



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FOURTH SEMESTER – APRIL 2023

UPH 4602 – INTRODUCTORY NANO SCIENCE & NANO TECHNOLOGY

Date: 06-05-2023

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

SECTION A - K1 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

1. **Answer the following**

- List a few commonly found nanomaterials in nature.
- Define aspect ratio of a nanomaterial.
- Give the reasons for using high vacuum chamber in physical vapour deposition method of synthesizing metal nanoparticles.
- State Bragg's law in X-ray diffraction.
- Name few nanomaterials used in high energy batteries.

2. **Fill in the blanks**

- Quantum dot is a _____ nano dimensional particle.
- When the size of a nanomaterial increases, its band gap _____.
- Transmission electron microscopy is similar to optical microscopy, except that the photons are replaced by _____.
- The abbreviation of FWHM in Scherrer's formula is _____.
- _____ are non scale crystalline structure which can transform the colour of light.

SECTION A - K2 (CO1)

Answer ALL the Questions
10)

(10 x 1 =

3. **True or False**

- Graphite sheets are 3D nanomaterials.
- The colour of nanoparticles shift towards red as their size is reduced.
- Ball milling is a top-down approach.
- AFM gives 2D images.
- Nano-robots are used for diagnostic and therapy.

4. **Match the following**

- Bucky Ball - 3D image
- X-ray diffraction - medical application
- Atomic force microscopy - C-60
- Scanning electron microscopy - particle size

e)	Tissue engineering - surface analysis	
SECTION B - K3 (CO2)		
	Answer any TWO of the following (20)	(2 x 10 = 20)
5.	a) Write a short note on the negative impact of nanotechnology on society. b) Explain the change of elastic properties with the size of nanomaterials.	(5) (5)
6.	Using a diagram, illustrate physical vapour deposition and explain laser ablation technique.	
7.	Sketch the schematic diagram of scanning tunnelling microscope and explain its working.	
8.	Write a detailed note on the applications of nanomaterials in diagnosis and drug delivery system.	
SECTION C – K4 (CO3)		
	Answer any TWO of the following	(2 x 10 = 20)
9.	a) Distinguish between 0D, 1D, 2D and 3D nanostructures with examples. b) Explain ball milling method of producing nanomaterials	(5) (5)
10.	Analyze the size effect in optical properties of nanomaterials.	
11.	Explain the working of Atomic Force Microscopy (AFM) with neat diagram.	
12.	Compare (i) the conventional high energy density batteries with those using nanomaterials (ii) the conventional solar photovoltaic cells with those using nanomaterials.	(5) (5)
SECTION D – K5 (CO4)		
	Answer any ONE of the following	(1 x 20 = 20)
13.	a) Summarize the nano revolution in industries. b) Explain how the hardness of nanomaterials change with their size.	(10) (10)
14.	a) Write the Scherrer's formula and explain how the grain size of nanoparticles are measured using Scherrer's formula. b) Explain the construction and working of scanning electron microscope using a neat diagram. c) Describe the usage of nanomaterials in photo – degradation.	(7) (7) (6)
SECTION E – K6 (CO5)		
	Answer any ONE of the following	(1 x 20 = 20)
15.	a) Summarize the electrical properties of nanomaterials. b) Explain in detail the wet chemical synthesis of nanomaterials.	(10) (10)
16.	a) Describe the working of transmission electron microscopy with the help of a neat schematic diagram. b) Write a note on bioremediation.	(12) (8)

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