

**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) Yield of crop can be improved by
(a) Breeding technology (b) Green revolution
(c) Photosynthetic efficiency (d) Vegetative propagation.
- (ii) The ripening genes for tomato was isolated by
(a) Differential screening of gDNA library
(b) Differential screening of cDNA library
(c) Screening of both gDNA and cDNA libraries
(d) Differential screening of both gDNA and cDNA libraries.
- (iii) Nitrogen containing basic compounds are
(a) Terpenoids (b) Flavonoids
(c) Alkaloids (d) All of these.
- (iv) Amino acids are precursor of
(a) Terpenoids (b) Alkaloids
(c) Alliums (d) All of these.
- (v) Cryopreservation is achieved by employing one of the following temperature range
(a) Over solid carbon dioxide (at -79° C)
(b) Low-temperature deep freezers (at -80° C)
(c) In liquid nitrogen (at- 196° C)
(d) All of these.
- (vi) Which of the following fern is a biofertilizer?
(a) Salvinia (b) Azolla (c) Pteridium (d) Marsilea.
- (vii) The map of the chromosome which shows identifiable sites is called _____
(a) Gene expression (b) Genome sequencing
(c) Chromosome walking (d) Genome map.

- (viii) Why might use of microsatellites in genetic mapping studies be an advantage over RFLPs?
 (a) Microsatellites are easier to detect
 (b) Microsatellites are more abundant than RFLPs
 (c) Microsatellites have more potential alleles than RFLPs
 (d) All of these / None of these.
- (ix) Which of the following N₂-fixeris involved in symbiotic association with legumes forming root nodules?
 (a) Rhizobium (b) Azotobacter
 (c) Rhodospirillum (d) Clostridium.
- (x) Short chain fatty acids are produced by
 (a) Thioesterase (b) Protease (c) Elongase (d) All of these.

Fill in the blanks with the correct word

- (xi) The Dark reaction can be manipulated by expressing _____ gene in C3 plants.
- (xii) Isopentene is the precursor of _____.
- (xiii) Symbiotic nitrogen-fixing cyanobacteria are present in_____.
- (xiv) The process of expression of foreign genes in a plant is called_____.
- (xv) _____ plant is supplemented with vitamin A in order to improve its nutritional quality.

Group - B

2. (a) Mention four characteristics which an ideal DNA marker should possess. [[CO3](Describe/LOCQ)]
- (b) Mention in which category of marker RAPD lies. [[CO2](Understand/LOCQ)]
- (c) Describe how RAPD can be useful in crop improvement citing suitable examples. [[CO2](Understand/LOCQ)]
- (d) In plant biotechnology usage of RAPD is limited due to certain reasons- explain its limitations. [[CO2](Apply/IOCQ)]
3 + 3 + 3 + 3 = 12
3. (a) Mention in which category of marker RAPD lies. [[CO2](Analyse/HOCQ)]
- (b) Describe how RAPD can be useful in crop improvement citing suitable examples. [[CO2](Remember/LOCQ)]
- (c) In plant biotechnology usage of RAPD is limited due to certain reasons- explain its limitations. [[CO2](Apply/IOCQ)]
4 + 6 + 2 = 12

Group - C

4. (a) Write about the breeding programme taken up by Prof. M. S. Swaminathan in India. Discuss the scientific approach behind this which resulted in Green revolution in India. [[CO2](Analyse/HOCQ)]

- (b) What is photosynthetic efficiency? How it can be improved by stopping wasteful photorespiration? [[CO2](Remember/LOCQ)]
(3 + 3) + (2 + 4) = 12
5. (a) What are climacteric fruits? Name the most important fruit ripening genes of this fruits. How they were identified? [[CO2](Analyse/HOCQ)]
- (b) Discuss the ethylene biosynthetic pathway by a flow chart. [[CO2](Remember/HOCQ)]
(2 + 3 + 4) + 3 = 12

Group - D

6. (a) Mention how herbicide resistant plants are produced . [[CO3](Analyse/HOCQ)]
- (b) Distinguish true alkaloids and protoalkaloids. [[CO4](Remember/LOCQ)]
- (c) Mention the role of HSP. [[CO2](Apply/IOCQ)]
6 + 4 + 2 = 12
7. (a) Mention two different enzymes and their function in genetic modification of plant oil. [[CO3](Analyse/HOCQ)]
- (b) Briefly discuss two phytochemicals and their function and sources. [[CO4](Remember/LOCQ)]
- (c) What is phosphinothricin? [[CO2](Apply/IOCQ)]
4 + 6 + 2 = 12

Group - E

8. (a) Mention the basic steps briefly followed to achieve a successful germplasm conservation and precautions [[CO1](Apply/IOCQ)]
- (b) Describe the usefulness of haploid culture in plant tissue culture and its application. [[CO1](Apply/IOCQ)]
(5 + 2) + (3 + 2) = 12
9. (a) Define mycorrhizae. [[CO3](Explain/IOCQ)]
- (b) Mention the different types of mycorrhizae [[CO3](Explain/IOCQ)]
- (c) Mention the usefulness of this in plant system. [[CO3](Explain/IOCQ)]
- (d) Cite the application of it in agriculture. [[CO3](Explain/IOCQ)]
2+ 3 + 4 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.12	38.54	33.34

Course Outcome (CO):

After the completion of the course students will be able to

1. Explain the different techniques of plant tissue culture for bio-resource production.
2. Impart knowledge on all recent biotechnological developments related to the quality improvement of crops.
3. Understand role of plant along with microorganisms in agro-industry.

4. Analyze the role different molecular markers for different characters related to agronomic importance.
5. Understand the role of plants as bioresources by virtue of their secondary metabolites.

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