

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 25B1WPH536 (03) / 18B1WPH532 (03)

MAX. MARKS: 15

COURSE NAME: Applied Materials Science

COURSE INSTRUCTOR: HAZ

MAX. TIME: 1 Hour

Note: (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems (c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	At what frequency the real and imaginary parts of the polarizability become dominant? Illustrate their distribution around that frequency.	1	2
Q2	How does dielectric constant of a solid containing permanent dipole moment vary with temperature? Illustrate your answer with an example.	1	2
Q3	Find the total polarizability of CO ₂ , if its susceptibility is 0.985×10^{-3} . Density of carbon dioxide is 1.977 kg/m^3 .	3	2
Q4	The polarizability of NH ₃ molecules in gaseous state from the measurement of dielectric constant is found to be $2.5 \times 10^{-39} \text{ Fm}^2$ and $2 \times 10^{-39} \text{ Fm}^2$ at temperatures 300 K and 400 K respectively. Calculate the contribution to the polarizability because of deformation of molecules and the contribution because of permanent dipole moment at each temperature.	3	2
Q5	Discuss the factors of dielectric breakdown mechanisms in insulators.	2	2
Q6	What are the chief characteristics of ferroelectric materials? How do you establish the existence of ferroelectricity in a material?	2	2
Q7	Explain the different types of polarization mechanisms in dielectrics and sketch their dependence on the frequency of the applied electric field.	2	2
Q8	Correlate porosity and density with the strength and thermal insulation characteristics of a ceramic material.	5	1

$$m_e = 9.1 \times 10^{-31} \text{ kg}; e = 1.6 \times 10^{-19} \text{ C}; N_A = 6.023 \times 10^{23}; k_B = 1.38 \times 10^{-23} \text{ J/K}; \epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}; \mu_B = 9.27 \times 10^{-24} \text{ Am}^2;$$