U.G. 5th Semester Examination - 2021

PHYSICS

[HONOURS]

Course Code : PHY(H)-P-CC-12/PR

[PRACTICAL]

(Solid State Physics)

Full Marks : 20 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Answer any **four** questions: 5×4=20

1. Establish Laue's equations representing the conditions for diffraction of X-rays. Show the equivalence of these equations with Bragg's Law. 5

2. What is Hall effect? Describe an experiment with a suitable diagram to measure the Hall coefficient and Hall voltage.

   Given : Electron rest mass= 9.1×10^{-31}Kg

   Planck 's constant = 6.63×10^{-34} Js

   leV=1.6×10^{-19}J

   Boltzmann constant = 1.38×10^{-23} J/K

   Permeability of free space $(\mu_0) = 4\pi\times10^{-7}$ H/m

   Permittivity of free space $(\varepsilon_0) = 8.85\times10^{-12}$ F/m

   Avogadro number = 6.02×10^{23}/mol 5

3. NaCl crystal has a cubic structure. If its density is 2.163 gm/cm^3 and its molecular weight is 58.45, calculate its lattice constant. The lattice constant of a cubic crystal is 2.25A^0. Find the interplaner spacing for the set of crystallographic planes having Miller indices (100). 3+2

4. Discuss the basic ideas of Kronig-Penny model of a crystalline solid (you need not solve any equation). What is the key factor in the model which leads to forbidden gaps between bands? 5

5. Discuss the characteristics of diamagnetism, paramagnetism, and ferromagnetism substances. How would you distinguish between the three types of substances experimentally? 5

6. What is the difference between a crystal and an amorphous solid? For reflection from the (100) plane, the glancing angle is 18° in the first order for a cubic crystal using X-rays of wavelength 1.54A^0. Determine the distance between adjacent (100) planes and (111) planes of the crystal. 5

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