BHAGINI NIVEDITA COLLEGE, UNIVERSITY OF DELHI

NANOMATERIALS AND APPLICATIONS; (BSC (HONS.) PHYSICS VI SEM)

ASSIGNMENT-04 (UPC: 32227612)

TIME:ALL THE ANSWERS WILL BE DISUCSS IN E-CLASS, DOUBTS CAN BE POSTED TO GROUP IN MEANWHILE AND AN ANSWER SHEET WILL BE PREPARED.

MARKS WILL BE GIVEN ACCORDINGLY

BE HOME BE SAFE, DON'T GO OUTSIDE, WASH YOUR HANDS PROPERLY, SUPPORT LOCKDOWN, FOLLOW ALL GUILDELINES AND INSTRUCTIONS OF GOVERNMENT

UNIT-4: LONG ANSWER TYPE SECTIONAL QUESTIONS

1. A quantum dot of a semiconductor has the following characteristics: diameter, d = 10 nm, dielectric constant, $\varepsilon = 12$, $\varepsilon_o = 8.854 \times 10^{-12}$ $m^{-3}Kg^{-1}S^4A^2$, $m_e = m_o$, $m_o = 9.1 \times 10^{-31}$Kg, h = 6.63×10^{-34} m^2KgS^{-1}, e = 1.6×10^{-19} C, E_g(bulk) = 3.3 eV. Determine the bandgap of the quantum dot. (3)
2. Discuss the absorption, emission and luminescence radiative processes. (9)
3. Explain excitons in context of semiconductors. (6)
4. What do you mean by excitons? How an exciton is classified in context of binding energy? Derive the expression for the binding energy of an exciton. Using either Effective mass approximation or tight binding approximation explain size dependence of energy gap. (15)
5. The interfacial energy for barium sulphate nano crystals in saturated aqueous solution is 120 mJ/m^2. If the critical radius is 1 nm, calculate the value of the Gibbs free energy barrier. (5)
6. How dielectric properties depend on the size of material? (5)
7. Explain the defects within and on the surface of a material. (8)

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