

2025

## BOTANY — HONOURS

Paper : DSCC-9

(Mycology)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer *any six* questions : 2×6
- What do you mean by anamorph and telemorph?
  - Write the difference between primary and secondary mycelium.
  - What is a clamp connection? In which group is it found?
  - What is trehalose?
  - What is plectenchyma?
  - What is dolipore septum?
  - What do you mean by endogenous dormancy?
  - What is a nutraceutical? Give one example.
  - Define DNA barcoding.
2. Answer *any three* questions :
- Draw and explain the typical growth curve of an unicellular fungus. 5
  - Outline of the classification of fungi proposed by Hawksworth *et al.* (1995). 5
  - Briefly describe the sequence of events of parasexual cycle in fungi. 5
  - Comment on the sexual reproduction of *Synchytrium endobioticum* with suitable diagrams. 3+2
  - Give a brief outline of industrial production of alcohol. 5
- Answer *any four* questions.
3. What is meant by spore liberation? Write the differences between active and passive spore liberation. Write a brief account of the passive spore liberation process, accompanied by suitable illustrations. 2+2+8
4. (a) What is chitin? Write the biosynthetic pathway of chitin with the help of a suitable flow chart.  
 (b) Give an outline of polyketide biosynthesis in fungi. (2+6)+4

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5. What is mycoprotein? Schematically represent the process of mycoprotein production from filamentous fungi. Explain the bioremediation potentiality of fungi. 1+6+5
6. What is plasmid? Describe the structure and function of linear plasmid present in fungi. 2+(6+4)
7. (a) Discuss the types of ascocarps found under Ascomycota.  
(b) Describe the process of development of ascus and ascospores in *Ascobolus*. 6+6
8. What are homothallism and heterothallism? Describe the different types of heterothallism in fungi. (2+2)+8

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## BOTANY — HONOURS

Paper : DSCC-10

(Microbiology)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Write short answers to **any six** of the following : 2×6
- What is Prion?
  - Name one aerobic and one anaerobic endospore-forming bacteria.
  - What is mean generation time?
  - Differentiate between temperate and virulent phages.
  - What is CRISPR-Cas?
  - What is resident microbiota?
  - What are chemolithotrophs? Cite one example.
  - Name two pathogenic bacteria that causes food-borne gastroenteritis.
  - Mention the contribution of Louis Pasteur in Microbiology.
2. Answer **any three** questions briefly :
- Draw and describe the different phases of bacterial growth in a batch culture. 5
  - Draw and describe the ultrastructure of bacterial flagella. 5
  - Classify antibiotics based on their mode of action and cite suitable examples. 5
  - What are Koch's postulates? 5
  - Distinguishing features of Firmicutes and Actinobacteria. 5
3. Answer **any four** questions :
- Comment on the chemical structure of the bacterial cellwall. Explain the major structural and chemical differences between cellwalls of Gram(+ve) and Gram(-ve) bacteria. 8+4
  - Outline the commercial production of bio-ethanol from agricultural biomass. Highlight the role of microbial enzymes in degradation of lignocellulosic wastes. 6+6
  - Explain with suitable diagrams  $F^+ \times F^-$  and  $Hfr \times F^-$  conjugation in *E.coli*. How does it helps in genetic recombination? 8+4

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- (d) Describe the infection cycle of a lytic bacteriophage with suitable diagrams. Mention the different modes of transmission of plant virus. 6+6
- (e) State the characteristics of an ideal chemotherapeutic agent. Discuss the mode of action of Phenol and Sulfa drugs on microbial growth. 6+6
- (f) Write short notes on the following : 4×3
  - (i) Proteobacteria
  - (ii) Mollicutes
  - (iii) Chlamydiae.

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## BOTANY — HONOURS

Paper : DSCC-11

(Biochemistry)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer **any six** questions of the following : 2×6
- What is 'Isoelectric point'?
  - Name an acidic and an aromatic amino acid.
  - What is miRNA?
  - What property of protein is used in protein purification by 'Ion exchange chromatography'?
  - $K_m$  values of two enzymes are provided below. Which of these two enzymes have higher affinity for its substrate and why?
    - Carbonic anhydrase =  $2.6 \times 10^{-2}$  M
    - Triose isomerase =  $4.7 \times 10^{-4}$  M
  - Write down the structure of the fatty acid – 20:4 ( $\Delta 5, 8, 11, 14$ ).
  - What is the utility of 'Handerson – Hasselbalch equation'?
  - What are enantiomers? Give an example.
  - Write down the significance of 'redox potential'.
2. Answer **any three** questions : 5
- Write a short note on essential fatty acids. 5
  - Write down the classes of enzymes as per IUBMB. Cite one example from each class. 5
  - 'All monosaccharides are reducing sugars but not all disaccharides.' — Justify. Mention the types of polysaccharides found in plants. 3+2
  - Give concise idea of rancidity and saponification. 3+2
  - Describe the properties and functions of triacylglycerol. 2½+2½
3. Answer **any four** questions : 3+1+1+1+1+2+3
- Define free energy, entropy and enthalpy. Write down the relation between them. What is coupled reaction? Cite an example. What is redox potential? Write down the structure and role of ATP as an energy currency. 3+1+1+1+1+2+3

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- (b) Briefly write the general sequence of a cellular signal development. Write in short about second messenger. Explain signal transduction mechanism involving MAP kinase. 3+3+6
- (c) Describe  $\beta$  pleated sheets. Explain salt precipitation method of protein purification. How are peptide bond and polypeptide chain formed among the constituent amino acids of proteins? 5+4+3
- (d) What are the different classes of structural lipids and storage lipids? Write the generic formula of triglyceride. Define PUFA with example. Why are membrane lipids called amphipathic? 5+1+3+3
- (e) Give an overview of cell membrane transport mechanism with reference to symport, antiport and uniport. 4+4+4
- (f) Draw and describe the different forms of DNA. Discuss the differences between mRNA and tRNA. 8+4
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## BOTANY — HONOURS

Paper : DSCC-12

(Cell and Molecular Biology)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer **any six** questions :

- |  |     |
|--|-----|
| (a) What is the difference between group I and group II introns?         | 2   |
| (b) State one difference between type I and type II restriction enzymes. | 2   |
| (c) What is a riboswitch? Give an example.                               | 1+1 |
| (d) What is 'FISH'?  | 2   |
| (e) Define apoptosis.  | 2   |
| (f) What are okazaki fragments?  | 2   |
| (g) What is Wobble hypothesis?   | 2   |
| (h) Mention the functions of guide RNA.                                  | 2   |
| (i) Write down the principle of SEM.                                     | 2   |

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

- |   |       |
|---|-------|
| (a) Write a note on PCR and its application.                                  | 5     |
| (b) Write down the ultrastructure of nucleolus.                               | 5     |
| (c) Briefly describe ribosome biogenesis with suitable diagram.               | 5     |
| (d) What is a selectable marker? Mention the steps of gene cloning.           | 2+3   |
| (e) Write a note on the applications of Southern and Western Blot techniques. | 2½+2½ |

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

- |   |       |
|---|-------|
| (a) Describe DNA packaging in eukaryotic chromosome with special emphasis on nucleosome concept.  | 12    |
| (b) Define Sarcoma. Discuss the roles of protooncogenes and tumor suppressor genes in cancer development. What is the role of Cyclin D1 for cancer development? | 2+6+4 |

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- (c) How is a messenger RNA modified after transcription in eukaryotes? What is the role of tRNA in protein synthesis? Describe the initiation stage of transcription in prokaryotes. 4+4+4
- (d) What are the three different mitotic checkpoints? Describe the role of MPF in mitotic entry. 4+8
- (e) Write down the role of the following during DNA replication in *E. coli* : 6+2+2+2
- (i) DNA polymerase I and III
  - (ii) Gyrase
  - (iii) Helicase
  - (iv) SSB protein.
- (f) Write a brief note on the properties of the genetic code. What do you mean by codon degeneracy? Briefly explain aminoacylation of tRNA. 6+2+4