College of Veterinary Science and Animal Husbandry
Kamdhenu University, Bhuj (Kutch)

DEPARTMENT OF VETERINARY PHYSIOLOGY & BIOCHEMISTRY

About Department

The Department of Veterinary Physiology & Biochemistry was started very recently as per MSVE 2016, for the ultimate benefits to the farmers and students in and around the Kutch region. The initial priority is to establish the minimum standard of UG teaching with respect to infrastructure facilities and laboratory instruments. At present the department is functioning under the principal office. Department will be actively involved in UG & PG teaching, strengthening of the diagnostic facilities at the veterinary college and research activities incorporating the rich livestock diversity of Kutch.

Faculty Details

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Designation:	Assistant Professor & Head
Qualification:	M.V.Sc.
Experience:	02 Years
PG Students Guided	-
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Name:	**Dr. Joshi Axaykumar Babulal**
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Summary of Publications

Sr. No.	Detail	Numbers
1.	Research Paper (National Journal)	16
2.	Research Paper (International Journal)	18
3.	Short Communications	01
4.	Recommendations	--
5.	Book/ Booklets	03
6.	Chapters in Books	17
7.	Training Manual / Practical Manual	07
8.	Technical Bulletins	--
9.	Review articles in scientific journals	07
10.	Popular articles in vernacular languages	13
11.	Informative leaflets / folders for farmers	02

Awards

Sr. No.	Details	Number of Awards
1.	National	--
2.	International	-
3.	Scientific Society/Body/Agency Awards for best paper presentation	01
4.	Scientific Society Awards for best poster presentation	02
5.	Best article award	--
6.	Best Thesis Award	02
7.	Best Teachers award	-
8.	Others	02

Details of Awards

Sr. No.	Name of Award	Name of Awardee	Year	Instituted by
1.	Poster Presentation Award	Dr. M. K. Patel	2025	ISAPM
2.	Best MVSc Thesis Award	Dr. M. K. Patel	2024	SAPI
3.	Poster Presentation Award	Dr. A. B. Joshi	2023	SVSBT
4.	Best Thesis award	Dr. A. B. Joshi	2023	ICMRP
5.	Oral Presentation award	Dr. A. B. Joshi	2023	ICMRP
6.	ICAR-Junior Research Fellowship	Dr. M. N. Thumar	2020	ICAR
7.	Vice Chancellor's Gold Medal	Dr. M. N. Thumar	2020	JAU

Achievements

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UG Academics

UG Course (As per VCI MSVE 2016 course curriculum)

Sr. No.	Course offered in First Professional Year	Credits Hours
1	Veterinary Physiology	4+1
Sr. No.	**Course offered in Second Professional Year**	**Credits Hours**
1	Veterinary Biochemistry	2+1

UG Syllabus – First Professional year

Veterinary Physiology

Theory

Unit	Contents
Unit 1	**BLOOD, CARDIOVASCULAR, NERVOUS AND MUSCULAR SYSTEMS** Introduction to Blood; Properties of blood as a body fluid, metabolism and fate of R.B.C; Hemoglobin-chemical structure, synthesis, physiological functions, derivatives of hemoglobin; Heart- morphological characteristic, systemic excitability conduction and transmission processes. Cardiac Cycle: Regulation of cardiac output; coronary circulation; properties of pulse; metabolism and energetic of working myocardial cell, extrinsic and intrinsic regulation; Electro Cardio Graph and its significance in Veterinary Sciences - Echocardiography. Haemorrhage haemostasis. Haemodynamics of circulation, circulatory mechanics, resistance to flow, vasoconstriction, nervous and circulating fluid volume controls of blood pressure, neurohormonal control of vascular smooth muscle. Circulatory controls- shock stresses, regional and fetal circulation. Capillary exchange, control of blood pressure. Adjustment of circulation during exercise. Muscle Physiology-basic muscle unit characteristic-electrical phenomenon in muscle cell - muscle action potential, excitation and propagation of impulse characteristics-latent period refractive ness, threshold level-all and none characteristics - contractile mechanism - excitation - contraction coupling-neuro-muscular transmission, types of muscle contraction, phenomenon of fatigue, rigor mortis. Organization of nervous system- Mechanism of information processing, hierarchical control. Major function system- sensory, consciousness, emotion, motor and visceral control and basic functional unit - neuron structure, type- functional characteristics of sub-units of neuron. Membrane potential - ionic basis of resting membrane potential (RMP) nerve action potential, excitation and propagation of impulse characteristics-latent period- refractive-ness, threshold level-all and none characteristics. Degeneration and regeneration of nerve fibre. Synaptic and junctional transmission. Functions of nervous system-reflexes-control of posture and movements, autonomic nervous system and visceral control. Neurotransmitter wakefulness, sleep cycle. Higher function of neurons system - learning, memory, electroencephalography. Sense organs and receptors physiology of special senses - Eye: functional morphology, nourishment and protection neural pathway, receptors- optics, ocular muscles and movements, photochemistry, Vision defects Ear: Physiology of hearing and common hearing impairment. Vestibule apparatus. Physiology of olfaction and taste
Unit 2	**DIGESTIVE AND RESPIRATORY SYSTEMS**

	Morphological characteristic of mono gastric and poly gastric digestive system. Prehension, rumination; defecation; vomition; regulation of secretory function of saliva, stomach, intestine, pancreas; bile secretion; hunger, appetite control, developmental aspects of digestion; luminous, membranous and microbial digestion in rumen and intestine; permeability characteristics of intestine, forces governing absorption, control intestinal transport of electrolyte and water, enzymatic digestion in monogastric and fermentative digestion in rumen, modification of toxic substances in rumen. Digestion in birds. Functional morphology of respiratory apparatus. Mechanics of breathing. Transport of blood gases, foetal and neonatal oxygen transport, dissociation curves, pressures, recoil tendency, elasticity, surfactants, pleural liquid, compliance, exchanges of gases in lungs and tissues, neural and chemical regulation of breathing, diffusion, perfusion, hypoxia. Frictional resistance to air flow, airways smooth muscle contraction, respiratory muscle work, panting, adaptation of respiration during muscle exercise, high altitude hypoxia, Non-respiratory lung functions. Respiration in birds.
Unit 3	**EXCRETORY AND ENDOCRINE SYSTEMS** Kidney- Functional morphology of nephrons, factors determining filtration pressure, determination of glomerular filtration rate (GFR) and renal plasma flow – Re-absorption mechanisms for glucose, protein, amino acids, electrolytes; ammonium mechanism, glomerulo-tubular balance, methods of studying renal functions; urine concentration; micturition, uremia. Fluid, water balance, fluid therapy, dehydration, water concentration mechanisms. Acid base balance and H+ regulation, correction and evolution of imbalances, total osmotic pressure. Formation and excretion of urine of Birds. Cerebrospinal fluid, synovial fluids - composition, formation and flow; Joints. Regulation of bone metabolism and homeostasis. Hormone cell interaction, sub-cellular mechanisms-metabolism of hormones-methods of study of endocrine system; Receptors- mechanism of regulation; Chemistry of hypothalamo- hypophyseal hormones, target organ, pineal, thyroid, thymus, pancreas, adrenal, prostaglandins, hormones of calcium metabolism, disorders, rennin-angiotensin system, atrial natriuretic factors, erythropoietin, GI hormones, pheromones.
Unit 4	**REPRODUCTION, LACTATION, GROWTH AND ENVIRONMENTAL PHYSIOLOGY** Genetic and endocrine control of gonadal development, modification of gonadotrophin release, ovarian functions, follicular development, dynamics, endocrine and receptor profiles, sexual receptivity, ovarian cycle, post-partum ovarian activity, ovum transport, capacitation, fertilization, reproductive cycles in farm animals- hormones present in the biological fluids during pregnancy and their uses for the diagnosis of pregnancy- maternal foetal placental participation in pregnancy and parturition, immunology of gestation, preparturient endocrine status. Spermatogenic cycle and wave- function of sertoli cell-leydig cell-semen - composition-evaluation; Testosterone - function and regulation - cryptorchidism. Puberty - photoperiod - uses of androgens, progestogens, estrogens. Functional and metabolic organization of mammary glands - structure and development; effect of estrogens and progesterone; hormonal control of mammary growth; lactogenesis and galctogenesis; biosynthesis of milk constituentssecretion of milk, and metabolism, prolactin and lactation cycle. Biochemical and genetic determinants of growth, regulation of growth, metabolic and hormone interactions, factors affecting efficiency of growth and production in ruminants and single stomach animals. Growth in meat producing animals and birds, growth curves. Recombinant gene transfer technologies for growth manipulation- advantages and limitations. Protein deposition in animals and poultry. Heat balance, heat tolerance, hypothermia, hyperthermia, thermo-regulation in farm animals, role of skin, responses of animals to heat and cold, fever, body temperature and hibernation. Temperature regulation in birds. Climatology- various parameters and their importance. Effect of different environmental variables like temperature, humidity, light, radiation, altitude on animal performance. Acclimation, acclimatization - general adaptive syndrome. Clinical aspects of endocrine - reproductive functions, circadian rhythm. Neurophysiology of behaviours, types of behaviour, communication, Learning and memory behavioural plasticity.

Practical

Unit	Contents
Unit 1	**BLOOD, CARDIOVASCULAR, NERVOUS AND MUSCULAR SYSTEMS** Collection of blood samples - Separation of serum and plasma - Preservation of de-fibrinated blood - enumeration of erythrocytes, leucocytes - differential leucocytic count - platelet count - estimation of hemoglobin - haematocrit - erythrocyte sedimentation rate - packed cell volume - coagulation time- bleeding time -Erythrocyte fragility and viscosity - blood grouping - recording of ECG - measurement of arterial blood pressure (Sphygmomanometry). Simulation experiments on Nerve- Muscle and heart physiology.
Unit 2	**DIGESTIVE AND RESPIRATORY SYSTEMS** Counting of rumen motility, estimation of volatile fatty acids and ammonia nitrogen in rumen liquor. Bacterial and protozoal count. In-vitro action of proteolytic enzymes- Amylase, pepsin and trypsin. Recording of respiration, spirometry. Recording of volume and capacities in different physiological states including determination of vital capacities.
Unit 3	**EXCRETORY AND ENDOCRINE SYSTEMS** Urine analysis-physiological constituents, pathological determinates, determination of Glomerular Filteration Rate. Titrable acidity, determination of inorganic phosphorus, urine ammonia nitrogen and creatinine in urine. Recording of rumenorintestinal movements (Demonstration) and Bio assay for tropic hormone. Demonstration of hormone estimation.
Unit 4	**REPRODUCTION, LACTATION, GROWTH AND ENVIRONMENTAL PHYSIOLOGY** Oestrus and phases of oestrous cycle in animals (vaginal mucus). Behavioural signs of oestrus. Sperm motility, sperm concentration -live and dead - abnormal sperm count. Measurement of growth in various species. Measuring surface area of animals. Health parameters of animals- body temperature, pulse, respiration and heart rate. Measurement of animal environmental conditions. Behaviour of animals- mating behavior, feeding behaviour (liveorvideo graphicorcomputer simulated demonstration).

Syllabus Distribution for Annual Board Examination:

Examination	PAPERS	UNITS	MAXIMUM MARKS	WEIGHTAGE
Internal Assessment	First Second Third	30 % (Unit 1 and 2) 60 % (Unit 2 and 3) 90 % (Unit 3 and 4)	40 40 40	10 10 10
Annual Board	**THEORY**			
	Paper-I Paper-II	Unit 1 and 2 Unit 3 and 4	100 100	20 20
	PRACTICAL			
	Paper-I Paper – II	Unit 1 and 2 Unit 3 and 4	60 60	20 20

UG Syllabus – Second Professional year

Veterinary Biochemistry

Theory

Unit	Contents
Unit 1	**GENERAL VETERINARY BIOCHEMISTRY** Scope and Importance of Biochemistry. Structure of Biological Membranes and Transport across Membranes. Donnan Membrane Equilibrium. Dissociation of Acids, pH, Buffer Systems, Henderson-Hasselbalch Equation. Biochemistry of Carbohydrates: Biological Significance of

	Important Monosaccharides(Ribose, Glucose, Fructose, Galactose, Mannose and Amino Sugars), Disaccharides (Maltose, Isomaltose, Lactose, Sucrose and Cellobiose), Polysaccharides, (Starch, Dextrins, Dextrans, Glycogen, Cellulose, Inulin, Chitin), and Mucopolysaccharides Including Bacterial Cell Wall Polysaccharides. Biochemistry of lipids: Properties and biological significance of simple, compound and derived lipids and lipoproteins. Fat indices. Structure and functions of prostaglandins. Biochemistry of proteins: Classification, Structure, Properties - Biological significance of proteins. Amino acids: Structure and classification. Physical and chemical properties of amino acids - amphoteric nature, optical activity, and peptide bond formation. Biochemistry of nucleic acids: Chemistry of purines, pyrimidines, nucleosides and nucleotides. Biological significance of nucleosides and nucleotides. Structures and functions of deoxyribonucleic acid (DNA) and a typical ribonucleic acid (RNA).
Unit 2	**INTERMEDIARY METABOLISM** Enzymes: Definition and classification. Coenzymes, cofactors and iso-enzymes. Properties: Protein nature, enzymesubstrate complex formation, modern concept of the active center of enzyme. Specificity of enzyme action: Substrate specificity, group specificity, stereo or optical specificity. Factors influencing enzyme action: Effects of temperature, pH, concentration of substrate and enzyme. Enzyme units: International Units, katal, turnover number and specific activity. Enzyme inhibition: Competitive, non-competitive, uncompetitive inhibition and suicidal inhibition. Allosteric enzymes. Biological oxidation: Enzymes and coenzymes involved in oxidation and reduction. Respiratory chain or electron transport chain, oxidative phosphorylation, inhibitors, uncouplers and other factors influencing electron transport chain. Carbohydrate metabolism: Glycolysis, Kreb's cycle, HMP shunt, gluconeogenesis, Cori cycle, glycogenesis, glycogenolysis, Bioenergetics of carbohydrate metabolism. Lipid metabolism: Beta oxidation of fatty acids, ketone body formation, biosynthesis of fatty acids. Bioenergetics of lipid metabolism. Protein metabolism: Biosynthesis and Degradation. Deamination, transamination and decarboxylation of amino acids. Ammonia transport and urea cycle. Nucleic acid metabolism: Metabolism of purines and pyrimidines. DNA and RNA biosynthesis and regulation. Regulation and Integration of metabolism.
Unit 3	**VETERINARY ANALYTICAL BIOCHEMISTRY** Disorders of Carbohydrate Metabolism: Diabetes mellitus, Ketosis, Bovine Ketosis, Pregnancy toxemia, hypoglycaemia in baby pigs, hyperinsulinism in Dogs. Hormonal control of carbohydrate metabolism and regulation of blood sugar. Biochemical tests for the detection of disturbance in carbohydrate metabolism. Plasma Proteins and clinical significance, Proteins and Dysproteinemias, Acute Phase proteins. Lipid Profile in disease diagnosis. Clinical Enzymology - Diagnostic importance of non-functional plasma enzymes and Isoenzymes, Liver function tests - Classification - Biochemical tests for differential diagnosis. Biochemical tests of renal function - Urine analysis - Role of BUN, Uric acid and Creatinine in diagnosis. Disturbance in acid base balance and its diagnosis. Biochemistry of digestive disorders. Biochemistry of oxidative stress and shock. Biochemical basis of fluid therapy. Detoxification in the body: Metabolism of xenobiotics, General reactions for biotransformation of different groups of substances, Cytochrome p450 system of enzymes.

Practical

Unit	Contents
Unit 1	**GENERAL VETERINARY BIOCHEMISTRY** Concentration of solutions and system International (S.I.) Units; Preparationor standardization of acids and alkalies; Preparation of Buffers; Titration curve of acid versus base; Qualitative test for carbohydrates and identification of unknown carbohydrates; Determination of acid number of an oil; Color and precipitation reactions of proteins; Estimation of amino acids (Sorensen's Method).
Unit 2	**INTERMEDIARY METABOLISM** Effect of temperature and pH on enzyme activity; Estimation of blood or plasma Glucose, Protein, Inorganic phosphate, Calcium, Magnesium; Estimation of ascorbic acid by Dichlorophenolindophenol (DCPIP) method; Estimation of milk lactose by Benedicts quantative

	method; Estimation of sodium and potassium by flame photometer; Paper or thin later Chromatography of amino acids; Estimation of vitamin A by colorimetry.
Unit 3	**VETERINARY ANALYTICAL BIOCHEMISTRY** Detection of Pathological Constituents in Urine; Assays of ALT and AST in Serum; Acute phase proteins (AorG Ratio); Estimation of total serum cholesterol, Blood Urea Nitrogen, creatinine, serum bilirubin (Direct, Indirect and Total). Principles of various diagnostic tests, normal and abnormal values in different species, differential diagnosis, correlating with diseases and rationale of arriving at the conclusion need to be rediscussed in detail during Final Professional in the course VETERINARY CLINICAL PRACTICES-II, Diagnostic Laboratory Section.

Syllabus Distribution of Veterinary Biochemistry for Annual Board Examination:

Examination	PAPERS	UNITS	MAXIMUM MARKS	WEIGHTAGE
Internal Assessment	First Second Third	30 % (Unit 1) 60 % (Unit 2) 90 % (Unit 3)	40 40 40	10 10 10
Annual Board	**THEORY**			
	Paper-I Paper-II	Unit 1 & 3 Unit 2	100 100	20 20
	PRACTICAL			
	Paper-I Paper – II	Unit 1 & 3 Unit 2	60 60	20 20

PG Academics

Summary of PG student:

Sr. No.	Details	No. of Students passed out	No. of Students presently enrolled
1.	Master	-	-
2.	Doctorate	-	-
3.	Total	-	-

To be started in next academic year (2026-27)

PG Courses

Sr. No.	Course Code	Title of Course	Credit Hours
		Veterinary Physiology	
1	VPY 601	Physiology of Digestion	2+1
2	VPY 602	Cardiovascular and Respiratory Physiology	2+1
3	VPY 603	Renal Physiology and Body Fluid dynamics	2+1
4	VPY 604	Haematology	2+1
5	VPY 605	Growth and Environmental Physiology	2+0
6	VPY 606	Physiology of Animal Reproduction	2+1
7	VPY 607	Clinical Physiology	1+1
8	VPY 608	Neuromuscular Physiology	2+0
9	VPY 609	Endocrinology of Domestic Animals	2+0
10	VPY 610	Instrumentation and Research Techniques in Veterinary Physiology	0+2
11	VPY 611	Physiology of Wild Life	1+0

12	VPY 612	Masters Seminar	1+0
13	VPY 613	Masters Research	0+30
Veterinary Biochemistry			
14	BCT 601	Biophysical Chemistry	2 + 0
15	BCT 602	Biochemistry of Biomolecules	2 + 0
16	BCT 603	Enzymology	2 + 1
17	BCT 604	Analytical Techniques and Instrumentation in Biochemistry	1 + 1
18	BCT 605	Clinical Biochemistry of Animals	2 + 1
19	BCT 606	Intermediary Metabolism and Regulation	3 + 0
20	BCT 607	Molecular Biochemistry	2 + 1
21	BCT 608	Nutritional and Industrial Biochemistry	2 + 0
22	BCT 609	Endocrinology and Reproductive Biochemistry	2 + 0
23	BCT 610	Biochemistry of Ruminants and Wild Animals	1 + 1
24	BCT 611	Introduction to Bioinformatics and Computational Biology	1 + 1
25	BCT 612	Master's Seminar	1 + 0
26	BCT 613	Master's Research	0 + 30

Ph. D. Courses

Sr. No.	Course Code	Title of Course	Credit Hours
Veterinary Physiology			
1	RPE 700	Research and Publication Ethics	1+1
2	VPY 701	Applied physiology of body fluids and electrolytes	2+1
3	VPY 702	Physiology of animal behaviour	2+0
4	VPY 703	Recent trends in ruminant digestion	2+1
5	VPY 704	Recent trends in neuroendocrinology	2+1
6	VPY 705	Myophysiology and kinesiology	2+0
7	VPY 706	Avian physiology	2+1
8	VPY 707	Physiology of lactation	2+1
9	VPY 708	Recent trends in environmental physiology and growth	2+1
10	VPY 709	Cellular and molecular physiology	2+0
11	VPY 710	Recent trends in immuno-physiology	2+1
12	VPY 711	Physiology of stress	2+0
13	VPY 712	Recent trends in reproductive physiology	2+1
14	VPY 713	Doctorate Seminar-I	1+0
15	VPY 714	Doctorate Seminar-II	1+0
16	VPY 715	Doctorate Research	0+75
Veterinary Biochemistry			
17	RPE 700	Research and Publications Ethics	1 + 1
18	BCT 701	Applied Molecular Biochemistry and Systems Biology	2 + 1
19	BCT 702	Membrane Biochemistry	2 + 0
20	BCT 703	Recent Trends in Enzymology	2 + 1
21	BCT 704	Diagnostic Techniques in Clinical Biochemistry	0 + 2
22	BCT 705	Recent Trends in Biochemical Techniques and Instrumentation	2 + 1

23	BCT 706	Developmental Biochemistry	2 + 0
24	BCT 707	Bioinformatics Tools in Biochemistry	1 + 1
25	BCT 708	Environmental and Toxicological Biochemistry	2 + 0
26	BCT 709	Biochemistry of Diseases and Disorders	2 + 0
27	BCT 710	Immuno-Biochemistry	2 + 0
28	BCT 711	Special Problem	0 + 2
29	BCT 712	Doctoral Seminar-I	1 + 0
30	BCT 713	Doctoral Seminar-II	1 + 0
31	BCT 714	Doctoral Research	0 + 75

PG Examination Patterns

Sr. No.	Examination	Theory	Practical
1.	Self-study (Assignment/ Presentation)	20	-
2.	Internal tests:- First Test Mid Term Test	 10 20	 - 50
3.	Semester End Examination	50	50
	Total Marks	**100**	**100**

Research Area of the Department

- **Milk Somatic cell study**
- **Stress physiology and mitigation strategies**
- **Molecular reproductive endocrinology**
- **Digestive Physiology & Metagenomics**
- **Environmental Physiology**
- **Proteomics & Peptidomics**
- **Clinical biochemistry**
- **Immuno-biochemistry**

Advanced Instrumentation Facilities

Sr. No.	Name of Instruments
-	

Contact details

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