M.Sc. (Part - I) (Chemistry) (CBCS Pattern) Semester - I

# PSCCHT03 - Physical Chemistry Paper-III

P. Pages : 2 **GUG/S/23/11185**

Time : Three Hours Max. Marks : 80

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**1.** a) Derive an expression for the energy of hydrogen atom by using Schrodinger wave equation. **8**

b) i) Describe the properties of well behaved wave function. **8**
ii) What are the postulates of quantum mechanics? Explain.

**OR**

c) What do you understand by the term degeneracy of energy states for a free particle in a three dimensional cubic box having length L. **4**

d) How the Schrondinger's wave equation is useful to calculate the energy of the rigid diatomic rotator. **4**

e) Find the expression for (d/dx-x) (d/dx+x). **4**

f) What is the ground state energy for an electron which is confined to a cubic system having edge length of 0.2 nm. **4**

**2.** a) What is meant by chemical potential? How does chemical potential vary with temperature and pressure? Derive the Gibbs-Duhem equation. **8**

b) Derive Maxwell relations and give an application of one of them. **8**

**OR**

c) What is residual entropy? Explain with suitable example. **4**

d) Describe the experimental method for determination of fugacity. **4**

e) Derive Gibb's Duhem Mergules equation. **4**

f) Derive thermodynamic equation of state. **4**

**3.** a) Discuss the first and second order phase transitions and lambda line observed in liquid Helium system. **8**

b) Draw and discuss the phase diagram for ferric chloride-water system. **8**

**OR**

c) Define **4**
i) Congruent melting point ii) Triple point.

d) Discuss the phase diagram of three component system with suitable example. **4**

e) Derive thermodynamic derivation of phase rule. **4**

f) Explain phase diagram of carbon system. **4**

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| **4.** | a) | Derive Michaelis Menten equation for enzyme catalysis. | **8** |
| | b) | Describe Activated Complex theory. | **8** |

**OR**

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| | c) | Explain Lindeman theory of unimolecular reaction. | **4** |
| | d) | Write a note on application of photosensitizers. | **4** |
| | e) | Write a short note on:<br>i) Quantum yield ii) Quenching | **4** |
| | f) | Derive the expression for RRKM theory. | **4** |
| **5.** | a) | Define wave function. | **2** |
| | b) | Explain eigen function. | **2** |
| | c) | Define partial molar quantities. | **2** |
| | d) | State Intensive and Extensive Properties. | **2** |
| | e) | Explain reduced phase rule. | **2** |
| | f) | Explain the effect of pH on enzyme catalysed reactions. | **2** |
| | g) | Give the reasons for high and low quantum yield. | **2** |
| | h) | What is the effect of temperature on reaction rate. | **2** |

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