

M.Sc. (Part-I) (Chemistry) (CBCS Pattern) Semester-II
PSCCHT07 : Physical Chemistry

P. Pages : 2

Time : Three Hours



GUG/S/25/11230

Max. Marks : 80

Notes : All questions are compulsory and carry marks as indicated.

1. a) Discuss the application of molecular orbital theory to H_2 molecule. 8
- b) Discuss HMO theory with reference to its application to ethylene and cyclobutadiene. 8

OR

- c) Explain the terms. 4
- i) Spin orbit coupling.
- ii) Zeeman Splitting.
- d) Using perturbation theory obtain the ground state energy of helium atom. 4
- e) Explain Russel - Sander's coupling. 4
- f) What is hybridisation? Write its salient features and draw BMO & ABMO and corresponding electron density on the bond axis. 4
2. a) Discuss Stirling approximation used in statistical mechanics and write its Limitations. 8
- Derive the expression for Fermi Dirac statistics.
- b) Discuss Debye- Huckel theory for activity coefficient of electrolytic solutions. 8

OR

- c) Obtain an expression for entropy of mixing and enthalpy of mixing of non-ideal solutions. 4
- d) Describe the thermodynamic criteria for non equilibrium states in terms of Gibb's free energy and enthalpy. 4
- e) Derive the Bose - Einstein statistics. 4
- f) Discuss the conservation of mass and energy in closed and open systems. 4
3. a) Discuss the thermodynamics of Frenkel and Schottky defects. 8
- b) Explain 8
- i) Co- precipitation as a precursor to solid state reactions.
- ii) Meissner effect.

OR

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| c) | Discuss in brief the types of defects found in crystals. | 4 |
| d) | Describe the B. C. S. theory. | 4 |
| e) | What is superconductivity? Explain low temperature superconductivity. | 4 |
| f) | Discuss the kinetics of solid state reactions. | 4 |
| 4. | a) Discuss liquid drop model with its assumptions, merits and demerits. | 8 |
| | b) Discuss: | 8 |
| | i) Neutron activation analysis. | |
| | ii) Ionization chamber counter. | |

OR

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| c) | Discuss Thermonuclear and photonuclear reactions. | 4 |
| d) | Explain radiometric titration with Suitable example. | 4 |
| e) | Explain in short Fermi gas model. | 4 |
| f) | Discuss G. M. counter in detail. | 4 |
| 5. | a) Determine the term symbol for the ground state electronic configuration of Nitrogen ($Z = 7$). | 2 |
| | b) Distinguish between bonding and antibonding molecular orbitals. | 2 |
| | c) What is Le - Chatelier principle of chemical equilibrium? | 2 |
| | d) Define ionic strength with suitable examples. | 2 |
| | e) Write a short note on p-n junction. | 2 |
| | f) Explain: Non - Stoichiometric defects in brief. | 2 |
| | g) Describe radioactive decay. | 2 |
| | h) Explain: Magic numbers. | 2 |
