FACULTY OF LIFE SCIENCES

Syllabus for

Bachelor of Science (Medical)

(SEMESTER: III-VI)

(Under Continuous Evaluation Grading System)

Session: 2023-25

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

The Heritage Institution

KANYA MAHA VIDYALAYA, JALANDHAR(AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Session-2023-25

SEMESTER III										
Course Name	**Program Name**	**Course Code**		**Course Type**	**Marks**					**Examination time (in Hours)**
					Total	**Paper**	**Ext.**		**CA**	
							L	**P**		
Zoology	B.Sc. (Medical)	BSMM-3483	BSMM-3483 (I)	E	100	Evolution	30	-	20	3
			BSMM-3483 (II)			Biodiversity-III	30	-		3
			BSMM-3483 (P)			Practical–III (related to Evolution and Biodiversity-III)	-	20		3
SEMESTER IV										
Zoology	B.Sc. (Medical)	BSMM - 4483	BSMM - 4483 (I)	E	100	Biochemistry	30	-	20	3
			BSMM - 4483 (II)			Animal Physiology	30	-		3
			BSMM -4483 (P)			Practical–III (related to Biochemistry and Animal Physiology)	-	20		3

B.Sc. (Medical) (Semester–III) (Session 2023-25)

ZOOLOGY

EVOLUTION

Course Code: BSMM-3483(I)

(THEORY)

Course Outcome

After passing this course the student will be able to:

- CO1. Understandconcept of evolution and identify the contributions of various Evolutionists.
- CO2. Know about origin of life and concept of speciation.
- CO3. Gain knowledge about fossils and its significance as well as evolution of man.
- CO4. Understand ecological adaptations in fishes, reptiles, birds and mammals.

B.Sc. (Medical) (Semester–III) (Session 2023-25)

ZOOLOGY

EVOLUTION

Course Code: BSMM-3483(I)

(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

Introduction to evolution
Evidences of organic evolution

Theories of organic evolution

Unit II

Origin of life
Concept of micro, macro and mega-evolution
Concept of Species
Speciation

Unit III

Fossils, its types and significance
Evolutionary rate
Origin & Extinction of reptiles
Evolution of man (in Brief)

Unit IV

Migration & Parental Care in Pisces
Flight adaptation & Bird migration
Adaptive radiations like scales & fins in fish, poison apparatus in snakes and dentition in Mammals.

Suggested Readings:

1. Avers, C. J.(1989). Evolution Process and Pattern in Evolution, New York Oxford Oxford university press.
2. Bhamarah, H.S.(1993), Juneka K., Cytogenetics & Evolution, Anmol Publication Pvt. Ltd.
3. Brookfield, A. P. (1986). Modern aspects of Evolution. Nelson Thornes publishers
4. Colbert. E.H.(2002), Evolution of Vertebrates, cbspd publishers
5. Freeman, S. and Herron, Jon C. (2007). Evolutionary analysis, Pearson Prentice Hall, New Jersey.

6. Futuyma, D. J. (1998), Evolutionary Biology, Sinauer Assoc. Inc. Pub. USA.
7. Meglitsch, P. A. (1991), Invertebrate Zoology (3rded), Oxford University Press.
8. Wen-Hsiung Li (1997), Molecular Evolution, Sinauer associatesInc.Pub. USA.
9. Rastogi, V.B(2003) Organic evolution, Medtech publishers
10. Strickberger, M.N(2000) Evolution , Jones and Bartlett publishers.
11. Tomar, B.S. and S.P.Singh(2000)Evolutionary Biology, Rastogi publishers.

B.Sc. (Medical) (Semester–III) (Session 2023-25)

ZOOLOGY

Biodiversity-III

(Chordates)

Course Code: BSMM-3483(II)

(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.

B.Sc. (Medical) (Semester–III) (Session 2023-25)

ZOOLOGY

BIODIVERSITY-III (Chordates)

Course Code: BSMM-3483(II)

(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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. Dhami, P.S. &Dhami 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 (9^{th}ed), 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.

B.Sc. (Medical) (Semester–III) (Session 2023-25)

Practical-III (Related to Evolutionand Biodiversity-III)

Course code: BSMM-3483(P)

Course Outcomes

- CO1. Familiarize organ systems.
- CO2. Aware about economically important specimens(preserved).
- CO3. Understanding of evolutionary phenomena.

B.Sc. (Medical) (Semester–III) (Session 2023-25)

Practical-III (Related to Evolutionand Biodiversity-III)
Course code: BSMM-3483(P)

Time: 3 hrs. **Marks: 20**

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, KanyaMahaVidyalaya, Jalandhar

Guidelines for conduct of Practical Examination:

1.	Draw a labelled sketch of the system of the given animal & explain it to the Examiner.	3
2.	Identify and classify the specimensupto order level. Write a short note on habitat, special features, feeding, habits and economic importance of the specimens.	8
3.	Idendify and write a note on the evolutionary phenomenon in the given specimen.	2
4.	Identify the slides/specimens, give two reasons for identification.	3
5.	Viva-voce & Practical file.	4

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, Echeneis 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)

Demonstration of evolutionary phenomena like homology, analogy, mimicry, crypsis.

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

(THEORY)

Course Outcome

After passing this course the student will be able to:

- CO-1.Understand the structure and functions of biologically important molecules.
- CO-2. Understand about enzymes, coenzymes and lipid metabolism.
- CO-3. Understand various processes of carbohydrate metabolism.
- CO-4. Gain knowledge about protein metabolism.

B.Sc. Medical (Semester–IV) (Session 2023-25)

ZOOLOGY

BIOCHEMISTRY

Course Code: BSMM-4483 (I)

(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

Biochemistry and its scope
Classification and functions of:
- Carbohydrates
- Proteins
- Lipids
- Nucleic acids

Unit II

Enzymes:
- Nature and their classification
- Coenzymes.

Lipid Metabolism:
- B-Oxidation of fatty acid
- Ketosis

Unit III

Carbohydrate Metabolism:
- Glycolysis
- Tricarboxylic acid cycle
- Hexose monophosphate shunt
- Glycogenesis
- Glycogenolysis
- Gluconeogenesis
- Oxidative Phosphorylation

Unit IV

Protein Metabolism:

Metabolism of amino acids
Oxidative deamination
Transamination
Decarboxylation
Hydrolysis of proteins
Ornithine cycle

Suggested Reading Material:-

1. Conn, E.E., Stump. P.K. Bruening, S. and Doi R.H. (2006), Outlines of Biochemistry (5th ed), John Wiley and Sons Inc., New York.
2. Fischer, J. and Arriold, J.R.P. (2001). Instant notes in Chemistry for Biologists, Viva Books Pvt. Ltd.
3. Harper, H.A. (2018): Harper's Biochemistry (31st ed).
4. Holde, K.E.V., Johnson, W.C. and Shing, P. (2005). Principles of Physical Biochemistry Prentice Hall, Inc., USA.
5. Lehninger, A (2017). Principles of Biochemistry, (7th ed).
6. Morris, H. Best, L.R., Pattison, S., Arerna, S. (2013). Introduction to General Organic Biochemistry, (11th ed), Wadsworth Group.
7. Robert, K., Murray, Mayes Daryl, K. Granner, Victor, W., Woodwell (1990), Harper's Biochemistry, 22nd Edition, Prentice Hall International Inc.
8. Sheehan, D (2013). Physical Biochemistry: Principles and Applications – John Wiley & Sons Ltd., England.
9. Stryer, L. (2019). Biochemistry (9th ed), San Francisco W.H. Freeman.

B.Sc. Medical (Semester–IV) (Session 2023-25)

ZOOLOGY

Animal Physiology

Course Code: BSMM-4483 (II)

(THEORY)

Course Outcomes

After passing this course the student will be able to:

- CO1.Understand mechanism of digestion and respiration.
- CO2.Have knowledge about composition of blood, blood groups, cardiac cycle and urine formation.
- CO3.Understand mechanism of skeletal muscle contraction and neural integration.
- CO4. Understand physiology of behavior and endocrine system.

B.Sc. Medical (Semester–IV) (Session 2023-25)

ZOOLOGY

Animal Physiology

Course Code: BSMM-4483 (II)

(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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.

Units I

Digestion : Digestion of dietary constituents, regulation of digestive processes and absorption. Extra and intra cellular digestion, enzymatic digestion and symbiotic digestion.

Respiration : Transport of O_2 and CO_2, Oxygen dissociation curve of haemoglobin, Bohr effect, chloride (-) shift, Haldane effect and control of breathing.

Units II

Heart : Origin and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, Blood pressure and micro-circulation.

Blood : Composition and functions of blood and lymph. Blood clotting. Blood groups including Rh factor, haemopoiesis

Excretion : Urine formation and osmoregulation.

Units III

Muscles : Ultrastructure, chemical and physical basis of skeletal muscle contraction.

Neural Integration: Structure of neuron, resting membrane potential, Origin and propagation of impulse along the axon, synapse and myoneural function.

Units IV

Physiology of Behavior: Taxes and reflexes, instinctive and motivate learning and reasoning

Endocrine : Structure and physiology of thyroid, parathyroid, adrenal, hypothalamus, pituitary, pancreas and gonads.

Suggested Reading Material:

1. Guyton, and Hall, (2015), Text Book of Medical Physiology, 15th Edition, Elsevier.
2. Hill, R. W., Wyse, G. K. and Anderson, N. 3 edi (2012), Animal physiology, Sinauer Associate, INC. Pub. Saunderland, Massachusettes, USA.
3. Hoar, W. S. (1984), General and Comparative Physiology, Prentice Hall of India Pvt. Limited, New Delhi, India.
4. Prosser, C.L.4th Edi (1991), Comparative Animal Physiology, Satish Book Enterprise Books seller & Publishers, Agra.
5. Purves, W. K., Oriane, G. H., Space, H. C. and Salava, D. (2001), Life – The Science of Biology (6th ed), Sinauer Assoc. Inc., USA.
6. Randall, D., Burggren, K.L. and French, K. (2002), Eckert Animal Physiology: Mechanisms and Adaptations, W.H. Freeman and Company, New York.
7. Taneja, S.K.(1997), Biochemistry & Animal Physiology, Trueman Book Co.
8. Willmer, P. Stone, G. and Johnston, I (2000). Environmental Physiology of Animals, Blackwell Science.
9. Withers, P.C. (1992), Comparative Animal Physiology, Saunder College Publishing, New York.

B.Sc. Medical (Semester–IV) (Session 2023-25)

ZOOLOGY

Practical -IV (Related to Biochemistry and Animal Physiology)

Course Code: BSMM-4483 (P)

(PRACTICAL)

Course Outcomes

- CO-1. Learn clinical procedures for blood & urine analysis.
- CO-2.Develop skill in simple biochemical laboratory procedures.
- CO-3.Skill in observing and to some extent in analysing various Biological Data.

B.Sc. Medical (Semester–IV) (Session 2023-25)

ZOOLOGY

Practical -IV (Related to Biochemistry and Animal Physiology)

Course Code: BSMM-4483 (P)

(PRACTICAL)

Time: 3hrs. **Marks: 20**

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. Study of the skeleton of *Scoliodon*, *Rana*, *Varanus*, *Gallus* and *Oryctolagus*.
2. Identification of food stuffs: starch, glucose, proteins and fats in solution.
3. Demonstration of osmosis and diffusion.
4. Demonstrate the presence of amylase in saliva, denaturation by pH and temperature.
5. Determination of coagulation and bleeding time of blood in man/rat/rabbit.
6. Determination of blood groups of human blood sample.
7. Recording of blood pressure of man.
8. Analysis of urine for urea, chloride, glucose and uric acid.
9. Estimation of haemoglobin content.
10. Field study: Visit to a fossil Park/Lab/ Science City and submit a report / Familiarity with the local vertebrate fauna.

Guidelines for conduct of Practical Examination:

1.	Identify the given bones, make labeled sketches of their respective–views	8
2.	Write down the steps and determine the constituents in the given sample.	3
3.	Write the procedure and perform the given physiology experiment.	3
4.	Report on visit to a fossil park/lab/Science City/study of local vertebrate fauna.	2
5.	Viva-voce & Practical file.	4

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

KANYA MAHA VIDYALAYA, JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Session-2023-25

SEMESTER V										
Course Name	**Program Name**	**Course Code**		**Course Type**	**Marks**					**Examination time (in Hours)**
					Total	**Paper**	**Ext.**		**CA**	
							L	**P**		
Zoology	B.Sc. (Medical)	BSMM-5483	I	E	100	Developmental Biology	30	-	20	3
			II			Genetics	30	-		3
			P			PRACTICAL-V (Related To Developmental Biology &Genetics)	-	20		3
SEMESTER VI										
Zoology	B.Sc. (Medical)	BSMM-6483	I	E	100	Medical Zoology	30	-	20	3
			II			Medical Laboratory Technology	30	-		3
			P			PRACTICAL-VI (Related To Medical Zoology &Medical Laboratory Technology)	-	20		3

B.Sc. Medical (Semester–V) (Session 2023-25)

ZOOLOGY

Course Title: Developmental Biology

Course Code: BSMM-5483 (I)

(THEORY)

Course Outcome

After successfully completing this course, students will be able to:

CO1: Understand the key events in earlyembryological developmentlike gametogenesis, fertilization and parthenogenesis.

CO2: Explain the process of cleavage, gastrulation, determination and differentiation.

CO3: Elaborate the development of frog, its metamorphosis and chick up to three germ layers.

CO4: Describethe development of rabbit, formation of foetal membranes and placenta.

B.Sc. Medical (Semester–V) (Session 2023-25)
ZOOLOGY
Course Title: Developmental Biology
Course Code: BSMM-5483 (I)
(THEORY)

Examination Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

Gametogenesis with particular reference to differentiation of spermatozoa, vitellogenesis; role of

follicle/subtesticular cells in gametogenesis

Egg maturation; egg membranes; polarity of egg

Parthenogenesis

Fertilization

UNIT-II

Cleavage and its patterns

Gastrulation

Determination and differentiation

Tissue interactions, basic concepts of organizers and inductors and their role

Embryonic development of Herdmania

UNIT-III

Development upto three germinal layers and their fate in frog and chick

Fate maps of chick and frog embryos

Metamorphosis in Frog

UNIT-IV

Embryonic development of Rabbit

Foetal membranes, their formation and role

Mammalian placenta–its formation, types and functions

Suggested Readings:

1. Balinsky, B.I. (2007), An Introduction to Embryology, Saunders, Philadelphia.
2. Bellairs, R. (1971), Development Processes in Higher Vertebrates, University of MiamiPress, Miami.
3. Berrill. N.J. (1971), Developmental Biology. McGraw Hill, New Delhi.
4. Gilbert, F. (2017), Developmental Biology, Sinaur.
5. Goel, S.C. (1984), Principles and Animal Developmental Biology, Himalaya, Bombay.
6. Karp. G. &Berrill, M.J. (1981), Development. McGraw Hill, New Delhi.
7. Pritchard, D.J. (1986), Foundation of Development Genetics, Taylor and Francis, London.
8. Saunders, J.W. (1982), Developmental Biology, Patterns, Principles, Problems, MacMillan,New York.
9. Waddigton CH. (1966), Principles of Development and Differentiation, MacMillan, NewYork.
10. Miller, W.A. (1997), Developmental Biology Springer Verlag, New York.

B.Sc. Medical (Semester–V) (Session 2023-25)
ZOOLOGY
Course Title: Genetics
Course Code: BSMM-5483 (II)
(THEORY)

Course Outcomes

After passing this course the student will be able to:

CO1: Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms. Understanding the role of genetic mechanisms like linkage, crossing over and multiple alleles.

CO2. Understand structure of nucleic acid, process of replication and translation, genetic code.

CO3: Understanding of how genetic concepts of mutations, regulation of gene expression and extranuclear inheritance.

CO4: Evolutionary and quantitative **genetics** including: the basis of **genetic** variation; heritability; Hardy-Weinberg Equilibrium and key concepts in population and how it affects broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.

B.Sc. Medical (Semester–V) (Session 2023-25)

ZOOLOGY

Course Title: Genetics

Course Code: BSMM-5483 (II)

(THEORY)

Examination Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

Modification of Mendelian Ratios: Non-allelic gene interaction, Modified F2 ratios. (9:7;9:3:4;12:3:1;13:3;15:1;9:6:1), Gene modifications due to incomplete dominance; lethal factors(2:1); Pleiotropic genes.

Multiple Alleles: Blood group inheritance, eye colour in *Drosophila*, pseudoallelism.

Multiple Factors: Qualitative and quantitative characters, inheritance of quantitative traits (skin colour in man).

Linkage: Linkage, sex-linked characters

Crossing Over and Recombination: crossing over, frequency of crossing over, cytological basis of crossing over, synaptonemal complex. Recombination in Fungi (Tetrad analysis).

UNIT-II

Gene and Genetic Code: Structure of nucleic acids **(DNA & RNA).**

Replication & transcription of DNA

Expression of gene (Protein synthesis in Prokaryotes and Eukaryotes).

Genetic code: Properties of genetic code, codon assignment, wobble hypothesis, split and overlapping Genes.

UNIT-III

Mutations: Spontaneous and induced mutations, physical and chemical mutagen. Detection of mutations in Maize and *Drosophila.* Inborn errors of metabolism in man (Phenylketonuria, Alcaptonuria, Albinism). Somatic mutations and carcinogenesis.

Regulation of gene expressions in prokaryotes (Operon model) in eukaryotes.

Extranuclear inheritance: Chloroplast with special reference to *Mirabilis jalapa*and kappa

particles in *Paramecium.*

UNIT-IV

Population genetics: Equilibrium of gene frequencies and Hardy-Weinberg law.

Genetic recombination in bacteria (conjugation, transduction and transformation) and in plasmids.

Applied Genetics: Recombination DNA, Genetic cloning and its applications in medicine and agriculture, DNA finger printing.

Suggested Readings:

1. Klug ,Cummings, Spencer, Palladino, Killian(twelth edition),Concepts of Genetics
2. Gardener, E.J., Simmons, M.J. &Sunstad, Principles of Genetics, (8th ed), D.P. John Wiley & Sons, New York.
3. Benjamin A. Pierce ,Genetics: a conceptual approach(6^{th} edition)
4. P.S Verma and V.K Aggarwal ,Genetics(9^{th} edition) S.Chand publications.
5. Veer BalaRastogi, Genetics (4^{th} edition) ,Knrn publications.
6. Prof P. K. Gupta(5^{th} revised edition 2018-19), ,Genetics Rastogi publications.
7. C. B Powar (2018) ,Cell Biology Himalayan publishing house.
8. Miglani, G.S(2000),Basic Genetics ,Narosa publishing house, New Delhi.
9. Weaver, R.F. and Hedrick, P.W. (1992), Genetics, Wm. C. Brown Publishers Dubuque.

B.Sc. Medical (Semester–V)(Session 2023-25)

ZOOLOGY

Course Title: PRACTICAL–V (Related to Developmental Biology and Genetics)

Course Code: BSMM-5483 (P)

Course Outcomes

CO1:Understanding of development patterns of frog, chick and Larva of *Herdmania*.

CO2:Knowledge of process of gametogenesis.

CO3:Understanding of pedigree analysis and preparation of family charts.

CO4:Understanding of inheritance of morphogenetic human characters.

CO5:Understanding of finger tip patterns.

B.Sc. Medical (Semester–V)(Session 2023-25)

ZOOLOGY

Course Title: PRACTICAL–V (Related to Developmental Biology and Genetics)

Course Code: BSMM-5483 (P)

Examination Time: 3 Hrs. **Marks: 20**

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, KanyaMahaVidyalaya, Jalandhar.

Guideslines for Conduct of Practical Examination:-

1.	Two Numericals based on Mendel/Hardy Weinberg Law.	6
2.	Perform the experiment for Dermatoglyphics/ Random mating/ Pod Length.	**3**
3.	Identification of given spots/slides.	**3**
4.	Make a pedigree chart from the given data.	**2**
5.	Chart/Assignment.	**2**
6.	Viva-voce and practical file.	**4**

1. Demonstrate the Law of segregation and independent assortment (use of coloured beads capsulesetc.).
2. Numericals for Segregation, Independent assortment,Epistasis&Hardy-Weinberg Law.
3. Demonstration of segregation in preserved material (Maize).
4. Demonstration of cytoplasmic inheritance in snails.
5. Inheritance of human characteristics.
6. Comparison of variance in respect of pod length and number of seeds/pods.
7. Calculation of gene frequencies and random mating (Coloured beads, capsules).
8. Pedigree analysis
9. Dermatoglyphics: Palm print and Finger tip patterns.
10. Study of the following permanent slides :
    - Polytene Chromosomes of *Chironomus.*
    - Stages of gametogenesis, structure of egg and sperm of a mammal.
    - Larva of *Herdmania.*
    - Developmental stages offrog-upto tadpole, chick-upto 96 hr.

11. Preparationof slide for Barr body from cheek cells.

12. **Assignment**: Preparation of charts showing developmental stages of any vertebrate.

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

B.Sc. Medical (Semester–VI) (Session 2023-25)
ZOOLOGY

MEDICAL ZOOLOGY

Course Code: BSMM-6483 (I)
(THEORY)

Course Outcome

After successfully completing this course, students will be able to:

CO-1. Understand about various pathogenic microbes, life history of various pathogenic protozoans and helminths as well as diseases caused by them.

CO-2. Know about life history, diseases and control measures of arthropod vectors and awareness about epidemic diseases.

CO-3. Provide basics knowledge about immune responses, antigens, antibody structure and immunoglobulins.

CO-4. Understand antigen-antibody interactions and gain knowledge about vaccines.

B.Sc. Medical (Semester–VI) (Session 2023-25)
ZOOLOGY

MEDICAL ZOOLOGY

Course Code: BSMM-6483 (I)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

1. Introduction of Parasitology (various terminologies in use).
2. Brief introduction to pathogenic microbes, viruses, Rickettsiae, spirochaetes and bacteria.
3. Brief accounts of life history, mode of infection and pathogenicity of the following with reference to man; prophylaxis and treatment:

a) Pathogenic protozoa: *Entamoeba, Trypanosoma, Leishmania, Giardia, Trichomonas* and *Plasmodium.*

b) Pathogenic helminthes: *Fasciola, Schistosoma, Echinococcus, Ancylostoma, Trichinella, Wuchereria, Dracunculus* and *Oxyuris.*

UNIT-II

4. Life cycle and control measures of arthropod vectors of human disease: Malaria *(Anopheles stephens, A.culicifaces,* Yellow fever, Dengue, Dengue haemorrhagic fever and Chickengunea. *(Aedes aegypti A. Albopicuts)*; Filariasis *(Culex pipien satigeans) Mansonia* sp. Japanese Encephalitis *(C. trinanelorhynchus);* Plague *(Stenophalide cheopis)* and Epidemic Typhus *(Pediculus spp).*
5. Epidemic diseases, such as Typhoid, Cholera, Small pox; their occurrence and eradication programs.

UNIT-III

6. Brief introduction to human defence mechanisms.
7. Humoral and cell mediated immune response. Physical & chemical properties of antigens. Antibody structure and function of M, G, A, E and D immunoglobulins.

UNIT-IV

8. Antigen and antibody interactions-Serodiagnostic assays (Precipitation, agglutination immunodiffusion, ELISA,RIA)
9. Vaccines

Suggested Readings:

1. Baker,F.J.andSilverton,R.E.(1985)IntroductiontoMedicalLaboratoryTechnology,(6th ed), Butlerworth and Co.Ltd.
2. Chatterjee, K.D. (2019), Parasitology, Protozoology and Helminthology (13thed).
3. Cheesborough, M. (1991), Medical Laboratory Technology for Tropical countries, Butlerworth and Co.,Ltd.
4. Garcia, L.S. (2001), Diagnostic Medical Parasitology, (4th ed), ASM Press Washington.
5. Kimball,J.W.(1987),Introduction of Immunology, (2nd ed),MacMillian Publishing Co.,NewYork.
6. Kuby, J. (2013), Immunology, 7th Edition W.H. Freeman & Co.,USA.
7. Roitt, I. (2017), Essential Immunology, 13th Edition, Blackwell Scientific Publications, Oxford.
8. Talib, V.H. (2019), Essential Laboratory Manual,2nd edition, Mehta Publishers, New Delhi.

B.Sc. Medical (Semester–VI) (Session 2023-25)
ZOOLOGY

MEDICAL LABORATORY TECHNOLOGY

Course Code: BSMM-6483 (II)
(THEORY)

Course Outcome

After successfully completing this 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.

CO 2: Know about routine clinical laboratory investigations including collection of different samples and perform other routine hematologicalprocedures.

CO 3:Describe basic scientific principles in learning new techniques and procedures in bacteriology and microbiology.

CO 4:Apply knowledge and technical skills associated histopathology, staining techniques and biochemical estimations.

B.Sc. Medical (Semester–VI) (Session 2023-25)
ZOOLOGY

MEDICAL LABORATORY TECHNOLOGY

Course Code: BSMM-6483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 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

Laboratory safety rules, hazards and precautions during sample collection and laboratory investigations.

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.(2019), Parasitology, Protozoology and Helminthology (13thed).
3. Cheesborough, M.(1991), Medical Laboratory Technology for Tropical countries,Butlerworth and Co.,Ltd.
4. Garcia, L.S.(2001), Diagnostic Medical Parasitology, (4th ed), ASM PressWashington.
5. Kimball,J.W.(1987),IntroductionofImmunology, (2nd ed),MacMillianPublishingCo.,NewYork.
6. Kuby, J.(2013), Immunology, 7th Edition W.H. Freeman & Co.,USA.
7. Roitt, I. (2017), Essential Immunology, 13th Edition, Blackwell Scientific Publications,Oxford.
8. Talib, V.H.(2019), Essential Laboratory Manual,2nd edition, Mehta Publishers, NewDelhi.

B.Sc. Medical (Semester–VI) (Session 2023-25)

ZOOLOGY

PRACTICAL–V (Related to Medical Zoology &Medical Laboratory Technology)

Course Code: BSMM-6483 (P)

(PRACTICAL)

Course Outcomes

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

CO3: Recognize the role of medical laboratory technology in the context of providing quality patient health care.

CO4:Understanding of sterilization techniques and will also learn about various histotechniques, handling and processing of tissue specimens as well as staining procedures.

CO5: Understanding of estimation of protein & sugar

B.Sc. Medical (Semester–VI) (Session 2023-25)

ZOOLOGY

PRACTICAL–VI (Related to Medical Zoology &Medical Laboratory Technology)

Course Code: BSMM-6483 (P)

(PRACTICAL)

Time: 3 hrs. **Max. Marks:20**

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. 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. Study of permanent slides and specimens of parasitic protozoans, helminthes and arthropods mentioned in the theory syllabus.
8. ESR and haematocrit.
9. Estimation of blood sugar, protein.
10. Demonstration of fixation, embedding, cutting of tissue sections, and their staining (routine haematoxylin and eosin).
11. Visit to a pathology Lab and preparation of report.

Guidelines for conduct of Practical Examination:

1.	Write down the principle and working of the given equipment.	4
2.	Write down the procedure, precautions and perform the experiment for physico-chemical examination of urine/ haematology.	4

3.	Identification, pathogenicity and host of parasitic organism.	4
4.	Estimation of blood sugar / protein in the given sample.	4
5.	Viva-voce and practical file	4

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