LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **BIOTECHNOLOGY**

THIRD SEMESTER – **NOVEMBER 2024**

PBT3ME02 – NANOBIOTECHNOLOGY

Date: 19-11-2024 Dept. No. Max. : 100 Marks

Time: 01:00 pm-04:00 pm

	SECTION A – K1 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
1	**Choose the best option**
a)	The smallest portion of a crystal which when repeated in different directions generates the entire crystal is called _____. i) Lattice points ii) Crystal lattice iii) Unit cell iv) None of these
b)	The nanoparticles of _____ helps to prevent tooth from decaying. i) zinc ii) magnesium iii) glucose iv) hydroxyapatite (HAp)
c)	Programmed cell death is also referred as _____. i) Proliferation ii) Metastasis iii) Apoptosis iv) Mitotic termination
d)	The "Lotus Leaf Effect" in biomimetics is primarily related to which of the following properties? i) Self-healing ii) Color change with temperature iii) Adhesion to surfaces iv) Water repellency and self-cleaning
e)	Smart food packaging using nanotechnology can _____. i) Change the color of food based on temperature. ii) Provide real-time information on food quality and safety. iii) Act as a protective coating to prevent food spoilage. iv) Remove contaminants from food.
	SECTION A – K2 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
2	**Answer in one or two sentences**
a)	What are biomolecular motors and where do they found in cells?
b)	What are major steps involved in the extraction of nanoparticles from plants?
c)	Mention any one containment strategy used to prevent the release of nanomaterials during manufacturing.
d)	Paraphrase the main components of a 3D bio-printing system.
e)	List common nanomaterials used for environmental cleanup.
	SECTION B – K3 (CO2)
	Answer any THREE of the following **(3 x 10 = 30)**
3	Explain the role of natural structures, such as lotus leaves or gecko feet, in the design of bioinspired nanomaterials.
4	Illustrate the process of bioreduction in the synthesis of nanoparticles by microorganisms.

5	Design a containment protocol for a facility producing carbon-based nanomaterials to minimize worker exposure.
6	Relate how the adhesive properties of gecko feet inspire the development of synthetic adhesives like superglue.
7	Show the differences between conventional bioremediation and nanobioremediation in terms of efficiency and environmental impact.
	SECTION C – K4 (CO3)
	Answer any TWO of the following **(2 x 12.5 = 25)**
8	Analyze the factors affecting the stability and release profile of drugs encapsulated in nanocapsules.
9	Examine the variations in the methods of nanoparticle formation between microorganisms like fungi and bacteria and plants.
10	Evaluate the effectiveness of Life Cycle Assessment in identifying the most critical stages for minimizing environmental harm from nanomaterials.
11	Compare and contrast the different types of 3D bio-printing techniques, such as inkjet, extrusion, and laser-assisted printing.
	SECTION D – K5 (CO4)
	Answer any ONE of the following **(1 x 15 = 15)**
12	Summarize the advantages and limitations of using bioinspired nanostructures in medical implants.
13	Assess the environmental impact of large-scale nanoparticle extraction from plants.
	SECTION E – K6 (CO5)
	Answer any ONE of the following **(1 x 20 = 20)**
14	Develop a comprehensive model for assessing the combined ecotoxicity of nanomaterials and other pollutants in a freshwater ecosystem.
15	Design a nanobioremediation system to treat industrial wastewater containing toxic organic pollutants.

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