

2019

Full Marks - 60

Time - 3 hours

The figures in the right-hand margin indicate marks

Answer *all* questions

1. a) What is Metabolism ? Describe the role of different types of enzymes in regulation of it. 8

b) Write notes on the following : 2 × 2

i) Isoenzymes

ii) Oxidation of Sucrose.

OR

c) Describe the steps involved in the biosynthesis of starch. 8

d) Write notes on the following : 2 × 2

i) Allosteric enzymes

ii) Synthesis of Sucrose.

2. a) Explain the two Photosystems and their role in Photosynthesis. 8

b) Write notes on the following : 2 × 2

i) Photorespiration

ii) CAM Plants.

OR

c) List the three Phase of Calvin Cycle of Photosynthesis. Describe in short the chemical steps in these phases. 8

d) Write notes on the following : 2 × 2

i) Photo oxidation of water

ii) Photosynthetic Pigments.

3. a) Describe the different steps involved in Glycolysis. 8

b) Write notes on the following : 2 × 2

i) Role of uncouplers

ii) Boyers confirmational model.

OR

[3]

- c) Describe the mechanism of Oxidative Phosphorylation in Plants. 8
- d) Write notes on the following : 2 × 2
- i) Regulation of PDH
 - ii) Fermentation.
4. a) Give a brief note on the different steps involved in the biosynthesis of triglycerol. 8
- b) Write notes on the following : 2 × 2
- i) α Oxidation
 - ii) Role of acetyl COA.

OR

- c) Name the cyclic process responsible for conversion of fats into sugars in germinating fatty seeds. 8

[Turn Over

[4]

- d) Write notes on the following : 2 x 2
- i) β oxidation of fatty acid
 - ii) Synthesis of glycerol.

5. a) Describe the biochemistry of biological Nitrogen fixation. 8

- b) Write notes on the following : 2 x 2
- i) Nitrogenase
 - ii) Nitrate assimilation.

OR

c) Describe the mechanism of signal transduction and the role of calcium as second messenger. 8

- d) Write notes on the following : 2 x 2
- i) Formation of root nodule
 - ii) Transamination.

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Answer *all* questions

Give diagrams wherever necessary

1. a) Describe the different techniques used in aseptic tissue culture. 8
- b) Write notes on the following : 2 × 2
- i) Role of Vitamin
- ii) Immobilised Cell Culture.

OR

- c) Write in brief the composition of culture media in tissue culture 8
- d) Write notes on the following : 2 × 2
- i) Suspension Culture
- ii) Role of hormone.

[2]

2. a) Give a brief note on embryogenesis. 8
- b) Write notes on the following : 2 × 2
- i) Totipotency
 - ii) Androgenesis.

OR

- c) What is Cryopreservation ? Describe its technique with a note on precaution. 8
- d) Write notes on the following : 2 × 2
- i) Micropropagation
 - ii) Protoplast fusion.
3. a) Describe different types of restriction endonuclease, their biological role and application. 8
- b) Write notes on the following : 2 × 2
- i) PBR 322
 - ii) YAC.

OR

[3]

c) Describe PCR method of gene cloning. 8

d) Write notes on the following : 2 × 2

i) Lambda phage

ii) T₁ plasmid.

4. a) Explain various methods of selection of clones having the desired Insert. 8

b) Write notes on the following : 2 × 2

i) Reporter gene

ii) Microprojectile bombardment.

OR

c) Describe Agrobacterium mediated gene transfer. 8

d) Write notes on the following : 2 × 2

i) cDNA Library

ii) GUS.

[4]

5. a) Write the role of transgenics bioremediation. 8
- b) Write notes on the following : 2 × 2
- i) Bt-Cotton
 - ii) Edible Vaccine.

OR

- c) Describe the transgenic crops with improved quality. 8
- d) Write notes on the following : 2 × 2
- i) Humulin
 - ii) Protease.

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Give diagrams wherever necessary

1. a) Give a brief note on the role of different branches of horticulture in rural economy. 8
- b) Write notes on the following : 2 × 2
- i) Coral tree
- ii) Succulents.

OR

- c) Describe the salient features of different types of ornamental plants. 8
- d) Write notes on the following : 2 × 2
- i) ecotourism
- ii) Importance of horticulture.

[2]

2. a) What are Vegetable and Fruit crops ? Describe how they are managed and marketed in a large scale. 8
- b) Write notes on the following : 2 × 2
- i) Hydroponics
 - ii) Biopesticides.

OR

- c) Describe the different types of a sexual method of propagation of plants. 8
- d) Write notes on the following : 2 × 2
- i) Biofertiliser
 - ii) Irrigation methods.
3. a) What is urban forestry ? Describe the different policies and practices used for its development. 8
- b) Write notes on the following : 2 × 2
- i) Bonsai
 - ii) Japanese graden.

OR

- c) Give a note on the role of floriculture to meet the market demands. 8
- d) Write notes on the following : 2 × 2
- i) Layout of avenues
 - ii) Ancient Indian garden.
4. a) What are the different methods used for preservation and processing of fruits and vegetables. 8
- b) Write notes on the following : 2 × 2
- i) Crop Sanitation
 - ii) Nutritional Management.

OR

- c) Describe the genetic, biological and chemical method for Pest Control. 8
- d) Write notes on the following : 2 × 2
- i) Food Safety
 - ii) Harvesting of Cut Flowers.

[4]

5. a) Describe various methods for conservation of germplasm. 8
- b) Write notes on the following : 2 × 2
- i) IAR 9
 - ii) Field Visit.

OR

- c) Explain how micropropagation helps in management of horticultural crops. 8
- d) Write notes on the following : 2 × 2
- i) IPR issues
 - ii) Documentation.

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1. a) Define regulatory enzymes. How allosteric and isozymes play their role in metabolism. 8
- b) Write notes on the following : 2 × 2
- i) Anabolism and Catabolism
 - ii) Catabolism of Sucrose.

OR

- c) Give a comprehensive description on synthesis and catabolism of starch. 8
- d) Write notes on the following : 2 × 2
- i) Synthesis of Sucrose
 - ii) Covalent modulation.

[2]

2. a) Give an account on the historical background of photosynthesis. 8
- b) Write notes on the following : 2 × 2
- i) Factors of CO₂ reduction
 - ii) Chlorophylls.

OR

- c) What are photosystem-I and photosystem-II ? Distinguish between photosynthesis and photorespiration. 8
- d) Write notes on the following : 2 × 2
- i) Crassulacean Acid Motabolism
 - ii) C₄ Path way.
3. a) Describe mitochondrial electron transport with illustrations. 8
- b) Write notes on the following : 2 × 2
- i) ATP synthase
 - ii) Factors of respiration.

OR

[3]

- c) Give a comprehensive description on mechanism of ATP synthesis. 8
- d) Write notes on the following : 2 × 2
- i) NADH Shuttle
 - ii) Racker's experiment.
4. a) Briefly describe glyoxylate cycle. 8
- b) Write notes on the following : 2 × 2
- i) Gluconeogenesis
 - ii) Lipids.

OR

- c) Describe the mechanism of lipid mobilisation during seed germination. 8
- d) Write notes on the following : 2 × 2
- i) α -oxidation
 - ii) β -oxidation.

[4]

5. a) Give an illustrative and descriptive account on biological nitrogen fixation. 8
- b) Write notes on the following : 2 × 2
- i) Ammonia assimilation
 - ii) Phospholipids.

OR

- c) Describe the physiology of nitrogen fixation. 8
- d) Write notes on the following : 2 × 2
- i) Transamination
 - ii) CGMP.

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Answer *all* questions

1. a) Describe the common culture media used for plant tissue culture and discuss its role of different constituents of these media. 8
- b) Write notes on the following : 2 × 2
- i) Callus culture
- ii) Laminar air flow cabinet.

OR

- c) Discuss different equipment and technique for aseptic tissue culture. 8
- d) Write notes on the following : 2 × 2
- i) Ms medium
- ii) Surface sterilization.

[2]

2. a) Briefly describe the methods of protoplast isolation, purification and culture. 8
- b) Write notes on the following : 2 × 2
- i) IVF
 - ii) Cryopreservation.

OR

- c) Briefly describe the various approaches for virus elimination from plants and discuss their merits and demerits. 8
- d) Write notes on the following : 2 × 2
- i) DNA banks
 - ii) Androgenesis.
3. a) Discuss briefly methods of bacterial transformation and selection of recombinant clones. 8
- b) Write notes on the following : 2 × 2
- i) BAC
 - ii) Applications of restriction endo nuclease.

OR

[3]

- c) Describe in some detail, the various types of artificial chromosome vectors. 8
- d) Write notes on the following : 2 × 2
- i) Shuttle vector
 - ii) PCR
4. a) Briefly describe the procedure for construction of a genomic library and outline the strategy for the isolation of a desired DNA segment from such a library. 8
- b) Write notes on the following : 2 × 2
- i) GFP
 - ii) Binary vectors.
- OR
- c) Discuss various vectorless mediated or direct gene transfer used in recombinant DNA technology. 8
- d) Write notes on the following : 2 × 2
- i) Colony hybridization
 - ii) Ti-plasmid.

[4]

5. a) Describe the role of transgenics in bioremediation and edible vaccines. 8
- b) Write notes on the following : 2 × 2
- i) Flavr savr tomato
 - ii) Moondust carnations.

OR

- c) Describe the role of transgenics for production of Industrial enzymes. 8
- d) Write notes on the following : 2 × 2
- i) Humulin
 - ii) Bt-cotton.

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Answer *all* questions

1. a) Discuss the genetics of apomixis and discuss its usefulness in plant breeding. 8

b) Write notes on the following : 2 × 2

i) Transgenic male sterility

ii) Anthensis.

OR

c) Discuss the relevance of mode of reproduction to crop improvement. 8

d) Write notes on the following : 2 × 2

i) Restorer lines

ii) Heterostyly.

2. a) Discuss in brief the various steps involved in hybridization. 8

5) Write notes on the following : 2 × 2

i) Tester

ii) Artificial selection.

OR

c) Describe in brief the purpose of plant introduction and outline the various steps involved in plant introduction. 8

d) Write notes on the following : 2 × 2

i) Pureline theory

ii) Bagging.

3. a) Define variability ? Explain briefly different measures to assess variability present in breeding populations. 8

b) Write notes on the following : 2 × 2

i) Segregation

ii) $G \times E$ interaction.

OR

c) Define components of variance and explain estimation of different components of variance. 8

[3]

- d) Write notes on the following : 2×2
- i) Quantitative characters
 - ii) Pleiotropy.
4. a) Discuss the physiological and molecular basis of heterosis. 8
- b) Write notes on the following : 2×2
- i) Test cross
 - ii) Hybrid vigour.
- OR
- c) Describe the various methods of hybrid seed method. 8
- d) Write notes on the following : 2×2
- i) Synthetic varieties
 - ii) Adh alleles in maize.
5. a) Discuss the applications and limitations of allopolyploidy in crop improvement. 8

[4]

b) Write notes on the following : 2×2

i) Genetic disharmony

ii) Gamma-garden.

OR

c) Discuss the various applications, achievements and limitations of distant hybridization in crop improvement. 8

d) Write notes on the following : 2×2

i) Aneuploidy

ii) Alkylating agents.

2020

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Answer *all* questions

1. a) Critically analyse on "Horticulture : Indispensable for progress in rural economy and employment generation." 8

b) Write notes on the following : 2 × 2

i) Food security

ii) Urban horticulture.

OR

c) State on the classification of ornamental plants with examples. 8

d) Write notes on the following : 2 × 2

i) Indian gulmohar

ii) Orchids.

[2]

2. a) State on the identification of varieties of banana, mango, cucurbits and chillies. 8
- b) Write notes on the following : 2 × 2
- i) Drip irrigation versus surface irrigation
 - ii) Scope and limitations of asexual method of propagation.

OR

- c) Critically discuss on different aspects of origin, distribution and production of fruits and vegetable crops. 8
- d) Write notes on the following : 2 × 2
- i) Weed control
 - ii) Biopesticides.
3. a) What is floriculture ? Discuss on the importance of flower shows and exhibitions. 8
- b) Write notes on the following : 2 × 2
- i) Layout of parks
 - ii) Bonsai.

OR

[3]

- c) State the concept of landscape. How urban forestry practices help in better landscaping of cities and towns ? 8
- d) Write notes on the following : 2 × 2
- i) Mughal garden
 - ii) Cut flowers.
4. a) What is integrated pest management ? Describe advantages and disadvantages of different strategies adopted under this management. 8
- b) Write notes on the following : 2 × 2
- i) Food safety
 - ii) Evaluation of quality traits.

OR

- c) Discuss on the methods of minimising loses during storage and transportation of fruits and vegetables. 8

d) Write notes on the following : 2×2

i) Post harvest diseases

ii) Advantages of food irradiation.

5. a) Discuss on the role of micro propagation and tissue culture in conservation of horticulture crops. 8

b) Write notes on the following : 2×2

i) Intellectual property rights

ii) Cultivar.

OR

c) Discuss on the National, International and professional societies and sources of information on horticulture. 8

d) Write notes on the following : 2×2

i) Germ plasm

ii) Nurseries.

2022

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Answer *all* questions

Give labelled diagrams wherever necessary.

Part-I

1. Answer the following : 1 × 8
- a) Rose plant is generally cultivated by the technique called ____.
- i) Cutting
 - ii) grafting
 - iii) layring
 - iv) Both cutting and layring.
- b) Marigold is an example of
- i) Annual
 - ii) binnial
 - iii) Perennials
 - iv) Climber.
- c) Example of epiphytes are
- i) Cucti
 - ii) Orchids
 - iii) Succulents
 - iv) Poppies
- d) Full form of BGA is ____.

- e) The technique of soil less cultures is known as ____.
- f) Full form of IPM is ____.
- g) The rooted part in grafting technique is called ____.
- h) ____ hormone is applied for the development of root in Tissue culture.

Part-II

2. Answer any *eight* of the following : 1½ × 8
- a) What do you mean by ecotourism ?
 - b) What are the identifying characters of Orchids ?
 - c) What do you mean by layering ?
 - d) What do you mean by budding ?
 - e) What are the advantages of using biofertilizers ?
 - f) What are different branches of horticulture ?
 - g) What do you mean by biopesticides ?
 - h) What are the advantages of drip irrigation ?
 - i) What do you mean by micropropagation ?
 - j) What do you mean by crop sanitation ?

Part-III

3. Answer any **eight** of the following : 2×8

- a) What are the importance of horticulture in food security ?
- b) What are the importance of ecotourism ?
- c) What are various chemical methods used for pest control ?
- d) What are the important features of urban forestry ?
- e) What are important methods used for minimizing loss of horticultural crops during storage ?
- f) What are important practices used for loss of horticultural crops during transportation ?
- g) What are genetic strategies of IPM ?
- h) What are important quarantine practices used in horticulture ?
- i) What are the identifying characters of *Opuntia* used as ornamental plants ?
- j) Give some examples of professional societies from which information on horticulture are available.

Part-IV

4. a) Give an account of the scope and importance of horticulture. 6

OR

- b) Give an account of the management and marketing of vegetable crops.

5. a) Describe the grafting techniques used in horticulture. 6

OR

- b) Describe the gardening traditions of Mughals.

6. a) Describe various methods used in the evaluation of quality tracts in post harvest technology. 6

OR

- b) Describe various quarantine practices used in disease control and management of horticultural crops.

7. a) Describe various methods of germplasm conservation of horticultural crops. 6

OR

- b) Give an account of various National, International and professional societies providing information on horticulture.

2022

Full Marks - 80

Time - 3 hours

The figures in the right-hand margin indicate marks

Answer *all* questions as per the instruction given therein

Part-I

1. 1. Answer the following : 1 × 12
- a) *Rhizobium* and *Frankia* are the examples of symbiotic nitrogen fixing bacteria. (True/false)
 - b) The genus *Azotobacter* belongs to which family ?
 - c) The *Azospirillum* species are aerobic nitrogen fixing bacteria. (True/false)
 - d) In *Azolla-Anabaena* association the alga mainly provides _____ to the fern.
 - e) The enzyme responsible for N_2 -fixation is _____.
 - f) In heterocysts, photosystem _____ is absent.
 - g) The mycorrhiza associations are particularly beneficial in areas where the soil does not contain sufficient nitrogen and _____.
 - h) VAM stands for Vesicular _____ mycorrhizae.

- i) *Gigaspora* is an example of ectomycorrhiza.
(True/false)
- j) The practice of turning into the soil undecomposed green plant tissues that add organic matter to the soil is known as _____.
- k) In vermicomposting _____ are used for converting organic materials into humus-like materials known as vermicompost.
- l) Sewage sludge is an example of biodegradable waste.
(True/false).

Part-II

2. Answer any *eight* of the following in two to three sentences each : 2 × 8

- a) What are the different types of biofertilizers ?
- b) Write the characteristic features of *Azospirillum*.
- c) What is the common medium used for *Azotobactor* culture ?
- d) How blue-green algae and *Azolla* are used in rice cultivation ?
- e) What are the environmental factors that affect the efficiency of N_2 -fixation by *Rhizobium* in soil.
- f) What are the characteristic features of endomycorrhizae ?

[3]

- g) What is the function of VAM fungi ?
- h) Where can mycorrhizal fungi be found ?
- i) What are the advantages of using organic fertilizers ?
- j) What are the three basic types of vermicomposting ?

Part-III

3. Write short notes on any **eight** of the following within 75 words each : 3 × 8

- a) Mass multiplication of *Rhizobium*
- b) *Azospirillum* isolation
- c) Carrier based inculants
- d) *Azolla-Anabaena* association
- e) Free-living aerobic N₂-fixers
- f) Mycorrhizal association
- g) Isolation of VAM
- h) Recycling of biodegradable municipal wastes
- i) Green manuring
- j) Organic fertilizers.

[4]

Part-IV

Answer the following within 500 words each :

4. a) What is Actinorrhizal symbiosis ? How is this helpful in increasing soil fertility ? 7

OR

- b) Give a note on the crop response to *Acetobacter* inoculum.

5. a) Describe the process on N_2 -fixation in *Azolla-Anabaena* association. 7

OR

- b) How do the blue-green algae and *Azolla* help in rice cultivation.

6. a) Give a note on the role of mycorrhizal association in increasing soil fertility. 7

OR

- b) How do VAM influence on growth and yield of crop plants.

7. a) Describe the process of recycling of biodegradable industrial wastes. 7

OR

- b) Describe the methods of vermicomposting with its field application

2022

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Answer *all* questions

Part-I

1. Answer the following by filling in the blanks or by selecting true/false. 1 × 8
- a) The term allosteric comes from two ancient Greek words "allos" and "stereos", where the meaning of "allos" is ____.
 - b) CGMP acts as a second ____ much like cyclic AMP.
 - c) Photolysis of water and evolution of O₂ takes place in PS ____.
 - d) Photorespiration involves three organelles : chloroplasts, ____ and mitochondria.
 - e) The pentose phosphate pathway takes place in the cytosol of the cell, the same location as glycolysis. (True/false)

- f) The metabolic pathways used to replenish oxaloacetate in the citric acid cycle after it has been consumed are known as ____ reactions.
- g) The process that converts pyruvate into glucose is called ____.
- h) The nitrifying bacteria are capable of reducing nitrates or nitrites to gaseous forms such as nitrous oxide or N_2 . (True/false)

Part-II

2. Answer any *eight* of the following : 1½ × 8

- a) What is covalent modulation ?
- b) How does NO act as a signalling molecule ?
- c) What is the role of antenna molecules in light reaction ?
- d) What is function of Q cycle ?
- e) What is red drop effect ?
- f) What is the role of O_2 in mitochondrial electron transport ?
- g) What is Recker's experiment ?
- h) What are the factors that affect respiration ?
- i) What is the significance of α -oxidation ?
- j) What is the importance of transamination reaction ?

[3]

Part-III

3. Write short notes on any *eight* of the following : 2 × 8

- a) Isozymes
- b) Calcium in signal transduction
- c) Photosynthetic pigments
- d) Regeneration stage of C₃ cycle
- e) Photorespiration
- f) NADH shuttle
- g) Cyanide resistant respiration
- h) Jagendorf's experiment
- i) Glyoxylate cycle
- j) Ammonia assimilation.

Part-IV

4. a) What do mean by anabolic pathway ? Explain with examples. 6

OR

b) Describe the mechanism of signal transduction and mention the roles of phospholipids and cGMP in it.

[4]

5. a) Describe the photochemical reactions taking place in chloroplasts for harvesting light energy. 6

OR

- b) Describe the C_4 pathway in detail. How is it efficient than C_3 pathway ?

6. a) Narrate the process of glycolysis with its regulation. 6

OR

- b) Describe the mechanisms of ATP synthesis.

7. a) Give a note on the synthesis of triglycerides in plants. 6

OR

- b) Describe in detail the mechanisms of symbiotic biological N_2 -fixation.

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Answer *all* questions

Part-I

1. Fill in the blanks. 1 × 8
- a) The ability of a single plant cell to grow, divide and differentiate into an entire plant is known as ____.
 - b) During protoplast isolation, the enzyme pectinase mainly degrades the ____, ____.
 - c) Hybrid between plasmid and phage λ vector is known as ____.
 - d) M13 is a filamentous ____ which injects *E.coli* host.
 - e) ____ genes allow for the identification of transformed cells without the need for selective media.
 - f) Electroporation is a physical ____ method that uses an electrical pulse in membranes through which nucleic acids can pass into cell.

[2]

- g) When through foods the immune system is stimulated to fight against certain disease, then such foods are known as _____, _____.
- h) the moodust carnation gets its blue colour from _____ genes.

Part-II

2. Answer any **eight** of the following : $1\frac{1}{2} \times 8$
- a) What do you mean by somatic embryogenesis ?
 - b) What is the role of auxin in nutrient media ?
 - c) How do triploids are formed ?
 - d) What is palindromic sequence ?
 - e) What are the characteristics of a cloning vector ?
 - f) What are the types of restriction endonucleases ?
 - g) What do you mean by cDNA library ?
 - h) What is the utility of luciferase in recombinant DNA technology ?
 - i) What are the industrial application of Aspergillase ?
 - j) What do you mean by superbug ?

[3]

Part-III

3. Write short notes on any *eight* of the following : 2 × 8

- a) Protoplast fusion
- b) Androgenesis
- c) Linear Restriction mapping
- d) Shuttle vector
- e) PUC 19
- f) Microinjection
- g) Heterologous probe
- h) Protease as industrial enzyme
- i) Flavr savr tomato
- j) Herbicide resistant plants.

Part-IV

4. a) Describe the composition of a typical plant tissue culture medium. Mention the roles of vitamins and hormones in it. 6

OR

b) What do you mean by cryopreservation ? Describe the process and mention its importance in germplasm conservation.

[4]

5. a) What are cloning vectors ? Give examples of three eukaryotic cloning vectors with their functions. 6

OR

- b) Write in detail the PCR mediated gene cloning method.
6. a) Describe the process of *Agrobacterium*-mediated gene transfer. 6

OR

- b) How to screen the DNA Libraries to obtain gene of interest.
7. a) Give a note on the role of transgenics in bioremediation. 6

OR

- b) How do the genetically engineered products are useful for human welfare ? Explain with examples.