FACULTY OF SCIENCE

M.Sc. II – Semester (CBCS) Examination, May / June 2017
Subject: Chemistry
Paper – III
Physical Chemistry

Time: 3 Hours
Max. Marks: 80

Note: Answer all questions from Part – A and Part – B.
Each question carries 8 marks in Part-A and 12 marks in Part-B.

PART – A (4x8 = 32 Marks)
[Short Answer Type]

1. a) Explain Henry's law of vapour pressure.
   b) Derive Gibbs – Duhem equation.

2. a) Write about Franck Condon principle.
   b) Derive the quantum yield of fluorescence.

3. a) Explain about \( n, l, \) and \( m \) quantum numbers.
   b) State and explain variation theorem and prove it.

4. a) Explain photovoltaic effect.
   b) Write about Meissner effect.

PART – B (4x12 = 48 Marks)
[Essay Answer Type]

5. a) What is fugacity and how is it determined?
   b) Discuss about various thermodynamic properties of dilute solutions.
   c) Write about:
      i) Vapour pressure lowering
      ii) Boiling point elevation.
   d) Explain the relationship between partition function and thermodynamic functions entropy and Gibbs free energy.

OR

6. a) What is quantum yield? How quantum yield is determined experimentally.
   b) Derive the kinetics of photo physical unimolecular reaction.

OR

   c) What is quenching? Derive Stern-Volmer equation.
   d) Explain electron transfer reactions with example.
7 a) Describe about radial distribution functions.
b) Explain about secular equations and secular determinant with a trial function \( \Psi = a_1 \phi_1 + a_2 \phi_2 \).

c) OR

Explain polar plots and boundary diagram.
d) Compare the MO and VB models of \( \text{H}_2 \) molecule.

8 a) Explain the band theory of solids.
b) What are superconductors? Explain BCS theory.

c) OR

d) Explain the preparation of 1-2-3 materials.
d) What is the principle involved in ARM.