

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-VII Semester (Open Elective)

COURSE CODE (CREDITS): 18B1 WPH731 (03)

MAX. MARKS: 25

COURSE NAME: Nanotechnology

COURSE INSTRUCTORS:

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	(a) Explain the principle of chemical reduction method for synthesizing metal and semiconducting nanoparticles with suitable examples.	2	3
	(b) Discuss the sol-gel method for nanoparticle synthesis. What are its advantages and limitations?		2
	(c) What role do surfactants or capping agents play in chemical synthesis of nanoparticles?		2
Q2	(a) Define Gibbs free energy (ΔG). Why must ΔG be negative for nanoparticle nucleation? Also, explain with a diagram the variation of ΔG with nucleus radius (ΔG vs r curve).	2	3
	(b) Discuss the role of Gibbs free energy in: (i) Nucleation of nanoparticles, (ii) Growth and stabilization of nanoparticles, (iii) Shape control of nanoparticles		3
Q3	(a) With neat diagrams, explain the structure of CNTs using chiral vector (n, m) representation. Also, discuss the electronic properties of CNTs and their dependence on chirality (armchair, zigzag, chiral).	3	3
	(c) Compare and contrast arc discharge, laser ablation, and CVD methods of CNT synthesis with advantages and disadvantages.		3
Q4	(a) Discuss the mechanical, electrical, and thermal properties of CNTs that make them superior to conventional materials.	4	3
	(b) Explain at least one advanced applications of CNTs in energy, medicine, and electronics in detail.		3