

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

B.Tech-V Semester (ECE/ECM)

COURSE CODE(CREDITS): 18B1WPH531(3)

MAX. MARKS: 15

COURSE NAME: Science and Technology of Materials

COURSE INSTRUCTORS: Dr. Santu Baidya

MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. Define the terms electric dipole moment, dielectric constant and Electric polarization. [3]

Q2. Derive an expression for electric potential due to a dipole of charge q and distance between two charges of the dipole being a . [2]

Q3. Derive relation between polarization, electric susceptibility and dielectric constant. A dielectric material contains 2×10^9 polar molecules/m³ each of dipole moment 1.8×10^{-27} cm. Assuming that all of the dipoles are aligned towards electric field $E = 10^5$ V/m. Find the polarization, electric susceptibility, and the relative permittivity. [2+3]

Q4. Describe in brief the various types of polarization mechanisms. [2]

Q5. If an ionic crystal is subjected to an electric field of 1000 V/m and the resulting polarization 4.3×10^{-8} cm². Calculate the relative permittivity of NaCl solution. [3]