April, 2026

Basic Molecular Biology

Full Marks-100 Time-3 hours

Answer as per instructions.
figures in the right-hand margin indicates marks

Part A

Q.1 Multiple Choice Questions (10x1)

I) The sugar present in RNA is
A. Deoxyribose B. Ribose C. Glucose D. Fructose

II) The basic repeating unit of chromatin is
A. Chromosome B. Gene C. Nucleosome D. Codon

III) Which RNA carries amino acids during protein synthesis?
A. mRNA B. rRNA C. tRNA D. snRNA

IV) The enzyme responsible for DNA synthesis is
A. DNA Polymerase B. RNA Polymerase C. Ligase D. Topoisomerase

V) DNA helicase functions to
A. Join DNA fragments B. Unwind DNA C. Synthesize primers D. Repair DNA

VI) Which enzyme removes RNA primers?
A. DNA Polymerase I B. DNA Polymerase III C. Helicase D. Ligase

VII) The enzyme responsible for transcription is
A. DNA Polymerase B. RNA Polymerase C. Ligase D. Helicase

VIII) The coding region of a gene is called
A. Intron B. Exon C. Promoter D. Operator

IX) The cap added at the 5′ end of mRNA is
A. Poly-A tail B. 7-methyl guanosine C. Adenine cap D. Uracil cap

X) The initiation codon is
A. UAA B. AUG C. UAG D. UGA

Part B

Q.2 Answer the following questions in maximum 50 words. (9x2)

I) State Chargaff's rule.

II) What are histone proteins?

III) What is a replication fork?

IV) What is the function of the promoter region?

V) Write the function of telomerase.

VI) What are stop codons? Name any two.

VII) What is polysome (polyribosome)?

VIII) Write the significance of the 5′ cap and poly(A) tail.

IX) What are Okazaki fragments?

Part C

Q.3 Answer any eight question maximum 250 words (8x5)

I) Explain the Watson and Crick model of DNA with suitable diagrams.

II) Describe the structure and functions of different types of RNA.

III) Discuss the organization and structure of nucleosomes.

IV) Discuss the mechanism of rolling circle replication.

V) Differentiate between leading and lagging strand synthesis.

VI) Explain the lac operon model of gene regulation.

VII) Discuss RNA splicing and its biological significance.

VIII) Explain the genetic code and its salient features.

IX) Explain post-translational modifications of proteins and their significance.

X) Explain the structure and functions of ribosomes.

Part D

Q. Answer any four question maximum 800 words (4×8)

Q.4) Explain in detail the historical experiments that established DNA as the genetic material. Discuss the contributions of Griffith, Avery–MacLeod–McCarty, and Hershey–Chase.

Q.5) Discuss the organization of chromatin in eukaryotes. Describe the structure of nucleosomes, histone proteins, and the different levels of chromosome packaging with suitable diagrams.

Q.6) Explain different models of DNA replication. Describe the Meselson and Stahl experiment and explain how it proved the semi-conservative mode of DNA replication.

Q.7) Explain the complete mechanism of transcription in prokaryotes with suitable diagrams. Discuss initiation, elongation, and termination.

Q.8) Discuss the mechanism of translation in eukaryotes. Compare translation in prokaryotes and eukaryotes.

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+3 Sem-4 (NEP)
BOT-C-1P-9 (MAJ)

April, 2026

Plant Ecology and Phytogeography

Full Marks-100 Time-3 hours

Answer as per instructions.
figures in the right-hand margin indicates marks

Part-I

Q.1 Multiple Choice Questions (10x1)

I) The term "Ecology" was first coined by
A. Darwin B. Haeckel C. Linnaeus D. Warming

II) Which of the following is an abiotic factor?
A. Competition B. Predation C. Temperature D. Parasitism

III) The study of interactions among organisms is called
A. Genetics B. Ecology C. Physiology D. Cytology

IV) The uppermost layer of soil rich in organic matter is
A. C horizon B. A horizon C. R horizon D. Bedrock

V) The pH of neutral soil is
A. 5 B. 6 C. 7 D. 8

VI) The movement of water through the environment is called
A. Carbon cycle B. Nitrogen cycle C. Hydrological cycle D. Oxygen cycle

VII) Which instrument measures rainfall?
A. Hygrometer B. Rain gauge C. Thermometer D. Barometer

VIII) The role of an organism in an ecosystem is known as
A. Habitat B. Niche C. Population D. Biomass

IX) Primary succession starts on
A. Previously vegetated land B. Bare substrate C. Agricultural land D. Forest floor

X) Species restricted to a particular geographical region are called
A. Cosmopolitan B. Endemic C. Exotic D. Naturalized

Part II

Q.2 Answer the following questions type maximum 50 words (9x2)

I) What are abiotic factors? Give any two examples.

II) Define biosphere.

III) Define soil texture.

IV) What is soil pH?

V) What is ecotone?

VI) Explain the edge effect.

VII) Define food chain with example.

VIII) Define endemism.

IX) What is an ecological pyramid?

Part III

Q.3 Answer any eight question in maximum 250 words (8×5)

I) Explain the structure and components of an ecosystem with a neat labeled diagram.

II) Explain the role of climatic factors (light, temperature, rainfall, and wind) in plant distribution.

III) Describe the xerophytic adaptations of plants growing in arid environments.

IV) Describe the process of soil formation and discuss the factors influencing it.

V) Describe the sources, movement, and conservation of water in terrestrial ecosystems.

VI) Define population ecology. Discuss the important characteristics of a population.

VII) Describe the structure and functions of a climax community.

VIII) Explain the carbon cycle and nitrogen cycle with neat labeled diagrams.

IX) Explain the principles and scope of phytogeography.

X) Explain the concept of endemism and discuss the factors responsible for the distribution of endemic plants.

Part IV

Q. Answer any four question in maximum 800 words (4×8)

Q.4) Explain the concepts of biosphere, ecological niche, habitat, and ecological homeostasis. Discuss their ecological significance with suitable examples.

Q.5) Explain the soil profile with a neat labeled diagram. Discuss the characteristics and significance of different soil horizons.

Q.6) Describe the different forms of precipitation and discuss the influence of atmospheric moisture, humidity, and rainfall on vegetation.

Q.7) Explain the concept of plant communities. Describe their characteristics, structure, stratification, and methods of community analysis.

Q.8) Explain the principles of energy flow in ecosystems. Discuss ecological productivity, ecological efficiency, and Lindeman's 10% law with appropriate diagrams.

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+3 Sem-4 (NEP)
BOT-C-1P-10 (MAJ)

April, 2026
Plant Systematics

Full Marks-100 Time-3 hours

Answer as per instructions.
figures in the right-hand margin indicates marks

Part-A

Q.1 Multiple Choice Questions (10x1)

I) The science of identifying and naming plants is known as:
A. Cytology B. Taxonomy C. Genetics D. Anatomy

II) A monograph is:
A. A study of one taxonomic group B. A newspaper
C. A field notebook D. A seed catalogue

III) The largest herbarium in India is:
A. MH, Chennai B. CAL, Howrah C. DD, Dehradun D. ASSAM

IV) ICN stands for:
A. International Code of Nomenclature B. International Classification Network
C. Indian Code of Nomenclature D. International Council of Nature

V) Priority in nomenclature means:
A. Latest name is accepted B. Earliest validly published name is accepted
C. Longest name is accepted D. Local name is accepted

VI) The ending "-aceae" is generally used for:
A. Orders B. Families C. Classes D. Divisions

VII) The "Father of Taxonomy" is:
A. Darwin B. Linnaeus C. Bentham D. Engler

VIII) Which evidence is used in plant systematics?
A. Cytology B. Palynology C. Molecular data D. All of the above

IX) Monophyletic groups contain:
A. Common ancestor and all descendants B. Only one species
C. Different kingdoms D. Unrelated organisms

X) Which family belongs to APG classification?
A. Magnoliaceae B. Poaceae C. Fabaceae D. All of the above

Part B

Q.2 answer the following questions in maximum 50 words (9x2)

I) What is a herbarium? Mention any two functions.

II) What is plant identification?

III) What is field inventory in plant taxonomy?

IV) Define taxon.

V) What is a holotype?

VI) What is numerical taxonomy?

VII) Define monophyletic group.

VIII) What is parallel evolution?

IX) Write a note on E- flora?

Part C

Q.3 Answer any eight question in maximum 250 words (8×5)

I) Write a detailed note on botanical gardens and explain their role in plant conservation.

II) Explain the procedure for collection, pressing, drying and mounting of herbarium specimens.

III) Explain the taxonomic hierarchy with suitable examples.

IV) Describe the principle of typification and different types of nomenclatural types.

V) Describe the contributions of Theophrastus, Bauhin and Tournefort to plant taxonomy.

VI) Discuss the importance of palynology, cytology and molecular biology in plant systematics.

VII) Discuss the principles and methodology of cladistic analysis.

VIII) Discuss the Angiosperm Phylogeny Group (APG) classification system and its significance.

IX) Discuss the role of molecular markers and DNA sequencing in phylogenetic studies.

X) Explain Hutchinson's classification system with its advantages and limitations.

Part D

Q. Answer any four-question in maximum 800 words (4×8)

Q.4) Discuss the principles, objectives, scope, and significance of plant taxonomy. Explain its role in biodiversity conservation and plant research.

Q.5) Discuss in detail the International Code of Nomenclature (ICN), including its objectives, principles, and importance in plant taxonomy.

Q.6) Describe the Bentham and Hooker classification system in detail. Discuss its merits, demerits, and present-day significance.

Q.7) Describe the floral characters, floral formula and economic importance of the family Poaceae.

Q.8) Explain the modern approaches used in angiosperm phylogeny and their applications in plant taxonomy.

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April, 2026

Cell Biology

Full Marks-100 Time-3 hours

Answer as per instructions.
figures in the right-hand margin indicates marks

Section-I

Q.1 Multiple Choice Questions (10x1=10)

I) The cell was first discovered by
A. Robert Hooke B. Antonie van Leeuwenhoek C. Schleiden D. Virchow

II) Which is a unique feature of plant cells?
A. Centrioles B. Cell wall C. Lysosome D. Flagella

III) Plant cell wall is mainly composed of
A. Chitin B. Peptidoglycan C. Cellulose D. Glycogen

IV) Plasma membrane is mainly composed of
A. Cellulose B. Proteins and lipids C. Chitin D. DNA

V) The "protein factory" of the cell is
A. Golgi body B. Ribosome C. Vacuole D. Lysosome

VI) Chlorophyll is located in
A. Cristae B. Thylakoid membrane C. Matrix D. Cytoplasm

VII) Peroxisomes are involved in
A. Protein synthesis B. Detoxification C. DNA replication D. Cell division

VIII) The nuclear lamina provides
A. Energy B. Structural support C. Food storage D. Protein synthesis

IX) RNA contains the nitrogen base
A. Thymine B. Uracil C. Cytosine D. Guanine

X) Which DNA form is most common in living cells?
A. A-DNA B. B-DNA C. Z-DNA D. C-DNA

Section-II

Q.2 Answer the following questions in maximum 50 words. (9x2)

I) Define plasmodesmata. State one of its functions.

II) What are microtubules?

III) What is facilitated diffusion?

IV) Why are lysosomes called the "suicidal bags" of the cell?

V) Define the nuclear envelope.

VI) Write two functions of peroxisomes.

VII) What is chromatin?

VIII) Define nucleotide.

IX) What is the nuclear lamina?

Part C

Q.3 Answer any eight question in maximum 250 words (8×5)

I) Describe the structure and functions of a typical eukaryotic plant cell with a neat labelled diagram.

II) Explain the Endosymbiotic Theory for the origin of eukaryotic cells. Mention the evidence supporting the theory.

III) Explain the Fluid Mosaic Model of plasma membrane with a neat labelled diagram.

IV) Discuss the process of endocytosis and exocytosis with suitable diagrams.

V) Describe the structure and functions of chloroplast with a neat labelled diagram.

VI) Discuss the biogenesis and semi-autonomous nature of mitochondria.

VII) Describe the chemical composition and functions of the plasma membrane.

VIII) Describe the stages of mitosis and discuss its significance.

IX) Describe the different types of RNA and explain their biological functions.

X) Explain the different mechanisms of membrane transport with suitable examples.

Part D

Answer any four question in maximum 800 words (4×8)

Q.4) Describe the organization of the cytoskeleton. Explain the structure and functions of microfilaments and intermediate filaments.

Q.5) Describe the structure and functions of the Endoplasmic Reticulum and Golgi apparatus. Add suitable labelled diagrams.

Q.6) Describe the structure of the nucleus with a neat labelled diagram. Explain the functions of the nuclear envelope, nuclear pore complex and nuclear lamina.

Q.7) Describe the stages of meiosis with neat labelled diagrams. Explain its significance and compare meiosis with mitosis.

Q.8) Explain the structure of DNA and RNA. Discuss the different forms of DNA (A, B and Z) with suitable diagrams.

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