ISC SEMESTER 2 EXAMINATION
SPECIMEN QUESTION PAPER
CHEMISTRY PAPER 1 (THEORY)

Maximum Marks: 35

Time allowed: One and a half hour

*Candidates are allowed an additional **10 minutes** for **only** reading the paper.*

*They must **NOT** start writing during this time.*

All questions are compulsory

The intended marks for questions or parts of questions are given in brackets. [ ]

All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.

Balanced equations must be given wherever possible and diagrams where they are helpful.

When solving numerical problems, all essential working must be shown.

In working out problems, use the following data:

Gas constant $R = 1\cdot987$ cal deg^{-1} mol^{-1} = $8\cdot314$ JK^{-1} mol^{-1} = $0\cdot0821$ dm^3 atm K^{-1}mol^{-1}

1 l atm = 1 dm^3 atm = $101\cdot3$ J. 1 Faraday = 96500 coulombs.

Avogadro's number = $6\cdot023 \cdot 10^{23}$.

SECTION A – 7 MARKS

Question 1

Fill in the blanks by choosing the appropriate word(s) from those given in the brackets:

(two, four, sec^{-1}, diamagnetic, acetaldehyde, mol^{-1}L sec^{-1}, paramagnetic, formaldehyde, acetone, ethanol)

(i)   When the concentration of a reactant of first order reaction is doubled, the rate of reaction becomes _____ times. The unit of rate constant (k) for the first order reaction is _____.   **[1]**

(ii)   The transition metals show _____ character because of the presence of unpaired electrons while Cu^+ is _____ because its electronic configuration is $[Ar]3d^{10}$.   **[1]**

(iii)   Calcium formate on distillation gives _____ but the distillation of calcium formate and calcium acetate gives _____.   **[1]**
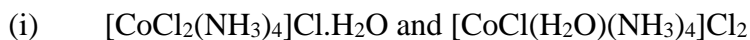
Question 2

Select and write the correct alternative from the choices given below.

(i) The type of hybridization involved in Octahedral complexes is: **[1]**

    (a) sp^3

    (b) dsp^2

    (c) sp^3d

    (d) d^2sp^3

(ii) One mole of a symmetrical alkene on ozonolysis gives two moles of an aldehyde having a molecular mass of 44 amu. The alkene is: **[1]**

    (a) ethene

    (b) propene

    (c) 1-butene

    (d) 2-butene

(iii) Primary amine when warmed with chloroform and alc. KOH yields: **[1]**

    (a) cyanides

    (b) isocyanides

    (c) benzene diazonium chloride

    (d) secondary amines

(iv) **Assertion**: The conversion of fresh precipitate to colloidal state is called peptization. **[1]**
Reason: It is caused by addition of common ions.

    (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 the correct explanation for assertion.

    (c) Assertion is true but reason is false.

    (d) Assertion is false but reason is true.

SECTION B – 16 MARKS

Question 3   **[2]**

Name the type of isomerism shown by each of the following pairs of compounds:

(i) $[CoCl_2(NH_3)_4]Cl.H_2O$ and $[CoCl(H_2O)(NH_3)_4]Cl_2$

(ii) $[Cr(NH_3)_5Br]SO_4$ and $[Cr(NH_3)_5SO_4]Br$

Question 4   **[2]**

(i)   Write chemical equations to illustrate each of the following name reactions:

    (a)   Rosenmund's reduction

    (b)   Clemmensen's reduction

OR

(ii)   How will you bring about the following conversions? (Give equation).

    (a)   Acetic acid to acetone

    (b)   Formaldehyde to urotropine

Question 5   **[2]**

What is a *zwitter ion*? Represent the zwitter ion of glycine.

Question 6   **[2]**

(i)   Arrange the following in the increasing order of their basic strength: $C_2H_5NH_2$, $C_6H_5NH_2$, $(C_2H_5)_2NH$.

(ii)   What are the products formed when benzene diazonium chloride reacts with phenol in weak alkaline medium? (Give equation).

Question 7   **[2]**

Give reasons for the following:

(i)   Diabetic patients are advised to take artificial sweeteners instead of natural sweeteners.

(ii)   The use of aspartame is limited to cold foods and drinks.

Question 8 **[2]**

The rate of reaction becomes four times when the temperature changes from 293K to 313K. Calculate the energy of activation (E_a) of the reaction assuming that it does not change with temperature. ($R = 8 \cdot 314$ $JK^{-1}mol^{-1}$)

Question 9 **[2]**

Give balanced equation for each of the following:

(i)   Ethylamine and nitrous acid

(ii)   Aniline and acetyl chloride

Question 10 **[2]**

Give one chemical test for each to distinguish between the following pairs of compound:

(i)   Acetaldehyde and benzaldehyde

(ii)   Acetone and acetic acid

SECTION C – 12 MARKS

Question 11 **[3]**

(i)   **Answer the following:**

(a) Define molecularity of a reaction. Give one difference between the order of reaction and its molecularity.

(b) The rate constant (k) of a first order reaction is $4 \cdot 5$ x 10^{-2} sec^{-1}. What will be the time required for the initial concentration of $0 \cdot 4$ M of the reactant to be reduced to $0 \cdot 2$ M?

OR

(ii)   **Answer the following:**

(a) For a first order reaction, show that the time required for the completion of 99% reaction is twice the time required for the completion of 90% of the reaction.

(b) For a reaction, rate = $k[A]^1[B]^{1.5}[C]^0$. What is the overall order of reaction?

Question 12 [3]

(i) What is the basic difference between the *electronic configuration of transition and inner transition elements*?

(ii) Why are Zn^{2+} ions colourless while Ni^{2+} ions are green in colour?

Question 13 [3]

(i) Write the formula of each of the following compounds:

(a) Potassium trioxalatoaluminate (III)

(b) Triammine triaquachromium (III) chloride

(ii) For the complex ion $[Co(NH_3)_6]^{3+}$, state the oxidation state of central metal atom and the coordination number of the complex ion.

Question 14 [3]

Give reason for each of the following:

(i) For ferric hydroxide sol. the coagulating power of phosphate ion is more than chloride ion.

(ii) Lyophilic colloidal solutions are more stable than lyophobic colloidal solutions.

(iii) Gelatin is added to ice cream.