22ESP211

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2023
(Second Semester)

Branch - **ENVIRONMENTAL SCIENCE**

ENVIRONMENTAL BIOTECHNOLOGY AND NANO TECHNOLOGY

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. In enhanced photosynthesis, what is the typical target for increasing carbon fixation?
   (i) Decreasing it to conserve resources
   (ii) Doubling it or more
   (iii) Keeping it the same as natural photosynthesis
   (iv) Eliminating carbon fixation altogether

2 Find the enzyme that is often involved in the initial breakdown of xenobiotics in biodegradation.
   (i) DNA polymerase (ii) Ribonuclease
   (iii) Cytochrome P450 (iv) Lipase

3 Which classifications of biofertilizers are primarily responsible for improving the soil's physical structure and nutrient availability?
   (i) Bacterial biofertilizers (ii) Fungal biofertilizers
   (iii) Algal biofertilizers (iv) Actinomycetes biofertilizers

4 Identify the method commonly used to produce carbon nanotubes in the laboratory.
   (i) CVD (Chemical Vapor Deposition)
   (ii) PCR (Polymerase Chain Reaction)
   (iii) ELISA (Enzyme-Linked Immunosorbent Assay)
   (iv) MRI (Magnetic Resonance Imaging)

5 Which is a common method for removing heavy metals from contaminated water?
   (i) Filtration (ii) Coagulation-flocculation
   (iii) Reverse osmosis (iv) Ion exchange

SECTION – B (15 Marks)

Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Discuss the effectiveness of immobilized cells in a specific biotechnological application.

OR

b Evaluate the effectiveness of installing biofilters to remove eutrophication in a pond ecosystem.

7 a Discuss the optimization of biosorption techniques to remove cyanide for varied industrial effluents.

OR

b Classify the types of *in situ* bioremediation.

Cont...

8 a Illustrate the importance of symbiotic nitrogen fixation.

OR

b State the list of components of Intellectual Property Rights (IPR).

9 a Discuss the bottom-up approach to the synthesis of nanomaterials.

OR

b Illustrate the significance of hydrogels in biological applications.

10 a Evaluate the application potential of nanoparticles in industrial wastewater treatment.

OR

b Explain the difference between nanomaterials and nanodevices.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Elucidate the role of genetically modified crops to wild population, genetic diversity and adoptability.

OR

b Construct different methods for the removal of nitrogen in wastewater.

12 a Assess the effectiveness and limitations of microbial biodegradation in remediating polyaromatic hydrocarbon (PAH) contamination in soil.

OR

b Compare the environmental and economic benefits of bio-pulping to chemical pulping.

13 a Design a Phosphate-Solubilizing Microorganism (PSM)-based soil improvement plan for a nutrient-deficient crop.

OR

b Evaluate the ethical dilemmas surrounding the use of biological weapons (biowarfare) and the implications for global security.

14 a Compare and contrast carbon nanotubes (CNTs) with conventional wastewater treatment methods for organic pollution removal.

OR

b Assess the environmental impact of nanomaterial fate and transport in different environmental compartments.

15 a Create a nanomaterial-based treatment process for the removal of pharmaceuticals from municipal wastewater.

OR

b Develop a nanomaterial-based photocatalytic water treatment system powered by solar energy.

Z-Z-Z

END