LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – NOVEMBER 2017

16PPH3ID01 - NANO SCIENCE

Date: 13-11-2017 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART A

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

1. Mention a few naturally available nanomaterials.
2. Explain the SPR and LSPR phenomena in noble metal nanoparticles.
3. Draw the block diagram of a UV-Visible Spectrophotometer.
4. Outline the sequence of events leading to spray pyrolysis of nanomaterials.
5. Draw the circuit a co-axial directional coupler.
6. Differentiate between intermolecular and intramolecular forces.
7. What are the significances of constituents of composites?
8. Why the properties of nanomaterials differ from bulk materials?
9. List a few applications of fluorescent materials.
10. What type of emission phenomenon occurs in a LED?

PART B

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

11. Discuss the recent nanotechnology based developments in the areas of aerospace and consumer goods.
12. Draw the diagram of a Molecular Beam Epitaxy (MBE) thin film deposition apparatus and explain its operation.
13. Outline the principle of optical storage system and discuss its operation with diagram.
14. Differentiate between SWMT and MWNT.
15. How is BET constant 'C' calculated? What is the significance of C?
16. How nanomaterials are synthesized using sol-gel process?

PART C

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

17. Based on quantum mechanical approach derive the equations for energy in a quantum well and quantum wires.
18. With neat diagrams explain the essential components, principle and operation of an Atomic Force Microscope (AFM).
19. Write note on a) Photonic crystal fiber b) Excitons and c) Vibrating Sample Magnetometer (VSM). (4+4+4.5)

20. a) How are the magnitude of bonding energy and shape of the potential energy curve varied from material to material? (6.5)

    b) What is Lennard-Jones potential? Write its significances. (6)

21. a) Discuss the electronic and mechanical properties of graphene. (6)

    b) Describe CVD method for synthesis of nanomaterials. (6.5)

22. a) How is x-ray photoelectron spectroscopy performed for chemical analysis? (7.5)

    b) Discuss the working principle of electrochemical sensors (5)

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