

P. Pages : 2

Time : Three Hours

**GUG/W/24/11230**

Max. Marks : 80

1. a) Discuss HMO theory with application to ethylene and 1,3 butadiene. 8
- b) Explain in details about MO theory applied to H_2^+ ion. 8

OR

- c) Explain Zeeman Splitting. 4
- d) Write a note on variation principle. 4
- e) What are term symbols? Calculate term symbol for ground state electronic configuration of nitrogen atom ($Z=7$). 4
- f) What are the approximations used by Huckel for the M. O. treatment of conjugated. Dienes. 4
2. a) What do you understand by Stirling's approximation? Write a comparative account of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. 8
- b) What are excess functions for non-ideal solution? Derive the expression for excess Gibbs free energy and Excess entropy. 8

OR

- c) How energy and mass are conserved in closed and open systems? 4
- d) Explain Maxwell-Boltzmann statistics. 4
- e) Explain Debye Huckel theory for activity coefficient. 4
- f) How activity & activity coefficients determined experimentally. Discuss any one method. 4
3. a) What are perfect and imperfect crystals? Explain intrinsic and extrinsic defects. 8
- b) i) Describe the B.C.S. theory. 8
- ii) Explain Meissner effect.

OR

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| c) | Write short note on non-stoichiometric defect. | 4 |
| d) | Explain colour centres in solid state with suitable examples. | 4 |
| e) | Explain co-precipitation as a pre-cursor to solid state reactions. | 4 |
| f) | Discuss the band theory of solids. | 4 |
| 4. | a) Discuss liquid drop model with its assumptions, merits and demerits. | 8 |
| | b) Write a note on counters & explain the GM counter. | 8 |

OR

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| c) | Write a note on Fermi gas model. | 4 |
| d) | Explain radiometric titration. | 4 |
| e) | Discuss Neutron Activation Analysis (NAA). | 4 |
| f) | Explain proportional counter. | 4 |
| 5. | a) Define Hybridization. | 2 |
| | b) What is spin orbit coupling? | 2 |
| | c) What is Le Chatelier principle of chemical equilibrium. | 2 |
| | d) Name the three statistics used in thermodynamics. | 2 |
| | e) Which point defect lowers the density of ionic crystals? Why? | 2 |
| | f) What is line defect? What is common type of dislocations? | 2 |
| | g) What do you mean by : (i) Quenching (ii) Geiger counter plateau | 2 |
| | h) What are photonuclear reactions? | 2 |
