B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE-BOARD III (SESSION 2024-25)- Set 1

CLASS: XII **CHEMISTRY (043)** **MAX. MARKS: 70M**

DATE: 12.1.26 **DURATION: 3 hrs**

ADMISSION NO. - **ROLL NO.**

Read the following instructions carefully and follow them :

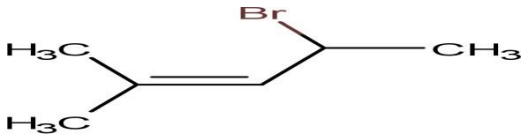
- This question paper contains 33 questions. All questions are compulsory.
- Question paper is divided into FIVE sections - Section A, B, C, D and E.
- Section A- question number 1 to 16 are multiple choice type questions. Each question carries 1 mark.
- Section B - question number 17 to 21 are very short answer type questions. Each question carries 2 marks.
- Section C- question number 22 to 28 are short answer type questions. Each question carries 3 marks.
- Section D- question number 29 and 30 are case-based questions. Each question carries 4 marks.
- Section E- question number 31 to 33 are long answer type questions. Each question carries 5 marks.
- There is no overall choice given in the question paper. However, an internal choice has been provided in a few questions in all the Sections except section A.
- Use of calculator is NOT allowed.

SECTION A

This section contains 16 questions with no internal choices. The following questions are of a MCQ type and carry 1 mark each.

<table>
<tr><td>1</td><td colspan="4">The boiling point of an azeotropic mixture of water and ethanol is less than that of water and ethanol. The mixture shows:</td><td>1</td></tr>
<tr><td></td><td>a)</td><td>No deviation from Raoult's Law</td><td>c)</td><td>Negative deviation from Raoult's Law</td><td rowspan="2"></td></tr>
<tr><td></td><td>b)</td><td>Positive deviation from Raoult's Law</td><td>d)</td><td>Ideal behavior & obeys Raoult's Law</td></tr>
<tr><td>2</td><td colspan="4">People add sodium chloride to water while boiling eggs. This is done to _____</td><td>1</td></tr>
</table>

	a)	Decrease the boiling point of water.	c)	Prevent coagulation of eggs.	
	b)	Increase the boiling point of water	d)	To make eggs tastier.	
3	For the electrochemical cell: $Mg\|Mg^{2+}\|\| Cu^{2+}\|Cu$ The incorrect statement is:				**1**
	a)	Mg act as anode	c)	Cell reaction is $Mg^{2+}+Cu \rightarrow Mg+Cu^{2+}$	
	b)	Cu act as cathode	d)	Electrons flow from Mg to Cu	
4	The quantity of charge required to obtain 1 mole of Al from Al_2O_3 is				**1**
	a)	1F	c)	3F	
	b)	6F	d)	2F	
5	For a pseudo first order reaction of the type $A + H_2O \rightarrow$ products, find the rate of the reaction in mol L^{-1} s^{-1} when [A] = 0.75 M, k= 0.02 s^{-1}.				**1**
	a)	0.077	c)	0.015	
	b)	0.085	d)	0.026	
6	Which one of the following first row transition elements is expected to have the highest third ionization enthalpy?				**1**
	a)	Iron Fe (Z = 26)	c)	Chromium Cr (Z = 24)	
	b)	Manganese Mn (Z = 25)	d)	Vanadium V (Z = 23)	
7	Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halogen compounds .The reaction is				**1**
	a)	Electrophilic elimination reaction	c)	Electrophilic substitution reaction	
	b)	Free radical addition reaction	d)	Nucleophilic substitution reaction	

8	The IUPAC name of the given structure 				**1**
	a)	2-Bromo-3-methylpent-3-ene	c)	4-Bromo-2-methylpent-2-ene	
	b)	4-Bromo-3-methylpent-3-ene	d)	2-Bromo-3-methylpent-4-ene	
9	Which of the following reagents cannot be used to oxidise primary alcohols to aldehydes?				**1**
	a)	CrO_3 in anhydrous medium	c)	$KMnO_4$ in acidic medium	
	b)	Pyridinium chlorochromate	d)	Heat in presence of Cu at 573 K	
10	The compound that does not give a positive iodoform test is:				**1**
	a)	Pentan-2 one	c)	Ethanal	
	b)	Ethanol	d)	Pentan-3-one	
11	Which of the following will dissolve in an alkali solution after it undergoes reaction with Hinsberg reagent ?				**1**
	a)	CH_3NH_2	c)	$(C_2H_5)_2NH$	
	b)	$(CH_3)_3N$	d)	$C6H_5NHC_6H_5$	
12	Which of the following statements is not true about glucose?				**1**
	a)	It is an aldohexose.	c)	On heating with HI, it forms n-hexane.	
	b)	It is present in cyclic furanose form.	d)	It does not give 2,4- DNP test.	

Assertion Reasoning Questions (1M each)

For question no. 13 to 16 there are two statements labeled as Assertion (A) and Reason (R) 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.

13	**ASSERTION**	Increase in temperature increases the rate of a chemical reaction.	**1**
	REASONING	Increase in temperature decreases activation energy of the reaction.	
14	**ASSERTION**	Copper cannot liberate hydrogen from mineral acids.	**1**
	REASONING	Standard electrode potential of Copper is greater than zero.	
15	**ASSERTION**	Higher haloalkanes are immiscible in water.	**1**
	REASONING	Halogen of haloalkane forms a hydrogen bond with water.	
16	**ASSERTION**	Phenol is less acidic than ethanol.	**1**
	REASONING	Phenoxide ion is stabilized by resonance.	

SECTION B

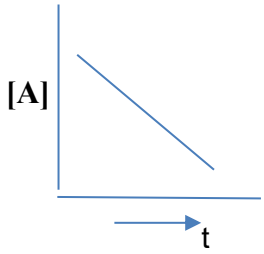
This section contains 5 questions with internal choice in one question. The following questions are of a very short answer type and carry 2 marks each.

17	Calculate the potential of an Iron electrode with reference to SHE in which the concentration of Fe^{2+} ion is 0.01 M. (Given that E^{o} (Fe^{2+}/Fe) = - 0.44 V at 298 K and log 10 = 1)	**2**

18	$\lambda^{o}m$ for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. Calculate $\lambda^{o}m$ for HAc. Name the law involved in calculation of limiting molar conductivity of an electrolyte.	**2**
19	Carbon dating is used by archaeologists to date trees, plants, and animal remains as well as human artefacts made from wood and leather. If an archaeologist found that the percentage of carbon-14 in the remains of an animal was 10% of what carbon-14 was in the animal's body when the animal died, find the age of this sample. (Given the half-life of carbon-14= 5800 years)	**2**
20	Carry out the following conversions : (i) Benzamide to Aniline (ii) Aniline to Chlorobenzene OR Arrange the following: (a) In increasing order of basic strength: $C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$ and CH_3NH_2 (b) In increasing order of boiling point: C_2H_5OH, $(CH_3)_2NH$, $C_2H_5NH_2$	**2**
21	Complete the following reactions: (i)  (ii) 	**2**

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer types and carry 3 marks each.

22	Imagine you are in a chemistry lab and the teacher is explaining the electrolysis of $CuSO_4$ solution and the products liberated after electrolysis. The teacher made two setups for the electrolysis process. In Set up-I electrolysis of $CuSO_4$ solution is done by using Pt electrodes and in Set up-II electrolysis of $CuSO_4$solution is done by using Cu electrodes. Answer **any three** questions based on this: i) In which Set up I or II will the colour of the CuSO4 solution fades away and why? ii) Write the chemical reaction taking place at the Cu anode in Set up II. iii) Name the product obtained at the cathode in Set up I. iv) Which out of Set up I or II depict refining of crude copper?	**3**
23	For a general reaction A → B, plot of concentration of A vs time is given in Fig. Answer the following question based on this graph. i) What is the order of the reaction? ii) What is the slope of the curve? iii) What are the units of rate constant?  	**3**
23	OR a. What is a Pseudo First order reaction ? b. Calculate the value of activation energy for this reaction. ($R = 8.314\ J\ K^{-1}\ mol^{-1}$) for a decomposition reaction whose rate constants k different temperatures are given below: $k1 = 2.15 \times 10^{-8}\ mol\ L^{-1}\ s^{-1}$ at 650 K $k2 = 2.39 \times 10^{-7}\ mol\ L^{-1}\ s^{-1}$ at 700 K	

<table>
<tr><td>24</td><td>Answer the following questions for the complex $[CrCl_2(NH_3)_4]Br$
i) IUPAC name of the complex.
ii) Write the type of structural isomerism exhibited by the complex.
iii) Write the oxidation number and coordination number of the central metal ion Cr.</td><td>3</td></tr>
<tr><td>25</td><td>For each of the following combinations of reagents and conditions, suggest whether substitution or elimination will predominate. Justify your answer.
(i) heating $CH_3CH_2CH_2Br$ with aqueous NaOH
(ii) heating $(CH_3)_3CBr$ with NaOH in ethanol
(iii) heating $(CH_3)_2CHBr$ with $(CH_3)_3C\text{-}O^-K^+$</td><td>3</td></tr>
<tr><td>26</td><td>Predict the major product when propene is subjected to two different conditions:
(i) reaction with water followed by acidic hydrolysis
(ii) reaction with diborane followed by oxidation with H_2O_2 in aqueous NaOH.
Name the rule that governs the major product in above addition reactions.</td><td>3</td></tr>
<tr><td>27</td><td>A compound X consisting of C and H atoms and one oxygen atom in a carbonyl group, undergoes the reactions as given in the table below.
<table><tr><th>Reaction</th><th>Result</th></tr><tr><td>Tollens' test</td><td>+ve</td></tr><tr><td>Iodoform test</td><td>+ve</td></tr></table>
Identify the product(s) that compound X will produce on undergoing the Aldol condensation reaction followed by dehydration. Justify your answer.</td><td>3</td></tr>
<tr><td>28</td><td>Give reasons for the following: (Any three)
(i) pKb value of aniline is more than methylamine.
(ii) Ethylamine is soluble in water whereas aniline is not soluble in water.
(iii) Primary amines have higher boiling points than tertiary amines.</td><td>3</td></tr>
<tr><td></td><td>(iv) Aniline does not undergo Friedel-Crafts reaction.</td><td></td></tr>
</table>

SECTION D

The following questions are case-based questions and carry 4 (2+1+1) marks. Read the passage carefully and answer the questions that follow.

29	Complex compounds play an important role in our daily life. Werner's theory of complex compounds says every metal atom or ion has primary valency (oxidation state) which is satisfied by -vely charged ions, ionisable where secondary valency (coordination number) is non-ionisable, satisfied by Iigands (+ve, -ve, neutral) but having lone pair. Primary valency is non-directional, secondary valency is directional.Complex compounds are name according to IUPAC system. Valence bond theory helps in determining shapes of complexes based on hybridisation, magnetic properties, outer or inner orbital complex. Complex show ionisation, linkage, solvate and coordination isomerism also called structural isomerism. Some of them also show stereoisomerism i.e. geometrical and optical isomerism. Ambidentate ligand are essential to show linkage isomerism. Polydentate Iigands form more stable complexes then unidentate Iigands. There are called ehelating agents. EDTA is used to treat lead poisoning, cis-platin as anticancer agents. Vitamin B12 is complex of cobalt. Haemoglobin, oxygen carrier is complex of Fe^{2+} and chlorophyll essential for photosynthesis is complex of Mg^{2+}. (a) What is hybridisation of $[CoF_6]^{3-}$ [Co = 27] Give its shape and magnetic properties. (b) Out Cis-$[Pt(en)_2\ CI_2]^{2+}$ and trans-$[Pt(en)_2CI_2]^{2+}$ which one shows optical isomerism? **OR** (b) Out $[Fe(CO)_5]$, $[Fe(C_2O_4\ )_3]^{3-}$, $[Fe(H_2O_6)^{3+}$, $[Fe(CN)_6]^{3-}$, which is most stable? (c) One mole of $CrCI_3.6H_2O$ reacts with excess of $AgNO_3$ to yield 3 mole of AgCI. Write formula of complex. Write IUPAC name also.	2 1 1
30	Polysaccharides may be very large molecules. Starch, glycogen, cellulose, and chitin are examples of polysaccharides. 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 hydrolyzed 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 cellulose 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 fiber.	
i)	Classify the following into monosaccharides and disaccharides. 2-deoxyribose, maltose, fructose and lactose.	**2**
ii)	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.	**1**
iii)	The linkages which join monosaccharides to form long chain polysaccharides : a. Peptide linkage b. Disulphide bonds c. Hydrogen bonds d. Glycosidic linkage **OR** Cellulose on complete hydrolysis yields: a. amylose b. amylopectin c. β-D- glucose d. α−D-glucose	**1**

SECTION E

The following question is a long answer type question with an internal choice and carries 5 marks.

31	i) Why are aquatic species more comfortable in cold water rather than in warm water?	**1**
	ii) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing:	**1**
	a) 1.2% sodium chloride solution?	
	b) 0.4% sodium chloride solution ?	
	iii) A 1.00 molal aqueous solution of trichloroacetic acid (CCl3COOH) is heated to its boiling point. The solution has the boiling point of 100.18°C. Determine the Van't Hoff factor for trichloroacetic acid. (Kb for water = 0.512 K kg mol^{-1})	**3**
	OR	
31	i) Explain the following phenomena with the help of Henry's law.	**2**
	(a) Painful condition known as bends.	
	(b) Feeling of weakness and discomfort in breathing at high altitude	
	ii) 15 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution freezes at -0.34° C. What is the molar mass of the substance? (Kf for water = 1.86 K kg mol-1).	**3**
32	**Account for the following:**	
	i) Transition metals and many of their compounds act as good industrial catalysts.	**1**
	ii) Transition metals and their compounds are mostly paramagnetic in nature.	**1**
	iii) Transition metals are known to form coloured complexes.	**1**
	iv) Cuprous ions are not known to exist in the aqueous state.	**1**
	v) Cr^{2+} is reducing in nature, while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent.	**1**
	OR	
32	i) Write the chemical reactions involved in the preparation of KMnO4 from pyrolusite ore.	**2**
	ii) What colour changes are observed when a base is added to potassium dichromate	**1**
	iii) Write a balanced redox equation representing the reaction between:	**2**
	a) Permanganate ion and ferrous ion in an acidic medium.	
	b) Permanganate ion and oxalate ion in an acidic medium.	

33	i) Write the equations involved in following named reactions: a) Stephen Reduction b) Clemmensen Reaction	**2**
	ii) How will you distinguish between the following pairs of compounds: a) acetophenone and benzophenone b) propanal and propanoic acid	**2**
	iii) Arrange the following in increasing order of acidic nature: CH_3CH_2COOH, $CH_3CHFCOOH$, CH_3CF_2COOH	**1**
	OR	
33	i) Write the reactions involved when acetaldehyde reacts with: a) CH_3MgBr in the presence of dry ether followed by hydrolysis. b) hydrogen cyanide followed by hydrolysis c) hydrazine in the presence of ethylene glycol.	**3**
	OR ii) Salicylic acid is an organic compound that is a type of beta-hydroxy acid (BHA) and phenolic acid with a chemical formula $C_7H_6O_3$. Salicylic acid is also known as ortho-hydroxybenzoic acid, which is a white colour crystalline solid that is used for the preparation of many pharmaceutical products and one of its major products is aspirin (2-acetoxybenzoic acid). a) Write the preparation of salicylic acid from phenol. b) Name the reagent used to convert salicylic acid into aspirin.	**2**

**********ALL THE BEST **********