NAVODAYA VIDYALAYA SAMITI - HYDERABAD REGION

SECOND PRE BOARD EXAMINATION, 2022-23

CLASS -**XII**

SUBJECT- **CHEMISTRY THEORY (043)**

SET: 2

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 Cr^{3+} / Cr couple is + 0.74 V and that for the Cd^{2+} / Cd couple is – 0.40 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) 0.34 V (b) 1.14 V (c) – 0.34 V (d) – 1.14 V

2. CH_3CHO was treated with a ***reagent X***. The product formed upon hydrolysis in the presence of an acid gave propan-2-ol. The reagent X is :

(a) Aqueous KOH (b) alcoholic KOH (c) CH_3MgI (d) alcoholic KCN

3. The structure of diamagnetic nickel complex, $[Ni(CO)_4]$ is

(a) trigonal bipyramidal (b) tetrahedral (c) square planar (d) distorted octahedral

4. When **initial concentration** of a reactant is tripled 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 **lowest** magnetic moment?

(a) Fe^{2+} (b) Co^{2+} (c) Cr^{3+} (d) Ni^{2+}

6. The decreasing 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

B. $(CH_3)_3N$, $(CH_3)_2NH$, 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 weakest acid?

A. NO_2CH_2COOH B. CH_3COOH C. CH_3CH_2COOH D. CH_2FCOOH

8. Write the IUPAC name of the following compound: $(CH_3)_3\ CCH_2CH_2Br$

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-3,3-dimethyl butane

9. The complex having **maximum** 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) Gd (B) Nd (C) Eu (D) Dy

11. The IUPAC name of ionization isomer of $[Ni(NH3)3Cl]NO_2$ is

A. Triamminenitrito-N-nickel(III)chloride

B. Triamminenitrito-N-nickel(II)chloride

C. Triamminechloridonickel(III)nitrate

D. Triamminechloridonickel(II)nitrite

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

CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$

A. $CH_3CH_2OH > CH_3CHO > CH_3OCH_3 > CH_3CH_2CH_3$

B. $CH_3CH_2CH3 > CH_3OCH_3 > CH_3CHO > CH_3CH_2OH$

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 methylamine and aniline.

A. Tollen's test

B. 2,4-DNP test

C. Diazotization test

D. Haloform test

14. The molar conductivities of NaCl, HCl, and CH_3COONa are 126.4, 425.9 and 91 $Scm^2\ mol^{-1}$ respectively. What is the molar conductivity of CH_3COOH?

(a) 290.5 $Scm^2\ mol^{-1}$ (b) 390.5 $Scm^2\ mol^{-1}$

(c) -555.3 $Scm^2\ mol^{-1}$ (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: Glucose is a reducing sugar.

Reason: Glucose has glycosidic linkage.

16. Assertion: Cannizaro reaction is given by ethanamide.

Reason: Secondary amines on more basic than primary amines in aqueous medium

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

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

18. Assertion: Transition metals have high melting points.

Reason: Most of the transition metals have more number of unpaired electrons and which is responsible for the formation of strong metallic bonds in transition metals

SECTION B (2 marks)

19. Explain why is Ortho nitrophenol more acidic than Ortho methoxyphenol?

20. In the following list of compounds, which will react faster by SN^2 mechanism and why?

$CH_3CH_2CH_2CH_2Br$, $(CH_3)_2CHCH_2Br$, $CH_3CH_2CH(Br)CH_3$ and $(CH_3)_3CBr$

21. The rate constants of a reaction at 500K and 700K are 0.02 S^{-1} and 0.07 S^{-1} respectively. Calculate the values of *E*a

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

a. Simple Aldol Condensation reaction b. Etard reaction

OR

B. Describe the following name reactions with chemical equations.

a. Wolff-Kishner reduction b. Clemmensen reaction

23. The initial concentration of N_2O_5 in the following first order reaction $2N_2O_5(g) \rightarrow 2\ NO_2(g) + 1/2O_2$ (g) was 1.24×10^{-2} mol L^{-1} at 318 K. The concentration of N_2O_5 after 60 minutes was 0.20×10^{-2}mol L^{-1}.Calculate the rate constant of the reaction at 318 K.

24. Three electrolytic cells A,B,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$, respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow?

25. A. (i) Where does the water present in the egg go after boiling the egg?

(ii) What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?

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 $[Co(NH3)4Cl2]^+$

(ii)On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta 0 > P$.

(iii) $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{3-}$ is weakly paramagnetic.

Explain.

27 The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b for benzene is 2.53 K kg mol–1

28. how can the following conversions carried out?

(a) 1-cyclobutane to n-octane

(b) Benzene to biphenyl

(c) Bromomethane to propanone

29.a. Out of $CH_3—NH_2$ and $(CH_3)_3N$, which one has lower boiling point? Why?

b. Write short notes on the following:

(i) Coupling reaction

(ii) Ammonolysis

30. Explain the three steps with the help of equations, the mechanism of dehydration of 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:

Solutions are homogeneous mixture of two or more substances. Ideal solution follow Raoult's law. The vapour pressure of each component is directly proportional to their mole fraction if both solute and solvent are volatile. The relative lowering of vapour pressure is equal to mole fraction of solute if only solvent is volatile.

Non-ideal solution form azeotropes which cannot be separated by fractional distillation. Henry's law is special case of Raoult's law applicable to gases dissolved in liquids.

Colligative properties depend upon number of particles of solute. Relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure are colligative properties which depend upon mole fraction of solute, molality and molarity of solutions. When solute undergoes either association or dissociation, molecular mass determined by colligative property will be abnormal.

van't Hoff factor is used in such cases which is ratio of normal molecular mass over observed molar mass.

(a) 50 ml of an aqueous solution of glucose (Molar mass 180 g/mol) contains 6.02×10^{22} molecules. What is molarity?

(b) Identify which liquid has lower vapour pressure at 90°C if boiling point of liquid 'A' and 'B' are 140°C and 180° respectively.

(c) What type of azeotropes are formed by non-ideal solution showing negative deviation from Raoult's law?

(d) Predict the Van't Hoff factor (*i*) CH_3COOH dissolved in water, (*ii*) CH_3COOH dissolved in

benzene.

32. Biomolecules are complex molecules which build up living organisms and required for their growth, maintenance and ability to reproduce. Carbohydrates are polyhydroxy aldehydes and ketones which are major sources of energy. Monosachharides are simple sugars which cannot be hydrolysed. Oligosachharide, on hydrolysis give 2 to 10 molecules of monosachharides. Polysachharides like starch and cellulose on hydrolysis give large number of molecules of glucose a-glucose and b-glucose (Anomers). Proteins are complex nitrogeneous polymers of amino acids connected through peptide bonds. The sequence in which amino acids are linked is called Primary structure. Secondary structures are of 2 types a-helix in globular proteins and b-pleated structure in fibrous proteins involving H-bonds. Tertiary structure has H-bonds, disulphide linkage, ionic bonding and van der Waals' forces. Insulin is hormone for metabolism of glucose, has quaternary structure. Denaturation of protein destroys secondary and tertiary structure, loss of biological activity but primary structure remaining the same.

Enzymes are highly specific, work at specific pH, moderate temperature and catalyse biochemical reactions. Hormones perform specific functions and secreted by endocrine glands. Vitamins are essential for healthy body. A, D, E, K are fat soluble vitamins. Vitamin C and B1, B2, B6 are water soluble. B12 is neither water, nor fat soluble. Nucleic acids are polymer of nucleotides. RNA consists of *m*-RNA, *t*-RNA, *r*-RNA. RNA has Adenine, Cytosine, Uracil and Guanine. It helps in protein synthesis. It cannot replicate. DNA contains deoxyribose, A, C, G and Thymine. It transfers genetic characteristics. DNA has double helix structure and undergoes replication.

(a) Which linkage by which nucleotide are joined together between 5′ and 3′ atoms of pentose sugar?

(b) Which one is complementary base of cytosine in one strand of DNA to that in other strand of DNA?

(c) Name a disachharide which on hydrolysis give glucose and galactose.

(d) What type of protein is present in albumin?

SECTION E

33. A. (a) A compound 'A' with formula $C_5H_{10}O$ gives a positive 2, 4 –DNP test but a negative Tollen's test It can be oxidizing to carboxylic acid 'B' of molecular formula $C_3H_6O_2$, when treated with alk. $KMnO_4$ under vigorous conditions. The salt of 'B' gives a hydrocarbon 'C' on Kolbes' electrolytic decarboxylation. Identify A, B, C & write chemical equations.

(b) Carryout the following conversions:

(i) Propanone to Propene

(ii) Benzoic acid to Benzaldehyde

OR

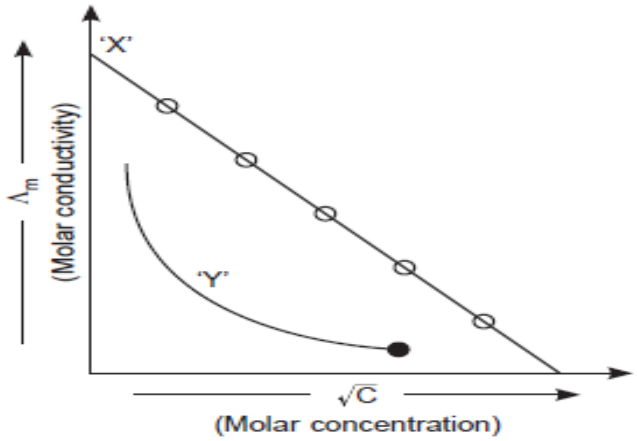
B. (a) A compound A with molecular formula $C_5H_{12}O$ on oxidation forms compound B with molecular formula $C_5H_{10}O$. The compound B gives iodoform test but does not reduce ammoniacal silver nitrate. The compound B on reduction with Zn – Hg/ HCl gives compound C with molecular formula C_5H_{12}. Identify A, B and C & give the chemical 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. Observe the graph shown in figure between Λm (molar conductivity) Vs √ C (Molar concentration) and answer the questions based on graph.



(*a*) The curve 'Y' is for KCl or CH_3COOH?

(*b*) What is intercept on Λm axis for 'X' equal to?

(*c*) Give mathematical equation representing straight line.

(*d*) What is slope equal to?

(*e*) What happens to molar conductivity on dilution in case of weak electrolyte and why?

35. (I) Answer the following questions

(a) Which transition metals of 3*d* series does not show variable oxidation state?

(b) Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution?

(c) Why are transition metals less electropositive than '*s*'-block elements?

(d) How does density vary from left to right in 3*d* series and why?

(e) Which lanthanoid shows +4 oxidation state and why?

OR

(II) Answer the following questions

(a) Complete the equation and balance:

$$Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow$$

(b) Complete the following:

$$3MnO_4^{2-} + 4H^+ \rightarrow$$

(c) Why are Zn, Cd and Hg non-transition elements?

(d) Which element in 3*d* series has lowest enthalpy of atomisation and why?

(e) Give two similarity between lanthanoids and actinoids.

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