

Unit 1: Cellular Basis of Animal Physiology

Animal cell ultra-structure, composition and functions. Physio-chemical laws and membrane phenomena. Body fluid and its dynamics. Transport through biological membranes.

Unit 2: Blood and Circulation

Composition of blood, structure & functioning of its constituents. Hematopoiesis. Blood coagulation and anticoagulants. Hemoglobin and its polymorphism. Anaemias. Reticulo-endothelial System. Body defense mechanism and immunogenesis. Electrophysiology of heart. Electro-cardiography – Principles and interpretation. Hemodynamics and concerned biophysical principles. Capillary fluid exchange, microcirculation and lymphatic circulation. Neural and humoral control of heart and blood vessels. Cardiac Output and vascular reflexes. Autoregulation mechanism in the heart, Regional circulation – coronary, pulmonary, cerebral, muscle, kidney and skin. Blood brain barrier. Circulatory shock and hypertension and cardiac failure.

Unit 3: Respiration

Mechanics of respiration. Neural and chemical control of respiration. Lung capacity and volumes. Gaseous transport and exchange. Hypoxia. Physiology of hypo-barrism and high altitude. Work and exercise physiology.

Unit 4: Excretion

Modern concepts of urine formation. Control of renal circulation. Secretion and absorption in renal tubules. Regulation of acid-base balance by blood buffers, lungs and kidneys. Hormonal and renal regulation of body fluids dynamics and electrolyte balance. Physiology of micturition. Uremia and other renal disorders.

Unit 5: Digestion

Control of motility and secretion of alimentary canal. Gastric hormones and reflexes in the control of digestive functions. Control of rumen motility. Digestion in ruminant and monogastric animals. GI motility and absorption from rumen and the digestive tract. Manipulation of rumen microflora to enhance fibre digestion and microbial protein synthesis. Nitrogen recycling and rumen bypass mechanisms. Post-ruminal digestion. Physiology of rumen disorders.

Unit 6: Muscle Physiology

Muscle types and their intra-cellular contractile mechanisms. Electrophysiology of muscles. Neuromuscular junction. Excitation contraction coupling, its biochemical and ionic mechanisms. Molecular basis of muscle contraction. Rigor mortis and muscle fatigue.

Unit 7: Nervous System

General organization of nervous system. Neurone structure and function. Excitability and transmission of impulse in neuron and muscle. Junctional transmission. Neuro-transmitters. Reflex action. Initiation of impulses from sense organ/receptors. Functions of spinal cord, brain stem and cerebellum. Limbic system and cerebral cortex. Hypothalamus and its autonomic functions in endocrine and visceral regulation. Ascending and descending tracts. Cerebral cortex, its role in motor and sensory functions. Physiology of learning and memory. Physiology of pain. Special senses (hearing, vision, taste, smell etc.).

Unit 8: Endocrinology

Hormones. Hormone receptors. Mechanism of hormone action at cellular and subcellular levels. Feedback control of hormone secretion. Hypothalamic – hypophyseal axis. It should include (i) Hypothalamic – hypophyseal axis controlling secretions from thyroid, parathyroid, adrenal and gonads, (ii) Endocrine control of general metabolism. Hypothalamic releasing and inhibiting factors. Pineal gland and its hormones. Hormones of hypophysis and all other endocrine glands. Mechanisms of different hormone actions. GI hormones. Endocrine disorders.

Unit 9: Reproduction and lactation

Gonadal hormones and their functions in male and female. Neuroendocrine-gonadal axis and feedback regulation. Male spermatogenesis. Accessory sex glands. Sexual behaviour erection, ejaculation etc. Semen evaluation. Factors affecting reproduction. Artificial insemination – collection, preservation and transport and semen diluents. Freezing of semen. Oogenesis. Follicular development. Ovulation. Corpus luteum. Reproductive cycles in animals. Factors affecting reproductive cycles. Female reproductive hormones. Oestrous synchronization, super-ovulation. Sperm capacitation and acrosomal reaction. Sperm and ovum transport in female genital tract. Fertilization. Implantation. Maternal recognition of pregnancy, Maintenance of pregnancy and its hormonal control. Physiology of placenta. Physiology of parturition and its hormonal control. Embryo transfer – collection, preservation, transport and transfer of embryos. Oocyte culture. In vitro fertilization. Mammary gland growth before puberty, during pregnancy and after parturition and its hormonal control. Lactation-Hormonal control of mamogenesis, lactogenesis and galactopoiesis. Milk let-down and persistency of milk secretion. Physiology of cessation of lactation and transition period. Physiology of cessation of lactation and transition period. Mammary gland involution. Milk precursors, synthesis of milk constituents and factors affecting it. Mastitis Methods of studying mammary uptake of nutrients, Ultrastructure of lactating mammary gland. Milk composition in different animals.

Unit 10: Physiology of Growth

Concept and definition. Growth regulation and factors affecting prenatal and post-natal growth. Role of growth in production. Growth curve and growth measurement, body conformation.

Unit 11: Climate Physiology

Physiology of climatic stress. Adaptation and acclimatization. Effects of stress on production and reproduction. Neuro-hormonal regulation of body temperature in homeotherms. Mechanism of adaptation. Photoperiodicity and biological rhythms. Design of shelters / animal houses for different class of livestock for different climate conditions. Heat stress alleviation tools, physiological and biochemical markers of thermal stress