Semester: 6	
Course : Major 2	
Paper Title: Animal Diversity and Eukaryotic Molecular Biology	
Paper Code: C3BT230621T	**Credits: 4**
Hours/week : 4	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Theory	
No of Modules : 2	

Course Overview:

1. To provide an overview of animal diversity with respect to Chordata and non-chordate phyla.
2.To familiarize the students with diverse aspects of animal biology, enabling them to develop an understanding of the animal kingdom.
3. To acquire information about the comparative anatomy of vertebrate phyla and learn how different systems function in their complexity.
4. To analyse the molecular mechanisms of eukaryotic DNA replication.
5. To evaluate the process and regulation of eukaryotic transcription.
6. To interpret the molecular events in eukaryotic translation and its regulation.

Course Outcome:

Module A

1. Outline concepts of animal diversity with reference to the animal kingdom, diversity in the animal world and selected vertebrate systems.
2. Describe characteristics of non-chordate phyla and chordates and major zoogeographical realms and discuss territoriality in animals, snake venom and venom apparatus, migration in Aves, stomach and digestion, heart and aortic arches, respiratory organs, modes of respiration and modes of excretion and osmoregulation in vertebrates.
3. Determine distinguishing features of non-chordate phyla and chordates and illustrate the role and importance of adaptations in territoriality, animal distribution, migration and volant life in Aves, venom apparatus and venom in snakes, digestion in ruminants, vertebrate stomach, heart, respiratory and excretory organs.
4. Analyse structural and functional characteristics of different phyla, causes for species diversity amongst zoogeographical regions, role of territoriality in animals and functional adaptations and their importance in stomach, heart and aortic arches, respiratory organs and modes of respiration, excretion and osmoregulation in vertebrates, digestion in ruminants, venom apparatus in snakes and for volant existence and migration in Aves.
5. Compare morphological and physiological traits in non-chordate phyla and chordates, species diversity across different zoogeographical regions, venom apparatus in different snakes, migration in avian groups, territoriality in animals and digestion, circulation, respiration, excretion and osmoregulation amongst vertebrate groups to understand their ecological and evolutionary importance.
6. Develop a comprehensive overview of animal diversity and animal biology.

Module B

1. Remember the key components and terminology of eukaryotic DNA replication, transcription, and translation, including DNA polymerases, PCNA, ARS,

telomeres and telomerase, RNA polymerases, transcription factors, promoters, enhancers, silencers, and translational machinery

2. Explain the mechanistic principles of eukaryotic replication, transcription, and translation, highlighting differences from prokaryotic systems and the roles of regulatory elements at each level of gene expression.
3. Apply concepts of replication control, transcription initiation, and translational regulation to interpret molecular events, experimental observations, and gene expression outcomes in eukaryotic cells.
4. Analyse the interconnected regulation of DNA replication, transcription, and translation by examining how polymerases, transcription factors, enhancers/silencers, and translational controls collectively ensure accurate gene expression and genome stability.
5. Evaluate the biological significance and efficiency of regulatory mechanisms involved in eukaryotic replication (including telomere maintenance), transcriptional control, and translational regulation in maintaining cellular function and preventing genomic instability.
6. Design experimental approaches integrating eukaryotic replication, transcription, and translation mechanisms to predict gene expression behaviour under normal and perturbed cellular conditions.

Prerequisites: ***Basic knowledge about animal biology and molecular biology***

SYLLABUS

UNIT/Module	**CONTENT**	**HOURS or NUMBER OF CLASSES**	**CO Mapping**	**COGNITIVE LEVEL**
Module A	UNIT I: The Animal Kingdom: General overview of major non-chordate phyla and Chordata. UNIT II: Animal Diversity; Zoogeographical realms and animal distribution; Territoriality in animals. UNIT III: Study of Selected Vertebrate Systems: Vertebrate stomach and digestion in ruminants; heart and aortic arches in vertebrates; respiratory organs and modes of respiration in vertebrates; modes of excretion and osmoregulation in vertebrates; Snake venom and venom apparatus; Volant adaptations and migration in Aves.	2 classes per week	CO1-CO6	K1-K6
Module B	UNIT IV: Eukaryotic replication: Differences from prokaryotic replication; DNA polymerases: types; PCNA; ARS; control and regulation; end replication problem; telomeres and telomerase; UNIT V: Transcription in eukaryotes: Eukaryotic RNA	2 classes per week	CO1-CO6	K1-K6

	polymerases, transcription factors, promoters, enhancers and silencers, mechanism of transcription initiation, formation of preinitiation complex, promoter clearance and elongation, enhancers and silencers. UNIT VI: Translation in eukaryotes: mechanism of translation initiation, elongation and termination, regulation of translation.			

Text Books

Module A

1. J.Z. Young. The Life of Vertebrates.
2. E.E. Ruppert, R.S. Fox, R.B. Barnes. Invertebrate Zoology.
3. K.V. Kardong. Vertebrates – Comparative Anatomy, Function, Evolution
4. K. Schmidt-Nielsen. Animal Physiology: Adaptation and Environment

Module B

5. James D. Watson. Molecular Biology of the Gene.
6. Robert. F. Weaver. Molecular Biology

Evaluation: Theory: CIA: 30 marks; Semester Exam: 70 marks

Paper Structure for Theory Semester Exam Module:
Module A (35 marks)
Any four out of five questions: Each of 2 marks
Any three out of four questions: Each of 9 marks with subparts.
[No sub-part will be less than 2 marks or more than 6 marks]

Module B (35 Marks)
Any 7 out of 9 questions; each of 5 marks, with subparts.
[No sub-part will be less than 1 mark or more than 4 marks]

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
	Module A	
CO1	Outline concepts of animal diversity with reference to the animal kingdom, diversity in the animal world and selected vertebrate systems.	K1
CO2	Describe characteristics of non-chordate phyla and chordates and major zoogeographical realms and discuss territoriality in animals, snake venom and venom apparatus, migration in Aves, stomach and digestion, heart and aortic arches, respiratory organs, modes of respiration and modes of excretion and osmoregulation in vertebrates.	K2
CO3	Determine distinguishing features of non-chordate phyla and chordates and illustrate the role and importance of adaptations in territoriality, animal distribution, migration and volant life in Aves,	K3

	venom apparatus and venom in snakes, digestion in ruminants, vertebrate stomach, heart, respiratory and excretory organs.	
CO4	Analyse structural and functional characteristics of different phyla, causes for species diversity amongst zoogeographical regions, role of territoriality in animals and functional adaptations and their importance in stomach, heart and aortic arches, respiratory organs and modes of respiration, excretion and osmoregulation in vertebrates, digestion in ruminants, venom apparatus in snakes and for volant existence and migration in Aves.	K4
CO5	Compare morphological and physiological traits in non-chordate phyla and chordates, species diversity across different zoogeographical regions, venom apparatus in different snakes, migration in avian groups, territoriality in animals and digestion, circulation, respiration, excretion and osmoregulation amongst vertebrate groups to understand their ecological and evolutionary importance.	K5
CO6	Develop a comprehensive overview of animal diversity and animal biology.	K6
	Module B	
CO1	Remember the key components and terminology of eukaryotic DNA replication, transcription, and translation, including DNA polymerases, PCNA, ARS, telomeres and telomerase, RNA polymerases, transcription factors, promoters, enhancers, silencers, and translational machinery	K1
CO2	Explain the mechanistic principles of eukaryotic replication, transcription, and translation, highlighting differences from prokaryotic systems and the roles of regulatory elements at each level of gene expression.	K2
CO3	Apply concepts of replication control, transcription initiation, and translational regulation to interpret molecular events, experimental observations, and gene expression outcomes in eukaryotic cells.	K3
CO4	Analyse the interconnected regulation of DNA replication, transcription, and translation by examining how polymerases, transcription factors, enhancers/silencers, and translational controls collectively ensure accurate gene expression and genome stability.	K4
CO5	Evaluate the biological significance and efficiency of regulatory mechanisms involved in eukaryotic replication (including telomere maintenance), transcriptional control, and translational regulation in maintaining cellular function and preventing genomic instability.	K5
CO6	Design experimental approaches integrating eukaryotic replication, transcription, and translation mechanisms to predict gene expression behaviour under normal and perturbed cellular conditions.	K6