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) Which of the following is a component of Binary vector system?
(a) pGreen (b) pCAMBIA 1301
(c) pBI121 (d) all of these

(ii) A vector that can multiply in two different systems is a
(a) binary vector (b) shuttle vector
(c) expression vector (d) cloning vector.

(iii) The length of 5'UTR is indirectly proportional with
(a) trancriptional efficiency
(b) translational efficiency
(c) post-transcriptional modification
(d) post-translational modification.

(iv) Vir A is a/an
(a) autophosphorylating kinase
(b) transcriptional activator of *vir* operon
(c) endonuclease
(d) ssDNA binding protein.

(v) Essential oil belong to the group----of secondary metabolites,
(a) terpenoids (b) alkaloids (c) resinous (d) sapogenins.

(vi) Which one of the following vitamins is an integrated part of plant tissue culture medium?
(a) Nicotinic acid (b) Myo-inositol
(c) Retinoic acid (d) Vitamin-C.

(vii) Majority of plant proteins are degraded by
(a) post-translational modification (b) nuclear localization
(c) ubiquitination (d) iysosomal porteases.

(viii) Pathogenesis resistant proteins are
(a) expressed when a plant is attacked by a pathogen
(b) expressed only at the site of infection
(c) expressed only in plants that are resistant to the pathogen
(d) only expressed away from the infection site in the SAR response.

(ix) Which of the following is plant homeodomain protein?
(a) Leucine Zipper transcription factor
(b) Zn-finger transcription factor
(c) Developmental transcription factor
(d) Basal transcription factor.

(x) Different strains of *Agrobacterium tumefacience* produces
(a) octopine (b) nopaline
(c) agropine (d) either of these.

Group – B

2. (a) 'Explants after transferring into the media darkens and slowly its functionality is lost'-justify with reasons. What is the actual phenomenon going on and mention how this problem can be overcome?

(b) Mention the advantages and disadvantages of micropropagation.

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

3. (a) Cytokinin is needed for the sustenance of plant life-justify the statement in view of its application aspect (write any three).

(b) Mention any two names of synthetic cytokinin.

(c) Mention the mode of action of cytokinin with suitable diagram.

3 + 2 + (5 + 2) = 12

Group – C

4. (a) Describe the five factors affecting the production of secondary metabolite in plant tissue culture.

(b) Mention the importance of alkaloids in plant.

(c) Name the plant secondary metabolite compound found in *Catharanths roseus* with hypotensive property. Write its chemical nature.

(d) Write briefly the biosynthetic pathway mentioning the precursor which plays a major role in the biosynthesis of it.

5 + 3 + (1 + 1) + (1 + 1) = 12

5. (a) Secondary metabolites are clearly derived by biosynthesis from primary metabolites- justify the statement with showing inter relationship among them.

   (b) Cite the types of entrapment used in cell immobilization with suitable example.

   (c) With suitable examples describe the reaction type as well as the precursor with product name in one step bioconversions by immobilized cells.

4 + 2 + (2 × 3) = 12

Group – D

6. (a) Compare and contrast between mitochondrial and chloroplast genome.

   (b) What are the different classes of plant transcription factors?

   (c) Give an account of the DNA- binding domain of each class by stating how they bind DNA. Give suitable examples.

4 + 2 + 6 = 12

7. (a) Describe the experiment of Barbara McClintock in the discovery of Activator and Dissociation elements in Maize. Give an account of them.

   (b) Mention at what step and how the following genes are regulated:
   Rubisco activase, Short-lived protein induced under auxin.

(3 + 3) + (3 + 3) = 12

Group – E

8. (a) Compare the following techniques for gene delivery to plant cells: Microinjection, PEG-mediated.

   (b) Mention the biotechnological approaches to development of protection against pathogens (PR proteins) discuss any two such example in this aspect.

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

9. (a) What are the laboratory experimental steps to be followed for Agro-mediated gene delivery?

   (b) Compare the advantages and disadvantages of it with particle gun-mediated gene delivery.

   (c) Write short notes on the constructs used for the production of 'Golden Rice' with suitable diagrams.

3 + 3 + 6 = 12