AAH-003-001602 Seat No. _____

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

April/May - 2016

Physics : Paper - P-602

(Statistical Mechanics, Solid State Physics & Plasma Physics)

Faculty Code : 003
Subject Code : 001602

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

Instructions : (1) Write answers of Q-1 (MCQs) in the main answer book.
(2) Figures on right side indicate marks.
(3) Symbols have their usual meaning.

1 Select correct answer from given options for the following questions : **20**

(1) An interesting feature shown by powder method is that the resolving power becomes very high when the reflected ray is thrown back by an angle nearly _____
(a) 90° (b) 45°
(c) 180° (d) 0°

(2) Bragg's law is represented by the equation ,
(a) $n\lambda = d \sin\theta$ (b) $n\lambda = 2d \sin\theta$
(c) $2\lambda = nd \sin\theta$ (d) $d\lambda = 2n \sin\theta$

(3) F-D statistics is applicable to particles which are _____
(a) distinguishable (b) indistinguishable
(c) having zero spin (d) electrons

(4) B-E statistics is applicable to particles which are _____
(a) distinguishable (b) photons
(c) electrons (d) macro

(5) In B-E statistics, internal energy of particles at absolute zero is taken as _____
(a) infinite (b) zero
(c) finite (d) negative

(6) At high temperature, Fermi distribution reduces to _____ distribution.
(a) Maxwell-Boltzman (b) Fermi-Dirac
(c) Einstein (d) Planck

(7) Electrical conductivity of Plasma increases with increase in _____
(a) magnetic field (b) pressure
(c) temperature (d) none

(8) At the temperature slightly more than melting point, material exists in the _____ state.
(a) vapour (b) liquid
(c) plasma (d) solid

(9) The nature of magnetic Bremsstrauhlung radiation will depend on the _____
(a) electric field (b) pressure
(c) electron density (d) none

(10) In Plasma Display Technology, a gas discharge plasma is created by applying _____ between the electrodes.
(a) electric field (b) magnetic field
(c) pressure (d) force

(11) The most ordered smectic crystals have a _____ structure.
(a) twisted (b) liquid
(c) layer (d) rod like

(12) In Thermotropic liquid crystals, the molecular ordering changes with change in _____
(a) concentration (b) electric field
(c) pressure (d) temperature

(13) Which crystal has twisted structure about the helical axis ?
(a) cholesteric (b) nematic
(c) smectic (d) lyotropic

(14) The Pure Nematic crystals are basically _____
(a) insulators (b) semiconductors
(c) conductors (d) gases

(15) Kammerlingh found that the resistance of mercury drops suddenly to almost zero when the temperature falls below _____
(a) 2.4 °K (b) 8.4 °K
(c) 4.2 °C (d) 4.2 °K

(16) When the dimension of a superconductor increases under a stress , its transition temperature T_c _____
(a) increases (b) becomes zero
(c) remains same (d) decreases

(17) In a superconducting state, when the magnetic field is switched off , current induced in superconductor does not decay with time. This current is called _____ current.
(a) Photo-electric (b) displacement
(c) thermoelectric (d) persistent

(18) When the size of superconductor is reduced below 10^{-4} cm, critical magnetic field
(a) decreases (b) becomes zero
(c) remains same (d) increases

(19) When the layer of ZnS : Mn is excited by ultra-violet or X-rays, it emits _____ luminescence.
(a) red (b) blue
(c) yellow (d) green

(20) Photo-sensitivity is defined as "photo conductivity per unit excitation _____
(a) frequency (b) intensity
(c) wavelength (d) power

2 Attempt the following :

(a) Write short answers to the following : (any **three**) **6**

(1) What are bosons and boltzons ?

(2) Explain division of phase space into phase cells and using Uncertainty principle, show that its volume is h^3.

(3) How the superconducting properties of metals can be changed ?

(4) Write limitations of Laue method for crystal structure determination.

(5) Explain Photo-sensitivity.

(6) Write names of various luminescent crystal solids (Phosphors).

(b) Give answers to the following : (any **three**) **9**

(1) Discuss : The Sterling's Approximation.
(2) Derive equation of volume in Phase space in terms of momentum.
(3) Obtain Stefan-Boltzmann law of energy density using Planck's formula.
(4) Explain Dulong and Petit law for specific heat of solids.
(5) Compare M-B, B-E and F-D statistics in brief.
(6) Write applications of Plasma.

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

(1) Derive the distribution law for B-E statistics.

(2) Derive Planck's law for Black body radiation.

(3) Explain : Rotating crystal method.

(4) Derive the distribution law for M-B statistics.

(5) Describe Powder-photograph method to determine the structure of a crystal.

3 Attempt the following :

(a) Write short answers to the following : (any **three**) **6**

(1) Discuss cyclotron radiation in Plasma.

(2) Explain "critical magnetic field " in case of superconductivity.

(3) What is "Larmour orbiting" ?

(4) Write names of various luminescent crystal solids (Phosphors).

(5) Write applications of liquid crystals.

(6) What is Photo ionization of atoms ?

(b) Give answers to the following : (any **three**) **9**

(1) Write a note on Cholesteric liquid crystals.

(2) Explain Meissner Effect of Flux exclusion.

(3) Discuss Ionization of atoms and molecules.

(4) Write a note on Smectic liquid crystals.

(5) Describe properties which change in superconductivity transitions.

(6) Explain "Bremsstrauhlung" in case of Plasma.

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

(1) Write a note : Applications of superconductors in various fields.

(2) Write in detail : Dielectric and magnetic properties of Plasma.

(3) Discuss : Electro-luminescence.

(4) Write a note : Applications of superconductors in various fields.

(5) Describe the method of production of Plasma in absence of any gas.
