

O.P.JINDAL SCHOOL , SAVITRI NAGAR

PRE – BOARD – II (2025-26)

(SET - B)

Class: XII

Maximum Marks:

70

Subject: CHEMISTRY

Time: 3.00 hrs.

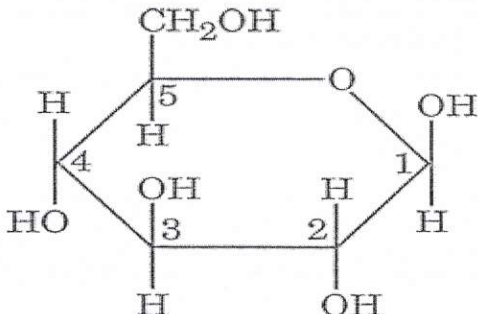
Read the following instructions carefully.

This question paper contains 33 questions.

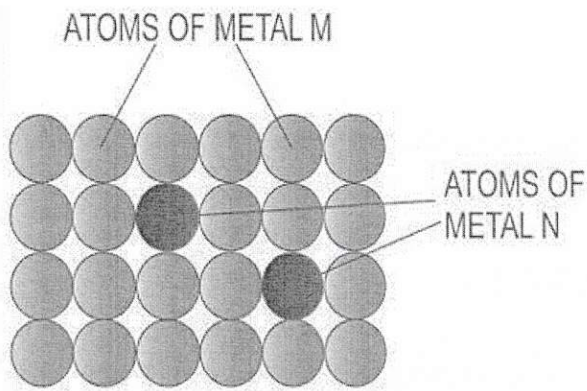
All questions are compulsory.

- (i) This question paper is divided into five sections – Section A, B, C, D and E.
- (ii) Section A – questions number 1 to 16 are multiple choice type questions. Each question carries 1 mark.
- (iii) Section B – questions number 17 to 21 are very short answer type questions. Each question carries 2 marks.
- (iv) Section C – questions number 22 to 28 are short answer type questions. Each question carries 3 marks.
- (v) Section D – questions number 29 and 30 are case-based questions. Each question carries 4 marks.
- (vi) Section E – questions number 31 to 33 are long answer type questions. Each question carries 5 marks.
- (vii) There is no overall choice given in the question paper. However, an internal choice has been provided in few questions in all the sections except Section A.

Section-A								
Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.								
1.	Match the following name reactions with their correct equations:		1					
<table><tr><td>Column A</td><td>Column B</td></tr><tr><td>(Name Reactions):</td><td>(Equations):</td></tr><tr><td>a) Wurtz reaction</td><td>(i) $R-Cl + AgF \rightarrow R-F + AgCl$</td></tr></table>		Column A	Column B	(Name Reactions):	(Equations):	a) Wurtz reaction	(i) $R-Cl + AgF \rightarrow R-F + AgCl$	
Column A	Column B							
(Name Reactions):	(Equations):							
a) Wurtz reaction	(i) $R-Cl + AgF \rightarrow R-F + AgCl$							

	b) Swartz reaction	(ii) $R-Cl + NaI \xrightarrow{\text{acetone}} R-I + NaCl$	
	c) Finkelstein reaction	(iii) $2R-Cl + 2Na \xrightarrow{\text{dry ether}} R-R + 2NaCl$	
	(A) a-i, b-ii, c-iii (B) a- iii, b-ii, c-i, (C) a-iii, b-i, c-ii (D) a-ii, b-i, c-iii		
2.	Which of the following haloalkanes is most reactive towards S_N2 reaction? (A) $CH_3 - CH_2 - I$ (B) $CH_3 - CH_2 - Br$ (C) $CH_3 - CH_2 - Cl$ (D) $CH_3 - CH_2 - F$		1
3.	Which of the following alcohols will not undergo oxidation? (A) Butan-1-ol (b) Butan-2-ol (c) 2-Methylbutan-2-ol (d) 3-Methylbutan-2-ol		1
4.	Consider the following standard electrode potential values: $Sn^{2+} (aq) + 2e^- \rightarrow Sn(s) E^\circ = -0.14 V$ $Fe^{3+} (aq) + e^- \rightarrow Fe^{2+} (aq) E^\circ = +0.77 V$ What is the cell reaction and potential for the spontaneous reaction that occurs? (A) $2 Fe^{2+} (aq) + Sn^{2+} (aq) \rightarrow 2 Fe^{3+} (aq) + Sn(s) E^\circ = -0.91 V$ (B) $2 Fe^{3+} (aq) + Sn(s) \rightarrow 2 Fe^{2+} (aq) + Sn^{2+} (aq) E^\circ = +0.91 V$ (C) $2 Fe^{2+} (aq) + Sn^{2+} (aq) \rightarrow 2 Fe^{3+} (aq) + Sn(s) E^\circ = +0.91 V$ (D) $2 Fe^{3+} (aq) + Sn(s) \rightarrow 2 Fe^{2+} (aq) + Sn^{2+} (aq) E^\circ = +1.68 V$		1
5.	Which of the following amines does not give foul smell of isocyanide on heating with chloroform and ethanolic KOH? (A) $CH_3CH_2NH_2$ (B) $(CH_3)_2CHNH_2$ (C) $(CH_3CH_2)_3N$ (D) $C_6H_5NH_2$		1
6.	α -helix structure refers to : (A) primary structure of protein (B) secondary structure of protein (C) tertiary structure of protein (D) quaternary structure of protein		1
7.	In the Haworth structure of the following carbohydrate, various carbon atoms have been numbered. The anomeric carbon is numbered as 		1

	(A) 1 (B) 2 (C) 3 (D) 5	
8.	In the complex compound $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ oxidation states of counter ion Fe and central metal ion Fe respectively are; (A) II, III (B) III, II (C) IV, III (D) II, II	1
9.	In the Hinsberg's method for separation of primary, secondary and tertiary amines, the reagent used is: (A)) Nitrous acid (B) $\text{CHCl}_3 + \text{aq. NaOH}$ (C) $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ (D) $\text{HCl} / \text{ZnCl}_2$	1
10.	The graphs below show the solubility of a primary, a secondary and a tertiary aliphatic amine I, J, and K in water, at the same temperature. The number of carbon atoms in each of the compounds is three. Amine I is the tertiary amine, amine J is the primary amine, and amine K is the secondary amine. Which of the graphs identifies the three amines correctly? (A) P (B) Q (C) R (D) S	1
11.	Given below is an image showing a specific property of transition metals.	1

	 Which property of transition metals is shown in the image? (A) Catalytic action (B) Formation of alloy (C) Coloured complex formation (D) Interstitial compound formation	
12.	Among the following electronic configurations of transition metals which one shows the highest oxidation state? (A) $[\text{Ar}] 3d^3 4s^2$ (B) $[\text{Ar}] 3d^5 4s^1$ (C) $[\text{Ar}] 3d^5 4s^2$ (D) $[\text{Ar}] 3d^8 4s^2$	1
	For Questions number 13 to 16, two statements are given — one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.	
13.	Assertion (A): Care should always be taken to ensure that solutions that flow in the blood stream are of the same osmotic pressure as that of the blood. Reason(R): Sodium ion and potassium ions are responsible for maintaining proper osmotic pressure balance inside and outside of the cells of organism.	1
14.	Assertion (A): Molecularity of reaction is determined experimentally. Reason (R): Molecularity is applicable only for an elementary reaction and not for a complex reaction.	1
15.	Assertion (A): Carboxylic acids react with alcohols in presence of conc. H_2SO_4 to give esters.	1

	Reason (R): H_2SO_4 acts as a dehydrating agent and shifts the equilibrium towards ester formation.	
16.	Assertion (A): n-Butyl chloride has lesser boiling point than n-Butyl bromide. Reason (R): C – Cl bond is less polar than C – Br bond.	1
SECTION B		
17.	$\text{PdCl}_2 \cdot 2\text{KCl}$ does not give precipitate of AgCl with AgNO_3 solution. Write the structural formula and IUPAC name of the complex OR (i) Write the formula of Pentaamminecarbonatocobalt(III)chloride. (ii) Write the IUPAC name of the linkage isomer of the complex $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{Cl}_2$.	2
18.	State Henry's law. Write its one application.	2
19.	Explain the following with an example. (i) Kolbe's reaction (ii) Williamson ether synthesis	2
20.	Answer the following: (any two) (a) What is peptide linkage? (b) What type of bonds hold a DNA double helix together? (c) Give one example each for water-soluble vitamins and fat-soluble vitamins.	2
21.	Write the products formed in the following reactions: (a) $\text{CH}_3\text{COOH} + \text{Cl}_2/\text{red P} \xrightarrow{\text{H}_2\text{O}}$ (b) $\text{CH}_3\text{CHO} \xrightarrow{\text{dil. NaOH}}$	2
SECTION C		
22.	(i) State Faraday's first law of electrolysis. (ii) How much electricity, in terms of Faraday, is required to reduce 1 mol of MnO_4^- to Mn^{2+} ion ? (iii) Name the cell which was used for providing electric power in the Apollo space programme	3
23.	For the reaction $\text{A} + \text{B} \rightarrow \text{Products}$, the following initial rates were obtained at various initial concentrations of reactants:	3

	sucrose (b) What is the name of the product (mixture) obtained after the hydrolysis of sucrose that shows an opposite optical rotation compared to sucrose? (ii) Why do amino acids show amphoteric behaviour ?	1 1
28.	The mechanism of formation of alcohols from alkenes is given below. Rectify the errors in the mechanism and rewrite the corrected steps. STEP 1 $>C=C< + H-\overset{H}{\underset{..}{\overset{+}{O}}}-H \rightleftharpoons \begin{array}{c} H \\ \\ -C- \overset{+}{C}< \\ \end{array} + H_2\ddot{O}$ STEP 2 $\begin{array}{c} H \\ \\ -C- \overset{+}{C}< \\ \end{array} + H_2\ddot{O} \rightleftharpoons \begin{array}{c} H & H \\ & \\ -C- & C- \overset{+}{O}-H \\ & \end{array}$ STEP 3 $\begin{array}{c} H & H \\ & \\ -C- & C- \overset{+}{O}-H \\ & \end{array} + H_2\ddot{O} \rightarrow \begin{array}{c} H & :\ddot{O}H \\ & \\ -C- & C- \\ & \end{array} + H_3\overset{+}{O}$	3
	SECTION D The following questions are case-based questions. Read the case carefully and answer the questions that follow.	
29.	One of the most distinctive properties of transition metal complexes is their wide range of colours. This means that some of the visible spectrum is being removed from white light as it passes through the sample, so the light that emerges is no	

longer white. The colour of the complex is complementary to that which is absorbed. The complementary colour is the colour generated from the wavelength left over. If green light is absorbed by the complex, it appears red. Table given below, gives the relationship between different wavelengths of the light absorbed and the colour observed.

Coordination Entity	Wavelength of light absorbed (nm)	Colour of light absorbed	Colour of coordination entity
$[\text{CoCl}(\text{NH}_3)_5]^{2+}$	535	Yellow	Violet
$[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$	500	Blue-green	Red
$[\text{Co}(\text{NH}_3)_6]^{3+}$	475	Blue	Yellow-orange
$[\text{Co}(\text{CN})_6]^{3-}$	310	Ultra-Violet (U.V.)	Pale Yellow
$[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$	600	Red	Blue
$[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	498	Blue-green	Violet

Answer the following questions:

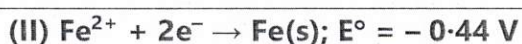
- (a) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ are of different colours in dilute solutions. Why?
 (b) Arrange $[\text{Co}(\text{CN})_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ in the increasing order of crystal field splitting energy (Δ_o)

OR

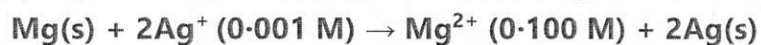
- (b) On the basis of crystal field theory, write the electronic configuration of d^5 ion if $\Delta_o < P$.
 (c) Define crystal field splitting energy.

30. According to the generally accepted definition of the ideal solution there are equal interaction forces acting between molecules belonging to the same or different species. (This is equivalent to the statement that the activity of the components equals the concentration.) Strictly speaking, this condition is fulfilled only in exceptional cases for mixtures (optical isomers, isotopic mixtures of an element, hydrocarbon mixtures). It is still usual to talk about ideal solutions as limiting cases in reality since very dilute solutions behave ideally with respect to the solvent. This view is further supported by the fact that Raoult's law empirically found for describing the behaviour of the solvent in dilute solutions can be deduced thermodynamically via the assumption of ideal behaviour of the solvent. Answer the following questions:
 (a) A student prepared two solutions at 300 K:
- Solution X: mixture of hexane and heptane.

	Solution Y: mixture of chloroform and acetone. Answer the following: (i) Which solution will behave ideally? Why? (ii) Which solution shows deviation from Raoult's law? State the type of deviation (b) A and B liquids on mixing show rise in temperature. Which type of deviation from Raoult's law is there? OR (b) In non-ideal solutions, which type of deviation from Raoult's law leads to the formation of maximum boiling azeotropes? (c) Why can azeotropic mixture not be separated by fractional distillation?	2 1 1						
31.	(a) (i) The standard electrode potential $E^0 (M^{2+} / M)$ for three metals X, Y, and Z are as follows: <table border="1"> <thead> <tr> <th>X</th><th>Y</th><th>Z</th></tr> </thead> <tbody> <tr> <td>-1.18 V</td><td>-0.91V</td><td>-0.44V</td></tr> </tbody> </table> Which metal out of X, Y, and Z will be the most stable in the M^{2+} state? Give reason. (b) Give reasons for the following: (I) Transition metals exhibit catalytic properties. (II) Among the transition elements, the highest oxidation state is exhibited in oxo anion of a metal. (III) Zn, Cd and Hg are non-transition elements. (c) Complete the following ionic equation: $Cr_2O_7^{2-} + 6 Fe^{+2} + 14H^+ \rightarrow$ OR Answer the following questions: (a) While studying the periodic properties, Arti came across an abnormal behaviour in the atomic size of Hf. She found that, even though Hf is placed below Zr in the same group, both have almost similar atomic sizes. (I) Which phenomenon is responsible for the above behaviour? Define it. (II) Mention any other consequence of the above phenomenon. (b) When pyrolusite ore is fused with KOH, in presence of air, a dark green coloured product 'A' is obtained which changes to purple coloured compound 'B' in acidic medium. Write the formulae of 'A' and 'B'.	X	Y	Z	-1.18 V	-0.91V	-0.44V	1 3 1 2 1
X	Y	Z						
-1.18 V	-0.91V	-0.44V						



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



Calculate emf of the cell (E_{cell}) if, $E^\circ_{\text{cell}} = 3.17 \text{ V}$. ($\log 10 = 1$)

[$\log 2 = 0.3010$, $\log 4 = 0.6021$, $\log 5 = 0.6990$].

3

OR

(i) State Kohlrausch's law.

(ii) The conductivity of **0.20 M** solution of KCl is **$2.48 \times 10^{-2} \text{ S cm}^{-1}$** . Calculate its molar conductivity.

1

(iii)

2

Concentration of KCl solution in mol/L	Conductivity at 298.15 K in S cm^{-1}	Molar Conductivity at 298.15 K in $\text{S cm}^2 \text{ mol}^{-1}$
1.000	0.1113	111.3
0.100	0.0129	129.0
0.010	0.00141	141.0

2

Based on the data given above, give plausible reason for the variation of conductivity and molar conductivity with concentration.