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BBG-003-001602 Seat No. _____

B. Sc. (Sem. VI) (CBCS) Examination

July – 2021

Statistical Mechanics, Solid State Physics and Plasma Physics : Paper - 602

Faculty Code : 003
Subject Code : 001602

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

1 Answer the following questions in brief : (1 mark each) **20**

(1) The minimum volume of a phase cell is h^3. True or False.

(2) Particles which obey Bose Einstein statistics are known as _____.

(3) Fermi Dirac distribution is given by $ni = \frac{gi}{e^{\alpha+\beta\in i} - 1}$. True or False.

(4) State Heisenberg's uncertainty principle.

(5) A superconductor is a perfect ferromagnetic material. True or False.

(6) Cooper pair of electrons effectively attract each other. True or False.

(7) The expulsion of magnetic field from a superconductor is known as _____.

(8) The production of current, when two superconductors are joined by an insulator is known as _____.

(9) Emission of visible light, when X-rays or UV rays are incident on a layer of materials such as Zns:cu where a potential difference is applied, is known as electro luminescence. True or false.

(10) Photoconductivity per unit excitation intensity is known as _____.

(11) What is luminescence ?

(12) Luminescence in sulphide phosphors can be explained by a model based on hole migration theory. True or False.

(13) A type-II superconductor has _____ critical magnetic fields.

(14) What is critical magnetic field ?

(15) The ordered arrangement of molecules in liquid crystalline state is due to weak Vander Waal's forces. True or False ?

(16) Write Bragg's equation.

(17) When impurity is added to plasma, its conductivity _____.

(18) The ionized state of matter is known as _____.

(19) The temperature at which a liquid crystal is converted into an isotropic liquid is known as critical temperature. True or False.

(20) Nematic liquid crystal have _____ like molecules.

2 (a) Answer any three : (2 marks each) **6**

(1) Write a note on phase space.

(2) What are bosons ? Write two properties of Bosons.

(3) What is Meissner effect ?

(4) Explain the concept of division of phase space.

(5) What are liquid crystals ?

(6) Write four properties of X-rays.

(b) Answer any three : (3 marks each) **9**

(1) Distinguish between Bose-Einstein statistics and Fermi-Dirac statistics.

(2) Write a note on electroluminescence.

(3) Write a note on Cooper pairs.

(4) What is Josephson effect ?

(5) Explain any one method of production of plasma.

(6) Explain thermodynamic probability.

(c) Answer any two : (5 marks each) **10**

(1) Starting with the basic postulates derive Fermi-Dirac distribution law.

(2) What is luminescence ? Explain the model of luminescence (hole migration theory) in sulphide phosphors activated by monovalent impurity like Ag.

(3) Write a note on plasma radiations.

(4) Explain Laue method of X-ray diffraction.

(5) Write a note on the applications of liquid crystals.

3 (a) Answer any three : (2 marks each) **6**

(1) Write a note on superconductivity.

(2) What are Fermions ? Write two of their properties.

(3) Derive Dulong and Petit's law for the specific heat of solids.

(4) Define plasma as a state of matter.

(5) What is thermal pinch effect ?

(6) Explain the change in heat capacity in superconducting state.

(b) Answer any three : (3 marks each) **9**

(1) Derive an expression for volume in phase space.

(2) Describe the electrical conductivity of plasma.

(3) Define photosensitivity and derive an expression for it.

(4) Explain the process of excitation and ionization of plasma.

(5) Explain three applications of superconductivity.

(6) Explain the influence of external agents on superconductivity.

(c) Answer any two : (5 marks each) **10**

(1) Derive Einstein's equation for the specific heat of solids.

(2) Derive the equation for plasma frequency.

(3) Derive Planck's radiation law and deduce the classical laws from it.

(4) Write a note on Cholesteric liquid crystals.

(5) Explain the powder crystal method of X-ray diffraction.
