NAVODAYA VIDYALAYA SAMITI - HYDERABAD REGION

SECOND PRE BOARD EXAMINATION, 2022-23

CLASS -**XII**

SUBJECT- **CHEMISTRY THEORY (043)**

SET: 1

TIME: 3 HOURS   Maximum Marks: 70

General Instructions:

Read the following instructions carefully:

- (i) **All questions are compulsory.**
- (i) **There are 35 questions in this paper with internal choice.**
- (ii) **SECTION A Consists** of **18** multiple-choice questions carrying **1 mark** each.
- (iii) **SECTION B** Consists of **7**very short answer questions carrying **2 marks** each.
- (iv) **SECTION C** Consists of **5** short answer questions carrying **3 marks** each.
- (v) **SECTION D** Consists of **2 case- based** questions carrying **4 marks** each.
- (vi) **SECTION E** Consists of **3 long answer** questions carrying **5 marks** each.
- (vii) **Use of log tables and calculators is not allowed.**
- (viii) The Question paper contains **06** no. of printed pages.

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. The standard electrode potential for Sn^{4+} / Sn^{2+} couple is + 0.15 V and that for the Cr^{3+} / Cr couple is – 0.74 V. These two couples in their standard state are connected to make a cell. The redox reaction is spontaneous. The cell potential will be:

   (A) 0.89 V   **(B) 0.59 V**   **(C) – 0.89 V**   **(D) – 0.59 V**

2. HCHO was treated with a reagent X. The product formed upon hydrolysis in the presence of an acid gave C_2H_5OH. The reagent X is:

   (A) Aqueous KOH   (B) alcoholic KOH   (C) CH_3MgI (D) alcoholic KCN

3. **The structure** of diamagnetic nickel complex, $[Ni(CN)_4]^{2-}$ is

   (A) trigonal bipyramidal   (B) tetrahedral   (C) square planar   (D) distorted octahedral

4. When **initial concentration** of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is:

   (A) Zero   (B) first   (C) second   (D) more than zero but less than first

5. Which one of the following shows **highest** magnetic moment?

   (A) Fe^{2+} (B) Co^{2+} (C) Cr^{3+} (D) Ni^{2+}

6. The increasing order of basic strengths of given compounds in gaseous phase is

   A. NH_3, CH_3NH_2, $(CH_3)_3N$, $(CH_3)_2NH$ B. NH_3, $(CH_3)_2NH$, $(CH_3)_3N$, , CH_3NH_2

   C. $(CH_3)_3N$, $(CH_3)_2NH$, CH_3NH_2, NH_3,   D. NH_3, CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$

7. Which acid from the following would you expect to be the strongest acid?

    A. NO_2CH_2COOH B. CH_3COOH

    C. CH_3CH_2COOH D. CH_2FCOOH

8. Write the IUPAC name of the following compound: (CH3)3 CCH2Br

    A. 3-Bromo-2, 2-dimethyl propane   B. 1-Bromo-2,2,2-trimethyl ethane

    C. 2-Bromo-1,1,1-trimethyl ethane   D. 1-Bromo-2, 2-dimethyl propane

9. The complex having **minimum** Δ_0 value , based on strength of ligand is

    (A) $[Co(NH_3)_6]^{3+}$ (B) $[Cr(H_2O)_6]^{3+}$ (C) $[Cr(CN)_6]^{3-}$ (D) $[CoCl_6]^{3-}$

10. As the atomic number of lanthanoid increases, the atomic radius deceases, but exception is

    (A) Ga   (B) Eu   (C) Nd   (D) Dy

11. The IUPAC name of ionization isomer of [Ni(NH3)3NO2]Cl is

    A. Triamminenitrito-O-nickel(II)chloride

    B. Triamminenitrito-N-nickel(II)chloride

    C. Triamminechloridonickel(III)nitrate

    D. Triamminechloridonickel(II)nitrite

12. Arrange the following compounds in increasing order of their boiling points:

  CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$

    A. $CH_3CH_2CH_3 < CH_3CHO < CH_3OCH_3 < CH_3CH_2OH$

    B. $CH_3CH_2CH_3 < CH_3OCH_3 < CH_3CHO < CH_3CH_2OH$

    C. $CH_3CH_2CH_3 < CH_3OCH_3 < CH_3CH_2OH < CH_3CHO$

    D. $CH_3CH_2CH_3 < CH_3OCH_3 < CH_3CH_2OH < CH_3CHO$

13. Choose a chemical test to distinguish between ethylamine and aniline.

    A.   Tollen's test

    B.   2,4-DNP test

    C.   Diazotization test

    D.   Haloform test

14. The molar conductivities of KCl, NaCl, and KNO_3 are 152,128 and 111 $Scm^2\ mol^{-1}$ respectively. What is the molar conductivity of **$NaNO_3$**?

    (A) $101 Scm^2\ mol^{-1}$ (B) $87\ Scm^2\ mol^{-1}$ (C) $-101\ Scm^2\ mol^{-1}$ (D) $-391\ Scm^2\ mol^{-1}$

ASSERTION REASON TYPE QUESTIONS (Q.No. 15-18)

  (A) Both A and R are true and R is the correct explanation of A.

  (B) Both A and R are true and R is **not** the correct explanation of A.

  (C) A is true but R is false.

  (D) A is false but R is true

15.   **Assertion**: Sucrose is a reducing sugar.

    Reason: Sucrose has glycosidic linkage.

16. **Assertion**: Hofmann's bromamide degradation reaction is given by ethanamide.

   Reason: Primary amines on more basic than secondary amines in aqueous medium

17. **Assertion:** All naturally occurring α-aminoacids except glycine are optically active.

   **Reason:** Most naturally occurring amino acids have L- configuration.

18. **Assertion:** Transition metals have high melting points.

   Reason: All transition metals have completely filled d-orbitals

SECTION B (2 marks)

19. While separating a mixture of Ortho- and Para- nitro phenols by steam distillation, name the isomer which is steam volatile? Give reasons**.**

20. In the following pair of compounds, which will react faster by SN^1 mechanism and why?
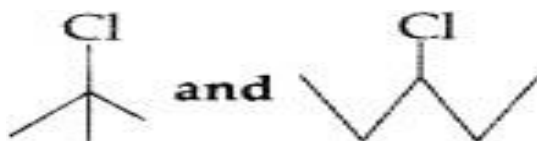
21. Show that in a first order reaction, time required for completion of 99.9% is 10 times of half- life (t 1/2) of the reaction.

22. A. Describe the following name reactions with chemical equations.

   a. Hell-Volhard- Zelinsky reaction   b. Gattermann Koch reaction
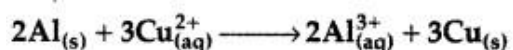
               OR

   b. Describe the following name reactions with chemical equations.

   a. Rosenmund reduction reaction   b. Stephen reaction

23. The rate constant for the first order decomposition of H2O2 is given by the following equation: $\log k = 14.34 - 1.25 \times 10^4 K/T$. Calculate Ea for this reaction?

24. Calculate $\Delta_r G°$ and log K. for the following reaction at 298 K.

$$2Al_{(s)} + 3Cu^{2+}_{(aq)} \longrightarrow 2Al^{3+}_{(aq)} + 3Cu_{(s)}$$

$$(E°_{Cell} = 2.02\ V),\ IF = 96500\ C\ mol^{-1}]$$

25. A. Write equation to show what happens when D-glucose is treated with the following reagents.

      (i) HI   (ii) Bromine water

             OR

   B. Write equation to show what happens when D-glucose is treated with the following reagents.

    (i) Concentrated Nitric acid   (ii) Acetic anhydride

SECTION C

26. i) Draw the geometrical isomers of complex [Pt(NH3)2Cl2].

   (ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 < P$.

   (iii) Why a solution of $[Ni(H2O)6]^{2+}$ is green while a solution of $[Ni(CN)4]^{2-}$ is colourless?

27. Calculate the boiling point of solution when 4 g of MgSO4 (molar mass $=120\ g\ mol^{-1}$) was dissolved in 100g of water, assuming MgSO4 undergoes complete ionization. (Kb for water = $0.52\ K\ kg\ mol^{-1}$)

28. Account for the following:

  (a) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

  (b) Alkyl halides, though polar, are immiscible with water.

  (c) n-Butyl bromide has higher boiling point than 3^0 butyl bromide.

29. a. Out of CH3—NH2 and (CH3)3N, which one has higher boiling point? Why?

  b. Identify A and B in each of the following:

  CH3-CH2-Cl $\xrightarrow{\text{NaCN}}$ A Reduction $\xrightarrow[\text{Ni/H}_2]{}$ B
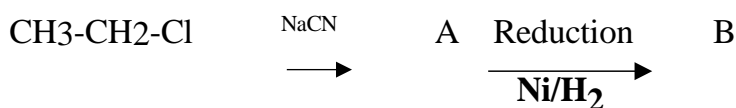
30. Explain the three steps with the help of equations, the mechanism of acid catalysed hydration of Ethene to form Ethanol.

OR

Write the names of reagents and equations for the preparation of the following ethers by Williamson's synthesis:

(i) 1-Propoxypropane

(ii) Ethoxybenzene

(iii) 2-Methoxy-2-methylpropane

SECTION D

31. Read the passage below and answer the following questions:

  Boiling point or freezing point of liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decrease the vapour pressure and the added solute particles affect the formation of pure solvent crystals.

  According to many researches the decrease in freezing point directly correlated to the concentration of solutes dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as freeze concentration of liquid food and to find the molar mass of an unknown solute in the solution. Freeze concentration is a high quality liquid food concentration method where water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution. The freezing point depression is referred as a colligative property and it is proportional to the molar concentration of the solution (m), along with vapour pressure lowering, boiling point elevation, and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity. (Jayawardena, J. A. E. C., Vanniarachchi, M. P. G., & Wansapala, M. A. J. (2017). Freezing point depression of different Sucrose solutions and coconut water.)

  1. When a non-volatile solid is added to pure water it will:

    a. boil above 100°C and freeze above 0°C

    b. boil below 100°C and freeze above 0°C

    c. boil above 100°C and freeze below 0°C

    d. boil below 100°C and freeze below 0°C

2. Colligative properties are:

    a. dependent only on the concentration of the solute and independent of the solvent and solute identity.

    b. dependent only on the identity of the solute and the concentration of the solute and independent of the solvent identity.

    c. dependent on the identity of the solvent and solute and thus on the concentration of the solute.

    d. dependent only on the identity of the solvent and the concentration of the solute and independent of the solute identity.

3. Assume three samples of juices A, B and C have glucose as the only sugar present in them.

The concentration of sample A, B and C are 0.1M, 0.5M and 0.2 M respectively. Freezing

point will be highest for the fruit juice:

    a. A   b. B   c. C   d. All have same freezing point

4. Identify which of the following is a colligative property:

    a. freezing point   b. boiling point   c. osmotic pressure   d. all of the above

32. Starch is the stored form of sugars in plants and is made up of amylose and amylopectin (both polymers of glucose). Amylose is soluble in water and can be hydrolysed into glucose units breaking glycosidic bonds, by the enzymes α- amylase and β-amylase. It is a straight chain polymer. Amylopectin is a branched chain polymer of several D-glucose molecules. 80% of amylopectin is present in starch. Plants are able to synthesize glucose, and the excess glucose is stored as starch in different plant parts, including roots and seeds. The starch that is consumed by animals is broken down into smaller molecules, such as glucose. The cells can then absorb the glucose.

Glycogen is the storage form of glucose in humans and other vertebrates, and is made up of monomers of glucose. It is structurally quite similar to amylopectin. Glycogen is the animal equivalent of starch. It is stored in liver and skeletal muscles.

Cellulose is one of the most abundant natural biopolymers. The cell walls of plants are mostly made of cellulose, which provides structural support to the cell. Wood and paper are mostly cellulosic in nature.

Like amylose, cellulose is a linear polymer of glucose. Cellulose is made up of glucose monomers that are linked by bonds between particular carbon atoms in the glucose molecule. Every other glucose monomer in cellulose is flipped over and packed tightly as extended long chains. This gives cellulose its rigidity and high tensile strength—which is so important to plant cells. Cellulose passing through our digestive system is called dietary fibre.

(Source: https://chem.libretexts.org)

1. In animals, Glycogen is stored in :

    a. Liver   b. Spleen   c. Lungs   d. Small Intestine

2. Amylose is:

    a. straight chain, water insoluble component of starch, which constitutes 20 % of it.

    b. straight chain, water soluble component of starch, which constitutes 20 % of it.

    c. branched chain, water insoluble component of starch, which constitutes 80 % of it.

    d. branched chain, water soluble component of starch, which constitutes 80 % of it.

3. Which biopolymer breaks down to release glucose, whenever glucose levels drop in

 Our body:

　　a. starch　　　　　　　b. cellulose　　　　　c. chitin　　　d. glycogen

 4. The linkages which join monosaccharaides to form long chain polysaccharides :

　　a. Peptide linkage　　　　b. Disulphide bonds　　　　c. Hydrogen bonds　d. Glycosidic linkage

SECTION E

33. A. a. An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollen's reagent, and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound. Write chemical equations for the reactions involved.

　　　　b. Carryout the following conversions:
　　　　　　(i) Propanone to Propene
　　　　　　(ii) Benzoic acid to Benzaldehyde

<p align="center">OR</p>

　　　B. a. An organic compound (A) (molecular formula $C_8H_{16}O_2$ was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). 'C' on dehydration gives But-l-ene. Identify A, B, C and Write equations for the reactions involved.

　　　　b. Give simple chemical tests to distinguish between the following pairs of compounds.

　　　　　(i) Propanal and Propanone　　　　　(ii) Phenol and Benzoic acid

34. A. Calculate the time to deposit 1.5 g of silver at cathode when a current of 1.5 A was passed through the solution of $AgNO_3$. (Molar mass of Ag = 108 g mol^{-1}, 1 F = 96500 C mol^{-1}

　　B. Calculate emf of the following cell at 25 °C:

　　　　Fe/Fe^{2+}(0.001 M) // H^+(0.01 M)/H2(g) (1 bar)/Pt(s)

　　　　$E°(Fe^{2+}/Fe)$ = -0.44V,　　　$E°(H^+/H2)$ = 0.00 V

　　C. What type of cell is mercury cell? Why is it more advantageous than dry cell?

35.　(I). A. The enthalpies of atomization of transition metals are quite high. Why?

　　　　B. The transition metals and many of their compounds act as good catalysts. Give reason.

　　C. Calculate the magnetic moment of a divalent ion in aqueous medium if its atomic number is 26.

　　D. Complete the following equations:

　　　　(i) $2CrO_4^{2-} + 2H^+ \longrightarrow$
　　　　(ii) $KMnO_4 \xrightarrow{\text{heat}}$
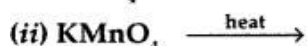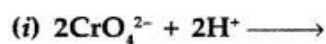
<p align="center">OR</p>

　(II) (a) A blackish brown solid 'A' when react with alkali metal hydroxide in presence of air, produces a dark green coloured compound 'B', which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound 'C'. Identify A, B, C and write the reactions involved.
　　　　(b) (i) Calculate the spin magnetic moment of M^{2+}(aq) ion. Atomic number (Z) = 27.
　　　　　(ii) Chromium is typical hard metal while mercury in liquid, explain.

<p align="center">===============</p>