

**PLANT BIOTECHNOLOGY
(BIOT 3211)**

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) GUS gene expression can be detected by
 - (a) Fluorometric assay
 - (b) Histochemical assay
 - (c) Microscopic detection
 - (d) Luminometer.
 - (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) Synthetic seeds are produced by encapsulating somatic embryos with
 - (a) sodium dichloride
 - (b) sodium acetate
 - (c) sodium alginate
 - (d) sodium nitrate.
 - (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) Salinity resistant proteins are expressed by
 - (a) constitutive promoter
 - (b) inducible promoter
 - (c) basal promoter
 - (d) stress resistant promoter.
 - (vii) The first transgenic plants expressing engineered foreign genes were tobacco plants produced by the use of
 - (a) Agrobacterium tumefaciens
 - (b) Bacillus thuringiensis
 - (c) Arabidopsis thaliana
 - (d) Streptomyces hygroscopicus.

- (viii) SUMOylation results into
(a) Recruitment of HDAC (b) Recruitment of HAT
(c) Recruitment of RNA polymerase (d) Recruitment of DNA polymerase.
- (ix) Ac/Ds element in Maize is a
(a) Insertion element (b) Dissociation element
(c) Transposable element (d) Retrotransposon.
- (x) Cybrids are produced by
(a) fusion of two different nuclei from two different plants
(b) fusion of two different nuclei from same two species
(c) nucleus of one species but cytoplasm of both the parents
(d) nucleus of both species but cytoplasm of one parent.

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.
[[C06](Evaluate/HOCQ)]
- (b) Relate the following phenomena : redifferentiation and dedifferentiation with respect to plant tissue culture.
[[C01](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.
[[C01](Explain/HOCQ)]
- (d) Analyze with suitable reasons why production of haploids is encouraged in plant breeding.
[[C01](Analyze/HOCQ)]
- 3 + 3 + 3 + 3 = 12**
3. (a) Describe briefly with schematic diagram the mode of action of auxin in plant cells.
[[C02](Describe/LOCQ)]
- (b) Demonstrate the application of auxin in plant tissue culture.
[[C02](Analysis/IOCQ)]
- (c) Relate the following phenomena: cytodifferentiation and xylogenesis with respect to plant tissue culture.
[[C02](Analysis/IOCQ)]
- 4 + 4 + 4 = 12**

Group- C

4. (a) Define primary metabolite and secondary metabolite.
[[C02](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.
[[C02](Knowledge/LOCQ)]
- (c) Schematically describe with suitable example how major classes of plant secondary metabolites are derived from primary metabolites.
[[C02](Apply/LOCQ)]
- 2 + (2 + 2 + 2) + 4 = 12**

5. (a) Justify the following approach which states:
'Hairy root culture is utilized for production of secondary metabolite.'
[(CO2)(Evaluate/LOCQ)]
- (b) Analyze the benefits of this approach. [(CO2)(Analysis/IOCQ)]
- (c) Mention two examples citing the plant names and secondary metabolite compounds developed through this approach. [(CO2)(Describe/LOCQ)]
- (d) Mention the precursors of flavonoid biosynthesis. [(CO2)(Understand/LOCQ)]
- 3 + 2 + 4 + 3 = 12**

Group - D

6. (a) What is ubiquitination? How it plays different roles in protein degradation and histone modification?
[(CO3)(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?
[(CO5)(Remember/IOCQ)]
- (2 + 2 + 2) + (3 + 3) = 12**
7. (a) Define C-value. What is understood by C-value paradox?
[(CO3)(understand/LOCQ)]
- (b) Compare and contrast the organization and nature of:
Nuclear genome, chloroplast genome and mitochondrial genome in plants.
[(CO3)(Analyze/IOCQ)]
- (c) Write short note on: different classes of chloroplast genome.
[(CO3)(Remember/IOCQ)]
- 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?
[(CO4)(Understand/LOCQ)]
- (b) What oncogenes 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?
[(CO5) (Explain/HOCQ)]
- (2 + 2 + 2) + (3 + 3) = 12**
9. (a) What is T-DNA? Why it is called so? [(CO4)(Understand/LOCQ)]
- (b) Why Agro only infects dicot plants? How it can be used for monocots also?
[(CO5)(Analyze/HOCQ)]
- (c) Mention some reporter genes used in plant vectors. [(CO4)(Remember/IOCQ)]
- 4 + 4 + 4 = 12**
-

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	37.50	42.70	19.80

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