COMMON PRE-BOARD EXAMINATION 2022-23

Subject: Chemistry(043)

Class: XII

Max. Marks: 70

Date :

Duration: 3 Hrs.

General Instructions:

Read the following instructions carefully.

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

b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.

c) SECTION B consists of 7 very short answer questions carrying 2 marks each.

d) SECTION C consists of 5 short answer questions carrying 3 marks each.

e) SECTION D consists of 2 case- based questions carrying 4 marks each.

f) SECTION E consists of 3 long answer questions carrying 5 marks each.

g) All questions are compulsory.

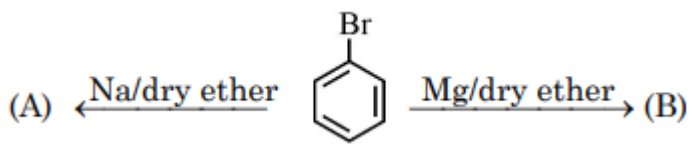h) Use of log tables and calculators is not allowed

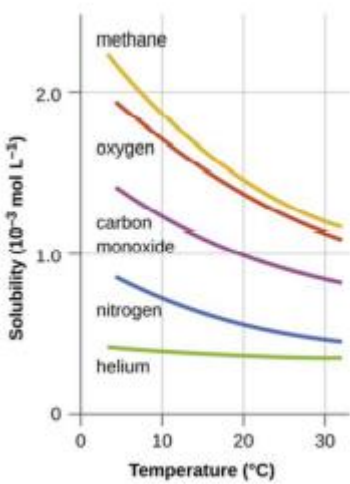|	SECTION A The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.	
1	What would be the reactant and reagent used to obtain 2, 4-dimenthyl pentan-3-ol? (a) Propanal and propyl magnesium bromide (b) 3-methylbutanal and 2-methyl magnesium iodide (c) 2-dimethylpropanone and methyl magnesium iodide (d) 2-methylpropanal and isopropyl magnesium iodide	1
2	Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follow (a) S_N1 mechanism (b) S_N2 mechanism (c) Any of the two above depending upon the temperature of reaction (d) Saytzeff rule	1
3	Cu^+ is less stable than Cu^{2+} in aqueous solution. This is because of a) More negative Hydration enthalpy of Cu^+ ion b) More negative Hydration enthalpy of Cu^{2+} ion c) Less negative Hydration enthalpy of Cu^{2+} ion d) Less enthalpy atomization of Cu	1
4	According to Maxwell Boltzmann distribution of energy, (a) The fraction of molecules with most probable kinetic energy does not change at higher temperatures. (b)The fraction of molecules with most probable kinetic energy increases at higher temperatures.	1

	(c) Most probable kinetic energy increases at higher temperatures. (d) Most probable kinetic energy decreases at higher temperatures.	
5	How is electrical conductance of a conductor related with length and area of cross-section of the conductor a) $G = l . a.K^{-1}$ b) $G = K. l.a^{-1}$ c) $G = K.a .l^{-1}$ d) $G = K. l.a^{-2}$	1
6	Suppose the reaction: $A + 2B \rightarrow AB_2$ occurs by the following mechanism: $\quad\quad\quad$ Step 1 $\quad A + B \rightarrow AB \quad\quad$ slow $\quad\quad\quad$ Step 2 $\quad AB + B \rightarrow AB_2$ fast $\quad\quad\quad$ Overall $\quad A + 2B \rightarrow AB_2$ The rate law expression must be Rate = _____. (a) k[A] (b) k[AB][B] (c) k[A][B] (d) k[A][B]^2	1
7	Benzoic acid is treated with $SOCl_2$ and the product (X) formed is reacted with ammonia to give (Y). (Y) on reaction with Br_2 and KOH gives (Z). (Z) in the reaction is (a) aniline (b) chlorobenzene (c) benzamide (d) benzoyl chloride	1
8	Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test for chloride ions with silver nitrate at 25°C? a) $CoCl_3.3NH_3$ b) $CoCl_3.4NH_3$ c) $CoCl_3.5NH_3$ d) $CoCl_3.6NH_3$	1
9	Which of the following does not undergo Cannizzarro's reaction? (a) Benzaldehyde (b) 2-Methylpropanal (c) p-Methoxybenzaldehyde (d) 2, 2-Dimethylpropanal	1
10	Which of the following statements is not correct for amines? (a). Most alkyl amines are more basic than ammonia solution. (b). pKb value of ethylamine is higher than benzylamine. (c). CH_3NH_2 on reaction with nitrous acid releases N2 gas. (d). Hinsberg's reagent reacts with secondary amines to form sulphonamides	1
11	Methyl ketones are usually characterised through (a) Tollen's reagent (b) Iodoform test	1

	(c) Schiff's test (d) Benedict solution test.	
12	In a reaction, $2X \rightarrow Y$, the concentration of X decreases from 0.50M to 0.38M in10min. What is the rate of reaction in Ms^{-1} during this interval? (a) 2×10^{-4} (b) 4×10^{-2} (c) 2×10^{-2} (d) 1×10^{-2}	1
13	What kind of isomerism exists between $[Cr(H_2O)_6]Cl_3$ (violet) and $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ (greyish-green)? (a) linkage isomerism (b) solvate isomerism (c) ionisation isomerism (d) coordination isomerism	1
14	What is the correct IUPAC name of the given compound ? $$CH_3 - \underset{\underset{COOH}{\overset{\overset{CH_3}{|}}{|}}}{C} - CH_2 - CH_3$$ (a) 2,2-Dimethylbutanoic acid (b) 2-Carboxyl-2-methylbutane (c) 2-Ethyl-2-methylpropanoic acid (d) 3-Methylbutane carboxylic acid	1
15	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A)** : Boiling points of alkyl halides decrease in the order R-I > R-Br > R-Cl > R-F. **Reason (R)** : Van der Waals forces decrease with increase in the size of halogen atom. Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1
16	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion (A)**: Sucrose is optically active. **Reason (R)**: Hydrolysis of sucrose brings about a change in rotation, from dextro (+) to laevo (−) Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1

17	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion(A)**: Cobalt (II) readily oxidises to Co (III) while forming complexes. **Reason(B)**: Co(III) has a stable t_{2g}^3 configuration in complexes. Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	1
18	Given below are two statements labelled as Assertion (A) and Reason (R) **Assertion(A)** : N, N-Diethylbenzene sulphonamide is insoluble in alkali. **Reason(B)** : Sulphonyl group attached to nitrogen atom is strong electron withdrawing group. Select the most appropriate answer from the options given below: a) Both A and R are true and R is the correct explanation of A b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R 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	a) Illustrate graphically the effect of catalyst on activation energy. b) Catalysts have no effect on equilibrium constant. Why?	2
20	a) Name the branched chain component of starch. b) How do Ribose in RNA and deoxyribose in DNA differ in the structure ? OR a) Write the product when D-glucose reacts with conc. HNO_3 . b) Amino acids show amphoteric behaviour. Why ?	2
21	Among all the isomers of molecular formula C_4H_9Br, identify (a) the one isomer which is optically active. (b) the one isomer which is highly reactive towards S_N2. (c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH **OR** Give reasons for the following : (i) Benzyl chloride is highly reactive towards the S_N1 reaction. (ii) Electrophilic reactions in haloarenes occur slowly.	2
22	(a) Although both $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ have sp^3 hybridisation yet $[NiCl_4]^{2-}$ is paramagnetic and $[Ni(CO)_4]$ is diamagnetic. Give reason. (Atomic no. of Ni = 28)	2

	(b) Write the electronic configuration of d^5 on the basis of crystal field theory when (i) $\Delta o < P$ and (ii) $\Delta o > P$	
23	The conductivity of 0.20M solution of KCl at 298 K is 0.0248 Scm^{-1} . Calculate its molar conductivity.	2
24	The decomposition of NH_3 on platinum surface: $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ is a zero order reaction with k = 2.5×10^{-4} mol L^{-1} s^{-1} . What is the rate of production of H_2?	2
25	Write structures of main compounds A and B in each of the following reactions : (a) $CH_3CH_2OH \xrightarrow{PCC} A \xrightarrow{CH_3OH \, / \, dry \, HCl(g)} B$ (b) $C_6H_5COCH_3 \xrightarrow{NaOI} A + B$	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	Give equations of the following reactions : (i) Phenol is treated with conc. HNO_3 . (ii) Propene is treated with B_2H_6 followed by H_2O_2 /OH– . (iii) Sodium t-butoxide is treated with CH_3Cl.	3
27	a) Arrange the following in increasing order of crystal field splitting energy : $[Cr(CN)_6]^{3-}$, $[Cr(NH_3)_6]^{3+}$, $[CrCl_6]^{3-}$ b) Write IUPAC name of the complex $[Cr(NH_3)_4Cl_2]^+$. Draw structures of geometrical isomers for this complex.	3
28	Calculate the mass of NaCl (molar mass =58·5 g mol^{-1}) to be dissolved in 37·2 g of water to lower the freezing point by 2°C, assuming that NaCl undergoes complete dissociation. (K_f for water = 1·86 K kg mol^{-1})	3
29	Give reasons : (Answer any three of the following) (i) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution. (ii) Aromatic diazonium salts are more stable than aliphatic diazonium salts (iii) Methylamine in water reacts with ferric chloride to precipitate hydrated	3

	ferric oxide. (iv) Aniline is acetylated before nitration reaction.	
30	(i) Write the structure of major alkene formed by β-elimination of 2, 2, 3–trimethyl–3–bromopentane with sodium ethoxide in ethanol. (ii) Which one of the compounds in the following pairs is chiral ? (iii) Identify (A) and (B) in the following : **OR** How can you convert the following ? (i) But-1-ene to 1-iodobutane (ii) Benzene to acetophenone (iii) Ethanol to propanenitrile	3
	SECTION D **The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.**	
31	Proteins are poly peptide chains made up of amino acids. There are 20 types of amino acids joined together by peptide bond between amino and carboxylic acid group. The amino acids are of two types-essential amino acids and non-essential amino acids. The primary structure of a protein is defined as the sequence of amino acids linked together to form a polypeptide chain. The first amino acid of sequence is called N-terminal amino acid and last amino acid of peptide chain is called C-terminal amino acid. The secondary structure of protein forms helix. There are three types of secondary structure- α-helix, β-pleated sheet structure and collagen helix. The tertiary structure of proteins represents overall folding of the polypeptide chains i.e.,further folding of the secondary structure. The spatial arrangement of these subunits with respect to each other is known as quaternary structure. a) How many peptide bonds will be formed when ten amino acids	(4)

	polymerise?	1
	b) Name the amino acid which is not optically active.	1
	c) What is the effect of denaturation on the structure of proteins? Give two examples of denaturation.	2
	OR	
	c) Differentiate between Fibrous proteins and Globular proteins.	
32	The chemical structures of the solute and solvent dictate the types of forces possible and, consequently, are important factors in determining solubility. For example, under similar conditions, the water solubility of oxygen is approximately three times greater than that of helium, but 100 times less than the solubility of chloromethane, $CHCl_3$. Considering the role of the solvent's chemical structure, note that the solubility of oxygen in the liquid hydrocarbon hexane, C_6H_{14}, is approximately 20 times greater than it is in water. Other factors also affect the solubility of a given substance in a given solvent. Temperature is one such factor, with gas solubility typically decreasing as temperature increases (Figure). This is one of the major impacts resulting from the thermal pollution of natural bodies of water.	(4)

When the temperature of a river, lake, or stream is raised abnormally high, usually due to the discharge of hot water from some industrial process, the solubility of oxygen in the water is decreased. Decreased levels of dissolved oxygen may have serious consequences for the health of the water's ecosystems and, in severe cases, can result in large-scale fish kills.

i. What is effect of temperature on solubility of gas in liquid?

1

ii. Name two factors which affect the value of K_H?

1

iii. When natural waters subjected to thermal pollution, how does it affect aquatic life?

2

	OR	
	Find the boiling point of a solution containing 0.52g of glucose ($C_6H_{12}O_6$) dissolved in 80.2 g of water (Given K_b for water = 0.52 K/m).	
	SECTION E	
	The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.	
33	a) $E°_{cell}$ for the given redox reaction is 2.71 V $Mg(s) + Cu^{2+}$ (0.01 M) → Mg^{2+} (0.001 M) + Cu(s) Calculate E_{cell} for the reaction. b) Write the direction of flow of current when an external opposite potential applied is (i) less than 2.71 V and (ii) greater than 2.71 V **OR** (a) A steady current of 2 amperes was passed through two electrolytic cells X and Y connected in series containing electrolytes $FeSO_4$ and $ZnSO_4$ until 2.8 g of Fe deposited at the cathode of cell X. How long did the current flow ? Calculate the mass of Zn deposited at the cathode of cell Y. (Molar mass : Fe = 56 g mol^{-1} Zn = 65.3 g mol^{-1}, 1F = 96500 C mol^{-1}) (b) In the plot of molar conductivity (Λ_m) vs square root of concentration ($c^{1/2}$), following curves are obtained for two electrolytes A and B : Answer the following : (i) Predict the nature of electrolytes A and B. (ii) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B ?	5
34	(a) Carry out the following conversions : (i) P-nitrotoluene to 2-bromobenzoic acid (ii) Propanoic acid to acetic acid (b) An alkene with molecular formula C_5H_{10} on ozonolysis gives a mixture of	

two compounds, B and C. Compound B gives positive Fehling test and also reacts with iodine and NaOH solution. Compound C does not give Fehling solution test but forms iodoform. Identify the compounds A, B and C.

OR

(a) Carry out the following conversions :

(i) Benzoic acid to aniline

(ii) Bromomethane to ethanol

(b) Write the structure of major product(s) in the following :

(i) $CH_3 - CH_2 - \underset{\underset{O}{||}}{C} - H \xrightarrow[\text{(b) KOH, Glycol/heat}]{\text{(a) } H_2N - NH_2}$

(ii) $CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CHO \xrightarrow{\text{conc. NaOH}}$

(iii) $\underset{}{\overset{COOH}{\bigcirc}} \xrightarrow{\text{NaOH}}$

35	a) Give reasons :	
	(i) Transition metals and their compounds show catalytic activities.	
	(ii) Separation of a mixture of Lanthanoid elements is difficult.	
	(iii) Zn, Cd and Hg are soft and have low melting point.	5
	(b) Write the preparation of the following :	
	(i) $Na_2Cr_2O_7$ from Na_2CrO_4	
	(ii) K_2MnO_4 from MnO_2	