

PE-264
(532) M.Sc. Chemistry (Second Semester)
Examination June 2022
Compulsory/Optional
PHYSICAL CHEMISTRY
Paper-III

Time: Three Hours

Maximum Marks: 080
Minimum Passing Marks:

नोट: दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note: Answer from both section as directed. The figures in the right-hand margin indicate marks.

SECTION-A

1. Answer the following questions- [1 X 10 = 10]
- (a) Calculate the ionic strength of MgSO_4 , if m is the molality of each ion.
 - (b) What is the effect of temperature on fugacity?
 - (c) Write the mathematical expression of Rotational partition function with special reference to statistical Thermodynamics?
 - (d) What is the measure of disorder in a system called in thermodynamics?
 - (e) Name two metals that can be used for cathodic protection of iron with special reference to electrochemistry.
 - (f) Why silicon is mostly used than germanium for semiconductor?
 - (g) What factors affect electrocatalysis?
 - (h) Name the factors affecting corrosion?
 - (i) What is velocity of a neutron with special reference of neutron diffraction?
 - (j) Who discovered electron diffraction technology?
2. Answer the following questions- [2 X 5 = 10]
- (a) One mole of acetone requires less heat to vapourise than one mole of water. Which of the two liquids has higher enthalpy of vapourisation?
 - (b) Explain the criteria for the applicability of Bose Einstein Statistics?
 - (c) Taking example of Daniel Cell. Explain why the EMF drops to zero after some time.
 - (d) How do magnetic field increase the electrocatalytic activity?
 - (e) Why is the neutron diffraction not commonly used?

SECTION-B

Answer all questions :-

[12 X 5 = 60]

UNIT-I

3. What do you understand by chemical potential? How is chemical potential used to deduce :-
- (a) Henry's Law
 - (b) Nernst Distribution Law
 - (c) Raoult's Law

Or,

What do you understand by excess functions of non-ideal solutions? Derive expression for excess thermodynamic functions for chemical potential, entropy and enthalpy?

UNIT-II

4. Define partition function? Derive the values of the following in terms of partition function :-
- (a) Internal Energy
 - (b) Entropy
 - (c) Third Law of Thermodynamics

Or,

What is quantum statistics? Discuss in detail Fermi-Dirac statistics?

UNIT-III

5. What do you mean by surface excessive phenomenon, hence derive Lippmann's equation?

Or,

What is over potential? Derive Butler-Volmer equation?

UNIT-IV

6. What do you understand by halfwave potential? What is its significance? Derive Ilkovic equation?

Or,

- (a) Derive Hodes-Huxley equation?
- (b) What is corrosion of metals? Explain the basic reason of metallic corrosion?

UNIT-V

7. Discuss basic principle, instrumentation, measurement techniques and applications of neutron diffraction?

Or,

Define electron diffraction? Explain the variation of scattering intensity with scattering angle using Wierl equation? Electron diffraction is particularly useful in studying surfaces of materials? Why?