

# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



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

**THIRD SEMESTER – NOVEMBER 2018**

**16/17PPH3ID01 – NANO SCIENCE**

Date: 31-10-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

## PART A

Answer **ALL** questions:

10 x 2 = 20 marks

1. With a neat block diagram, indicate the various applications of nanotechnology.
2. Define SPR and SPP.
3. List the advantages of Quantum Computing.
4. Mention the advantages of FESEM over SEM.
5. Draw the circuit employed to measure the dark current of a solar cell.
6. How are quantum confined structures classified?
7. What is catenation? How is it related with bond energy?
8. Differentiate between PVD and CVD.
9. What is electroluminescence? Give an example for electroluminescence device.
10. Mention the important components of a biosensor.

## PART B

Answer any **FOUR** questions:

4 x 7.5 = 30 marks

11. Explain the role of nanoparticles in increasing the efficiency of energy production.
12. Highlight the importance of nanomaterials in Imaging of cancer cells.
13. Derive the expression for effective band gap of a quantum well.
14. How are the metal oxide nanostructures synthesized using sol gel method? Write its advantages and drawbacks.
15. The experimental data for the adsorption of nitrogen on alumina at 77.3 K fit in a BET isotherm. The slope and intercept of a plot of  $P/[V(P_0-P)]$  and  $P/P_0$  are  $2.88 \times 10^{-2} \text{ cm}^{-3}$  and  $9.87 \times 10^{-4} \text{ cm}^{-3}$ . Area of cross section of  $\text{N}_2$  molecule is  $16.2 \times 10^{-20} \text{ m}^2$ . Calculate  $V_{\text{mono}}$  and surface area of alumina.
16. What are the major inelastic scattering events? How are the continuum and characteristic X-rays generated?

## PART C

Answer any **FOUR** questions:

4 x 12.5 = 50 marks

17. Discuss the applications of nanotechnology in (1) Optics (2) Agriculture (3) Cosmetics (4) Textile (5) Nanofoods and (6) Heavy industry.
18. With the block diagram, explain the instrumentation, phase contrast and advantages of a TEM.
19. Draw the schematic of ion implantation facility and discuss the experimental procedure along with a few examples of nanostructures.
20. Explain the nonbonding intermolecular forces with suitable equations.
21. Discuss the synthesis of nanomaterials using the CVD method. Write the types of reactions involved in CVD.
22. a) Describe the working principle of a solar cell and a fuel cell. (7.5)  
b) Explain the applications of photocatalysis in air purification. (5)

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