Nano Lect 2 – Questions and Keypoints

Key Points

1. Quantum Well technology
    a. Basic well physics 1D/2D/3D
    b. Band Gap engineering (Hetrostructures)
    c. Quantum dots in optical detectors (modulators)
    d. Excitons (hole/electron coupled pairs)
2. Quantum dots
    a. Properties
        i. Size tunable
        ii. Non-linear
        iii. Tunable Semiconductors
3. Physics of quantum dots
    a. Heat as phonons
    b. Effective mass – confinement dependent
    c. Band structure strongly size determined
4. Fabrication
    a. Grow on surface – InGaAs on GaAs
    b. Chemical synthesis in test tube and then deposition on surface
    c. Shape/size dependent on chemistry and conditions
    d. Can get dots to crystals to fractals
5. Applications
    a. Biomedical
        i. Imaging
        ii. Cancer treatments
        iii. DNA sorting

Questions

1. How does a hetrostructure differ from a homostructure?
2. What is a quantum dot?
3. What is an exiciton
4. Why is the band gap size dependent in a quantum dot?
5. Why do different size QD fluoresce at different colors?