

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figure to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

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- Q.1(A) Answer The Following Questions. (Any Two Out of Three) (10)**
1. Derive the Maxwell-Boltzmann distribution law.
 2. Derive the distribution law of Bose-Einstein statistics.
 3. Derive the distribution law of Fermi-Dirac statistics.
- Q.1(B) Answer The Following Questions. (Any One Out of Two) (04)**
1. Explain : Micro states & Macro states.
 2. State and prove : Stirling's theorem.
- Q.2(A) Answer The Following Questions. (Any Two Out of Three) (10)**
1. Explain the procedure to determine the Miller indices for the representation of planes.
 2. Describe the hexagonal close-packed structure.
 3. Describe the Face-centred cubic structure.
- Q.2(B) Answer The Following Questions. (Any One Out of Two) (04)**
1. Write short note on : Packing Factor.
 2. Write short note on : Point group in lattice.
- Q.3(A) Answer The Following Questions. (Any Two Out of Three) (10)**
1. Explain : Meissner effect.
 2. Discuss the London's theory in detail.
 3. Write note on : applications of super conductivity.
- Q.3(B) Answer The Following Questions. (Any One Out of Two) (04)**
1. Write the conclusions from BCS theory.
 2. Discuss the influence of stress, impurity and size on super conductivity.
- Q.4(A) Answer The Following Questions. (Any Two Out of Three) (10)**
1. Describe the thermotropic liquid crystals.
 2. What is ionic bond ? Describe the characteristics of ionic bond.
 3. Write a short note on : Molecular bond and its characteristics.
- Q.4(B) Answer The Following Questions. (Any One Out of Two) (04)**
1. Write the characteristics of a metallic bond.
 2. Write short note on : Applications of liquid crystal.
- Q.5(A) Answer The Following Questions. (Any Two Out of Three) (10)**
1. What are carbon nanotubes ? Mention the various structures of carbon nanotubes . Describe any one fabrication method of carbon nanotubes.
 2. Write a short note on : Electrical and mechanical properties of carbon nanotubes.
 3. What is meant by quantum nanostructure ? Discuss the preparation of quantum nanostructures.
- Q.5(B) Answer The Following Questions. (Any One Out of Two) (04)**
1. Write a note on : Applications of carbon nanotubes.
 2. What is meant by nanotechnology ? Discuss the applications of quantum nanostructures .