

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI-86
(For candidates admitted during the academic year 2019-2020 & thereafter)

SUBJECT CODE : 19PH/PE/MN15
M.Sc. DEGREE EXAMINATION – APRIL 2022
PHYSICS
SECOND SEMESTER

CODE : ELECTIVE

PAPER : MATERIAL PHYSICS AND NANOSCIENCE

TIME : 3 HOURS

MAX. MARKS : 100

SECTION A

(10x3= 30)

I. ANSWER ALL QUESTIONS

1. What is surface to volume ratio? Elucidate what happens to surface area upon the transition of bulk to nano.
2. List out a few size dependent phenomenon of nanomaterials.
3. Compare quantum dot, quantum wire and quantum well.
4. What are nano composites? Give some examples.
5. Is bottom-up approach preferable than top-down approach? Justify your answer.
6. Define green synthesis. Mention its significance.
7. Explain how to calculate the crystallite size of the nanomaterial from XRD data.
8. Brief out Brunauer - Emmett - Teller (BET) analysis to find the surface area of nanomaterial.
9. Explain the significance of nanomaterials in drug delivery.
10. Mention a few recent advancements in the field of solar cells.

SECTION – B

(5x5= 25)

II. ANSWER ANY FIVE QUESTIONS

11. Pen down the evolution of band structures and fermi surface associated to nanoparticles.
12. Write short notes on superparamagnetic materials and their applications.
13. Briefly explain a core-shell nanoparticles with a suitable diagram.

14. Describe the importance and prominent applications of Spray pyrolysis.
15. What are Langmuir-Blodgett films and explain the method of synthesis of nanofilm with the help of Langmuir-Blodgett films.
16. Explain the working principle of Impedance spectroscopy with necessary diagrams. What is it used for?
17. Discuss the application of nanomaterial in optical data storage system and quantum computing.

SECTION – C**(3x15= 45)****III.ANSWER ANY THREE QUESTION**

18. What are smart materials? Discuss their types and applications in detail.
19. What are the different types of carbon nanostructures? Discuss any one of the synthesis methods and elaborate the important properties of carbon nanostructures.
20. Explain the basic principle and the various steps involved in sol gel synthesis with necessary diagrams. List out the advantages and Limitations.
21. Explain the principle, construction and working of different modes of an Atomic Force Microscope with a neat diagram. Discuss the advantages and disadvantages of this method.
22. (i) What is Photocatalysis? Discuss the Photocatalytic applications of nanomaterials in water purification. (10 marks)

(ii) What are nanosensors? Write a short note on electrochemical sensor. (5 mark)
