

- (ii) Why ferromagnetism is not found in liquids and gases?
 (iii) Why an ordinary iron piece does not behave as a magnet?
 (iv) State the Gauss's law in magnetism.
 (v) Is the source of magnetic field is analogous to the source of electric field?

- (vii) State the condition under which the equation $\nabla \times \vec{B} = \mu_0 \vec{J}$ is valid. $\rightarrow \quad \rightarrow \quad \rightarrow$
 $1 \times 6 = 6$

CHEMISTRY Paper-V

(Inorganic Chemistry-B)

Max. Marks : 22

Time : 3 Hours

- Note:** (i) Attempt *five* questions in all, selecting *one* question from each Unit.
 (ii) Unit-V is compulsory.
 (iii) Be brief and specific in your answer.

Unit-I

1. (a) Define and draw Tetrahedral and Octahedral voids. What are their sizes? How many of it are associated with each constituents particle in a closed packed structure?
 (b) Show that there are four NaCl formula units in a unit cell of sodium chloride. 2,2
2. (a) Show that changing size of cation or anion, co-ordination number also changes.
 (b) What are the consequences of Shottky defects?
 (c) What is basic difference in *n*-type and *p*-type semiconductor? 2,1,1

Unit-II

3. Give reasons to explain:

- (i) Which have high B.P. – H₂O or H₂S?
- (ii) Which have high B.P. – Kr or Ar?
- (iii) Which have high M.P. – HgCl₂ or CaCl₂?
- (iv) Covalent or Ionic bonding is not possible in metals. 1,1,1,1

4. (a) Draw BORN-HABER cycle to calculate proton Affinity for Ammonia in the formation of $\text{NH}_4\text{Cl}(s)$.
 (b) Is covalent character possible in Ionic compounds? Explain polarization and polarizability giving example. 22

Unit – III

5. (a) While moving down the group in periodic table size increases but aluminium (143 pm) has larger size as compared to Gallium (135 pm), why?
 (b) Show various product while H_3BO_3 is heated at different temperature.
 (c) Draw structure of Borazine. Why it is called inorganic benzene?
 (d) Draw bonding in B_2H_6 , showing important parameters. 1,1,1,1
6. (a) How many pentagonal and hexagonal faces are therein C_{60} fullerene?
 (b) How CaC_2 and Al_4C_3 differs?
 (c) Lewis acid character of BF_3 is very low, why?
 (d) CCl_4 cannot be hydrolysed but SiCl_4 can be easily hydrolysed, why? 1,1,1,1

Unit – IV

7. (a) What is the structure of PCl_5 in solid and vapour state?
 (b) Why H_2SO_4 act as oxidising agent? Give an example to show its oxidising character.
 (c) Give an example of oxide of N, which have/is :
 (i) blue solid
 (ii) laughing gas
 (iii) N have +2 oxidation state
 (iv) paramagnetic character 1,1,2
8. (a) Complete the reactions :
 (i) $\text{P}_4\text{O}_6 + \text{H}_2\text{O} (\text{hot}) \rightarrow$
 (ii) $\text{P}_2\text{O}_5 + \text{H}_2\text{O} (\text{cold}) \rightarrow$
 (b) Why reactivity of interhalogen compounds is more as compared to parent halogens?
 (c) I_3^- exists but F_3^- not exists, why?
 (d) Bond angle in OF_2 is smaller than Cl_2O , why? 1,1,1,1

Unit – V

9. (a) How many particles are there in FCC Unit cell?
 (b) Give an example which shows both Schottky and Frankel defects.
 (c) Boric acid is not a protonic acid, how?
 (d) Give structure of S_4N_4 .
 (e) What is oxidation state of nitrogen in hydrozoic acid HN_3 ?
 (f) Arrange in order of increasing acidic strength :
 $\text{HClO}_3, \text{HClO}_2, \text{HClO}, \text{HClO}_4$ 1×6=6

CHEMISTRY Paper-VI
(Organic Chemistry-B)

31

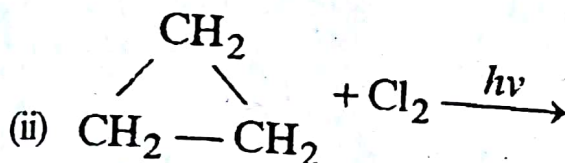
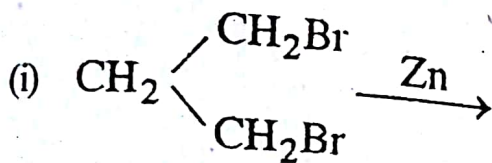
Time : 3 Hours

Note: Attempt *four* questions in all, selecting *one* question from each Unit.
Question No. 9 is compulsory. All questions carry equal marks.

Max. Marks : 22

Unit-I

1. (a) Justify that the order of relative reactivities of halogenation of alkanes is $F_2 > Cl_2 > Br_2 > I_2$.
(b) Complete the following reactions :



22

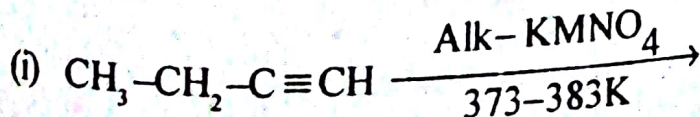
2. (a) How do you prepare cycloalkanes by Dehalogenation of dihalides and Simmon's S-mith reaction?
(b) Give mechanism of Corey - House method and Freud's method.

Unit-II

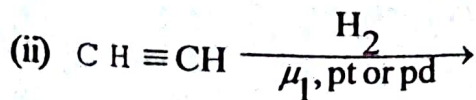
3. (i) Discuss the mechanism of ozonide formation.
(ii) Why peroxide effect is shown only by HBr and not by HCl or HI?
22
4. (a) Give the mechanism of oxymercuration reduction.
(b) Discuss the mechanism of the alkylation of alkenes. 22

Unit-III

5. (a) Write and explain the free radical and nucleophilic addition to alkynes.
(b) How will you convert?
(i) Trans-2- butene into 2-butyne 22
(ii) 3-Hexyne into propanal
6. (a) Discuss the structure of acetylene and why acetylene shows acidic reactions. Explain.
(b) Complete the following reactions:



FILE NO.



22

Unit-IV

7. (a) Chlorobenzene gives *p*-nitrochlorobenzene when it reacts with $\text{HNO}_3/\text{H}_2\text{SO}_4$ although chlorine is electro withdrawing atom.

(b) What is Friedal-Craft reaction? Give its mechanism.

8. (a) Define the terms :

22

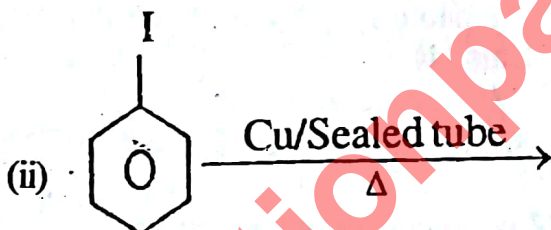
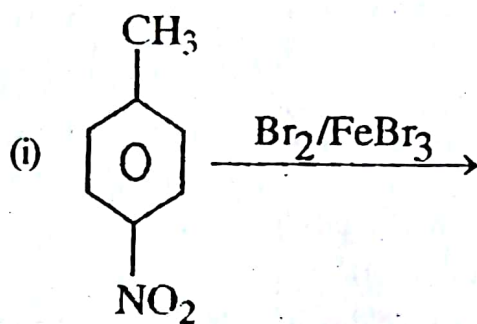
(i) Benzenoids

(ii) Non- Benzenoids aromatics

Give at least one example.

(b) Calculate the following reactions :

22



22

9. Compulsory Question :

(i) How many Sigma bonds are there in a molecule of (i) Ethane (ii) Ethene?

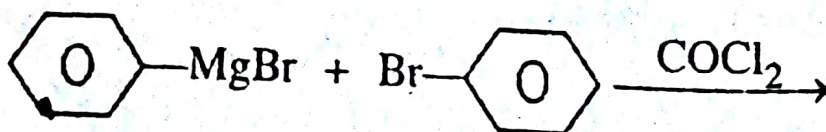
(ii) What is Markonikoff's rule?

(iii) What is Hydrogenation?

(iv) What is Birch reduction?

(v) What are different classes of dienes ? Given examples.

(vi) Complete the following reaction :



1x6=6

Time : 3 Hours

Note: Attempt five questions in all with one question each from Section-A to D and Section-E is compulsory.

Max. Marks : 22

Section - A

1. (a) Derive that for reversible adiabatic expansion of an ideal gas :
 $TV^{\gamma-1} = \text{constant}$ 2
- (b) Calculate the work done during isothermal expansion of one mole of an ideal gas from 10 atmospheres to 1 atmosphere at 27°C. 2
2. (a) Derive that Joule-Thomson coefficient is given by : 2

$$\mu = -\frac{1}{C_p} \left(\frac{\partial H}{\partial T} \right)_T$$

- (b) Two moles of hydrogen at S. T. P. are compressed adiabatically to a volume of 10 litres. Calculate the final pressure and temperature of the gas given that γ for hydrogen is 1.41 2

Section - B

3. (a) Show that the temperature dependence of heat of reaction is given by the relation :

$$\left(\frac{\partial \Delta H}{\partial T} \right)_P = \Delta C_p$$

Name the equation. 2

- (b) Define enthalpy of neutralization and explain why ΔH_{neu} of strong acid with strong base is constant and the value changes if one of them is weak. 2

4. (a) The bond dissociation energy of gaseous H_2 , Cl_2 , and HCl are 430 kJ/mole, 242 kJ/mole and 427 kJ/mole, respectively. Calculate ΔH_f for HCl gas 2
- (b) What is Hess's law of constant heat summation? What is the thermodynamic basis of Hess's law? 2

Section - C

5. (a) Explain the origin of electric charge on colloidal particles. 2
- (b) Write notes on : 2
- (i) Electrophoresis
- (ii) Dialysis
6. (a) Discuss applications of colloids in : 2
- (i) Smoke precipitation
- (ii) Sewage disposal

- (b) Give differences between lyophilic and lyophobic colloids. 1
(c) What are protective colloids? 1

Section– D

7. (a) Derive thermodynamically the relation $\Delta T_f = k_f \times m$ (m = molality of the solution). 2
(b) A 4 per cent solution of sucrose $C_{12}H_{22}O_{11}$ is isotonic with 3 per cent solutions of an unknown organic substance. Calculate the molecular mass of the unknown substance. 2
8. (a) How is Van't Hoff factor used for the determination of degree of dissociation or degree of association of a solute in the solution? 2
(b) What is the cause of elevation in boiling Pt. ? Explain clearly with the help of vapour- pressure temperature curve. 1
(c) Explain why equimolar solutions of NaCl and canesugar do not have the same osmotic pressure. 1

Section– E

(Compulsory Question)

9. (a) Define the term 'Peptisation'.
(b) What is 'collodion'?
(c) What do you mean by 'Inversion temperature'?
(d) Compare isothermal reversible expansion with adiabatic reversible expansion of an ideal gas.
(e) What are the advantages of Berkeley and Hartely's method over other methods of measuring osmotic pressure ?
(f) Define enthalpy of hydration. 6×1=6

BOTANY Paper-A

(Plant Diversity-II)

Time : 3 Hours

Max. Marks : 36

Note : (i) Attempt five questions in all.

(ii) Question No. 1 is compulsory.

(iii) Attempt four more questions selecting one from each Unit (Unit I, II, III, IV).

(iv) Draw well labelled diagrams wherever necessary.

1. Compulsory :

(A) Choose the correct option.

(i) Pyrenoids are found associated with chloroplasts of :

(a) *Anthoceros*

(b) *Funaria*