

FACULTY OF LIFE SCIENCES

Syllabus for the

Subject: Zoology

For the award of the Degree in

Bachelor of Science (Medical)/ Honours

(Offered under 4- year UG Degree Programme)

(Credit Based Continuous Evaluation Grading System under NEP 2020)

(SEMESTER: III-IV)

Session: 2025-26



Kanya Maha Vidyalaya, Jalandhar (Autonomous)

The Heritage Institution

KANYA MAHAVIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF FOUR YEAR UNDER GRADUATE DEGREE PROGRAMME

Session-2025-26

Bachelor of Science (Medical)/ Honours Semester -III										
Course Name	Paper	Course Code	Course Type	Credits L-T-P	Hours per week L-T-P	Total Marks	Marks			Exam Time in Hrs
							L	P	CA	
Zoology	Diversity of Chordates	BSML-3483	DSC	4-0-0	4-0-0	100	70	-	30	3
	Chordates Lab	BSMP-3483	DSC	0-0-2	0-0-4	50	-	35	15	3
Bachelor of Science (Medical)/ Honours Semester -IV										
Zoology	Cell Biology	BSML-4483	DSC	4-0-0	4-0-0	100	70	-	30	3
	Cell Biology Lab	BSMP-4483	DSC	0-0-2	0-0-4	50	-	35	15	3
Zoology	Medical Lab Technology	BSMM-4480	SEC	2-0-1	2-0-2	100	50	20	30	3+3

Bachelor of Science (Medical)/ Honours Semester–III (Session 2025-26)

Course Title: Zoology (Diversity of Chordates)

Course Code: BSML-3483

(THEORY)

Course Outcomes

After passing this course the student will be able to:

- CO1: Understand general body plan of Herdmania and external characters of Amphioxus.
- CO2: Understand external characters and affinities of Petromyzon as well as body systems of Labeo.
- CO3: Understand body plan and various systems of Frog and Uromastix.
- CO4: Understand body systems of Pigeon and Rat.

Bachelor of Science (Medical)/ Honours Semester–III (Session 2025-26)

Course Title: Zoology (Diversity of Chordates)

Course Code: BSML-3483

(THEORY)

Credits: 4-0-0

Time: 3 Hours

Max Marks: 100

Theory: 70

CA: 30

Instructions for the Paper Setter

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Brief Introduction to Protochordata

Urochordata: Type study- *Herdmania*

Cephalochordata: External features and affinities of *Amphioxus*

Unit II

Cyclostomata: External Characters of *Petromyzon*

Affinities of Cyclostomata

Pisces: Type study-*Labeo*

Unit III

Amphibia: Type study-Frog

Reptilia: Type study-*Uromastix*

Unit IV

Aves: Type study-Pigeon

Mammals: Type study-Rat

Suggested Reading Material.

1. Dharni, P.S. & Dharni J.K. (1998), Vertebrates, R. Chand & Co., New Delhi.
2. Hildebrand, M. and Goslow. Jr. G.E. (2001), Analysis of Vertebrates Structure, John Wiley, N. Y.
3. Jollie, M. (1968), Chordate Morphology, Reinhold, New York.
4. Kardong, K. V. (1995), Vertebrates – Comparative Anatomy, Function, Evolution. W.B.C. Pub. , Oxford.
5. Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates (9thed), McGraw Hill Higher Education, New York.

6. Linzey, D. (2001), Vertebrate Biology, McGraw Hill Publishing Company, New York.
7. Pough, F. H., Heiser, J. B. and McFarland, W. N. (1990), Vertebrate Life (3rd ed), Macmillan Pub. Co., New York.
8. Young, J. Z. (1982), The Life of Vertebrates, New York.
9. Parker, T.J. and Haswell, W.A (1981) Text Book of Zoology, Vol. II (Vertebrates), ELBS and Macmillian Press Ltd.

Bachelor of Science (Medical)/ Honours Semester–III (Session 2025-26)

Course Title: Zoology (Chordates Lab)

Course Code: BSMP-3483

(PRACTICAL)

Course Outcomes

- CO1. helps the students to get acquaintance to animal kingdom especially the animal species belonging to phylum Chordata
- CO2: Familiarize organ systems.
- CO3: Know about economically important specimens (preserved).
- CO4: Learn about histology and morphology of chordates

Bachelor of Science (Medical)/ Honours Semester–III (Session 2025-26)

Course Title: Zoology (Chordates Lab)

Course Code: BSMP-3483

(PRACTICAL)

LTP: 0-0-2

Time: 3 Hrs.

Max Marks: 50

Marks: 35

CA: 15

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

Guidelines for conduct of Practical Examination:

1. Draw a labelled sketch of the system of the given animal & explain it to the Examiner. 5
 2. Identify and classify the specimens upto order level. Write a short note on habitat, special features, feeding, habits and economic importance of the specimens. 10
 3. Identify the slides/specimens, give two reasons for identification. 8
 4. Assignment/ Visit Report 6
 5. Viva-voce & Practical file. 6
- I. Classification up to order level, except in case of Pisces and Aves where classification up to subclass level, habits, habitat, external characters and economic importance (if any) of the following animals is required :**
- Urochordata** : *Herdmania, Molgula, Pyrosoma, Doliolum, Salpa & Oikopleura*.
- Cephalochordata**: *Amphioxus*. Study of the following prepared slides:
T.S. *Amphioxus* through various regions, Pharynx of *Amphioxus*
- Cyclostomata** : *Myxine, Petromyzon & Ammocoetes* Larva.
- Chondrichthyes** : *Zygaena* (hammer head shark), *Pristis* (saw fish), *Narcine* (electric ray), *Trygon*, *Rhinobatus* and *Chimaera* (rabbit fish).
- Actinoptergii** : *Polypterus, Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Tetradon, Echeineis and Solea*.
- Dipneusti (Dipnoi)** : *Protopterus* (African lung fish)
- Amphibia** : *Uraeotyphlus, Necturus, Amphiuma, Amblystoma* and its Axolotl Larva, *Triton, Salamandra, Hyla, Rhacophorus*
- Reptilia** : *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Vipera, Crocodilus, Gavialis*,

Chelone(turtle) and *Testudo* (tortoise),Differences in nonpoisonous and poisonous snakes.

Aves : *Casuarius, Ardea, Anas, Milvus, Pavo, Eudynamics, Tyto* and *Alcedo*.

Mammalia : *Ornithorynchus, Echidna, Didelphis, Macropus, Loris, Macaca, Manis, Hystrix, Funambulus, Panthera, Canis, Herpestes, Capra, Pteropus*.

II. Study of the following systems with the help of charts/models/videos:

Herdmania : General anatomy

Labeo : Digestive and reproductive systems, heart, afferent and branchial arteries, cranial nerves and internal ear.

Pigeon : Digestive, arterial, venous and urino-genital systems.

WhiteRat : Digestive, arterial, venous and urino-genital systems.

Study of permanent slides of whole mount of Pharynx of *Herdmania* and *Amphioxus*.

Cycloid scales of *Labeo*, blood smear of mammal, Histology of rat/rabbit (compound tissues)

Note:- Some changes can be made in the practicals depending on the availability of material.

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Cell Biology)

Course Code: BSML-4483

(THEORY)

Course Outcome

After passing this course the student will be able to:

- CO1: Perform a variety of molecular and cellular biology techniques
- CO2: Describe cellular membrane structure and function, fine structure and function of cell organelles.
- CO3: Knowledge about structure and function of cell organelles.
- CO4: Learn elementary idea about Cancer and Immunity.

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Cell Biology)

Course Code: BSML-4483

(THEORY)

Credits: 4-0-0

Time: 3 Hours

Max Marks: 100

Theory: 70

CA: 30

Instructions for the Paper Setter

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Methods in Cell Biology

- (a) Principles of light and phase contrast microscopy
- (b) Electron microscopy (TEM and SEM)
- (c) Fixation and fixatives
- (d) Staining techniques.

UNIT-II

Organization of Cell: Extra nuclear and nuclear, ultrastructure and functions of cell organelles

- (a) Plasma Membrane: Structure, osmosis, active and passive transport, endocytosis and exocytosis.
- (b) Endoplasmic reticulum: Structure, types and associated enzymes.
- (c) Mitochondria: Structure, mitochondrial enzymes and role of mitochondria in respiration and mitochondrial DNA.

UNIT-III

Organization of Cell:

- (a) Golgi complex: Structure and functions.
- (b) Ribosomes: Types of ribosomes, their structure and functions.
- (c) Lysosomes: Polymorphism and their function.
- (d) Centrosome: Structure and functions.

UNIT-IV

Nucleus: Structure and functions of nuclear membrane, nucleolus and chromosomes.

An elementary idea of cell transformation in cancer

An elementary idea of cellular basis of immunity

Suggested Readings:

1. Cooper, G. M. (2004), The cell, A Molecular Approach, ASM press, Washington, D. C.
2. Karp, G. (1984). Cell Biology (4th ed), McGraw Hill, New York.
3. Pawar, C.B (1999), Cell Biology, Himalaya Publishing House, Bombay.
4. Dhami P. K. (2000) Zoology I, Pradeep Publishers.

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Cell Biology Lab)

Course Code: BSMP-4483

(PRACTICAL)

Course Outcomes

After passing this course the student will be able to:

- CO1: Understand the techniques of Chromatography
- CO2: Learn about protein estimation through Gel electrophoresis
- CO3: Understand the Electron microscopy
- CO4: Learn about structures of cell organelles through micrographs

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Cell Biology Lab)

Course Code: BSML-4483

(THEORY)

LTP: 0-0-2

Time: 3 Hrs.

Max Marks: 50

Marks: 35

CA: 15

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

1. CHROMATOGRAPHY

A. Paper chromatography.

B. Thin layers chromatography

2. Gel electrophoresis through photographs or through research laboratories

3. Familiarity with TEM & SEM.

4. Study of different ultra structures of cell organelles through micrographs.

Guidelines for conduct of practical Examination: -

- | | |
|--|---|
| 1. Write the principle, Procedure and Application of Chromatography and show the results to the Examiner | 8 |
| 2. Write a note on Principle, Procedure and applications of Gel Electrophoresis. | 8 |
| 3. Write a note on microscopy | 5 |
| 4. Identify the slides/micrographs and give two reasons for identification. | 6 |
| 5. Viva-voce & Practical file. | 8 |

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Medical Lab Technology)

Course Code: BSMM-4480

(THEORY)

Course outcomes:

After completion of course students will be able to:

- CO1: Comply with safety regulations and universal precautions during lab investigations and perform basic laboratory techniques on biological specimens.
- CO2: Know about routine clinical laboratory investigations including collection of different samples and perform other routine hematological procedures.
- CO3: Describe basic scientific principles in learning new techniques and procedures in bacteriology and microbiology.
- CO4: Apply knowledge and technical skills associated histopathology, staining techniques and biochemical estimations.

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Medical Lab Technology)

Course Code: BSMM-4480

(THEORY)

Credits: 2-0-0

Theory: 50

Time: 3 Hours

Instructions for the Paper Setter

Eight questions of equal marks (10 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Antigen and antibody interactions- Serodiagnostic assays (Precipitation, agglutination immunodiffusion, ELISA, RIA)

Vaccines

Laboratory Techniques: Colorimetry, Microscopy, Autoclaving, Centrifugation and Spectrophotometry

UNIT- II

Collection, transportation and preservation of different clinical samples.

Haematology, collection of blood (venous and capillary), anticoagulants (merits and demerits), Romanowsky's stains, total RBC count, erythrocyte sedimentation rate, TLC, DLC, platelet count

UNIT- III

Bacteriology: sterilization (dry heat, moist heat, autoclave, filtration), disinfection, staining techniques, (gram stain, AFB stain, etc), culture media (defined and synthetic media & routine laboratory media), bacterial culture (aerobic and anaerobic) and antibiotic sensitivity.

UNIT- IV

Histopathology: Common fixatives and staining techniques.

Biochemistry: Principal/theory and significance of estimation of urea, sugar, cholesterol, creatinine, enzymes (transaminase, phosphatase, amylase and lipase), uric acid in blood, estimation of proteins, sugar, bile salts, ketone bodies in urine and liver function test.

Suggested Readings:

1. Baker, F.J. and Silverton, R.E. (1985) Introduction to Medical Laboratory Technology, (6th ed), Butlerworth and Co. Ltd.
2. Chatterjee, K.D. (1995), Parasitology, Protozoology and Helminthology (12th ed).

3. Cheesborough, M. (1987), Medical Laboratory Technology for Tropical countries (2nd ed), Butlerworth and Co., Ltd.
4. Garcia, L.S. (2001), Diagnostic Medical Parasitology, (4th ed), ASM Press Washington.
5. Kimball, J.W. (1986), Introduction of Immunology, MacMillian Publishing Co., New York.
6. Kuby, J. (2000), Immunology, W.H. Freeman & Co., USA.
7. Roitt, I. (1984), Essential Immunology, Blackwell Scientific Publications, Oxford.
8. Talib, V.H. (1999), Essential Laboratory Manual, Mehta Publishers, New Delhi.

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Medical Lab Technology Lab)

Course Code: BSMM-4480

(PRACTICAL)

Course outcomes:

After completion of course students will be able to:

- CO1: Apply knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations support.
- CO2: Perform basic clinical laboratory procedures using appropriate laboratory techniques and instrumentation in accordance with current laboratory safety protocol and quality patient health care.
- CO3: Understanding of sterilization techniques and will also learn about various histopathology techniques, handling and processing of tissue specimens as well as staining procedures.
- CO4: Understanding of estimation of protein & sugar

Bachelor of Science (Medical)/ Honours Semester–IV (Session 2025-26)

Course Title: Zoology (Medical Lab Technology Lab)

Course Code: BSMM-4480

(PRACTICAL)

Credits: 0-0-1

Time: 3 Hours

Practical: 20

1. Demonstration of safety rules in laboratory like proper handling of patients, specimens and disposal of syringes, needles etc.
2. Demonstration of the use of autoclave, centrifuge and spectrophotometer.
3. Cleaning and sterilization of glass ware, using hot air oven, autoclave etc.
4. Physico-chemical examination of urine.
5. Preparation of thick and thin blood smear.
6. Counting of WBC, RBC and DLC.
7. ESR and haematocrit
8. Demonstration of fixation, embedding, cutting of tissue sections, and their staining (routine haemotoxylin and eosin). Visit to a pathology Lab and preparation of report.

Note:- Some changes can be made in the practical depending on the availability of material.