



K26P 1177

Reg. No. :

Name :

Second Semester M.Sc. Degree (C.B.C.S.S. – O.B.E. – Reg./Supple./Imp.)
Examination, April 2026
(2023 Admission Onwards)

CHEMISTRY/CHEMISTRY WITH DRUG CHEMISTRY SPECIALIZATION
MSCHE02C11/MSCHD02C11 : Physical Chemistry – II

Time : 3 Hours

Max. Marks : 60

SECTION – A

Short answer questions. Answer **any five** questions. Each question carries **three** marks : (5×3=15)

1. Differentiate distinguishable and indistinguishable particles.
2. State Stirling's approximation.
3. State the relationship between partition function and internal energy.
4. State the Bose – Einstein distribution law.
5. What is the Sackur–Tetrode equation ?
6. State Bragg's law.

SECTION – B

Paragraph questions. Answer **any three** questions. Each question carries **six** marks : (3×6=18)

7. Explain thermodynamic probability and its relation to entropy.
8. Explain the statistical formulation of the third law of thermodynamics.
9. Classify crystal defects and briefly explain point, line and plane defects.
10. Explain the concept of structure factor and its relation to X-ray diffraction intensity.
11. Describe the BCS theory of superconductivity.

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SECTION – C

Essay type questions. Answer **any three** questions. Each question carries **nine** marks : (3×9=27)

12. Derive the Maxwell–Boltzmann distribution law starting from the concept of thermodynamic probability and applying Stirling's approximation. Discuss the assumptions involved.
13. Compare Maxwell–Boltzmann, Bose–Einstein and Fermi–Dirac statistics, discussing their assumptions, mathematical forms and areas of applicability.
14. Explain the anatase and rutile structures of TiO_2 , comparing their stability and applications.
15. Discuss the refinements to simple band theory, explaining k-space representation and the construction of Brillouin zones.
16. Discuss the structures of transition metal oxides, with special reference to spinels, inverse spinels and perovskites.