Directorate of Education, GNCT of Delhi
Mid Term Examination Practice Paper
Session: 2025-26
CLASS – XII
Chemistry (CODE :043)

Time: 3 Hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.

(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 7 short answer questions carrying 3 marks each.

(e) SECTION D consists of 2 case - based questions carrying 4 marks each.

(f) SECTION E consists of 3 long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

SECTION-A

Directions (Q. No. 1-16) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. On increasing the temperature, solubility of carbon dioxide in water-
   (a) increases
   (b) decreases
   (c) no change
   (d) unpredictable

2. The standard electrode potential for the cell: $Mg \mid Mg^{2+}$ (0.2 M) $\| Ag^{+}$ (0.01 M) $\mid Ag$ is 3.17 V. The standard Gibbs energy change for the reaction occurring in cell will be-
   (a) 3.17 F

(b) 6.34 F

(c) -6.34 F

(d) Insufficient data to calculate

3. The rate constant, *k* of a reaction is 2.5 min^{-1} , the order of reaction is –

   (a) zero

   (b) first

   (c) second

   (d) cannot be determined

4. Out of the following transition elements, the highest oxidation state is shown by:

   (a) Sc (Z = 21)

   (b) Cr (Z = 24)

   (c) Mn (Z = 25)

   (d) Cu (Z = 29)

5. For the elementary reaction **M**→ **N**, the rate of disappearance of 'M' increases eight times upon doubling the concentration of 'M'. The order of reaction with respect to 'M' is:

   (a) 1

   (b) 2

   (c) 3

   (d) 4

6. For a complex $[Co\mathbf{X}_6]^{3-}$, the crystal field splitting energy(Δ_o) would be maximum when **X** is -

   (a) CN^-

   (b) NO_2^-

   (c) Cl^-

   (d) OH^-

7. Lanthanoid which is well known to exhibit +2 oxidation state is:

   (a) Eu

   (b) Ce

   (c) Am

(d) Gd

8. The major product formed by the reaction of $(CH_3)_3C–Br$ and CH_3ONa is–
   (a) 2-Ethoxy-2-methylpropane
   (b) 2-Methylpropene
   (c) 2,2-Dimethylpropane
   (d) 2-Methylpropane-2-ol

9. Which of the following solution exhibits positive deviation from Raoult's law?
   (a) Ethanol + acetone
   (b) Phenol + aniline
   (c) Chloroform + acetone
   (d) HCl + water

10. Among following, compound having highest pK_a value is–
   (a) Ethanol
   (b) Phenol
   (c) *p*-Methoxyphenol
   (d) *p*-Nitrophenol

11. Which of the following statement is correct?
   (a) Conductivity of HCl solution will be higher than KCl solution at same concentration
   (b) Conductivity of acetic acid solution will be higher than KCl solution at same concentration
   (c) Conductivity does not depend upon solvation of ions present is solution
   (d) Conductivity of KCl solution decreases with rise in temperature

12. Out of the following molecules, select one which is chiral–
   (a) 1-Chloropentane
   (b) 2-Chloropentane
   (c) 3-Chloropentane
   (d) 2-Chloro-2-methylbutane

For Question no. 13 to 16, a statement of Assertion followed by Reason are given. Choose the options out of following choices:

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

13. **Assertion:** Chloroform is kept in dark coloured bottles.
Reason: Chloroform is used as solvent in organic synthesis.

14. **Assertion:** Propan-2-ol undergoes acid catalysed dehydration easily as compared to propan-1-ol.
Reason: Rate of dehydration depends upon ease of protonation of alcohols.

15. **Assertion :** *cis*-$[CrCl_2(ox)_2]^{3-}$ is optically inactive.
Reason : *cis*-$[CrCl_2(ox)_2]^{3-}$ forms non-superimposable mirror image.

16. **Assertion:** Sc^{3+} ions are coloured.
Reason: Colour of d-block elements is due to d-d transition.

SECTION-B

Directions (Q. Nos. 17-21) : This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. i) State Kohlrausch law of independent migration of ions.
ii) Why conductivity of electrolytic solutions decreases on dilution?

18. Identify the type of isomerism exhibited by the following pairs of complexes:
i) $[Co(NH_3)_6]$ $[Cr(CN)_6]$ and $[Co(CN)_6]$ $[Cr(NH_3)_6]$
ii) $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$

19. Write the reactions occurring in H_2-O_2 fuel cell. Mention its two advantages.

20. Explain the effect of catalyst on following:

i) activation energy

ii) rate of reaction

21. i) Out of $[CoF_6]^{3-}$ and $[Co(en)_3]^{3+}$, which is more stable and why?

ii) On crystal field splitting in octahedral field, energy of doubly degenerate (e_g) orbitals are increased. Explain the reason.

SECTION-C

Directions (Q. Nos. 22-28) : This section contains 5 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Account for the following:

(a) Transition elements shows variable oxidation states.

(b) Atomic radii of *4d* and *5d* series elements are nearly same.

(c) Transition metals and their compounds are used as catalysts.

23. A first order reaction is 25% complete in 40 minutes. How much time will it take for 50% completion of the reaction.

(Given: *log* 2 = 0.301, *log* 3 = 0.4771, *log* 4 = 0.6021)

24. i) Write the balanced ionic equations for the reaction of $KMnO_4$ with following in acidic medium:

(a) H_2S

(b) $FeSO_4$

ii) The colour of potassium dichromate solution changes with pH of the solution. Explain.

25. i) Mention an example of Finkelstein reaction.

ii) Explain following with appropriate reasons:

(a) 1-Chloropropane on reaction with aqueous KOH forms propan-1-ol while heating with alcoholic KOH results in formation of propene.

(b) Thionyl chloride is preferred over other reagents for preparation of chloroalkanes from alcohols.

OR

i) Write the structural isomers of C_4H_9Br and arrange them in increasing order of their boiling points.

ii) What are ambident nucleophiles? Mention examples.

26. The rate constant of a first order reaction increases from 2×10^{-2} to 4×10^{-2} when the temperature changes from 300 K to 310 K. Calculate the energy of activation (E_a).
(Given: *log* 2 = 0.301, *log* 3 = 0.4771, *log* 4 = 0.6021)

27. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0°C. Calculate the van't Hoff factor and dissociation constant of fluoroacetic acid.
(Given: K_f for water = 1.86 K kg mol^{-1}, Molar mass of fluoroacetic acid = 78 g mol^{-1})

28. Mention the electrode reactions taking place in following cell:
$Ni(s) | Ni^{2+}$ (0.160 M) || Ag^{+}(0.002 M) | Ag(s)
Also calculate the EMF of the given cell at 298 K.
[Given: $E°_{Ni2+|Ni} = -0.25V$, $E°_{Ag+|Ag} = 0.80V$]

SECTION-D

Directions (Q. Nos. 29-30) : The following questions are case-based questions. Each question has an internal choice and carries 4 marks each.

29. Three students conducted an experiment to measure osmotic pressures of 0.5 molar solutions of sodium chloride, calcium chloride and glucose taken in random order at 300K. The recorded data are presented in the table below:

Sr. No.	Student	Osmotic Pressure / atm
1.	Anuj	24.6
2.	Swati	12.3
3.	Saksham	36.9

i) Which student measured the osmotic pressure of 0.5 M NaCl solution? Provide justification for your answer.

ii) Under what condition reverse osmosis occurs through semi permeable membrane?

iii) Calculate the concentration of K_2SO_4 that would be isotonic to the 0.5 M NaCl solution at 300 K.

OR

10 g glucose (molar mass 180 g/mol) and 10 g urea (molar mass 60 g/mol) are dissolved in 250 mL water the corresponding osmotic pressures were found to be $\mathbf{\Pi_1}$ and $\mathbf{\Pi_2}$ respectively. Determine the relationship between osmotic pressures $\mathbf{\Pi_1}$ and $\mathbf{\Pi_2}$.

30. The substitution reaction of alkyl halide mainly occur by S_N1 or S_N2 mechanism. Whatever mechanism alkyl halides follow the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for the substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product mixture depending upon the type of mechanism followed by alkyl halide.

i) Out of the following molecules, which is chiral?

1-Chloropentane, 2-Chloropentane, 3-Chloropentane

ii) Define-enantiomers.

iii) Arrange the following in the increasing order of their reactivity towards S_N2 reaction:

2-Bromopentane, 1-Bromopentane, 2-Bromo-2-methylbutane

OR

Out of Benzyl chloride and Chlorobenzene, which undergoes S_N2 reaction faster and why?

SECTION-E

Directions (Q. No. 31-33) : The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. i) For the complex, $[Pt(en)_2Cl_2]$.

(a) Determine the coordination number and oxidation state of platinum in the complex.

(b) Write its IUPAC name.

(c) Depict the structure of its isomer which is optically active.

ii) Identify the complex(es) which exhibits geometrical isomerism:

$[Ni(CN)_4]^{2-}$, $[Co(NH_3)_3Cl_3]$, $[Cr(en)_2(NH_3)_2]^{3+}$, $[Co(en)_3]^{3+}$

OR

i) Write the balanced ionic equations for the reaction of $KMnO_4$ with following in acidic medium:

(a) H_2S (b) $FeSO_4$

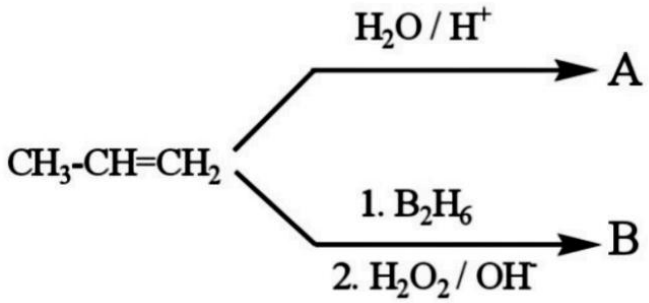
ii) Account for the following:

(a) Cu^+ is unstable in aqueous solution.

(b) A transition metal exhibits highest oxidation state in oxides and fluorides.

iii) Explain: $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic while $[Fe(CN)_6]^{3-}$ is weakly paramagnetic.

32. i) Consider the following reactions:



i) Identify the products **A** and **B**.

ii) Explain the mechanism of the reaction involved in conversion of propene into **A**.

iii) A carbonyl compound on reduction with $NaBH_4$ forms compound **B.** Identify carbonyl compound.

iv) How alcohol **A** can be prepared using appropriate Grignard reagent? Mention chemical reaction involved.

OR

i) Out of *ortho*-Nitrophenol and *para*-Nitrophenol, which is more steam volatile and why?

ii) Give an example of following reactions:

(a) Reimer-Tiemann reaction

(b) Williamson synthesis

iii) Mention a chemical test to distinguish between ethanol and propanol.

33. i) State Faraday's second law of electrolysis.

Aqueous copper sulphate solution and aqueous silver nitrate solution are electrolysed by 1 ampere current for 10 minutes in separate electrolytic cells. If the amount of silver deposited is 1.08 g, how much copper will deposited?

(Atomic mass of Cu = 63.54 g mol^{-1}, Ag = 108 g mol^{-1})

ii) What type of cells constitutes lead storage battery? Write anode, cathode and overall reaction taking place in cell when the current is drawn from it.

OR

i) Molar conductivities(Λ_m^o) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 Scm^2 mol^{-1} respectively. Calculate Λ_m^o (in S cm^2 mol^{-1}) for CH_3COOH. How much CH_3COOH will be in dissociated form at a particular concentration, if its molar conductivity is 78.1 Scm^2 mol^{-1}?

ii) Identify the nature of electrolytes represented by **A** and **B** in given graph. Discuss the reason of these variations taking suitable example.