Con. 1008-13. **CG-2289**

(2½ Hours) **[Total Marks : 60**

N.B. : (1) **All** questions are **compulsory**.
(2) **Figures** to the **right** indicate **full** marks.
(4) Use of **log tables**/non programmable **calculator** is allowed.

1. (a) Explain "inversion centre" and "identity" with suitable examples. 4

OR

(a) Define the terms "symmetry element" and "symmetry operation"with suitable examples. 4

Attempt any **two** of the following :–

(b) Explain the meaning of the following with suitable examples. (diagrams are expected) 4
(i) C_{2v} (ii) C_2h

(c) Identify the symmetry elements associated with HCl and H_2 molecules. Mention the point groups assigned to them. 4

(d) Draw a neat labelled molecular orbital diagram for BeH_2 molecule. Mention its structure, bond order and magnetic property. 4

(e) Draw a neat labelled molecular orbital diagram for H_2O molecule. Mention its molecular configuration and magnetic property. 4

2. (a) Define 'Atomic Packing Factor'(APF). Calculate the APF in case of simple cube. 4

OR

(a) Explain the structure of 'NaCl'. Explain whether it obeys radius ratio rule. 4

Attempt any **two** of the following :–

(b) Calculate the number of atoms in fcc unit cell. State the relationship between lattice constant 'a' and radius of an atom 'r' for fcc unit cell. 4

(c) Name the types in which solids are classified, on the basis of bonding. Explain any one of them in detail. 4

(d) Give an account of 'Fullerenes' and alkali metal fullerides. 4

(e) Give an account of applications of superconductors. 4

3. (a) Name the elements of second inner transition series. Give their electronic configuration. 4

OR

(b) Explain the following with reasons. 4
(i) Basicity of Lanthanon hydroxides, decreases from Lanthanum to Lutetium.
(ii) Post lanthanide elements have high densites.

Attempt any **two** of the following :–

(b) Discuss the oxidation states of lanthanides. 4

(c) Give an account of magnetic properties of lanthanides. 4

(d) Write a note on applications of lanthanides. 4

(e) Discuss in brief, extraction of Uranium by solvent extraction method. 4

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4. (a) What are polyatomic cations and polyatomic anions ? Give two examples of each. 4

OR

(a) Explain the redox reactions with reference to liquid ammonia and acetic acid as solvent. 4

Attempt any **two** of the following :–

(b) Discuss any two factors affecting the basicity of monoatomic anions. 4

(c) Explain the hydrolysis reactions of Cr^{3+} ion. 4

(d) Discuss the role of following factors while selecting a solvent as a medium for reaction. 4

(i) Dielectric constant (ii) Dipole moment

(e) Explain the following with suitable examples 4

(i) Acidic solvents (ii) Amphiprotic solvents

(iii) Basic solvents (iv) Non-ionizing solvents.

5. Attempt any **four** of the following :–

(a) Identify the mirror planes in Sulphur hexafluoride molecule with the help of diagrams. 3

(b) Give the importance of molecular symmetry in inorganic chemistry. 3

(c) Explain tetrahedral void with a neat diagram. 3

(d) Define superconductivity and transition temperature. 3

(e) TBP is selected as a suitable extractant for the separation of individual lanthanide ions. Give reasons. 3

(f) The absorption spectra of lanthanide ions are characterised by very sharp bands. Explain. 3

(g) How does monoatomic cation render acidity to solution ? 3

(h) Alkali metals in liquid ammonia are good reducing agents. Explain. 3
