250/ZOO/CC401

ZOOLOGY:SEMESTER-4								
Course Type	**Course Code**	**Nameofthe Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
CC-A10 **4 credit**		**Biomolecules and Mammalian Physiology**	**3**	**3**	**25**	**50**	**75**	**2hrs.**
		Practical	**1**	**2**	**05**	**20**	**25**	**2hrs.**

Pre-requisite for the course (if any): Biology as a Subject at4.0Level (Class XII)

Course Learning Outcomes (CLO)

1. Students will be able to understand and explain the mechanism that works to keep the human body functioning.
2. Students will be able to explain the interaction and interdependence of physiological and biochemical processes.
3. It will make the students understand the appropriate functioning of each body system in animals and mechanism of working.
4. Students will be able to explain the mechanism of action of hormones and related molecules involved in various physiological processes
5. Students will be able to understand and perform biological and analytical techniques in labs to explain biological activities

InstructionsforPaper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Introduction, classification, structure, function and general properties of proteins, carbohydrates and lipids. Nomenclature, classification and mechanisms of enzyme action; Enzyme Kinetics, factors affecting enzyme activity, inhibition of enzymes **Nutrition:** Nutritional components: Carbohydrates, fats, lipids, Vitamins and Minerals; Types of nutrition & feeding, Digestion of lipids, proteins, carbohydrates & nucleic acids; symbiotic digestion, lactose in tolerance, Physico-chemical mechanism of Absorption of nutrients & assimilation; control of secretion of digestive juices.	**12**
II	**Muscles:** Types of muscles, ultra-structure of skeletal muscle, neuro muscular junction. Bio-chemical and physical vents during muscle contraction, single muscle twitch, tetanus, muscle fatigue, muscle tone, oxygen debt., Cori's cycle, single unit smooth muscles **Circulation**: Origin, conduction and regulation of heart beat; cardiac cycle, electrocardiogram, cardiac output, fluid pressure and flow pressure in closed and open circulatory system; Composition and functions of blood & lymph; Mechanism of coagulation of blood, coagulation factors; anticoagulants, haemopoiesis.	**11**

III	**<u>Respiration</u>:** Exchange of respiratory gases, transport of gases, lung air volumes, oxygen dissociation curve of haemoglobin, Bohr's effect, Hamburger's phenomenon (Chloride shift), control / regulation of respiration (peripheral reflexes, chemical control and Higher centres), Myoglobin. **<u>Excretion:</u>**Patterns of excretory products viz. Amonotelic, ureotlic uricotelic, ornithine cycle (Kreb's – Henseleit cycle) for urea formation in liver; Urine formation, composition of Urine, counter-current mechanism of urine formation, osmoregulation, micturition.	**11**
IV	**Neural Integration:** Nature, origin and propagation of nerve impulse along with medullated & non-medullated nerve fibre, conduction of nerve impulse across synapse, synaptic delay and synaptic fatigue, Neurotransmitter. **Reproduction:**Spermatogenesis,Capacitationofspermatozoa,oogenesis,ovulation,formationof corpusluteum, oestrous-anoestrous cycle, Menstrual cycle in human, fertilization, implantation and gestation, parturition	**11**
V Practical	1. Qualitative tests for identification of simple sugars, disaccharides and polysaccharides. 2. Study of human salivary amylase activity: Effect of temperature, pH, Concentration. 3. Estimation of abnormal constituents of urine (Albumin, sugar, ketone bodies). 4. Use of Kymograph unit & respirometer. 5. Haematin crystal preparation. 6. Estimation of Hb. 7. DLC of Man/ RBC count/ WBC count. 8. Blood antigens and antibodies: Blood group testing	**30**

LearningResources

1. Agarwal R A, Srivastava A. K., Kumar K. Animal Physiology and Biochemistry; S Chand Publishing; Twenty Third edition, 1978.
2. VasantikaKashyap(2021) AText-Book of Animal Physiology and Biochemistry; Kedar Nath Ram Nath Publisher
3. Arumugam N, FatimaD, Narayanan L.M. (2016) Animal Physiology and Biochemistry; Saras Publication
4. Moyes C, Schulte P(2015). Principles of Animal Physiology, Pearson; 3rd edition
5. Satya narayana (2021). Biochemistry, Elsevier; 6th edition

250/ZOO/CC402

ZOOLOGY:SEMESTER-4								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
CC-A11 **4 credit**		**Cytogenetics**	**3**	**3**	**25**	**50**	**75**	**2hrs.**
		Practical	**1**	**2**	**05**	**20**	**25**	**2hrs.**

Level of the course:100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0Level (Class XII)

Course Learning Outcomes (CLO)

1. Students will be able to understand about Biology of chromosomes
2. Students will be able to explain the concept of gene mutations and genetics of cell cycle
3. It will make the students understand about Human cytogenetics
4. Students will be able to explain the mechanism molecular cytogenetics
5. Students will be able to understand about practical exposure of cytogenetics

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No.1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit Ito IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	**Biology of Chromosomes:** Molecular anatomy of eukaryotic chromosomes. Heterochromatin and euchromatin. Giant Chromosomes: Polytene and Lampbrush Chromosomes **Sex Chromosomes:** Sex determination. Dosage compensation in *C. elegans*, *Drosophila* and Humans. **ChromosomeBandingTechniques:**Q-banding,C-banding,G-banding,R-banding,T-banding,High-Resolution & Replication banding and Nuclease banding. Functional significance of chromosome bands.	**12**
II	**Genes in Pedigrees:** Mendelian pedigree pattern. Heritable diseases in human. Inheritance of mitochondrial diseases, Non-Mendelian traits. **GeneMutations:**Spontaneous mutations – Base pair substitution and frame shift mutations. Induced mutations – Radiation, chemical and environmental. *In –vitro* site specific mutagenesis. Detection of mutagens – The Ames test and sister chromatid exchanges. **Genetics ofCellCycle:** Genetic regulation of cell division in yeast and eukaryotes. Molecular basis of cellular check points. Molecular basis of neoplasia.	**11**
III	**Human Cytogenetics:** Human karyotype, Nomenclature for normal chromosomes (ISCN), Variablechromosome features, Nomenclature for acquired chromosome aberrations **Numerical and Structural Abnormalities of Human Chromosomes –Syndromes:** Autosomal syndromes –cat-cry syndrome, Trisomy13, Trisomy 18, Trisomy 21.Sex	**11**

	chromosomal syndromes – Turner syndrome, Klinefelter syndrome, XYY, True and Pseudo-hermaphroditism. **The mechanisms which contribute to cytogenetic alterations:** Polyploidy ,Aneuploidy, Duplications, deletions, inversions, translocations.	
IV	**MolecularCytogeneticTechniques:**FISH,Chromosomepainting,automatedkaryotyping,Flowcytometery, DNA fingerprinting, Molecular Markers in Genome Analysis, PCR and its applications in genome analysis, Microarrays. **Genome Projects:** Human genome project – history, organization, goals and value of the project. Genetic & Physical mapping of the human genome, Human genome diversity project, Model organisms and other genome projects.	**11**
V Practical	1. Identification of meiotic and mitotic stages from permanent slides. 2. Study of chiasma frequency and terminalisation co-efficient. 3. Study of mitosis from hepatic ceacae /bonemarrow of suitable animals (invertebrate /vertebrate) and preparation of karyotype and idiogram. 4. Nuclear sexing from polymorpho nuclear leucocytes 5. Preparation of human buccal smear to study sex chromatin. 6. Preparation of pedigree sand pedigree analysis. 7. Introduction of banding techniques. 8. PCR: Introduction 9. Isolation of genomic DNA. 10. A Survey /Project report for the study of: a) ABO and Rh blood groups b) Some morpho genetic and behavioural traits. c) Some biochemical traits.	**30**

LearningResources

1. Atherly, A.C.,J.R.Girton and J.F.Mc Donald.TheScience of Genetics. SaudersCollege Publishing, Harcort Brace College Publishers, NY.
2. Brooker,R.J.Genetics:Analysis and Principles.Benjamin/Cummings,LongmanInc.
3. Fairbanks,D.J. and W.R.Anderson.Genetics–The Continuity of Life. Brook/Cole Publishing Company ITP, NY, Toronto.
4. Gardner,E.J.,M.J. Simmons and D.P.Snustad. Principles of Genetics. JohnWileyand Sons.Inc., NY.
5. Griffiths, A.J.F.,J.H. Miller, D.T.Suzuki, R.C. Lewontin and W.M.Gelbart. An introduction to genetic analysis.
6. W.H.Free man and company, NY.Lewin, B.Genes. VI. Oxford University Press, Oxford, NewYork, Tokyo.
7. Snustad, D.P.and M.J.Simmons.Principles of Genetics.JohnWiley and Sons.Inc., NY.
8. Watson, J.D., N.H.Hopkins, J.W.Roberts, J.A.Steitzand A.M.Weiner. Molecular Biology of Genes. The Benjamin /Cummings Publishing Company Inc., Tokyo.
9. Tom Strachan & Read, A.P.Human Molecular Genetics 3rd edition, Garland Publishing 2004, London

250/ZOO/CC403

ZOOLOGY:SEMESTER-4								
Course Type	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
CC-A12 **4 credit**		**Basics of Endocrinology and Immunology**	3	3	25	50	75	2 hrs.
		Practical	1	2	05	20	25	2 hrs.

Level of the course:100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0Level (Class XII)

Course Learning Outcomes (CLO): Students will be able to

1. Develop an in-depth comprehensive knowledge of endocrinology from a physiological cellular and molecular perspective.
2. This course will make students understand the basic structure and chemical organization of hormones and various signaling molecules.
3. The students will how the immune system can fight infection and other diseases
4. Students will able to understand the concept of vaccines and its cons and pros.
5. The student will get practical knowledge of basic structure and function of hormones and Immune system.

InstructionsforPaper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No.1and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	**Introduction to hormone:** History of endocrinology, Classification and Characteristic, pituitary gland and its general physiological action: Adenohypophysis hormone (somatotropin and prolactin), Glycoprotein hormones (FSH, LH and TSH), Neuro-hypophysis hormone (oxytocin and vasopressin, urotensin), physiological role of adrenal hormone, Thyroid hormone action in poikilotherms and homeotherms.	**12**
II	**Hormone Action and applications;** Membrane and nuclear receptor hormones (regulation and signal transduction) Permissive actions of hormones and termination of hormone action. Endocrine feedback to stumuli. **Hormone and human health:** Production of hormones as pharmaceuticals, Genetic analysis of Hormonal disorders. Hormones on IVF, Pregnancy testing and Amniocentesis.	**11**
III	Over view of Immune System: Introduction to basic concepts in immunology, Components of immune systemof Innate and Adaptive Immunity, Cells and organs of immune system (primary and secondary organs), Basic properties of antigen B and T cell epitopes, Adjuvants and haptens, structure ,classes and functions of antibodies.	**11**

IV	**Working of immune system:** Structure and functions of MHC molecules. Basic properties and functions of cytokines, Complement system (component and pathways), Introduction to concept of auto immunity (Rheumatoid Arthritis and tolerance, AIDS). General introduction to Vaccines with its function in biological sciences.	**11**
V Practical	1. Study of the permanent slides of all the endocrine glands Histological study of lymphoid organs spleen, thymus and lymph nodes through slides/ Photographs 3. Preparation of stained blood film to study various types of blood cells. 4. Ouchterlony's double immune-diffusion method. 5. ABO blood group determination. 6. Demonstration of a. ELISA b. Immuno electrophoresis 7. Immunological diagnosis of pregnancy. 2. Qualitative test for the presence of sugar in urine.	**30**

LearningResources

1. General Endocrinology C.Donnell Turner Pub Saunders Toppan Endocrinology: An Integrated Approach; Stephen Nussey and Saffron Whitehead. Oxford: BIOS Scientific Publishers; 2001.
2. Hadley, M.E. and Levine J.E. 2007. Endocrinology, 6thEdition. Pearson Prentice- Hall, Pearson Education Inc., New Jersey.
3. Kindt,T. J.,Goldsby, R.A.,Osborne, B.A. and Kuby,J (2006).Immunology, VI Edition. W.H. Freeman and Company.
4. David, M., Jonathan, B., David, R.B. and Ivan R.(2006).Immunology, VII Edition, Mosby, Elsevier Publication.
5. Abbas,K.Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication