## VETERINARY PHYSIOLOGY

### Course Structure - at a Glance

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VPY 601: PHYSIOLOGY OF DIGESTION 2+1

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-reticular motility, its significance and control.

UNIT V
Rumen microbiology. Digestion in birds.

Practical

Suggested Readings

VPY 602: CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY 2+1

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

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 II

Quantitative analysis of renal function, renal haemodynamics. Glomerular filtration- its mechanism and measurement. Permeselectivity of the glomerular capillary wall, structural basis of GFR, tubular reabsorption and transport.

UNIT III


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  
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.

UNIT III
Immunity, immunoglobulins, immunogenetics, polymorphism in hemoglobin, transferrin etc. Changes in blood during diseases. Iatrogenic blood diseases, hemorrhagic diathesis, hemophilias.

UNIT IV

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  
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.
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

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.

UNIT III
Male mating behaviour, spermatogenesis, spermiogenesis, Seminiferous, epithelial cycles. Spermatozoa- structure and composition, maturation and transportation. Secretions of male reproductive tract.

UNIT IV
Transport of male and female gametes, fertilization, implantation. Pregnancy and parturition. Post-partum recovery in different species of domestic 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

Objective:

UNIT I
To teach physiological basis of clinical abnormalities in body functions. 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

Suggested Readings
**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 II**


**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. 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 of study bioregulation including methods of endocrine analysis. Manipulation and disruption of biorhythms in homeostatic and natural ecosystem.

UNIT II

UNIT III
Genetic and genomic approaches in endocrinology. Animal models and alternate uses of animal model. Regulation and metabolism of hypothalamic, hypophyseal, thyroid and adrenal hormones.

UNIT IV

UNIT V

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 70: 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 III**

**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.

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**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 III**

**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

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 II


UNIT III


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

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

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.

UNIT IV


Practical


Suggested Readings

Selected articles from journals.
VPY 705: MYOPHYSIOLOGY AND KINESIOLOGY  
2+1

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.

UNIT IV

Practical

Suggested Readings
Selected articles from journals.

VPY 706: AVIAN PHYSIOLOGY  
2+1

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

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.
VPY 707: PHYSIOLOGY OF LACTATION 2+1

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 III

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.

VPY 708: ADVANCES IN ENVIRONMENTAL PHYSIOLOGY AND GROWTH 2+1

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

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.

UNIT IV

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 AND METABOLISM 2+1

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

**Theory**

**UNIT I**
Introduction to rumen bacteria, protozoa and fungi. Development and natural fluctuation in rumen microbial population.

**UNIT II**
Microbial ecology and physiology of feed degradation within the rumen. Metabolism of nitrogen containing compounds.

**UNIT III**
Degradation of carbohydrate, fat and protein by rumen microbes, NPN utilization, Microbe-microbe interaction. Protected nutrients and other feed additives.

**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

**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

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 animals.

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

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

Practical

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