



PA-003-001602

Seat No. _____

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

March / April – 2020

Physics : Paper - 602

(Statistical Mechanics, S. S. P., Plasma Physics)

(Old Course)

Faculty Code : 003

Subject Code : 001602

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

[Total Marks : 70

Instructions :

- (1) Symbols have their usual meaning.
- (2) Figures on right side indicate marks.
- (3) All questions are compulsory.

1 Write very short answers to the following questions. 20

- (1) “Bosons” are the particles which are identical and indistinguishable but having zero or integral spin. – is it true or false ?
- (2) The particles in MB distribution law are applicable to only _____ (Fill in the blanks)
- (3) Name the phenomena which explain Richardson–Dushman equation.
- (4) In case of MB statistics, only one particle can be accommodated in a given quantum state or a cell – True or false.
- (5) The super fluid property exhibited by liquid Helium below certain low temperature is associated with which phenomena ?
- (6) Define the spin of the particles on which FD statistics is applied.
- (7) In presence of electric field, plasma will show properties of dielectric. True/False.
- (8) Write equation for Bragg’s law.

- (9) Define type (structure) of liquid crystals.
- (10) Super conductors are perfect _____ in the super conducting state. (Fill in the blanks)
- (11) What is MHD for plasma production? Give full form of MHD.
- (12) _____ % of matter of all universe is believed to be in PLASMA state. (Fill in the blanks)
- (13) Who had given the theory for PLASMA oscillations ?
- (14) By which event, plasma in the Earth's atmosphere is created ?
- (15) Name the pair, by which Exiton is known.
- (16) At the temperature more than boiling point, material exists in the _____ state. (Fill in the blanks)
- (17) What is value of the transition temperature for mercury below which its resistance becomes extremely small ?
- (18) In case of super conductors, if atomic mass of isotopes increases, its critical temperature decreases – is it true or false ?
- (19) Narrate the force, by which the ordered arrangement of molecules in the liquid crystalline state is provided.
- (20) Give a name of liquid crystal having twisted structure about the helical axis.

2 Attempt the following :

- (a) Write short answers to the following : (any **three**) **6**
- (1) Explain division of phase space into phase cell and using uncertainty principle, show that its volume is h^3 .
 - (2) What are “Fermions” and “Bozons” ?
 - (3) How the super conducting properties of metals can be changed ?
 - (4) Write limitation of Lave method for crystal structure determination.
 - (5) Explain photo sensitivity.
 - (6) Give names of luminescent crystal solids.

- (b) Give answers to the following : (any **three**) **9**
- (1) Discuss : The Sterling's Approximation.
 - (2) What is Macro states and micro states ?
 - (3) Write application of plasma.
 - (4) Give Einestein's theory of specific heat of solids and discuss it for high temp.
 - (5) Describe properties which do not change in super conducting transition.
 - (6) Explain Dulong and Petit law for specific heat of solids.
- (c) Write in detail : (amy **two**) **10**
- (1) Derive the distribution law for BE statistics.
 - (2) Rotating crystal method; explain it.
 - (3) Discuss free electron model for electronic emission.
 - (4) Derive the distribution law for MB statistics.
 - (5) Describe power photograph method to determine the structure of a crystal.

3 Answer the following :

- (a) Write short answers to the following : (any **three**) **6**
- (1) What is ionization of atoms and molecules ?
 - (2) Write applications of liquid crystals.
 - (3) Discuss cyclotron radiation in plasma.
 - (4) What is "Larmour Orbiting" ?
 - (5) What is photo ionization of atoms ?
 - (6) Explain black body radiation in plasma.
- (b) Give answers to the following : (any **three**) **9**
- (1) Explain Meissner effect of Flux exclusion.
 - (2) What is "Bremsstrahlung" in case of plasma ?
 - (3) Describe properties which change in super conductivity transitions.
 - (4) Write a note on smectic liquid crystals.
 - (5) Write a note on cholesteric liquid crystals.
 - (6) Discuss the concept of Collisions in plasma.

(c) Write in detail : (any two) 10

- (1) Discuss : London's theory for super conductivity.
 - (2) Write a note on plasma oscillations.
 - (3) Discuss : Electro-luminescence.
 - (4) Describe the method of production of plasma in absence of any gas.
 - (5) Discuss influence of magnetic field, current strength, stress, impurity and size on super conductivity.
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