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M.Sc.(Physics) (2015 & 2017) (Sem.-4)

Subject Code : MPH-402

Paper ID : [A2824]

Max. Marks : 100

1. Attempt FIVE questions in ALL including COMPULSORY questions no. 9
2. All questions carry EQUAL marks.

- Q1. a) Deduce and explain a formula for classification of nanostructures by dimensionality. (8)
- b) What do you mean by quantum confinement? Write a formula for energy levels in infinite potential well of L width. What is the difference for case of finite potential V_0 ? (12)
- Q2. a) What are nano rods? Discuss the structure and characteristics of various types of quantum dots. (2+10=12)
- b) Find the density of electronic states in 1D, 2D and 3D nanostructures. (8)
- Q3. a) What is top down and bottom up approach for preparation of nano materials? (8)
- b) Describe the principle and process in plasma assisted methods for synthesis of nano structured materials. (12)
- Q4. a) Describe the principles in chemical and physical vapour deposition (CVD & PVD) methods for synthesis of nano structure materials. (8)
- b) Describe the principles and process in sol-gel method for synthesis of nano structure materials. (12)
- Q5. a) What is electron microscopy? Describe scanning electron microscope with neat diagram. (12)
- b) Write the electronic and magnetic properties of oxides. (8)
- Q6. a) State and explain Debye-Scherrer equation. What is its significance in analysis of nano particles? (12)
- b) Write short notes on Raman spectra of nano materials. (8)

- Q7 a) What do you mean by elastic and inelastic scattering of electrons? (8)
- b) Describe in detail the various synthetic techniques of carbon nanotubes. (12)
- Q8 a) Describe the principles and processes of arc-discharge and laser-ablation methods for synthesis of fullerenes. (12)
- b) How are mechanical properties of CNTs different from conventional materials? (8)
- Q9 Answer briefly :**
- a) What are quantum dots?
- b) What is nano technology?
- c) Write different types of carbon nanotubes.
- d) Define nano composites.
- e) Define lithography.
- f) What is a Bucky ball?
- g) What is graphene?
- h) Write Moore's first law. (8 × 2.5 = 20)