

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For candidates admitted during the academic year 2023 -2024 & thereafter)

M.Sc. DEGREE EXAMINATION – APRIL 2026
BRANCH III - PHYSICS
FOURTH SEMESTER

CODE : ELECTIVE
PAPER : NANOSCIENCE AND NANOTECHNOLOGY
SUBJECT CODE : 23PH/PE/NN15
TIME : 3 HOURS **MAX. MARKS : 100**

Q. No.	SECTION A	CO	KL
	ANSWER ALL QUESTIONS (10 x 3 = 30)		
1	What is nanoscience and nanotechnology?	1	1
2	What are quantum dots? Mention any two applications.	1	1
3	What is agglomeration? How can it be minimised?	1	1
4	Write notes on surface plasmon resonance.	1	1
5	Define superparamagnetism.	2	2
6	How does melting point vary at the nanoscale?	2	2
7	What is activated carbon?	2	2
8	State the principle of SEM.	2	2
9	Why does the band gap increase when decreasing the size of nanostructures?	3	3
10	What is Supercapacitor?	3	3
Q. No.	SECTION B	CO	KL
	Part A		
	ANSWER ANY TWO QUESTIONS (2 x 5 = 10)		
11	Explain the role of quantum size effects on the optical properties of nanomaterials.	3	3
12	Describe the ball milling technique for the synthesis of nanomaterials.	3	3
13	Discuss the working principle of Atomic Force Microscopy (AFM).	3	3
	Part B		
	ANSWER ANY SIX QUESTIONS (6 x 5 = 30)		
14	Discuss the historical development of nanoscience and nanotechnology.	4	4
15	Explain the mechanical properties of nanomaterials with suitable examples.	4	4
16	Describe electrical properties of nanomaterials with reference to ferroelectrics and dielectrics.	4	4
17	Explain Physical Vapour Deposition (PVD) technique for thin film preparation.	4	4
18	Describe the sol–gel method for nanomaterial synthesis.	4	4
19	Explain the principle and applications of Transmission Electron Microscopy (TEM).	4	4

20	Discuss BET surface area analysis and its significance in nanomaterials.	4	4
21	Explain the working of a Vibrating Sample Magnetometer (VSM).	4	4
Q. No.	SECTION C ANSWER ANY TWO QUESTIONS (2 x 15 = 30)	CO	KL
22	Evaluate the synthesis techniques of nanomaterials and justify the suitability of chemical methods over physical methods.	5	5
23	Explain in detail the different forms of carbon nanostructures.	5	5
24	Evaluate the role of nanotechnology in energy applications such as fuel cells, batteries and photovoltaics.	5	5
25	Discuss societal and technological impacts of nanotechnology in environmental protection.	5	5
