not a correct explanation of assertion.  (c) Assertion is true but Reason is false.  (d) Assertion is false but Reason is true. | 1 |
|  | **SECTION B** |  |
|  | **This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.** |  |
| 19 | 1. i) Name the electrolyte is used in dry cell?   (ii) What type of metals can be used for cathodic protection of iron against  rusting? | 2 |
| 20 | State a condition under which a bimolecular reaction is kinetically first order reaction.Give example. |  |
| 21 | When a graph is plotted for log k Vs 1/T, a straight line with a slope of – 4250 K is obtained. Calculate ‘Ea’ for the reaction. | 2 |
| 22 | For the complex [Fe(CO)5], write the hybridization state and magnetic character of the complex. (At. number: Fe = 26) | 2 |
| 23 | **(**i)which is an example of allylic halide ?? (ii)which will react faster in SN1 reaction with OH and why ?  **OR**   (i)which is an example of a benzylic halide? (ii)which will react faster in SN1 reaction with OH and why ? | 2 |
| 24 | Write chemical equations to illustrate the following name reactions:  (1) Williamson’s synthesis. (2) Esterification reaction | 2 |
| 25 | What are the hydrolysis products of (i) sucrose (ii) lactose? **OR** What are essential and non-essential amino acids? Give two examples of each type | 2 |
| **SECTION C**  **This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each**. | |  |
| 26 | The elevation in boiling point when 0·30 g of acetic acid is dissolved in 100 g of benzene is 0·0633 oC. Calculate the molecular weight of acetic acid from this data. What conclusion can you draw about the molecular state of the solute in the solution? (Given Kb for benzene = 2·53 K kg mol-1 , at. wt. of C = 12, H = 1, O = 16 | 3 |
| 27 | Write the electronic configuration of Fe(III) on the basis of crystal field theory when it forms an octahedral complex in the presence of  (i) strong field ligand, and (ii) weak field ligand. (Atomic no. of Fe = 26) (ii)If the CFSE for octahedral [CoCl6] 4– is 18,000 cm–1,then find the value for CFSE for tetrahedral [CoCl4] 2– ? | 3 |
| 28 | Primary alkyl halide C4H9Br (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal, it gives compound (d), C8H18 which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) to (d)and write the equations for all the reactions.  **[OR]** A compound ‘A’ having molecular formula C4H9Br on reaction with alcoholic KOH gives a compound ‘B’. Bromination of ‘B’ gives compound ‘C’. Compound ‘C’ on treatment with soda amide gives a gaseous compound ‘D’. The gas ‘D’ when passed through ammonical silver nitrate solution forms white precipitate. Identify compounds A, B, C and D and write down the reactions involved. | 3 |
| 29 | How are the following conversions carried out:  (i) Anisole to phenol  (ii) Methyl magnesium bromide to 2-Methylpropan-2-ol  (iii) Phenol to picric acid  **[OR]**  Explain the mechanism of the dehydration of Ethanol at 443K. | 3 |
| 30 | Give a chemical test to distinguish between the following pair of compounds:  (a) (CH3)2NH and (CH3)3N  (b) Aniline and N-methylaniline (c) Ethylamine and diethylamine | 3 |
|  | **SECTION -D This section consists of 2 case- based questions carrying 4 marks each.**  **Read the passage carefully and answer the questions that follow**. |  |
| 31 | Colligative properties are not dependent on the chemical nature of the solution’s components. Thus, colligative properties can be linked to several quantities that express the concentration of a solution, such as molarity, normality, and molality. The four colligative properties that can be exhibited by a solution are: Boiling point elevation, Freezing point depression, Relative lowering of vapour pressure and Osmotic pressure. These properties are mostly seen in dilute solutions. Colligative properties are said to be inversely proportional to the solute molar mass.  On the addition of a non-volatile liquid to a pure solvent, the vapour pressure of a solution decrease. Therefore, to make vapour pressure equal to atmospheric pressure we have to increase the temperature of the solution. This is termed as elevation in boiling point.  The phenomenon of the spontaneous flow of solvent molecules through a semipermeable membrane from a pure solvent to a solution or from a dilute to a concentrated solution is called osmosis. The flow of solvent molecules can be stopped if some extra pressure is applied from the solution side. This pressure that just stops the flow of solvent is called osmotic pressure of the solution.  a)Arrange the following in the increasing order of boiling and freezing point:  1M glucose, 1M PbCl2, 1M Al2(SO4)3.  b) A mixture of chloroform and acetone shows negative deviation from Raoult's law. Explain.  **c)** **When 1.5 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point of benzene was raised from 353.23 K to 353.93 K. Calculate the molar mass of the solute.**  **(Kb for benzene = 2.52 K kg mol–1)** | 4 |
| 32 | Carbohydrates, proteins, nucleic acids, etc. form the basis of life and are responsible for the growth and maintenance of living systems. Therefore, they are referred to as biomolecules. Carbohydrates are widely distributed in nature. Carbohydrates are optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis. Glucose, fructose, sucrose, starch, cellulose, etc. are some naturally occurring carbohydrates. They act as the major source of energy for animals and human beings. Monosaccharides are the simple carbohydrates that cannot be broken further into smaller units on hydrolysis, e.g., glucose and fructose, ribose, etc. Oligosaccharides are the carbohydrates which on hydrolysis give two to ten units of monosaccharides, e.g., sucrose, maltose, raffinose, stachyose, etc. Polysaccharides are the carbohydrates which produce a large number of monosaccharide units on hydrolysis, e.g., starch, cellulose, etc.  i. Name the products of hydrolysis of lactose?  ii. Which disaccharide is found only in animals and not in plants? Which carbohydrate is the main constituent of plant cell wall?  iii. Represent the glycosidic linkage in sucrose. | 4 |
|  | **SECTION E**  **The following questions (33 to 35) are long answer type and carry 5 marks each. Two questions have an internal choice.** |  |
| 33 | 1. Consider the figure below and answer the questions (i) to (iii) given below.     i) What will happen if salt bridge is removed?  ii) How will concentration of Zn2+ ions and Ag+ ions be affected when the cell functions?  iii) Resistance of a conductivity cell filled with 0.1 mol L–1KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L–1 KCl solution is 520 Ω, calculate the conductivity and molar conductivity of 0.02 mol L–1 KCl solution.  The conductivity of 0.1 mol L–1 KCl solution is 1.29 S/m.  **OR**  a) Give equations showing the chemistry of the lead storage battery when it is in use.  b) The electrical resistance of a column of 0.05 mol L–1 NaOH solution of diameter 1 cm and length 50 cm is 5.55 × 103 ohm. Calculate its resistivity, conductivity and molar conductivity. | 5 |
| 34 | 1. Why are Mn2+ compounds more stable than Fe2+ towards oxidation to their+3 state? 2. Explain briefly how +2 state becomes more and more stable in the first half of the first row transition elements with increasing atomic number? 3. Cobalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised. Explain. 4. Transition elements form alloys easily. 5. Give reason. The lowest oxide of transition metal is basic the highest is amphoteric/ acidic.   **OR**  Explain giving reasons: a)Transition metals and many of their compounds are paramagnetic . b)The enthalpies of atomisation of the transition metals are high. c)The transition metals generally form coloured compounds. d)Transition metals and their many compounds act as good catalysts.  e) Of the d4 species, Cr2+ is strongly reducing while manganese (III) is strongly oxidizing. | 5 |
| 35 | a)Write the equations involved in the following reactions:  (i) Wolff-Kishner reduction (ii) Etard reaction  (b) An organic compound (A) has characteristic odour of bitter almonds. On treatment with NaOH, it forms compounds (B) and (C). Compound (B) has molecular formula C7H8O which on oxidation gives back (A). The compound (C) is a sodium salt of an acid. When (C) is treated with soda-lime, it yields an aromatic compound (D). Deduce the structures of (A), (B), (C) and (D). Write the sequence of reactions involved.  **OR** (a)Give reason for following : ((i) The alpha hydrogen of aldehydes and ketones are acidic in nature.  (ii) Propanone is less reactive than ethanal towards addition of HCN.  (iii) Benzoic acid does not give Friedel-Crafts reaction.  (b)Arrange the following in order of property indicated for each set.  (i) CH3CHO, CH3CH2OH, CH3OCH3, CH3CH2CH3 (increasing order of boiling points)  (ii) (CH3)2CHCOOH, CH3CH2CH(Br)COOH, CH3CH(Br)CH2COOH (increasing order of their acid strengths) | 5  5 |
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