

Physics Iit Jam Questions And Solution

Useful Data

1. Speed of light in free space, $c = 3 \times 10^8 \text{ m s}^{-1}$
2. Planck's constant, $h = 6.6 \times 10^{-34} \text{ J s}$
3. Electron charge, $e = 1.6 \times 10^{-19} \text{ C}$
4. Electron mass, $m_e = 9.1 \times 10^{-31} \text{ kg}$
5. $\ln 2 = 0.7$

NOTE: Answer ALL the 20 questions. Questions 1-10 (objective questions) carry 20 marks each and questions 11-20 (subjective questions) carry 20 marks each. Write the answers to the objective questions in the OMR form. For Objective Questions a number of marks is given.

1. In a crystalline solid, the energy band structure (E-k relation) for an electron of mass m is given by $E = \frac{\hbar^2 k^2}{2m}$. The effective mass of the electron in the crystal is:
(A) m
(B) $\frac{1}{2}m$
(C) $\frac{m}{2}$
(D) $2m$
2. Two dipoles, dipole P₁ and P₂, are placed at (1, 0, 0) and (1, 0, 0) respectively, with both of them pointing in the -z direction. Without changing the orientation of the dipoles, P₁ is rotated to (0, 1, 0). The ratio of the electrostatic potential energy of the dipoles after rotating to that before rotating is:
(A) $\frac{1}{16}$
(B) $\frac{1}{2}$
(C) $\frac{1}{4}$
(D) $\frac{1}{8}$

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