22ESP211N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(Second Semester)

Branch – **ENVIRONMENTAL SCIENCE**

ENVIRONMENTAL BIOTECHNOLOGY AND NANO TECHNOLOGY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Question No.	Question	K Level	CO
1	What is a Genetically Modified Organism (GMO)? a) An organism that has been produced using mechanical tools b) An organism whose DNA has been altered using genetic engineering c) An organism found only in deserts d) An organism that cannot reproduce	K1	CO1
2	What is cell immobilization? a) Cells that move freely in water b) A way to kill cells c) A method where cells are kept in one place d) A process that stops cells from growing	K2	CO1
3	What are xenobiotics? a) Pollutants foreign to the natural environment b) Naturally occurring minerals in soil c) Essential nutrients for plant growth d) Beneficial microbes in compost	K1	CO1
4	What is the role of biosurfactants in microbial treatment of oil pollution? a) They increase oil production b) They solidify oil waste c) They prevent microbes from accessing oil d) They help microbes break down oil	K2	CO1
5	Which is a phosphate solubilizing microorganism? a) Aspergillus b) Lactobacillus c) Streptococcus d) Candida	K1	CO1
6	What is the function of phosphate solubilizing microorganisms (PSM)? a) Increase pesticide resistance b) Convert insoluble phosphates into forms available to plants c) Prevent photosynthesis d) Absorb nitrogen from the atmosphere	K2	CO1
7	Which of the following is used as an adsorbent in nanotechnology? a) Zeolites b) Water c) Air d) Salt	K1	CO1
8	What is one reason synthetic nano materials are preferred over natural ones in certain applications? a) They are always cheaper b) They can be precisely engineered for specific properties c) They occur more frequently in nature d) They never degrade	K2	CO1
9	Nanotechnology helps in the treatment of industrial wastewater by: a) Removing pollutants b) Increasing waste production c) Spreading contaminants d) Reducing water flow	K1	CO1
10	The role of nanodevices in environmental applications is to: a) Reduce the efficiency of green chemistry b) Only store waste materials c) Increase soil erosion d) Detect, monitor, and treat pollutants at the nanoscale	K2	CO1

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Explain cell immobilization and its role in wastewater treatment, including the techniques, advantages, and environmental applications.	K2	CO1
	(OR)		
11.b.	Briefly demonstrate the processes of biodecolourization, biofiltration, bioindicators, and bioreactors used in wastewater treatment.		
12.a.	Identify and explain the types of biodegradation and bioremediation. How can you apply microbial methods to solve environmental pollution caused by xenobiotics?	K3	CO2
	(OR)		
12.b.	Apply the concept of bioleaching using *Thiobacillus ferroxidans* and biosorption to remove cyanide from acid mine drainage. How would you develop a treatment plan?		
13.a.	Identify and classify different types of biofertilizers, explaining how they contribute to nitrogen fixation in agriculture.	K3	CO3
	(OR)		
13.b.	Apply the properties of *Bacillus thuringiensis* to design a biological insecticide for crop protection.		
14.a.	Categorize natural and synthetic nanomaterials and compare their environmental impacts.	K4	CO4
	(OR)		
14.b.	Survey the potential health and environmental risks of nanomaterials and infer the best risk management strategies.		
15.a.	Analyze the role of nanomaterials in wastewater treatment and classify the types of adsorbents used for water purification.	K4	CO4
	(OR)		
15.b.	Examine how nanotechnology contributes to energy sectors such as solar, wind, and biomass energy, and list the major benefits.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Question No.	Question	K Level	CO
16	Discuss the concept of GMO and LMO, highlighting their applications, regulations, and environmental impacts.	K6	CO1
17	Explain the biodegradation of polyaromatic hydrocarbons (PAHs) and pesticides through microbial processes.	K5	CO3
18	Evaluate the different biosafety levels (BSL-1 to BSL-4) with examples of organisms handled at each level.	K4	CO3
19	Explain the factors influencing nanoparticle growth, shape, size, and structure during synthesis.	K5	CO4
20	Assess the future prospects and challenges of using nanotechnology for environmental protection and sustainable development.	K4	CO5

Z-Z-Z END