

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



M.Sc. DEGREE EXAMINATION – PHYSICS

THIRD SEMESTER – NOVEMBER 2019

17/18PPH3ID01 – NANO SCIENCE

Date: 04-11-2019

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

Part-A

Answer ALL the questions:

10 x 2 = 20 Marks

1. Give examples for active and passive nanostructures.
2. Write the condition for weak quantum confinement.
3. Mention the application of Scherrer's equation.
4. Draw the block diagram of the STM.
5. What are photonic crystals?
6. Mention those parameters which influence the strength of intermolecular force.
7. How are semiconductor nanocomposites classified?
8. Write the significance of Langmuir-Blodgett (LB) technique.
9. What is resonant radiation?
10. Why are the CNTs claimed as the promising material for FED?

Part-B

Answer any FOUR questions:

4 x 7.5 = 30 Marks

11. Highlight the potential benefits, risks, social justice and civil liberties involved in the implementation of nanotechnology.
12. With necessary diagram, explain the instrumentation and procedure for synthesizing nanomaterials by Molecular Beam Epitaxy (MBE) method.
13. With neat diagram discuss the principle, operation and applications of UV-Visible spectrophotometer.
14. a) How is total interaction potential between two molecules calculated? (5)
b) Calculate Lennard-Jones potential between two Xenon atoms separated by a distance of 2.0 . The depth of the potential well is 0.997 kJ/mol and is 3.40 . (2.5)
15. Describe the following with suitable examples;
a) semiconductor core-shell nanoparticles. (2.5)
b) coupled semiconductor metal oxide nanocomposites. (5)
16. How are nanoparticles and nanopolymers synthesized using sol-gel process?

Part-C

Answer any FOUR questions:

4 x 12.5 = 50 Marks

17. With suitable diagram, discuss the electronic band structure of nanocrystals and solids.
18. Draw the block diagram of AFM and explain its essential components, operation and applications.
19. Discuss the applications of nanotechnology in
- a. Imaging of cancer cells (5)
 - b. Biological tags and drug delivery system (7.5)
20. Explain the energy of the following interactions with suitable equations
- i) ion-dipole ii) dipole-dipole iii) ion-induced dipole and iv) dispersion
21. a) How is BET constant 'C' calculated and explain its significance? (6)
- b) Describe CVD method for the synthesis of nanomaterials. (6.5)
22. a) How is X-ray photoelectron spectroscopy performed for chemical analysis? (7.5)
- b) Describe the components and working principle of electrochemical sensors. (5)

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