

2021

CHEMISTRY

(Honours)

Paper-C-I

(Inorganic Chemistry-I)

Full Marks : 60

Time : 3 hours

Answer all questions.

*The figures in the right-hand margin
indicate marks.*

GROUP—A

1. Answer the following :

1 × 8

(a) Among Li^+ , Cs^+ , Na^+ and Rb^+ , _____
has maximum ionic radius.

(Turn Over)

(2)

0.414-0.7

- (b) For octahedral coordination, the radius ratio (r_+/r_-) is $\frac{0.414-0.732}{}$.
- (c) Select the species having the smallest radius at Si, P, Cl.
- (d) Shape of CCl_4 is tetrahedral.
- (e) The number of electrons in O_2^+ is 15.
- (f) The oxidation number of Cr in $\text{K}_2\text{Cr}_2\text{O}_7$ is +6.
- (g) Schottky defect point defect of its crystals decreases the density of a solid.
- (h) According to VSEPR theory the geometry of IF_7 is Pentagonal bipyramidal.

(3)

GROUP-B

2. Answer any *eight* of the following : 1.5×8

- (a) State Pauli's exclusion principle.
- (b) Why PCl_5 is stable but not NCl_5 ?
- (c) Why ionisation energy of Fluorine is more than that of oxygen?
- (d) Why HF is more polar than HCl?
- (e) Define standard electrode potential.
- (f) p-block elements includes which groups in the periodic table?
- (g) Which forces are collectively known as van der Waal's forces?

(4)

- (h) Define London forces.
- (i) How can we calculate bond order?
- (j) Write the Lewis structure of H_2SO_4 .

GROUP—C

3. Answer any *eight* of the following : 2×8

- (a) Sketch *d* orbitals.



- (b) What do you mean by Schottky defect?

- (c) Explain Heisenberg's uncertainty principle.

- (d) Write the molecular orbital configuration of NO^+ and NO^- .

(5)

- (e) Discuss the geometry of NH_3 molecule.

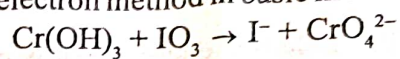
- (f) H_2O is a liquid, where as H_2S is a gas at room temperature. Explain why?

- (g) NF_3 has less dipole moment than NH_3 . Why?

- (h) LiCl has higher boiling point than HCl , why?

- (i) Mention the bond orders for O_2 , B_2 and N_2 .

- (j) Balance the following equation by ion electron method in basic medium



GROUP—D

4. Answer any *four* questions :

6×4

(6)

- (a) List the important difference between an orbit and an orbital. How does the wave mechanical model of an atom lead to the concept of orbital ?
- (b) Discuss postulates of Bohr's model of atom. Give its limitations.
- (c) What are p-block elements ? Give general characteristics of P-block elements.
- (d) State Fajan rule. Explain with the help of this rule, among LiCl and KCl which is more covalent.
- (e) What is lattice energy ? How can it be determined by using Born-Haber cycle ?

(7)

- (f) What is Semiconductors ? Briefly explain n-type and p-type semiconductors.
- (g) What is Markownikoff's rule ? Discuss its mechanism.
- (h) Define intramolecular and intermolecular van der Waal's forces. Discuss dipole-dipole and ion-dipole attractions.

2021

CHEMISTRY

(Honours)

Paper-C-II

(*Physical Chemistry-I*)

Full Marks : 60

Time : 3 hours

Answer all questions.

*The figures in the right-hand margin
indicate marks.*

GROUP—A

1. Answer the following :

1 × 8

- (a) The average distance covered by a molecule between two successive collisions is called mean free path of gas molecule

(Turn Over)

(2)

- (b) The approximate composition of glass is silica, borax, Na₂O
Sodium, Silicon oxide, Boron oxide, Calcium
- (c) Sodium chloride crystal has a _____ lattice.
face-centred
- (d) The rise of a liquid in a capillary tube is due to the property of _____.
surface tension
- (e) The unit of van der Waal's constant a is dm³ lit² mol⁻² and b is lit² mol⁻¹.
- (f) A mixture of NH_4^+ and NH_3 is a buffer solution.
ammonia nitrogen, Lewis acid base pair
- (g) The density of ice is less than that of water.
- (h) A relation between vapour pressure and temperature is known as Clausius-Clapeyron equation.
Clausius-Clapeyron equation

I-CC-Chem-II

(Continued)

(3)

GROUP-B

2. Answer any *eight* of the following : 1.5 × 8

- (a) Define surface tension.
- (b) What is absolute zero?
- (c) Define boiling point.
- (d) Define common ion effect.
- (e) Define buffer capacity.
- (f) Define unit cell.
- (g) Define mean free path of gas molecules.
- (h) Write the unit of viscosity in S.I unit.

I-CC-Chem-II

1500 S.I. unit
(Turn Over)

(4)

- (i) What is degree of hydrolysis?
- (j) Write the law of equipartition of energies.

GROUP—C

3. Answer any *eight* of the following : 2×8

- (a) Discuss cleaning action of soap.
- (b) Why are the liquid drops are spherical?
- (c) What do you mean by Diagonal plane of symmetry?
- (d) What are Miller indices?

(5)

- (e) Write the characteristics of buffer solutions.
- (f) Define solubility product.
- (g) Write two values of R.
- (h) Write the difference between ideal gas and real gas.
- (i) Write the relationship between different types of velocities.
- (j) Name the different intermolecular forces present in the liquid.

GROUP—D

4. Answer any *four* of the following : 6×4

$a = a \cdot m \cdot 10^{-2} \cdot \text{mol}^2$

(6)

- (a) How do real gases deviate from ideal gas behaviour ? Derive van der Waal's equation.
- (b) Discuss briefly the structure of water molecule.
- (c) Define viscosity. How it is determined ?
- (d) Discuss the laws of crystallography.
- (e) Distinguish between Schottky defect and Frenkel defect.
- (f) What are indicators ? Discuss the selection of indicators and their limitations.

(7)

- (g) What is buffer solution ? Derive Henderson's equation for acidic and the basic buffer mixtures.
- (h) Discuss the theory of Acid-Base indicators using phenolphthalein indicator.

Total Number of Pages—8

II-CC—Chem-III

2022

CHEMISTRY

(Organic Chemistry)

[Honours]

Paper — III

Full Marks : 60

Time : 3 hours

Answer all questions

The figures in the right-hand margin indicate marks

GROUP — A

1. Answer *all* questions :

1 × 8

(a) Dehydrohalogenation of alkyl halide is an example of _____ reaction.

(b) What is the shape of carbocation intermediate ?

(Turn Over)

(2)

(c) The process of mixing an equimolar proportion of D and L isomers of a compound is called _____

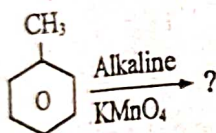
(d) Give an example of meso-compound.

(e) $\text{CH}_3-\text{CH}=\text{CH}_2 + \text{HBr} \longrightarrow ?$ (complete the reaction)

(f) $\text{CH}\equiv\text{CH} \xrightarrow[\text{Hg}^{2+}]{\text{dil. H}_2\text{SO}_4} ?$ (complete the reaction)

(g) What is the role of anhydrous AlCl_3 in the Friedel-Craft's reaction?

(h) Write the major product :



GROUP - B

2. Answer any eight questions :

$1\frac{1}{2} \times 8$

(Continued)

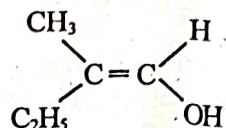
II-CC-Chem-III

(3)

(a) What is nucleophile? Give an example of neutral nucleophile.

(b) What happens when ethyl bromide reacts with sodium metal in dry ether?

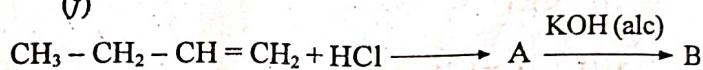
(c) Assign E/Z configuration :



(d) Draw the enantiomers of lactic acid by Fischer projection.

(e) What do you mean by triplet carbene?

(f)



What are A and B.

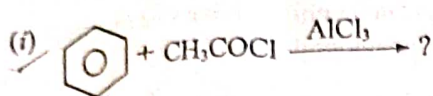
(g) Name the reagents used oxy-mercuration and demercuration of alkene.

(h) Calculate the angle strain in cyclobutane.

II-CC-Chem-III

(Turn Over)

(4)



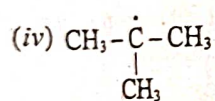
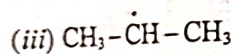
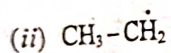
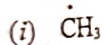
Complete the reaction.

- (j) Justify with reason, Electrophillic substitution reaction in phenol takes place at ortho and para position.

GROUP - C

3. Answer any eight questions : 2×8

- (a) Which among the following is the most stable free radical and why ?



(5)

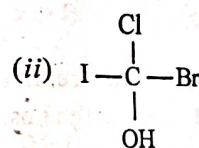
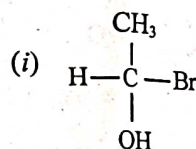
- (b) Can you prepare isobutane by wurtz reaction ? Give reason.

- (c) Why aniline is less basic than ammonia ?

- (d) What is sawhorse projection formula ? Explain with one example.

- (e) Write the conditions for optical activity of a molecule.

- (f) Give R/S configuration of the following :



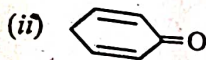
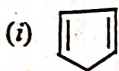
(6)

(g) Write the name of product obtained by the ozonolysis of But-1-ene and followed by hydrolysis.

(h) Staggered conformation is more stable than eclipsed conformation. Explain.

(i) Write the mechanism of chlorination of benzene in presence of FeCl_3 .

(j) Explain whether the following structures are aromatic or not.



GROUP - D

Answer all questions :

6 × 4

4. What is inductive effect? Explain the relative strength of organic acids and bases on the basis of Inductive effect.

6

II-CC-Chem-III

(Continued)

(7)

Or

Write short notes on :

3 + 3

(i) Electromeric effect

(ii) Free radical substitution mechanism in halogenation of Alkane.

5. Write short notes on :

3 + 3

(i) CIP Rules

(ii) Meso compounds

Or

(i) Diastereomerism

(ii) Specific angle of rotation.

6. Explain E_1 and E_2 mechanism with example.

6

Or

Write notes on Baeyer Strain theory.

6

II-CC-Chem-III

(Turn Over)

(8)

7. Explain Nitration and Sulphonation of Benzene with mechanism.

3 + 3

Or

Explain the directive influence of various groups in aromatic substitution.

6

Total Number of Pages—7

II-CC—Chem-IV

2022

CHEMISTRY

(*Physical Chemistry*)

[Honours]

Paper—IV

Full Marks : 60

Time : 3 hours

Answer all questions

The figures in the right-hand margin indicate marks

GROUP—A

1. Answer *all* questions : 1 × 8

(a) For an isothermal process the change internal energy (ΔU) of the system is _____

(Fill in the blank)

(Turn Over)

(2)

(b) What is the standard enthalpy of formation of a compound?

(c) Write the relationship between ΔG , ΔH and ΔS at a constant temperature.

(d) Define inversion temperature.

(e) The partial molar free energy is called _____

(f) What is the effect of catalyst on chemical equilibrium?

(g) Between 1M NaCl and 1M $C_6H_{12}O_6$, which has more boiling point?

(h) Define Van't Hoff factor.

GROUP - B

2. Answer any eight questions :

$1\frac{1}{2} \times 8$

(3)

(a) What is extensive property? Give an example.

(b) The calorific value of Sugar ($C_{12}H_{22}O_{11}$) is 90KJ/gm. Calculate its enthalpy of combustion.

(c) Define bond energy and write its unit.

(d) What is residual entropy?

(e) What are the conditions for a spontaneous process?

(f) Give the expression for entropy of mixing.

(g) For the reaction, $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, the value of K_c is 2×10^{-2} . Calculate the value of K_p at $27^\circ C$.

(h) Why the term, fugacity is used?

(i) Write two factors affecting the vapour pressure of a liquid.

(4)

(j) State Boyle-Van't Hoff law.

GROUP - C

3. Answer any eight questions :

2 × 8

(a) Prove, $\Delta H = \Delta U + \Delta nRT$ for an ideal gas.

(b) Define path function and Give two examples.

(c) Define and explain enthalpy of formation.

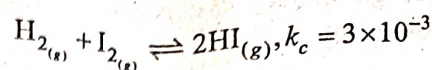
(d) 2 moles of an ideal gas expands reversibly and isothermally from 15dm^3 to 50dm^3 at 298K . Calculate the workdone by the gas.

(e) Show that, $\left(\frac{\partial H}{\partial P}\right)_T = 0$ for an ideal gas.

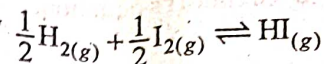
(f) Find out the relationship between K_p and K_c .

(5)

(g) For the reaction,



Calculate K_c for the reaction at constant temp.



(h) Write the expression for the effect of temperature on equilibrium constant.

(i) Define reverse osmosis.

(j) Calculate the elevation of boiling point of solution whose molality is 0.5 and molar elevation constant is 0.62.

GROUP - D

Answer all questions :

6 × 4

(6)

4. Derive an expression for the work done when an ideal gas undergoes expansion isothermally and reversibly.

Or

Derive Kirchhoff's equation.

5. Write a note on Carnot Cycle.

Or

Derive Gibbs-Helmholtz equation.

6. Derive Gibbs-Duhem equation.

Or

Derive the relation between free energy change and equilibrium constant thermodynamically.

(7)

7. Derive the relation between molecular weight and depression of freezing point of a solution containing non-volatile solute.

Or

State and explain Henry's law and write its applications.

Total Pages : 6

III-CC- Chem-5

2022

CHEMISTRY

Paper-CC-V

Full Marks : 60

Time : 3 hours

Answer all questions.

The figures in the right-hand margin indicate marks.

GROUP—A

1. Answer *all* questions : 1 × 8

(a) Name one metal which can be obtained
— by self reduction method in metallurgy.

(b) What is the conjugate base of HCO_3^-
— ion?

(c) Explain why fluorine shows -1 oxidation state in all its compound.

(Turn Over)

(2)

- (d) Calculate the oxidation number of sulphur in H_2SO_5 molecule.
- (e) Which element has highest catenation tendency?
- (f) Write the shape of ClF_3 molecule.
- (g) What is the hybridisation of Xenon in XeF_2 ?
- (h) Name the molecule which is isoelectronic with Borazine.

GROUP—B

2. Answer any eight :

1.5 × 8

- (a) Explain why chromium metal oxide can not be reduced by using carbon as reducing agent.
- (b) Write two limitations of Arrhenius theory for acid-base concept.
- (c) Write two examples of Hard acid.

(3)

- (d) Define allotropy. Give the allotropes of carbon.

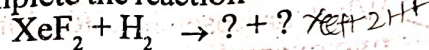
- (e) Write the relationship between standard free energy and electrode potential.

- (f) Give two examples of XX_3 type stable interhalogen compounds.

- (g) Write the anhydrides of HNO_3 and H_3PO_4 .

- (h) Write one method of preparation of XeF_4 .

- (i) Complete the reaction



- (j) Write two applications of silicones.

GROUP—C

3. Answer any eight :

2 × 8

- (a) What is inert pair effect?

(4)

- (b) Write the difference between ore and mineral.
- (c) Write two important ores of copper.
- (d) Explain $[\text{AgI}_2]^-$ is a stable complex but $[\text{AgF}_2]^-$ is unstable complex.
- (e) Explain why Cu^{2+} ion is more stable than Cu^+ ion in aqueous medium.
- (f) Between HClO and HClO_3 , which is more acidic and why?
- (g) Write the structure of HNO_2 and HNO_3 .
- (h) What are pseudohalide ions? Give two examples.
- (i) Discuss the structure of XeF_6 on basis of hybridisation.
- (j) Write any two difference between Inorganic and organic polymers.

(5)

GROUP-D

4. Explain Ellingham diagram for the reduction of metal oxide to metal. 6

Or

Explain HSAB principle and write its applications.

5. Write short note on : 3+3

- (i) Diagonal relationship
- (ii) Structure of basic beryllium acetate

Or

Describe the relative stability of different oxidation state of 'P' block elements.

6. Write short note on : 3+3

- (i) Interhalogen compounds
- (ii) Graphitic compounds

(6)

Or

Describe the manufacture of HNO_3 by Ostwald's process. Give one property in which it acts as oxidising agent.

7. Describe the valence bond and molecular orbital treatment to explain the structure of XeF_2 .

6

Or

What are phosphazenes ? Give the preparation and structure of tri-phosphazene.

Handwritten calculations:

48
18
66

39
14
23
76

66
63
76
205
16
25
192
24
673

2022

CHEMISTRY

Paper-CC-VI

Full Marks : 60

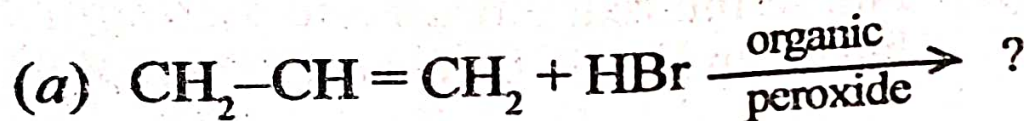
Time : 3 hours

Answer all questions.

The figures in the right-hand margin indicate marks.

GROUP—A

1. Answer *all* questions : 1 × 8



write the major product.

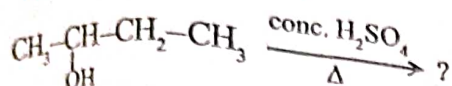
(b) What is the hybridisation of Benzyne ?

(Turn Over)

(2)

(c) Draw the structural formula of tert-butyl ether.

(d) Write the major product :



(e) $\text{CH}_3-\text{CO}-\text{CH}_3 \xrightarrow{?} \text{CH}_3-\text{CH}_2-\text{CH}_3$
name the reagent.

(f) Between CH_3-CHO and $\text{CH}_3-\text{CO}-\text{CH}_3$, which is more reactive towards AdN reaction.

(g) $\text{CH}_3-\text{CH}_2-\text{COOH} + \text{Br}_2 \xrightarrow{\text{red 'P'}} ?$

(h) Name the reagent used to distinguish between $\text{H}-\text{COOH}$ and CH_3-COOH .

GROUP-B

2. Answer any eight :

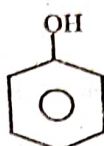
1.5 × 8

(a) Why benzyl chloride is more reactive than chlorobenzene towards SN reaction.

(Continued)

(3)

(b) What happens when ethyl chloride reacts with sodium metal in dry ether? Give equation.

(c)  $\xrightarrow[\Delta]{\text{CHCl}_3/\text{KOH}}$? write the major product.

(d) How do you prepare secondary alcohol from Grignard's reagent? Give equation?

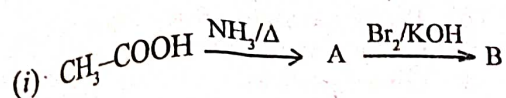
(e) Why is ethanol soluble in water?

(f) Write the IUPAC name of Oxalic acid and Lactic acid.

(g) What is Fehling solution?

(h) Shortly explain Michael-Addition reaction.

(4)



What are A and B ?

(j) How do you prepare Maleic acid ?

GROUP—C

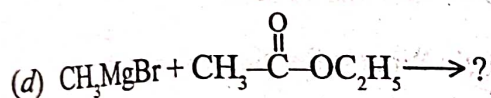
3. Answer any *eight* :

2 × 8

(a) Write the limitation of Williamson's reaction by taking a suitable reaction.

(b) Convert Benzene to Benzoic acid.

(c) Give an example of Bouveault-Blanc reduction reaction.



(e) What happens when benzaldehyde reacts with conc. sodium hydroxide solution ? Give equation.

(5)

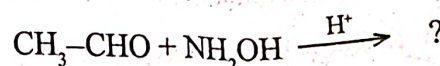
(f) What is Kolbe's-Schmidt reaction ?

(g) Write two methods of synthesis of Glycol.

(h) Write down the mechanism of Esterification.

(i) Why Benzoic acid is more acidic than acetic acid ?

(j) Complete the reaction with mechanism



GROUP—D

4. Discuss the preparation of chlorobenzene with mechanism from (i) Benzene, (ii) Benzene diazonium chloride.

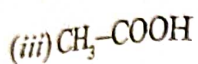
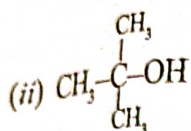
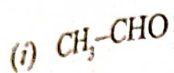
3+3

Or

How do you synthesize the following compounds from Grignard's reagent ?

2 × 3

(6)



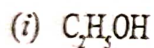
5. Explain the following reactions with mechanism: 3+3

(i) Fries rearrangement

(ii) Reimer-Tiemann reaction

Or

Write one method of preparation of epoxide. What happens when ethylene epoxide reacts with 2+2+2



(Continued)

(7)

6. Explain mechanism of 3+3

(i) Cannizzaro's reaction

(ii) Wolff-Kishner reaction

Or

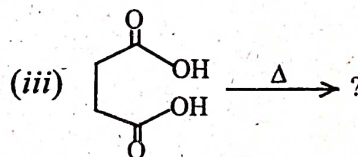
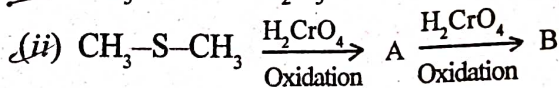
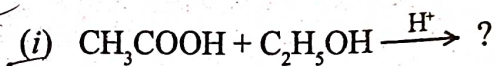
Starting from malonic ester, how the following compounds are synthesized? 2 x 3

(i) Succinic acid

(ii) Cinnamic acid

(iii) Hydrocarbon

7. Complete the reactions 2 x 3



(Turn Over)

(8)

Or

Explain the mechanism of

3+3

- (i) Curtius rearrangement
 - (ii) Hoffmann-Bromamide reaction
-

2022

CHEMISTRY

Paper-CC-VII

Full Marks : 60

Time : 3 hours

Answer all questions.

*The figures in the right-hand margin
indicate marks.*

GROUP—A

1. Answer all questions : 1 × 8

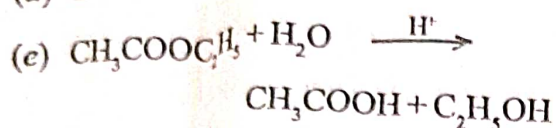
- (a) In phase equilibrium of sulphur system, what is the degree of freedom at triple point ?
- (b) If a system has two component and single phase, then its degree of freedom is ———.

(Turn Over)

(2)

(c) What is the value ΔH_{mix} and ΔV_{mix} for an ideal solution?

(d) Define azeotropic mixture.



what is its order of reaction?

(f) Write the unit of rate constant for zeroth order reaction.

(g) Name the catalyst used in Haber's process.

(h) Define desorption.

GROUP—B

2. Answer any eight:

1.5 × 8

(a) Define the term 'components' in a system by giving an example.

(3)

(b) What do you mean by metastable equilibrium?

(c) What is critical solution temperature?

(d) Write the formula of distribution coefficient. $K_d = \frac{\text{Conc}^{\circ} \text{ of Solute in Solvent-1}}{\text{Conc}^{\circ} \text{ of Solute in Solvent-2}}$

(e) The rate of reaction with respect to reactant is always negative. Justify.

(f) For the reaction $\text{A} + 2\text{B} \longrightarrow 3\text{C}$, the value of $\frac{d(\text{A})}{dt} = 2 \times 10^{-4} \text{ M} \cdot \text{sec}^{-1}$, calculate $\frac{d(\text{B})}{dt}$.

(g) Define Activation energy.

(h) For an exothermic reaction, the threshold energy and reactant energy are 215 KJ and 75 KJ respectively. Calculate its activation energy.

(4)

- (i) What is enzyme catalysis ? Give an example.
- (j) What is the effect of temperature on the rate of physical adsorption ?

GROUP—C

3. Answer any eight : 2×8

- (a) What is condensed phase rule ? To which system this rule is applicable ?
- (b) What are the condition of a good freezing mixture ?
- (c) Write two applications of Nernst distribution law.
- (d) Write the difference between upper and lower critical solution temperature.
- (e) Write any two difference between order and molecularity of a reaction.

(g) steady state approximation is a state where the reaction mechanism of the enzyme rate of formation of the catalyst is zero.

- (f) Derive half life period for a zeroth order reaction.
- (g) What do you mean by steady state approximation in reaction mechanism ?
- (h) Explain specificity and selectivity of a catalyst.

(i) What is heterogeneous catalysis ? Give one example.

(j) Write the difference between adsorption and absorption.

GROUP—D

Answer all questions : 6×4

4. Explain all the curves and points in the phase rule diagram of sulphur system.

Or

Draw and explain the application of simple eutectic in the Pattinson's process of Pb-Ag system for desilverisation of lead.

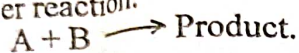
(6)

5. Explain the temperature composition diagram for distillation of a maximum boiling azeotropic solution by giving example.

Or

Derive Nernst distribution equation and write its applications.

6. Derive rate constant for the kinetics of 2nd order reaction.



Or

Write short notes on :

3+3

- (i) Arrhenius equation
 - (ii) Collision theory of reaction rate
7. What is acid-base catalysis ? Explain the kinetics of acid-base catalysis.

(7)

Or

Write a note on Gibb's adsorption isotherm.

2023

CHEMISTRY

Paper-C-VIII

Full Marks : 60

Time : 3 hours

Answer all questions.

The figures in the right-hand margin indicate marks.

GROUP—A

Answer all questions : 1×8

1. (a) The name of the complex $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2][\text{PtCl}_4]$ is ———.
- (b) What is the relationship between Δ_t and Δ_o for the same metal ion and ligands.

(Turn Over)

(2)

- (c) The first transition series comprises of elements from — to —.
- (d) The unit of magnetic moment is —.
- (e) What is the oxidation state of Cr in CrO_3 ?
- (f) Name the element of Lanthanide which is radioactive.
- (g) Name the metal present in chlorophyll of green pigment.
- (h) Carbonic anhydrase contains — metal element.

GROUP—B

Answer any *eight* : 1.5×8

2. (a) Give two postulates of Werner's co-ordination theory.

(Continued)

(3)

- (b) Find the number of unpaired electrons present in Fe^{3+} ion in octahedral weak field.
- (c) What is Linkage isomerism? Give an example.
- (d) Explain why Cu^{2+} compounds are coloured.
- (e) Why Hg-Hg bond is stronger than Cd-Cd bond?
- (f) Why +3 oxidation state is more common for Lanthanides compounds in solid state?
- (g) Explain the working of Na^+/K^+ pump.
- (h) What do you mean by chelate therapy? Give an example.
- (i) Why Gd and Lu exhibit only +3 oxidation state?
- (j) How is VOCl_2 obtained from VOCl_3 ?

(4)

GROUP—C

Answer any eight :

2 × 8

3. (a) Why Ti(IV) compounds are colourless ? Write its magnetic character.
- (b) Write the difference between double salt and complex salt.
- (c) Calculate EAN of the central metal in $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$ and $\text{K}_4[\text{Fe}(\text{CN})_6]$.
35 *36*
- (d) How emf values determine stability of various oxidation state ?
- (e) Why FeI_3 is not formed ?
- (f) Why V_4S^{3-} ion has strong purple colour ? — *charged lone pairs*
- (g) Explain why transition metals form complex easily ?
- (h) Explain briefly the role of metal ions in biological systems.

*12
+ 29
36*

(5)

- (i) What are reasons for toxicity of Hg ?
- (j) Write a short note 'Heme'.

GROUP—D

4. What are the factors that affect the magnitude of CFSE ? Briefly discuss. 6

Or

Discuss molecular orbital theory of tetrahedral co-ordination compounds.

5. What is Latimer diagram ? Write its applications. 6

Or

Explain the following properties of transition metals : 2 × 3

- (i) Variable oxidation state
- (ii) Formation of coloured compounds
- (iii) Catalytic property

*12
+ 29
36*

*12
+ 29
36*

*12
+ 29
36*

(6)

6. Describe the chemistry of +2 oxidation state of Cobalt.

6

Or

Discuss the following properties of Lanthanides :

3 × 2

(i) Lanthanide contraction

(ii) Magnetic properties

7. Discuss the chemistry of carbonic anhydrase and carboxy peptidase.

6

Or

Describe the chemistry of Myoglobin with its applications.

Total Pages : 6

IV-CC— Chem-IX

2023

CHEMISTRY

Paper-C-IX

Full Marks : 60

Time : 3 hours

Answer **all** questions.

The figures in the right-hand margin indicate marks.

GROUP—A

Answer *all* questions :

1 × 8

1. (a) Gabriel phthalimide synthesis is used for the preparation of ———.
- (b) Which amine will respond carbylamine reaction ?
- (c) An aqueous solution benzene diazonium chloride on heating gives ———.

(Turn Over)

(2)

(d) Furan reacts with ammonia in presence of alumina at 400 °C gives _____.

(e) Anthracene undergoes electrophillic substitution reaction preferably at _____ position.

(f) _____ acts as a reservoir for protein synthesis.

(g) Pyridine is _____ basic than pyrrole.

(h) Write the structure of Nicotine.

GROUP—B

Answer any eight : 1.5 × 8

2. (a) Convert Benzene to Aniline.

(b) Explain why trimethyl amine weaker base than methyl amine?

(c) What happens when Aniline reacts with Bromine in aqueous medium? Give equation.

(3)

(d) Convert Nitrobenzene to meta-bromochlorobenzene through benzene diazonium chloride as an intermediate.

(e) What happen when α -Terpineol is treated with cone H_2SO_4 ?

(f) How can you synthesis anthracene from Benzene?

(g) How can you convert furfural to furoic acid?

(h) What is diazonium coupling reaction? Give an example.

(i) What do you mean by monocyclic terpenoids?

(j) What are alkaloids? Write their major sources.

GROUP—C

Answer any eight : 2 × 8

(4)

3. (a) Explain Nucleophilic substitution in 2,4-dinitrochlorobenzene is easier than chlorobenzene.

(b) Write a note on Hoffmann bromamide reaction.

(c) What do you know about Cope elimination reaction?

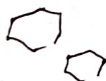
(d) How do you convert benzene diazonium chloride to Iodobenzene?

(e) What happens when furfural is subjected to Cannizzaro's reaction? Write equation.

(f) How can you estimate methoxy group in an alkaloid?

(g) What is Fischer-Indole synthesis? Write equation.

(h) What happens when Pyridine undergoes reduction with HI?



(5)

(i) What is Isoprene rule? Explain with suitable example.

(j) Explain the cause of stability of Bicyclic monoterpenoids.

GROUP-D

6 × 4

4. Discuss the reduction of Nitrobenzene in (a) Acidic, (b) Alkaline, (c) Neutral medium.

2+2+2

Or

Discuss the effect of substituent and solvent on basicity of amines.

5. Elucidate the structure of Naphthalene.

6

Or

Discuss the mechanism of diazotisation reaction. How do you synthesize phenol from benzene diazonium chloride.

(6)

6. Elucidate the structure of Pyridine and confirm it by synthesis. 6

Or

Describe the chemical properties of furan.

7. Elucidate the structure of Hygrine. 6

Or

How will you detect the followings in an alkaloid ? 3+3

(i) Presence of unsaturation

(ii) Presence of phenolic group

Hist

Total Pages : 7

IV-CC- Chem-X

2023

CHEMISTRY

Paper-C-X

Full Marks : 60

Time : 3 hours

Answer **all** questions.

The figures in the right-hand margin indicate marks.

GROUP—A

Answer *all* questions : 1×8

1. (a) Write the unit of molar conductivity.

(b) ^{m², ghm⁻¹, gm⁻¹}
If the equivalent conductance of NaOH solution is $0.2 \times 10^3 \text{ ohm}^{-1} \cdot \text{cm}^2 (\text{gmeq})^{-1}$, then what is its molar conductance.

$0.2 \times 10^3 \text{ ohm}^{-1} \cdot \text{cm}^2 \cdot \text{gm}^{-1}$

(Turn Over)

(2)

- (c) Electrophoretic effect tends to decrease the mobilities of ions in solution.
- (d) What is the effect of temperature on ionic product of water? increase
- (e) The charge of the anode in Galvanic cell is -ve
- (f) Calculate the pH of 1N HCl solution. (0)
- (g) Measure of the electrical intensity due to presence of ions in the solution is known as ionic strength
- (h) The variation of polarisation with temperature is given by Mossotti equation.

GROUP—B

Answer any eight : 1.5×8

2. (a) How are specific and equivalent conductance of a solution related with each other.

(3)

- (b) Write two functions of salt bridge.
- (c) Justify that the aqueous solution of CH_3COONa is alkaline.
- (d) What happens the transport number of an ion on increasing temperature?
- (e) Write the relationship between electrochemical equivalent (z) and chemical equivalent (E).
- (f) Explain the term 'ionic mobility'.
- (g) If the oxidation potential of an electrode is +0.76 volt, then what is its reduction potential.
- (h) What is conductivity of water? What is its use?
- (i) What is reversible electrode?
- (j) What is molar polarisation?

(4)

GROUP—C

Answer any *eight* :

2 × 8

3. (a) Write down the limitations of Arrhenius theory of electrolytic dissociation.
- (b) Explain why the specific conductance of an electrolyte decreases with dilution but molar conductance increases with dilution.
- (c) Explain the titration curve of strong acid with weak base.
- (d) How degree of dissociation of a weak electrolyte is measured from conductance value ?
- (e) Write a note on single electrode potential.
- (f) Derive the relationship between free energy and electrical energy.

(5)

- (g) Explain the term induced polarisation and orientation polarisation.
- (h) What is liquid junction potential ?
- (i) Write the difference between electromotive force (EMF) and potential difference.
- (j) What do you mean by di-electric constant of a substance ?

GROUP—D

4. Give an account of Debye-Huckel theory of strong electrolytes. Explain about asymmetric and electrophoretic effects. 6

Or

Write short notes on :

3+3

- (i) Wien effect
- (ii) Walden's rules

(6)

5. Describe Hittorf's method for determination of transport number of Ag^+ ion in AgNO_3 by using platinum electrodes. 6

Or

Illustrate how the solubility of a sparingly soluble salt can be determined with the help of conductance measurement.

6. Derive Nernst equation for the determination of cell potential at any concentration of an electrolyte. 6

Or

How pH of an unknown solution is measured by using calomel electrode?

7. Derive an expression for the EMF of a concentration cell without transference. 6

Or

(7)

Define dipole moment. How is it determined by refraction method?

2023

CHEMISTRY

Paper- CC -XI

(Organic Chemistry)

Full Marks : 60

Time : 3 hours

Answer from **all** the Groups as directed.

*The figures in the right-hand margin
indicate marks.*

*Candidates are required to give their answers
in their own words as far as practicable.*

GROUP—A

1. Answer *all* questions.

1 × 8

(a) What is the range of UV spectroscopy?

(Turn Over)

(2)

- (b) According to Woodward - Fieser rule, what is the basic value of α , β -unsaturated ketone.
- (c) The total number of normal modes of vibration of a linear molecule consisting of N atoms is given by _____.
- (d) The unit of force constant in CGS unit is _____.
- (e) How many NMR signals are formed for 1, 2 - dichloropropane ?
- (f) McLafferty rearrangement ion peak in mass spectrum is usually the basic peak for _____ (aldehydes / ketone/ acids)
- (g) Write the energy order of different electronic transitions.
- (h) Fructose is _____ (Aldose/ ketose)

(3)

GROUP—B

1.5 × 8

2. Answer any eight.

- (a) Hypsochromic shift (Blue shift) is caused by _____ of conjugation.
- (b) Write the SI unit of molar absorption co-efficient.
- (c) What happens to the excited molecule when radiation is cut off ?
- (d) How hydrogen bonding change the position of absorption in the IR spectroscopy ?
- (e) What is absorbance ?
- (f) What do you mean by overtones ?
- (g) What is the type of ions produced in mass spectrometer ?
- (h) Define the term Precessional frequency.

(4)

- (i) Explain epimers with example.
- (j) Give two examples of disaccharides.

GROUP—C

3. Answer any eight.

2 × 8

(a) Why the methanol a good solvent for UV but not for IR spectroscopy.

(b) Calculate λ_{\max} of the following compound.



(c) How will you distinguish between $\text{CH}_3\text{-CH}_2\text{-CHO}$ and CH_3COCH_3 by IR spectroscopy.

(d) Predict the number of fundamental vibrational modes in the following molecules

(5)

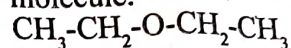
(i) H_2S

(ii) C_2H_2

(e) Give any two important application of IR spectroscopy.

(f) How many NMR signals are formed in n-propyl alcohol and Isopropyl alcohol.

(g) Write the multiplicity of the signals in NMR spectrum of the following molecule.



(h) Explain spin-spin coupling.

(i) Predict the mass spectra of n-butane.

(j) Fructose contains a keto group but still it gives silver mirror test with Tollen's reagent. Explain.

(6)

GROUP—D

4. Explain Beer-Lambert's law. Write it's limitations. 6

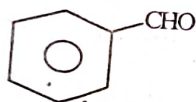
Or

Explain bathochromic and hypsochromic shift with examples.

5. Distinguish between the following pair of compounds on basis of IR spectroscopy. 3+3

(i) $\text{CH}_3\text{-CH}_2\text{-OH}$ and $\text{CH}_3\text{-CH}_2\text{-CHO}$

(ii) $\text{CH}_3\text{-CH}_2\text{-CHO}$ and



Or

Write short notes on:

3+3

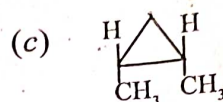
- (i) Fundamental vibration
(ii) Fermi Resonance

(7)

6. Explain NMR spectra of the following: 2×3

(a) Ethyl bromide

(b) 1, 3 - dichloropropane



Or

Discuss the Basic principle of Mass spectroscopy.

3×2

7. Write short note on:

(a) Ruff's degradation

(b) Killani Fischer synthesis

Or

Discuss the Open chain structure of D-fructose.

2023

CHEMISTRY

Paper- CC -XII

(*Physical Chemistry*)

Full Marks : 60

Time : 3 hours

Answer from **all** the Groups as directed.

*The figures in the right-hand margin
indicate marks.*

*Candidates are required to give their answers
in their own words as far as practicable.*

GROUP—A

1. Answer *all* questions.

1 × 8

(a) When a wave function is single valued
and continuous it is known as _____.

(*Turn Over*)

(2)

- (b) Give an example of commutative property.
- (c) What is the bond order of O_2 ion?
- (d) The number of vibrational degree of freedom of CO_2 molecule is _____.
- (e) Radiation scattered with same frequency that of incident beam is called _____.
- (f) The light of a firefly is an example of _____.
- (g) The free energy change in photo-chemical reaction is _____.
- (h) The magnetic behaviour of excited triple state is _____.

GROUP—B

2. Answer any *eight*.

1.5×8

(3)

- (a) What is the energy of an electron in electron volt (ev) present in 3rd shell of hydrogen atom.
- (b) Verify the commutator identity
$$[\hat{A}, \hat{B}] = [-\hat{B}, \hat{A}]$$
- (c) Arrange the bond length in ascending order of C-C, C=C and C \equiv C.
- (d) Write the relationship between energy and wave number of electromagnetic radiation.
- (e) Give the expression for rotational energy for a diatomic molecule (rigid rotor).
- (f) Define degree of freedom.
- (g) The mass of hydrogen atom is what 1.6×10^{-27} kg is the reduced mass of H_2 molecule.
- (h) What is force constant? Write its unit.

(4)

- (i) Define Quantum yield.
(j) What is photosensitised reaction ?

GROUP—C

3. Answer any *eight*. 2 × 8

(a) Show that the energy of a free particle is not quantised.

(b) Explain orthogonal wave function & normalised wave function.

(c) Write the significance of ψ and ψ^2 .

(d) Justify BF_3 and CO_2 molecules are non polar.

(e) What is morse potential ?

(f) Find out the order of stability for O_2 , O_2^- , O_2^+ & O_2^{2-} species.

(g) Explain siglet and triplet states.

(h) Explain the rules of mutual exclusion.

(i) What is HOT-BAND ?

(5)

- (j) Discuss Stanr-Einstein's law of equivalence.

GROUP—D

4. Write the various postulates of quantum mechanics with explanation. 6

Or

Derive Schrodinger's wave equation in a particle of three dimensional box.

5. Give the postulates of VBT and discuss in details the energy changes during the formation of H_2 molecule. 6

Or

Draw the MOT energy diagram of CO and H_2O molecules.

6. Discuss selection rules, spectral intensities and isotopic effect of non-rigid rotor. 6

Or

What do you understand by anharmonic vibrations? Write the general equation for vibrational energy of an anharmonic oscillator.

7. Discuss Rayleigh, Stokes and Anti-Stokes line in Raman spectroscopy.

6

Or

What is radiative and non-radiative process? Explain Jablonski diagram.

Total Number of Pages—8

VI-CC—Chem-13

2024

CHEMISTRY

(Inorganic Chemistry-IV)

Paper — CC-CHEM-13

Full Marks : 60

Time : 3 hours

Answer **all** questions

The figures in the right-hand margin indicate marks

GROUP — A

1. Answer *all* questions :

1 × 8

(a) What is the hapticity of ligand benzene in organometallic compound dibenzene chromium ?

(Turn Over)

(2)

- (b) Write two examples of mononuclear carbonyl compounds.
- (c) What is the co-ordination number of C-atom in tetrameric methyl-lithium?
- (d) The total number of electrons donated by two C_5H_5 rings in ferrocene are _____.
- (e) What is Wilkinson's catalyst?
- (f) The composition of water gas is _____.
- (g) The complexes in which ligand displacement by other ligands is rapid within mixing time are called _____ complexes.
- (h) When cobaltamine undergoes base hydrolysis it exhibits _____ order kinetics.

(Continued)

(3)

GROUP — B

2. Answer any *eight* questions :

$1\frac{1}{2} \times 8$

- (a) What do you mean by π -acid ligand? Give an example.
- (b) What is Zeise salt? Give its chemical formula.
- (c) Calculate the Effective Atomic Number of the complex $[V(CO)_6]$ and $[Cr(CO)_6]$.
- (d) What is composition of Ziegler-Natta catalyst?
- (e) Write one laboratory method of preparation of Grignard Reagent.
- (f) Write about Heterogeneous hydrogenation with a suitable example.
- (g) What is the precipitating agent of cations

VI-CC—Chem-13

(Turn Over)

(4)

of first group of qualitative analysis ? Write the cations present in this group.

(h) The solubility of Ag_2S is 2.0×10^{-2} moles/litre. Find out its solubility product const. (K_{sp}).

(i) Write the condition of trans effect.

(j) What is the effect of strength of M-L (Metal-Ligand) bond in octahedral complexes, on the rate of reaction for anation.

GROUP - C

3. Answer any *eight* questions : 2×8

(a) What is 18-electron rule ? Give one example.

(b) Explain why metal complexes with organic ligand $\text{C}_5\text{H}_5\text{N}$ is not treated as organo-metallic compound.

(5)

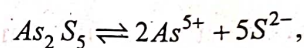
(c) Predict the molecular formula of the carbonyls of Fe with the help of EAN Rule. It is provided that oxidation state of Fe is zero in this carbonyl.

(d) Write notes on Mannich condensation.

(e) Trialkyl aluminium exists as a dimer, Explain.

(f) What is Hydroformylation ? Give its uses.

(g) For a particular reaction



Find out the relation between solubility product constant (K_{sp}) and solubility(S).

(h) Write the group reagent used in precipitating Gr-II cations in common qualitative analysis. Write the mechanism behind it.

(i) What do you mean by kinetic stability and thermodynamic stability ?

(6)

- (i) Write how ligand field effects the rate of reaction.

GROUP – D

Answer all of the following questions : 6×4

4. (a) Discuss briefly about molecular orbital diagram for CO molecule and calculate its bond order. 6

Or

- (b) Discuss about the general methods of preparation of metal carbonyls in 3d series by direct combination and reductive carbonylation methods. 6

5. (a) Describe any two methods of preparation of Ferrocene. What happens when Ferrocene undergoes acetylation and alkylation. 6

(7)

Or

- (b) Discuss and explain the various structural features of methyl lithium. 6

6. (a) Write notes on the following : 3×2

(i) Homogeneous Hydrogenation of Alkenes.

(ii) Wacker process.

Or

- (b) Discuss the applications of solubility product constant and common ion effect. 6

7. (a) Discuss the various factors that influence the formation or stability of complexes. 6

Or

(b) Discuss and explain the trans-influence in square planar complexes.

6

Total Number of Pages—7

VI-CC—Chem-14

2024

CHEMISTRY

(Organic Chemistry-V)

Paper — CC-CHEM-14

Full Marks : 60

Time : 3 hours

Answer all questions

The figures in the right-hand margin indicate marks

GROUP — A

1. Answer *all* questions :

1 × 8

- (a) The pH at which there is not net migration of amino acid under the influence of applied field is called _____.

(Turn Over)

(2)

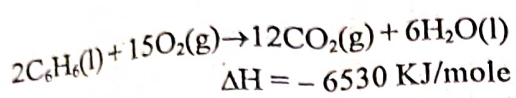
- (b) Name the condensation products formed by the reaction of two or more amino acid molecules.
- (c) Name the enzyme which can breakup sucrose into glucose and fructose.
- (d) The pyrimidine base _____ which is found only in RNA and not in DNA.
- (e) Write the name of products obtained when simple lipids undergoes alkali hydrolysis.
- (f) Among the fuels Petrol, Hydrogen, Kerosine and CNG, _____ has highest calorific value.
- (g) Write two examples of analgesics drugs.
- (h) The groups which help in the deepening of the colour is called _____.

(3)

GROUP - B

2. Answer any *eight* questions : $1\frac{1}{2} \times 8$
- (a) Write two examples of essential amino acids.
 - (b) What is Peptide Bond ? Show in diagram.
 - (c) Write two examples of denatured protein.
 - (d) What do you mean by enzyme inhibitors ?
 - (e) Write the structure and molecular formula of 2-Deoxy Ribose.
 - (f) Define Iodine value or Iodine number.
 - (g) What do you mean by oil and fats ?
 - (h) Calculate the calorific value of Benzene as per to the following thermochemical equation

(4)



- (i) What do you mean by antimalarials? Give an examples.
- (j) What is chromophore? Give two examples of it.

GROUP - C

3. Answer any *eight* questions : 2×8

- (a) Write about the acid-Base behaviour of Amino acids.
- (b) What do you mean by electrophoresis?
- (c) What are the different kind of bonding is responsible for the tertiary structure of proteins?
- (d) Distinguish between DNA and RNA.

(5)

group

- (e) What is the effect of temperature on enzymes?
- (f) What is Hydrogenation or hardening of oils? Give an example.
- (g) Three moles of Alc.KOH is required to saponify completely an oil of molecular mass 638 a.m.u. calculate the saponification value of that oil. [mol. mass of KOH = 56].

- (h) Write two important functions of metabolism.
- (i) What are antibiotics? Give two examples.
- (j) What is Vatdyes? Give an example.

GROUP - D

Answer all of the following questions : 6×4

(6)

4. (a) Discuss how the amino acids are synthesised by the following methods 3×2

(i) Strecker synthesis

(ii) Gabriel synthesis.

Or

- (b) Discuss about primary and secondary structures of proteins. 6

5. (a) Describe the important characteristics of enzymes. 6

Or

- (b) What do you mean by Nucleosides and Nucleotides? Give one example in each case with structure. 6

6. (a) What do you mean by Rancidity of oil and fats? Discuss on Different types of Rancidity. 6

(7)

Or

- (b) Discuss briefly about metabolic pathways of proteins. 6

7. (a) Discuss isolation, synthesis and uses of antibiotic chloroamphenicol. 6

Or

- (b) What is Phthalein dyes? Discuss the synthesis of Phenolphthalein and Fluorescein. 6

2023

CHEMISTRY

Paper- DSE-I

(Polymer Chemistry)

Full Marks : 60

Time : 3 hours

Answer from **all** the Groups as directed.

*The figures in the right-hand margin
indicate marks.*

*Candidates are required to give their answers
in their own words as far as practicable.*

GROUP—A

1. Answer *all* questions.

1 × 8

(a) Zeigler-Natta catalyst is _____.

(Turn Over)

(2)

- (b) Structural units of high polymers are called _____.
- (c) Give an example of initiator for the radical chain polymerisation.
- (d) What is the formula to get \bar{M}_n ?
- (e) What is the relationship between T_g and T_m for symmetrical polymers.
- (f) High molecular weight polymers show _____ crystalline melting point.
- (g) Nylon-6 can be obtained by self condensation of _____ monomers.
- (h) What are the monomers of Bakelite?

GROUP—B

2. Answer any *eight*. 1.5 × 8

- (a) What is functionality? Give an example.

(3)

- (b) Write the basic difference between HDPE and LDPE.
- (c) What is glassy state of a polymer?
- (d) How molecular weight affects mechanical properties of polymers?
- (e) Define polydispersity index.
- (f) Define relative viscosity.
- (g) Name any two factors which affects glass transition temperature.
- (h) Between \bar{M}_n and \bar{M}_w , which has higher molecular weight and why?
- (i) Write two applications of Teflon.
- (j) How polyvinyl acetate can be prepared?

(4)

GROUP—C

3. Answer any *eight*.

2 × 8

- (a) What is elastomer ? Give an example.
- (b) Write the difference between thermo-setting and thermoplastic polymers.
- (c) Write the factors which influence the solubility of polymers.
- (d) Explain why the step polymerisation is a slow process than addition polymerisation.
- (e) Write notes on co-ordination polymers.
- (f) Calculate the extent of reaction when two moles of glycerol react with three moles of pythallic anhydride.
- (g) What are the biodegradable polymers?
✓ Give two examples.

(5)

(h) Find functionality of Benzene and phenol.

(i) Write the monomers of BUNA-S-rubber and PAN.

(j) Write the equation of Flory-Huggins theory of polymer solution.

GROUP—D

4. Write short notes on :

6 × 4

- (i) Molecular forus and chemical bonding in polymers
- (ii) Poly functional system in polymers 3+3

Or

Discuss the classification of polymers on the basis of mechanism of polymers. 6

5. Write the mechanism and kinetics of condensation polymerisation.

(6)

Or

How crystalline melting point and degree of crystallinity can be determined.

6. Discuss Osmometry method for the determination of molecular weight of high polymers.

Or

Briefly describe the factors that affect T_g of a polymer.

7. Discuss the preparation, properties and uses of polystyrene and PVC.

Or

Discuss the preparation, properties and uses of Teflon and Nylon 6, 6.

Total Pages : 6

V-DSE-Chem-II

2023

CHEMISTRY

Paper- DSE-II

(Green Chemistry)

Full Marks : 60

Time : 3 hours

Answer **all** questions.

*The figures in the right-hand margin
indicate marks.*

*Candidates are required to give their answers
in their own words as far as practicable.*

GROUP—A

1. Answer *all* questions:

1 × 8

(a) Who is the father of Green chemistry ?

(Turn Over)

(2)

- (b) _____ are called designer solvents.
- (c) Name the Green reagent used for methylation reaction.
- (d) _____ is a versatile photocatalyst and powerful oxidant for air pollutants.
- (e) Michael-Addition reaction can be carried out in the presence of which green solvent.
- (f) What is the range of atom economy obtained by green synthesis?
- (g) TBTO is used as an _____ agent.
- (h) Name the gas released during Bhopal gas tragedy.

GROUP—B

2. Answer any *eight*.

1.5 × 8

- (a) What are the limitations of bio-catalyst?

(3)

- (b) Name the chemical used in conventional method in green chemistry.
- (c) Name the applications of ultra sound assisted reactions.
- (d) What are renewable and non-renewable sources?
- (e) Write the chemical equation of esterification.
- (f) What is fluorous biphasic system?
- (g) Diel-Alder reaction is a chemical between _____ and _____.
- (h) Write the structural formula of Adipic acid.
- (i) What is sustainable development?
- (j) What is closed loop recycling?

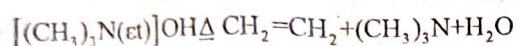
(4)

GROUP—C

3. Answer any *eight*. 2 × 8

(a) Write any two uses of super critical fluid water.

(b) Calculate % atom economy in the following reaction.



(c) What do you mean by safer solvents? Give an example.

(d) Explain the usefulness of Biomass.

(e) Describe the green synthesis of adipic acid from glucose.

(f) Explain the green synthesis of Urethane.

(g) State sonochemical effects observed during chemical reaction.

(5)

(h) Explain Hofmann elimination reaction.

(i) How PVC can be synthesized?

(j) What is reducing agent? Give an example.

GROUP—D

4. Discuss the objectives and principles of Green Chemistry. 6

Or

(a) Describe the use of super critical CO_2 as a solvent. 3

(b) Comment on water as a reaction solvent. 3

5. Explain substitution and addition reaction using ultrasound technique with suitable example. 6

Or

Write short notes on:

3+3

(6)

- (i) Bhopal gas Tragedy
- (ii) Flixborough accident

6. Describe the green synthesis of: 3+3

- (i) Ibuprofen
- (ii) Catechol

Or

Explain the following reactions using ultrasound assisted technique: 3+3

- (i) Simmons-Smith reaction
- (ii) Saponification

7. What are biodiesel ? What are the sources of biodiesel ? Write it's merits. 6

Or

- (a) Discuss the synthesis of Natural polylactic acid from corn. 4
- (b) What is antifoulant ? 2

2024

CHEMISTRY

Paper — DSE-CHEM-3

Full Marks : 60

Time : 3 hours

Answer all questions

The figures in the right-hand margin indicate marks

GROUP — A

1. Answer *all* questions : 1 × 8

(a) Bosch process is used in the industrial preparation of _____ gas.

(b) The chemical composition of hypo is _____.

(Turn Over)

(2)

- (c) Name the region of earth's atmosphere where ozone layer exists.
- (d) Name any two primary air pollutants.
- (e) Write the name of purification process by which sea water is desalinated.
- (f) What is aeration ?
- (g) The process of producing energy by utilizing heat trapped inside the earth surface is called _____.
- (h) Name the type of reaction takes place in Sun.

GROUP - B

2. Answer any *eight* questions : $1\frac{1}{2} \times 8$

- (a) Name the products obtained when brine solution undergo electrolysis.

(3)

- (b) What do you mean by doping ?
- (c) Write two uses of Sulphuric Acid.
- (d) What is Smog ? Write the types of Smog.
- (e) Define ecosystem.
- (f) Write two types of fresh water pollution.
- (g) What is thermal pollution ?
- (h) What do you mean by hydrological cycle ?
- (i) What is tidal energy ?
- (j) What is Non-conventional (Renewable) energy source ? Give two example of it.

(4)

GROUP - C

3. Answer any *eight* questions : 2×8

- (a) What is synthetic gas ? Give its composition.
- (b) Distinguish between Cast Iron and Wrought Iron.
- (c) What do you mean by P-type semiconductor ? What does 'P' stand for in semiconductor ?
- (d) What is Green house effect ?
- (e) What do you mean by Ozone layer depletion ?
- (f) What is dechlorination ? Explain.
- (g) What are the advantages of Ozone as water purifier ?

(5)

(h) What do you mean by water quality parameters ?

(i) Write notes on Solar Photovoltaic Cell.

(j) What is the principle behind Atom Bomb and Hydrogen Bomb.

GROUP - D

Answer *all* of the following questions : 6×4

4. (a) Discuss the preparation, uses, storage and hazards in handling Acetylene gas. 6

Or

(b) Write one method of preparation of $K_2Cr_2O_7$ and $KMnO_4$. Give their uses. 6

5. (a) What is Air Pollution ? Discuss briefly about different types of air pollutants in the Atmosphere. 6

(6)

Or

(b) Describe any three different procedures to control the various polluting gases. 6

6. (a) Discuss briefly about different techniques for measuring water pollution. 6

Or

(b) Write notes on the following : 3 × 2

(i) Sludge Disposal

(ii) Sewage Disposal

7. (a) What is Natural Gas ? Discuss its advantages and disadvantages of Natural gas as concerned to source of energy. 6

(7)

Or

(b) Describe the disposal and management of Radioactive Waste. 6