

(3 Hours)

Marks: 80

- N.B.
- 1 Question ONE is compulsory
 - 2 Attempt any THREE questions out of the remaining
 - 3 Figure to the right indicate full marks
 - 4 Diagram at appropriate places carries marks
 - 5 Assume suitable data if necessary

- 1 Write short note on
 - (a) Sol- Gel processing (06)
 - (b) Electron, Atom and Ions (05)
 - (c) Electronic effects of biomolecules-nanoparticle interaction (05)
 - (d) Inertial impaction (04)
- 2 (a) Explain in detail the Combustion Flame Synthesis method for Fullerene with neat diagram of primary zone reactor in conjunction with secondary zone reactor (10)
 - (b) Describe the sequence of steps in fabricating a Carbon Nanotube by CVD (07)
 - (c) Physical properties of Carbon Nanotube (03)
- 3 (a) Describe the Laser Ablation synthesis methods based on pellet formation for Carbon Nanotube preparation with neat diagram (10)
 - (b) Describe the Gas Evaporation Technique used for metal nanoparticle preparation with neat diagram (10)
- 4 (a) Explain in detail counter diffusion and fullerene crystal formation at the interface with neat diagram (10)
 - (b) Describe the characterization mechanism of Transmission Electron Microscope with neat diagram (10)
- 5 (a) Explain in brief about X ray Diffraction. (05)
 - (b) Write short note on Quantum Mechanics and Quantum Dots (05)
 - (c) How does the pH of the medium affect the biomolecules - nanoparticle interaction? (05)
 - (d) What are the different types of inorganic materials used for the synthesis of Hybrid Nano-bio assemblies (05)
- 6 Three different sized nanoparticles from a nano operation settle through air. Assume the particles are spherical having the diameter 5, 500 and 5000 μm . Calculate the settling velocity of a particle moving in a gas stream and determine how far each fall in 30 sec. Air temperature and pressure: 70 $^{\circ}\text{F}$ and 1atm. (20)

$\rho_p = 2309 \text{ kg/m}^3$	$\mu_{(\text{AIR})} = 2.1 \times 10^{-5} \text{ kg/m.s}$
$\rho = 1.2 \text{ kg/m}^3$	$g = 9.8 \text{ m/s}^2$