

**PLANT BIOTECHNOLOGY
(BIOT 3202)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

***Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.***

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Growth hormone producing apical dominance is
(a) auxin (b) gibberrelin (c) ethylene (d) cytokinin.
 - (ii) The production of secondary metabolite require choose the correct options
(a) protoplast (b) cell suspension
(c) meristem (d) auxiliary buds.
 - (iii) In which phase of growth curve of callus / cell suspension culture of plant secondary metabolites accumulate
(a) stationary phase (b) lag phase
(c) log phase (d) lag and stationary phase.
 - (iv) One transposable element in plant is
(a) insertion element of maize (b) dissociation element
(c) AC/DS element of maize (d) retrotransposon.
 - (v) Insect resistance in the transgenic plant has been achieved by
(a) transferring genes for Bt toxins
(b) transferring genes for protease inhibitors
(c) transferring genes for other insecticidal secondary metabolities
(d) transferring genes for combating with insects.
 - (vi) Which of the following gene detoxifies herbicide phosphinothricin?
(a) Nitrilase (b) Glutathione S-transferase (GST)
(c) Phosphinothricin acetyl transferase (d) Catalase.
 - (vii) GFP is used as
(a) selectable marker gene (b) visible marker gene
(c) inducible promoter (d) transgene.

- (viii) SUMOylation results into
(a) recruitment of HDAC (b) recruitment of HAT
(c) recruitment of RNA polymerase (d) recruitment of DNA polymerase.
- (ix) Different strains of *Agrobacterium tumefaciens* produces
(a) Octopine (b) Nopaline (c) Agropine (d) Either of these.
- (x) FCA protein is regulated at
(a) transcriptional step by inducible promoter
(b) post transcriptional step by alternative splicing
(c) post transcriptional step by transsplicing
(d) post translational step by acetylation.

Group- B

2. (a) In totipotency the two phenomena are inherent capacity of a plant cell which give rise to a whole plant – mention the phenomena and briefly describe them. [(CO6)(Evaluate/HOCQ)]
- (b) Describe the following redifferentiation and dedifferentiation with respect to plant tissue culture. [(CO1)(Apply/IOCQ)]
- (c) In media preparation often activated charcoal is added for better callus induction-discuss with suitable explanation the reason of inclusion of activated charcoal in media. [(CO1)(Explain/HOCQ)]
- (d) Analyze with suitable reasons why production of haploids is encouraged in plant breeding. [(CO1)(Analyze/HOCQ)]
- 3 + 3 + 3 + 3 = 12**
3. (a) Name the scientist who have reported auxin for the first time. [(CO1)(Remember/LOCQ)]
- (b) Name two synthetic auxin used in plant tissue culture. [(CO1)(Remember/LOCQ)]
- (c) Mention the mechanism of action of auxin with suitable diagram with respect to Arabidopsis plant. [(CO1)(Explain/IOCQ)]
- 2 + 2 + (5 + 3) = 12**

Group- C

4. (a) What do you mean by primary metabolite and secondary metabolite? [(CO2)(Understand/LOCQ)]
- (b) Medicinal plants are rich in secondary metabolite plant products — write two such plant product along with the plant name and chemical nature of the product. [(CO2)(Knowledge/LOCQ)]
- (c) Describe with suitable example how major classes of plant secondary metabolites are derived from primary metabolites. [(CO2)(Apply/LOCQ)]
- 2 + (2 + 2 + 2) + 4 = 12**

5. (a) Define bioconversion. [[C02](Understand/LOCQ)]
 (b) Describe briefly giving two examples citing the fungi name and plant names along with the product developed in elicitor based approach in secondary metabolite production. [[C02](Understand/LOCQ)]
 (c) Mention the role of the following along with suitable example in production of secondary metabolite production: light, temperature, phosphate salt and carbon. [[C02](Apply/IOCQ)]
2 + 4 + 6 = 12

Group - D

6. (a) What is ubiquitination? How it plays different roles in protein degradation and histone modification? [[C03](Analyze/IOCQ)]
 (b) Describe the structure of eukaryotic core promoter. How much of it must be taken from CaMV 35S rRNA promoter in cloning of a transgene and why? [[C05](Remember/IOCQ)]
(2 + 2 + 2) + (3 + 3) = 12
7. (a) Describe the structure of basic leucine zipper class of transcription factor with a diagram. [[C03](Remember/LOCQ)]
 (b) Describe the experiment of Barbara McClintock in the discovery of Activator and Dissociation elements in Maize. Give an account of them. [[C04](Understand/LOCQ)]
4 + (4 + 4) = 12

Group - E

8. (a) How DNA with transgene is precipitated in microparticle-mediated method? What microparticles are preferred in this method? Why 14% maltose is used in the selection media? [[C04](Understand/LOCQ)]
 (b) Name the oncogenes which are present in Ti plasmid? If a plant is transformed using Ti-plasmid-based vector, then why they do not cause any tumor in plants? [[C05](Explain/HOCQ)]
(2 + 2 + 2) + (3 + 3) = 12
9. (a) Why vitamin A is important for health? What health problems are linked to a vitamin A deficiency? How golden rice is different from white rice? [[C06](Remember/LOCQ)]
 (b) Mention the nature of Bt-protoxin and describe with suitable diagram process of the protein activation. [[C06](Understand/LOCQ)]
(2 + 2 + 2) + (2 + 4) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	57	30	13

Course Outcome (CO):

On completion of the course, students will be able to:

1. Explain the basic concepts of plant tissue culture and its application of numerous techniques.
2. Interpret how various plant biochemical metabolic pathways work in the plant system and relate them with medicinally important bioactive compounds.
3. Understand basic molecular biological aspects of plant by studying the structure and organization of plant genome
4. Describe the molecular biological techniques of gene transfer to plants.
5. Understand concept of raising transgenic plants
6. Impart knowledge on all recent biotechnological developments related to GMO through quality improvement of crops

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