LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – APRIL 2017

PH 3875- NANO SCIENCE

Date: 24-04-2017 Dept. No. Max. : 100 Marks
09:00-12:00

PART A

Answer **ALL** questions: **10 x 2 = 20 marks**

1. Explain the role of "Nanofiltration".
2. State the conditions for strong quantum confinement.
3. Draw the flow chart to demonstrate different approaches to synthesize nanoparticles.
4. Mention the essential components of a SEM.
5. What are photonic crystals?
6. Explain interdynamic aspects of intermolecular forces.
7. Mention any two mechanical properties of semiconductor nanoparticles.
8. What are carbon nanotubes?
9. How will you synthesize nanoparticle by sonochemical method?
10. Mention the broader application areas of nanosensors.

PART B

Answer any **FOUR** questions: **4 x 7.5 = 30 marks**

11. Draw the essential components of an optical disc system and discuss its function.
12. With block diagram discuss the instrumentation and operation of Molecular Beam Epitaxy thin film deposition technique.
13. Discuss the structural, optical and surface properties of metal nanoparticles.
14. a) Discuss the fundamentals solar cells (4)
    b) Discuss the advantages of LEDs in detail. (3.5)
15. Discuss the procedure to synthesize the nanoparticles by electro-chemical method.
16. Write a short note on the following.
    a) Fullerenes b) CNTs. c) C60.

PART C

Answer any **FOUR** questions: **4 x 12.5 = 50 marks**

17. Highlight the role of nanotechnology in medical field with particular emphasis on imaging of cancer cells, biological tags and drug delivery system.
18. With necessary circuit diagrams explain the step wise procedure for I-V characterization of a solar cell.
19. Review the historical background of nanotechnology and its implications in scientific revolutions and opportunities along with social justice.
20. a) Discuss the principle of operation and the major components of electrochemical sensors in detail. (10)
    b) Give any four applications of biosensors (2.5)
21. a) Explain the structure and functions of core-shell nanoparticles. (5)
    b) Briefly discuss the optical and mechanical properties of nanocomposites (7.5)
22. Explain the fundamentals of sol-gel approach and discuss the experimental procedure to synthesize metal-oxide nanoparticles

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