



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

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

THIRD SEMESTER – NOVEMBER 2015

**PH 3875 - NANO SCIENCE**

Date : 11/11/2015  
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

**PART A**

Answer **ALL** questions:

**10 x 2 = 20 marks**

1. Write a note on “Nano foods”.
2. State the conditions for strong quantum confinement.
3. Explain the principle of microwave heating synthesis of nanomaterials.
4. Draw the block diagram of STM.
5. Highlight the importance of nanophotonics.
6. Rank the common intermolecular interactions (Van der Waals, electrostatic, covalent bond, hydrogen bond) in terms of strength and range.
7. Classify carbon nanotubes.
8. List out the advantages of bottom-up approach over top-down approaches.
9. Define surface Plasmon resonance.
10. What are the nanomaterials used for improving the resolution of monitors?

**PART B**

Answer any **FOUR** questions:

**4 x 7.5 = 30 marks**

11. Explain the applications of nanomaterials in biological tags and drug delivery system.
12. Describe the powder X-ray diffraction method to determine the structure and crystallite size of nanomaterials.
13. What are semiconductor quantum dots and derive the expression for its energy?
14. How does micro-emulsion method useful for synthesizing the metal-oxide nanoparticles?
15. Write short notes on photoluminescence and core-shell nanoparticles. **(3.5 + 4)**
16. Illustrate the photovoltaic device applications of nanomaterials.

**PART C**

Answer any **FOUR** questions:

**4 x 12.5 = 50 marks**

17. Discuss the scientific revolutions and opportunities at the nanoscale with special references to energy, information and communication, and heavy industry.
18. With neat diagram discuss the procedure for developing nanostructures employing ion implantation technique.
19. With block diagram outline the principle and operation of a transmission electron microscope (TEM).
20. a) Discuss the salient features and applications of metal-oxide nanocomposites.  
b) Write short notes on Langmuir-Blodgett deposition of nanoparticles. **(5+7.5)**
21. Using the block diagram, explain the working principle, instrumentation and applications of X-ray photoelectron spectroscopy.
22. What are nanosensors? How they are useful in defence, aerospace and biology?

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