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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)



Ph.D. (Second Semester-Summer) Examinations, April – 2026
23SPPECY2011 – Nanomaterials & Their Applications

(Chemistry)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions.

(14 x 5 = 70 Marks) Marks

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| 1.a. | What are the common types of crystal structures observed in nanomaterials? | 7 |
| b. | What are some real-world applications of self-assembled nanomaterials? | 7 |
| 2. | Why do nanoscale materials often exhibit enhanced mechanical flexibility and toughness? | 14 |
| 3.a. | How do thermodynamic and kinetic factors influence self-assembly processes? | 7 |
| b. | What are the major synthesis techniques for carbon nanotubes? | 7 |
| 4. | What are the main chemical synthesis techniques used for nanomaterials? | 14 |
| 5.a. | What are the key differences between Thermal CVD and Plasma-Enhanced CVD? | 7 |
| b. | How does Atomic Force Microscopy (AFM) measure surface topography at the nanoscale? | 7 |
| 6.a. | What is the principle of Auger Electron Spectroscopy (AES), and how does it differ from XPS? | 7 |
| b. | What is the working principle of Scanning Tunnelling Microscopy (STM), and how does it achieve atomic resolution? | 7 |
| 7. | What is the working principle of High-Resolution Transmission Electron Microscopy | 14 |
| 8.a. | How do nanomaterials enhance the performance of Lithium-Ion Batteries (LIBs)? | 7 |
| b. | How do nanomaterials improve the sensitivity and selectivity of chemical sensors? | 7 |

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