

**Time: 2 hours Max Marks: 50**

**This paper contains ONE printed page and THREE parts**

**INSTRUCTIONS: Draw diagrams wherever necessary**

**PART-A**

**Answer any SEVEN of the following 2 x 7 = 14 marks**

1. Write any two applications of nanotechnology in biology.
2. Draw the force-distance curve. Mention why it is important in nanobiotechnology.
3. What are Quantum dots? Mention its types.
4. What is self-assembly? How is it relevant for the functioning of a cell?
5. What is the significance of DNA-based computation?
6. Name any two microorganisms that produce nanoparticles.
7. What is nano-mechanobiology? Give an example of nanomaterials used for the same.
8. How do magnetic nanoparticles induce hyperthermia? Where can this be used?
9. State any two applications of nanoparticles in the environment.

**PART B**

**Answer any FOUR of the following: 5 x 4 = 20 marks**

1. Explain Power-stroke model and Brownian-Ratchet model of cells working as nanomachines for their motor-driven intracellular transport.
2. What is special about Magnetotactic bacteria? Explain the structures they produce with their applications. (1+4)
3. What is non-viral transfection? What are the factors that affect it? Explain chitosan based non-viral transfection. (1+2+2)
4. Using examples, explain the advantages and disadvantages of using nanoparticles as imaging agents.
5. Draw a flowchart for solar cell production using a biomaterial.
6. Explain ethical, legal and social implications of nanomaterials.

**PART C**

**Answer any TWO of the following: 8 x 2 = 16 marks**

1. Briefly explain the process of photolithography. Mention any two applications of photolithography in biology. (6+2)
2. Using simple diagrams, briefly explain any four of the DNA/RNA based detection assays.
3. What are nanofertilizers and nanopesticides? How are they different from conventional systems? Write a note on producing them in the lab. (4+3+1)