



M. G. Science Institute, Ahmedabad

Autonomous | Affiliated to Gujarat University, Ahmedabad

(Managed by the Ahmedabad Education Society)

Department of Zoology

**Bachelor of Science (Hons.) in Zoology
(Effective from Academic Year 2026-27)**

Syllabus for B.Sc. (Hons.) Zoology

Semester-6

ZOM361T: Animal diversity-chordates and Human physiology

Semester: VI	Course Title:- Animal diversity-chordates and Human physiology	Credit: 4
Course No.: 361T	Major-14 (T)	Hours: 4/week

Course Outcomes: On successful completion of the course, the learner will be able to:

COs	Cognitive Abilities	Course Outcomes
CO 1	Remembering	Describe classification, habit, habitat and external morphology of <i>Columba livia</i> . Describe functions, properties, composition and haemopoiesis of blood.
CO 2	Understanding	Explain the functional anatomy of digestive, respiratory, circulatory, brain and urinogenital systems of pigeon. Explain swim bladder, accessory respiratory organs, parental care and migration in fishes. Describe habits, habitat and peculiarities of Dipnoi. Explain parental care strategies in Amphibia. Describe and compare structural adaptations of Mesozoic reptiles. Describe structure and functions of lymphatic system including lymph circulation and lymphoid organs.
CO 3	Applying	Explain non-specific immunity including phagocytosis, inflammation and fever.
CO 4	Analyzing	Classify types of feathers and correlate them with flight adaptation. Differentiate between Chondrichthyes and Osteichthyes. Explain blood clotting mechanism, blood groups and blood disorders. Explain pulmonary ventilation, exchange and transport of respiratory gases. Describe control of respiration including nervous and chemical regulation and effects of carbon monoxide poisoning.
CO 5	Evaluating	Evaluate different parental care strategies in Amphibia with reference to survival advantage. Evaluate non-specific defence mechanisms including phagocytosis, inflammation and fever in disease resistance.
CO 6	Creating	Design a comparative model / chart / concept map integrating structural adaptations across chordates and physiological regulation mechanisms in humans.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3	1		2		1	1	1	
CO 2	3	1	1	2	2	1	1		1
CO 3	3	3		3	1	2		2	2
CO 4	3	3	1	2	2	2	1	3	
CO 5	3	3	3	2		2	2	3	3
CO 6	3	3		3	2	2	2	2	2

Unit No.	Unit Contents	No. of Hours of Teaching
1	<p>ANIMAL DIVERSITY (Chordates) Type Study: General structure & morphology with functional anatomy of Pigeon (<i>Columba livia</i>)</p> <ul style="list-style-type: none"> • Classification • Habit & Habitat • External Characters • Digestive System • Respiratory system • Circulation system • Brain • Urinogenital system • Types of feathers 	15
2	<p>ANIMAL DIVERSITY (Chordates) General Topics: Pisces:</p> <ul style="list-style-type: none"> • Differences between Chondrichthyes & Osteichthyes, • Swim bladders • Accessory respiratory organs • Parental care • Migration • Dipnoi: Habits, Habitat and peculiarities of Protopterus, Lepidosiren and Neoceratodus <p>Amphibia:</p> <ul style="list-style-type: none"> • Parental care. <p>Reptilia:</p> <ul style="list-style-type: none"> • Dinosaurs: (Brontosaurus, Triceratops, Tyranosaurus, 	15

	Dimetrodon, Stegosaurus, Pteranodon, Ichthyosaurus, Iguanodon).	
3	<p>HUMAN PHYSIOLOGY: The Cardiovascular system – The Blood</p> <ul style="list-style-type: none"> • Functions • properties and composition of blood • Haemopoiesis (Formation of blood cells- RBC, WBC, Platelets) • Blood clotting mechanisms • Blood groups and blood types • Blood disorders (Homeostatic imbalances: Anemia, Sickle-Cell Disease, Hemophilia, and Leukemia). <p>Lymphatic system :</p> <ul style="list-style-type: none"> • Brief introduction. • Functions of the Lymphatic system • Lymphatic vessels and Lymph circulation (Route, Thoracic duct, Right Lymphatic duct, Maintenance) • Lymphoid organs: (Primary and secondary) - Thymus, Bone Marrow, Lymph nodes, Spleen, Lymphatic nodules • Non-Specific Resistance to Disease : First line of defence: Skin & Mucous Membranes (Mechanical factors, Chemical factors) Second line of defence: Antimicrobial substances (Interferon, Complement, Antimicrobial proteins) • Mechanism of Phagocytosis, Inflammation, Fever 	15
4	<p>HUMAN PHYSIOLOGY: Respiration:</p> <ul style="list-style-type: none"> • Pulmonary ventilation • Exchange of respiratory gases • Transport of respiratory gases : a) Oxygen b) Carbon dioxide • Carbon monoxide poisoning (in brief) • Control of respiration : <ul style="list-style-type: none"> a) Nervous control : <ul style="list-style-type: none"> Respiratory centre : Medullary rhythmicity area, Pneumotaxic area Apneustic area Regulation of respirator Centre activity : <ul style="list-style-type: none"> Cortical influences Inflation reflex b) Chemical stimuli - Hypercapnia c) Other factors - body temperature, sudden pain, etc. 	15

Reference Books for Chordates:

1. Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut.
2. Chordate Zoology, P. S. Dhami, and J. K. Dhami, S. Chand & Co., Delhi.
3. Introduction to Chordates, T. C. Majupuria, Pradeep Publication, Jalandhar.
4. Chordate Zoology, E.L. Jordan, P.S. Verma, S. Chand & Company, Delhi.
5. Text book of practical zoology - Vertebrates, S. S. Lal Rastogi Publication, Meerut.

Reference Books for Physiology:

1. Principles of Anatomy and Physiology, Tortora and Anagnostakos, HarperCollins College Publishers, 4th Edition.
2. Animal Physiology and Related Biochemistry, H. R. Singh, Shobhan Lal Naginchand & Co. Edu. Pub., Jalandhar.
3. Textbook of Animal Physiology, A. K. Berry, Emkay Pub., New Delhi

ZOM362T: Biochemistry, Animal behaviour and Developmental biology

Semester: VI	Course Title:- Biochemistry, Animal behaviour and Developmental biology	Credit: 4
Course No.: 362T	Major-15 (T)	Hours: 4/week

Course Outcomes: On successful completion of the course, the learner will be able to:

COs	Cognitive Abilities	Course Outcomes
CO 1	Remembering	Define lipids and explain their biological significance, components and classification (simple, compound and derived lipids). Define enzymes, describe their chemical nature, classification and nomenclature.
CO 2	Understanding	Explain structure and functions of phosphoglycerides (lecithin, cephalin, plasmalogens) and steroids. Define ethology and explain different types of learning including imprinting, habituation and conditioning (e.g., experiments of Ivan Pavlov). Describe embryological development of chick i
CO 3	Applying	Explain factors affecting enzyme activity and interpret enzyme kinetics under varying conditions. Describe and illustrate glycogenesis, glycogenolysis, glycolysis (EMP pathway), Krebs cycle, ETS and HMP shunt with structures.
CO 4	Analyzing	Differentiate saturated and unsaturated fatty acids and analyze physical and chemical properties of lipids (hydrolysis, rancidity, saponification, hydrogenation). Analyze instrumental learning, avoidance learning and discrete trial procedures. Explain communication mechanisms between bats and moths and social organization in baboons. Classify eggs based on quantity and distribution of yolk and compare cleavage patterns. Analyze stages (24h, 33h, 48h, 72h chick embryo), extra-embryonic membranes and flexion & torsion.
CO 5	Evaluating	Evaluate mechanism of enzyme action and significance of marker enzymes in diagnosis. Compare gluconogenesis and gluconeogenesis and evaluate their physiological importance. Evaluate reproductive behaviour and courtship strategies in animals
CO 6	Creating	Design a conceptual model integrating biochemical pathways, enzyme regulation, behavioral adaptations and developmental processes.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3	1	1	1	1	1	1	1	1
CO 2	3	2	1		2	1	1		1
CO 3	3	3	1	3		2	2	2	2
CO 4	3	3	1	2	2	2	1	3	2
CO 5	3	3		2	3	2	2		3
CO 6	3	3	3	2		3		3	3

Unit No.	Unit Contents	No. of Hours of Teaching
1	<p>LIPIDS AND ENZYMES:</p> <p>(A) Lipids:</p> <ul style="list-style-type: none"> • Introduction • Definition • Biological significance of Lipids • Components – Alcohols and Fatty acids (Saturated acids & Unsaturated acids) <p>Classification of lipids:</p> <ul style="list-style-type: none"> • Simple Lipids: Triglycerides-Fats & Waxes, • Compound Lipids: Phosphoglycerides-Lecithin, Cephalin, Plasmalogens • Derived Lipids : Steroids <p>Physical properties:</p> <ul style="list-style-type: none"> • Colour • Odour • Taste • Solubility • Melting point • Specific gravity • Insulation • Emulsification <p>Chemical properties:</p> <ul style="list-style-type: none"> • Hydrolysis • Rancidity • Saponification • Hydrogenation <p>(B) Enzymes:</p> <ul style="list-style-type: none"> • Introduction • Definition • Chemical nature 	15

	<ul style="list-style-type: none"> • Nomenclature & Classification • Factors affecting enzyme activity (Temperature, pH, Enzyme concentration, Substrate concentration, Activators, Inhibitors) • Mechanism of enzyme action • Significance of enzymes (Marker enzymes) 	
2	<p>METABOLISM:</p> <ul style="list-style-type: none"> • Metabolism – Introduction, Definition, Anabolism, Catabolism • Glycogenesis (structures required). • Glycogenolysis (structures required). • Glycolysis (EM Pathway) (structures required). • Krebs cycle (structures required). • Electron Transport System • HMP Shunt Pathway (structures required). • Glucogenesis (structures required). • Gluconeogenesis (structures not required). 	15
3	<p>ANIMAL BEHAVIOUR (Ethology):</p> <ul style="list-style-type: none"> • Introduction to Ethology • Learning: Definition Types of Learning: <ul style="list-style-type: none"> (a) Imprinting (b) Habituation (c) Classical conditioning (E.g. Pavlov's expt.) (d) Instrumental conditioning • Discrete trials procedures • Active avoidance learning • Escape learning • Passive avoidance learning • Reproductive behavior patterns Courtship: Introduction, Need of courtship. - Courtship signals - e.g. Balloon Fly (<i>Hilara sator</i>) - Persuasion & Appeasement - e.g. Stickleback's behaviour, Herring gull. - False information - e.g. Scorpion fly (<i>Hylobittacus apicalis</i>) • Communication in/between bats and moths. • Social organization in baboons. 	15
4	<p>DEVELOPMENTAL BIOLOGY:</p> <ul style="list-style-type: none"> • Types of eggs depending upon the quantity of yolk. (Microlecithal/Oligolecithal, Mesolecithal and Polylecithal/Macrolecithal/Megalecithal), • Types of eggs depending upon the distribution of yolk. (Homolecithal/Isolecithal, 	15

	<p>Centrolecithal and Telolecithal),</p> <ul style="list-style-type: none"> ● Cleavage: Planes of Cleavage: (Meridional, Vertical, Equatorial, Latitudinal), Patterns of Cleavages: radial, spiral (dextral& sinistral), bilateral, incomplete/meroblasticandcomplete/holoblastic. <p>Embryology of Chick:</p> <ul style="list-style-type: none"> ● Structure of Hen's Egg ● Fertilization ● Cleavage ● Blastulation ● Gastrulation (Primitive streak, Mesogenesis, Somite Formation) ● Development of brain ● Development of heart ● Flexion & Torsion ● Extra-embryonic membranes ● 24 hrs, 33 hrs, 48 hrs and 72 hrs old chick embryo ● Types of Placentation in mammals (histological) 	
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Reference Books for Biochemistry:

1. Elementary Biochemistry, J. L. Jain, S. Chand & Company, Delhi.
2. Harper's Biochemistry, Lange, McGraw-Hill.
3. Biochemistry, I. Stryer, Freeman.
4. Principles of Biochemistry, Lehninger, CBS Publications.

Reference Books for Animal Behaviour:

1. Animal Behaviour, Mohan P. Arora, Himalaya Publishing House.
2. Essentials of Behaviour, P. J. B. Slater, Cambridge Univ. Press.
3. An Introduction to Animal Behaviour, Manning, Addition Wesley.

Reference books for Developmental Biology:

1. Introduction of Embryology, Balinsky, CBS College Publishers.
2. Developmental Biology, T. Subramanayam, Narosa Publishing House.
3. Developmental Biology, V.B. Rastogi, Rastogi Publications, Meerut.
4. An Outline of Animal Development, Davenport, Addition-Werley.

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ZOM363P: Zoology Major Practical-363

Semester: VI	Course Title:- Zoology Major Practical-363	Credit: 4
Course No.: 363P	Major-16 (P)	Hours: 8/week

Course Outcomes: On successful completion of the course, the learner will be able to:

COs	Cognitive Abilities	Course Outcomes
CO 1	Remembering	Identify and describe external characters and organ systems of <i>Columba livia</i> using charts/models. Identify lymphatic organs (lymph node, spleen, thymus) through charts and slides.
CO 2	Understanding	Demonstrate structural organization of heart, arterial, venous and respiratory (air sacs) systems in pigeon. Describe parental care, migration and peculiarities of Dipnoi such as Protopterus, Lepidosiren and Neoceratodus.
CO 3	Applying	Perform hematological experiments: RBC count, WBC count, Hb estimation, bleeding time, clotting time and blood grouping. Prepare and identify stained blood smear and haemin crystals. Perform colorimetric estimation of cholesterol (Ferric chloride method) and creatinine. Identify stages of chick embryology (blastula, gastrula, 21–72 hrs embryo) through permanent slides.
CO 4	Analyzing	Differentiate male and female reproductive systems and types of feathers in pigeon. Distinguish between Chondrichthyes and Osteichthyes and explain swim bladder and accessory respiratory organs using specimens/charts. Identify peculiar adaptations of Mesozoic reptiles. Interpret respiratory charts including respiratory muscles, alveolar membrane and oxygen–haemoglobin dissociation curve. Trace and interpret metabolic pathways. Classify eggs, cleavage patterns and placental types using charts and slides.
CO 5	Evaluating	Evaluate courtship and survival behaviors in species like <i>Hilara sartor</i> , <i>Gasterosteus aculeatus</i> , <i>Larus argentatus</i> and <i>Hylobittacus apicalis</i> .
CO 6	Creating	Construct atomic models of glycerol, fatty acids and phospholipids; identify basic steroid nucleus (cholesterol).

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CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3	1	1	1	1	1	1	1	1
CO 2	3	2	1	2	2	1	1	2	1
CO 3	3	3	1		2	2	2	2	
CO 4	3	3	1		2	2	1	3	2
CO 5	3	3	3	2	3	2	2	3	3
CO 6	3	3	2	3	2		2	2	

Unit No.	Unit Contents	No. of Hours of Teaching
1	<p align="center">PART - A (Based on paper ZOM 361T)</p> <p>ANIMAL DIVERSITY (Chordates) Type Study: Pigeon (<i>Columba livia</i>)</p> <ul style="list-style-type: none"> • External Characters • Digestive System • Heart • Arterial system • Venous system • Brain • Excretory system • Male reproductive system • Female reproductive system • Respiratory system(Air sacs) • Types of feathers 	15
2	<p>ANIMAL DIVERSITY (Chordates) General Topics: Study by charts/models/specimens to study peculiarities of :</p> <p>Pisces:</p> <ul style="list-style-type: none"> • Differences between Chondrichthyes & Osteichthyes, • Swim bladders • Accessory respiratory organs • Parental care • Migration. • Dipnoi: Habits, Habitat and peculiarities of Protopterus, Lepidosiren and Neoceratodus. <p>Amphibia:</p>	15

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	<ul style="list-style-type: none"> • Parental care. <p>Reptilia:</p> <ul style="list-style-type: none"> • Dinosaurs: (Brontosaurus, Triceratops, Tyranosaurus, Dimetrodon, Stegosaurus, Pteranodon, Ichthyosaurus, Iguanodon). 	
3	<p>HUMAN PHYSIOLOGY-BLOOD</p> <ul style="list-style-type: none"> • Total RBC count in your own blood. • Total WBC count in your own blood. • Preparation of your own blood smear, stained by Geimsa stain, to identify the different WBCs. • Estimation of Hb in your own blood • Preparation of Haemin crystals from your own blood • Determination of bleeding time and Blood clotting time of your own blood • Determination of blood groups <p>Lymphatic system : Study by charts/slides of:</p> <ul style="list-style-type: none"> • Lymphatic circulatory system in humans • T.S. through a lymph node • T.S. through spleen, • T.S. through thymus 	15
4	<p>HUMAN PHYSIOLOGY - RESPIRATION Study by charts of:</p> <ul style="list-style-type: none"> • Respiratory muscles • Alveolar-capillary (respiratory) membrane • Exchange of the respiratory gases • Oxygen-haemoglobin dissociation curve 	15
1	<p align="center">PART - B (Based on paper ZOM362 T)</p> <ul style="list-style-type: none"> • Colorimetric estimation of Cholesterol in Serum (Ferric chloride method) • Colorimetric estimation of Creatinine in urine • Effect of temp / pH on the activity of salivary amylase <p>LIPIDS: Study by charts of:</p> <ul style="list-style-type: none"> • Basic steroid nucleus, Cholesterol • Preparation of Atomic models of: Glycerol, Butyric acid, Crotonic acid, Tributyrin, Lecithins, Cephalins and Plasmalogens <p>ENZYMES: Study by charts of:</p>	15

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	<ul style="list-style-type: none"> • Factors affecting enzyme activity: Temperature, pH, • Graph showing effect of [S] on the velocity of an enzyme catalyzed reaction. 	
2	<p>METABOLISM: Study by charts of:</p> <ul style="list-style-type: none"> • Glycogenesis (structures required). • Glycogenolysis (structures required). • Glycolysis (EM Pathway) (structures required). • Krebs cycle (structures required). • Electron Transport System • HMP Shunt Pathway (structures required). • Glucogenesis (structures required). • Gluconeogenesis (structures not required). 	15
3	<p>ANIMAL BEHAVIOUR (Ethology): Study by charts of:</p> <ul style="list-style-type: none"> • Communication in/between bats & moths • Social organization in Baboons <p>Reproductive behavior patterns:</p> <ul style="list-style-type: none"> • Courtship signals – e.g. Balloon Fly (<i>Hilara sartor</i>) • Persuasion & Appeasement – e.g. ♂ Stickleback's zigzag dance, Herring gull. • False information – e.g. Scorpion fly (<i>Hylobittacus apicalis</i>) 	15
4	<p>DEVELOPMENTAL BIOLOGY : Study by charts of:</p> <ul style="list-style-type: none"> • Types of eggs depending upon the amount of yolk (as per theory syllabus). • Types of eggs depending upon the distribution of yolk (as per theory syllabus). • Patterns of cleavage (as per theory syllabus). • Types of placenta in mammals (histological). <p>CHICK EMBRYOLOGY: Study by charts of:</p> <ul style="list-style-type: none"> • Structure of unfertilized egg, • Blastula stage of chick embryo, • Gastrula stage of chick embryo. • Study of permanent slides of W.M. of 24, 33, 48 & 72 hrs. old chick embryos 	15