

[Time: 2½ Hours]

[Marks:60]

Please check whether you have got the right question paper.

- N.B:**
1. All questions are **compulsory**.
 2. Figures to the right indicate full marks.
 3. All question carry equal marks.

- Q.1 a)** Attempt any **two** of the following :- **08**
- i) Elaborate on solid electrolytes.
 - ii) Describe Hall Effect and its applications.
 - iii) What are ferroelectrics? Give their application.
 - iv) Explain the hopping conduction mechanism.
- b)** Attempt any **one** of the following :- **04**
- i) Give the inter relationship between piezoelectric and pyroelectric materials.
 - ii) Discuss thermocouple with example. What are its applications?
- Q.2 a)** Attempt any **two** of the following:- **08**
- i) Explain magnetic properties of Perovskites with suitable example.
 - ii) Describe the application of DTA in the study of thermal expansion of polymers.
 - iii) Elaborate on magnetic hysteresis loop.
 - iv) Discuss magnetic properties of Fe, MnO₂ and brass alloy.
- b)** Attempt any **one** of the following :- **04**
- i) Give short note on Magneto plumbites.
 - ii) Discuss the temperature dependence of heat capacity.
- Q.3 a)** Attempt any **two** of the following:- **08**
- i) On the basis of MO Theory, explain the bonding in dibenzene chromium.
 - ii) Discuss the sigma and pi-molecular orbital's formation in AB₂ molecules with suitable example.
 - iii) Explain the bond order and magnetic nature of BF₃ on the basis of MO Theory.
 - iv) Give short note on application of MO Theory in the structural elucidation of Inorganic compounds.
- b)** Attempt any **one** of the following :- **04**
- i) Describe the structure of ferrocene through MO Theory.
 - ii) Elaborate on application of MO Theory to HCl molecule.
- Q.4 a)** Attempt any **two** of the following:- **08**
- i) Explain the construction of energy level diagrams in different chemical environment.
 - ii) Give the advantages of LFT over CFT.
 - iii) Illustrate the correlation diagram for d² ion tetrahedral ligand field.
 - iv) Discuss the fundamental vibrational transitions in NH₃ molecule.

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b) Attempt any one of the following:-

- i) Describe the Bethe method of descending symmetry.
- ii) Explain with suitable example that IR and Raman spectra give complimentary informations.

04

Q.5 Attempt any four of the following :-

- (a) Thomson effect
- (b) Classify dielectrics with suitable examples.
- (c) Thermal stresses
- (d) Magnetic properties of Ilmenites
- (e) Bond order and magnetic nature of BeH₂ molecule.
- (f) Structure of B₂H₆⁻² ion
- (g) Hole formalism
- (h) Prove that $T_d = E_g + T_{2g}$.

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