



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - PHYSICS

FOURTH SEMESTER – APRIL 2013

PH 4958 - NANO SCIENCE

Date : 03/05/2013

Dept. No.

Max. : 100 Marks

Time : 1:00 - 4:00

PART A

Answer **ALL** questions

10 x 2 = 20

1. Explain the GMR and TMR effects.
2. Give a few examples for environmentally friendly energy systems.
3. What is meant by surface sensitization?
4. Schematically explain the creation of an exciton.
5. List a few common surfactants employed in microemulsion.
6. Explain the reaction mechanism for hydrolysis and condensation.
7. Outline the principle of a vibrating sample magnetometer.
8. Mention the main components of a UV spectrophotometer.
9. List the properties of nanophotonic structures.
10. With block diagram, briefly explain the action of a dye-sensitized photovoltaic cell.

PART B

Answer any **FOUR** questions

4 x 7.5 = 30

11. Explain the background of nanotechnology from historical perspectives.
12. Highlight the importance of core-shell nanoparticles and discuss the formation and properties of type I and type II structures.
13. Distinguish between hydrothermal and solvothermal processes and explain the chemical and thermodynamical factors governing the solvothermal process.
14. Using block diagram, explain the working principle of a Scanning Tunneling Microscope (STM).
15. With block diagram discuss the functioning of an optical storage system.

PART C

Answer any **FOUR** questions

4 x 12.5 = 50

16. Outline the nanotechnology enabled applications in the fields of 1) Energy 2) Information and communication and 3) Heavy industry. (4.5+4+4)
17. With necessary diagram, discuss the classification of semiconductor nanostructures with suitable examples in each category of material.

18. With schematic representation, explain the major components of an ion implantation facility and discuss the detailed procedure employed for creating nanocrystalline phase with suitable illustrations.
19. Explain the principle and functioning of an AFM with necessary diagrams.
20. Discuss the striking properties of carbon nanotube structures and explain its use in 1) field emission 2) flat panel display and 3) fuel cell. (4.5+8)
