# AGRICULTURAL BIOTECHNOLOGY
## (BIOT 5141)

**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) SCAR is
(a) Sequence characterised amplified region
(b) Sequence categorised amplified region
(c) Sequence conformation amplified region
(d) None of the above

(ii) Which type of molecular marker involves the use of restriction enzymes to detect variations in DNA sequence?
(a) RAPD markers (b) RFLP markers
(c) SSR markers (d) SNP markers.

(iii) Norman Borlaug won Nobel Prize for the following
(a) Developing a semi-dwarf, high-yielding, winter wheat variety
(b) Developing a dwarf, high-yielding, spring wheat variety
(c) Developing a semi-dwarf, high-yielding, winter rice variety
(d) Developing a tall, high-yielding, spring rice variety.

(iv) Fruit ripening genes were identified by
(a) Screening cDNA library
(b) Screening gDNA library
(c) Screening both cDNA and gDNA libraries
(d) Differential screening of cDNA library

(v) Phy A gene codes for
(a) $P_{700}$ (b) Rubisco small subunit
(c) Rubisco large subunit (d) PEPC.

(vi) Nitrogen containing plant secondary metabolites are
(a) Terpenoids (b) Alkaloids
(c) Flavonoids (d) None of these.

(vii) Carotenoids are
(a) Terpenoids (b) Alkaloids
(c) Flavonoids (d) None of these.

(viii) Nicotine is
(a) True alkaloid (b) Protoalkaloid
(c) Pseudoalkaloid (d) None of these.

(ix) Which of the following is a role of Azotobacter as a biofertilizer?
(a) Nitrogen fixation (b) Phosphorus solubilization
(c) Disease resistance (d) Enhancing root colonization.

(x) Which of the following types of germplasm is stored for long-term preservation?
(a) Active germplasm collection (b) Seed bank collections
(c) Field collections (d) None of the above.

*Fill in the blanks with the correct word*

(xi) Antioxidant present in garlic is _____.

(xii) Phosphoinotricin is a type of _____.

(xiii) FLVRSAVR tomato was developed by supressing _____ gene.

(xiv) Biofertilizers are considered an environmentally friendly alternative to chemical _____ because they improve soil health without causing pollution or depletion of natural resources.

(xv) Cryopreservation is a technique used for_____.

## Group - B

2. (a) Discuss the characteristics of molecular marker. *[(CO2)(Analyse/LOCQ)]*
(b) State in short the categories of molecular marker. *[(CO2)(Remember/LOCQ)]*
(c) Describe with suitable examples on application of molecular marker in plant genome analysis and breeding. *[(CO2)(Apply/IOCQ)]*

**3 + 4 + 5 = 12**

3. (a) What are the items required for the development of functional marker? *[(CO3)(Analyse/HOCQ)]*
(b) Schematically describe the different approaches involved in development of functional markers. *[(CO4)(Remember/LOCQ)]*
(c) Explain how functional markers plays role in the following aspects citing suitable example (attempt any two): Improvement of Agronomic Traits, Quality Traits, and Stress Resistance. *[(CO2)(Apply/IOCQ)]*

**3 + 3 + 6 = 12**

## Group - C

4. (a) What breeding programme was taken up in USA that resulted into Green Revolution? *[(CO3)(Analyse/HOCQ)]*
(b) Why it was so successful? *[(CO4)(Remember/LOCQ)]*

(c) How it was modified in Mexico? *[(CO2)(Apply/IOCQ)]*

**4 + 4 + 4 = 12**

5. (a) What is harvest index? *[(CO3)(Analyse/HOCQ)]*
   (b) What role it has on crop yield and how? *[(CO4)(Remember/LOCQ)]*
   (c) Describe how agricultural techniques can be used to improve it. *[(CO2)(Apply/IOCQ)]*

**2 + 2 + 8 = 12**

## Group - D

6. (a) Analyse the function of plant primary metabolite and secondary metabolites. *[(CO3)(Analyse/HOCQ)]*
   (b) Discuss the mode of action of alkaloids compounds. *[(CO4)(Remember/LOCQ)]*
   (c) What are different types of biotic and abiotic stresses? *[(CO2)(Apply/IOCQ)]*

**5 + 3 + 4 = 12**

7. (a) Analyse the role of herbicides. *[(CO3)(Analyse/HOCQ)]*
   (b) Briefly explain how pesticide resistant plants are developed. *[(CO4)(Remember/LOCQ)]*
   (c) Define compatible solutes with example. *[(CO2)(Apply/IOCQ)]*

**4 + 6 + 2= 12**

## Group - E

8. (a) Mention the types of biofertilizer. *[(CO3)(Remember/LOCQ)]*
   (b) Define PGPR along with its mechanism of action. *[(CO3)(Remember/LOCQ)]*
   (c) Write 2 examples of PGPR bacteria name, along with its mechanism and name of the plant getting benefitted. *[(CO3)(Apply/IOCQ)]*

**2 + (2 + 2) + (2 × 3) = 12**

9. (a) Define mycorrrhizae . *[(CO3)(Analyse/HOCQ)]*
   (b) Mention the different types of mycorrrhizae mention the usefulness of this in plant system. *[(CO4)(Remember/LOCQ)]*
   (c) Cite the application of it in agriculture. *[(CO3)(Explain/IOCQ)]*

**2 + 6 + 4 = 12**

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| Cognition Level | LOCQ | IOCQ | HOCQ |
|---|---|---|---|
| Percentage distribution | 38.54 | 40.62 | 20.84 |