# VETERINARY PHYSIOLOGY

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VETERINARY PHYSIOLOGY

Course Contents

VPY 601 PHYSIOLOGY OF DIGESTION 2+1 SEM - I

Objective
To teach comparative physiology of digestive system of monogastric animals, ruminants and birds, and basic techniques.

Theory
UNIT-I: Basic characteristics and comparative physiology of digestive system of domestic animals.
UNIT-II: Gastro-intestinal motility, secretory functions of gastro-intestinal tract, their regulation and gastro-intestinal hormones.
UNIT-III: Absorption, metabolism and excretion of various nutrients, appetite and control of feed intake.
UNIT-IV: Development of ruminant system and rumen environment. Ruminant microbial digestion, its advantages and disadvantages. Rumino-recticular motility, its significance and control.
UNIT-V: Rumen microbiology. Digestion in birds.

Practical

Suggested Readings
Forbes JM. & France J. 1993. Quantitative aspects of Ruminant Digestion & Metabolism. CABI.

VPY 602 CARDIOVASCULAR AND RESPIRATORY 2+1 SEM - I

PHYSIOLOGY

Objective
To teach function and regulation of heart, recording of ECG and respiration in different animals and basic techniques.

Theory
UNIT-I: Heart muscle, heart as pump, origin and propagation of heart beat. Electrophysiology of heart, rhythmic excitation of heart, cardiac cycle, heart sound and dynamics of valvular and congenital heart defect.
UNIT-II: Cardiac output and its measurements, factors affecting cardiac output. Venous return and its regulation. Control of the heart.
UNIT-III: Normal electro-cardiogram, electrocardiographic interpretation in cardiac myopathies and cardiac arrhythmias.
UNIT-IV: Circulation and hemodynamics, coronary, systemic and pulmonary circulation, their regulation, energetics of circulation, pathophysiology of circulation.
UNIT-V: Respiration, mechanism of ventilation, hemoglobin, oxygen and carbon-dioxide transport. Respiratory gas exchange. Respiratory adjustment at high altitude and deep swimming. Neural and chemical control of respiration, artificial respiration. Respiration in birds.

Practical
**Suggested Readings**

**VPY 603**  
**RENAL PHYSIOLOGY AND BODY FLUID DYNAMICS**  
2+1 SEM - I

**Objective**
To impart knowledge regarding excretory system of mammals and birds, maintenance of body fluid homeostasis.

**Theory**
UNIT-I: An overview of nephron structure and function. Renal homeostatic function and renal excretory function.
UNIT-IV: Skin- general anatomy of epidermis, dermis, hypodermis, mechanical protection, permeability, actinic irradiation, sweat glands, sebaceous glands. Skin grafting. Immune properties of skin.
UNIT-V: Composition of body fluids and their regulation. Excretory system in birds.

**Practical**
Collection and preservation of urine. Physical and chemical analysis of urine and its interpretation in health and disease condition. Demonstration of various kidney function tests, glomerular filtration rate, creatinine clearance rate, urea clearance rate and glucose tolerance test.

**Suggested Readings**

**VPY 604**  
**HAEMATOLOGY**  
2+1 SEM - I

**Objective**
To acquaint the students about haematology of different animals including hands-on training.

**Theory**
UNIT-I: Red blood cells, anaemia, different types of anaemia, polycythemia and their effect on circulation in mammals and birds.
UNIT-II: Resistance of the body to infection, leukocytes, tissue macrophage system and inflammation.

**Practical**
Haemograms, platelet count, erythrocyte fragility. Estimation of serum iron and iron binding capacities of plasma. Separation of variants of hemoglobin and transferrin by electrophoresis. Examination of bone marrow. Isolation of different types of blood cells by sedimentation and column chromatography.

**Suggested Readings**
VPY 605 VITAMINS AND MINERALS IN ANIMAL PHYSIOLOGY 2+0 SEM - I

Objective
To teach the importance of these nutrients in normal body functions and in disease conditions.

Theory
UNIT-I: Introduction and brief history, definition, general properties and overview of functions.
UNIT-II: Fat soluble vitamins, their functions and deficiency diseases.
UNIT-III: Water soluble vitamins and vitamin-like compounds, their functions and deficiency diseases.
UNIT-IV: Physiological functions of trace elements, their role in metabolism, toxicity, deficiency diseases.

Suggested Readings

VPY 606 PHYSIOLOGY OF ANIMAL REPRODUCTION 2+1 SEM - II

Objective
To impart knowledge of male and female reproductive system of different species of animals including birds.

Theory
UNIT-I: Functional histomorphology of male and female reproductive system, development of male and female sex organs. Endocrine and neuroendocrine relation in male and female reproductive function in different domestic animals.
UNIT-II: Sexual cycles and mating behaviours in females, oogenesis, folliculogenesis and ovulation. Secretions of female reproductive tract in different species of animals.

Practical
Heat detection in different animals, palpation of reproductive organs. Physical and biochemical evaluation of semen, determination of sperm enzyme, leakage during freezing. Preservation of semen, RIA of steroid hormones.

Suggested Readings

VPY 607 CLINICAL PHYSIOLOGY 2+1 SEM - II

Objective
To teach physiological basis of clinical abnormalities in body functions.

Theory
UNIT-I: Cardiovascular, respiratory, hepatic and renal evaluation of body functions in relation to clinical conditions.
UNIT-II: Carbohydrate, fat, protein and mineral metabolism in health and disease of various species.
UNIT-III: Functions and dysfunctions of liver, kidney and gastro-intestinal tract.
UNIT-IV: Clinico-immunological evaluation of immune responses and clinical enzymology.

Practical
Separation of amino acids. Thin-layer chromatography of serum lipids.

**Suggested Readings**


**VPY 608**

**NEUROMUSCULAR PHYSIOLOGY**

**Objective**

To impart knowledge of coordination of body functions and regulation of brain functions and sense organs.

**Theory**

**UNIT-I**: Types and classification of muscles, comparative histopathology of muscles. Skeletal muscle fibers, membrane and action potential at myoneuronal junction. Molecular characteristics of contractile filaments, molecular mechanism of muscle contraction, relationship between actin and myosin filaments, overlap and tension developed by the contracting muscles. Contractile process of smooth muscles.


**UNIT-III**: Nervous system, synapse, transmission and processing of information, receptors, brain and spinal reflexes, motor functions of brain stem, limbic system, memory, sleep, learning, autonomic nervous system.

**UNIT-IV**: Special senses and somatic senses.

**Practical**

Recording of electro-myogram, fatigue, tetanus in muscles. Effect of temperature on different types of muscles, demonstration of intestinal movements, effect of drugs on all types of muscles, estimation of muscles specific enzymes.

**Suggested Readings**


**VPY 609**

**CHEMICAL BIOREGULATION IN PHYSIOLOGICAL FUNCTIONS**

**Objective**

To acquaint the students about different endocrine glands of the body and their relationship with production.

**Theory**

**UNIT-I**: Methods to study bioregulation including methods of endocrine analysis. Manipulation and disruption of biorhythms in homeostatic and natural ecosystem.


**UNIT-IV**: Gonadal and placental hormones, their regulation and mechanism of action. Hormonal principles of pineal gland and its role in production.

endocrinology.

**Suggested Readings**


**VPY 610 RESEARCH TECHNIQUES IN VETERINARY PHYSIOLOGY**

**Objective**

Training in various techniques for application in research in Animal Physiology.

**Practical**


**Suggested Readings**


**VPY 701 APPLIED PHYSIOLOGY OF BODY FLUIDS AND ELECTROLYTES**

**Objective**

To teach physiological and clinical implication of changes in electrolytes and body fluids.

**Theory**

- **UNIT-I**: Volume and composition of body fluids, exchange of water and electrolytes between body compartments, blood and external environment. Osmolarity of fluid.
- **UNIT-II**: Regulation of volume and osmolarity of extra cellular fluid. Regulation of pH and acid base balance. Formation and composition of cerebrospinal fluid and lymph.
- **UNIT-IV**: Clinical feature in fluid and electrolyte imbalance, clinicopathological indictors of fluid and electrolytes imbalance.

**Practical**

Determination of electrolytes viz. sodium, potassium and chloride in plasma, determination of total body water and plasma volume by various techniques i.e. dye dilution and radioisotope technique, Estimation of osmolarity and osmolality of body fluids.

**Suggested Readings**

Selected articles from journals.

**VPY 702 PHYSIOLOGY OF ANIMAL BEHAVIOUR**

**Objective**

To impart knowledge on various aspects of animal behaviour viz. communication in animals, sexual behaviour, feeding behaviour etc.

**Theory**

- **UNIT-I**: Introduction to animal ethology. Neurophysiological basis of animal behaviour.
- **UNIT-II**: Behaviour in relation to changes in the environment. Feeding behaviour, grazing, stall feeding and rumination.
- **UNIT-IV**: Social behaviour, communication in animals, animal temperament. Response of dogs and horses to training.

**Suggested Readings**

Selected articles from journals.
VPY 703  COMPARATIVE PHYSIOLOGY OF RUMINANT DIGESTION  2+1  SEM - I

Objective
To teach functional development of rumen and comparative digestive functions in different ruminant species.

Theory
UNIT-I: Functional development of ruminant stomach. Rumen motility and its control.
UNIT-IV: Manipulation of rumen fermentation, protected nutrients feeding, probiotics supplementation etc. Rumen flow rate and rumen volume.

Practical
Reticulo-ruminal motility, artificial rumen techniques, total volatile fatty acids and their fractions, bacteria, protozoa and fungi in rumen. Flow rates of ruminal contents.

Suggested Readings
Selected articles from journals.

VPY 704  ADVANCES IN NEURO-ENDOCRINOLOGY  2+1  SEM - I

Objective
To acquaint the students about neuro-endocrine integrating mechanism in animals and birds.

Theory
UNIT-I: Neuroendocrine integrating mechanism. Structure of hypothalamus, pituitary gland, limbic and other neural pathways and endocrine functions.
UNIT-II: Neural control of oxytocin, adrenocorticotropic hormone, aldosterone, thyrotropic hormone, growth hormone, gonadotrophins etc. Hypothalamic releasing factors and the neuro-vascular link between brain and anterior pituitary.
UNIT-III: Role of afferent impulses from genitals and other regions in reproductive system. Influence of hormones on brain activity.

Practical

Suggested Readings
Selected articles from journals.

VPY 705  MYOPHYSIOLOGY AND KINESIOLOGY  2+1  SEM - I

Objective
To impart the knowledge regarding exercise and work physiology, molecular basis of muscle contraction.

Theory
UNIT-I: Structure of muscle, chemical composition, muscle contraction and irritability. Mechanical properties of skeletal muscle.
UNIT-II: Thermal properties of muscles. Chemical correlates of contraction.
UNIT-III: Molecular basis of muscular contraction of skeletal muscle. Pathophysiology of muscles and myocardium.

Practical

Suggested Readings
Selected articles from journals.
**VPY 706 AVIAN PHYSIOLOGY 2+1 SEM - I**

**Objective**
To impart complete knowledge about physiology of domestic fowl and comparative physiology of other birds.

**Theory**
- **UNIT-I**: Digestive and urinary system.
- **UNIT-II**: Blood, cardiovascular and respiratory system.
- **UNIT-III**: Reproductive and endocrine system.
- **UNIT-IV**: Nervous system and musculo-skeletal system.

**Practical**
Study of blood cells, haemoglobin, packed cell volume (haematocrit) and erythrocyte sedimentation rate. Determination of glucose, calcium, uric acid and urea in blood. Electrophoretic separation of plasma proteins and egg proteins.

**Suggested Readings**
Selected articles from journals.

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**VPY 707 PHYSIOLOGY OF LACTATION 2+1 SEM - II**

**Objective**
To acquaint students with physiology and mechanism of lactation.

**Theory**
- **UNIT-I**: Functional anatomy, histology and cytology of mammary gland in domestic animals.
- **UNIT-II**: Development of mammary gland, hormonal control of mammary gland growth.
- **UNIT-IV**: Neural control of lactation, milk let down, milk ejection and inhibition of milk ejection. Induced lactation. Composition of milk in different species of animals.

**Practical**
Examination of normal udder of cow and buffalo. Composition of colostrum and milk during different phases of lactation. Effect of adrenalin and oxytocin on milk let down, artificial induction of lactation. Estimation of lactogenic hormones.

**Suggested Readings**
Selected articles from journals.

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**VPY 708 ADVANCES IN ENVIRONMENTAL PHYSIOLOGY AND GROWTH 2+1 SEM - II**

**Objective**
To acquaint the students about co-relation of various environmental factors on growth and performance of animals.

**Theory**
- **UNIT-I**: Ecology of farm animals, biological rhythms, mammalian circadian rhythms, their regulation. Components of physical environment, biometeorology and principles of thermoregulation in mammals and birds.
- **UNIT-II**: Physiological response of farm animals to heat and cold. Effect of various climatic components on health and production (growth and egg production), reproduction and climatic adaptation.
- **UNIT-III**: Concept and definitions of cellular, prenatal and postnatal growth- patterns in different species of domestic animals.

**Practical**
Growth measurement and growth curves, recording of various climatic variables, effect of climatic variables on growth and production.

**Suggested Readings**
Selected articles from journals.
VPY 709  ADVANCES IN RUMEN MICROBIOLOGY  2+1  SEM - II
AND METABOLISM

Objective
Students will learn about rumen ecosystem and symbiotic relationship of flora and fauna, their structure and functions. Rumen manipulation techniques.

Theory
UNIT-II: Microbial ecology and physiology of feed degradation within the rumen. Metabolism of nitrogen containing compounds.
UNIT-IV: Genetics and biotechnology of rumen microbes, rumen anaerobic fungi, their role and interaction with other rumen microbes.

Practical
Counting of total and differential protozoa, total and viable bacteria and fungi in rumen liquor. Individual VFA by GLC. Defaunation and manipulation of rumen fermentation. Culture of bacteria and fungi.

Suggested Readings
Selected articles from journals.

VPY 710  ADVANCES IN IMMUNOPHYSIOLOGY  2+1  SEM - II

Objective
To study cells and organs of immune system, its development and role in physiological functions and immunomodulation.

Theory
UNIT-I: Introduction, history, body defense, organs of immune system, ontogeny and phylogeny of immune system, vertical transmission of immunity and difference between vertebrates and invertebrates.
UNIT-II: Immunoglobulins-basic structure and functions, hematopoiesis, T-cell and B-cell-evolution, development and their functions, species-specific immunity, cytokines-sources and actions, MHC, genetic organization of immunoglobulin, MHC and complement system.
UNIT-III: Immune-endocrine interactions, immune system in reproduction, ageing, stress and other physiological functions, immunomodulation.
UNIT-IV: Hypersensitivity, diseases related to immune system, dysfunction, autoimmune disorders and their genesis, immunodeficiency.

Practical
Qualitative & quantitative analysis of immunoglobulins in body fluids, RIA, ELISA, Electrophoresis techniques in immunophysiology, raising hyperimmune sera and blood group immunophysiology.

Suggested Readings

VPY 711  PHYSIOLOGY OF STRESS  2+1  SEM - II

Objective
To teach the mechanism and effect of stress on production and reproduction in domestic animals.

Theory
UNIT-I: Definition of stress, various types of stresses, their effect on animal production and reproduction.
UNIT-II: Physico-chemical changes of blood composition due to exercise and work. Energy utilization and requirement of muscles during work and exercise.
UNIT-III: Capacity of work under field and controlled laboratory conditions, factors that regulate it.
UNIT-IV: Effect of various stresses on endocrine status of animals, endurances in
Practical Measurement of various biochemical parameters during stress and/or exercise in animals, measurement of various hormones during different stresses in animals, measurement of cardio-respiratory reactions during stresses.

Suggested Readings
Selected articles from journals.

VPY 790 SPECIAL PROBLEM 0+2 SEM- I, II
Objective To provide expertise in handling practical research problem(s).
Practical Short research problem(s) involving contemporary issues and research techniques.
VETERINARY PHYSIOLOGY

List of Journals

- Acta Endocrinologica
- Advances in Clinical Chemistry
- Advances in Reproductive Physiology
- Advances in Veterinary Sciences
- American Journal of Clinical Nutrition
- American Journal of Physiology
- American Journal of Veterinary Research
- Animal Nutrition and Feed Technology
- Animal Reproduction Science
- Animal Sciences
- Annual Review of Physiology
- Buffalo Journal
- Domestic Animal Endocrinology
- Indian Journal of Animal Reproduction
- Indian Journal of Animal Nutrition
- Indian Journal of Animal Physiology
- Indian Journal of Animal Research
- Indian Journal of Animal Science
- Indian Veterinary Journal
- Journal of Endocrinology
- Journal of Physiology
- Journal of Reproduction and Fertility
- Neuroendocrinology

E-Resources

- http://intl-joe, endocrinology-journals.org (Journal of Endocrinology)
- www.jneurosci.org (Journal of Neuroscience)

Suggested Broad Topics for Master’s and Doctoral Research

- Manipulation of rumen fermentation to enhance growth and productivity in ruminants.
- Normal renal functions of domestic animals.
- To study the mechanism of regulation of various hormones involved in production and reproduction in domestic animals.
- Dietary effects on growth and production in poultry.
### VETERINARY BIOCHEMISTRY

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# VETERINARY BIOCHEMISTRY

## Course Contents

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<th>2+0</th>
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<td><strong>Objective</strong></td>
<td>Teaching of principles of physical chemistry as applicable to veterinary sciences.</td>
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| **Theory** | **UNIT-I:** Pre-biotic world, chemical evolution. cellular architecture, molecular organization and metabolic function.  
**UNIT-II:** Thermodynamics, chemical equilibrium, standard state, living cell as steady state, open system obeying laws of thermodynamics. Minimum energy conformation, quantum mechanical calculation. ΔG and ATP.  
**UNIT-III:** Properties of water, homeostasis, pH, osmosis, viscosity, surface forces, adsorption, dialysis, diffusion rate and the sizes of organisms. The blood buffering system. Chemical basis of oral and parental fluid/electrolyte therapies, Bacterial toxigenic diarrhoeas. |

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<tr>
<td><strong>Objective</strong></td>
<td>To make students well versed with methodologies used in biochemistry.</td>
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| **Practical** | Solving problems using Henderson–Hasselbalch equation, pH, pKa and buffer concentration, normality. Application of colorimetry, spectrophotometry and NMR-X ray crystallography.  
Paper, column and thin layer chromatography. Partition and adsorption co-efficient, quantitative and qualitative chromatography of amino acids, lipids and sugars including elution. Gas chromatography. Packing of column and choice of detectors and densitometry.  

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<th>VBC 603</th>
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<td><strong>Objective</strong></td>
<td>To acquaint students about molecular basis of structure and functional aspects of NA and AA.</td>
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<td><strong>Theory</strong></td>
<td><strong>UNIT-I:</strong> Nucleotides, nucleic acids, high order structures, cohesions and condensins in chromosome structure. SMC proteins, sequencing, mutation, evolution. DNA libraries. Bacterial RNA polymerase, RNA interference. DNA replication, RNA synthesis, control</td>
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655
of gene expression. DNA microarrays/chips.


Suggested Readings


VBC 604 BIOCHEMISTRY OF BIOMOLECULES: 2+0 SEM - I CARBOHYDRATES, LIPIDS AND MEMBRANE STRUCTURE

Objective
Teaching of molecular basis of structure and functional aspects of carbohydrates and lipids.

Theory
UNIT-I: Carbohydrates: Structure, glycoconjugates in cell surface, extra cellular matrix, sugar code functions, peptidoglycan-specific antibiotics. Cellular effects of Insulin, Glucose supply and removal, Ruminal fermentation, role of liver, glucose tolerance, indirect monitoring of blood glucose, ketone bodies.

UNIT-II: Lipid classification, metabolism of LCFA, TAG, PL, Sphingolipids, cholesterol, lipoproteins. Regulation of lipid metabolism in fed and fasted states. Regulation of FA oxidation. FAs as regulatory molecules. Glucose production and FAs in type II diabetes. Ketone bodies as fuel.


Suggested Readings


VBC 605 ENZYME CATALYSIS, KINETICS, 2+0 SEM - II INHIBITION AND REGULATION

Objective
To givethorough knowledge of molecular basis of enzyme action in relation to diagnostic importance.

Theory
UNIT-I: Mechanisms: Enzyme activation energy and reaction co-ordination, acid- base, covalent, metal ion. Proximity and orientation effects. Preferential transitional state
binding.


Suggested Readings

VBC 606 METABOLISM-I: CARBOHYDRATES AND LIPIDS

Objective
To teach regulatory mechanisms of carbohydrates and lipids metabolism in health and diseases.

Theory
UNIT-I: Metabolic control, analysis for enzymes limiting the flux through a pathway. Trophic strategies, universal mapping of metabolic pathways. Thermodynamic relationships. ΔG, ATP and phosphoryl group transfer, coupled reactions, thioesters, NAD+ and FAD.
UNIT-II: Overview of carbohydrate, and lipid cycles, control of glycolysis, glycolysis in cancer cells, control of pentose phosphate pathways, deficiency of glucose-6-phosphate dehydrogenase. Control of glycoegen metabolism, control of gluconeogenesis. GSD. Regulation of citric acid cycle, pathways that use citric acid intermediates, Sugar interconversions and nucleotide– linked sugar formation. Disorders associated with impairment of metabolism.
UNIT-IV: Regulation of fatty acid metabolism, inhibitors of fatty acids biosynthesis, sphingolipid degradation and lipid storage disease. Regulation of cholesterol synthesis. PGs in NSAID, leukotrienes, HETEs, hypersensitivity. Influence of glucose metabolism on lipid metabolism.

Suggested Readings

VBC 607 METABOLISM - II: NUCLEIC ACIDS AND AMINO ACIDS

Objective
To understand regulatory mechanisms of amino acid and nucleic acid metabolism in health and diseases.

Theory
UNIT-I: Overview of pathways of amino acid and nucleic acid metabolism. Lysosomal degradation, ubiquitin, proteosome, breakdown of amino acids, heme biosynthesis and degradation, biosynthesis of physiologically active amines. Nitric oxide, homocystein as marker of disease. Diseases of amino acid metabolism, porphyrias.
UNIT-II: Nucleotide synthesis and degradation, inhibition of thymidylate synthesis in
cancer therapy. Mutation in coenzyme binding sites and diseases. Forces stabilizing NA structure, restriction endonucleases, small inhibitory RNAs. Chromatin organization. Inhibitors of topoisomerases as antibiotic and anti-cancer agents, interfering with purine and pyrimidine metabolism.


Suggested Readings

VBC 608 METABOLISM–II: INTEGRATION AND REGULATION 2+0 SEM-II

Objective
To give exposure in inter-relationship of cellular metabolism of various macromolecules.

Theory
UNIT-I: Regulation and integration of all metabolic pathways.
UNIT-II: Organ specialization in fuel metabolism: Brain, muscle, adipose tissue, liver, kidney, inter organ metabolic pathways, hormonal control of fuel metabolism. Tracing metabolic fates, perturbing the system.
UNIT-III: Signal transduction, gated ion channels, G-proteins, adenylate cyclase, receptor tyrosine kinase, protein phosphatases, cGMP, Ca²⁺, interaction with phosphoserine/tyrosine, integrations, drugs and toxins, cell cycle and CDKs that affect cell signaling.

Suggested Readings

VBC 609 CENTRAL DOGMA AND PROTEIN FUNCTION 2+0 SEM - I

Objective
Teaching of applied aspects of replication, transcription and translation.

Theory
UNIT-I: Overview of transcription and translation in eukaryotes. Collision between DNA polymerase and RNA polymerase, inhibitors of transcription, introns, evolution and expansion of the genetic code.
UNIT-III: Actin structure, microfilament dynamics, actin-myosin reacting cycle, tubulin dimer, microtubules dynamics, kinesins, dyehins.
UNIT-IV: Antigen-antibody binding, cytokines, principles of immunochemical methods: agglutination, precipitation, typing of major histo-compatibility antigens. Blood group substances in farm animals.

Suggested Readings

VBC 610 CLINICAL BIOCHEMISTRY OF ANIMALS 2+1 SEM - I
Objective
To make a student well versed with biochemical basis for diagnosis and prognosis of diseases in animals and poultry.

Theory
UNIT-II: Myocardial infarction, respiratory distress syndrome. Primary renal dysfunctions and test, doping. Problems in game horses.

Practical
Estimation of constituents (enzymes, metabolites and electrolytes) of body fluids during normal and pathological conditions. Estimation of hormones. Liver and kidney function tests. Total volatile fatty acids and the fractions in ruminants.

Suggested Readings
Jurisica I & Wigle D. 2006. Knowledge and Discovery in Proteomics. CRC.

VBC 611 BIOCHEMICAL BASIS OF DISEASES OF 2+0 SEM - II
DOMESTIC ANIMALS
Objective
To give a detailed overview of role of biomolecules in health and diseases in animals and poultry.

Theory
UNIT-I: Diabetes mellitus, hyperinsulemia, galactosemia, hypoglycaemia of baby pigs, Glycogen Storage Disease. Carbohydrate balance in ruminants. Biochemical alterations in body fluids of ruminants in hypoglycaemia, Ruminant ketosis.
Suggested Readings

VBC 612 ENDOCRINOLOGY AND REPRODUCTIVE BIOCHEMISTRY

Objective
To give a conceptual discussion on role of biomolecules in health and diseases in animals and poultry.

Theory
UNIT-I: Mechanism of hormone action, Receptor binding, biosynthetic and metabolic aspects in physio-pathology of hormones, factors, and minerals.
UNIT-II: Metabolic functions of the hormones of the hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal, pineal, ovaries and testes. Biochemistry of prostaglandins and related agents. Clinical endocrine aspects in production and reproduction status in domestic animals and poultry.

Suggested Readings

VBC 613 BIOCHEMICAL BASIS OF ANIMAL PRODUCTION

Objective
To teach about biochemistry of draft capacity, meat production and dairy chemistry.

Theory
UNIT-II: The biochemistry controlling postmortem energy metabolism mechanisms. Application of genomic technologies to the improvement of meat quality of farm animals. Identification of meat quality parameters by proteomics. Application of proteomics to understand the molecular mechanisms behind meat quality. Oxidative stability of post mortem muscles from sheep of various ages.
UNIT-III: Metabolic demands of draft animals, and biochemical aspects of work and kinesiology.

Practical
Biochemical tests for proteins of meat, milk and egg and analysis of wool structure.

Suggested Readings

VBC 701 ADVANCES IN BIOCHEMISTRY OF RUMINANT DISORDERS

Objective
To give exposure about biochemical changes in diseases of ruminants.

Theory
UNIT-I: Comparative ruminant metabolism, metabolism of various nutrients by microflora. Postruminal digestion of dietary and microbial biomolecules.
UNIT-II: Metabolic disorders of rumen and recent development in disorders of ruminants associated with protein, carbohydrate and fat metabolism.
UNIT-III: Recent development in disorders of ruminants associated with mineral and electrolyte metabolism.

**Suggested Readings**
Selected articles from journals.

**VBC 702 ADVANCES IN ENZYMEOLOGY 2+0 SEM - II**

**Objective**
To teach current developments in actions of enzymes.

**Theory**
UNIT-I: Current concept on how enzymes work.
UNIT-II: Recent innovations in enzymes kinetics to understand mechanism.
UNIT-III: Current topics on regulatory enzymes.
UNIT-IV: Lysozymes, serine proteases, drug design.

**Suggested Readings**
Selected articles from journals.

**VBC 703 ADVANCES IN CLINICAL BIOCHEMISTRY 0+2 SEM - II**

**Objective**
To educate students about current developments in clinical biochemistry.

**Theory**
UNIT-I: Scope of clinical biochemistry and its application in disease diagnosis.
UNIT-II: Molecular basis of cell injury and diseases.
UNIT-III: Molecular basis of autoimmunity, immunodeficiency, oncogenesis.

**Practical**
Nucleic acid extraction, protein arrays, RT-PCR, hybridization, electrophoretogram ad chromatogram of macromolecules.

**Suggested Readings**
Selected articles from journals.

**VBC 704 MEMBRANE DYNAMICS AND SIGNAL TRANSDUCTION IN ANIMAL CELL 2+0 SEM - I**

**Objective**
Discussions on recent developments in membrane function.

**Theory**
UNIT-I: Developments in physical & chemical features of biological transport.
UNIT-II: Developments in membrane dynamics.
UNIT-IV: Developments in molecular mechanisms of signal transduction, regulation by steroid hormone, protein kinases.
UNIT-V: Developments in signaling in microorganisms, special senses.

**Suggested Readings**
Selected articles from journals.

**VBC 705 METHODS IN PROTEIN ANALYSIS 2+1 SEM - I**

**Objective**
Discussions on contemporary information on techniques in protein research.

**Theory**
UNIT-I: Separation, purification and characterization of proteins in ECF and membrane.
UNIT-III: Use of FRET (fluorescence resonance energy transfer) to measure transient changes in second messenger or protein kinase activity in living cell. Proteomics.
Practical
Proteomics, protein quantification.

Suggested Readings
Selected articles from journals.

VBC 706  NUTRITIONAL BIOCHEMISTRY  2+0  SEM - I

Objective
To give exposure about biochemical principle as applicable to nutrition in animals and poultry.

Theory
UNIT-I: Evolution of diet and nutritional status of animals, digestion, absorption in ruminants, equine and poultry.
UNIT-II: Calorimetry, BMR, SDA, PER, nutritional need for growth, work, production and disease. Parental nutrition.
UNIT-III: Obesity, food additives and naturally occurring toxic substances in food, dietary factors in carcinogenesis, free radical, antioxidant and pro-oxidant.

Suggested Readings
Selected articles from journals.

VBC 707  ADVANCES IN INTERMEDIARY METABOLISM  2+0  SEM - I

Objective
To teach methods and approaches in research on metabolism.

Theory
UNIT-I: Energy transformation in living cell, enzymes system, high energy compounds.
UNIT-II: Overview of cycles, role of TCA in producing biological precursor in evolution. Control of fatty acid metabolism, lipoprotein metabolism, pathways of amino acids, integration of cycles, metabolism of purines, pyrimidines. CoA, NAD+, FAD+ and ATP.
UNIT-III: Analytical approaches in studies on intermediary metabolism.

Suggested Readings
Selected articles from journals.

VBC 708  ENDOCRINE CONTROL OF FUEL METABOLISM  2+0  SEM - II

Objective
To study hormonal regulation and integration of mammalian metabolism.

Theory
UNIT-I: Hormone: Diverse structure for diverse functions.
UNIT-II: Tissue specific metabolism.
UNIT-IV: Regulation of body mass, production of beef, egg, poultry and fish.

Suggested Readings
Selected articles from journals.

VBC 709  DIAGNOSTIC ENZYMEOLOGY - I  2+0  SEM - I

Objective
To expose students about use of enzymes in diagnostics.

Theory
UNIT-I: History, development, validation of clinical enzyme assay.
UNIT-II: Assay of enzymes in clinical cases. Enzyme uria. Enzymes in pathogenesis.
UNIT-III: Enzyme histochemistry and cytochemistry, immobilized enzymes. Enzyme immuno diagnostics, molecular genetics.

Suggested Readings
Selected articles from journals.

VBC 710  DIAGNOSTIC ENZYMEOLOGY - II  2+0  SEM - II

Objective
To provide in-depth knowledge about enzymes in diagnosis of diseases of animals and poultry.
Theory

UNIT-I: Phosphatases, creatine kinase in diagnosis of diseases of animals and poultry.
UNIT-II: Amino transferases, trypsin in diagnosis of diseases of animals and poultry.
UNIT-III: Dehydrogenases in diagnosis of diseases of animals and poultry.
UNIT-IV: Cholinesterase, lipase, amylase, GGT, GTPx, arginase, AST, ALT & SDH in diagnosis of diseases of animals in poultry. Enzymes in pathogenesis.

Suggested Readings
Selected articles from journals.

VBC 711 BIOCHEMISTRY OF DEVELOPMENT AND DIFFERENTIATION 2+0 SEM - I

Objective
To develop understanding of biochemical basis of embryo development in mammals and aves.

Theory
UNIT-I: Molecular basis of reproductive events including gametogenesis, fertilization, embryo development and differentiation, gene knock out
UNIT-II: Homeotic gene maintenance and repair of body tissue.
UNIT-III: Biochemical basis of chick and fetal development

Suggested Readings
Selected articles from journals.

VBC 712 ADVANCES IN TECHNIQUES IN BIOCHEMISTRY 0+2 SEM - I, II

Objective
To expose students about current developments in techniques used in animal biochemistry.

Practical
Tracer methodologies as applied to problems in biochemistry. Electrophoresis, HPLC, GLC & TLC, spectrometry as applied to problems in biochemistry. X-Ray-Crystallography, NMR Spectrometry. Atomic absorption spectrophotometry as applied to problems in biochemistry. Ultracentrifugation as applied to problems in biochemistry.

Suggested Readings
Selected articles from journals.

VBC 713 ADVANCES IN MINERAL AND VITAMIN METABOLISM AND RELATED DISEASES 2+0 SEM - II

Objective
To expose students to latest class material to be given on recent trends in research on cofactor and mineral metabolism disorders in animals.

Theory
UNIT-I: Biochemical basis of conditions related to nutrient deficiency and excess.
UNIT-II: Metabolism of Ca, P, Mg, Na, K and the related diseases in animals and poultry.
UNIT-III: Minerals and B Vitamins as cofactors and their metabolism in livestock and poultry.
UNIT-IV: Biochemical mechanisms of fat soluble and water soluble vitamins and their metabolism in livestock and poultry.

Suggested Readings
Selected articles from journals.

VBC 790 SPECIAL PROBLEM 0+2 SEM - I, II

Objective
To provide expertise in handling practical research problem(s).

Practical
Short research problem(s) involving contemporary issues and research techniques.
VETERINARY BIOCHEMISTRY

List of Journals

- Indian Journal of Chemical Technology
- Indian Journal of Biochemistry and Biophysics
- Indian Journal of Chemistry - Section B
- Indian Veterinary Journal
- Journal of Chemical Sciences
- Journal of Indian Chemical Society
- Meat Science - An International Journal
- The EMBO Journal
- Theriogenology
- Trends in Biochemical Sciences

E-Resources

- www.niscair.res.in/ScienceCommunication (Indian Journal of Biochemistry)
- www.medind.nic.in/iaf/iafm.shtml (Indian Journal of Clinical Biochemistry)
- www.ijcb.co.in (Indian Journal of Clinical Biochemistry)
- www.mcponline.org (Molecular & Cellular Proteomics)
- www.elsevier.com/vj/proteomics (Proteomics Virtual Journal)
- www.elsevier.com (Journal of Proteomics)
- www.elsevier.com (Clinical Biochemistry)
- www.sciencedirect.com/science/journal (Science Direct –Clinical Biochemistry)
- www.jbc.org (Journal of Biological Chemistry)

Suggested Broad Topics for Master’s and Doctoral Research

- Biochemical parameters in body fluids of patients in livestock and poultry
- Assay of enzymes for diagnosis of diseases in poultry and livestock.
- Endocrine studies on domestic and companion animals in relation to production and health status