



JA-003-001601

Seat No. _____

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

August - 2019

Physics : 602

(Statistical Mechanics, Solid State Physics & Plasma Physics)
(Old Course)

Faculty Code : 003

Subject Code : 001601

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions:** (1) All questions are compulsory.
(2) Symbols have their usual meanings.
(3) Figures to the right indicate marks.

- 1 Answer the following : (1 mark each) **20**
1. When substance changes from gas to plasma, there is latent heat of fusion. True or False ?
 2. In elastic collisions, the change in internal energy is _____.
 3. When impurity is added to plasma, its conductivity_____.
 4. The magnetic property of plasma is mostly_____.
 5. The minimum volume of a phase cell is_____.
 6. Electrons are Fermions. True or false ?
 7. Fermi Dirac distribution is given by_____.
 8. According to Heisenberg's uncertainty principle the position and momentum can not be determined simultaneously. True or false ?
 9. A super conductor is a perfect_____magnetic material.
 10. Cooper pair of electrons effectively attract each other. True or false?
 11. Expulsion of magnetic field below T_c in a superconductor is known as_____.

12. The production of current, when two superconductors are joined by an insulator is known as_____.
13. 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_____.
14. Photoconductivity per unit excitation intensity is known as _____.
15. The temperature at which a material is converted into a superconductor is known as _____.
16. Luminescence in sulphide phosphors can be explained by a model based on_____.
17. In a superconductor Cooper pair of electrons interact with each other by phonon exchange.
True or false ?
18. According to Dulong and Petit's law the molar specific heat of a solid $C_v = \text{---}R$.
19. The temperature at which a liquid crystal is converted into an isotropic liquid is known as_____.
20. For a Nematic liquid crystal, the longer axis along the preferred direction is called_____.

- 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 ?
- (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 the method of production of plasma.

- (c) Answer any two: (5 marks each) **10**
- (1) Starting with the basic postulates derive Fermi-Dirac statistics.
 - (2) Explain the factors which affect superconductivity.
 - (3) Write a note on plasma radiations.
 - (4) Explain Thermotropic liquid crystal.
- 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 the classical equation $C_v = 3R$, for the specific heat of solids.
 - (4) Define plasma state.
 - (5) What is thermal pinch effect ?
- (b) Answer any three : (3 marks each) **9**
- (1) Derive an expression for volume in phase space.
 - (2) Derive the equation for plasma frequency.
 - (3) Define photosensitivity and derive an expression for it.
 - (4) Explain Fermi energy.
 - (5) Explain three applications of superconductivity.
- (c) Answer any two : (5 marks each) **10**
- (1) Derive Einstein's equation for the specific heat of solids.
 - (2) What is luminescence? Explain the model of luminescence in sulphide phosphors.
 - (3) Derive Planck's radiation law and deduce the classical laws from it.
 - (4) Explain plasma as a state of matter.
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