Name of Student: _____   Roll no. _____

Pre-Board Assessment - January 2024
CLASS: 12
Subject: Chemistry

Time allowed: 3 hours   Maximum Marks: 70

General Instructions

➤ This question paper contains 35 questions. All questions are compulsory.

➤ In SECTION-A: Question no. 1 to 18 are multiple choice questions (MCQ) carrying 1 mark each.

➤ In SECTION-B: Question no. 19 to 25 are very short answer type questions (VSA) carrying 2 marks each.

➤ In SECTION-C: Question no. 26 to 30 are short answer type questions (SA) carrying 3 marks each.

➤ In SECTION-D: Question no. 31 and 32 are case based question carrying 4 marks each.

➤ In SECTION-E: Question no. 33 to 35 are long answer type questions (LA) carrying 5 marks each.

SECTION-A (OBJECTIVE TYPE QUESTIONS)
Each question carries 1 mark.

1) The values of van't hoff factor for KCl , NaCl and K_2SO_4 respectively are

a) 2,2,2   c) 1,1,1

b) 2,2,3   d) 1,1,2

2) Standard Electrode Potential for Standard Hydrogen Electrode is?

a) - 0.5V   b) +2.0V   c) + 1.0V   d) 0.0V

3) The role of catalyst is to change

a) Enthalpy of reaction   c) Gibbs free energy of reaction

b) Activation energy of reaction   d) All the of above

4) The stability of ferric ion is due to

a) Half-filled d- orbitals   c) Half-filled f- orbitals

b) completely filled f- orbitals   d) completely filled d- orbitals

5) Dehydration of secondary alcohol with copper at 573K gives
   a) alkenes   b) ketone   c) aldehyde   d) ether

6) Molecules whose mirror is non-superimposable over them are known as chiral. Which of the following mirror images is chiral?
   a) 2- bromobutane
   b) 2-bromopropane
   c) 1-bromobutane
   d) 2-bromopropan-2-ol

7) Glycogen is an example of
   a) monosaccharide's
   b) Disaccharide's
   c) polysaccharide's
   d) vitamins

8) When attraction between A-B is less than that of AA and BB, the solution will show which type of deviation from Raoult's law
   a) negative   b) positive   c) both   d) no deviation

9) Aldehyde and ketone can be distinguished by
   a) $NaHSO_3$
   b) Fehling solution
   c) Silver nitrate
   d) concentrated sulphuric acid

10) The units of molar conductivity is:
   a) $S\ m^2mol^{-1}$
   b) $S\ m^2mol^1$
   c) $S\ Cm^2mol^{-1}$
   d) $S\ m^3mol^{-1}$

11) The IUPAC name of $(CH_3)_2$-C=CH-$COCH_3$
   a) 2-Methylpent-3-ene-4-one
   b) 4-Methylpent-3-ene-2-one
   c) 1,1-Dimethyl-2-ene-1-one
   d) 2,4-Dimethyl-2-ene-4-one

12) The value of Henry's constant-
   a) increases with increase in temperature
   b) decreases with increase in temperature
   c) remains constant
   d) first increases then decreases

13) The atomic number of cerium is 58. The correct electronic configuration of Ce^{3+} is:
   a) $[Xe]4f^1$ b) $[Kr]4f^1$ c) $[Xe]4f^{13}$ d) $[Kr]4d^1$

14) Identify the order of reaction when units of rate constant is $mol\ L^{-1}\ Sec^{-1}$?
   a) Second   b) Zero   c) Third   d) First

(15-18) Assertion - Reason based questions:

These question consists of two statements each printed as Assertion and Reason. While answering these questions you are required to choose any one of the

following responses. A. If both Assertion and Reason are true, Reason is correct explanation of the Assertion. B. If both Assertion and Reason are true but Reason is not correct explanation of the Assertion. C. If Assertion is true but Reason is false. D. If both Assertion and Reason are false

15) ASSERTION (A): Molality of the solution does not change with change in temp.

REASON(R) : The molarity is expressed as number of moles per 1000g of the solvent.

16) ASSERTION (A): Oxidation state of Ni in $[Ni(CN)_4]^{2-}$ is +2.

REASON(R): The charge on cyanide ion is -1 and the total charge on the complex anion is -2.

17) ASSERTION (A): All aldehydes do not take part in aldol condensation.

REASON(R): Carbanion is generated by the removal of alpha hydrogen by the base in the Aldol condensation.

18) ASSERTION (A): All amino acids exist as Zwitter ion.

REASON (R): alpha- amino acids have both $-NH_2$ and $-COOH$ group.

SECTION-B (VERY SHORT ANSWER TYPE QUESTIONS)
Each question carries 2 marks.

19) Define Kohlrausch law. How does it help in calculation of molar conductivity at infinite dilution for a weak electrolyte CH_3COOH ?

20) Give two differences between DNA and RNA?

21) Time required to decompose thionyl chloride to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

22) Write equation for the preparation of 1- bromobutane from the following:

   a) Butan-1-ol   b) 1- chlorobutane

23) a) How will you prepare phenol from cumene?

   b) Arrange the following in increasing order of acidic strength and Give reason.
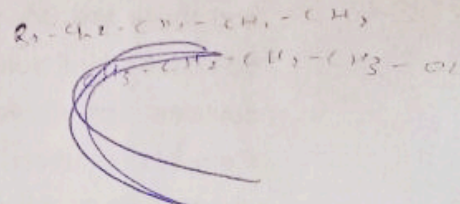   Phenol, p-nitrophenol, p-methyl phenol

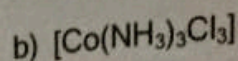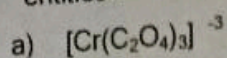24) Convert benzene diazonium chloride into:

   a) Phénol   b) Iodobenzene

OR

How p-aminoazobenzene can be obtained from aniline?

25) How many geometrical isomers are possible in the following coordination entities?

a) $[Cr(C_2O_4)_3]^{-3}$

b) $[Co(NH_3)_3Cl_3]$

SECTION-C (SHORT ANSWER TYPE QUESTIONS)
Each question carries 3 marks.

26) Define isotonic solution. A three percent solution of sucrose $C_{12}H_{22}O_{11}$ is isotonic with 4% solution of an unknown organic compound. Calculate molecular mass of the unknown compound?

27) $[Co(NH_3)_6]^{3+}$ is an inner orbital complex, whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex?

28) Explain the following reactions:

a) Stephen Reduction

b) Cannizzaro reduction

c) Reimer Tiemann reaction

OR

Convert

i) propanone to propene

ii) ethanol to 3-hydroxybutanal

iii) benzoic acid to benzaldehyde

29) Account for the following:

a) pK_b of aniline is more than methylamine.

b) Ethylamine is soluble in water whereas aniline is not.

c) Gabriel Phthalimide Synthesis is preferred for synthesizing primary amines.

30) How are vitamins classified. Name the vitamin responsible for coagulation of blood?

SECTION D: CASE STUDY QUESTIONS.
Each question carries 4 marks.

Read the following passage carefully and answer the following questions:

31. Transition elements have partly filled d-orbitals in their normal oxidation states or in their common oxidation states. There are four series in transition elements and these are 3d- series (first transition series), 4d-series (second transition series), 5d-series (third transition series) and 6d-series (fourth transition series). Each series contains ten elements. Elements of group 12 are not considered as transition elements as these have fully-filled d-subshells. Transition elements show all the characteristics of metals. These elements show variable oxidation states, form

coloured ions, form complexes from alloys and interstitial compounds. They show high enthalpies of atomisation, show catalytic properties and magnetic moment.

(a) Why Zn, Cd and Hg are not considered as transition elements?

(b) Which element of d-block shows maximum oxidation state?

(c) Why transition elements show variable oxidation states?

Or

Why transition elements show higher enthalpies of atomization?

(d) Calculate the magnetic moment of a divalent ion in its aqueous solution if its atomic number is 25.

32. In case of optically active alkyl halides, product formed as a result of S_N2 mechanism has the inverted configuration as compared to the reactant. This is because the nucleophile attaches itself on the side opposite to the one where halogen atom is present thus, S_N2 reactions of optically active halides are accompanied by inversion of configuration. In case of optically active alkyl halides S_N1 reactions are accompanied by racemization. Actually the carbocation formed in the slow step being sp^2 hybridized is achiral. The attack of nucleophile is accomplished from either side resulting in mixture of products having same configuration.

Read the following passage carefully and answer the following questions:

i) Define racemization. (1)

ii) Write two differences between S_N1 and S_N2 reactions. (2)

iii) Which alkyl halide from the following pair would react more rapidly by S_N2 mechanism, explain (1)

$CH_3CH_2CH_2CH_2Br$ OR $CH_3CH_2CH(Br)CH_3$
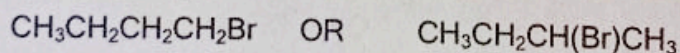
OR

Which alkyl halide from the following pair would react more rapidly by S_N1 mechanism, explain

$CH_3CH_2CH_2CH_2Br$ OR $CH_3CH_2CH(Br)CH_3$
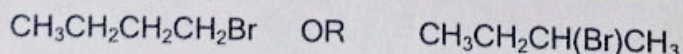
SECTION E: LONG ANSWER TYPE QUESTIONS
Each question carries 5 marks.

33) a) The rate constants of a reaction at 500 K and 700 K are 0.02 s^{-1} and 0.07 s^{-1} respectively.

Calculate the value of E_a (3)

b) What are the factors affecting rate of reaction. (2)

OR

a) Define pseudo first order reaction with example? (2)

b) Define energy of activation. The rate of a particular reaction doubles when temperature changes from 27°C to 37°C . Calculate the energy of activation? (3)

34) a) Write equations of the following reactions: (2)

    i) Sandmeyer reaction

    ii) Swart's reaction

    b) Haloarenes are less reactive than haloalkanes why? (2)

    c) Write one use of DDT? (1)

OR

a) Primary alkyl halide C_4H_9Br (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), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the eq. for all the reactions. (3)
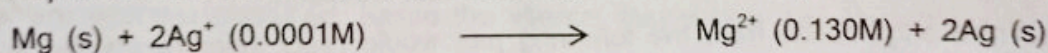
b) How the following conversion can be carried out? (2)

    (i) Aniline into chlorobenzene

    (ii) Benzene into 4-Bromonitrobenzene

35) a) Give the working of dry cell. (2)

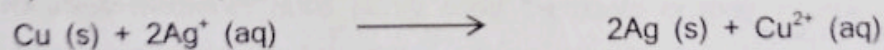   b) Represent the cell in which the following reaction takes place (3)

$$Mg \text{ (s)} + 2Ag^+ \text{ (0.0001M)} \longrightarrow Mg^{2+} \text{ (0.130M)} + 2Ag \text{ (s)}$$

Calculate its E_{cell} if $E°_{cell}$ = 3.17 V.

OR

a) Give the working of fuel cell. (2)

b) Calculate equilibrium constant for the following reaction (3)

$$Cu \text{ (s)} + 2Ag^+ \text{ (aq)} \longrightarrow 2Ag \text{ (s)} + Cu^{2+} \text{ (aq)}$$

Given that $E°_{Ag^+/Ag}$ = 0.80V and $E°_{Cu^{+2}/Cu}$ = 0.34V