



CORE COURSE 1. Non-Chordates I

2 Marks Questions (20 questions)

• Remembering

1. Define classification, systematics, and taxonomy.
2. What is the taxonomic hierarchy?
3. State the principle of priority in zoological nomenclature.
4. What are taxonomic types? Give an example.
5. Define synonymy and homonymy in taxonomy.
6. What is the three-domain concept by Carl Woese?
7. What are the five kingdoms proposed by Whittaker?
8. Mention any two general characteristics of Protozoa.
9. Name the types of locomotion seen in Euglena, Paramoecium, and Amoeba.
10. What is conjugation in Paramoecium?
11. Define metagenesis with an example.
12. What is polymorphism in Cnidaria?
13. List two functions of coral reefs.
14. Define symmetry in Metazoa with examples.
15. What is segmentation in Metazoa?
16. Mention the general characteristics of Porifera.
17. What are spicules in sponges?
18. List any two parasitic adaptations of helminths.
19. Name the host organisms of *Fasciola hepatica*.
20. What are the pathogenic effects of *Ascaris lumbricoides*?

3 Marks Questions (15 questions)

• Understanding and Applying

1. Differentiate between classification, systematics, and taxonomy.
2. Describe the importance of taxonomic hierarchy in animal classification.
3. Explain the significance of the principle of priority in zoological nomenclature.
4. Compare the three-domain concept with the five-kingdom classification.
5. Explain the locomotion in Euglena.
6. Describe conjugation in Paramoecium.
7. Summarize the life cycle of *Entamoeba histolytica*.
8. Explain the canal system in sponges.
9. Describe metagenesis in *Obelia* with a diagram.
10. Explain the importance of coral reefs in marine ecosystems.
11. Describe the general characteristics of Platyhelminthes.
12. Outline the life cycle of *Taenia solium*.
13. Explain the pathogenicity of *Wuchereria bancrofti*.
14. Compare the classes within Porifera based on general characteristics.
15. Describe the adaptations of helminths for parasitism.

5 Marks Questions (15 questions)

• Analyzing Evaluating, and Creating

1. Analyze the evolutionary significance of symmetry in Metazoa.



2. Evaluate the role of segmentation in the evolution of complex organisms.
3. Discuss the diversity and conservation of coral reefs.
4. Classify Protozoa up to phylum according to Levine et al. (1980).
5. Discuss the life cycle and control measures for *Plasmodium vivax*.
6. Explain the canal system and its variations in Porifera.
7. Analyze the role of metagenesis in the life cycle of Cnidarians.
8. Compare and contrast the locomotion mechanisms in *Euglena*, *Paramecium*, and *Amoeba*.
9. Discuss the pathogenicity and control measures of *Fasciola hepatica*.
10. Classify Platyhelminthes and describe the key features of its classes.
11. Evaluate the parasitic adaptations in *Ascaris lumbricoides* and *Wuchereria bancrofti*.
12. Explain the polymorphism in Cnidaria with examples.
13. Analyze the evolutionary significance of metagenesis in *Obelia*.
14. Create a comparative chart of characteristics between the five-kingdom and three-domain systems of classification.
15. Propose strategies for the conservation of coral reefs.



CORE THEORY 2 (CC2)- Molecular Biology

2 Marks Questions (20 Questions)

- **Remembering**

1. Define Chargaff's Rule.
2. What are hypo- and hyperchromic shifts in DNA?
3. List the salient features of DNA.
4. What are the functions of tRNA and rRNA?
5. State the importance of RNA priming in DNA replication.
6. What is the significance of telomeres in replication?
7. Define semi-conservative replication.
8. What is the role of transcription factors?
9. State two differences between prokaryotic and eukaryotic transcription.
10. What is the wobble hypothesis?
11. Define codon degeneracy.
12. Name the processes involved in post-transcriptional modifications of eukaryotic RNA.
13. What is RNA splicing?
14. Define introns and exons.
15. State the role of enhancers and silencers in transcription regulation.
16. What is the lac operon?
17. Define DNA methylation.
18. What is the role of histone acetylation in gene expression?
19. State the principle of PCR.
20. What is Southern blotting used for?

3 Marks Questions (15 Questions)

- **Understanding and Applying**

1. Explain the Watson and Crick model of DNA with a diagram.
2. Discuss the types of RNA and their functions.
3. Describe the mechanism of DNA replication in prokaryotes.
4. Prove that DNA replication is bidirectional.
5. Explain the role of RNA primers in DNA replication.
6. Outline the transcription process in prokaryotes.
7. Compare prokaryotic and eukaryotic transcription.
8. Explain the wobble hypothesis with an example.
9. Describe the steps involved in mRNA capping and poly-A tail addition.
10. What is alternative splicing? Explain its significance.
11. Outline the regulation of the lac operon in prokaryotes.
12. Describe the role of DNA methylation in epigenetic regulation.
13. Explain the RecBCD model of DNA repair in prokaryotes.
14. What is the principle of Northern blotting?
15. Compare PCR and Western blot techniques.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating**

1. Analyze the importance of Chargaff's Rule in understanding DNA structure.



2. Evaluate the Watson and Crick model in the context of DNA's biological function.
3. Discuss the semi-conservative nature of DNA replication with experimental evidence.
4. Analyze the importance of telomeres and their replication mechanism.
5. Discuss the role of transcription factors and their regulation in eukaryotes.
6. Explain the genetic code and its degeneracy, with examples.
7. Evaluate the mechanism of protein synthesis in prokaryotes.
8. Discuss the splicing mechanism and its importance in gene expression.
9. Analyze the regulatory roles of activators, enhancers, and repressors in transcription.
10. Explain miRNA-mediated gene silencing with an example.
11. Evaluate the role of histone modifications in epigenetic gene regulation.
12. Compare nucleotide excision repair and base excision repair mechanisms.
13. Analyze the role of the SOS repair mechanism in maintaining genome integrity.
14. Create a comparative chart of molecular techniques (PCR, Southern, Northern, and Western blots).
15. Propose a research experiment using PCR and Southern blotting to detect a gene mutation.



CORE COURSE 3: Non-Chordates II – Coelomates

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. Define coelom.
2. What is metamerism?
3. List the general characteristics of Annelida.
4. Name the types of nephridia in Annelida.
5. Define tagmatization in Arthropoda.
6. List the classes of Arthropoda.
7. What is the evolutionary significance of Onychophora?
8. Mention the respiratory organs in prawns and cockroaches.
9. What is metamorphosis in Lepidopteran insects?
10. List two characteristics of social life in termites.
11. What is torsion in Gastropoda?
12. Name the respiratory structures in **Pila** sp.
13. List the general characteristics of Mollusca.
14. Define the water vascular system.
15. Name the larval forms of Echinodermata.
16. State two affinities of Echinodermata with chordates.
17. Mention the general characteristics of Hemichordata.
18. Define hemocoel with an example.
19. What is the function of the nervous system in **Pila** sp.?
20. Name two features that relate Hemichordata with chordates.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Explain the evolutionary significance of coelom.
2. Describe the structure and function of nephridia in Annelida.
3. Discuss the importance of metamerism in Annelida.
4. Classify Annelida up to classes with examples.
5. Compare the respiratory mechanisms in prawns and cockroaches.
6. Describe the structure and function of the insect compound eye (cockroach).
7. Explain the process of metamorphosis in Lepidopteran insects.
8. Summarize the social behavior of termites.
9. Describe the general characteristics of Onychophora.
10. Classify Mollusca up to classes with examples.
11. Explain the nervous system in **Pila** sp.
12. Describe torsion in Gastropoda and its significance.
13. Explain the water vascular system in **Asterias**.
14. Compare the larval forms of Echinodermata with their adult forms.
15. Discuss the relationship of Hemichordata with chordates.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]**

1. Analyze the evolutionary trends in the development of coelom.
2. Discuss the significance of metamerism in the evolution of Annelida.



3. Evaluate the functional importance of nephridia in Annelida.
4. Compare the respiratory systems of prawns and cockroaches.
5. Analyze the evolutionary adaptations in Arthropoda that contributed to their diversity.
6. Evaluate the evolutionary relationship of Onychophora with Arthropoda and Annelida.
7. Discuss the role of torsion in the evolution and lifestyle of Gastropoda.
8. Explain the feeding and respiration mechanisms in **Pila** sp.
9. Analyze the affinities of Echinodermata with chordates, focusing on larval forms.
10. Compare the classification and general characteristics of Mollusca and Echinodermata.
11. Evaluate the ecological and evolutionary significance of the water vascular system in Echinodermata.
12. Discuss the evolutionary significance of Hemichordata and their relationship with chordates.
13. Create a comparative chart of the nervous systems in Annelida, Arthropoda, and Mollusca.
14. Propose a hypothesis on how the social life of termites contributes to their survival and evolutionary success.
15. Create a diagrammatic representation of the life cycle of Lepidopteran insects, focusing on metamorphosis.



CORE COURSE 4: Cell Biology

• 2 Marks Questions (20 Questions)

Remembering [CO-1]

1. State the key features of the fluid mosaic model of the plasma membrane.
2. Define active and passive transport.
3. What is facilitated transport? Give an example.
4. Name the three types of cell junctions.
5. Mention the structural components of the endoplasmic reticulum (ER).
6. List two functions of the Golgi apparatus.
7. Define lysosomes and their primary function.
8. What is the semi-autonomous nature of mitochondria?
9. State the endosymbiotic hypothesis of mitochondrial origin.
10. Name the major steps of the mitochondrial respiratory chain.
11. What is the role of peroxisomes in cells?
12. Define centrosomes and their function in cell division.
13. Name the types of cytoskeletal filaments.
14. What are microtubules? Mention one accessory protein associated with them.
15. Define euchromatin and heterochromatin.
16. What is the function of the nuclear pore complex?
17. State the main phases of the cell cycle.
18. Define oncogenes and tumor suppressor genes.
19. Mention the role of p53 in cancer.
20. What is apoptosis?

3 Marks Questions (15 Questions)

• Understanding and Applying [CO-2, CO-3]

1. Explain the composition and organization of the plasma membrane according to the fluid mosaic model.
2. Compare active and passive transport with examples.
3. Describe the structure and function of tight junctions in cells.
4. Explain the process of protein sorting in the Golgi apparatus.
5. Describe the structure of the endoplasmic reticulum and its role in protein synthesis.
6. Discuss the chemiosmotic hypothesis in mitochondrial ATP synthesis.
7. Explain the structure and function of peroxisomes.
8. Describe the role of centrosomes in cell division.
9. Explain the functions of microfilaments in cellular processes.
10. Describe the packaging of chromatin into nucleosomes.
11. Compare euchromatin and heterochromatin.
12. Explain the role of proto-oncogene activation in cancer development.
13. Describe the RTK (Receptor Tyrosine Kinase) pathway with an example.
14. Compare the roles of JAK/STAT and RTK pathways in cell signaling.
15. Discuss the importance of apoptosis in maintaining cellular homeostasis.

5 Marks Questions (15 Questions)



Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

- 1. Analyze the functional significance of the fluid mosaic model in the plasma membrane's behavior.
 2. Evaluate the mechanisms of transport across the plasma membrane with examples.
 3. Discuss the structural and functional significance of gap junctions in intercellular communication.
 4. Explain the vesicular transport mechanisms between the ER and Golgi apparatus.
 5. Evaluate the endosymbiotic hypothesis in the context of mitochondrial structure and function.
 6. Discuss the chemiosmotic hypothesis and its significance in ATP synthesis.
 7. Analyze the role of accessory proteins in the assembly and regulation of the cytoskeleton.
 8. Discuss the structural organization and functional importance of the nuclear envelope and nuclear pore complex.
 9. Evaluate the regulation of the cell cycle and its disruption in cancer.
 10. Discuss the roles of p53, Retinoblastoma, and Ras in tumor suppression and oncogenesis.
 11. Explain the nucleosome as a basic unit of chromatin packaging and its role in gene regulation.
 12. Analyze the role of RTK signaling pathways in growth and development.
 13. Evaluate the JAK/STAT pathway and its importance in immune signaling.
 14. Discuss the process and regulation of apoptosis, including its role in disease.
 15. Propose a model for integrating cell signaling pathways with cell cycle regulation to control cancer progression.



CORE COURSE 5: Chordata

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. List the three defining characteristics of chordates.
2. Define Protochordata and name its subphyla.
3. Mention two features of Urochordates.
4. What is the significance of metamorphosis in **Ascidia**?
5. Define the term "pharyngeal slits."
6. State two feeding adaptations in **Branchiostoma**.
7. Name two orders of cyclostomes.
8. What are the general characteristics of cyclostomes?
9. Name the two living subclasses of Pisces.
10. What are accessory respiratory organs in fishes? Provide an example.
11. Define parental care in fishes.
12. What is the function of the swim bladder in fishes?
13. Name the three orders of living amphibians.
14. Define paedomorphosis with an example.
15. List two differences between poisonous and non-poisonous snakes.
16. Mention the role of the Jacobson's organ in reptiles.
17. Define migration in birds with an example.
18. State the principles of flight in birds.
19. What is echolocation? Provide an example in mammals.
20. List two exoskeletal derivatives of mammals.

3 Marks Questions (15 Questions)

• Understanding and Applying [CO-2, CO-3]

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1. Describe the general characteristics of Phylum Chordata.
2. Classify Protochordata up to classes with examples.
3. Explain metamorphosis in **Ascidia**.
4. Describe the feeding mechanism in **Branchiostoma**.
5. Discuss the general characteristics of cyclostomes.
6. Classify cyclostomes up to order with examples.
7. Explain the role of accessory respiratory organs in fishes.
8. Describe the process of migration in fishes.
9. Discuss parental care in fishes with examples.
10. Explain metamorphosis in amphibians with examples.
11. Describe the poison apparatus and biting mechanism in snakes.
12. Compare the exoskeleton of birds and mammals.
13. Discuss the aerodynamic principles of flight in birds.
14. Explain adaptive radiation in mammals with reference to locomotory appendages.
15. Describe the mechanism of echolocation in microchiropterans.

5 Marks Questions (15 Questions)

• Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]

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1. Analyze the evolutionary significance of chordate features.
2. Compare the general characteristics of Urochordata and Cephalochordata.
3. Evaluate the structural adaptations of the pharynx in **Branchiostoma** for feeding.
4. Discuss the evolutionary significance of metamorphosis in **Ascidia**.
5. Evaluate the significance of accessory respiratory organs in the adaptation of fishes.
6. Discuss the different modes of migration in fishes with examples.
7. Analyze the various parental care strategies in fishes and their adaptive significance.
8. Evaluate the role of metamorphosis and paedomorphosis in the life history of amphibians.
9. Discuss the classification and adaptive significance of the orders of amphibians.
10. Compare the poison apparatus of snakes and the differences between poisonous and non-poisonous snakes.
11. Analyze the role of exoskeleton and feather adaptations in birds for flight and thermoregulation.
12. Evaluate the principles of aerodynamics in bird flight and its evolutionary implications.
13. Discuss the classification and adaptive significance of mammalian locomotory appendages.
14. Analyze the role of echolocation in microchiropterans and its significance in their survival.
15. Propose a diagrammatic representation of the evolutionary relationships among the major classes of chordates.



CORE COURSE 6: Animal Physiology: Controlling and Co-ordinating System

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

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1. Define epithelial tissue and state its functions.
2. Mention two types of connective tissues with examples.
3. What are the main types of muscular tissues?
4. Name the four primary types of tissues in animals.
5. Define ossification.
6. State the difference between compact and spongy bones.
7. Mention the types of cartilages found in mammals.
8. What is resting membrane potential in a neuron?
9. Define action potential.
10. Differentiate between myelinated and non-myelinated nerve fibres.
11. What are the types of synapses?
12. Name the principal hormones secreted by the thyroid gland.
13. Define the menstrual cycle and mention its phases.
14. What is the oestrous cycle?
15. State the role of the pancreas as an endocrine gland.
16. List two functions of the adrenal gland.
17. Define steroidal hormones and give an example.
18. What are the functions of the hypothalamus?
19. Name two placental hormones.
20. Mention the histological layers of the mammalian ovary.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Classify epithelial tissues and describe their locations and functions.
2. Explain the structure and function of connective tissues with examples.
3. Compare the structure of skeletal, smooth, and cardiac muscle tissues.
4. Describe the process of ossification and its significance.
5. Explain the structure and types of cartilages.
6. Describe the propagation of an action potential in myelinated nerve fibres.
7. Explain the mechanism of synaptic transmission.
8. Describe the structure and function of the neuromuscular junction.
9. Discuss the histology of mammalian testis and its role in reproduction.
10. Explain the physiology of the menstrual cycle with its hormonal regulation.
11. Describe the histology and function of the thyroid gland.
12. Compare steroidal and non-steroidal hormones in terms of their mechanism of action.
13. Explain the signal transduction pathway for steroidal hormones.
14. Describe the role of the hypothalamus in neuroendocrine regulation.
15. Explain the functions of placental hormones during pregnancy.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]**



1. Analyze the structural adaptations of epithelial tissues for their specific functions.
2. Discuss the types of connective tissues with examples of their locations and functions.
3. Compare the histological structure and functional characteristics of the three types of muscle tissues.
4. Evaluate the process of ossification and its role in skeletal development.
5. Discuss the functional significance of resting membrane potential and action potential in neuronal signaling.
6. Compare the types of synapses and evaluate their roles in neural transmission.
7. Analyze the molecular and chemical basis of muscle contraction with reference to the sliding filament theory.
8. Evaluate the histology and function of the mammalian ovary and its role in reproduction.
9. Discuss the physiological and hormonal regulation of the oestrous cycle.
10. Evaluate the structure and function of the adrenal gland and its role in stress response.
11. Analyze the mechanisms of action for steroidal and non-steroidal hormones and their physiological effects.
12. Discuss the hypothalamus-pituitary axis and its importance in neuroendocrine control.
13. Evaluate the roles of the thyroid and pancreas in endocrine regulation.
14. Discuss the signal transduction pathways of hormones and their implications for cellular responses.
15. Propose a model that integrates the functions of placental hormones with maternal and fetal physiology during pregnancy.



CORE COURSE 7: Fundamentals of Biochemistry

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. Define monosaccharides and give one example.
2. Name two derivatives of monosaccharides.
3. What are the primary functions of carbohydrates in living organisms?
4. List the three major types of lipids.
5. What is the significance of unsaturated fatty acids in the human diet?
6. Define β -oxidation of fatty acids.
7. What is a triacylglycerol and its function?
8. Name two types of phospholipids and their biological importance.
9. Define glycolysis.
10. State the function of the citric acid cycle in cellular metabolism.
11. What is gluconeogenesis?
12. Define transamination in protein metabolism.
13. What are glucogenic and ketogenic amino acids?
14. List two essential amino acids.
15. What are the structures of purines and pyrimidines?
16. Define nucleotides and their role in nucleic acid structure.
17. Name two co-factors required for enzyme activity.
18. What is Michaelis-Menten kinetics?
19. What is the role of isozymes?
20. Name two inhibitors of the electron transport chain in oxidative phosphorylation.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Describe the structure of a disaccharide with one example.
2. Explain the significance of polysaccharides in living organisms.
3. Discuss the difference between saturated and unsaturated fatty acids.
4. Describe the process of fatty acid biosynthesis.
5. Explain the structure of sphingolipids and their biological importance.
6. Discuss the main steps of glycolysis and its energy yield.
7. Describe the pentose phosphate pathway and its function in the cell.
8. Compare the metabolism of glucogenic and ketogenic amino acids.
9. Discuss the various protein bonds that stabilize the protein structure.
10. Describe the mechanism of enzyme action with an example.
11. Explain how the urea cycle contributes to nitrogen metabolism.
12. Describe the function of the mitochondrial respiratory chain.
13. Compare the structures of nucleosides and nucleotides in nucleic acids.
14. Describe the factors that affect the rate of enzyme-catalyzed reactions.
15. Explain the process of redox reactions in oxidative phosphorylation.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]**

1. Analyze the structure and biological importance of carbohydrates, with examples.
2. Discuss the biosynthesis and breakdown of fatty acids, including the steps in β -oxidation for palmitic acid and linoleic acid.



3. Evaluate the physiological importance of essential and non-essential amino acids.
4. Analyze the metabolic pathways involved in glycolysis and their regulation.
5. Discuss the biochemical significance of the citric acid cycle in cellular metabolism.
6. Explain the molecular and chemical basis of muscle contraction and the role of proteins in this process.
7. Evaluate the role of nucleic acids in cellular functions, discussing the structure and metabolism of nucleotides.
8. Discuss the mechanisms of enzyme inhibition and their biological relevance.
9. Evaluate the factors influencing enzyme specificity and the importance of enzyme cofactors.
10. Analyze the oxidative phosphorylation process, including the role of the mitochondrial respiratory chain.
11. Compare the various modes of enzyme regulation and their effects on metabolic pathways.
12. Discuss the role of the electron transport system and its inhibitors in cellular respiration.
13. Evaluate the mechanisms of signal transduction pathways for steroidal and non-steroidal hormones.
14. Analyze the catabolism of purines and pyrimidines, with a focus on adenosine and guanosine.
15. Propose an integrated model of carbohydrate, lipid, and protein metabolism, explaining their interconnections and regulation.



Skill Enhancement courses-A (SEC-A)-Apiculture

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. Define apiculture and explain its significance.
2. Name two species of Apis bees and one non-Apis bee species.
3. What is the classification of honey bees?
4. List the general morphological features of Apis honey bees.
5. Define the term "bee colony" and its components.
6. Name two types of beehives used in modern beekeeping.
7. What is bee pasturage?
8. What factors should be considered when selecting a bee species for apiculture?
9. List two modern beekeeping equipment used in apiary management.
10. Define artificial beekeeping and its significance.
11. Name one method of extracting honey using modern techniques.
12. Mention one indigenous method of honey extraction.
13. Name two common bee diseases.
14. What is the role of beeswax in apiculture?
15. Define propolis and its use in beekeeping.
16. Mention one product of apiculture other than honey and beeswax.
17. What is the role of pollen in the beekeeping industry?
18. Name one enemy of bees that affects the hive.
19. What is cross-pollination in horticultural gardens?
20. List one modern method of artificial beehive usage in cross-pollination.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Compare Apis and Non-Apis bee species in terms of their characteristics and uses.
2. Explain the social organization within a bee colony and the roles of different bees.
3. Discuss the importance of bee pasturage and factors influencing the selection of bee foraging sites.
4. Describe the general morphology of Apis honey bees with reference to their body parts.
5. Explain the significance of selecting a proper bee species for successful apiculture.
6. Discuss the process of artificial bee rearing in an apiary.
7. Describe the structure and functioning of Newton and Langstroth beehives.
8. Explain the methods of honey extraction and the advantages of modern techniques over traditional ones.
9. Discuss the preventive measures to control bee diseases and pests.
10. Describe two major diseases that affect bees and their impact on honey production.
11. Discuss the importance of beeswax and its applications in the industry.
12. Explain the economic importance of honey in apiculture.
13. Discuss the various products obtained from bees and their uses.



14. Describe modern beekeeping equipment and their role in efficient honey production.
15. Explain the concept of entrepreneurship in apiculture and its relevance to the modern economy.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]**

1. Analyze the classification of honey bee species and compare the morphology and behavior of Apis and Non-Apis species.
2. Evaluate the social organization of a bee colony, highlighting the functions of the queen, worker, and drone.
3. Discuss the selection criteria for choosing bee species for apiculture and the challenges involved.
4. Analyze the impact of bee diseases and pests on the beekeeping industry and propose preventive measures.
5. Discuss the design and structure of modern beehives (e.g., Newton and Langstroth) and their advantages for honey production.
6. Evaluate the methods of honey extraction (indigenous and modern) and suggest ways to improve efficiency in traditional practices.
7. Analyze the benefits and drawbacks of artificial beekeeping and rearing in controlled environments.
8. Evaluate the importance of bee pasturage in determining the success of an apiary and the production of quality honey.
9. Analyze the economic impact of apiculture on the local and global economy, focusing on honey, beeswax, and other bee products.
10. Discuss the use of bees in cross-pollination and the modern methods employed to enhance horticultural productivity through artificial beehives.
11. Evaluate the role of apiculture in supporting biodiversity and the environment through pollination.
12. Discuss the potential for entrepreneurship in the beekeeping industry, considering market demand, sustainable practices, and new innovations.
13. Analyze the physiological and behavioral adaptations of honey bees that make them suitable for apiculture.
14. Evaluate the effectiveness of current disease control methods in beekeeping and suggest improvements.
15. Propose a detailed plan for setting up a commercial apiary, including selection of species, equipment, management practices, and marketing strategies.



CORE COURSE-8: Comparative Anatomy of Vertebrates

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. What are the primary functions of the integumentary system in vertebrates?
2. Name two derivatives of the integument in amphibians.
3. What is the structure of the digestive system in amphibians?
4. Name two types of dentition in mammals.
5. Describe the basic structure of gills in fish.
6. What is the function of the swim bladder in fish?
7. Name two respiratory organs in birds.
8. What is the main function of lungs in mammals?
9. Define double circulation and give an example of animals with it.
10. What is the structure of the heart in birds?
11. List the primary components of the excretory system in mammals.
12. Name the two types of kidneys in vertebrates.
13. What is the basic function of cranial nerves?
14. List the five sensory receptors in vertebrates.
15. What is the difference between axial and appendicular skeletons?
16. What is the structure of the appendicular skeleton in pigeons?
17. Define jaw suspension in mammals.
18. What is the primary role of the olfactory receptor?
19. What is the role of the auditory receptor in vertebrates?
20. Name the three aortic arches found in vertebrates.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Compare the structure and function of the integument in amphibians and birds.
2. Discuss the structure and function of the stomach in mammals, including any special adaptations.
3. Compare the respiratory organs in fish and mammals.
4. Describe the comparative anatomy of the circulatory system in fish and birds.
5. Explain the role of kidneys in different vertebrate groups.
6. Compare the evolution of the urinary system in amphibians and reptiles.
7. Explain how the nervous system and sense organs are adapted for survival in different vertebrates.
8. Compare the cranial nerves in amphibians and birds.
9. Describe the function of the olfactory system in mammals and birds.
10. Compare the structure of the digestive system in amphibians and reptiles.
11. Explain the structure of the heart in mammals and its significance for circulation.
12. Describe the basic functions of the respiratory system in birds and mammals.
13. Compare the structure of the appendicular skeleton in mammals and birds.
14. Describe the process of jaw suspension in mammals and its importance.
15. Compare the structure and function of the excretory system in amphibians and mammals.

5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]**

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1. Analyze the structure, function, and evolutionary significance of the integumentary system in amphibians, birds, and mammals.
2. Evaluate the comparative anatomy of the stomach in various vertebrate groups, focusing on adaptations for diet and digestion.
3. Analyze the respiratory system of fish, birds, and mammals, highlighting their adaptive features for oxygen uptake.
4. Discuss the comparative anatomy of the circulatory system in vertebrates, including the heart and aortic arches.
5. Compare the structure and evolution of kidneys in different vertebrate groups, focusing on adaptations for excretion.
6. Analyze the evolution of the urinary and genital systems in vertebrates, emphasizing the development of the urino-genital ducts.
7. Discuss the role of the nervous system and sense organs in vertebrate survival, comparing different systems across vertebrate groups.
8. Evaluate the structure and function of cranial nerves in vertebrates, highlighting their role in sensory and motor control.
9. Compare the structure and functions of olfactory and auditory receptors in vertebrates, including their evolutionary adaptations.
10. Analyze the structure of the axial and appendicular skeletons, discussing their function in locomotion and support in different vertebrates.
11. Discuss the significance of jaw suspension in mammals and its evolution in relation to feeding habits.
12. Compare the circulatory systems in fish, amphibians, and mammals, evaluating their efficiency in oxygen transport.
13. Analyze the role of sensory receptors in vertebrates, focusing on the adaptation of the auditory and olfactory systems for environmental survival.
14. Discuss the evolutionary adaptations of the nervous system in vertebrates, comparing brain structures across different species.
15. Create a comparative model of the skeletal system in birds and mammals, analyzing the adaptations of the appendicular skeleton for flight and terrestrial locomotion.



CORE COURSE 9: Animal Physiology: Life Sustaining Systems

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. What is the primary function of the gastrointestinal tract?
2. Define mechanical digestion.
3. What is the role of bile in lipid digestion?
4. Name the primary site of carbohydrate absorption in humans.
5. What is the function of lipase in digestion?
6. Define tidal volume in relation to respiratory volumes.
7. What are the two main respiratory pigments in humans?
8. What is the effect of carbon monoxide poisoning on hemoglobin?
9. Name the factors that influence the oxygen dissociation curve.
10. What is the structure of hemoglobin?
11. Define hemostasis.
12. What is the function of platelets in blood clotting?
13. What is hematopoiesis?
14. Name the components of the ABO blood group system.
15. Define cardiac output.
16. What is the role of the sinoatrial node in the heart?
17. What is the role of the pulmonary circuit in the circulatory system?
18. Name the organ involved in thermoregulation in humans.
19. What is the function of the kidney in osmoregulation?
20. Define glomerular filtration rate (GFR).

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Explain the mechanical digestion that occurs in the mouth.
2. Discuss the chemical digestion of carbohydrates in the human gastrointestinal tract.
3. How are proteins absorbed in the small intestine?
4. Describe the process of respiration, including the role of the diaphragm.
5. Explain the transport mechanisms of oxygen in the blood.
6. Describe the dissociation curve of oxygen and the factors that influence it.
7. Explain the blood clotting process and its importance.
8. Discuss the regulation of blood groups and the importance of the Rh factor.
9. Describe the conduction system of the heart and how it generates the heartbeat.
10. Explain the mechanism of urine formation in the kidneys.
11. Describe how cardiac output is regulated.
12. Compare the process of thermoregulation in camels and polar bears.
13. Explain the role of the kidneys in regulating the acid-base balance.
14. Discuss the mechanism of oxygen transport in blood.
15. Describe the basic components and function of the respiratory system in humans.



5 Marks Questions (15 Questions)

• **Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]**

1. Analyze the structural organization of the human gastrointestinal tract and its role in digestion.
2. Evaluate the role of enzymes in chemical digestion, specifically lipase and amylase.
3. Compare the absorption processes of carbohydrates, lipids, and proteins in the human digestive system.
4. Analyze the factors that affect the oxygen dissociation curve and how this influences oxygen delivery to tissues.
5. Discuss the role of hemoglobin in the transport of oxygen and carbon dioxide in the blood.
6. Analyze the blood clotting mechanism and its regulation in human physiology.
7. Evaluate the significance of blood groups and Rh factors in transfusion medicine.
8. Discuss the functioning of the coronary circulation in providing oxygen to the heart muscle.
9. Explain the cardiac cycle, including the phases and how it relates to cardiac output.
10. Analyze how the body regulates heat in extreme conditions, comparing human thermoregulation with that in other mammals.
11. Evaluate the mechanisms of osmoregulation in aquatic vertebrates compared to terrestrial vertebrates.
12. Discuss the renal physiology involved in the formation of urine and its role in maintaining homeostasis.
13. Compare the mechanisms of acid-base balance regulation by the kidneys and lungs.
14. Analyze the role of conducting myocardial fibers in the electrical activity of the heart.
15. Create a diagram and explain the steps involved in the mechanism of respiration, including the transport of gases in the blood.



CORE COURSE 10: Immunology

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. What is the concept of health and disease in immunology?
2. Name the main cells involved in the immune system.
3. What are the organs involved in the immune system?
4. Define innate immunity.
5. What are anatomical barriers in innate immunity?
6. What is adaptive immunity?
7. Name the two types of adaptive immunity.
8. What is the difference between cell-mediated and humoral immunity?
9. Define antigenicity.
10. What is the role of haptens in immunology?
11. Name the types of immunoglobulins in humans.
12. Define antigen-antibody interaction.
13. What is the principle of an immunoassay?
14. What is monoclonal antibody production?
15. Define the Major Histocompatibility Complex (MHC).
16. What is the role of T-cell receptors?
17. Define cytokines in the immune system.
18. What is the complement system?
19. Name the different pathways of complement activation.
20. Define hypersensitivity.

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Describe the anatomical barriers involved in innate immunity.
2. Explain the role of inflammation in the innate immune response.
3. Describe the cell types involved in cell-mediated immunity.
4. Explain the structure and function of B-cell epitopes.
5. Describe the structure and functions of immunoglobulins.
6. Explain antigen-antibody interactions in the immune response.
7. Describe the process of antigen processing and presentation.
8. Explain the structure and function of MHC Class I and Class II molecules.
9. Describe the process of T-cell development and selection.
10. Discuss the functions of various types of cytokines in immune responses.
11. Describe the steps involved in complement activation.
12. Discuss the different types of hypersensitivities as per Gell and Coombs' classification.
13. Compare and contrast active and passive immunization.
14. Describe the different types of vaccines.
15. Explain the process of monoclonal antibody production and its applications.



5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]**
 1. Analyze the concept of health and disease and its relevance to immunology.
 2. Compare and contrast innate immunity with adaptive immunity.
 3. Evaluate the factors influencing immunogenicity.
 4. Analyze the differences between antigenicity and immunogenicity with examples.
 5. Compare the structure and function of the different classes of immunoglobulins (IgG, IgM, IgA, IgE, IgD).
 6. Discuss the antigen-antibody interactions in detail, with examples.
 7. Evaluate the role of cytokines in immune system regulation and response.
 8. Discuss the complement system and its role in immune defense mechanisms.
 9. Analyze the different types of hypersensitivity reactions and their implications in health.
 10. Evaluate the importance of the Major Histocompatibility Complex (MHC) in immune function.
 11. Compare the structures of T-cell receptors and their role in antigen recognition.
 12. Evaluate the role of immunoassays (ELISA and RIA) in diagnosing immune system diseases.
 13. Analyze the structure and functions of the different cytokine families in immune response.
 14. Discuss the process of T-cell development, including selection and maturation.
 15. Evaluate the role of vaccines in modern immunology and compare the different types.



Skill Enhancement courses (SEC-B)-Aquarium Fish Keeping

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. Define the scope of the aquarium fish industry as a cottage industry.
2. What is the difference between exotic and endemic species of aquarium fishes?
3. Name two species of freshwater aquarium fishes.
4. Name two species of marine aquarium fishes.
5. What is sexual dimorphism in aquarium fishes?
6. What are the common characteristics of the guppy fish?
7. What are the common characteristics of the swordtail fish?
8. Name one freshwater fish used in aquariums.
9. What is the primary food source for aquarium fishes?
10. Define formulated fish feeds.
11. What is the role of live fish feed organisms in feeding aquarium fishes?
12. What are larval predators in aquarium fish culture?
13. What is the role of a fish handling system in transportation?
14. What are the basic packing techniques for live fish transportation?
15. What is the purpose of forwarding techniques in live fish transport?
16. What are some common tools used for maintaining aquariums?
17. What are the essential elements for setting up an aquarium?
18. Define the process of setting up an aquarium fish farm.
19. What are the main types of aquarium fish feed?
20. What is the role of fish farming as a cottage industry?

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Explain the potential scope of the aquarium fish industry as a cottage industry.
2. Describe the characteristics and sexual dimorphism in the guppy.
3. Explain the features of the swordtail and its role in aquarium fish culture.
4. Compare and contrast the characteristics of freshwater and marine aquarium fishes.
5. Describe the common food sources for aquarium fishes.
6. Explain the process of formulating fish feeds for aquarium fishes.
7. Describe the role of live fish feed organisms in maintaining healthy aquarium fishes.
8. Explain the concept of larval predators in the context of aquarium fishes.
9. Describe the techniques involved in the transportation of live aquarium fishes.
10. Discuss the importance of handling, packing, and forwarding techniques in live fish transport.
11. Describe the general maintenance required for a freshwater aquarium.
12. Explain the importance of a proper budget in setting up an aquarium fish farm.
13. Discuss the benefits of exotic species in aquarium fish farming.
14. Explain the role of aquatic plants in the maintenance of an aquarium.
15. Describe how to maintain water quality in an aquarium.



5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5, CO-6]**

1. Analyze the potential of the aquarium fish industry in the context of the cottage industry.
2. Compare and contrast the biological characteristics of freshwater aquarium fishes like Guppy, Molly, and Goldfish with marine fishes like Angel Fish, Blue Morph, and Anemone Fish.
3. Evaluate the role of sexual dimorphism in identifying different species of aquarium fishes.
4. Discuss the importance of feeding in aquarium fish keeping and the role of live fish feed organisms in maintaining healthy fish populations.
5. Evaluate the effectiveness of formulated fish feeds in the aquarium industry.
6. Analyze the challenges involved in transporting live aquarium fishes and discuss the best practices for fish handling.
7. Compare different types of fish packing and forwarding techniques for live fish transport.
8. Evaluate the process and importance of setting up a proper aquarium fish farm, considering the budget, equipment, and management strategies.
9. Discuss the environmental and economic impacts of maintaining an aquarium fish farm.
10. Analyze the benefits and drawbacks of rearing exotic versus endemic species of aquarium fishes.
11. Discuss the importance of water parameters such as pH, temperature, and salinity in aquarium fish maintenance.
12. Analyze the role of aquarium fish as larval predators and their effect on the tank ecosystem.
13. Evaluate the role of modern aquarium equipment in enhancing the health and breeding of aquarium fishes.
14. Discuss the process and challenges involved in breeding popular aquarium fishes like guppies and swordtails.
15. Propose a business plan for setting up an aquarium fish farm as a cottage industry, including budget, equipment, and strategies for sustainable practices.



CORE COURSE 11. Ecology

- **Remembering [CO-1]**

1. Define autecology.
2. Define synecology.
3. What are the levels of organization in ecology?
4. State the laws of limiting factors in ecology.
5. What is the biosphere?
6. Differentiate between unitary and modular populations.
7. Define fecundity tables.
8. What are survivorship curves?
9. What is meant by dispersal in population ecology?
10. Define exponential growth in populations.
11. What is the Lotka-Volterra equation for competition?
12. What is the concept of r and K strategies?
13. Define ecological succession.
14. What is a detritus food chain?
15. Define ecological pyramid.
16. What is the nitrogen cycle?
17. What are megadiversity countries?
18. Define flagship species.
19. What is the Red Data Book?
20. What is a protected area in wildlife conservation?

3 Marks Questions (15 Questions)

- **Understanding and Applying [CO-2, CO-3]**

1. Explain the difference between autecology and synecology.
2. Describe the different levels of organization in an ecosystem.
3. Discuss the significance of the laws of limiting factors in population dynamics.
4. Explain how physical factors influence an ecosystem.
5. Describe the different patterns of population growth: geometric, exponential, and logistic.
6. Explain the concept of density-dependent and density-independent population regulation.
7. What are the characteristics of a population and how are they studied using life tables?
8. Describe Gause's Principle and provide one laboratory example.
9. Discuss the significance of species diversity, abundance, and richness in a community.
10. Explain the concepts of vertical stratification and the edge effect in a community.
11. Discuss the role of energy flow and ecological pyramids in ecosystems.
12. Describe the difference between in situ and ex situ conservation.
13. Explain the advantages and problems associated with wildlife corridors.
14. What are the ecological roles of keystone species?
15. Discuss the concept of food webs in ecosystems.



5 Marks Questions (15 Questions)

- **Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]**
- 1. Analyze the factors that limit population growth according to the laws of limiting factors.
- 2. Compare and contrast unitary and modular populations with examples.
- 3. Explain the Lotka-Volterra competition equation with a real-world example.
- 4. Evaluate the impact of different ecological succession types on biodiversity.
- 5. Analyze the nitrogen cycle and its importance to ecosystems.
- 6. Discuss the importance of the biosphere and its role in supporting life on Earth.
- 7. Analyze the significance of r and K strategies in population regulation with examples.
- 8. Evaluate the ecological consequences of human-induced changes in species diversity and abundance.
- 9. Discuss how food chains and food webs contribute to the functioning of ecosystems.
- 10. Evaluate the role of biodiversity hotspots in global conservation efforts.
- 11. Propose a strategy for the conservation of endangered species, using the example of the Olive Ridley turtle.
- 12. Discuss the threats to the survival of the Tiger and suggest conservation strategies.
- 13. Analyze the role of keystone species in maintaining ecological balance.
- 14. Discuss the concept of ecological efficiency and its relevance to food webs.
- 15. Evaluate the effectiveness of protected areas in conserving wildlife, using examples from the Indian Wildlife Act.



CORE COURSE 12. Principle of Genetics

2 Marks Questions (20 Questions)

- **Remembering [CO-1]**

1. Define incomplete dominance.
2. What is co-dominance?
3. Define epistasis.
4. What are multiple alleles?
5. Explain isoalleles with an example.
6. What is a pseudoallele?
7. Define lethal alleles.
8. What is pleiotropy?
9. Define penetrance and expressivity.
10. What is crossing over?
11. Explain linkage in genetics.
12. What is complete linkage?
13. Define recombination frequency.
14. What is a linkage map?
15. What is sex linkage?
16. Explain non-disjunction in *Drosophila*.
17. What are the types of gene mutations?
18. Define chromosomal aberrations with an example.
19. What is dosage compensation in *Drosophila*?
20. What is transposable genetic element?

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the principles of inheritance in Mendelian genetics.
2. Describe the concept of incomplete dominance with an example.
3. Explain co-dominance and provide a genetic example.
4. Describe the concept of epistasis with an example.
5. Explain the process of measuring recombination frequency.
6. What is interference in linkage and crossing over?
7. Discuss the concept of multiple alleles with reference to human blood groups.
8. Explain pleiotropy with an example from human genetics.
9. What is the significance of the Cis-trans test for allelism?
10. Discuss the causes and consequences of lethal alleles.
11. Describe the process of linkage map construction using three-factor crosses.
12. Explain the concept of sex linkage with an example from *Drosophila*.
13. Describe the molecular basis of mutations caused by UV light.
14. Explain the mechanisms of sex determination in *Drosophila*.
15. Describe the complement test in bacteriophages with an example.



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Analyze the significance of incomplete dominance and co-dominance in genetic inheritance.
2. Discuss the phenomenon of epistasis in relation to gene interaction, providing suitable examples.
3. Analyze the impact of mutations in the genetic material, focusing on types of gene mutations and their effects.
4. Discuss the molecular basis of chemical mutagens and their effect on the DNA structure.
5. Evaluate the effects of non-disjunction in human chromosomes with specific reference to Chromosome 21.
6. Evaluate the significance of linkage maps and their application in genetic research.
7. Discuss the process of crossing over and its role in genetic recombination.
8. Compare and contrast the mechanisms of sex determination in *Drosophila* and humans.
9. Analyze the effects of transposable genetic elements on the genome, with specific examples from bacteria and *Drosophila*.
10. Evaluate the role of dosage compensation in ensuring balanced gene expression in males and females.
11. Discuss the concept of genetic fine structure and explain Benzer's experiment on the *rII* locus in bacteriophages.
12. Discuss the role of IS elements in bacteria and their implications in genetic variation.
13. Explain the phenomenon of extra-chromosomal inheritance with examples from *Paramecium* and snails.
14. Analyze the role of mutagens in inducing genetic mutations, focusing on the molecular changes caused by UV light and chemicals.
15. Discuss the potential applications of mutation detection methods in organisms like *Drosophila* and *Neurospora*.



Discipline Specific Elective (DSE-A2): Biology of Insects

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. What is the basis of insect classification?
2. Name the key features used in the classification of insects.
3. Define the term "insect order" with an example.
4. What are the external features of insects?
5. Name two types of insect antennae.
6. Define "mouthparts" and give an example of how they adapt to feeding habits.
7. What is the function of insect wings?
8. List two types of insect legs adapted to specific habitats.
9. What are abdominal appendages?
10. Define insect genitalia.
11. What are photoreceptors?
12. What is metamorphosis?
13. Name the types of insect metamorphosis.
14. Define trophallaxis.
15. Name two examples of social insects.
16. What are allelochemicals?
17. Name two major insect pests in paddy.
18. Define a "mechanical vector" with an example.
19. Define a "biological vector" with an example.
20. Name two diseases transmitted by mosquitoes.

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the importance of insect classification and its significance.
2. Describe the general morphology of the insect head.
3. Differentiate between compound eyes and simple eyes in insects.
4. Explain how insect antennae are adapted for their environment.
5. Describe the structure and function of insect wings.
6. Explain the role of insect thorax in movement.
7. Discuss the function of photoreceptors in insects.
8. Describe the role of neuroendocrine control in insect metamorphosis.
9. What is the significance of trophallaxis in social insects?
10. Explain the theory of co-evolution between insects and plants.
11. How do allelochemicals mediate host-plant selection by insects?
12. Describe the mechanism of host-plant selection by phytophagous insects.
13. Explain the difference between mechanical and biological insect vectors.
14. Discuss the role of houseflies as vectors of disease.
15. Explain the role of mosquitoes in transmitting diseases, with an example.



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Discuss the classification of insects up to orders, highlighting key characteristics of each order.
2. Analyze the adaptations of insect mouthparts to diverse feeding habits with examples.
3. Evaluate the relationship between insect thorax structure and locomotion.
4. Discuss the structure and function of the insect nervous system, focusing on its role in sensory processing.
5. Explain the types of metamorphosis in insects and the neuroendocrine control involved.
6. Analyze the structure and function of photoreceptors and their role in insect behavior.
7. Discuss the social structure of termite colonies and their role in ecosystems.
8. Evaluate the process and ecological significance of trophallaxis in social insects.
9. Explain the role of allelochemicals in shaping insect-plant interactions with examples.
10. Analyze the impact of major insect pests on paddy crops and suggest management strategies.
11. Compare and contrast the roles of houseflies and mosquitoes as disease vectors.
12. Evaluate the co-evolution of insects and plants, focusing on mutual benefits and dependencies.
13. Discuss how insect vectors influence the spread of human diseases and their global impact.
14. Explain the physiological mechanisms of insect respiration and their adaptations to various environments.
15. Propose a management plan to control insect pests in agriculture, considering ecological principles.



DSE-B1-Endocrinology

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. Define the endocrine system.
2. What are neurohormones? Give one example.
3. Name the types of hormone transport in the body.
4. What are the key characteristics of hormones?
5. Define the Hypothalamo-Hypophyseal axis.
6. What is the Hypothalamo-Hypophyseal portal system?
7. List two hormones secreted by the hypothalamus.
8. Name the two main parts of the pituitary gland.
9. What are the hormones produced by the adrenal cortex?
10. Name the hormones secreted by the pancreas.
11. Define diabetes mellitus.
12. What is Graves' disease?
13. Define cAMP and its role in hormone signaling.
14. What is the function of IP3 in hormone action?
15. Define homeostasis.
16. What is the role of prolactin in fishes?
17. Name one function of melanotropin in amphibians.
18. What is the estrous cycle?
19. Define RIA (Radioimmunoassay).
20. What does ELISA stand for?

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the classification of hormones with examples.
2. Describe the feedback mechanism in the regulation of endocrine glands.
3. Explain the structure and function of the hypothalamus.
4. Differentiate between type I and type II diabetes mellitus.
5. What is the role of hypothalamic nuclei in neuroendocrine regulation?
6. Discuss the hormones and functions of the thyroid gland.
7. Explain the significance of calcium homeostasis in mammals.
8. Describe the role of glucagon in glucose homeostasis.
9. Discuss the mechanism of action of steroidal hormones.
10. Explain the function of prolactin in birds.
11. Discuss the effects of melanotropin in teleost fishes.
12. Explain the phases of the estrous cycle in rats.
13. Discuss the hormonal regulation of the menstrual cycle in humans.
14. Describe the role of ELISA in hormone bioassays.
15. What is the importance of the Hypothalamo-Hypophyseal-Gonadal Axis?



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Discuss the structure and functions of the Hypothalamo-Hypophyseal axis in detail.
2. Analyze the role of hypothalamic nuclei in the regulation of the endocrine system.
3. Evaluate the structure and function of the pituitary gland and its hormonal secretions.
4. Compare and contrast the functions of steroidal and non-steroidal hormones with examples.
5. Explain the molecular mechanisms of hormone action via the cAMP and IP3-DAG pathways.
6. Discuss the structure, hormones, and disorders of the adrenal gland.
7. Analyze the role of thyroid and parathyroid hormones in metabolism and calcium regulation.
8. Evaluate the impact of diabetes mellitus on human physiology and its hormonal basis.
9. Explain the menstrual cycle in humans with emphasis on hormonal regulation.
10. Analyze the role of calcium homeostasis in maintaining mammalian physiology.
11. Discuss the functions of prolactin across fishes, amphibians, and birds, highlighting evolutionary significance.
12. Explain the effects of melanotropin on skin pigmentation in amphibians and its physiological importance.
13. Create a detailed account of the estrous cycle phases and hormonal changes in rats.
14. Evaluate the methods and applications of RIA and ELISA in hormone bioassays.
15. Design a comparative overview of endocrine regulation in mammals and non-mammalian vertebrates.



CORE COURSE 13. Developmental Biology

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. Define gametogenesis.
2. What is the difference between spermatogenesis and oogenesis?
3. Name two types of eggs based on yolk distribution.
4. What are egg membranes? Name any two.
5. Define fertilization and its importance.
6. What is a cleavage plane?
7. Mention the type of cleavage seen in frogs and chicks.
8. Define blastula and name the type found in frogs.
9. What is a fate map?
10. Name one method used for fate mapping.
11. Define gastrulation.
12. What are embryonic organizers?
13. What was Spemann and Mangold's experiment about?
14. List the extra-embryonic membranes found in chick embryos.
15. Define implantation.
16. What are the main functions of the placenta?
17. What is molecular induction?
18. Define in vitro fertilization (IVF).
19. What is stem cell potency?
20. Name two applications of stem cell therapy.

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the process of spermatogenesis.
2. Describe the process of oogenesis in mammals.
3. Compare fertilization in sea urchins and mammals.
4. Discuss the patterns of cleavage and their significance.
5. Explain the fate mapping technique using vital dyes.
6. Describe the process of gastrulation in frogs.
7. Discuss the role of embryonic organizers in development.
8. Explain the extra-embryonic membranes and their functions in chick embryos.
9. Describe the process of implantation in humans.
10. Explain the structural types of placenta with examples.
11. Discuss the development of the brain in chick embryos.
12. Describe molecular induction in eye development.
13. Explain the concept of stem cells with examples of markers.
14. Discuss the role of stem cell therapy in cartilage regeneration.
15. What are the ethical implications of IVF and stem cell research?



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Compare and contrast spermatogenesis and oogenesis with reference to sea urchins and mammals.
2. Analyze the role of egg membranes in fertilization and early development.
3. Evaluate the differences in cleavage and blastula formation between frogs and chicks.
4. Explain the process of fate mapping in chick embryos using radioactive techniques.
5. Discuss the stages of gastrulation in chick embryos and their significance.
6. Analyze Spemann and Mangold's experiment on embryonic induction and its implications.
7. Describe the structure and functions of extra-embryonic membranes in chick development.
8. Discuss the process and importance of implantation in human embryonic development.
9. Evaluate the types and functions of the placenta in mammals with examples.
10. Explain the development of the eye in chick embryos, focusing on molecular induction.
11. Analyze the significance of in vitro fertilization in overcoming infertility.
12. Discuss the concept of stem cell potency and its types, with relevant applications.
13. Evaluate the role of stem cells in bone marrow transplantation.
14. Describe the molecular mechanisms of brain development in chick embryos.
15. Create a detailed account of the applications of developmental biology in regenerative medicine.



CORE COURSE 14. Evolutionary Biology

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. Define the chemical basis of the origin of life.
2. What is the RNA world hypothesis?
3. State Lamarck's theory of evolution.
4. Mention two key differences between Darwinism and Neo-Darwinism.
5. What is the significance of the geological time scale?
6. Name the methods used to determine the age of fossils.
7. Define natural selection.
8. List the modes of natural selection.
9. What is the biological species concept?
10. Define isolating mechanisms in speciation.
11. What is adaptive radiation? Provide one example.
12. Mention two unique characteristics of hominids compared to primates.
13. State the Hardy-Weinberg equilibrium principle.
14. What is genetic drift?
15. Define allele frequency.
16. List two examples of background extinction.
17. Name two mass extinction events.
18. What is convergent evolution? Give one example.
19. Define phylogenetic tree.
20. What is parsimony in phylogenetic tree construction?

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the RNA world hypothesis with its significance in evolution.
2. Compare Darwinism and Lamarckism with examples.
3. Discuss Neo-Darwinism and its key principles.
4. Describe the role of fossils in understanding evolutionary history.
5. Explain the modes of natural selection with examples.
6. Discuss the importance of isolating mechanisms in speciation.
7. Describe the concept of adaptive radiation using the Galapagos finches.
8. Compare the skeletal features of hominids and primates.
9. Explain the derivation of Hardy-Weinberg law with its assumptions.
10. Discuss how genetic drift and migration disrupt Hardy-Weinberg equilibrium.
11. Explain the K-T extinction event with its causes and consequences.
12. Describe the process of phylogenetic tree construction.
13. Differentiate between convergent and divergent evolution with examples.
14. Explain speciation through chromosomal rearrangements in *Drosophila*.
15. Discuss the evolution of the horse with fossil evidence.



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Analyze the chemical basis for the origin of life and its relevance to modern biochemistry.
2. Evaluate the RNA world hypothesis and its implications for the origin of genetic material.
3. Compare and contrast Lamarckism, Darwinism, and Neo-Darwinism.
4. Analyze the geological time scale and its significance in evolutionary studies.
5. Explain the methods of fossil age determination with examples of carbon dating.
6. Discuss in detail the modes of natural selection and their evolutionary impact with examples.
7. Analyze the role of adaptive radiation in macroevolution using the Galapagos finches.
8. Describe the unique evolutionary traits of hominids and their significance in human evolution.
9. Evaluate the factors disrupting Hardy-Weinberg equilibrium and their influence on population genetics.
10. Solve problems related to estimation of allele and gene frequencies in populations.
11. Discuss the causes and impacts of mass extinctions with a focus on the K-T extinction.
12. Construct and interpret a phylogenetic tree using parsimony.
13. Compare convergent and divergent evolution with reference to specific evolutionary pathways.
14. Discuss the significance of chromosome rearrangements in speciation with examples from *Drosophila*.
15. Analyze the evolutionary trends observed in the fossil record of horse evolution.



Discipline Specific Elective (DSE-A3)- Animal Biotechnology

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. What is the basic organization of the E. coli genome?
2. Define recombinant DNA technology.
3. What are restriction endonucleases? Name one example.
4. Mention two features of plasmid vectors.
5. What is the role of cosmids in cloning?
6. Define a shuttle vector and provide one example.
7. What is the difference between genomic libraries and cDNA libraries?
8. Name two techniques for bacterial transformation.
9. What is the principle of agarose gel electrophoresis?
10. Define Southern blotting.
11. Mention the role of polymerase chain reaction (PCR) in genetic studies.
12. What is RAPD-PCR?
13. Define DNA fingerprinting.
14. What are transgenic animals? Provide one example.
15. What is nuclear transplantation?
16. Name two applications of transgenic animals.
17. What is animal cell culture?
18. Define gene therapy.
19. What is the molecular basis of sickle cell anemia?
20. What is Dolly cloning?

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Describe the organization of the Drosophila genome.
2. Explain the role of restriction endonucleases in recombinant DNA technology.
3. Discuss the features and significance of BAC and YAC cloning vectors.
4. Compare plasmid vectors and phage vectors with respect to their use in cloning.
5. Describe the steps involved in the construction of a cDNA library.
6. Explain the principle and application of Polyacrylamide Gel Electrophoresis (PAGE).
7. Discuss the differences between Southern, Northern, and Western blotting.
8. Explain the principle and applications of RT-PCR.
9. What are the main steps involved in creating a genetically modified organism using the micro-injection technique?
10. Describe the process of producing knock-out mice and its significance.
11. Explain the molecular diagnosis of cystic fibrosis using DNA techniques.
12. Discuss the applications of transgenic animals in pharmaceutical production.
13. What is the significance of genetically modified economically important animals?
14. Explain the concept and steps of gene therapy in humans.
15. Discuss the applications of DNA fingerprinting in forensic sciences.



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Analyze the structural differences between *E. coli* and *Drosophila* genomes and their implications in genetic studies.
2. Evaluate the advantages and limitations of recombinant DNA technology.
3. Compare and contrast the features of shuttle and expression vectors with examples.
4. Discuss the stepwise process of constructing a genomic library and its applications.
5. Analyze the role of PCR in allele-specific detection and its significance in genetic engineering.
6. Explain the process of creating transgenic animals through the retroviral method and its ethical implications.
7. Evaluate the use of nuclear transplantation in cloning animals and discuss Dolly as a case study.
8. Analyze the role of molecular techniques in diagnosing genetic diseases like thalassemia.
9. Describe the principle, process, and applications of Southern blotting.
10. Compare the utility of BAC, YAC, and HAC vectors in large-scale genome projects.
11. Discuss the role of genetically modified animals in organ transplantation.
12. Analyze the applications and limitations of gene therapy in treating genetic disorders.
13. Explain the process of producing transgenic animals for pharmaceutical purposes and its economic impact.
14. Construct a workflow to diagnose sickle cell anaemia using molecular diagnostic tools.
15. Discuss the future prospects and challenges of genetic engineering in producing GMOs and therapeutic interventions.



DSE-B3- Animal Behaviour and Chronobiology

2 Marks Questions (20 Questions)

Remembering [CO-1]

1. Define stereotyped behavior with an example.
2. What is a Fixed Action Pattern (FAP)?
3. Differentiate between instinct and learned behavior.
4. What is associative learning?
5. Define classical conditioning with an example.
6. Explain the term "habituation" in animal behavior.
7. What is imprinting in animals? Provide an example.
8. Describe social organization in termites briefly.
9. What is the role of pheromones in bee communication?
10. What is altruism in animal behavior?
11. Define Hamilton's Rule.
12. Mention one example of cooperation in animals.
13. What is sexual dimorphism? Provide one example.
14. Describe mate choice in peacocks.
15. What is parental care in fishes? Name one fish species exhibiting this behavior.
16. What is parent-offspring conflict?
17. Define circadian rhythm.
18. What is the role of melatonin in biological rhythms?
19. What are zeitgebers? Provide one example.
20. What is the adaptive significance of a biological clock?

3 Marks Questions (15 Questions)

Understanding and Applying [CO-2, CO-3]

1. Explain the difference between reflex actions and orientation behaviors.
2. Describe operant conditioning with an example.
3. What is the significance of FAP in animal behavior?
4. Explain the communication methods in bees, focusing on dance communication.
5. Discuss the concept of haplodiploidy in the evolution of altruism.
6. Explain the role of male rivalry in intra-sexual selection with an example.
7. Discuss the role of relatedness in kinship theory with an example.
8. Explain the concept of sibling rivalry with one example from the animal kingdom.
9. What are the characteristics of tidal rhythms?
10. Differentiate between short-term and long-term biological rhythms.
11. Explain circannual rhythms with an example of bird migration.
12. Discuss the significance of lunar rhythms in animal behavior.
13. What is the role of photic and non-photoc zeitgebers in biological rhythms?
14. Explain nest-building behaviour in fishes as an example of parental care.
15. Discuss the adaptive significance of circadian rhythms in animals.



5 Marks Questions (15 Questions)

Analyzing, Evaluating, and Creating [CO-4, CO-5 , CO-6]

1. Compare and contrast instinctive and learned behaviors with suitable examples.
2. Analyze the role of associative learning in animal survival strategies.
3. Evaluate the significance of classical and operant conditioning in animal training.
4. Discuss the organization of termite societies and the role of caste differentiation.
5. Evaluate Hamilton's Rule in explaining altruistic behavior in social insects.
6. Analyze the mechanisms of mate choice in peacocks and its evolutionary significance.
7. Evaluate the cost-benefit tradeoff of parental care in fishes.
8. Explain parent-offspring conflict in detail, providing examples from primates or birds.
9. Discuss the characteristics and ecological importance of circannual rhythms in migratory birds.
10. Analyze the role of melatonin in regulating biological rhythms in mammals.
11. Discuss the significance of biological clocks in adapting to environmental changes.
12. Compare the roles of photic and non-photic zeitgebers in regulating animal behavior.
13. Create a model to explain how circadian rhythms influence feeding patterns in nocturnal animals.
14. Evaluate the relationship between lunar rhythms and reproductive strategies in marine animals.
15. Design an experimental setup to study the effect of zeitgebers on circadian rhythms in mammals.