B.K. BIRLA CENTRE FOR EDUCATION

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

PRE-BOARD III EXAMINATION SESSION 2025-26
Chemistry(043) SET -2

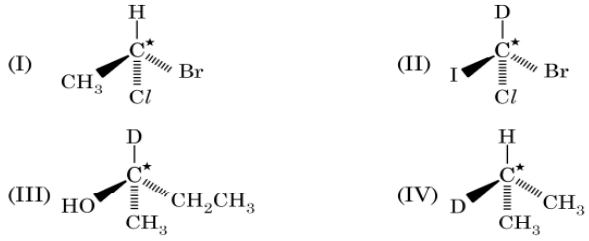
Class: XII | Duration: 3 Hr
Date: 12/01/2026 | Max. Marks: 70

***General Instructions*:**

Read the following instructions carefully.

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.

	SECTION- A	
1.	If limiting molar conductivity of Ca^{2+} and Cl^- are 119.0 and 76.3 S cm^2 mol^{-1}, then the value of limiting molar conductivity of $CaCl_2$ will be (a) 195.3 S cm^2 mol^{-1} (b) 271.6 S cm^2 mol^{-1} (c) 43.3 S cm^2 mol^{-1} (d) 314.3 S cm^2 mol^{-1}.	1
2.	Which of the following has magnetic moment value of 5.9? (a) Fe^{2+} (b) Fe^{3+} (c) Ni^{2+} (d) Cu^{2+}	1
3.	If concentration of reactant 'A' is increased 10 times and the rate of reaction becomes 100 times. What is the order with respect to 'A'? (A) 1 (B) 2 (C) 4 (D) 10	1
4.	Which one of the following characteristics of the transition metals is associated with higher catalytic activity? (A) High enthalpy of atomisation (B) Paramagnetic behaviour (C) Colour of hydrate ions (D) Variable oxidation states	1
5.	The value of K_H at 298 K for Ar(g), CO_2(g), HCHO(g) and CH_4(g) are 40.32, 1.68, $1.84\times10^{-5}$and 0.416 kbar respectively. When these gases are arranged in increasing order of solubility, the correct order is : (A) HCHO < CH_4 < CO_2 <Ar (B) HCHO < CO_2 < CH_4<Ar (C) Ar< CO_2< CH_4< HCHO (D) Ar< CH_4< CO_2< HCHO	1
6.	Based on crystal field theory, the electronic configuration of d^6in terms of $t_{2g}$and e_g in an octahedral field when Δ_o< P will be- (A) $t_{2g}^6 e_g^0$ (B) $t_{2g}^3 e_g^3$ (C) $t_{2g}^4 e_g^2$ (D) $t_{2g}^2 e_g^4$	1
7.	In which of the following molecules, C atom marked with asterisk is chiral?	1

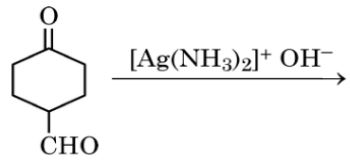
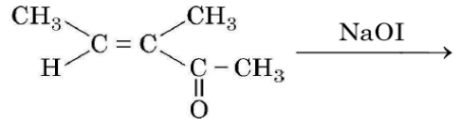
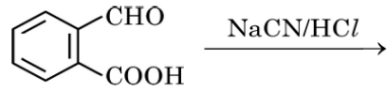
	 (A) I, II, and III (B) I, II, IV (C) I, III, IV (D) I, II, III, IV	
8.	Which one of the following halides contains $'C_{sp^2}$– X'bond ? (A) Alkyl halide (B) Allyl halide (C) Vinyl halide (D) Benzyl halide	1
9.	Out of the following organic compounds, the one which will react with Lucas reagent at room temperature is : (A) $CH_2 = CH – CH_2OH$ (B) $CH_3CH_2CH_2OH$ (C) $C_6H_5CH_2OH$ (D) $(CH_3)_3COH$	1
10.	The correct name of the given reaction is $Ar – N_2^+ X^- \xrightarrow{Cu\ CN/KCN} Ar – CN + N_2$ (A) Sandmeyer's reaction (B) Gabriel Phthalimide synthesis (C) Carbylamine reaction (D) Hoffmann bromamide degradation reaction	1
11.	The organic compounds X, Y and Z are amines having equivalent molecular weight. X and Y on reaction with benzene sulphonyl chloride give white precipitate, however white precipitate obtained from compound Y remains insoluble in NaOH. Compound Z does not react with benzene sulphonyl chloride. Among Compounds X, Y and Z, tertiary amine is/are (A) X and Y (B) only X (C) only Y (D) only Z	1
12.	Maltose on treatment with dilute HCl gives- a) D-glucose and D-fructose b) D-glucose and D-galactose c) D-glucose d) D-fructose	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): -** When a cell is placed in hypotonic solution, it shrinks. **Reason (R): -** Reverse osmosis is used for desalination of water.	1
14.	**Assertion (A) :** The units of rate constant of a zero order reaction and rate of reaction are the same. **Reason (R) :** In zero order reaction, the rate of reaction is dependent on the concentration of reactants.	1
15.	**Assertion (A):** Presence of a nitro group at ortho or para position increases the reactivity of Haloarenes towards nucleophilic substitution. **Reason (R):** Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.	1
16.	**Assertion (A) :** N-Ethylbenzene sulphonamide is soluble in alkali. **Reason (R) :** Hydrogen attached to nitrogen in sulphonamide is acidic.	1
SECTION- B		

17.	Write the mechanism of acid dehydration of ethanol to yield Ethene. **"OR"** a) Phenol is more acidic than ethanol. Is it correct? Justify your answer. b) What happens when phenol reacts with chloroform in presence of NaOH? Write chemical equation.	2
18.	A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$. [Given: log1=0, log2=0.301, log3=0.4771, log5=0.6990, log7=0.8451, log10=1]	2
19.	(i) Write the shape and magnetic character of $[Ni(CN)_4]^{2-}$ [Atomic number: Ni = 28] (ii) Write the formula of Pentaamminechloridocobalt(III) chloride and the number of ions produced from this complex in solution.	1 1
20.	Give reasons for the following: (a) When 2g of benzoic acid is dissolved in 25 g of benzene, the experimentally determined molar mass is always greater than the true value. (b) Mixture of ethanol and acetone shows positive deviation from Raoult's Law.	2
21.	Give one point of difference between **any two** of the following pairs : (a) Starch and Cellulose (b) Glycosidic linkage and Peptide bond (c) Primary and Secondary structure of protein	1+1
	SECTION- C	
22.	Shanu's automobile radiator is filled with 1.0 kg of water. How many grams of ethylene glycol (Molar mass = 62 g/mol) must Shanu add to get the freezing point of the solution lowered to - 2.8 °C. [K_f for water is 1.86 $Kkgmol^{-1}$.]	3
23.	Write the reactions taking place at anode and cathode, and calculate the emf of the following cell at 298K $Cr\|Cr^{3+}(0.1M)\|\|Fe^{2+}(0.001M)\|Fe$ [Given: $E^o_{Cr^{3+}/Cr} = -0.74\,V$, $E^o_{Fe^{2+}/Fe} = -0.44V$.]	3
24.	The following data were obtained during the kinetic studies of the reaction : $A + 2B \rightarrow C + 2D$ (table below) Determine the order of reaction with respect to each reactant and the overall order of the reaction. Write the rate law expression for the reaction.	3
25.	A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in propane. Write the structures of the isomers possible. Give the IUPAC name of the isomer which can exhibit Enantiomerism.	3
26.	Give reasons for the following: a) t-butyl bromide on reaction with sodium methoxide gives alkene as main product and not ether. b) Among o-nitrophenol and p-nitrophenol, which will have higher boiling point and why? c) The bond angle  in alcohols is slightly less than the tetrahedral angle.	1x3

Experiment	Initial [A] (mol/L)	Initial [B] (mol/L)	Initial rate of formation of C ($M\ min^{-1}$)
1	0·10	0·10	$3{\cdot}0 \times 10^{-4}$
2	0·30	0·30	$9{\cdot}0 \times 10^{-4}$
3	0·10	0·30	$3{\cdot}0 \times 10^{-4}$
4	0·20	0·40	$6{\cdot}0 \times 10^{-4}$

27.	Ethanamine reacts with benzoyl chloride to form a product 'X'. Give the structure and IUPAC name of 'X'. Can 'X' undergo Hoffmann bromamide degradation reaction ? If yes, then give the structure of the product. If no, then give reason. **OR** (a) Name the reaction which can be used to distinguish chemically between Ethanamine and Aniline (b) For controlled electrophilic substitution reaction of aniline its -NH_2 group is protected by acetylation reaction with acetic anhydride in presence of pyridine. Write the reaction involved and name of the main product. (c) Write the product formed when benzene Diazonium chloride is treated with KI	3 1 1 1
28.	(a) Write the IUPAC name of- H_3C-CH(Br)CH(CH_3)COOH. (b) Which acid of CH_3COOH and CH_2FCOOH would you expect to be stronger? Justify your answer. (c) Arrange the following in increasing order of their boiling points- Propanol, Propanal, Propane, Propanoic acid	1 1 1
	SECTION- D	
29.	The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds are known to play many important functions in area of analytical chemistry, metallurgy, biological system, industry and medicine. Formation of coordination compound is largely used in analytical chemistry for the qualitative detection and qualitative estimation of metal ions. Coordination compounds also find poisoning caused by ingestion of poisonous metal by human beings. In coordination compound metal show two types of linkages- primary and secondary. Primary valencies are ionisable are satisfied by negatively charged ions. Secondary valencies are non-ionisable and are satisfied by neutral or negative ions having lone pair of electrons. Primary valencies are non-directional while secondary valencies decide the shape of the complexes. Answer the following questions : i) What mass of AgCl will get precipitated when 4 mole of $[Ni(H_2O)_6]Cl_2$ reacts with excess of $AgNO_3$? [Given: At. Mass of N= 14u, O = 16u, Cl = 35.5u, Ni = 59u, Ag = 108u) ii) Name the red pigment of blood which acts as an oxygen carrier and is a complex of Fe^{2+} and porphyrin. **"OR"** i) Low spin octahedral complexes of Nickel are not known. Give reason ? ii) What is the primary and secondary valency of $[Co(en)_3]^{3+}$?	 2 1 1
30.	Reduce carbohydrates, increase protein to check diabetes, older people may need greater carbohydrates reduction. An average Indian derives 61 – 64% of energy from consumption of food rich in carbohydrates. A study published in the Journal of Diabetes Care has recommended reducing this to 49 – 56% for remission or prevention of Type 2 diabetes, one of the leading causes of death worldwide. Along with reducing carbohydrate intake, the study suggests that one should also increase protein intake up to 14 – 20% of the total energy consumption. Fat should contribute not more than 21 – 27% of the total energy consumption. In simple words, 50% of the plate should consist of fruits and green vegetables, 25% carbohydrates, 25% food rich in protein. Type 1 diabetes is due to deficiency of insulin. Answer the following questions : (a) Write any two functions of carbohydrates. (b) What are monosaccharides? (c) (i) Write the name of the deficiency diseases caused due to the lack of Vitamin D.	 2 1

	"OR" (c)(ii) Name the hormone which maintains the glucose level within narrow limit in the blood.	1
	SECTION- E	
31.	(i) A solution of $Ni(NO_3)_2$ is electrolyzed between platinum electrodes using a current of 5.0 ampere for 20 minutes. What mass of nickel will be deposited at the cathode? (Given : At. mass of Ni = 58.7 g mol^{-1}, 1F = 96500 C mol^{-1}) (ii) How does molar conductivity of strong and weak electrolytes vary with concentration? Explain with diagram **"OR"** (a) The conductivity of 0.001 M acetic acid is 4×10^{-5} S/cm. Calculate the dissociation constant of acetic acid, if molar conductivity at infinite dilution for acetic acid is 390 S cm^2/mol (b) Write the chemistry of lead storage battery when it is being used (discharged).	3 2 3 2
32.	(a) Account for the following: (i) Transition metals exhibit higher enthalpies of atomization. (ii) Cr^{2+} is reducing and Mn^{3+}oxidising when both have d^4 configuration. (iii) Transition metals form alloys (iv) (b) Complete and balance the following chemical equations : (i) $MnO_4^-(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$ (ii) $Cr_2O_7^{2-}(aq) + C_2O_4^{2-}(aq) + H^+(aq) \rightarrow$ **"OR"** (A) Why the second and third members in each group of the transition elements have similar atomic radii? (B) Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only? (C) The $E^0_{M^{2+}/M}$value for copper is positive (0.34 V), what is possibly the reason for this? (D) Write the reactions involved in the preparation of potassium permanganate from MnO_2.	1 x 3 1 x 2 1 1 1 2

33.	(i) Write the structure of expected product of – (A) Cannizarro reaction of 2-chlorobenzaldehyde. (B) Wolf-Kishner reduction of 2 –methylbutanal. (ii)Draw the structures of major product(s) in each of the following reactions : (a)  (b)  (c)  **"OR"** (i) Carry out the following conversions: (I) Propanone to Propane (II) Acetophenone to Benzoic acid (III) Benzyl chloride to Phenylethanoic acid (ii) An alkene 'A' (Mol. formula C_5H_{10}) on ozonolysis gives a mixture of two compounds, 'B' and 'C'. Compound B' gives positive Fehling's test and forms Iodoform on treatment with I_2 and NaOH. Compound C' does not give Fehling's test but forms iodoform. Identify the compounds A, B, and C. Write the reaction for ozonolysis and formation of iodoform from B and C. Write IUPAC name of ABC	1 ×2 1 × 3 1 × 3 1 × 2

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

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