

1 (Sem-6/FYUGP) BOT 61 MJ

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BOTANY

(Major)

Paper : BOT0600104

(Plant Physiology)

Full Marks : 45

Time : 2 hours

*The figures in the margin indicate full marks
for the questions.*

1. Choose the correct answer from the options
given below for the following : $1 \times 5 = 5$

(a) Aquaporins are proteins that facilitate

(i) active transport of water

(ii) passive transport of water

(iii) transport of ions

(iv) transport of sugars

(b) Which type of transport occurs when
mineral ions move along their
concentration gradient?

(i) Active transport

(ii) Facilitated diffusion

(iii) Passive transport

(iv) Osmosis

(c) Which of the following plant growth regulators promote(s) lateral bud growth and delays senescence?

- (i) Auxins (ii) Cytokinins
(iii) Gibberellins (iv) Absciscic acid

(d) Which form of phytochrome promotes flowering in long-day plants?

- (i) P₆₆₀ (Pr) (ii) P₇₃₀ (Pfr)
(iii) P₅₀₀ (iv) P₄₀₀

(e) The triple response of ethylene includes

- (i) increased cell elongation, thickening of the stem, and faster germination
(ii) stem elongation, leaf expansion, and increased photosynthesis
(iii) inhibition of stem elongation, thickening of the stem, and horizontal growth
(iv) root hair formation, vascular differentiation, and cell elongation

2. Write short notes on any *five* of the following : 2×5=10

- (a) Root pressure theory
(b) Anti-transpirants

(c) Chelating agents

(d) Antiport

(e) Phloem loading

(f) Absciscic acid

(g) Vernalization

(h) Phytochrome

(i) Oxidative stress

(j) Reactive oxygen species

3. Answer briefly any *four* of the following questions : 5×4=20

(a) Describe the apoplast and symplast pathways of water movement.

(b) Explain the cohesion-tension theory of ascent of sap in plants.

(c) Describe any two functions and deficiency symptoms of magnesium and potassium in plants.

(d) Explain the source-to-sink concept in phloem transport.

(e) What is the significance of the red and far-red light in phytochrome function?

- (f) What are growth retardants? How do they affect plant growth and development?
- (g) What is seed dormancy? Explain the methods of breaking seed dormancy.
- (h) Discuss heavy metal stress and the role of phytochelatins in detoxification.

4. Answer any *one* of the following questions : 10

- (a) Define water potential. Explain its components and their significance in plant water relations. 2+8=10
- (b) Describe the symptoms of deficiency of any three essential elements and their impact on plant growth and development. 10
- (c) Describe the process of phloem translocation and explain the Pressure Flow Hypothesis with labeled diagram. 10
- (d) Define photoperiodism and classify the plants based on their photoperiodic response. Explain its significance in plant growth and development. 7+3=10

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1 (Sem-6/FYUGP) BOT 62 MJ

2 0 2 6

BOTANY

(Major)

Paper : BOT0600204

(Reproductive Biology of Angiosperm)

Full Marks : 45

Time : 2 hours

*The figures in the margin indicate full marks
for the questions.*

1. Answer the following as directed : 1×5=5

- (a) What is parasexual hybridization?
- (b) Name the term used for 'arrangement of ovule in the ovary'.
- (c) What are hypostases?
- (d) A hydrophilic substance that forms the pollen coat material is _____.

(Fill in the blank)

(e) In NPC system, P stands for _____.

(Fill in the blank)

(2)

2. Answer any *five* of the following questions :

2×5=10

- (a) What is florigen? What is its function?
- (b) Write a note on perisperm.
- (c) What do you understand by double fertilization? Who discovered it?
- (d) Write about the contribution of P. Maheshwari in the field of embryology.
- (e) How cybrids are different from hybrids?
- (f) Distinguish between self-incompatibility and male sterility.
- (g) Write a short note on male germ unit (MGU).
- (h) Draw a labelled diagram of LS of ovule structure.
- (i) What do you mean by gynodioecy and androdioecy?
- (j) Differentiate between Anemophily and Entomophily.

(3)

3. Answer any *four* of the following questions :

5×4=20

- (a) "Flower is a modified shoot." Elaborate the statement.
- (b) What is sporophytic self-incompatibility? Write the differences between SSI and GSI. 1+4=5
- (c) Discuss the various methods of Pollen storage.
- (d) Describe the causes of polyembryony.
- (e) "Callose plays an important role in microsporogenesis." Discuss.
- (f) Discuss the significance of seed dispersal. Add a note on hydrochory. 2+3=5
- (g) Describe two methods to overcome self-incompatibility.
- (h) Write a note on the NPC system of pollen classification.

4. Answer any *one* of the following questions : 10

- (a) What are the different types of endosperms? Describe the endosperm haustoria found in different angiosperms with suitable diagram.

2+8=10

- (b) What are the basic aspects of palynology? Discuss the scope of palynological studies. $2+8=10$
- (c) Discuss different types of Apomixis in plants and their application in plant breeding. $6+4=10$
- (d) What is megagametogenesis? Describe in detail the structure and development of tetrasporic mature female gametophyte. $2+8=10$

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1 (Sem-6/FYUGP) BOT 63 MJ

2 0 2 6

BOTANY

(Major)

Paper : BOT0600304

(Plant Metabolism and Biochemistry)

Full Marks : 45

Time : 2 hours

*The figures in the margin indicate full marks
for the questions.*

1. Answer the following questions : 1×5=5

- (a)* Who proposed the Chemiosmotic theory of ATP synthesis?
- (b)* How many turns of Calvin cycle are taken to produce one molecule of hexose?
- (c)* Name a free-living nitrogen-fixing bacteria.
- (d)* What is the primary CO₂ acceptor in C₄ pathway?
- (e)* What is the end product of β -oxidation?

(2)

2. Answer any *five* of the following questions :

2×5=10

- (a) Write two properties of enzyme.
- (b) Define dual activities of RuBisCo.
- (c) What is photorespiration? Mention the cell organelles involved in photorespiration.
- (d) Write three phases of aerobic respiration.
- (e) What is ammonification? Name two bacteria directly involved in ammonification process.
- (f) Define signal transduction.
- (g) What are the first stable products in C_3 and C_4 cycle?
- (h) What are antenna molecules and what are their primary functions?
- (i) What is prosthetic group? What are the different types of prosthetic groups?
- (j) What are secondary metabolites? Name two alkaloids in plants.

(3)

3. Answer any *four* of the following questions :

5×4=20

- (a) Explain the role of leg-hemoglobin in the root nodules of leguminous plants.
- (b) Describe the mechanism and significance of the MAP kinase signalling pathway.
- (c) Write a note on enzyme inhibition.
- (d) Define non-symbiotic nitrogen fixation. List non-symbiotic nitrogen-fixing microorganisms and mention their role in soil fertility.
- (e) Elucidate the role of calcium-calmodulin cascade in signal transduction mechanism. What do you mean by receptor-ligand interaction?
- (f) Differentiate between C_3 and C_4 pathways.
- (g) Describe cyanide-resistant respiration and its alternative pathway.
- (h) Explain the biosynthesis of starch in plants.

4. Answer any *one* of the following questions : 10

(a) What is photophosphorylation? Explain the process of cyclic and non-cyclic photophosphorylation. 2+8=10

(b) What is biological nitrogen fixation? Describe the process of formation of mature nodule during biological nitrogen fixation. 2+8=10

(c) What are triglycerides? Name two common glycerides in plants. Give an account on breakdown of fatty acid by β -oxidation in plants. 1+1+8=10

(d) Define shikimate pathway. Discuss the biosynthesis of phenolic compounds by this pathway. Mention the significance of shikimate pathway. 2+7+1=10

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2026

BOTANY

(Major)

Paper : BOT0600404

(Applied Plant Biology)

Full Marks : 45

Time : 2 hours

*The figures in the margin indicate full marks
for the questions.*

1. Answer the following as directed : 1×5=5

(a) Auxin : Cytokinin > 1 leads to the development of _____.

(Fill in the blank)

(b) Why do cDNA libraries vary between different tissues of the same organism?

(c) What is a palindromic DNA sequence?

(d) What do you mean by germplasm conservation?

(e) Name the microbe used in genetically engineered Roundup Ready soybeans.

(2)

2. Answer any *five* of the following questions :

2×5=10

- (a) What are symmetric hybrids?
- (b) State dedifferentiation and redifferentiation.
- (c) Differentiate between selectable markers and screenable markers, giving one example of each.
- (d) Why are protoplasts preferred over intact plant cells in techniques like micro-injection and electroporation? Give two reasons.
- (e) What are degenerate primers, and why are they used in PCR?
- (f) What is a reporter gene? Name one commonly used reporter gene in plant transformation.
- (g) What are the key features of an ideal cloning vector?
- (h) Mention the significance of triploids in plant breeding.
- (i) What are Moondust carnations? Name the foreign gene and its source used in the production of Moondust carnations.
- (j) Mention how Bt-cotton remains insect pest-free.

(3)

3. Answer any *four* of the following questions :

5×4=20

- (a) Write a note on somatic embryogenesis.
- (b) Explain the structure and features of pBR322 vector.
- (c) Explain the principle of α -complementation in β -galactosidase screening. How does it help to distinguish recombinant from non-recombinant colonies? 2+3=5
- (d) Describe the biolistic (particle gun) method of gene transfer.
- (e) Write a note on primer design in PCR and factors affecting specificity.
- (f) Write a note on transformation of bacterial cells.
- (g) Discuss the process of haploid production.
- (h) Write a note on Golden rice and its importance.

4. Answer any *one* of the following questions : 10

- (a) Define protoplast culture. Give a detailed description of the methods of isolation, culture and regeneration of plant protoplasts.

- (b) Describe in detail the construction and screening of a DNA library to isolate a gene of interest.
- (c) Compare *Agrobacterium*-mediated gene transfer and direct gene transfer methods in plants.
- (d) What are superbugs? Discuss the role of superbugs in degradation, detoxification and accumulation of pollutants. 2+8=10

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