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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKEUP EXAMINATION, APRIL - 2018

B.Tech VI Semester

COURSE CODE: 10B11PH611 MAX. MARKS: 25

COURSE NAME: Materials Science

COURSE CREDITS: 04 MAX. TIME: 1Hr 30 Min

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

1. Discuss the expression for ionic polarizability and highlight the differences with respect to electronic polarizability. [3]

2. The atomic polarizability of neon is $4.3 \times 10^{-41}\ Fm^2$. If a neon atom is placed in an electric field of $5 \times 10^4\ V/m$, calculate its dipole moment and the displacement of the centroids of positive and negative charges in it. [2]

3. Differentiate between the number average and weight average molecular weights for a polymer. [2]

3. A system of electron spins placed in a magnetic field of *5 Tesla* at any temperature *T*. If the number of spins parallel to the magnetic field is twice as large as the number of antiparallel spins, determine the value of temperature. [3]

5. Derive an expression for acceptance angle for an optical fibre and give its significance. [3]

6. For an optical fibre with core and cladding refractive indices *1.466* and *1.460* respectively, the cut off parameter is *2.4*. For an operating wavelength of *800 nm*, calculate the number of modes, core radius, critical angle and numerical aperture. [5]

7. Derive an expression for the paramagnetic susceptibility using classical theory. [5]

8. Assuming the magnetic moment to be five times the Bohr magneton, calculate approximately how large must be the magnetic induction for the orientation energy to be comparable to the thermal energy at 300 K. [2]

$\mu_o = 4\pi \times 10^{-7}\ Hm^{-1}$; $m_e = 9.1 \times 10^{-31}$ kg; $e = 1.6 \times 10^{-19}$ C; $\varepsilon_o = 8.85 \times 10^{-12}\ C^2N^{-1}m^{-2}$, Atomic No. for Ne = 10; $k_b = 1.38 \times 10^{-23}\ JK^{-1}$