**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27**

**M.Sc. BIOTECHNOLOGY - II SEMESTER**

**SEMESTER EXAMINATION: APRIL 2022**

**(Examination conducted in July 2022)**

**BT DE 8621: Nanobiotechnology**

**Time- 2 ½ hrs Max Marks-70**

**This question paper contains TWO printed pages and THREE parts**

**Part A (Answer *ANY TEN* questions) 2mx10=20marks**

1. Define nanobiotechnology and write two applications of nanotechnology in biology.
2. How are integrin proteins important in cell-nanostructure interaction?
3. What is a nanoparticle? Write one application in biotechnology.
4. Write any two unique characteristics of nanoparticles compared to bulk systems.
5. Name two material characterization techniques that provide information on nanosystem size.
6. Name any four types of defects that impact the mechanical properties of nanomaterial.
7. What is self-assembly? Why is it important in biotechnology?
8. What is special about magnetotactic bacteria?
9. Why are DNA detection assays important?
10. Write two advantages of Nanopesticides.
11. What are quantum dots? Give an example.
12. State two examples as how nanoparticles are used in environmental remediation?

**Part B (Answer *ANY FIVE* questions) 6mx5=30marks**

1. Draw the energy band diagram and two characteristics of each: conductor, semiconductor and insulator.
2. Answer the following:
   1. Mention two important features of a cell working as a nanobiomachine. (2 marks)
   2. How do magnetotactic bacteria use magnetosomes in navigation and survival? (4 marks)
3. Answer the following:
   1. Write a note on photochromic and photoelectric applications of Bacteriorhodopsin (3 marks)
   2. Write a note on three types of chip-based heterogeneous DNA detection assays (3 marks)
4. Briefly explain the factors that impact cell-nanostructure interaction.
5. What are nano-bioinsecticides? How are they made? Why are they important?
6. Using the concepts of nanobiotechnology, briefly write the flowchart for developing a nanobiosensor made of gratings for detection of viral protein load in blood serum samples.
7. Write a note on:
   1. Biopiracy of nanobioproducts
   2. Nanoparticles for imaging applications

**Part C (Answer *ANY TWO* questions) 10mx2=20marks**

1. What is bottom-up fabrication of nanosystems? Briefly explain chemical-vapor deposition and molecular self-assembly methods.

(OR)

Write a short note on following:

* 1. Fourier-transform Infrared (FTIR) spectroscopy
  2. Atomic force microscopy (AFM)

1. Answer the following questions:
   1. Nanoparticle synthesis methods from microbes
   2. Nanoparticle synthesis methods from Plants
   3. Four applications of nanoparticles in healthcare

(OR)

Write a short note on the applications of Nanotechnology in following with an example:

* 1. Nanotheranostics
  2. Nanobiocatalysis
  3. Crop improvement
  4. Nanoinformatics