

(2½ Hours)

[Total Marks: 60]

Please check whether you have got the right question paper.

N.B. : 1. All question are compulsory.

2. Figures to the right indicate full marks.

- Q.1. a) Attempt any two of the following:-**
- i) Derive the wave function for the hybrid orbitals formed in methane molecule considering only sigma bonding. **04**
 - ii) Discuss the bonding in diborane on the basis of Molecular orbital approach. **04**
 - iii) Describe the effect of hydrogen bonding on properties of compounds with suitable examples. **04**
 - iv) What is Curie –Weiss Law for ferromagnetic and antiferromagnetic substances? **04**
- b) Attempt any one of the following:-**
- i) What is hydrogen bonding explain its importance and any one method of detection. **04**
 - ii) Write note on dipole attractions. **04**
- Q.2. a) Attempt any two of the following:-**
- i) Construct a character table for C_{3v} point group. **04**
 - ii) Discuss the application of group theory to explain the sigma and pi bonding in AB_4 molecule. **04**
 - iii) What are irreducible representations? State their characteristics. **04**
 - iv) Define sub group. Give the sub group for ammonia molecule. **04**
- b) Attempt any one of the following:-**
- i) Obtain matrix representation for reflection operation on the basis of group theory. **04**
 - ii) Explain Abelian and nonabelian point group with suitable example. **04**
- Q.3. a) Attempt any two of the following:-**
- i) Give the treatment and control measures for Lead poisoning. **04**
 - ii) How Oil is recovered from Oil Shales? Give the environmental impact of it. **04**
 - iii) Write a note on geothermal energy. **04**
 - iv) Explain the sources, toxic effects and treatment of Cadmium poisoning. **04**
- b) Attempt any one of the following:-**
- i) Explain biomethylation of Mercury and biochemical effects caused by it. **04**
 - ii) Discuss the hazardous effects of radiation pollution. **04**

- Q.4. a) Attempt any two of the following:-**
- i) Explain the reaction of oxygenation of hemocyanin and hemerythrin. **04**
 - ii) Explain the reactions catalysed by monooxygenase. **04**
 - iii) Discuss the catalytic reaction of conversion of atmospheric nitrogen to ammonia by the nitrogenase enzyme. **04**
 - iv) What are ionophores? Draw the structure of valinomycin and nonactin. **04**
- b) Attempt any one of the following:-**
- i) Describe the reactions catalysed by superoxide dismutase in biological system. **04**
 - ii) Explain the mechanism of the action of $\text{cis-[Pt(NH}_3)_2\text{Cl}_2]$ as an anti-cancer drug. **04**
- Q.5 Attempt any four of the following:-** **12**
- a) Explain bonding in triiodide with respect to molecular orbital approach.
 - b) Describe Faraday's method of determination of magnetic susceptibility.
 - c) Explain the symmetry restrictions on the dipole in a molecule.
 - d) Construct the group multiplication table for C_{2v} point group.
 - e) Explain "Lead poisoning is more dangerous to children than adults."
 - f) Write note on "Wind Power" as indirect source of energy.
 - g) Write note on "Hill equation with reference to haemoglobin"
 - h) Explain the composition and the role of ferritin in living system.