REV-01
MMB/16/22

2025/05

**SET A**

# M.Sc. MICROBIOLOGY
## FOURTH SEMESTER
## AGRICULTURAL MICROBIOLOGY
## MMB-401

[USE OMR FOR OBJECTIVE PART]

**Duration: 3 hrs.** **Full Marks: 70**

**Time: 30 min.** **Marks: 20**

**(Objective)** 1X20=20

*Choose the correct answer from the following:*

1. …….. a process where the nutrients are taken up by the soil microbes and incorporated into organic forms
   a. Green Manuring b. Mineralization
   c. Bioremediation d. Immobilization

2. Which metal is a key component of the nitrogenase enzyme?
   a. Zinc b. Copper
   c. Molybdenum d. Iron

3. The relationship between Rhizobium and legumes is an example of:
   a. Parasitism b. Commensalism
   c. Mutualism d. Predation

4. Which organism group is primarily responsible for nutrient mineralization?
   a. Earthworms b. Soil bacteria and fungi
   c. Nematodes d. Algae

5. Which of the following is a phosphate-solubilizing biofertilizer?
   a. Rhizobium b. Pseudomonas
   c. Frankia d. Azolla

6. PGPR are considered an eco-friendly alternative to:
   a. Crop rotation b. Chemical pesticides and synthetic fertilizer
   c. Organic compost d. Irrigation

7. What is the primary environmental risk of pesticides that are not biodegradable?
   a. Increase in plant growth b. Soil fertility improvement
   c. Bioaccumulation and ecosystem toxicity d. Enhanced microbial diversity

8. The nitrogenase enzyme complex consists of how many main protein components?
   a. One b. Two- Fe protein and Mo-Fe protein
   c. Three- Fe, Mo and S protein d. Four

9. Azolla is best known for its symbiotic relationship with:

a. Rhizobium
b. Anabaena
c. Nostoc
d. Azotobacter

10. The rhizosphere is the zone:

a. Above the soil surface
b. Between soil layers
c. Surrounding plant roots rich in microbial activity
d. With no microbial life

11. In ex situ bioremediation, the contaminated material is:

a. Treated at the original site
b. Left Untreated
c. Remove and treated elsewhere
d. Burned

12. Bioaugmentation refers to

a. Adding fertilizer to soil
b. Adding specific microbes to enhance pollution degradation
c. Using plants to absorb heavy metals
d. Increasing the crop yield by using chemicals

13. Which among the following is the most abundant reservoir of carbon?

a. Living organisms
b. Atmosphere
c. Ocean
d. Fossils and Sedimentary rock

14. *Jatropha curcas* is considered suitable for biodiesel because it:

a. Grow well in wasteland
b. Required less water resources
c. Need fertilizer for survival
d. Produce edible oil

15. The first genetically modified crop approved for human consumption was:

a. Bt cotton
b. Flavr Savr Tomato
c. Golden rice
d. Roundup Tomato

16. Aflatoxins are toxic compounds produced by:

a. *Aspergillus flavus* and *Aspergillus parasiticus*
b. *Escherichia coli*
c. *Penicillium chrysogenum*
d. *Streptococcus pneumoniae*

17. Bioindicators are important in environmental science because they:

a. Replace chemical test completely
b. Provide early sign for ecosystem changes
c. Only show long term effect
d. Are cheaper

18. One of the key challenges in using microbial herbicides is:

a. High Environmental Toxicity
b. Development of resistance in microorganisms
c. Limited effectiveness in various environmental conditions
d. Expensive production cost

19. Which among the following act as biosensor?

a. Nucleic acid
b. Protein
c. Antibiotics
d. All of the above

20. The natural resources of sulfur is

a. Atmosphere
b. Volcanoes
c. Ocean
d. Automobile emissions

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## Descriptive

**Time : 2 hrs. 30 min.** **Marks : 50**

*[ Answer question no.1 & any four (4) from the rest ]*

1. Explain elaborately the process of nutrient mineralization and immobilization. 10

2. **Write a short note on:** 5×2=10
   a. PGPR
   b. Azolla

3. What are GMOs? Briefly explain their advantages and concerns. Elaborate the environmental risk assessment associated with GMO 10

4. Explain the principle, types and application 5×2=10
   **a.** Biosensor
   **b.** Microbes

5. Explain the mechanism of biological nitrogen fixation with suitable diagram and signify the role of nitrogenase activity. 10

6. Explain the concept of bioremediation. Discuss its types, mechanisms, advantages, limitations, and applications. 10

7. Discuss the status of India in applicability of GMO. Explain Intellectual Property Rights (IPR) in relation to Genetically Modified Organisms (GMOs). 10

8. **Write short notes on** 5×2=10
   a) Bio-diesel crops of India
   b) Carbon Cycle

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