Directorate of Education, GNCT of Delhi
Annual 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. 1 mole of liquid A and 2 moles of liquid B make a solution having a total vapour pressure 40 torr. The vapour pressure of pure A and pure B are 45 torr and 30 torr respectively. The above solution
   (a) is an ideal solution.
   (b) shows positive deviation.
   (c) shows negative deviation.
   (d) is a maximum boiling azeotrope.

2. Standard electrode potential for Sn^{4+}/Sn^{2+} couple is +0.15 V and that for the Cr^{3+}/Cr couple is —0.74 V. The two couples in their standard states are connected to make a cell. The cell potential will be
   (a) +1.19 V
   (b) +0.89 V
   (c) +0.18 V
   (d) +1.83 V

3. Out of Fe^{2+}, Co^{2+}, Cr^{3+}, Ni^{2+}, the one which shows lowest magnetic moment is :
   (a) Fe^{2+}
   (b) Co^{2+}
   (c) Cr^{3+}
   (d) Ni^{2+}

4. Which type of isomerism is shown by the given complex ?
   $[Co(en)_3]^{3+}$
   (a) Coordination isomerism
   (b) Optical isomerism
   (c) Linkage isomerism
   (d) Ionisation isomerism
      [Atomic number : Fe = 26, Co = 27, Ni = 28, Cr = 24]

5. Auto-oxidation of chloroform in air and light produces a poisonous gas known as
   (a) Phosphine gas
   (b) Mustard gas
   (c) Phosgene gas
   (d) Tear gas

6. The correct IUPAC name of $(CH_3)_3$ C – CH_2Br is :
   (a) 2,2-Dimethyl-2-bromopropane
   (b) 1-Bromo-2,2,2-trimethylethane
   (c) 2-Bromo-1,1,1-trimethylethane
   (d) 1-Bromo-2,2-dimethylpropane

7. Williamson's synthesis of preparing dimethylether is a/an
   (a) electrophilic substitution
   (b) S_N1 reaction
   (c) electrophilic addition
   (d) S_N2 reaction

8. Which of the following alcohols will not undergo oxidation ?
   (a) Butanol
   (b) Butan-2-ol
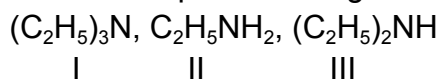   (c) 2-Methylbutan-2-ol
   (d) 3-Methylbutan-2-ol

9. Which of the following does not undergo Aldol condensation ?
    (a) HCHO
    (b) CH_3CH_2CHO
    (c) CH_3COCH_3
    (d) CH_3CHO

10. Which one of the following has the lowest pK_a value ?
    (a) $CH_3 - COOH$
    (b) $O_2N - CH_2 - COOH$
    (c) $Cl - CH_2 - COOH$
    (d) HCOOH

11. Three compounds are given below :
    $(C_2H_5)_3N$, $C_2H_5NH_2$, $(C_2H_5)_2NH$
            I   II   III
    Identify the correct decreasing order of their basic strength in gas phase :
    (a) II > III > I
    (b) III > I > II
    (c) III > II > I
    (d) I > III > II

12. Nucleic acids are the polymers of :
    (a) Nucleosides
    (b) D-ribose
    (c) Amino acids
    (d) Nucleotides

For Questions number 15 to 18, 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.
15. **Assertion (A)** : Chloroform and acetone mixture shows negative deviation from Raoult's law.
    Reason (R) : In chloroform and acetone mixture, A – A or B – B type intermolecular interactions are weaker than A – B type interactions.

16. **Assertion (A)** : Conductivity of an electrolyte increases with decrease in concentration.

   Reason (R) : Number of ions per unit volume decreases on dilution.

17. **Assertion (A)** : Glucose gets oxidised to six carbon carboxylic acid on reaction with bromine water.

   Reason (R) : Glucose contains a ketonic group.

18. **Assertion (A)** : Benzene diazonium salt is stable and can be easily stored.

   Reason (R) : Benzene diazonium chloride decomposes easily.

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. A non-volatile solute 'X' (molar mass = 50 g mol^{-1}) when dissolved in 78g of benzene reduced its vapour pressure to 90%. Calculate the mass of X dissolved in the solution.

18. A first order reaction takes 40 min for 75 % decomposition. Calculate rate constant. (log 2 = 0·30, log 4 = 0·60)

19. Give the IUPAC name and electronic configuration of central metal atom in terms of t_{2g} and e_g of $K_4[Mn(CN)_6]$.

20. Write the reaction involved in the following :
   (a) Reimer-Tiemann reaction
   (b) Kolbe'sreaction

21. (A) (a) Draw the zwitter ion structure for sulphanilic acid. 2 × 1 = 2
       (b) How can the activating effect of –NH$_2$ group in aniline be controlled ?
                                   OR
   (B) How will you carry out the following conversions :
       (a) Ethanamide to Methanamine
       (b) Ethanenitrile to Ethanamine

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. Calculate elevation of the boiling point of the solution when 4 g of $MgSO_4$ (molar mass = 120 g/mol) was dissolved in 100 g of water, assuming $MgSO_4$ undergoes complete ionisation.
    (K_b for water = 0.52 K kg mol^{-1})

23. Conductivity of 2×10^{-3} M methanoic acid is 8×10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation if $\Lambda°_m$ for methanoic acid is 404 S cm^2 mol^{-1}.

24. (a) Which ion amongst the following is colourless and why ?
        Ti^{4+}, Cr^{3+}, V^{3+}
        (Atomic number of Ti = 22, Cr = 24, V = 23)
    (b) Why is Mn^{2+} much more resistant than Fe^{2+} towards oxidation ?
    (c) The highest oxidation state of a metal is shown in its oxide or fluoride only. Justify the statement.

25.

Metal	Cr	Mn	Fe	Co	Ni	Cu	Zn
$E°_{M2+/M}$	-0.91	-1.18	-0.44	-0.28	-0.25	+0.34	-0.76

    (a) Why is $E°_{Mn2+/Mn}$ value highly negative as compared to other elements ?
    (b) What is the reason for the irregularity in the above E° values ?
    (c) Why is $E°_{Cu2+/Cu}$ value exceptionally positive ?

26. Write chemical equations for the following :
    (a) Reaction between phenol and Zn dust.
    (b) Reaction of anisole with bromine in ethanoic acid.
    (c) Reaction between methoxybenzene and HI.

27.(A) (a) Why do tertiary alkyl halides undergo SN1 reaction at a faster rate ?
        (b) Define Enantiomers.
        (c) Why is chloroform stored in dark coloured air tight bottles ? 1+1+1

OR

(B) (a) Write the major alkene that would be formed by dehydrohalogenation of 2-Bromopentane.
   (b) Which would undergo S_N2 reaction at a faster rate and why ?
      CH_3CH_2Br or $(CH_3)_3Br$
   (c) Why is chlorobenzene less reactive towards nucleophilic substitution reaction ?

28. (a) Write the reaction involved in Cannizaro's reaction.
    (b) Give chemical tests to distinguish between the following pair of compounds :
       (i) Propanal and Propanone
       (ii) Benzaldehyde and Benzoic acid

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. Oxidation-reduction reactions are commonly known as redox reactions. In galvanic cell, the chemical energy of a spontaneous redox reaction is converted into electrical energy, whereas in an electrolytic cell, electrical energy is used to carry out a non-spontaneous redox reaction. The standard electrode potential for any electrode dipping in an appropriate solution is defined with respect to standard electrode potential of hydrogen electrode taken as zero. Concentration dependence of the potentials of the electrodes and the cells are given by Nernst equation.

   Answer the following questions:
    (a) Predict whether the reaction is spontaneous or non-spontaneous if E°cell is positive ? 1
    (b) When does a galvanic cell behave like an electrolytic cell ? 1
    (c) Define the following terms : 2´1=2
       (i) Redox reaction
       (ii) Galvanic cell
                         OR
    (c) Write cell reaction and Nernst equation for the following cell at 25°C : 2
       Ni (s) | Ni^{2+} (aq) || Ag^+ (aq) | Ag (s)

30. In coordination compounds, metals show two types of linkages, primary and secondary. Primary valencies are ionisable and 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:
   (a) If $PtCl_2 . 2NH_3$ does not react with $AgNO_3$, what will be its formula ? 1
   (b) What is the secondary valency of $[Co(en)_2Cl_2]^+$? 1
   (c) (i) Write the formula of Iron(III)hexacyanidoferrate(II).
       (ii) Write the IUPAC name of $[Co(NH_3)_5Cl] Cl_2$.   2
                                    OR
   (c) Write the hybridization and magnetic behaviour of $[Ni(CN)_4]^{2-}$ 2
       [Atomic number : Ni = 28]

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.(A) (a) What happens to the rate constant k and activation energy E_a as the temperature of a chemical reaction is increased ? Justify.
   (b) The following data were obtained during the kinetic studies of the reaction :

$$A \ + \ 2B \ \rightarrow \ C + 2D$$
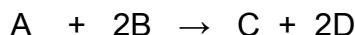
Experiment	Initial [A] (mol/L)	Initial [B] (mol/L)	Initial rate of formation of C (M min^{-1})
1	0.1	0.1	3 x x 10^{-4}
2	0.3	0.3	9.0 x 10^{-4}
3	0.1	0.3	3.0 x 10^{-4}
4	0.2	0.4	6.0 x 10^{-4}

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.

OR

(B) (a) Define pseudo first order reaction with one example.
   (b) The rate constant of a first order reaction increases from 4 x 10^{-2} to 8 x 10^{-2} when the temperature changes from 27°C to 37°C. Calculate its energy of activation (Ea).
   (Given : 2.303 R = 19.15 JK^{-1} mol^{-1}, log2 = 0.30)

2+3=5

32. (A) Compound A undergoes Rosenmund reduction to give compound B with molecular formula C_7H_6O. Compound B does not give Fehling s test but reacts with conc. NaOH to give C and D.
   Identify A, B, C and D and write all the reactions involved.
   Write one chemical test to distinguish between compound B and propanone.

OR

(B) Compound A with molecular formula (C_2H_6O) on oxidation by PCC gives compound B, which on treatment with dilute alkali forms compound C which is a β-hydroxy aldehyde. B on oxidation by potassium permanganate forms C.
   Identify A, B, C and D and write all the chemical equations involved.

33. (A) (a) Write the reaction of glucose with :
   (i) HI
   (ii) HNO_3 (conc.)
   (iii) HCN
   (b) Give two differences between DNA and RNA.

OR

(B) (a) Name the linkage formed when carboxyl end of one amino acid condenses with amino end of other amino acid.
   (b) What are essential amino acids and non-essential amino acids ?
   (c) (i) Why are the two strands of DNA complementary ?
   (ii) What type of linkage joins two nucleotides ?