

VETERINARY BIOCHEMISTRY

Course Structure - at a Glance

CODE	COURSE TITLE	CREDITS
VBC 601	CHEMISTRY OF ANIMAL CELL	2+0
VBC 602	TECHNIQUES IN BIOCHEMISTRY	0+2
VBC 603	APPLICATIONS OF GENOMICS AND PROTEOMICS IN MOLECULAR BIOLOGY	2+0
VBC 604	BIOCHEMISTRY OF BIOMOLECULES: CARBOHYDRATES, LIPIDS AND MEMBRANE'S STRUCTURE	2+0
VBC 605	ENZYME CATALYSIS, KINETICS, INHIBITION AND REGULATION	2+0
VBC 606	METABOLISM-I: CARBOHYDRATES AND LIPIDS	2+0
VBC 607	METABOLISM-II: NUCLEIC ACIDS AND AMINO ACIDS	2+0
VBC 608	METABOLISM-III: INTEGRATION AND REGULATION.	2+0
VBC 609	CENTRAL DOGMA AND PROTEIN FUNCTION	2+0
VBC 610	CLINICAL BIOCHEMISTRY OF ANIMALS	2+1
VBC 611	BIOCHEMICAL BASIS OF DISEASES OF DOMESTIC ANIMALS	2+0
VBC 612	ENDOCRINOLOGY AND REPRODUCTIVE BIOCHEMISTRY	2+0
VBC 613	BIOCHEMICAL BASIS OF ANIMAL PRODUCTION	2+1
VBC 691	MASTER'S SEMINAR	1+0
VBC 699	MASTER'S RESEARCH	20
VBC 701	ADVANCES IN BIOCHEMISTRY OF RUMINANT DISORDERS	2+0
VBC 702	ADVANCES IN ENZYMOLOGY	2+0
VBC 703	ADVANCES IN CLINICAL BIOCHEMISTRY	0+2
VBC 704	MEMBRANE DYNAMICS AND SIGNAL TRANSDUCTION IN ANIMAL CELL	2+0
VBC 705	METHODS IN PROTEIN ANALYSIS	2+1
VBC 706	NUTRITIONAL BIOCHEMISTRY	2+0
VBC 707	ADVANCES IN INTERMEDIARY METABOLISM	2+0
VBC 708	ENDOCRINE CONTROL OF FUEL METABOLISM	2+0
VBC 709	DIAGNOSTIC ENZYMOLOGY-I	2+0
VBC 710	DIAGNOSTIC ENZYMOLOGY-II	2+0
VBC 711	BIOCHEMISTRY OF DEVELOPMENT AND DIFFERENTIATION	2+0
VBC 712	ADVANCES IN TECHNIQUES IN BIOCHEMISTRY	1+1
VBC 713	ADVANCES IN MINERAL AND VITAMIN METABOLISM AND RELATED DISEASES	2+0
VBC 790	SPECIAL PROBLEM	0+2
VBC 791	DOCTORAL SEMINAR I	1+0
VBC 792	DOCTORAL SEMINAR II	1+0
VBC 799	DOCTORAL RESEARCH	45

VBC 601: CHEMISTRY OF ANIMAL CELL**2+0**

Objective: Teaching of principles of physical chemistry as applicable to veterinary sciences.

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. AG 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.

Suggested Readings

Chang 2005. *Physical Chemistry for the Bioscience*. Univ. Science Books.

Dvorak AM & Harris W. 1991. *Blood Cell Biochemistry*. 2nd Ed. Plenum. Garby L. 1995. *Bioenergetics*. Cambridge.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 602: TECHNIQUES IN BIOCHEMISTRY**0+2**

Objective: To make students well versed with methodologies used in biochemistry.

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 coefficient, quantitative and qualitative chromatography of amino acids, lipids and sugars including elution. Gas chromatography. Packing of column and choice of detectors and densitometry.

Application of electrophoresis. Electrophoresis of proteins and nucleic acids. Use of sodium dodecyl sulfate and molecular weight determination. Densitometry procedures and quantitative assays. Immunoelectrophoresis, its applications. Isoelectrofocussing and isotacophoresis. Molecular sieving and its application in Biochemistry. General properties of dextran, acrylamide, agar and other media used for gel filtration. Ultracentrifugation- its principle and use, preparative analytical and density gradient ultracentrifugation. Fractionation of sub-cellular components and molecular weight determination using ultracentrifuge.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Garrity S. 1999. *Experimental Biochemistry*. 3^r Ed. Academic Press.

Gowenlock AH. 1996. *Varley's Practical Clinical Biochemistry*. 6th Ed. CBS.

Holme DJ & Hazel P. 1983. *Analytical Biochemistry*. Longman.

Objective: To acquaint students about molecular basis of structure and functional aspects of NA and AA.

Theory**UNIT I**

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 of gene expression. DNA mi croarrays/chips.

UNIT II

PCR, Recombinant DNA technology in improving domestic animals. RELP, Gene and gene products. Genetic changes in hereditary diseases, cancer and detection ion DNA probes. Gene Therapy DNA vaccines, anti-tumor antibodies. Telomerases and Topoisomerases in treatment of diseases. *Staphylococcus* resistance to erythromycin.

UNIT III

Peptide bonds, acid-base properties, stereochemistry, side chain modifications, biological activities. Green fluorescent protein. Polypeptide diversity, protein purification and analysis, protein sequencing, reconstructing the sequence. Gene duplication and protein families, protein modules, combinatorial peptide libraries folding. Structural bio-informatics. Protein structure prediction and design. Proteomics. Drug molecules, myoglobin and haemoglobin. Mechanism and co-operativity in Hb. High altitude adaptation in ruminants and equines. Use of amino acid analysis in disease diagnosis.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Murray RK, Granner DK, Mayes PA & Rodwell, VK. 2000. *Harper's Biochemistry*. Lange Medical Book.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

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

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.

UNIT III

Lipid bilayers, lipid motility, integral membrane proteins, lipid linked proteins, peripheral membrane proteins, fluid mosaic model, membrane skeleton, lipid asymmetry, vesicle trafficking, secretory pathway, membrane rafts, caveolae fusion, lung surfactant, structure of bacterial rhodopsin. thermodynamics of membrane transport, ionophores, porins, ion channels, aquaporins, transport proteins, P and F types (Na⁺ - K⁺) ATPases, Ca²⁺, Ion-gradient, Gap Junction, Cl⁻HCO₃⁻-exchanger, cardiac glycosides, abnormalities in cell membrane fluidity. Haemolytic anaemia.

Suggested Readings

Combs GF. 1992. *The Vitamins - Fundamental Aspects in Nutrition and Health*. Academic Press.

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

VBC 605: ENZYME CATALYSIS, KINETICS, INHIBITION AND REGULATION**2+0**

Objective: To give thorough 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.

UNIT II

Chemical kinetics, enzyme kinetics, kinetic data analysis, bisubstrate reactions. Competitive, Uncompetitive, Mixed inhibitors. Allosteric regulation. Drug design, drug discovery, bioavailability and toxicity, clinical trials. Cytochrome P450 and adverse drug reactions; synthesis of bacterial peptidoglycans, oxygenases, mixed function oxidases. Enzyme linked diagnostics.

UNIT III

Lysozyme. Serine proteases, physiology and tumor cell metastasis. Nerve poisons, blood coagulation cascade, Equine immunodeficiency enzyme inhibitors. Suicide activators (DFMO for inhibition of ornithine decarboxylases in trypanosomiasis).

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Hang C & Wang T. 1988. *Enzyme Dynamics and Regulation*. Springer-Verlag.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 606: METABOLISM-I: CARBOHYDRATES AND LIPIDS**2+0**

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. AG, 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 glycogen 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 III

Electron transport and oxidative phosphorylation. Generation of heat by uncoupling in brown adipose tissue.

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

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Glaser JA & Deutscher MP. 1995. *Introduction to Biophysical Methods for Protein and Nucleic Acid Research*. Academic Press.

Russell TR, Brew K, Faber H & Schultz J. 2001. *From Gene to Protein: Information Transfer in Normal and Abnormal Cells*. Miami Winter Symposium-16. Academic Press.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

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

UNIT I

Overview of pathways of amino acid and nucleic acid metabolism. Lysosomal degradation, ubiquitin, proteasome, 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.

UNIT III

Viral nucleic acids, DNA damage and repair, telomerase, ageing and cancer. Topoisomerases as drug targets. Chemotherapy can target precursors of DNA synthesis. Antibiotics and toxins that target RNA polymerase. Lysosomal enzymes, gout, diseases in purine and pyrimidine nucleotide metabolic impairment.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

Swenson MJ & Reece WO. 1996. *Dukes' Physiology of Domestic Animals*. 11th Ed. Panima.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 608 METABOLISM-III: INTEGRATION AND REGULATION 2+0

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.

UNIT IV

Oncogenes and cancers. Mitochondrial genes and diseases. Reactive oxygen species. Cyanide and arsenic poisoning. Metabolic interrelationships in obesity, diabetes, cancer, aerobic and anaerobic exercise in horses, pregnancy, lactation and stress injury. Mitochondria in apoptosis and oxidative stress. Cell suicide, liver diseases, renal diseases, acid-base balance. Metabolic/sensory transduction in nervous tissue. Vision. Blood coagulation.

Suggested Readings

Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

Kurjan J & Taylor BL. 1993. *Signal Transduction*. Academic Press.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 609: CENTRAL DOGMA AND PROTEIN FUNCTION**2+0**

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 II

The effects of antibiotics and toxins on protein synthesis. X - chromosome inactivation. Eukaryotic gene expression, protein targeting.

UNIT III

Actin structure, microfilament dynamics, actin-myosin reacting cycle, tubulin dimer, microtubules dynamics, kinensins, dyeins.

UNIT IV

Antigen-antibody binding, cytokines, principles of immunochemical methods: agglutination, precipitation, typing of major histocompatibility antigens. Blood group substances in farm animals.

UNIT V

Proteins as infectious agents (prions - BSE). Protein misfolding and aggregation. Plasma proteins, synthesis, functions. Influences of physiological factors and inflammation on proteins. Dysproteinemias. Defects in collagen synthesis. Transmissible multiple drug resistance, transcription factors and cardiovascular diseases. Transferrin, Lactoferrin, Ferritin and Ceruloplasmin.

Suggested Readings

Creighton TE. 1993. *Protein Structures and Molecular Properties*. WH Freeman.

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 610: CLINICAL BIOCHEMISTRY OF ANIMALS**2+1**

Objective: To make a student well versed with biochemical basis for diagnosis and prognosis of diseases in animals and poultry.

UNIT I

Disturbances of gastro-intestinal function, disturbances of rumen function. Lactic acidosis, Pickled pigs and malignant hyperthermia. Diagnosis of neuromuscular disorders.

UNIT II

Myocardial infarction, respiratory distress syndrome. Primary renal dysfunctions and test, doping. Problems in game horses.

UNIT III

Enzymes of diagnostic importance. Toxicity of ammonia in animals. Genetic defects in urea cycle. Lysosomal storage diseases. ATP synthase inhibitory protein during ischemia. Ischaemic - reperfusion injury.

UNIT IV

Molecular oncology and tumor markers. CSF characteristics in diseases. Clinical biochemistry in toxicology. Glycosylated hemoglobin, HbA1c, fructosamine. Deranged glucose metabolism in cancerous tissue. Free Radical damage.

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

Devlin 2005. *Textbook of Medical Biochemistry with Clinical Correlations*. Wiley Liss.

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

Kaneko JJ, Harvey JH & Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

Liebler DL. 2002. *Introduction to Proteomics*. Humana Press.

Pryor WA. 1996. *Free Radicals in Biology*. Academic Press. Searcy RL. 1969. *Diagnostic Biochemistry*. McGraw-Hill.

VBC 611: BIOCHEMICAL BASIS OF DISEASES OF DOMESTIC ANIMALS

2+0

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.

UNIT II

Hypercholesterolemia, atherosclerosis, hyperlipidemia in canine, feline, equine. Pathophysiology of ketonemia. Ketosis associated with fasting, diabetes, pregnancy, lactation and post exercise.

UNIT III

Anemias of the newborn, cytosolic enzyme deficiencies and membrane abnormalities in erythrocytes. Porphyrins and porphyrias. Disorders of iron metabolism, neutrophil function defects and its testing. Equine immunodeficiency.

UNIT IV

Hepatic insufficiencies and its laboratory assessment. Pancreatitis and insufficiency. Metabolic diseases of Ca, P, Mg metabolism. Iron overload and injection, inorganic polyphosphate metabolism.

Suggested Readings

David L Nelson & Cox Michael M. 2007. *Lehninger's Principles of Biochemistry*. 4th Ed. Freeman.

Kaneko JJ, Harvey JH, Bruss ML. 1999. *Clinical Biochemistry of Domestic Animals*. 5th Ed. Academic Press.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 612: ENDOCRINOLOGY AND REPRODUCTIVE BIOCHEMISTRY

2+0

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

Morgane PJ & Panksepp J. 2002. *Hand Book of Hypothalamus*. Dekker.

Nes WR & McKean ML. 1977. *Biochemistry of Steroids and other Isoprenoids*. University Park Press.

Voet D, Voet JG & Pratt CW. 2006. *Fundamentals of Biochemistry of Life at the Molecular Level*. 2nd Ed. John Wiley & Sons.

VBC 613: BIOCHEMICAL BASIS OF ANIMAL PRODUCTION**2+1**

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

Theory**UNIT I**

Chemistry of milk lipids, proteins, carbohydrates, minerals, vitamins, pigments, and enzymes. Structure of milk lipids, fat globular membranes, modification of milk fat. Milk proteins - casein, amino acid composition, whey proteins, immunoglobulins, genetic polymorphism. Carbohydrates: structure and sweetness.

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

Eston R & Reilly T. 1986. *Kinanthropometry and Exercise Physiology*. Laboratory Manual.

E & FN SPON. Hay JG. 2002. *Basic Mechanics of the Skeletal System*. Prentice Hall.

Hudson BJE. 1994. *New Developing Sources of Food Proteins*. Chapman & Hall.

Jenness R & Patton S. 2001. *Principles of Dairy Chemistry*. Wiley Eastern.

Miller GD, Jarus JK & McBean LD. 2004. *Dairy Food and Nutrition*. CRC.

VBC 701: ADVANCES IN BIOCHEMISTRY OF RUMINANT DISORDERS**2+0**

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 ENZYMOLOGY

2+0

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

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.

UNIT IV

Functional tests : DNA finger printing, micro and mini satellites, PCR-RFLP in clinical biochemistry, DNA microarrays. Biomolecular prospecting and molecular designing.

Practical

Nucleic acid extraction, protein arrays, RT-PCR, hybridization, electrophoretogram and chromatogram of macromolecules.

Suggested Readings

Selected articles from journals.

VBC 704: MEMBRANE DYNAMICS AND SIGNAL TRANSDUCTION IN ANIMAL CELL

2+0

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 III

Developments in solute transport across membrane.

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

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

Theory

UNIT I

Separation, purification and characterization of proteins in ECF and membrane.

UNIT II

Subcellular organization of proteins fused with green fluorescent protein. High throughput methodologies for determining protein structure.

Investigating protein with mass spectrometry. Method of determining three dimensional structure of protein. Use of atomic force microscopy in visualizing protein complexes and membrane surfaces.

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**

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**

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**

Objective: To study hormonal regulation and integration of mammalian metabolism.

UNIT I

Hormone: Diverse structure for diverse functions.

UNIT II

Tissue specific metabolism.

UNIT III

Hormonal regulation of fuel metabolism.

UNIT IV

Regulation of body mass, production of beef, egg, poultry and fish.

Suggested Readings

Selected articles from journals.

VBC 709: DIAGNOSTIC ENZYMOLOGY – I

2+0

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 urea. 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 ENZYMOLOGY – II

2+0

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

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

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**

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**

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 & 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**

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

Practical

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