

M.Sc. (Part—II) Semester—III (CBCS) Examination

CHEMISTRY (New)

(Inorganic Chemistry, Solid State Chemistry)

Paper—XII

Time : Three Hours]

[Maximum Marks : 80

Note :—(1) All questions are compulsory and carry equal marks.

(2) Use of Scientific calculator is allowed.

UNIT—I

1. (a) Discuss the radius ratio rule for determining the shapes of ionic crystals. 5
- (b) Draw the structure of zinc blende and Wurtzite and show that coordination around each type of ion in these structures. What is the basic difference in these two types of crystals ? 6
- (c) What are spinels ? Give their classification with examples. 5

OR

- (p) Discuss in detail, the close packing of identical solid spheres. What is meant by hcp and ccp ? 6
- (q) What is tolerance factor ? Explain its utility in the structural behaviour of ABO_3 type crystals. 5
- (r) Explain the crystal structure of Li_2O and Na_2O . 5

UNIT—II

2. (a) What do you mean by non-stoichiometric compounds ? Discuss the consequences of non-stoichiometric solids. 6
- (b) Explain the terms :
 - (i) Edge dislocation
 - (ii) Skrew dislocation. 5
- (c) Write brief explanatory note on colour centres in crystals. 5

OR

- (p) Discuss in detail the following types of defects in crystal :
 - (i) Frenkel defect
 - (ii) Schottky defect. 6
- (q) Explain the role of non-stoichiometry on the electrical conductivity of nickel oxides. 5
- (r) What are various surface imperfections ? Discuss the case of low angle grain boundary and the formation of stacking faults in FCC and HCP crystals. 5

UNIT—III

3. (a) Define and explain the following terms :
 - (i) Electronic polarizability
 - (ii) Ionic polarizability
 - (iii) Dipole polarizability. 6

- (b) How does the band theory of solids explain the classification of solids into conductor, semiconductor and insulator ? 5
- (c) Write brief note on super ionic conductors. 5

OR

- (p) Show with the help of Schematic band structure, position of fermi energy level in the case of intrinsic silicon at absolute zero temperature. Indicate how the position of fermi energy level changes when the donors and acceptors are added to solid silicon. 6
- (q) Explain in brief on symmetry classification of piezo, pyro and ferro electric materials. 5
- (r) Write brief note on photovoltaic cells and significance. 5

UNIT—IV

4. (a) Describe the classification of magnetic materials. 5
- (b) Explain Meissner effect, type-I and type-II superconductors. 6
- (c) Explain the applications of superconductivity. 5

OR

- (p) What do you understand by superconducting state ? Under what conditions one can achieve it. 5
- (q) Write brief note on domain theory of magnetic materials. 5
- (r) Explain in brief why zinc ferrite is antiferro-magnetic, while nickel ferrite is ferromagnetic. 6

UNIT—V

5. (a) Write brief note on Laser actions. 5
- (b) What do you understand by population inversion ? With the help of energy level diagram explain how population inversion is achieved to laser. 6
- (c) Explain principle, construction and working of ruby lasers. 5

OR

- (p) Discuss three level and four level laser systems. 6
- (q) Discuss various pumping methods used in lasers for obtaining population inversion. 5
- (r) What is difference between spontaneous and stimulated emissions ? Explain. 5