



DAV PUBLIC SCHOOLS, JHARKHAND ZONE - J
HALF YEARLY EXAMINATION 2026-27

CLASS - XII
 SUBJECT – chemistry

F.M – 70
 TIME- 3hrs

General Instructions :

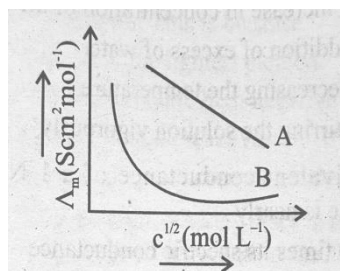
Read the following instructions carefully.

- (a) There are 33 questions in this question paper with internal choice.
- (b) Question paper is divided into 5 sections - SECTION A, B, C, D AND E.
- (c) SECTION A consists of 16 (Q1 to Q16) multiple-choice questions carrying 1 mark each.
- (d) SECTION B consists of 7 (Q17 to Q21) very short answer questions carrying 2 marks each.
- (e) SECTION C consists of 5 (Q22 to Q28) short answer questions carrying 3 marks each.
- (f) SECTION D consists of 2 (Q29 and Q30) case-based questions carrying 4 marks each.
- (g) SECTION E consists of 3 (Q31 to Q33) long answer questions carrying 5 marks each.
- (h) Use of log tables and calculators is not allowed

- 1 Low concentration of oxygen in the blood and tissue of the people living at high altitude is due to 1

- | | |
|-------------------------------|--|
| (a) High atmospheric Pressure | (b) Low Temperature |
| (c) Low atmospheric Pressure | (d) Both Low and high atmospheric Pressure |

- 2 Mark the correct choice of electrolytes represented in the graph 1



- | | |
|--|---|
| (a) $A \rightarrow \text{NH}_4\text{OH}$ | B $\rightarrow \text{NaCl}$ |
| (b) $A \rightarrow \text{NH}_4\text{OH}$ | B $\rightarrow \text{NH}_4\text{Cl}$ |
| (c) $A \rightarrow \text{CH}_3\text{COOH}$, | B $\rightarrow \text{CH}_3\text{COONa}$ |
| (d) $A \rightarrow \text{KCl}$ | B $\rightarrow \text{NH}_4\text{OH}$ |

- 3 Specific conductance of 0.1 M HNO_3 is $6.3 \times 10^{-2} \text{ ohm cm}^{-1}$. The molar conductance of the solution is 1

- | | |
|---|--|
| (a) $100 \text{ ohm}^{-1} \text{ cm}^2$ | (b) $515 \text{ ohm}^{-1} \text{ cm}^2$ |
| (c) $630 \text{ ohm}^{-1} \text{ cm}^2$ | (d) $6300 \text{ ohm}^{-1} \text{ cm}^2$ |

- 4 For the galvanic cell $\text{Zn} | \text{Zn}^{2+} (0.1\text{M}) || \text{Cu}^{2+} (1.0\text{M}) | \text{Cu}$; the cell potential increase if: 1
 (a) Zn^{2+} is increased (b) Cu^{2+} is increased
 (c) Cu^{2+} is decreased (d) surface area of anode is increased

- 5 "For the reaction $2\text{A} + \text{B} \rightarrow \text{A}_2\text{B}$, the order with respect to each reactant is 1. what will be the effect on the reaction rate if the concentration of reactant A is doubled and the concentration of reactant B is decreased by half?" 1
 (a) increase 2 times (b) increase 4 times
 (c) decrease 2 times (d) remain the same

- 6 Which of the following statement is not correct: 1
 (a) Fe, Ni, Co form interstitial compound
 (b) $\text{CuSO}_4 + \text{Ca}(\text{OH})_2$ is called Bordeaux mixture
 (c) Verdigris is basic copper acetate $[\text{Cu}(\text{COOCH}_3)_2\text{Cu}(\text{OH})_2]$
 (d) 24 carat gold is an alloy of Au and Cu

- 7 The absorption maxima of several octahedral complex ions are as follows: 1

S.No.	Compound	$\lambda_{\text{max}} \text{nm}$
1.	$[\text{Co}(\text{NH}_3)_6]^{3+}$	475
2.	$[\text{Co}(\text{CN})_6]^{3-}$	310
3.	$[\text{Co}(\text{H}_2\text{O})_6]^{3+}$	490

The crystal field splitting is maximum for:

- (a) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Co}(\text{CN})_6]^{3-}$
 (c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (d) All the complex ions have the same splitting, Δ_o
- 8 One mole of the complex compound $\text{Co}(\text{NH}_3)_5\text{Cl}_3$, gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of AgNO_3 solution to yield two moles of AgCl (s). The structure of the complex is 1
 (a) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3] \cdot 2\text{NH}_3$ (b) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2] \text{Cl} \cdot \text{NH}_3$
 (c) $[\text{Co}(\text{NH}_3)_4\text{Cl}] \text{Cl}_2 \cdot \text{NH}_3$ (d) $[\text{Co}(\text{NH}_3)_5\text{Cl}] \text{Cl}_2$
- 9 Choose the correct statement. 1
 (a) Coordination number has nothing to do with the number of groups or molecules attached to the central atom
 (b) Coordination number is the number of coordinate bonds formed between the central metal atom and its ligands.
 (c) Werner's coordination theory postulates only one type of valency
 (d) All the above are correct

- 10 Ferons are among the most commonly used haloalkanes in industries. The reaction through which they are manufactured from tetrachloromethane is known as 1
- (a) Finkelstein reaction (b) Sandmeyer's reaction
(c) Swarts reaction (d) Wurtz-Fittig reaction
- 11 Choose the incorrect statement regarding SN_2 reactions: 1
- (a) As nucleophile concentration rises, reaction rate increases.
(b) Both the attack of the nucleophile and the departure of the leaving group occur simultaneously.
(c) Inversion of configuration occurs on asymmetric centers
(d) The SN_2 mechanism is predominant in tertiary alkyl halides.
- 12 What is the correct order of dipole moments from highest to lowest among the following? 1
- (a) $\text{CH}_3\text{Cl} > \text{CH}_3\text{Br} > \text{CH}_3\text{F}$ (b) $\text{CH}_3\text{Cl} > \text{CH}_3\text{F} > \text{CH}_3\text{Br}$
(c) $\text{CH}_3\text{Br} > \text{CH}_3\text{Cl} > \text{CH}_3\text{F}$ (d) $\text{CH}_3\text{Br} > \text{CH}_3\text{F} > \text{CH}_3\text{Cl}$
- 13 a) Both A and R are true and R is the correct explanation of A. 1
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.
- Assertion (A): Aryl halides and vinyl halides are less reactive than alkyl halides and are not easily hydrolyzed.
- Reason (R): The cleavage bond in aryl halides acquires a double bond character due to resonance, which makes its cleavage difficult
- 14 Assertion: Change in colour of acidic solution of potassium dichromate by breath is used to test drunk drivers. 1
- Reason: Change in colour is due to the complexation of alcohol with $\text{K}_2\text{Cr}_2\text{O}_7$
- 15 Assertion (A): Activation complex for the forward reaction will have lower energy than that for the backward reaction in an exothermic reaction. 1
- Reason (R): Reactants have greater energy than products for an exothermic reaction.
- 16 Assertion : On increasing dilution, the specific conductance keep on increasing. 1
Reason : On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.

Section – B

- 17 Calculate emf of the following cell at 298K. $\text{Zn}/\text{Zn}^{2+}(10^{-4}\text{M})\parallel\text{Ag}^{+}(10^{-2}\text{M})/\text{Ag}$ 2
(Given $E^0\text{Zn}^{2+}/\text{Zn} = -0.76\text{ V}$, $E^0\text{Ag}^{+}/\text{Ag} = 0.80\text{ V}$)
- 18 a) Why the colligative property of an electrolyte solution is always greater than that of non-electrolyte solution? 2
b) Which type of deviation is shown by Carbon tetra chloride and chloroform mixture and why?
- 19 If half life period of A in a first order reaction reaction is 2 minutes , How long will it take [A] to reach 25% of its initial concentration. 2

OR

What do you understand by the rate law and rate constant of reaction ? identify the order of reaction , if the units of its rate constant are (i) $\text{L}^{-1}\text{Mols}^{-1}$ (ii) $\text{LMol}^{-1}\text{s}^{-1}$

- 20 A) On the basis of crystal field theory write the electronic configuration for d^5 ion with a weak ligand for which $\Delta_0 < P$. 2
(b) Explain $[\text{Fe}(\text{CN})_6]^{3-}$ is an inner orbital complex whereas $[\text{FeF}_6]^{3-}$ is an outer orbital complex. [Atom no Fe=26]
- 21 Draw the structures of optical isomers of each of the following complex ions: 2
(i) $[\text{PtCl}_2(\text{en})_2]^{2+}$
(ii) Write the IUPAC name of linkage isomer of $[\text{Co}(\text{NH}_3)_5\text{SCN}]^{2+}$

SECTION – C

- 22 Calculate the magnetic moment of the following complexes; 3
(i) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ (ii) $[\text{CoF}_6]^{3-}$ (iii) $[\text{Fe}(\text{CN})_6]^{3-}$
- OR
- Explain the following cases giving appropriate reason.
- (i) Nickel does not form low spin octahedral complexes
(ii) The π –complexes are known for transition metal only
(iii) Co^{2+} is easily oxidised to Co^{3+} in the presence of strong ligand
- 23 Explain (i) The state of hybridization (ii) Shape of the following : 3
(a) $[\text{Co}(\text{NH}_3)_6]^{3+}$
(b) $[\text{NiCl}_4]^{2-}$

- 24 Give reasons 3
- Out of $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$ and $\text{C}_6\text{H}_5\text{CHCl}$ C_6H_5 which is more easily hydrolysed by aqueous KOH?
 - C-Cl bond length in chlorobenzene is shorter than C-Cl bond length in $\text{CH}_3\text{-Cl}$.
 - On substitution of one H by Cl in the isomers of C_4H_{10} . (i) Which isomer gives a tertiary alkyl halide?
- 25 How do you convert the following : (Any three) 3
- Prop-1-ene to 1-fluoropropane
 - Chlorobenzene to 2-chlorotoluene
 - Benzene to biphenyl
 - Toluene to benzyl alcohol
- 26 When a chromite ore (A) is fused with sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of compound (B) is obtained. After treatment of this yellow solution with sulphuric acid, compound (C) can be crystallised from the solution. When compound (C) is treated with KCl, orange crystals of compound (D) crystallise out. Identify A to D and also explain the reactions. 3
- 27 1. State Kohlrausch law of independent migration of ions. 3
2. The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9 \text{ S cm}^2\text{mol}^{-1}$. Calculate the conductivity of this solution.
- 28 When a steady current of 2A was passed through two electrolyte cell A and B containing ZnSO_4 and CuSO_4 connected in series, 2 g of Cu were deposited at the cathode of cell B. How long did the current flow ? what mass of Zn was deposited at cathode of cell A ? (At Mass of Cu = 63.5 g mol^{-1} , Zn = 65 g mol^{-1} , $1F = 96500 \text{ C mol}^{-1}$) 3

Section:-D

- 29 Read the passage carefully and answer the questions that follow: Arushi was performing an experiment in her school laboratory to determine the boiling point elevation of a sugar solution. She prepared two solutions by dissolving 34.2 g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) in 500 g of water and 58.5 g of NaCl in another 500 g of water. She observed that the NaCl solution had a higher boiling point than the sucrose solution. Her teacher explained that this difference was due to the van't Hoff factor and the number of particles into which a solute dissociates in solution. Sucrose is a non-electrolyte and does not dissociate in water, while NaCl is an electrolyte and dissociates into Na^+ and Cl^- ions. The elevation in boiling point is a colligative property and is given by: $\Delta T_b = i K_b m$ 4
- State the van't Hoff factor (i) for sucrose?
 - Why does the NaCl solution exhibit a higher boiling elevation compared to the

sucrose solution, even though both are dissolved in the same amount of water?

OR

What is the Van't Hoff factor for compound which undergoes tetramerisation in an organic solvent.

(C). Calculate the molality of sucrose solution.

- 30 A group of Class 12 students performed an experiment to study the rate of decomposition of hydrogen peroxide (H_2O_2) in the presence of a potassium iodide (KI) catalyst. They observed that the reaction was faster at higher temperatures. The balanced reaction is: $2\text{H}_2\text{O}_2(\text{aq}) \xrightarrow{\text{KI}} 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ They measured the time taken to collect a certain volume of oxygen at different temperatures and found that the reaction rate increased with temperature. Their teacher explained that the reaction follows first-order kinetics and the rate constant k can be calculated using the integrated rate equation: $K = (2.303/t) \log[R]_0/[R]$ The class was also introduced to the Arrhenius equation: $k = Ae^{-E_a/RT}$ which shows how the rate constant changes with temperature and activation energy.
- (a) What role does potassium iodide (KI) play in the reaction?
- (b) Predict the order and unit of rate constant for the above reaction
- (c) How does temperature affect the rate of a chemical reaction? If the rate constant at two temperatures is known, how can you calculate the activation energy?

OR

Draw the Plot of $\ln K$ vs $1/T$ for the chemical reaction . What does the intercept represent.

Section :-E

- 31 Assign reason for each of the following : 1x5
- (i) Transition metals and their compounds are generally found to be good catalysts in chemical reactions.
- (ii) Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent.
- (iii) Cu^+ is unstable in an aqueous solution.
- (iv) The transition metals generally formed coloured compound.
- (v) Actinoid exhibit much larger number of oxidation state than lanthanoids.

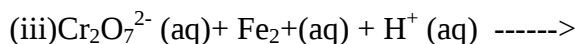
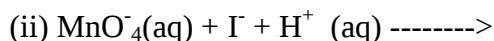
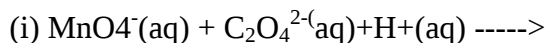
OR

Attempt **any five** of the following:

1x5

(a) Name a member of the lanthanoid series which is known to exhibit +4 oxidation state.

(b) Complete and balance the following equations:



(c) Draw the structures of chromate and dichromate ions.

32 (1) Draw the graph between vapour pressure and temperature and Explain the elevation in boiling point of the solvent in the solution. 2+3

(2) When 25.60g of Sulphur was dissolved in 1000g of benzene, the freezing point lowered by 0.512 K. Calculate the formula of Sulphur (S_x)

OR

A 5.0 g sample of a non-electrolyte is dissolved in sufficient water to make 500 mL of solution. The osmotic pressure of the solution is found to be 2.46 atm at 300 K. 3+2

[Given: $R = 0.0821 \text{ Latm K}^{-1} \text{ mol}^{-1}$]

a) Calculate the molar mass of the solute.

b) If the same mass of solute is dissolved in 250 mL of solution at the same temperature, what will happen to the osmotic pressure? Give a reason.

33 a) Define half-life of a reaction. Write the expression of half-life for 3+2

(i) Zero order reaction (ii) First order reaction

(b) The rate of reaction quadruples when the temperature changes from 296K to 313K. Calculate the energy activation of the reaction assuming that it does not change with temperature.

OR

1+1+3

(a) What is meant by a complex reaction ?

(b) Give an example of a pseudo first order reaction.

(c) For first order reaction, calculate the ratio between the time taken to complete $\frac{3}{4}$ of the reaction and the time taken to complete half of the reaction.