



HALF YEARLY EXAMINATION (2022-23)

Subject: CHEMISTRY

Max. Marks:70

Grade: XII

Time: 3Hrs

Name:

Section:

Roll No:

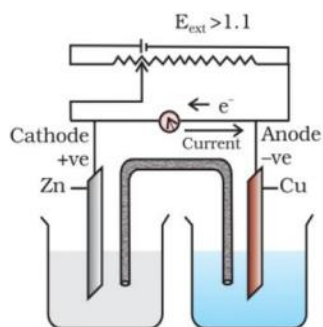
General Instructions:

Read the following instructions carefully.

1. There are 37 questions in this question paper.
2. SECTION A - Q. No. 1 to 10 are multiple choice questions carrying 1 mark each.
3. SECTION B - Q. No. 11 to 20 are very short answer questions carrying 1 mark each.
4. SECTION C - Q. No. 21 to 27 are short answer questions carrying 2 marks each.
5. SECTION D - Q. No. 28 to 34 are short answer questions carrying 3 marks each.
5. SECTION E - Q. No. 35 to 37 are long answer question carrying 5 marks.
6. All questions are compulsory.
7. Use of calculators is not allowed

SECTION A

- | | | |
|---|---|---|
| 1 | When mercuric iodide is added to the aqueous solution of potassium iodide, the: | 1 |
| | (a) Freezing point is raised | |
| | (b) Freezing point does not change | |
| | (c) Freezing point is lowered | |
| | (d) Boiling point does not change | |
| 2 | The molal elevation constant depends upon | 1 |
| | (a) nature of solute. | |
| | (b) nature of the solvent. | |
| | (c) vapour pressure of the solution. | |
| | (d) enthalpy change. | |
| 3 | Limiting molar conductivity of NH_4OH is equal to -: | 1 |
| | (a) $\Lambda^\circ\text{mNH}_4\text{Cl} + \Lambda^\circ\text{mNaCl} + \Lambda^\circ\text{mNaOH}$ | |
| | (b) $\Lambda^\circ\text{mNaOH} + \Lambda^\circ\text{mNaCl} - \Lambda^\circ\text{mNH}_4\text{Cl}$ | |
| | (c) $\Lambda^\circ\text{mNaOH} - \Lambda^\circ\text{mNH}_4\text{Cl} - \Lambda^\circ\text{mHCl}$ | |
| | (d) $\Lambda^\circ\text{mNH}_4\text{Cl} + \Lambda^\circ\text{mNaOH} - \Lambda^\circ\text{mNaCl}$ | |
| 4 | The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is | 1 |
| | (a) 2.87 B.M. | |
| | (b) 3.87 B.M. | |
| | (c) 3.47 B.M | |
| | (d) 3.57 B.M | |



Looking at the setup of an electrochemical cell, what happens when $E_{ext} > 1.1 \text{ V}$

- (a) Zn dissolves at anode & copper deposits at cathode
- (b) Current travels from Cu to Zn
- (c) Zinc deposits at anode and copper dissolves at cathode.
- (d) No current is obtained

6 Molar conductivity of ionic solution depends on _____.

1

- (a) pressure
- (b) distance between electrodes
- (c) concentration of electrolytes in solution
- (d) surface area of electrodes

7 Solutions of two electrolytes 'A' and 'B' are diluted. The λ_m of 'B' increases 1.5 times while that of A increases 25 times. Which of the two is a strong electrolyte?

1

- (a) electrolyte A
- (b) electrolyte B
- (c) electrolyte A & B
- (d) None of these

8 When 0.1 mol $\text{COCl}_3(\text{NH}_3)_5$ is treated with excess of AgNO_3 ; 0.2 mol of AgCl are obtained. The conductivity of solution will correspond to-

1

- (a) 1: 3 electrolyte
- (b) 1: 2 electrolyte
- (c) 1: 1 electrolyte
- (d) 3: 1 electrolyte

9 Metallic radii of some transition elements are given below. Which of these elements will have highest density?

1

Element	Fe	Co	Ni	Cu
Metallic radii/pm	126	125	125	128

- (a) Fe
- (b) Ni
- (c) Co
- (d) Cu

10 In an octahedral crystal field, the t_{2g} orbital are

1

- (a) raised in energy by $0.4 \Delta_o$
- (b) lowered in energy by $0.4 \Delta_o$
- (c) raised in energy by $0.6 \Delta_o$
- (d) lowered in energy by $0.6 \Delta_o$

SECTION B

- | | | |
|----|--|---|
| 11 | Why a person suffering from high blood pressure is advised to take minimum quantity of common salt? | 1 |
| 12 | What happens to vapour pressure of water, if a tablespoon of sugar is added to it? Give reason to your answer. | 1 |
| 13 | The conductivity of metals decreases while that of electrolytes increases with increase in temperature. Why? | 1 |
| 14 | Give reason: It is not easy to determine λ°_m of a weak electrolyte by extrapolation of \sqrt{c} vs λ_m curves? | 1 |
| 15 | What is the use of the platinum foil in hydrogen electrode? | 1 |
| 16 | Write the IUPAC name of the linkage isomer of: $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$ | 1 |
| 17 | What happens when KMnO_4 is heated? Write the equation. | 1 |
| 18 | Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless? | 1 |
| 19 | Why is mercury a liquid? | 1 |
| 20 | Why is Cr^{3+} more stable than Cr^{2+} ? | 1 |

SECTION C

- | | | |
|----|--|---|
| 21 | Henry's law constant for the solubility of methane in benzene at 298 K is 4.27×10^5 mm Hg. What is the solubility of methane in benzene at 298 K under 760 mm Hg? | 2 |
| 22 | How many electrons flow when a current of 5 amps is passed through a solution for 193 sec? | 2 |
| 23 | "The chromates and dichromates are interconvertible by the change in pH of medium." Why? Give chemical equations in favour of your answer. | 2 |
| 24 | a) How is the variability in oxidation states of transition metals different from that of the non-transition metals?
b) The enthalpies of atomisation of the transition metals are high. Why? | 2 |
| 25 | Explain that the complex $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic on the basis of valence bond theory. | 2 |
| 26 | Explain the following:
a) The coordination-complexes are known for transition elements only.
b) Nickel (II) does not form low spin octahedral complexes. | 2 |
| 27 | a) When does electrochemical cell behaves like an electrolytic cell?
b) What will happen if salt bridge is removed? | 2 |

SECTION D

- | | | |
|----|---|---|
| 28 | Some ethylene glycol is added to your car's cooling system along with 5 kg of water. If the freezing point of water glycol solution is -15°C , what is the boiling point of the solution? | 3 |
|----|---|---|

($K_b = 0.52 \text{ K kg/mol}$, $K_f = 1.86 \text{ K kg/mol}$ for water)

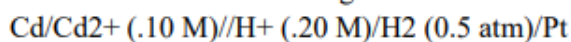
OR

On dissolving 19.5 g of CH_2FCOOH in 500 g of water a depression of 1°C in freezing point of water is observed. Calculate the Vant Hoff factor. Given $K_f = 1.86 \text{ K Kg mol}^{-1}$.

- | | | |
|----|--|---|
| 29 | <p>a) From the given molar conductivities at infinite dilution, calculate Λ_m° for NH_4OH
 Λ_m° for $\text{Ba}(\text{OH})_2 = 457.6 \text{ Scm}^2/\text{mol}$
 Λ_m° for $\text{BaCl}_2 = 240.6 \text{ Scm}^2/\text{mol}$
 Λ_m° for $\text{NH}_4\text{Cl} = 129.8 \text{ Scm}^2/\text{mol}$</p> <p>b) The conductivity of 0.20M solution of KCl at 298K is 0.025 S/cm. Calculate its molar conductivity.</p> | 3 |
|----|--|---|

- 30 a) What is the role of ZnCl_2 in a dry cell? 3
b)

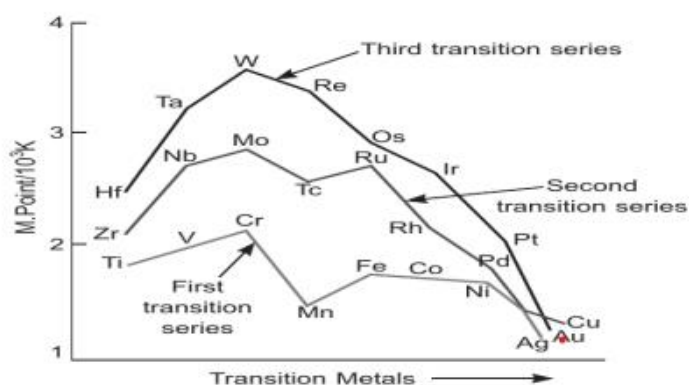
Calculate emf of the following cell



[Given E° for $\text{Cd}^{2+}/\text{Cd} = -0.403\text{V}$]

- 31 Answer the following questions: 3
a) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}(\text{aq})$ is green in colour whereas $[\text{Ni}(\text{H}_2\text{O})_4(\text{en})]^{2+}(\text{aq})$ is blue in colour, give reason in support of your answer.
b) Write the formula and hybridization of the following compound:
tris(ethane-1,2-diamine) cobalt (III) sulphate

- 32 Observe the graph of transition metal and answer the questions. 3



- a) Why does W (tungsten) has highest melting point in aqueous solution?
b) Which element in 3d series has lowest enthalpy of atomization and why?
c) How does density vary from left to right in 3d series and why?
- 33 a) Draw figure to show the splitting of d orbitals in an octahedral crystal field
b) What is spectrochemical series ?
- 34 Explain Lanthanoid contraction, its cause & any two consequences? 3

. SECTION E

- 35 a) With the help of suitable diagram illustrate the two types of non-ideal solutions. 5
b) At 25°C the saturated vapour pressure of water is 3.165kPa . Find the saturated vapour pressure of a 5% aqueous solution of urea at the same temperature.
(molar mass of urea = 60 g/mol)

OR

- a) State Raoult's law for the solution containing volatile components. Write one difference between an ideal solution and a non-ideal solution
b) Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litre of water at 25°C , assuming that it is completely dissociated.
(Atomic mass of $\text{K} = 39\text{u}$, $\text{O} = 16\text{u}$, $\text{S} = 32\text{u}$)

- 36 For the complex $[\text{Fe}(\text{en})_2\text{Cl}_2]\text{Cl}$, identify :

- (a) The oxidation no. of iron.
(b) The hybrid orbitals and the shape of the complex.
The magnetic behavior of the complex.
(d) Draw the isomers of the complex.
Name of the complex. [At. No. of $\text{Fe} = 26$]

OR

- a) A metal ion Mn^{+} having d^4 valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming $\Delta_o > P$:
- i) Write the electronic configuration of the valence electrons of the metal Mn^{+} in t_{2g} and e_g .
- ii) What type of hybridization will Mn^{+} have?
- iii) Name the type of isomerism exhibited by this complex.
- b) Give evidence that $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$ are ionisation isomers.
- c) Draw the isomers of $[Co(NH_3)_3(NO_2)_3]$
- a) Describe the preparation of potassium permanganate.
- d) How does the acidified permanganate solution react with iron (II) ions?
- e) Compare the chemistry of the actinoids with that of lanthanoids with reference to:
(i) electronic configuration (ii) oxidation states

OR

- a) Indicate the steps in the preparation of potassium dichromate from chromite ore.
- b) Write the ionic equations for its reaction with iron (II) solution.
- c) What are alloys? Name an important alloy which contains some of the lanthanoid metals. Mention its uses.
