LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – NOVEMBER 2016

PH 3875 - NANO SCIENCE

Date: 14-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART A

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

1. Briefly explain the concept of quantum computers.
2. Draw the energy level diagram to illustrate the formation of an exciton.
3. Outline the principle of microwave heating synthesis of nanoparticles.
4. Define the fill factor of a solar cell.
5. Explain the principle of a wave guide.
6. Explain the different types intermolecular forces with suitable examples.
7. Briefly explain the concept of micro emulsions.
8. What are nanocomposites? Mention any two types of nanocomposites.
9. How will you synthesize the metal oxides by sol-gel method?
10. Explain the basic mechanism of nanosensors.

PART B

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

11. With neat sketch discuss the working principle and operation of a Scanning Tunnelling Microscope.
12. Discuss the role of nanotechnology in the field of Energy and Information & communication.
13. What are semiconductor quantum dots? Derive the expression for its energy gap.
14. a) Explain the fundamentals of LEDs **(3.5).**
    b) Discuss the applications of photovoltaic device in detail. **(4).**
15. Discuss the synthesis of nanoparticles by Langmuir-Blodgett method with suitable diagrams.
16. Highlight the mechanical and optical properties of Fullerenes and CNTs.

PART C

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

17. Discuss the classification of semiconductor nanostructures involving 0D, 1D, 2D and 3D.
18. With block diagram explain the essential components and working principle of a Transmission Electron Microscope (TEM).
19. Explain the importance of ion implantation technique and discuss the experimental procedure with suitable diagram.
20. a) Discuss the types of sensors based on physical properties. **(6)**
    b) Explain the applications of photocatalytic device in the purifications of air and water **(6.5).**
21. With neat block diagram, explain the essential components and working principle of X-ray photoelectron spectroscopy
22. How will you prepare thin films by chemical vapour deposition (CVD) method?

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