PSCCHT07 - Paper-VII: Physical Chemistry

_____

Notes : 1. All questions are compulsory and carry equal marks.
2. Write equations and draw diagram wherever necessary.

1. a) Describe perturbation technique used in quantum mechanics with suitable example. Calculate the upper bound to ground state energy by using
$\psi = \left(\sqrt{30}/a^{5/2}\right) \times (a-x)$ for a box of width 'a'. **8**

b) Discuss HMO theory with application to ethylene and 1, 3 butadiene. **8**

OR

c) Calculate the electron density at each atom in allyl radical and cyclopropenyl radical. **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-
i) Spin orbit coupling ii) Zeeman Splitting **4**

f) What are the approximations used by Huckel for the M. O. treatment of conjugated πe^- system? **4**

2. a) Discuss Debye-Huckel theory for activity coefficient of electrolytic solutions. **8**

b) What is entropy production? Obtain entropy production in coupled reaction. **8**

OR

c) Describe F.D. distribution law. **4**

d) Discuss the conservation of mass and energy in closed and open system. **4**

e) Obtain the expression for entropy of mixing and enthalpy of mixing of nonideal solution. **4**

f) What is thermodynamic excess function? Write the expression for **4**
i) Excess chemical potential $\left(\mu^E\right)$.

ii) Excess Gibb's free energy $\left(G^E\right)$.

3. a) Discuss the thermodynamics of Frenkel and Schottky defects. **8**

b) i) Discuss the kinetics of solid state reaction. **8**

ii) Explain Meissner effect.

OR

c) Describe B.C.S. theory. **4**

d) Explain colour centres in solid state with suitable examples. **4**

e) Write a note on point defects. **4**

f) Write a note on high temperature super conductivity. **4**

4. a) Discuss the particle detector, G.M. Counter and thermonuclear reactions. **8**

b) Discuss liquid drop model with its assumptions, merits and demerits. **8**

OR

c) Explain in short Fermi gas model. **4**

d) Explain the types of radioactive equilibrium. **4**

e) Discuss Neutron activation analysis. **4**

f) Explain radiometric titration with suitable example. **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 electrophoretic effect? **2**

d) What is Le-Chatelier principle of chemical equilibrium? **2**

e) Write a short note on P-n junction. **2**

f) What is line defect? What are common type of dislocations? **2**

g) What are photonuclear reactions? **2**

h) What do you mean by: **2**
   i) Quenching   ii) Geiger counter plateau

****