

M.Sc.- I (Chemistry) New CBCS Pattern Semester-II
PSCCHT07 - Paper-VII : Physical Chemistry

P. Pages : 2

Time : Three Hours



GUG/W/23/11230

Max. Marks : 80

1. a) Discuss the application of molecular orbital theory to H_2 molecule. **8**
- b) Discuss HMO theory with application 1, 3 butadiene. **8**

OR

- c) What is hybridization? Write its salient features and draw BMO and ABMO and corresponding electron density on the bond axis. **4**
- d) Use 2s and 2p atomic orbitals to construct SP-hybrid orbitals and establish the bond angle between them. **4**
- e) Explain the following terms- **4**
- i) Spin orbit coupling
 - ii) Zeeman splitting
- f) What are the approximations used by Huckel for the M.O. treatment of conjugated- π system? **4**
2. a) What is entropy production? Obtain entropy production in coupled reaction. **8**
- b) Give the comparison of Maxwell-Boltzmann Bose-Einstein and Fermi-Dirac statistics. Derive the expression for Maxwell-Boltzmann statistics. **8**

OR

- c) Discuss the conservation of mass and energy in closed and open system. **4**
- d) Obtain the Le-Chatelier principle of chemical equilibrium from the total differential of chemical affinity in terms of I, P and Z (zeta). **4**
- e) Discuss about Stirling Approximation. **4**
- f) Obtain an expression for entropy of mixing and enthalpy of mixing of non-ideal solution. **4**
3. a) Discuss thermodynamics in Schottky defects with suitable example. **8**
- b) Explain in detail solid state reaction. **8**

OR

- c) Describe the BCS theory. **4**

- d) Discuss in brief Frenkel defect found in crystals. 4
 - e) Write a note on perfected and imperfect crystals. 4
 - f) Explain co-precipitation as precursor to solid state reaction. Mention other precursor methods also. 4
4. a) Explain nuclear shell model. What are the evidence in favour of this model? Give the advantages of this model. 8
- b) Discuss 8
- i) Isotopic dilution analysis
 - ii) NAA

OR

- c) Explain radiometric titration with suitable example. 4
 - d) Discuss GM counter. 4
 - e) Discuss liquid drop model. 4
 - f) Explain in short Fermi gas model. 4
5. a) Distinguish between bonding and antibonding molecular orbitals. 2
- b) What is Russel-sander's coupling? 2
- c) Using the Stirling approximation calculate $nNA!$ When NA-Avagadro's number. 2
- d) What do you mean by dislocations? 2
- e) Write differences between extrinsic and intrinsic semiconductors. 2
- f) What are photonuclear reactions? 2
- g) What is radioactive equilibrium? 2
- h) Calculate the ionic strength of 0.25M K_2SO_4 and 0.15M KCl. 2
