



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION – PHYSICS**

**THIRD SEMESTER – NOVEMBER 2014**

**PH 3875 - NANO SCIENCE**

Date : 07/11/2014

Dept. No.

Max. : 100 Marks

Time : 09:00-12:00

**PART A**

**Answer ALL questions:**

**10 x 2 = 20 marks**

1. Highlight the issue of social justice and civil liberty in connection with the developments in nanotechnology research.
2. Draw the graph that demonstrates the size dependence of melting temperature of CdS nanoparticles.
3. Mention a few chemical and biological approaches to synthesize nanoparticles.
4. Write the Scherrer's equation to determine the particle size of nanocrystals.
5. Briefly explain the concept of quantum computing.
6. What is known as London forces?
7. Define core-shell nanoparticles.
8. What is critical micelle concentration?
9. Distinguish between Auger electrons and photoelectrons.
10. Mention the important beneficial features of a biosensor.

**PART B**

**Answer any FOUR questions:**

**4 x 7.5 = 30 marks**

11. Draw the key components of an optical disc system and discuss its function.
12. Explain the principle and working of a SEM with neat diagram.
13. Discuss the spray pyrolysis process for synthesizing nanoparticles.
14. Describe the sol-gel synthesis of metal oxides.
15. Discuss the salient features of fullerenes and its derivatives.
16. How is Brunauer – Emmett - Teller (BET) analysis used to characterize the synthesized nanoparticles?

## PART C

**Answer any FOUR questions:**

**4 x 12.5 = 50 marks**

17. Based on quantum mechanical treatment discuss the formation of 1).Quantum well and 2). Quantum wires **(8 + 4.5).**
18. Discuss applications of nanomaterials in 1) Energy 2) Information and communication 3) Heavy industry and 4) Consumer goods **(3.5+3+3+3).**
19. With neat sketch discuss the instrumentation and working principle of a TEM.
20. Write short notes on the following. 1) Chemical vapour deposition. 2) Distinguish between hydrothermal and solvothermal methods and 3) Optical and mechanical properties of nanocomposites. **(4+4+4.5)**
21. Using the block diagram, explain the working principle, instrumentation and applications of energy dispersive X-ray (EDX) method.
22. Discuss the various applications of nanoscience in the area of LED, fuel cells and electrochemical sensors.

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