VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Programme
In
Zoology

[3 Years (Degree) & 4 Years (Honours/Honours with Research)]

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Programme in Zoology -Major

Teaching & Evaluation Scheme Semester - V & VI

[Academic Year of Implementation 2025-2026]

Semester-V

Course Code	Course Title	Teaching Schedule Hours/Week	Exam Duration & Marks			Total Theory/Practical Marks	Credit
			Duration (Hours)	(CCE) Internal Marks	(SEE) External Marks		
ZO – MJ – 501	Biochemistry	2	1:00	25	25	50	2
ZOP – MJ – 501	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – MJ – 502	Non-chordates and Chordates III	2	1:00	25	25	50	2
ZOP– MJ – 502	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – MJ – 503	Bhartiya Gyan Parrampara - I	2	1:00	25	25	50	2
ZOP – MJ – 503	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**

Semester-VI

Course Code	Course Title	Teaching Schedule Hours/Week	Exam Duration & Marks			Total Theory/Practical Marks	Credit
			Duration (Hours)	(CCE) Internal Marks	(SEE) External Marks		
ZO – MJ – 601	Animal physiology and endocrinology	2	1:00	25	25	50	2
ZOP – MJ – 601	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – MJ – 602	Non-chordates and Chordates IV	2	1:00	25	25	50	2
ZOP– MJ – 602	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – MJ – 603	Bhartiya Gyan Parrampara - II	2	1:00	25	25	50	2
ZOP – MJ – 603	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Programme in Zoology – Minor Elective

Teaching & Evaluation Scheme Semester - V & VI

[Academic Year of Implementation 2025 - 2026]

Semester-V

Course Code	Course Title	Teaching Schedule Hours/Week	Exam Duration & Marks			Total Theory/Practical Marks	Credit
			Duration (Hours)	(CCE) Internal Marks	(SEE) External Marks		
ZO – ME – 501	Biochemistry	2	1:00	25	25	50	2
ZOP – ME – 501	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – ME – 502	Non-chordates and Chordates III	2	1:00	25	25	50	2
ZOP– ME – 502	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**

Semester-VI

Course Code	Course Title	Teaching Schedule Hours/Week	Exam Duration & Marks			Total Theory/Practical Marks	Credit
			Duration (Hours)	(CCE) Internal Marks	(SEE) External Marks		
ZO – ME – 601	Animal physiology	2	1:00	25	25	50	2
ZOP – ME – 601	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**
ZO – ME – 602	Non-chordates and Chordates IV	2	1:00	25	25	50	2
ZOP– ME – 602	Practical	4	4:00	25	25	50	2
			Total	**50**	**50**	**100**	**4**

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

Undergraduate Programme in Zoology

Skill Enhancement Course

Teaching & Evaluation Scheme Semester-V & VI

[Academic Year of Implementation 2025 - 2026]

Semester-V

Course Code	Course Title	Teaching Schedule Hours/Week	Exam Duration & Marks			Total Theory/Practical Marks	Credit
			Duration (Hours)	(CCE) Internal Marks	(SEE) External Marks		
ZO – SEC – 501	Bioinstrumentation	1	0:30	12	13	25	1
ZOP – SEC – 501	Practical	2	2:00	12	13		1
			Total	**50**	**50**	**50**	**2**

Programme Outcome (PO):

PO-01: Scientific Knowledge & Conceptual Understanding: Develop a strong foundation in scientific principles, theories and concepts across disciplines, fostering interdisciplinary learning, advance knowledge and problem-solving abilities.

PO-02: Analytical & Critical Thinking: Apply critical thinking and analytical reasoning to evaluate scientific data, hypotheses and real-world problems, leading to evidence-based conclusions.

PO-03: Research & Inquiry-based Learning: Develop investigative skills through experimentation, data analysis and scientific inquiry to contribute to research and innovation.

PO-04: Laboratory & Technical Skills: Gain hands-on experience with laboratory techniques, instrumentation and computational tools relevant to scientific research and industry applications.

PO-05: Digital & Computational Literacy: Utilize digital tools, computational techniques and emerging technologies such as AI, bioinformatics and statistical modelling to enhance scientific learning and problem-solving.

PO-06: Environmental & Societal Responsibility: Understand the role of science in addressing environmental, health and societal challenges, promoting sustainability and ethical responsibility.

PO-07: Effective Communication & Collaboration: Develop proficiency in scientific communication, both written and oral, for effective dissemination of knowledge while collaborating in multidisciplinary teams.

PO-08: Innovation & Entrepreneurship: Foster an entrepreneurial mind-set by applying scientific knowledge for innovation, technology development, and industry-oriented applications. Develop sustainable solutions to address real-world challenges in research and environmental management.

PO-09: Lifelong Learning & Professional Growth: Cultivate curiosity and adaptability for continuous learning, equipping students for higher education, research, and professional careers.

PO-10: Ethical Leadership & Value-based Education: Develop leadership qualities, ethical values, and a sense of responsibility in applying science for societal progress, aligning with Indian knowledge systems and global perspectives.

Programme Specific Outcome (PSO):

1. Remembering (Knowledge)

   PSO1: Recall the classification, morphology, and anatomy of different animal groups and Identify key concepts and terminology in zoology.

2. Understanding (Comprehension)

   PSO2: Explain the structure and function of animal systems, such as nervous, circulatory, and digestive systems and Interpret zoological data and graphs related to animal populations and ecosystems.

3. Applying (Application)

   PSO3: Apply zoological principles to understand animal behavior, ecology, and evolution and Use zoological concepts to analyze real-world scenarios related to conservation, wildlife management, and animal welfare.

4. Analyzing (Analysis)

   PSO4: Break down complex zoological concepts, such as animal development and physiology, into component parts and Evaluate zoological evidence to support a claim related to animal diversity, adaptation, and extinction.

5. Evaluating (Synthesis)

   PSO5: Design experiments to investigate zoological questions and hypotheses related to animal behavior, ecology, and evolution and Critique zoological research and methodologies related to animal conservation and management.

6. Creating (Evaluation)

   PSO6: Develop innovative solutions to zoological problems related to animal conservation, welfare, and management and Communicate zoological findings effectively through various media, such as research papers, presentations, and popular articles.

T. Y. B. Sc. Semester V

COURSE CODE: ZO – MJ - 501
COURSE TITLE: BIOCHEMISTY
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Understand enzyme classification, specificity, kinetics and Analyze enzyme regulation and inhibition.
CO2: Understand the structure and properties of nucleic acids.
CO3: Analyze DNA denaturation, renaturation, and the concept of hypo - and hyperchromicity. Understand and Explain Key Metabolic Pathways.
CO4: Comprehend Lipid Metabolism and Examine Amino Acid Catabolism and Nitrogen Disposal

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	**Chemistry of Biomolecules**
	1.1: SECTION A(Metabolism of Carbohydrates, Lipids and Proteins)	
1.1.1	Glycolysis & citric acid cycle, Gluconeogenesis, Glycogenolysis and Glycogenesis, phosphate pentose pathway	
1.1.2	Lipids-Biosynthesis of palmitic acid, β-oxidation of saturated fatty acids, Ketogenesis	
1.1.3	Catabolism of amino acids: Transamination, Deamination, Biosynthesis of amino acids, Ornithine Cycle (Urea cycle)	
	1.2: SECTION B (Nucleic Acid)	

1.2.1	Structure: Purines and pyrimidines, Nucleosides, Nucleotide
1.2.2	Nucleic acids Cot Curves: Base pairing
1.2.3	Denaturation and Renaturation of DNA
1.2.4	Types of DNA and RNA
1.2.5	Complementarity of DNA
1.2.6	Hpyo and Hyperchromaticity of DNA

	UNIT 2	**Enzyme Biochemistry**
	2.1: SECTION A	
2.1.1	Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozym	
2.1.2	Mechanism of enzyme action	
2.1.3	Enzyme kinetics: Factors affecting rate of enzyme-catalyzed reactions	
2.1.4	Derivation of Michaelis-Menten equation, Concept of Km and Vmax	
2.1.5	Lineweaver-Burk plot	
2.1.6	Enzyme inhibition	
2.1.7	Allosteric enzymes and their kinetics & Regulation of enzyme action	
	2.2: SECTION B (Applications of enzymes)	
2.2.1	Enzymes in diagnostics, medicines and research	
2.2.2	Enzyme therapy	

COURSE CODE : ZOP – MJ - 501
COURSE TITLE: PRACTICALS IN BIOCHEMISTRY
COURSE LEVEL: T. Y. B. Sc. SEM - V
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. Effect of pH on salivary amylase activity.
2. Effect Temperature on salivary amylase activity.
3. Estimation of total protein by Lowry's method.
4. Determination of Km and Vmax using Lineweaver-Burk graph. (Dry experiment)
5. To identify and distinguish between Purine and Pyrimidine bases.
6. To study structure of DNA and RNA with the help of charts.
7. To study different types of DNA with the help of charts / models.
8. To study different types of DNA with the help of charts / models.
9. To study Carbohydrate metabolism with help of charts – Glycolysis, Krebs Cycle, Gluconeogenesis.
10. To study Urea cycle with help of charts.
11. To study β – Oxidation of Fatty acid with help of charts.

REFERENCES:

- Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
- Zubayet al: Principles of Biochemistry: WCB (1995)
- Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004) 4.
- Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
- Satyanarayan and Chakrapani , (2017) Biochemistry, Elsevier; Fifth edition.
- Cox, M.M and Nelson, D.L. (2008). Lehninger Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007).Biochemistry, VI Edition, W.H. Freeman and Co., New York. Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.

E -RESOURCES:

https://www.youtube.com/watch?v=ti9SbKgMEic
https://www.youtube.com/watch?v=ng8823q42JE
https://www.youtube.com/watch?v=spwDq9ZG_Tg
https://www.youtube.com/watch?v=EzuKxqojS0Q
https://www.youtube.com/watch?v=NvTcWpPrLNA
https://www.youtube.com/watch?v=y-QAXrIDXFE
https://www.youtube.com/watch?v=V4906m8VkTE
https://www.youtube.com/watch?v=wLx8D3H1UOQ
https://www.youtube.com/watch?v=MefANbnSdH0

T. Y. B. Sc. Semester V

COURSE CODE: ZO – MJ - 502
COURSE TITLE: NON-CHORDATES AND CHORDATES - III
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Learn about the importance of systematic, taxonomy and structural organization of animals and Getting familiarized with the morphology and anatomy of representatives of various animals' groups.

CO2: Explain comparative account of different vertebrate skeletal systems; understand the pattern of evolution, structural organization and functions.

CO3: Students recognize structural principles by studying all body systems of animal type and Know the behaviour pattern like parenting.

CO4: Enhance collaborative learning and communication skills through practical sessions, team work and assignments and Practical curriculum includes museum specimens of various phyla and classes.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT: Classification up to order, Animal type, Osteology and Amplifications.

	UNIT 1	**Nonchordates**
	1.1: SECTION A (Taxonomy of Nonchordates to be studied up to order)	
1.1.1	Protozoa	
1.1.2	Porifera	
1.1.3	Cnidaria	
1.1.4	Helminthes	
1.1.5	Annelida	
	1.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Leech)	

1.2.1	External features
1.2.2	Digestive system
1.2.3	Haemocoelomic system
1.2.4	Excretory system
1.2.5	Nervous system
1.2.6	Reproductive system
1.2.6	Parasitic adaptation

	UNIT 2	**Chordates**
	2.1: SECTION A (Taxonomy of chordate to be studied up to order)	
2.1.1	Protochordata	
2.1.2	Cyclostomata	
2.1.3	Pisces	
2.1.4	Amphibia	
	2.2: SECTION B (Amplifications of chordates and Osteology)	
2.2.1	Types of scales	
2.2.2	Parental care in Pisces	
2.2.3	Neoteny in Amphibia	
2.2.4	Comparative study of vertebrates • Pectoral girdles • Pelvic girdle • Fore limbs • Hind limbs	

COURSE CODE: ZOP – MJ - 502
COURSE TITLE: PRACTICALS IN NON-CHORDATES AND CHORDATES - III
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. Classification of following animals up to order:
   I. Protozoa: Ceratium, Entamoeba, Polystomella, Plasmodium, Opalina, Balantidium,
   II. Porifera: Leucosolenia, Pheronema, Euspongia.
   III. Cnidaria: Obelia, Millipora, Valella, Rhizostoma, Tubipora, Alcyonium, Cerianthus, Pennatula, Adamsia, Zoanthus, Favia, Fungia, Astrea
   IV. Platyhelmithes: Bipalium, Opisthorchis,
   V. Nementhelminthes: Trichinella, Wacheria
   VI Annelida: Sabella, Serpula, Arenicola, , Acanthobdella,

2. The following practical of **Leech** to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.
   I. External features and Digestive system
   II. Nervous system,
   III. Reproductive system
   IV. Mountings: Jaws, Salivary glands, Ovary and Testicular Nephridia

3. Classification of following animals up to order:
   I. Protochordates: Ciona, Doliolum and Salpa
   II. Cyclostomata:Bdelostoma
   III. Pisces: Sphyrna, (Skates), Harpodon, Clarius, Eel, Tetradon, Flute fish, Acipenser, Pterois and Lepidosiren/Neoceratodus
   IV. Amphibia:Ichthyophis, Necturus, Amphiuma, Alytes and Pipa

4. Parental care in fishes : Gasterosteus, Rhodeus, Kurtus, Hipocampus/ Pipe fish, Tilapia and Skate (Mermaids purse)
5. Types of scales in fishes: Placoid, Cycloid and Ctenoid
6. Neoteny in Amphibia: Axolotal larva, Typhlomolge, Necturus and Oikopleura
7. Comparative study of osteology in vertebrates:
   - Pectoral girdles
   - Pelvic girdle
   - Fore limbs
   - Hind limbs

REFERENCES:

- A Manual of Zoology Vol. I & II - EkambernathAyar. S. Vishwanathan Chennai.
- A Text Book of General Biology - Tomer& Singh. RastogiPublication,Meerut
- Barnes, R. S. K.; Calow, P.; Olive, P. J. W.; Golding, D. W.; Spicer, J. I. (2002) The
- Invertebrates: a Synthesis, Blackwell Publishing.
- Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students, Asia
- Publishing Home.
- Chordate Zoology E.L Jordan & P. S. Verma. S.Chand
- Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) Animal
- Diversity, McGraw-Hill.
- Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
- Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4th
- edition), McGraw-Hill.
- Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
- Modern Text Book of Zoology Prof. R. L. Kotpal Invertebrates Rastogi publication,11th edition 2019-2020A
- Outline of comparative anatomy of vertebrate Kingsley J.S. Central book depot, Allahabad
- Parker and Haswell. Text Book of ZOOLOGY (Invertebrate)
- PrushthvanshiPraniyoaneGarbhvidya - A.B.Vyas. Guj. GranthNirman Board.
- Text Book of Invertebrates. Saras publication
- Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
- Text book of Zoology - R. D. Vidyarthi. S.Chand
- Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt.ltd. Delhi
- The vertebrate Body by Romer Alfred Sherwood, Publisher: W, b, Saunders Company London.
- UtkrushthaAprushthvanshiPraniyo - U.M.Rawal. Guj.Granthnirman Board.
- Vertebrate Zoology: An Experimental Field Approach-Nelson G.Hairston. Cambridge University Press, 1994
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

E -RESOURCES:

http://egymkosh.ac.in/bitstream/123456789/16496/1/Unit-9.pdf
https://biologywise.com/information-about-hydrostatic-skeleton

T. Y. B. Sc. Semester V

COURSE CODE: ZO – MJ - 503
COURSE TITLE: BHARTIYA GYAN PARRAMPARA - I
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Explain the fundamental principles and importance of Indian Knowledge Systems in the context of Zoology and Compare and contrast the ancient Indian classification of animals with modern taxonomic systems.

CO2: Analyze the scientific basis behind the classification of animals into various Vargas according to Vedic literature and Evaluate the cultural, spiritual, and ecological significance of cows in Indian tradition and compare their status across different religions.

CO3: Interpret the symbolism of animals (particularly snakes) in Indian mythology, spiritual practices, and traditional medicine.

CO4: Apply traditional knowledge about animals to address contemporary challenges in conservation, sustainable development, and ecological balance.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	Generic Indian Knowledge Systems (IKS) in Zoology
1.1.1	**Importance of Indian Knowledge System for Zoology** • Historical development of animal sciences in ancient India • Key texts and sources: Vedas, Upanishads, CharakaSamhita, Sushruta Samhita • Concept of interconnectedness in Indian tradition • Ethical framework for human-animal relationships	
1.1.2	**Ancient Indian Classification of Animals** • Chaturvimshati classification (24 types) • Classification based on origin: Jarayuja, Andaja, Swedaja, Udbhijja • Classification based on habitat and characteristics	

1.1.3	• Comparison with Linnaean taxonomy **Different Varga as per Vedas** • JalaVarga: Aquatic animals and their significance • DugdhaVarga: Milk-producing animals and milk products • MadhuVarga: Honey bees and other insects producing beneficial substances • MamsaVarga: Classification of animals based on their flesh characteristics • MutraVarga: Understanding of medicinal properties of animal urine
	UNIT 2 **Subject Specific IKS - Cow Science (Gomata Vigyan)**
2.2.1	**Significance of Cow (Gomata)** • Care and protection of indigenous cattle breeds • Scientific understanding of Panchagavya (five cow products) • Ecological and agricultural importance • Nutritional and medicinal properties of cow products
2.2.2	**Voice of Cows: Contemporary Interpretations** • Bhaktivedanta Swami Goshala model • Modern research on cow behavior and communication • Case studies of successful indigenous cattle conservation programs
2.2.3	**Cows in Vedic Literature** • References in Rig Veda, Atharva Veda, Yajur Veda • Narratives in HarivamshaPurana and SrimadBhagavatam • Teachings of Gavopanishad • Interpretation of RikSamhita verses related to cows
2.2.4	**Breeds of Cow:** • Milch breeds: Gir, Shiwal, Red sindhi, Deoni • Draught resistant breeds: Kankrerj, Kangayam, Malvi, Siri • Dual breeds: Hariana, Ongole, Tharparkar, Rathi
2.2.5	**Importance of Cows in Agriculture** • Traditional organic farming using cow-based inputs • Soil health and cow-based fertilizers • Pest management using cow products • Integration of cattle in sustainable agricultural system

COURSE CODE: ZOP – MJ - 503
COURSE TITLE: BHARTIYA GYAN PARRAMPARA - I
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. To study ancient classification of animals.
2. To study different types of honey on the bases of the colour.
3. To study importance of panchagavya.
4. To study significance of kamdhenu cow.
5. To study milch breeds of cow:Gir, Shiwal, Red sindhi, Deoni
6. To study Draught resistant breeds: Kankrerj, Kangayam, Malvi, Siri
7. To study Dual breeds: Hariana, Ongole, Tharparkar, Rathi

REFERENCES:

- DravyagunaVijnan, Vol.III, Dr. J.L.N.Sastry, ChaukhambhaOrientalai, Varanasi.
- Gau-ank, Geeta press, Gorakhpor
- Voice of Cows: The Newsletter of Bhaktivedanta Swami GoshalaVrindavan, February 2014-Vol14-Issue2

E -RESOURCES:

https://www.dattapeetham.org/page/view/significance-of-a-cow
https://www.abtakmedia.com/without-vedas-therehttps://www.karigarofficial.com
https://svastika.in
https://www.asianagrihistory.org/pdf/volume10/veterniray.pdf
https://en.wikipedia.org/wiki/Indian_natural_history
https://pmc.ncbi.nlm.nih.gov/articles/PMC2997667/
https://www.britannica.com/place/India/Agriculture-and-animal-husbandry
https://en.wikipedia.org/wiki/History_of_zoology_through_1859
https://pmc.ncbi.nlm.nih.gov/articles/PMC3094705/
https://pmc.ncbi.nlm.nih.gov/articles/PMC8514395/
https://www.britannica.com/topic/agriculture/The-Indian-subcontinent
https://www.indiatoday.in/amp/india/story/maharashtra-bjp-nda-indigenous-cow-rajyamata-gomata-assembly-election-2608721-2024-09-30
https://www.ndtv.com/india-news/maharashtra-citing-vedic-significance-declares-cow-as-rajyamata-gomata-6683398
https://www.businesstoday.in/india/story/ahead-of-polls-maharashtra-declares-indigenous-cows-as-rajyamata-gomata-448161-2024-09-30
https://www.anaadi.org/post/hindu-perspective-of-gomata
https://www.tribuneindia.com/news/india/maharashtra-government-declares-desi-cows-rajyamata-gomata/

https://economictimes.indiatimes.com/news/india/maharashtra-declares-indigenous-cows-rajyamata-gomata-ahead-of-assembly-elections/videoshow/113824550.cms
https://www.ask-oracle.com/article/the-sacred-cow-unveiling-the-reverence-for-gomata-in-hinduism/

TEACHING-LEARNING METHODOLOGY:

- Lectures and classroom discussions
- Field visits to gaushalas, biodiversity parks, and traditional knowledge centers
- Case studies on successful integration of traditional and modern knowledge
- Student presentations and seminars on selected topics
- Hands-on projects documenting local traditional knowledge

T. Y. B. Sc. Semester V

COURSE CODE: ZO – SEC - 501
COURSE TITLE: Bioinstrumentation
COURSE LEVEL: 300 - 399
CREDIT: 01
TOTAL ENGAGEMENT: 1 credit x 15 hrs. = 15 hrs.
TEACHING PER WEEK: 1 hrs.
MINIMUM WEEKS PER SEMESTER: 15 weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Students will be able to understand and explain principal of different microscopes
CO2: Students will be able to describe s different parts of microscopes
CO3: Students will be able to explain application of different microscopes
CO4: Students will be able to understand and learn preparation of slides

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1
	1.1: SECTION A (Bio instruments: Principle, Structure and its application)
1.1.1	Light microscope
1.1.2	Binocular microscope (Mono-objective & Stereoscopic)
1.1.3	Phase contrast microscope
1.1.4	Fluorescent microscope
1.1.5	Inverted microscope
1.1.6	Microtomy

COURSE CODE: ZOP – SEC - 501
COURSE TITLE: Bioinstrumentation
COURSE LEVEL: 300 - 399
CREDIT: 01(Practical)
TOTAL ENGAGEMENT: 1 credit x 30 hrs. = 30 hrs.
TEACHING PER WEEK: 2 hrs.
MINIMUM WEEKS PER SEMESTER: 15 weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

To study following bio-instruments principle, structure and application with the help of charts, model, photographs or instruments:

1. Light microscope
2. Binocular microscope
3. Phase contrast microscope
4. Fluorescent microscope
5. Inverted microscope
6. Microtome

REFERENCES:

- Microscopy and Micro technique by R. Marimuthu. MJP Publishers Chennai.
- Springer handbook of microscopy by Peter Haukes, John Spance -2019
- Microscopy: A very short introduction by Terence David Allm - 2015
- Fundamentals of Light microscopy and electronic imaging by Dauglas Murphy, Michael Davidson – 2013
- E-learning resources – Microscopy - Micro Notes
- Practical zoology Invertebrates by S. S. Lal, Rastogi Publication, Meerut – New Delhi.

T. Y. B. Sc. Semester V

COURSE CODE: ZO – ME - 501
COURSE TITLE: BIOCHEMISTY
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Define biochemistry and explain its importance in biological processes and Describe water's structure and its role in biochemical reactions.
CO2: Understand chemical bonding (covalent, ionic, hydrogen) and the role of pH and buffers in biology and Classify amino acids and explain protein structure and function.
CO3: Classify carbohydrates and lipids, and explain their roles in energy storage and cellular functions and Describe DNA and RNA structure and their role in genetic information and protein synthesis.
CO4: Apply thermodynamics to understand biochemical reactions and energy flow in metabolism.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	
	1.1: SECTION A (Introduction to Biochemistry)	
1.1.1	Overview of Biochemistry**:** Definition, scope, and importance.	
1.1.2	Water and its Role in Biochemistry**:** Structure and properties of water, hydrogen bonding, and its importance in biochemical processes	
	1.2: SECTION B (Basic Principles of Biochemistry)	
1.2.1	Atomic Structure and Chemical Bonding: Covalent and ionic bonds, van der Waals forces, hydrogen bonds.	
1.2.2	Acid-Base Chemistry: pH, buffers, and their role in biological systems.	
1.2.3	Thermodynamics in Biochemistry: Laws of thermodynamics	

	UNIT 2	
	2.1: SECTION A (Biomolecules - 1)	

2.1.1	Amino Acids: Structure, classification, and functions of amino acids as the building blocks of proteins.
2.1.2	Proteins: Structure of proteins (primary, secondary, tertiary, and quaternary), protein function, and denaturation.
2.1.3	Carbohydrates: Monosaccharides, disaccharides, polysaccharides, and their roles in ener storage and structure.
	2.2: SECTION B (Biomolecules – 2)
2.2.1	Lipids: Types of lipids (fats, phospholipids, and sterols) and their role in energy storage, membrane structure
2.2.2	Nucleic Acids: Structure of DNA and RNA, their roles in genetic information storage

COURSE CODE : ZOP – ME - 501
COURSE TITLE: PRACTICALS IN BIOCHEMISTRY
COURSE LEVEL:T.Y. B. Sc. SEM - V
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. To observe and identify different chemical bonds (covalent, ionic, hydrogen) in biological molecules.
2. To measure the pH of various solutions.
3. To perform qualitative tests for carbohydrates and lipids.
4. To perform qualitative tests for lipids.
5. To identify and distinguish between Purine and Pyrimidine bases.
6. To study structure of DNA and RNA with the help of charts.
7. To study different types of DNA with the help of charts / models.

REFERENCES:

- Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
- Zubayet al: Principles of Biochemistry: WCB (1995)
- Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004) 4.

E -RESOURCES:

https://www.youtube.com/watch?v=JxK5rZxbyQY
https://www.youtube.com/watch?v=vn1s9udYi8Q
https://www.youtube.com/watch?v=2_p4hUFVK4Q
https://www.youtube.com/watch?v=S6LXyzZn5Ls
https://www.youtube.com/watch?v=0lZRAShqft0

T. Y. B. Sc. Semester V

COURSE CODE: ZO – ME - 502
COURSE TITLE: NON-CHORDATES AND CHORDATES - III
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Learn about the importance of systematic, taxonomy and structural organization of animals and Getting familiarized with the morphology and anatomy of representatives of various animals' groups.

CO2: Explain comparative account of different vertebrate skeletal systems; understand the pattern of evolution, structural organization and functions and Students recognize structural principles by studying all body systems of animal type.

CO3: Know the behaviour pattern like parenting and Enhance collaborative learning and communication skills through practical sessions, team work and assignments.

CO4: Practical curriculum includes museum specimens of various phyla and classes.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT: Classification up to order, Animal type, Osteology and Amplifications.

	UNIT 1	**Nonchordates**
	1.1: SECTION A (Taxonomy of Nonchordates to be studied up to order)	
1.1.1	Protozoa	
1.1.2	Porifera	
1.1.3	Cnidaria	
1.1.4	Helminthes	
1.1.5	Annelida	
	1.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Leech)	

1.2.1	External features
1.2.2	Digestive system
1.2.3	Haemocoelomic system
1.2.4	Excretory system
1.2.5	Nervous system
1.2.6	Reproductive system
1.2.6	Parasitic adaptation

	UNIT 2	**Chordates**
	2.1: SECTION A (Taxonomy of chordate to be studied up to order)	
2.1.1	Protochordata	
2.1.2	Cyclostomata	
2.1.3	Pisces	
2.1.4	Amphibia	
	2.2: SECTION B (Amplifications of chordates and Osteology)	
2.2.1	Types of scales	
2.2.2	Parental care in Pisces	
2.2.3	Neoteny in Amphibia	
2.2.4	Comparative study of vertebrates • Pectoral girdles • Pelvic girdle • Fore limbs • Hind limbs	

COURSE CODE: ZOP – ME - 502
COURSE TITLE: PRACTICALS IN NON-CHORDATES AND CHORDATES - III
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. Classification of following animals up to order:
   I. Protozoa: Ceratium, Entamoeba, Polystomella, Plasmodium, Opalina, Balantidium,
   II. Porifera: Leucosolenia, Pheronema, Euspongia.
   III.Cnidaria: Obelia, Millipora, Valella, Rhizostoma, Tubipora, Alcyonium, Cerianthus, Pennatula, Adamsia, Zoanthus, Favia, Fungia, Astrea
   IV. Platyhelmithes: Bipalium, Opisthorchis,
   V. Nementhelminthes: Trichinella, Wacheria
   VI Annelida: Sabella, Serpula, Arenicola, , Acanthobdella,

2. The following practical of **Leech** to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.
   I. External features and Digestive system
   II. Nervous system,
   III. Reproductive system
   IV. Mountings: Jaws, Salivary glands, Ovary and Testicular Nephridia

3. Classification of following animals up to order:
   I. Protochordates: Ciona, Doliolum and Salpa
   II. Cyclostomata:Bdelostoma
   III. Pisces: Sphyrna, (Skates), Harpodon, Clarius, Eel, Tetradon, Flute fish, Acipenser, Pterois and Lepidosiren/Neoceratodus
   IV. Amphibia:Ichthyophis, Necturus, Amphiuma, Alytes and Pipa
4. Parental care in fishes : Gasterosteus, Rhodeus, Kurtus, Hipocampus/ Pipe fish, Tilapia and Skate (Mermaids purse)
5. Types of scales in fishes: Placoid, Cycloid and Ctenoid
6. Neoteny in Amphibia: Axolotal larva, Typhlomolge, Necturus and Oikopleura
7. Comparative study of osteology in vertebrates:
   - Pectoral girdles
   - Pelvic girdle
   - Fore limbs
   - Hind limbs

REFERENCES:

- A Manual of Zoology Vol. I & II - EkambernathAyar. S. Vishwanathan Chennai.
- A Text Book of General Biology - Tomer& Singh. RastogiPublication,Meerut
- Barnes, R. S. K.; Calow, P.; Olive, P. J. W.; Golding, D. W.; Spicer, J. I. (2002) The
- Invertebrates: a Synthesis, Blackwell Publishing.
- Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students, Asia
- Publishing Home.
- Chordate Zoology E.L Jordan & P. S. Verma. S.Chand
- Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) Animal
- Diversity, McGraw-Hill.
- Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
- Kardong, K.V. (2006) Vertebrates: Comparative Anatomy, Function, Evolution (4th
- edition), McGraw-Hill.
- Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
- Modern Text Book of Zoology Prof. R. L. Kotpal Invertebrates Rastogi publication,11th edition 2019-2020A
- Outline of comparative anatomy of vertebrate Kingsley J.S. Central book depot, Allahabad
- Parker and Haswell. Text Book of ZOOLOGY (Invertebrate)
- PrushthvanshiPraniyoaneGarbhvidya - A.B.Vyas. Guj. GranthNirman Board.
- Text Book of Invertebrates. Saras publication
- Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
- Text book of Zoology - R. D. Vidyarthi. S.Chand
- Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt.ltd. Delhi
- The vertebrate Body by Romer Alfred Sherwood, Publisher: W, b, Saunders Company London.
- UtkrushthaAprushthvanshiPraniyo - U.M.Rawal. Guj.Granthnirman Board.
- Vertebrate Zoology: An Experimental Field Approach-Nelson G.Hairston. Cambridge University Press, 1994
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

E -RESOURCES:

http://egymkosh.ac.in/bitstream/123456789/16496/1/Unit-9.pdf
https://biologywise.com/information-about-hydrostatic-skeleton

T. Y. B. Sc. Semester VI

COURSE CODE: ZO – MJ - 601
COURSE TITLE: ANIMAL PHYSIOLOGY AND ENDOCRINOLOGY
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Understand the basic cellular and molecular mechanisms involved in nerve signaling and explain the functions of different cells of the nervous system.

CO2: Understand the physiological mechanisms of synaptic transmission, sensory perception, and motor control. Describe the structure and function of the respiratory system. Understand the mechanics of gas exchange and transport of respiratory gases.

CO3: Explain the regulation of respiration by neural, chemical, and mechanical factors. Differentiate and calculate the various parameters of lung capacity. Analyse characteristics of different endocrine glands and their secretions.

CO4: Observe the structural and functional relationships amongst hypothalamus, pituitary and other glands. Examine the chemical classes of hormones and mechanism of hormone action. Establish a link between the normal vs pathophysiological conditions of endocrine organs and glands.

COURSE CONTENT:

	UNIT 1	**Animal Physiology**
	1.1: SECTION A (Physiology of respiration)	
1.1.1	Introduction to Respiratory Physiology • Overview of human respiratory system • Aquatic & terrestrial respiratory organs and structures.	
1.1.2	Exchange of gases • Exchange of respiratory gases • External respiration & Internal respiration	
1.1.3	• Partial pressures of gases (O_2, CO_2) • Gas laws- Dalton's Law and Henry's law.	
1.1.4	Transport of Gases • Transport of oxygen • Transport of carbon-di-oxide.	
1.1.5	• O_2 dissociation Curve Regulation of Respiration	

1.1.6	• Neural control of respiration: brainstem centers (medulla, pons) • Role of chemoreceptors in regulation (central and peripheral) Respiratory pigments: Distribution; composition; properties; Functions, Respiratory quotient
	1.2: SECTION B
1.2.1	Introduction to Nervous System Physiology • Neurons: structure, types, and functions • Neuroglial cells and their roles in the nervous system • Resting membrane potential and ion gradients
1.2.2	Action Potentials and Signal Transmission • Ion channels and action potential generation • Propagation of action potentials & Refractory period
1.2.3	Synaptic Transmission • Synapse: Structure and types (Chemical and Electric). • Neurotransmitter release, receptors, and signal transduction • Excitatory and inhibitory postsynaptic potentials (EPSPs and IPSPs)
1.2.4	Structure and function of sense organs • Human eye and • Human ear

	UNIT 2	**ENDOCRINOLOGY**
	2.1: SECTION A	
2.1.1	Introduction: An overview of vertebrate endocrine system. Structural features and hormones of endocrine glands- hypothalamus, pituitary, pineal, thyroid, parathyroid, GI tract, pancreatic islets, adrenals and gonads.	
2.1.2	General classes of hormones: Peptide, Thyroid, Steroid, Neuro transmitters, Neuropeptides, Chalones, Peptide-growth stimulating factors, Eicosanoids and pheromones	
2.1.3	Hormones and endocrine glands: Synthesis and control of synthesis, Storage, Metabolism and functions.	
2.1.4	Mechanisms of hormone action: Receptors and types- Membrane receptors, Nuclear receptors; Receptor regulation and signal transduction, Second messengers, Permissive actions of hormones and termination of hormone action.	
	2.2: SECTION B	
2.2.1	Pathophysiology of hypothalamic, pituitary, pineal, thyroid, parathyroid, GI tract, pancreatic islets, adrenal and gonadal hormones.	

COURSE CODE : ZOP – MJ - 601
COURSE TITLE: PRACTICALS IN ANIMAL PHYSIOLOGY AND ENDOCRINOLOGY
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. To study aquatic & terrestrial respiratory organs and structures
2. To study the rate of oxygen consumption of Albino rat or black rat. (With a help of video/chart)
3. To perform a practical on lung capacity: Tidal Volume (TV), Inspiratory Reserve Volume (IRV), Expiratory Reserve Volume (ERV) and Vital Capacity (VC) etc.
4. To study different types of neurons and Neuroglia cells.
5. To study Synapse: Structure and types (Chemical and Electric).
6. To study Nerve Conduction Velocity measurements. (Nerve stimulator machine)
7. To study structure and function of sense organs: (i) Human eye and (ii) Human ear
8. Hormonal control and regulation of glands: Pituitary gland, Thyroid gland, Parathyroid gland,
9. Histological observations of endocrine glands
10. Study of pathology of endocrine glands

REFERENCES:

- K Sembulingam - Essentials of Medical Physiology
- Sherwood - Human Physiology From Cells to Systems
- Principles of Anatomy & Physiology, 2006, 11th Edition, Tortora G.J. & Grabowski S.,John Wiley & sons, Inc.
- Human physiology, Vol. I & II, 1980, 12th Edn. Dr. C. C. Chatterjee, Medical appliedagency, Kolkata
- Text book of Animal Physiology, 2008, 2nd Edn. Nagabhushanam, S. V. S. Rana, S.Kalavathy, Oxford University Press, India.
- Textbook of Practical Physiology,2001,G.K.Pal,Pravati Pal:Orient Longman
- Experimental Physiology,2005,S.C.Rastogi:NewAgeInternational Publishers.

E-RESOURCES:

https://bio.libretexts.org/Learning_Objects/Worksheets/Book%3A_The_Biology_Corner_(Worksheets)/Anatomy_Worksheets/Investigation%3A_Measuring_Lung_Capacity
https://www.ncbi.nlm.nih.gov/books/NBK482414/
https://egyankosh.ac.in/bitstream/123456789/7545/1/Unit-12.pdf
https://egyankosh.ac.in/bitstream/123456789/81597/1/PRACTICAL%20MANUAL.pdf
https://egyankosh.ac.in/bitstream/123456789/81429/3/Block-1.pdf
https://youtu.be/0GSRbmcNh3A?si=eWjvYup6u6s5HouV
https://youtube.com/playlist?list=PL6rxSTt9Nocl_xTWGiGgXhfqT21UesHHl&si=hL9RpVHsU4N1zQcB
https://youtu.be/fgXmffCyxco?si=RteQFx83XbV6xCqh
https://youtu.be/-vOJXUx1oE0?si=_RiAtP-SAyO9xsqd
https://youtu.be/w5DItm5RU_Q?si=diNevOH7kOo8pWDr

T. Y. B. Sc. Semester VI

COURSE CODE: ZO – MJ - 602
COURSE TITLE: NON-CHORDATES & CHORDATES - IV
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Identified the taxonomic status up to order level of higher invertebrates and vertebrates.
CO2: Learn about the importance of systematics, taxonomy and structural organization of animals.
CO3: Understand to analyse and critically the structure and functions of various system of higher non chordate and chordates animal.
CO4: Enhance collaborative learning and communication skills through practical sessions, team work and assignments. Practical curriculum includes museum specimens of various phyla and classes.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	**Non chordates**
	1.1: SECTION A (Taxonomy of Non chordates to be studied up to order)	
1.1.1	Arthropoda	
1.1.2	Mollusca	
1.1.3	Echinodermata	
1.1.4	Hemichordata:	
	1.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Sepia)	
1.2.1	External features	
1.2.2	Digestive system	
1.2.3	Respiratory system	
1.2.4	Circulatory system	
1.2.5	Excretory system	
1.2.6	Nervous system	
1.2.7	Reproductive system	

	UNIT 2	**Chordates**
	2.1: SECTION A (Taxonomy of chordate to be studied up to order)	
2.1.1 2.1.2 2.1.3	Reptiles Aves Mammals	
	2.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Pigeon)	
2.2.1 2.2.2 2.2.3 2.2.4 2.2.5 2.2.6	External Characters Digestive system Respiratory system (Air sacs) Circulatory system (Heart, Arterial system and Venous system) Urinogenital system Brain	

COURSE CODE: ZO – MJ - 602
COURSE TITLE: Non-Chordates & Chordates - IV
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. Classification of following animals up to order:
   I. Arthropoda: Apus, Daphnia, Cyclops, Cypris, Squilla, Hippa, Sacculina, Mantis, Dragon fly, Ear-wig, Mosquito, Ant, Bettle, Tick, Mite,
   II. Mollusca:Heliotis, Patella, Nautilus, Oyster, Mytilus, Doris, Cyprea, Teredo, Solen, Octopus, Loligo,
   III. Echinodermata: Astropecten, Strongylocentrotus, Synapta, Sand-dollar, Holothuria,
   IV.Hemichordata:Saccoglossus and Rhabdopleura
2. The following practicals of **Sepia** to be studied/taught only with the help of charts, models, Videos, photographs, permanent slides, working models, simulators etc.
   - Digestive system, Nervous system
   - Mountings: Jaws, Radula, Chromatophores and Spermatophores
3, Classification of following animals up to order:
   I. Reptiles: Trionyx, Sphenodon, Gecko, Eryx, Krait and Alligator
   II. Aves: Parrot, Great Indian Bustard, Horned owl, Flamingo, Emu
   III.Mammals: Ornithorhynchus, Didelphys, Erinaceus, Seal, Mongoose, Loris, Rabbit and Rhesus monkey
4. The following practical of **Pigeon** to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.
   - Digestive system
   - Urinogenital system,
   - Brain
   - Mountings : Pecten and Hyoid apparatus
6. Types of feathers in birds

REFERENCES:

- A Manual of Zoology Vol. I & II - EkambernathAyar. S. Vishwanathan Chennai.
- A Text Book of General Biology - Tomer& Singh. Rastogi Publication, Meerut
- Barnes, R. S. K.; Calow, P.; Olive, P. J. W.; Golding, D. W.; Spicer, J. I. (2002) The Invertebrates: a Synthesis, Blackwell Publishing.

- Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students, Asia Publishing Home.
- Chordate Zoology E.L Jordan & P. S. Verma. S.Chand
- Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) Animal
- Diversity, McGraw-Hill.
- Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
- Modern Text Book of Zoology Prof. R. L. Kotpal Invertebrates Rastogi publication,11th edition 2019-2020A
- PrushthvanshiPraniyoaneGarbhvidya - A.B.Vyas. Guj. GranthNirman Board.
- Text Book of Invertebrates. Saras publication
- Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
- Text book of Zoology - R. D. Vidyarthi. S.Chand
- Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt.ltd. Delhi
- The vertebrate Body by Romer Alfred Sherwood, Publisher: W, b, Saunders Company London.
- UtkrushthaAprushthvanshiPraniyo – U. M. Rawal. Guj.GranthNirman Board.
- Vertebrate Zoology: An Experimental Field Approach-Nelson G.Hairston. Cambridge University Press, 1994
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

E - RESOURCES:

http://egymkosh.ac.in/bitstream/123456789/16496/1/Unit-9.pdf
http://www.notesonzoology.com/invertebrates/locomotion/locomotion-in-star-fish-
https://biologywise.com/information-about-hydrostatic-skeleton

T. Y. B. Sc. Semester VI

COURSE CODE: ZO – MJ - 603
COURSE TITLE: BHARTIYA GYAN PARRAMPARA - II
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOMES:

CO1: Explain the fundamental principles and importance of Indian Knowledge Systems in the context of Zoology. Compare and contrast the ancient Indian classification of animals with modern taxonomic systems.

CO2: Analyze the scientific basis behind the classification of animals into various Vargas according to Vedic literature.

CO3: Evaluate the cultural, spiritual, and ecological significance of cows in Indian tradition and compare their status across different religions.

CO4: Interpret the symbolism of animals (particularly snakes) in Indian mythology, spiritual practices, and traditional medicine. Apply traditional knowledge about animals to address contemporary challenges in conservation, sustainable development, and ecological balance.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	Serpent Science in Indian Tradition
1.1.1	Mythological Significance of Snakes • Symbolism of Sheshanaga, Vasuki, and other serpent deities • Naga worship traditions across India • Astronomical connections of serpent mythology • Cultural practices related to snake worship	
1.1.2	Serpents in Kundalini Yoga • Concept of Kundalini Shakti as serpent energy • Relationship between nadis (energy channels) and serpent imagery • Practical aspects of awakening consciousness	

	• Scientific interpretations of Kundalini experiences
1.1.3	Snakes in Ayurveda • Traditional knowledge of snake venom and its medicinal uses • Ayurvedic treatments for snake bites • Snake-based preparations in traditional medicine • Ethical aspects of using animal products in medicine
1.1.4	Dual thinking of Snakes in Indian Tradition • Key for identification of venomous and non-venomous snakes • Positive symbolism: Wisdom, eternity, and protection • Regional variations in serpent symbolism • Contemporary relevance of serpent symbolism • Venomous and non-venomous snakes of Gujarat
	UNIT 2 **Subject Specific IKS – Insects in Indian Knowledge Systems**
2.2.1	Insects in Indian Knowledge Systems • Sericulture and apiculture traditions • Insect-based traditional medicines • Pest management in traditional agriculture • Seasonal insect cycles documented in traditional almanacs
2.2.2	Traditional Knowledge of Birds • Bird classification in Sanskrit texts • Migratory patterns observed in ancient India • Bird symbolism in Indian art and literature • Traditional bird conservation practices

COURSE CODE : ZOP – MJ - 603
COURSE TITLE: BHARTIYA GYAN PARRAMPARA - II
COURSE LEVEL: T.Y. B. Sc. SEM - V
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. To study 7 snake deities that are worshipped in India: Sheshanaga, Vasuki, Karkotaka, Takshaka, Kaliya, Manasa, Gullika
2. To study Key for identification of venomous and non-venomous snakes.
3. To study species of honeybees commonly found in India.
4. To study social organization of honey bees.
5. To study medicinal importance of honey, bee wax, bees venom.
6. To study types of silkworm.
7. To study bird symbolism in Indian art and literature: Eagle, Crane, Peacock, Crow, Sparrow, Falcon, Owl, Swan, Pelican, Penguin, Bluebird, Quail, Nightingale, Hummingbird, Cardinal, Chickadee, Woodpecker, Dove, Heron, Blackbird.
8. To study birds in Indian culture: Eagle, Peacock, Vulture, Owl, Crow, Crane, Swan, Chukar, Pigeon, Parakeet, Cuckoo, Indian Roller, Rooster.

REFERENCES:

- Economic Zoology: G. S. Shukla & V. B. Upadhyay, Rastogi Publication, Meerut.
- Economic and Applied Entomology: Kumar and Nigum, Emkay Publication, Delhi.
- Modern Text Book of Zoology (invertebrate) R.L. Kotpal, Rastogi Publication, Meerut, India.
- Invertebrate Zoology- E.L. Jordan &P.S.Verma
- Invertebrate Zoology- T.C. Majupuria, Pradeep Publication, Jalandhar,

E-RESOURCES:

https://www.hinduwebsite.com/buzz/symbolism-of-snakes-in-hinduism.asp
https://en.wikipedia.org/wiki/Snake_worship
https://www.astroved.com/blogs/why-are-snakes-considered-sacred-in-hinduism
https://en.wikipedia.org/wiki/Snakes_in_mythology
https://timesofindia.indiatimes.com/etimes/trending/7-snake-deities-that-are-worshipped-in-india-and-why/photostory/111843516.cms
https://timesofindia.indiatimes.com/etimes/trending/7-snake-deities-that-are-worshipped-in-india-and-why/amp_etphotostory/111843516.cms

https://www.karigarofficial.com/blogs/blog/symbolism-and-importance-of-snakes-in-hinduism-ayurveda-and-mythology
https://en.wikipedia.org/wiki/N%C4%81ga
https://en.wikipedia.org/wiki/Serpent_symbolism
https://openknowledge.fao.org/server/api/core/bitstreams/54bfbee7-88e4-4a96-8029-d12fb5266a2f/content
https://www.vedantu.com/biology/apiculture-and-sericulture
https://byjus.com/biology/difference-between-apiculture-and-sericulture/
https://egov.uok.edu.in/elearning/tutorials/1011020512BR15103CR15Apiculture%20Lac%20culture%20and%20%20sericultureapiculture%20lac%20culture%20and%20%20sericulture%20upload.pdf
https://www.gktoday.in/sericulture-apiculture-and-poultry/
https://pmc.ncbi.nlm.nih.gov/articles/PMC4561416/
ttps://www.britannica.com/place/India/Agriculture-and-animal-husbandry
https://www.fao.org/3/bp265e/bp265e.pdf

T. Y. B. Sc. Semester VI

COURSE CODE: ZO – ME - 601
COURSE TITLE: ANIMAL PHYSIOLOGY COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Describe the structure and function of the digestive system and its role in nutrient absorption. Explain the digestion and absorption of carbohydrates, proteins, and fats, and the enzymes involved.

CO2: Understand the structure and function of the cardiovascular system and its circulation processes. Describe the cardiac cycle, blood pressure regulation, and gas transport in the blood.

CO3: Explain kidney structure and function, focusing on filtration, reabsorption, and secretion. Understand the respiratory system's structure and function in gas exchange and breathing.

CO4: Integrate knowledge of the digestive, cardiovascular, renal, and respiratory systems in maintaining homeostasis.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1
	1.1: SECTION A (Digestive system)
1.1.1	Structure and function of the digestive tract (mouth, stomach, small and large intestine)
1.1.2	Digestion and absorption of nutrients (carbohydrates, proteins, fats)
1.1.3	Enzymes involved in digestion
	1.2: SECTION B (Circulatory System)
1.2.1	Structure and function of the heart, blood vessels, and blood
1.2.2	Cardiac cycle and blood pressure regulation
1.2.3	Circulation (systemic, pulmonary)

1.2.4 1.2.5	Blood composition (plasma, red blood cells, white blood cells, platelets) Mechanisms of oxygen and carbon dioxide transport

	UNIT 2
	2.1: SECTION A (Excretory Sysstem)
2.1.1 2.1.2 2.1.3	Structure and function of kidneys Structure and function of Nephron Filtration, reabsorption, and secretion in nephron
	2.2: SECTION B (Respiratory system)
2.2.1 2.2.2 2.2.3	Structure and function of the respiratory system (lungs, trachea, bronchi) Mechanism of breathing (inspiration and expiration) Gas exchange and transport (oxygen and carbon dioxide)

COURSE CODE : ZOP – ME - 601
COURSE TITLE: PRACTICALS IN ANIMAL PHYSIOLOGY
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. To study the structure of the digestive tract (mouth, stomach, small and large intestine) using models or histology slides.
2. To observe the digestion and absorption of nutrients (carbohydrates, proteins, and fats) in various conditions and identify the role of digestive enzymes.
3. To study the structure and function of the heart and blood vessels using anatomical models or histological slides.
4. To study systemic and pulmonary circulation through charts.
5. To determine the composition of blood through blood smear preparation and staining.
6. To examine the structure and function of the kidneys and nephrone using histology slides or kidney models.
7. To study the structure and function of the respiratory system (lungs, trachea, bronchi) using anatomical models/ chats.
8. To measure respiratory rates to understand the mechanism of breathing (inspiration and expiration).
9. To study gas exchange and transport (oxygen and carbon dioxide) with the help of charts.

REFERENCES:

- K Sembulingam - Essentials of Medical Physiology
- Sherwood - Human Physiology From Cells to Systems
- Principles of Anatomy & Physiology, 2006, 11th Edition, Tortora G.J. & Grabowski S.,John Wiley & sons, Inc.
- Human physiology, Vol. I & II, 1980, 12th Edn. Dr. C. C. Chatterjee, Medical appliedagency, Kolkata
- Text book of Animal Physiology, 2008, 2nd Edn. Nagabhushanam, S. V. S. Rana, S.Kalavathy, Oxford University Press, India.
- Textbook of Practical Physiology,2001,G.K.Pal,Pravati Pal:Orient Longman
- Experimental Physiology,2005,S.C.Rastogi:NewAgeInternational Publishers.

E-RESOURCES:

https://bio.libretexts.org/Learning_Objects/Worksheets/Book%3A_The_Biology_Corner_(Worksheets)/Anatomy_Worksheets/Investigation%3A_Measuring_Lung_Capacity
https://www.ncbi.nlm.nih.gov/books/NBK482414/
https://egyankosh.ac.in/bitstream/123456789/7545/1/Unit-12.pdf
https://egyankosh.ac.in/bitstream/123456789/81597/1/PRACTICAL%20MANUAL.pdf
https://egyankosh.ac.in/bitstream/123456789/81429/3/Block-1.pdf
https://youtu.be/0GSRbmcNh3A?si=eWjvYup6u6s5HouV
https://youtube.com/playlist?list=PL6rxSTt9Nocl_xTWGiGgXhfqT21UesHHl&si=hL9RpVHsU4N1zQcB
https://youtu.be/fgXmffCyxco?si=RteQFx83XbV6xCqh
https://youtu.be/-vOJXUx1oE0?si=_RiAtP-SAyO9xsqd
https://youtu.be/w5DItm5RU_Q?si=diNevOH7kOo8pWDr

T. Y. B. Sc. Semester VI

COURSE CODE: ZO – ME - 602
COURSE TITLE: NON-CHORDATES, CHORDATES - IV
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 15 hrs. = 30 hrs.
TEACHING PER WEEK: 2 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

COURSE OUTCOME:

CO1: Identified the taxonomic status up to order level of higher invertebrates and vertebrates.
CO2: Learn about the importance of systematics, taxonomy and structural organization of animals.
CO3: Understand to analyse and critically the structure and functions of various system of higher non chordate and chordates animal.
CO4: Enhance collaborative learning and communication skills through practical sessions, team work and assignments. Practical curriculum includes museum specimens of various phyla and classes.

	CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
Mapping between COs with PSOs	CO1	✓			✓		✓
	CO2	✓	✓	✓	✓	✓	✓
	CO3	✓			✓	✓	✓
	CO4	✓		✓	✓	✓	✓

COURSE CONTENT:

	UNIT 1	**Nonchordates**
	1.1: SECTION A (Taxonomy of Nonchordates to be studied up to order)	
1.1.1	Arthropoda	
1.1.2	Mollusca	
1.1.3	Echinodermata	
1.1.4	Hemichordata:	
	1.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Sepia)	
1.2.1	External features	
1.2.2	Digestive system	
1.2.3	Respiratory system	
1.2.4	Circulatory system	
1.2.5	Excretory system	
1.2.6	Nervous system	
1.2.7	Reproductive system	

	UNIT 2	**Chordates**
	2.1: SECTION A (Taxonomy of chordate to be studied up to order)	
2.1.1 2.1.2 2.1.3	Reptiles Aves Mammals	
	2.2: SECTION B (Study of the following animal types with reference to the Structure and functions of various organs of all systems: Pigeon)	
2.2.1 2.2.2 2.2.3 2.2.4 2.2.5 2.2.6	External Characters Digestive system Respiratory system (Air sacs) Circulatory system (Heart, Arterial system and Venous system) Urinogenital system Brain	

COURSE CODE: ZOP – ME - 602
COURSE TITLE: Non-Chordates, Chordates - IV
COURSE LEVEL: 300 - 399
CREDIT: 02
TOTAL ENGAGEMENT: 2 Credits X 30 hrs. = 60 hrs.
TEACHING PER WEEK: 4 Hrs.
MINIMUM WEEKS PER SEMESTER: 15 Weeks
EFFECTIVE FROM: 2025-26

STUDENT'S LEARNING OUTCOME:

1. Classification of following animals up to order:
   I. Arthropoda: Apus, Daphnia, Cyclops, Cypris, Squilla, Hippa, Sacculina, Mantis, Dragon fly, Ear-wig, Mosquito, Ant, Bettle, Tick, Mite,
   II. Mollusca:Heliotis, Patella, Nautilus, Oyster, Mytilus, Doris, Cyprea, Teredo, Solen, Octopus, Loligo,
   III. Echinodermata: Astropecten, Strongylocentrotus, Synapta, Sand-dollar, Holothuria,
   IV.Hemichordata:Saccoglossus and Rhabdopleura
2. The following practicals of **Sepia** to be studied/taught only with the help of charts, models, Videos, photographs, permanent slides, working models, simulators etc.
   - Digestive system, Nervous system
   - Mountings: Jaws, Radula, Chromatophores and Spermatophores
3, Classification of following animals up to order:
   I. Reptiles: Trionyx, Sphenodon, Gecko, Eryx, Krait and Alligator
   II. Aves: Parrot, Great Indian Bustard, Horned owl, Flamingo, Emu
   III.Mammals: Ornithorhynchus, Didelphys, Erinaceus, Seal, Mongoose, Loris, Rabbit and Rhesus monkey
4. The following practical of **Pigeon** to be taught/studied only with the help of Charts/models/videos/photographs/permanent slides, working models, simulators etc.
   - Digestive system
   - Urinogenital system,
   - Brain
   - Mountings : Pecten and Hyoid apparatus
6. Types of feathers in birds

REFERENCES:

- A Manual of Zoology Vol. I & II - EkambernathAyar. S. Vishwanathan Chennai.
- A Text Book of General Biology - Tomer& Singh. Rastogi Publication, Meerut
- Barnes, R. S. K.; Calow, P.; Olive, P. J. W.; Golding, D. W.; Spicer, J. I. (2002) The Invertebrates: a Synthesis, Blackwell Publishing.

- Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
- Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students, Asia Publishing Home.
- Chordate Zoology E.L Jordan & P. S. Verma. S.Chand
- Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) Animal
- Diversity, McGraw-Hill.
- Holland, P. (2011) The Animal Kingdom: A Very Short Introduction, Oxford University Press.
- Modern Text Book of Zoology Prof. R. L. Kotpal Invertebrates Rastogi publication,11th edition 2019-2020A
- PrushthvanshiPraniyoaneGarbhvidya - A.B.Vyas. Guj. GranthNirman Board.
- Text Book of Invertebrates. Saras publication
- Text Book of Chordates - A. Thangamani, S. Prasanna Kumar
- Text book of Zoology - R. D. Vidyarthi. S.Chand
- Text Book of Zoology - S.N. Prasad. Vikas Publishing House pvt.ltd. Delhi
- The vertebrate Body by Romer Alfred Sherwood, Publisher: W, b, Saunders Company London.
- UtkrushthaAprushthvanshiPraniyo – U. M. Rawal. Guj.GranthNirman Board.
- Vertebrate Zoology: An Experimental Field Approach-Nelson G.Hairston. Cambridge University Press, 1994
- Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

E - RESOURCES:

http://egymkosh.ac.in/bitstream/123456789/16496/1/Unit-9.pdf
http://www.notesonzoology.com/invertebrates/locomotion/locomotion-in-star-fish-
https://biologywise.com/information-about-hydrostatic-skeleton

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B. Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 501

(Biochemistry) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1. Estimation of total Protein by Lowry's method (10)

OR

Q. 1. Effect Temperature on salivary amylase activity.

OR

Q. 1. Effect of pH on salivary amylase activity.

Q. 2. Draw any one Metabolic cycle (Glycolysis, Krebs Cycle, Gluconeogenesis, Urea cycle, β – Oxidation of Fatty acid) (06)

Q.3. 1. Identify and Describe (Purine/pyrimidine) (04)

2. Identify and Describe (DNA/RNA)

Q. 4. Viva – voce (03)

Q. 5. Journal (02)

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B. Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 502

(Non Chordates and Chordates - III) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1 Draw labelled diagram of _____ Leech. (05)

Q. 2 Identify and describe the bones of **girdles/ Limbs**. (03)

Q. 3 Write the specimens as per instructions. (12)

1. Identify and classify with giving reasons (Invertebrates)
2. Identify and classify with giving reasons (Invertebrates)
3. Identify and describe/ classify with giving reasons (Invertebrates)
4. Identify and classify with giving reasons (Vertebrates)
5. Identify and classify with giving reasons (Vertebrates)
6. Identify and describe (Vertebrates)

Q. 4 Viva voce (03)

Q. 5 Journal (02)

****

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B. Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 503

(Bhartiya Gyan Parampara - I**) – BGP - Credit - 02**

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q-1 Write in detail ancient classification of animals/ Write significance of Kamdhenu Cow. **(10)**

Q-2 Identify the specimen as per the Instruction. **(10)**

1. Identify and describe.(Types of Honey base on colour)
2. Identify and describe.(Types of Panchagavya)
3. Identify and describe.(Milch breed of Cow)
4. Identify and describe.(Draught resistant breeds of Cow)
5. Identify and describe.(Dual breeds of Cow)

Q-3 Viva-voice **(03)**

Q-4 Journal **(02)**

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T. Y. B. Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZO - SEC – 501

(Bioinstrumentation) - Credit - 01

Time: 2 hours **Total marks: 13**

NOTE: Certified Journal is Compulsory.

Q. 1 Write the specimens as per instructions. (08)

1. Identify and describe its principle
2. Identify and describe its structure
3. Identify and describe its application
4. Identify and describe

Q. 2 Viva voce (03)

Q. 3 Journal (02)

****

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B. Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZOP - ME – 501

(Biochemistry) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1. To perform qualitative tests for carbohydrates. (08)

OR

Q. 1. To perform qualitative tests for lipids.

OR

Q. 1. To perform qualitative tests for protein.

Q. 2. To measure the pH of various solutions (04)

Q.3. 1. Identify and Describe (Purine/pyrimidine) (08)

2. Identify and Describe (DNA)

3. Identify and Describe (RNA)

4. Identify and Describe (Chemical bond)

Q. 4. Viva – voce (03)

Q. 5. Journal (02)

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B.Sc. SEM – V

PRACTICAL EXAMINATION ZOOLOGY: ZO - ME – 502

(Non Chordates and Chordates - III) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1 Draw labelled diagram of _____ Leech. (05)

Q. 2 Identify and describe the bones of **girdles/ Limbs**. (03)

Q. 3 Write the specimens as per instructions. (12)

1. Identify and classify with giving reasons (Invertebrates)
2. Identify and classify with giving reasons (Invertebrates)
3. Identify and describe/ classify with giving reasons (Invertebrates)
4. Identify and classify with giving reasons (Vertebrates)
5. Identify and classify with giving reasons (Vertebrates)
6. Identify and describe (Vertebrates)

Q. 4 Viva voce (03)

Q. 5 Journal (02)

****

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B.Sc. SEM – VI

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 601

(Animal Physiology) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q.1. To perform a practical on lung capacity: Tidal Volume (TV), Inspiratory Reserve Volume (IRV), Expiratory Reserve Volume (ERV) and Vital Capacity (VC) etc. (10)

OR

Hormonal control and regulation of glands: Pituitary gland, Thyroid gland, Parathyroid gland.

OR

To study the rate of oxygen consumption of Albino rat or black rat.

Q.2. 1. Identify and Describe (Neurons / Neuroglial Cells) (10)

2. Identify and Describe (Synapse type)
3. Identify and Describe (Sense Organ)
4. Identify and Describe (Histological slide of Endocrine gland)
5. Identify and Describe (Pathology of Endocrine Gland)

Q.3. Viva – voce (03)

Q.4. Journal (02)

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B.Sc. SEM – VI

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 602

(Non chordates and Chordates) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1 Draw labelled diagram of _____ Sepia. (05)

Q. 2 Draw labelled diagram of _____ Pigeon. (05)

Q. 3 Write the specimens as per instructions. (10)

1. Identify and classify with giving reasons (Invertebrates)
2. Identify and classify with giving reasons (Invertebrates)
3. Identify and classify with giving reasons (Vertebrates)
4. Identify and classify with giving reasons (Vertebrates)
5. Identify and describe

Q. 4 Viva voce (03)

Q. 5 Journal (02)

****

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B. Sc. SEM – VI

PRACTICAL EXAMINATION ZOOLOGY: ZOP - MJ – 603

(Bhartiya Gyan Parampara - II**) – BGP - Credit - 02**

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q-1 Write Snake deities that are worshipped / Write Key for Identification of Venomous and Non-venomous Snakes **(10)**

Q-2 Identify the specimen as per the Instruction. **(10)**

1. Identify and describe.(Species of Honey bees/ Social organization of Honey bees)
2. Identify and describe.(Medicinal importance of Honey)
3. Identify and describe.(Type of Silk Worm))
4. Identify and describe.(Bird symbolism in Indian art and literature)
5. Identify and describe.(Birds in Indian culture)

Q-3 Viva-voice **(03)**

Q-4 Journal **(03)**

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B.Sc. SEM – VI

PRACTICAL EXAMINATION ZOOLOGY: ZOP - ME – 601

(Animal Physiology) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1. To determine the composition of blood through blood smear preparation and staining (10)

OR

To measure respiratory rates to understand the mechanism of breathing

Q.2. 1. Identify and Describe (histology slides of Salivary Gland/stomach / small or large intestine) (10)

2. Identify and Describe (structure of the kidneys /nephrone)
3. Identify and Describe (structure of the lungs/trachea/bronchi)
4. Identify and Describe (Oxygen/Carbon dioxide gas exchange)
5. Identify and Describe (Systemic/Pulmonary circulation)

Q. 3. Viva – voce (03)

Q. 4. Journal (02)

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VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

T.Y. B.Sc. SEM – VI

PRACTICAL EXAMINATION ZOOLOGY: ZOP - ME – 602

(Non chordates and Chordates) - Credit - 02

Time: 4 hours **Total marks: 25**

NOTE: Certified Journal is Compulsory.

Q. 1 Draw labelled diagram of _____ Sepia. (05)

Q. 2 Draw labelled diagram of _____ Pigeon. (05)

Q. 3 Write the specimens as per instructions. (10)

1. Identify and classify with giving reasons (Invertebrates)
2. Identify and classify with giving reasons (Invertebrates)
3. Identify and classify with giving reasons (Vertebrates)
4. Identify and classify with giving reasons (Vertebrates)
5. Identify and describe

Q. 4 Viva voce (03)

Q. 5 Journal (02)

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