BIOFERTILIZERS AND BIOPESTICIDES
(BIOT 4132)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) PDA media is used for isolation of
(a) *Rhizobium sp* (b) *Aspergillus sp*
(c) *Trichoderma sp* (d) All of (a), (b) & (c).

(ii) Cofactor used for nitrogen fixation is
(a) Ni (b) Mo (c) Co (d) None of these.

(iii) Organism participating in nitrogen contribution for production of Rice is
(a) *Frankia sp* (b) *Acetobacter sp*
(c) *Lactobacillus sp* (d) *Aspargillus sp.*

(iv) Mycorrhizae is association between
(a) Plant and fungi (b) Fungi and bacteria
(c) Algae and bacteria (d) None of (a), (b) & (c).

(v) *Actinomycetes* participating in nitrogen fixation is
(a) *Frankia sp* (b) *Acetobacter sp*
(c) *Lactobacillus sp* (d) *Aspargillus sp.*

(vi) Nature of BT toxin is
(a) Alpha endotoxin (b) Beta endotoxin
(c) Delta endotoxin (d) None of (a), (b) & (c).

(vii) Bacterial chemotaxis is induced by
(a) Flavonoid (b) Plant exudates
(c) Lectin (d) All of (a), (b) & (c).

(viii) The two metalloproteins of nitrogenase enzyme are
(a) Fe protein and Fe-S protein (b) Fe-S protein and Mo-Fe protein
(c) Fe protein and Fe-Mo protein (d) Fe protein and Mo protein.

(ix) Nodulins are
(a) Bacterial protein (b) Plant protein
(c) Both bacterial and plant protein (d) None of (a), (b) & (c).

(x) *fix* genes are
(a) Homologous to *nif* genes of *Klebsiella*
(b) Non-homologous to *nif* genes of *Klebsiella*
(c) Homologous to *nod* genes of *Rhizobium*
(d) Non-homologous to *nod* genes of *Rhizobium.*

Fill in the blanks with the correct word

(xi) Commercial BT strain is marketed as _____.

(xii) _____ genes augment the Cry toxins.

(xiii) The genes that are involved in N-fixation in *Azotobacter* are _____.

(xiv) The sustainable approach of pest control is _____ Programme.

(xv) Regulator protein for *nif* operon is _____.

Group - B

2. (a) Briefly discuss the isolation and identification process of *Rhizobium sp.* *[(CO1)(Analyse/HOCQ)]*

(b) Analyse the mode of action *Anabanea-azolla* symbiosis. *[(CO2)(Analyse/IOCQ)]*

7 + 5 = 12

3. (a) Explain how free living nitrogen fixer collect energy for nitrogen fixation. *[(CO3)(Analyse/HOCQ)]*

(b) What is rhizosphere and what its importance? *[(CO2)(Remember/LOCQ)]*

(c) Analyse the role of acetylene reduction assay. *[(CO2)(Apply/IOCQ)]*

4 + 4 + 4 = 12

Group - C

4. (a) Briefly explain how *Azotobacter sp* contribute nitrogen to the soli. *[(CO3)(Explain/IOCQ)]*

(b) Distinguish between organic fertilizer and biofertilizer. *[(CO1)(Remember/LOCQ)]*

8 + 4 = 12

5. (a) Illustrate the role of organic acid secreted by phosphate solubiliising bacteria. *[(CO3)(Analyse/HOCQ)]*

(b) What is VAM and why it is important? *[(CO2)(Remember/LOCQ)]*

6 + 6 = 12

Group - D

6. (a) What are Nodulins? Hoe they are classified? *[(CO4)(Analyse/LOCQ)]*

(b) How nod genes are induced? Discuss their regulation. *[(CO4)(Remember/HOCQ)]*

(2 + 4) + (2 + 4) = 12

7. (a) Describe the arrangement of nif genes in any free living diazotrophs. Mention the function of the main operon of nif gene. *[(CO4)(Describe/LOCQ)]*

(b) What is meant by Rhizosphere engineering? Discuss the different approaches of it by a suitable diagram. *[(CO4)(Apply/HOCQ)]*

6 + (2 + 4) = 12

Group - E

8. (a) Mention two important fungal diseases related to biopesticide. *[(CO5)(Analyse/HOCQ)]*

(b) Illustrate the advantages and disadvantages of biopesticide over chemical pesticide. *[(CO5)(Remember/LOCQ)]*

(c) Discuss the mode of action of alleopathic substance with suitable example. *[(CO6)(Apply/IOCQ)]*

4 + 4 + 4 = 12

9. (a) What is gene pyramiding? What are the novel toxin combinations used by commercial companies? *[(CO5)(Analyse/HOCQ)]*

(b) Describe the crystal structure of BT toxin mentioning the structure and function of its domains. *[(CO6)(Remember/LOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	37.5	22	40.5

Course Outcome (CO):

After the completion of the course students will be able to:

1. Explain the role of beneficial microbes in sustainable agriculture.
2. Gain knowledge on isolation and identification of nitrogen fixing bacteria.
3. Role of phosphate solubilizing bacteria.
4. Understand molecular biology of nitrogen fixation.
5. Understand the importance of biopesticide over chemical pesticide.
6. Isolate and identify biopesticides for increased agricultural productivity.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*