II-TERM EXAMINATION : 2024-25
CLASS - XII (ISC)
CHEMISTRY PAPER 1
(THEORY)

Maximum Marks: 70
Time Allowed: Three Hours
(Candidates are allowed **additional 15 minutes** for **only** reading the paper.
They must **NOT** start writing during this time.)

This paper is **divided into four sections – A, B, C** and **D**.
Answer **all** questions.
Section – A consists of **one** question having **sub-parts** of **one** mark each.
Section – B consists of **ten** questions of **two** marks each.
Section – C consists of **seven** questions of **three** marks each, and
Section – D consists of **three** questions of **five** marks each.
Internal choices have been provided in **one question each in Section B,
Section C and Section D.**
All working, including rough work, should be done on the same sheet as, and adjacent to the
rest of the answer.
The intended marks for questions or parts of questions are given in brackets [ ].
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 = 1·987 cal deg^{-1} mol^{-1} = 8·314 JK^{-1} mol^{-1} = 0·0821 dm^3
atm K^{-1} mol^{-1} 1 l atm = 1 dm^3
atm = 101·3 J. 1 Faraday = 96500 coulombs.
Avogadro's number = 6·023 × 10^{23}

SECTION-A [14 Marks]

Question 1

(A) Fill in the blanks by choosing the appropriate word (s) from those given
in the brackets : [4×1=4]
[Two , Williamson's synthesis , Three , Anisole , Toluene , Friedel-crafts
alkylation , Iodoform , sec^{-1} , mol^{-1} , L sec^{-1} Lewis base , Acetone , Lewis acid ,
Chloroform , HCHO]

(i) Sodium phenoxide react with methyl chloride to give _____ and the
reaction is known as _____ .

(ii) When the concentration of a reactant of first order reaction is tripled, the
rate of reaction becomes _____ times. The unit of rate constant (k) for
the first order reaction is _____ .

(iii) In coordination complexes, the central metal atom or ion behaves as
_____ and the legands behave as _____ .

(iv) Calcium acetate on dry distillation gives _____ which gives _____
on heating with iodine and alkali.

(B) Select and write the correct alternative from the choices gives below : [7]

(i) The catalytic activity of transition metals and their compounds is mainly
due to :

(a) their magnetic behaviour
(b) unpaired e⁻
(c) their ability to show variable oxidation state
(d) their chemical reactivity

(ii) The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of chemical reaction will be :
(a) 230.3 minutes   (b) 22.03 minutes
(c) 46.06 minutes   (d) 460.6 minutes

(iii) The formation of salicylic acid from phenol using NaOH and CO_2 is known as :
(a) Riemer-Tiemann reaction
(b) Fittig reaction
(c) Williamson synthesis
(d) Kolbe schmidt reaction

(iv) A solution of urea boils at 100.18°C at one atm pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively the above solution will freeze at :
(a) 06.54 °C   (b) −0.654 °C
(c) 6.54 °C   (d) 0.654 °C

(v) In the plot of $\ell n\ K$ vs $\dfrac{1}{T}$ the slope is :

(a) $-\dfrac{Ea}{R}$ (b) $-\dfrac{Ea}{2.303\,R}$

(c) $\dfrac{Ea}{2.303\,R}$ (d) $\dfrac{Ea}{2.303}$

(vi) **Assertion :** Von't Hoff factor for benzoic acid in benzene is less than one.
Reason : Benzoic acid behaves as a weak electrolyte in benzene.
(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.

(vii) **Assertion :** Acetaldehydes undergoes aldol condensation with conc. NaOH.
Reason : Aldehydes which contain α–hydrogen undergo aldol condensation.
(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.

(C) **React the passage given below carefully and answer the questions that follows :**   [3]
Solution play a very important role in our daily life. Alloys, a homogeneous mixture of metal are solution of solid in solid All intravenous injections must be isotonic with our body fluid. Diabetic patients are more likely to have a heart attack and blood pressure due to the higher glucose levels in the blood.
(i) What will happen if blood cells are kept in hypertonic solution ?
(ii) Name the process when solvent and solution are separated by semi permeable membrane, and the pressure applied on the solution side in more than the osmotic pressure.
(iii) Calculate the molarity of 30 g of $Co(NO_3)_2.\ 6H_2O$ in 4.3 litre of solution. [molar mass of $Co(NO_3)_2.6H_2O=292$ g/mol]

SECTION-B [20 Marks]

Question 2

A solution containing 1.23 g of calcium nitrate in 10 g of water boils at 100.975 °C at 760 mm of Hg. Calculate the Van't Hoff factor for the salt at this concentration (K_b for water = 0.52 K kg mol^{-1}, mol. wt of calcium nitrate = 164 g/mol) [2]

Question 3 [2]

Answer the following :

(i) Name the transition element present in first transition series which exhibits maximum oxidation state.

(ii) Why transition elements form alloy ? Give reason.

Question 4 [2]

Convert the following :

(i) Phenol to chlorobenzene (ii) Ethanol to ethoxyethane

Question 5 [2]

The elements of 3d transition series are given as :

Sc , Ti , V , Cr , Mn , Fe , Co , Ni , Cu , Zn

Answer the following :

(i) Which element has the highest melting point ?

(ii) Which element is a strong oxidising agent in M^{3+} oxidation state and why ?

Question 6 [2]

Write mechanism for the reaction -

When ethyl alcohol is treated with conc. H_2SO_4 at 443 K.

Question 7 [2]

(i) How can you graphically find the activation energy of the reaction ?

(ii) The slope of the line in the graph of log K versus $\frac{1}{T}$ is –5841. Calculate the activation energy of the reaction.
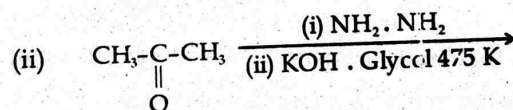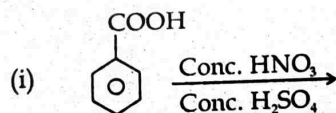
Question 8 [2]

Give reasons for the following :

(i) Why wilted flowers revive when placed in fresh water.

(ii) Why ethylene glycol is added to water of car radiators in hills ?

OR

Complete and balance the following equations :

(i) $\xrightarrow[\text{Conc. } H_2SO_4]{\text{Conc. } HNO_3}$

(ii) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3 \xrightarrow[\text{(ii) KOH . Glycol 475 K}]{\text{(i) } NH_2 . NH_2}$

Question 9

A solution prepared by dissolving 8.95 mg of a gene fragment (non-electrolyte) in 35 ml of water has an osmotic pressure of 0.335 torr at 25 °C. Calculate the molar mass of gene fragment. [2]
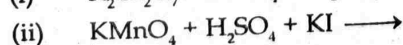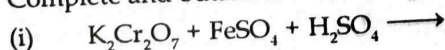
Question 10 [2]

Give reasons for the following :

(a) $(CH_3)_3C - CHO$ does not undergo aldol condensation.

(b) Carboxylic acids have higher boiling point than aldehyde and ketone.

Question 11 [2]

Complete and butane the following equations:

(i) $K_2Cr_2O_7 + FeSO_4 + H_2SO_4 \longrightarrow$

(ii) $KMnO_4 + H_2SO_4 + KI \longrightarrow$

Question 12 [3]

For the reaction $Cl_2 + 2NO \longrightarrow 2NOCl$ following data are given :

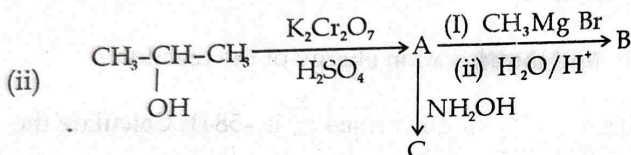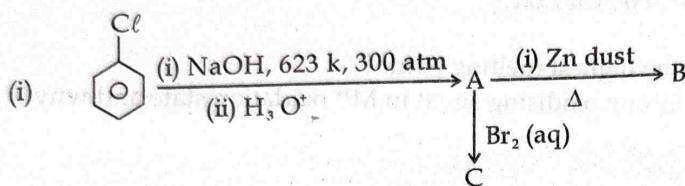| Exp. No.	$[Cl_2]$	$[NO]$	Rate (Mol $L^{-1}S^{-1}$)
1	0.02	0.01	2.4×10^{-4}
2	0.02	0.03	2.16×10^{-3}
3	0.04	0.03	4.32×10^{-3}

Determine :
(a)   the order w.r.t Cl_2 and NO
(b)   rate law
(c)   rate constant.

Question 13 [3]

Identify the products A, B and C in the following reaction sequence :

(i)

(ii)

Question 14 [3]

Write the chemical equation for the following named reactions :
(a)   Hell volhard zelinsky (HVZ) Reaction.
(b)   Benzoin condensation
(c)   Clemmensen reduction

Question 15 [3]

Give the balanced equation for the following :
(i)   Chlorobenzene treated with ammonia in the presence of Cu_2O at 475 K and 60 atm.
(ii)   Ethyl chloride is treated with $AgNO_2$.
(iii) 2-Bromopentane is heated with alcoholic KOH ?

Question 16 [3]

(i)   Mention any two factors that influence the rate of a chemical reaction.
(ii)   The rate constant for an isomerisation reaction $A \longrightarrow B$ is 4.5×10^{-3} min^{-1}. If the initial concentration of A is 1 M. Calculate the rate of reaction after 1 hour.

Question 17 [3]

How can the following conversions be brought about ?
(i)   Picric acid from phenol
(ii)   But – 2 – en-1-al from ethanol
(iii) Benzanamide from toluene

Question 18 [3]

Write a good chemical test to distinguish between the following pairs of compound :
(i)   Phenol and Ethanol
(ii)   Formic acid and Acetic acid
(iii) Acetaldehyde and Benzaldehyde

OR

(i) Indicate the type of isomerism exhibited by the following complexes :
    (a) $[Pt(NH_3)(H_2O)Cl_2]$
    (b) $[Co(NH_3)_5 NO_2](NO_3)_2$

(ii) Why do the complex $Pt\,Cl_4.2KCl$ do not give precipitate of $AgCl$ with $AgNO_3$ solution ?

SECTION–D [15 Marks]

Question 19   [5]

(i) Write the balanced equation for the following and name them.
    (b) Acetyl chloride is reduced by hydrogen in presence of palladium and barium sulphate in boiling xylene poisoned with Sulphur.
    (b) Acetone reacts with dil NaOH.
    (c) Benzoic acids is treated with mixture of conc. HNO_3 and conc. H_2SO_4.

(ii) Arrange the following compounds as directed :
    (a) CH_3CHO , $HCHO$, CH_3COCH_3 , C_6H_5CHO (increasing order of reactivity in nucleophilic addition reaction)
    (b) $HCOOH$, C_6H_5COOH , CH_3COOH , $ClCH_2COOH$ (decreasing order of acidic strength)

Question 20

(i) Write the hybridisation and magnetic character of $[Fe(CN)_6]^{4-}$ and $[Ni(CO)_4]$ using VBT. (Fe = 26, Ni = 28)   [5]

(ii) $Cr(H_2O)Cl.SO_4.4NH_3$ exists in two isomeric forms 'A' and 'B'. Isomer A react with $AgNO_3$ to give while ppt. but does not react with $BaCl_2$. Isomer 'B' gives while ppt with $BaCl_2$ but does not react with $AgNO_3$. Answer the following questions.
    (a) Write the structural formulae of A and B.
    (b) Give the IUPAC name of A and B.
    (c) Name the type of isomerism exhibited by them.

Question 21

(i) 20% of first order reaction is completed in five minutes. How much time will the 60% reaction take to complete? Calculate the half life period per the above reaction.   [3]

(ii) The rate constant of a first order reaction becomes 5 times when the temperature is raised from 350 K to 400 K. Calculate the activation energy of the reaction.   [2]

OR

(i) The freezing point of 0.01 m solution of $K_3[FeCN)_6]$ is –0.062 °C :   [3]

    (a) Calculate Van't Hoff factor for this solution.
    (b) Calculate the percentage dissociation of it.
    [K_f for water = 1.86 K kg mol^{-1}]

(ii) Liquids A and B form ideal solution for all compositions of A and B at 25 °C. Two such solutions with 0.25 and 0.50 mole fractions of A have the total vapour pressure of 0.3 and 0.4 bar, respectively. What is vapour pressure of pure liquid B in bar ?   [2]

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