



**JSS COLLEGE OF ARTS, COMMERCE AND
SCIENCE**

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ZOOLOGY

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programmes

Chemistry, Botany, Zoology

Chemistry, Zoology, Biotechnology

2017-18

Programme - CZBt

Scheme of Study

Year	Sem	Course	Title of the Paper	Paper code	Credits	Percentage			Maximum Marks						Exam Duration		
						L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
												Th	Pr	Th	Pr		
I BSc	I	DSC	Theory-Animal Diversity Practical- Animal Diversity	CMA30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
	II	DSC	Theory -Comparative Anatomy and Developmental Biology of Vertebrates Practical- Comparative Anatomy and Developmental Biology of Vertebrates	CMB30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
II BSc	III	DSC	Theory-Physiology and Biochemistry Practical- Physiology and Biochemistry	CMC30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
	IV	DSC	Theory-Genetics and Evolutionary Biology Practical- Genetics and Evolutionary Biology	CMD30005	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
III BSc	V	DSE-7A	Theory-Applied Zoology Practical- Applied Zoology	CME30005	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
		DSE-7B	Theory-Insect, Vector and Diseases Practical- Insect, Vector and Diseases	CME30205	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
	VI	DSE-7A	Theory-Aquatic Biology Practical- Aquatic Biology	CMF30005	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
		DSE-7B	Theory-Immunology Practical- Immunology	CMF30205	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
	VII	SEC	Theory-Medical Diagnostics	CME30405	2:0:0	70	-	30	50	-	10	05	10	05	2H	-	

Programme - CBZ

Scheme of Study

Year	Sem	Course	Title of the Paper	Paper code	Credits	Percentage			Maximum Marks						Exam Duration		
						L:T:P	Th	Pr	IA	Th	Pr	IA-1		IA-2		Th	Pr
												Th	Pr	Th	Pr		
I BSc	I	DSC	Theory-Animal Diversity Practical- Animal Diversity	CMA30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
	II	DSC	Theory -Comparative Anatomy and Developmental Biology of Vertebrates Practical- Comparative Anatomy and Developmental Biology of Vertebrates	CMB30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
II BSc	III	DSC	Theory-Physiology and Biochemistry Practical- Physiology and Biochemistry	CMC30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
	IV	DSC	Theory-Genetics and Evolutionary Biology Practical- Genetics and Evolutionary Biology	CMD30008	4:0:2	50	20	30	70	70	10	05	10	05	3H	3H	
III BSc	V	DSE-7A	Theory-Applied Zoology Practical- Applied Zoology	CME30008	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
		DSE-7B	Theory-Insect, Vector and Diseases Practical- Insect, Vector and Diseases	CME30208	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
	VI	DSE-7A	Theory-Aquatic Biology Practical- Aquatic Biology	CMF30008	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
		DSE-7B	Theory-Immunology Practical- Immunology	CMF30208	4:0:1	50	20	30	70	70	10	05	10	05	3H	3H	
	VII	SEC	Theory-Medical Diagnostics	CME30608	2:0:0	70	-	30	50	-	10	05	10	05	2H	-	

Programme Outcome for Bachelor of Science in Chemistry, Zoology, Biotechnology:

After completing the graduation in the Bachelor of Science the students are able to:

- PO1. Demonstrate the ability to justify, explain, and/or approach the concept both in written and oral forms
- PO2. Demonstrate the ability to present clear, logical and succinct arguments
- PO3. Develop state-of-the-art laboratory skills and professional communication skills.
- PO4. Apply the scientific method to design, execute, and analyze an experiment.
- PO5. Appreciate the central role of chemistry in the society and use this as a basis for ethical behaviour in issues facing chemists/drugs.
- PO6. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.
- PO7. Identify the major groups of organisms with an emphasis on animals and plants.
- PO8. Compare and contrast the characteristics of animals that differentiate themselves from other living and non-living creatures.
- PO9. Give specific examples of physiological adaptations.
- PO10. Design and develop solution to Biotechnology problems keeping in mind the safety measures for environment and society.
- PO11. Support Biotechnology research activity with strong technical background knowledge.

Programme Specific Outcome

After completing the graduation in Chemistry, Zoology, Biotechnology the students are able to:

- PSO1. Find jobs at all level of chemical, pharmaceutical, food products and life oriented material Industries
- PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.
- PSO3. Recognize the relationship between different structures and functions at different levels.
- PSO4. Characterize the biological, chemical and physical features of environments that Animals inhabit.
- PSO5. Demonstrate effectively the applications of biochemical and biological sciences.
- PSO6. Know and apply appropriate tools and techniques in biotechnological manipulation
- PSO7. Understand his or her responsibilities in biotechnological practices.

Programme Outcome for Bachelor of Science in Chemistry, Botany, Zoology:

After completing the graduation in the Bachelor of Science the students are able to:

- PO1. Demonstrate the ability to justify, explain, and/or approach the concept
- PO2. Demonstrate the ability to present clear, logical and succinct arguments
- PO3. Develop state-of-the-art laboratory skills and professional communication skills.
- PO4. Apply the scientific method to design, execute, and analyze an experiment.
- PO5. Appreciate the role and use of chemistry for ethical issues facing chemists/drugs.
- PO6. Identify the taxonomic position of plants using required principles and methods.
- PO7. Understand the impact of the plant diversity in societal and environmental context.
- PO8. Use interdisciplinary approaches with quantitative skills to work on biological problems.
- PO9. Understand Chemistry as an integral part for addressing social, economic, and environmental problems.
- PO10. Identify the major groups of organisms with an emphasis on animals and plants.

Programme Specific Outcome

Bachelor of Science in Chemistry, Botany, Zoology

After completing the graduation in the Bachelor of Science the students are able to:

PSO1. Find jobs at all level of chemical, pharmaceutical, food products, life oriented material industries

PSO2. Apply appropriate techniques for the qualitative and quantitative analysis of chemicals in laboratories and in industries.

PSO3. Explicate ecological interconnectedness of life

PSO4. Analyze the avenues and remedies for burning environmental issues

PSO5. Recognize the relationship between different structures and functions at different levels.

PSO6. Characterize the biological, chemical and physical features of environment of animals inhabits.

CMA30008/ CMA30005

**I SEMESTER
CORE COURSE I
ANIMAL DIVERSITY**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Identify in depth chordata

CO2. Write down the characteristics of chordata

CO3. Identify in details with examples chordata

CO4. Deliberate in details with examples non chordata

CO5. Learn the classification and characteristics of non chordata

CO6. Write down the details of non chordate

Unit I

15 hrs

Introduction to Biodiversity

Phylum Protozoa: General characters and classification up to classes; Locomotory organelles and locomotion in Protozoa.

Phylum Porifera

General characters and classification upto classes; Canal System in poriferans

Phylum Cnidaria

General characters and classification upto classes; Polymorphism in Physalia.

Phylum Platyhelminthes

General characters and classification upto classes; parasitic adaptations (morphological and physiological)

Phylum Nematelminthes

General characters and classification upto classes; transmission, pathogenicity and preventive measures of Ascaris.

UnitII

15 hrs

Phylum Annelida

General characters and classification upto classes; Metamerism in Annelida and external morphology of Leech

Phylum Arthropoda

General characters and classification upto classes; Metamorphosis in Insects and economic importance insects

Phylum Mollusca

General characters and classification upto classes; Torsion in gastropods, pearl formation

Phylum Echinodermata

General characters and classification upto classes; Water-vascular system in Asteroidea

Unit III

15 hrs

Protochordates

General features and Phylogeny of Protochordata

Agnatha

General features of Agnatha and classification of cyclostomes upto classes

Pisces

General features and Classification upto orders; Osmoregulation in Fishes

Amphibia

General features and Classification upto orders; Parental care in Amphibia

Reptiles

General features and Classification upto orders; Poisonous and non-poisonous snakes, biting mechanism in snakes, types of venom.

Unit IV

15 hrs

Aves

General features and Classification upto orders; Flightless birds and their distribution, major types of beaks. Kinds of migration in birds

Mammals

Classification up to orders; Origin of mammals, Distribution of prototheria and metatheria with example

Dentition in mammals. structure of teeth and their types. Adaptive radiation in mammals.

Reference:

1. Alexander R.M. 1975 – The chordate – Cambridge – University Press, London
2. Barnes, R.D. 1974, Invertebrate Zoology – III edition by W.B. Saunders Co., Philadelphia.
3. Barrington, E.J.W., 1976, Invertebrate structure and function by Thomas Delson & Sons Ltd., London.
4. Chandler A.C. An Introduction to Parasitology, John Willy & Co.,
5. Earthworm Cinderella of Organic Farming-Radha D. Kale
6. Economic Zoology. - Shukla and Upadhya.
7. Ekambarnatha Ayyar – Invertebrate – Volumes
8. Hyman, L.H. 1940. The Invertebrates Vol. 1, 2.
9. Jordan and Verma P.S. Invertebrate Zoology
10. Jordan E.L. Verma P.S. – Chordate Zoology.
11. Kingsley J.S. 1962. Outlines of comparative anatomy of Vertebrates. Central Book Depot, Allahabad
12. Kotpal R.L. Chordata.
13. Kotpal R.L. Invertebrates.
14. Parker. J.J. Haswell, W.A. 1961 Text Book of Zoology vol. 1, 2nd edition. By Macmillan Co., London.
15. [Sandhu G.S](#), [Harshvardhan Bhaskar](#), Text book on Invertebrate Zoology, Campus Books International, 2002, 2005 – [Vol](#) 1 and 2
16. Simpson G.C. Principles of Taxonomy

PRACTICAL –I

ANIMAL DIVERSITY

1. **PROTOZOA**- Culture preparation and observation of different protozoans. Paramecium, Euglena, Amoeba,
2. **PORIFERA**-Sycon, Hyalonema, , Gemmule, Monaxon spicules.,
3. **COELETERATA**-Obelia, Physalia, Aurelia, Ephyra larva, Metridium
4. **HELMINTHES**-Taenia solium, Planaria, Fasciola, Ascaris male and female,
5. **ANNELIDA**: Pheretima-Mounting of setae , Nereis, Leech
Onychophora: Peripatus
6. **ARTHROPODA**- Palaemon, Palamnaeus, Scolopendra, Spirostreptus
7. **MOLLUSCA**- Chiton, Unio, Sepia, Octopus.
8. **ECHINODERMATA**- Asteropecten, Ophiothrix, Holothuria, Antedon, Pedicellariae of Seaurchin.
9. **PROTOCHORDATA**- Balanoglossus, Herdmania, Myxine, Ammocoetes larva.
10. **PISCES**- Pristis, Torpedo, Labeo, Exocoetus
11. **AMPHIBIA**- Salamandra, Bufo, Hyla.
12. **REPTILES**- Chamaeleon, Draco, Vipera, Naja, Chelone, Bungarus, Enhydrina.
13. **AVES AND MAMMALS**- Bat, Loris, Guinea pig, Koel, Kite, Duck.
14. Study of animal dissection through digi frog software.
15. Preparation of animal album containing photographs, cut outs, with appropriate write up the above mentioned taxa. Different taxa/topics may be given to different sets of students.**(Invertebrates-05, Vertebrates-05)**

Note: Charts, Photographs and models can be shown.

SCHEME OF EXAMINATION

Duration: 3 hrs.

Max. Marks: 70 Marks

- | | |
|--|----------|
| 1. Identify and comment on A to E (5 X 4)
(Porifera to Echinodermata) | 20Marks |
| 2. Identify and comment on F to I (5 X 4)
(Protochordates to Mammals) | 20Marks |
| 3. Mounting of protozoan cultures | 05 Marks |
| 4. Identification of poisonous and non-poisonous snakes | 05 Marks |
| 5. Submission of Animal album | 10 Marks |
| 6. Class Records | 10 Marks |

SCHEME OF VALUATION FOR PRACTICAL- I

1. Identification-01, Classification-01,Diagram –0 1,Salient features–01
2. Identification-1, Classification-1,Diagram – 1,Salient features -1
3. Procedure-1,Labelled diagram-2, Slide preparation – 2
4. Identification-1, Classification-1,Diagram – 1,Salient features– 2

CMB30008/ CMB30005

**II SEMESTER
CORE COURSE II
COMPARATIVE ANATOMY AND DEVELOPMENTAL
BIOLOGY OF VERTEBRATES**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

- CO1. Learn in details with examples anatomy of vertebrate
- CO2. Write down in details with examples comparative anatomy
- CO3. Deliberate the details of comparative anatomy
- CO4. Identify in details with application of developmental biology
- CO5. Learn in depth developmental biology
- CO6. Deliberate in details with examples developmental biology

Unit I

15 hrs

Integumentary System

Integument and its modifications in the chordates- epidermal derivatives and dermal derivatives- with reference to glands and digital tips. Comparison of integument in Vertebrate series- Pisces (Shark), Amphibia (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Rabbit). Evolution of visceral arches.

Digestive System

Comparative account of the digestive glands in different Vertebrates. Comparative account of the alimentary canal in Vertebrate series

Respiratory System

Evolutionary trends in the respiratory system with reference to modification of gills, lungs, air sacs and swim bladder.

Unit II

15 hrs

Circulatory System

Evolution of heart and aortic arches in vertebrates

Urinogenital System

Succession of kidney, Evolution of urinogenital ducts in vertebrates

Nervous System

Comparative account of brain of Shark, Frog, Lizard, Pigeon and Rabbit.

Sense Organs

Types of receptors in Vertebrates

Trace the development of membranous labyrinth in Pisces and Amphibians.

Evolution of ear ossicles in the Mammals.

Unit III

15 hrs

Early Embryonic Development

Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds

Fertilization: external (amphibians), internal (mammals), monospermy and polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

Foetal membranes: Development, structure and functions of amnion, chorion, yolk sac and allantoises.

Unit IV

15 hrs

Late Embryonic Development

Structure of mature spermatozoon, Graafian follicle, Human menstrual cycle.

Ovulation, fertilization, morula, blastocyst, implantation and placentation.

Placenta: Histological and morphological classification of mammalian placenta with examples.

Modern trends in human reproduction : Invitro fertilization ,cloning, sperm and egg banks, sexually transmitted diseases(AIDS, syphilis and gonorrhoea).

Reference:

1. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer
2. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc
3. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc.,
4. Hildebrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons
5. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
6. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and
7. Evolution. IV Edition. McGraw-Hill Higher Education
8. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House. Publishers, Sunderland, Massachusetts, USA. Press.
9. Young J.Z. 1950 - Life of Vertebrates – Oxford University Press, London.

PRACTICAL –II
COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF
VERTEBRATES

1. Skeleton of [Pigeon] and [Rabbit].
2. Carapace and plastron of turtle /tortoise
3. Mammalian skulls: Herbivorous (Rabbit/ Horse) and Carnivorous (Dog/Cat)
4. Skull of Frog, Pigeon
5. Vertebrae of Frog (Atlas, Pro, Amphi and Acoelous), Pigeon (Heterocoelous Vertebra, Synsacrum) Rabbit (Atlas, Axis, Thoracic vertebrae)
6. Pectoral and Pelvic girdles of Frog, Pigeon and Rabbit.
7. Fore and hind limb skeletons of Frog, pigeon and Rabbit.
8. Study of development of hen's egg – Window technique
9. Frog - cleavage stages, Blastula, gastrula, neurula stage (whole mount)
10. Chick embryo stages-18hrs, 24hrs, 36 hrs, 48hrs. (whole mount and sections)
11. Study of Vertebrate embryos-Human and Pig
12. Study of the different types of placenta- Sheep, Rat placenta(section)
13. Identification of various family planning devices
14. Study of skeletal system through software
15. Repetition

SCHEME OF EXAMINATION

Duration: 3 hrs.	Max.Marks:70 Marks
1. Identify and comment on A to E (5 X 4) (1 to 6 experiment)	20Marks
2 .Identify and comment on F to H (5 X 4) (8 to 10 experiments)	20Marks
3 . Window technique	08 Marks
4. Identify and comment on I & J (11&12)	06 Marks
5. Identify and comment on K & L(13)	06 Marks
6. Class Records	10 Marks

SCHEME OF VALUATION FOR PRACTICAL -II

1. Identification – 1, Classification-1,Diagram – 1,Salient features–1
2. Identification – 1, Classification-1,Diagram – 1,Salient features -1
3. Procedure-3, Diagram – 1,Preparation – 4
4. Identification – 1, Diagram – 1, Salient features– 1
5. Identification – 1, Diagram – 1, Salient features–1

CMC30008/ CMC30005

**III SEMESTER
CORE COURSE III
PHYSIOLOGY AND BIOCHEMISTRY**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Specify in depth physiology

CO2. Learn in details with examples physiology

CO3. Learn the classification and characteristics of biochemistry

CO4. Learn the characteristics of biochemistry

Unit I

15 hrs

Nerve and muscle

Structure of a neuron, types of neuron, axonic conduction and synaptic transmission of nerve impulse, neurotransmitters

Ultra-structure of skeletal muscle, sliding filament theory. Chemical composition of muscle.

Digestion

Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids, mechanical process in digestion

Unit II

15 hrs

Respiration

Pulmonary ventilation, respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood: Respiratory pigments (Haemoglobin, Haemocyanin, Haemoerythrin and chlorocruorin)

Excretion

Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism

Cardiovascular system

Composition of blood, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle.

Unit III

15 hrs

Reproduction and Endocrine Glands

Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle Structure and function of pituitary, thyroid, pancreas and adrenal

Carbohydrate: Structure and classification

Protein: Structure and classification

Lipid: Structure and classification

Unit IV

15 hrs

Carbohydrate Metabolism

Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain

Protein metabolism : Transamination, Deamination and Urea Cycle

Lipid Metabolism: Biosynthesis and β oxidation of palmitic acid

Vitamins: Definition and classification, (fat soluble and water soluble vitamins) physiological role and disorders.

Reference:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2006) Biochemistry. VI Edition. W.H Freeman and CO.
2. Guyton, A.C. and Hall, J.E (2011) Text book of medical physiology. XII Edition, Harcourt Asia Pvt. Ltd/W.B. Saunders Company.
3. Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Book/McGraw-Hill
4. Jayaraman J. 1981. Laboratory Manual in Biochemistry Wiley Eastern Ltd.,
5. Lehninger A.L.: Nelson D. Land Co., M.M. 2nd edition 1993. Principles of Biochemistry, CBS Publishers, New Delhi
6. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009)
7. Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, John Wiley & Sons, Inc
8. Nelson, D.L. Cox, M.M. Lehninger, A.L (2009). Principles of Biochemistry. IV Edition. W.H Freeman and Co.
9. Widmaier, E.P., Raff H. and Strang, K.T. (2008) Vander's Human physiology XI Edition. McGraw Hill

PRACTICAL –III
PHYSIOLOGY AND BIOCHEMISTRY

1. Qualitative test for carbohydrate test-Molisch's test, Iodine test, Fehling's test and picric acid test.
2. Qualitative test for proteins- Biuret test, Ninhydrin test, Millon's test and Xanthoproteic test.
3. Qualitative test for lipids-Acrolein Test, Leiberman-Burchard test, Salkowasky test
4. Identification of vitamins presents in the food materials with their physiological role
5. Salivary amylase activity on starch.
6. Dehydrogenase activity in milk.
7. Preparation of hematin crystals.
8. Blood typing –ABO type and Rh factors.
9. Detection of nitrogenous wastes – Ammonia (Nessler's test), Urea (Urease test), Uric acid (Follin's U test).
10. Study of permanent histological sections of mammalian pituitary, thyroid, parathyroid.
11. Study of permanent histological sections of mammalian Pancreas, adrenal gland, testis and ovary.
12. Study of permanent slides of liver, lung and kidney.
13. Study of permanent slides of spinal cord, bone marrow and T.S of cartilage.
14. **Field Study:** Visit to a Pathology lab / Hospital to know about different techniques of biochemical analysis and submission of the report.
15. Repetition.

SCHEME OF PRACTICAL EXAMINATION:

Duration: 3 hrs	Max. Marks: 70
1. Biochemistry experiments by lots (1 to 3)	10 Marks
2. Physiology experiments by lots (5 to 9)	10Marks
3. Identify and comment the slide A, B, C & D (10 to 13)	20Marks
4. Identify the vitamin present in the food material and comment on their physiological role and disorders.	10 Marks
5. Report	10 Marks
6. Practical records	10 Marks

SCHEME OF VALUATION FOR PRACTICAL III

1. Procedure - 04, Experiment- 04, Result - 02
2. Procedure - 04, Experiment- 04, Result - 02
3. Identification -01, Classification-01, Diagram –01, Salient features– 02
4. Identification -01, Sources-01, Physiological role –01, Deficiency disease – 02

CMD30008/ CMD30005

**IV SEMESTER
CORE COURSE IV
GENETICS AND EVOLUTIONARY BIOLOGY**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Learn in depth genetics

CO2. Identify the detail of evolution

CO3. Understand in depth evolution

CO4. Identify in details with application, if applicable, genetics

Unit I

15 hrs

Introduction to Genetics

History of genetics mono and dihybrid crosses, Mendel's law.

Mendelian Genetics and its Extension

Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance.

Multiple alleles, Lethal alleles, Epistasis, Pleiotropy. Extra-chromosomal inheritance- Maternal inheritance-shell coiling in Limnaea. Cytoplasmic inheritance- Kappa particle in Paramecium

Sex Determination

Chromosomal basis of sex determination in animals. Non-disjunction. Genic balance theory. Klinefelter and Turners syndromes. Environmental and hormonal effects on determination of sex.

Unit II

15 hrs

Linkage, Crossing Over and Chromosomal Mapping

Linkage and crossing over: Linkage in Drosophila, linkage in man; Significance of crossing over. Genetic maps of chromosomes. Construction of chromosome map.

Sex linked inheritance: Drosophila- Red and white color inheritance

Man- Haemophilia and color blindness, Y-linked genes.

Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion,

Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced mutations

Spontaneous mutations, Reverse mutations, Suppressor mutations.

Unit III

15 hrs

Introduction to Evolutionary Theories

Concept of organic evolution. Lamarckism, Darwinism, Neo-Darwinism- Industrial melanism(Natural selection).

Evidences of Evolution

Indirect evidences - comparative morphology & anatomy, connecting links.

Homology, vestigial organs, Physiology and biochemistry – enzyme, hormones,

serology, and amino acid sequence analysis, excretory product analysis, cytology, genetics and embryology.

Direct evidences from palaeontology – Nature, types of fossils. Geological time scale mentioning dominant groups in each period

Unit IV

15 hrs

ADAPTATIONS AND SPECIATION:

Adaptations: Aquatic adaptations: Primary (Shark) and secondary (Turtle) Volant adaptations: Active (Insect, Bird and Bat) and passive flights (Exocoetes, Rhacophorus and Draco) Arboreal adaptations – Chameleon, Loris, Desert adaptations–Phrynosoma, Camel, Coloration and mimicry. **Ethology-**

Definition, innate – taxes, reflexes, instincts and motivation, learned behaviour – habituation, imprinting, conditioned reflexes and insight learning.

Adaptive radiation – examples, micro and macro evolution – examples.

Speciation- Isolation types, nature of speciation – allopatric and sympatric, reproductive isolating mechanisms with examples.

Trends in Human evolution- Australopithecus, Paranthropus, Kenyanthropus and *Homo erectus*, *Homo sapiens*.

Reference:

1. Barton.N.H. Briggs, D.E.G., Eisen, J.A., Goldstein, D.B.and N.H. (2007).
2. Campbell, N.A.and Reece J.B. (2011) Biology.IX Edition, Pearson, Benjamin, Cumming.
3. Douglas,J.Futuyma(1997)Evolutionary Biology.Sinauer Associates Evolution. Cold Spring, Harbour Laboratory Press.
4. Gardner, E.J.Simmons, M.J., Snustad, D.P (2008).Principles of Genetics.
5. Hall,B.K. and Hallgrimsson, B.(2008) Evolution.IV Edition,Jones and Bartlett
6. Klug,W.S.,Cumming,M.R., Spencer,C.A.(2012).Concepts of Genetics Organic Evolution by Veer Bala Rastogi
7. Principles of Genetics by Robert.H.Tamarin, Tata McGraw-Hill pub. Publishers
8. Ridley, M. (2004) Evolution.III Edition. Blackwell Publishing
9. Russell, P.J. (2009) Genetics-A Molecular Approach.III Edition. Benjamin
10. Snustad, D.P., Simmons, M.J (2009). Principles of Genetics Edition.
11. Stebbins G.L. (1970) The process of organic evolution, Prentice Hall Publ.
12. Strickberger, M.W, (1995) Genetics, Mac Millan Co.VIII Edition. Wiley India X Edition. Benjamin Cummings.

PRACTICAL –IV
GENETICS AND EVOLUTIONARY BIOLOGY

1. Genetic problems- Monohybrid and Dihybrid cross.
2. Complementary genes: flower color in sweet pea.
Supplementary genes: Comb patterns in Fowls.
3. Epistatic genes: Plumage colors in Fowls and Multiple genes: Skin color in man.
4. Multiple alleles: ABO blood group in human. And Sex linked inheritance: *Drosophila* and human.
5. Study of Human Karyotypes (normal) and abnormal- (Turner, Klinefelter, Down's and Cri-du-chat syndrome (abnormal)).
6. General morphology of *Drosophila melanogaster* (male and female).
7. Mounting of sex comb and wing of *Drosophila*
8. Identification of mutants of white eye, bar eye, sepia eye, vestigial wing and ebony body of *Drosophila*
9. Preparation of media and maintenance and breeding of *Drosophila* – (Demonstration)
10. Study of homology – vertebrate forelimbs and analogy-wing of bird & limb skeleton from suitable specimens/ pictures.
11. Study of aquatic adaptations: Shark & Turtle.
Study of arboreal adaptations: Chameleon, Loris.
12. Study of Volant adaptations : Exocoetus Fish, Bat, Pigeon, Draco.
13. Submission of report on-
 - a. Evolution of Horse
 - b. Evolution of Camel
 - c. Evolution of Elephant
 - d. Evolution of Man
14. Experiment on genetic drift-Sampling error and population size.
15. Repetition.

SCHEME OF EXAMINATION

DURATION: 3 HOURS

MAX.MARKS:70

- | | |
|---|----------|
| 1. Genetics problem any 3 | 15marks |
| 2. Identify with reasons A (Wild male & Female <i>Drosophila melanogaster</i>) B&C (Drosophila mutant) | 09 marks |
| 3. Identify and comment-Human Karyotypes(normal and abnormal). | 08 marks |
| 4. Mounting of wing/ sex comb of Drosophila. | 03marks |
| 5. Identify and comment- Homologous or Analogous organs. | 03marks |
| 6. Identify and comment on adaptation in D, E and F. | 12 marks |
| 7. Submission of report. | 10 marks |
| 8. Class record. | 10 marks |

SCHEME OF VALUATION FOR PRACTICAL IV

1. Genetic Problems
2. Identification-01, Reasons-0 2
3. Identification -01, Reasons -03
4. Procedure-01, Mounting-02
5. Identification-01, Comment-03
6. Identification – 01, Diagram – 01, Salient features–02

CME30008/ CME30005

**V SEMESTER
DISCIPLINE SPECIFIC ELECTIVE COURSE
APPLIED ZOOLOGY**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

- CO1. Understand the detail of communicable diseases
- CO2. Understand the classification and characteristics of medical zoology
- CO3. Learn the characteristics of applied zoology
- CO4. Understand in detail with examples applied zoology
- CO5. Know about the importance of insects in forensic science and medicine.

Unit I

15 hrs

Introduction to Host-parasite Relationship

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

Epidemiology of Diseases

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

Rickettsiae and Spirochaetes

Brief account of *Rickettsia prowazekii*, *Borrelia recurrentis* and *Treponema pallidum*

Unit II

15 hrs

Parasitic Protozoa

Life history and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*

Parasitic Helminthes

Life history and pathogenicity of *Ancylostoma duodenale* and *Wuchereria bancrofti*

Unit III

15 hrs

Insects of Economic Importance

Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*

Insects of Medical Importance

Medical importance and control of *Pediculus humanus corporis*, Anopheles, Culex, Aedes, *Xenopsylla cheopis*

Unit IV

15 hrs

Animal Husbandry

Preservation and artificial insemination in cattle; Induction of early puberty and Synchronization of estrus in cattle

Poultry Farming

Principles of poultry breeding, Management of breeding stock and broilers, processing and preservation of eggs

Fish Technology

Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed.

Life cycle of *Bombyx mori*. Structure of silk gland and secretion of silk

PRACTICAL –7A APPLIED ZOOLOGY

1. Study of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.
2. Study of arthropod vectors associated with human diseases: Pediculus, Culex, Anopheles, Aedes and Xenopsylla.
3. Study of insect damage to different plant parts/stored grains through damaged products/ photographs.
4. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*
5. Plastination techniques by using some insects.
6. Maintenance of freshwater aquarium
7. Collection and mounting of Ants.
8. Animal associations: - Mutualism – Termites and Trichonympha.
9. Commensalism – Echenies and shark
Protocooperation – Hermit crab and Sea anemone.
10. Predation – Snake and Frog. Parasitism – Head louse, Bed bug, Mosquito, Ticks, mites.
11. Identification of mulberry and non mulberry silkworms. Identification different larvae of silk worm- Using specimens / pictures
12. Identification of food fishes of Karnataka
13. Field visits to a Vermiculture / Sericulture / fisheries / apiculture / poultry / dairy farm- submission of any 3 Reports
14. Repetition

Reference:

1. Arora, D. R and Arora, B. (2001). Medical Parasitology. II Edition. CBS Publications
2. Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani CBCS Undergraduate Program in Zoology
4. Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).
5. Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches. CABI publications, U.K.
6. Hafez, E. S. E. (1962). Reproduction in Farm Animals. Lea & Fabiger Publisher
7. Kumar and Corton. Pathological Basis of Diseases.
8. Park, K. (2007). Preventive and Social Medicine. XVI Edition. B.B Publishers.
9. Pedigo, L.P. (2002). Entomology and Pest Management, Prentice Hall. Publishers.

Scheme of Practical Examination

Duration: 3 Hours

Max Marks: 70

- | | |
|--|----------|
| 1. Identification of parasites (any six)
(3 from Unit I and II, 3 from Unit III and IV) | 24 Marks |
| 2. Identify and comment upon animal association A & B | 10 Marks |
| 3. Identification of mulberry and non mulberry silkworms | 06 Marks |
| 4. Identification of food fishes of Karnataka | 06 Marks |
| 5. Identification different larvae of silk worm-
Using specimens / pictures | 04 Marks |
| 6. Report submission | 10 Marks |
| 7. Class record. | 10 Marks |

SCHEME OF VALUATION FOR PRACTICAL -7A

1. Identification -01, Classification-01,Diagram - 01, Salient features-01
2. Identification - 01,Diagram - 02,Salient features -02
3. Identification -01, Diagram - 01, Salient features- 01
4. Identification - 01, Diagram - 01, Salient features- 01
5. Identification - 01, Diagram - 01, Salient features-02

CME30208/ CME30205

**V SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE
INSECT, VECTORS AND DISEASES**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Learn in detail of insect, vector diseases

CO2. Identify in detail with examples insect, vector diseases

CO3. Deliberate the detail of insect, vector diseases

CO4. Learn in depth Insect, vectors and diseases

Unit I

15 hrs

Introduction to Insects

General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits

Concept of Vectors : Brief introduction of Carrier and Vectors (mechanical and biological vector),

Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Insects as Vectors

Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

Unit II

15 hrs

Dipteran as Disease Vectors

Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies;

Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes

Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous

Leishmaniasis, Phlebotomus fever; Control of Sand fly

Study of house fly as important mechanical vector, Myiasis, Control of house fly

Unit III

15 hrs

Siphonaptera as Disease Vectors

Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas

Siphunculata as Disease Vectors

Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis; Control of human louse

Unit VI

15 hrs

Hemiptera as Disease Vectors

Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures

PRACTICAL –7B
INSECT VECTORS AND DISEASES

1. Study of different kinds of mouth parts of insects.
2. Study of following insect vectors through permanent slides/ photographs:
Aedes, Culex, Anopheles, Pediculus humanus capitis,
3. Pediculus humanus corporis, Phthirus pubis, Xenopsylla cheopis,
Cimex lectularius’.
4. Phlebotomus argentipes, Musca domestica, through permanent slides/
Photographs.
6. Study of different diseases transmitted by above insect vectors.
7. Submission of a project report on any one of the insect vectors and disease transmitted

Reference:

1. Imms, A.D. (1977). *A General Text Book of Entomology*. Chapman & Hall, UK
2. Chapman, R.F. (1998). *The Insects: Structure and Function*. IV Edition, Cambridge University Press, UK
3. Pedigo L.P. (2002). *Entomology and Pest Management*. Prentice Hall Publication
4. Mathews, G. (2011). *Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases*. Wiley-Blackwell

CMF30008/ CMF30005

VI SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE
AQUATIC BIOLOGY

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Learn in detail with examples aquatic biology

CO2. Write down in detail with examples aquatic biology

CO3. Identify the classification and characteristics of aquatic biology

CO4. Identify in depth aquatic biology

.

UNIT I

15 hrs

Aquatic Biomes

Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, Streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine Benthic zone and coral reefs.

Hydrosphere – (Water) Physical and chemical properties.

UNIT II

15 hrs

Freshwater Biology

Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous. **Ecosystems:** Concept, types and structure of ecosystem.

Fresh water ecosystem: Physico-chemical nature of fresh water. The pond as an ecosystem – abiotic components, producers and consumers, interaction between components

UNIT III

15 hrs

Marine Biology

Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.

UNIT IV

15 hrs

Management of Aquatic Resources

Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment, Water quality assessment- BOD and COD.

Reference:

1. B. Das, (2012). Parasitology, Books & Allied Pvt. Ltd-II
- 2.S. Bhattacharya (2011). Environmental toxicology, Books & Allied Pvt. Ltd
- 3.S. Bhattacharya (2011). Environmental toxicology, Books & Allied Pvt. Ltd
4. T. K. Saha. (2012). Ecology and Environmental Biology. Books & Allied Pvt.

PRACTICAL –7A

AQUATIC BIOLOGY

1. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.
2. Estimation of dissolved oxygen in different water samples.
3. Estimation of dissolved carbon dioxide in different water samples.
4. Estimation of chlorides in different water samples.
5. Estimation of hardness in different water samples.
6. Estimation of pH, using pH-meter, pH paper.
7. Study of pond ecosystem.
8. Study of aquarium ecosystem.
9. Morphometric measurement of locally available freshwater fish and marine water fish.
10. Identification of fish based on their morphology.
11. Identification of muscles and prawn.
12. Fish by products.
13. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/
Fisheries Institutes.
14. Repetition.

Scheme of Practical Examination

Duration 3 Hours

Max Marks: 70 Marks

- | | | |
|----|--|----------|
| 1. | Estimation of any 2 parameters – by lots | 10Marks |
| 2. | Estimation of any 2 parameters – by lots | 10Marks |
| 3. | Morphometric measurement of freshwater fish and marine water fish. | 10Marks |
| 4. | Identification of fish based on their morphology. | 08 Marks |
| 5. | Identification of muscles and prawn. | 08 Marks |
| 6. | Fish by products | 04 Marks |
| 7. | Report | 10 Marks |
| 8. | Record | 10 Marks |

SCHEME OF VALUATION FOR PRACTICAL -7A

1. Procedure - 04, Experiment- 04, Result - 02
2. Procedure - 04, Experiment- 04, Result - 02,
3. Procedure - 04, Experiment- 04 , Result - 02,
4. Identification -01, Classification-01, Diagram –01, Salient features– 02
5. Identification -01, Sources-01, Physiological role –01, Deficiency disease – 01
6. Identification -01, Comment.

CMF30208/ CMF30205

**VI SEMESTER ZOOLOGY
DISCIPLINE SPECIFIC ELECTIVE COURSE
IMMUNOLOGY**

Theory

Credits -4(60 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Deliberate in details with application, if applicable immunology

CO2. Learn in details with examples immunology

CO3. Identify in details with examples immunology

CO4. Identify the characteristics of immunology

CO5. Deliberate in depth immunology

Unit I: Overview of the Immune System **15Hrs**

Introduction to basic concepts in immunology, components of immune system, principles

of innate and adaptive immune system

Cells and Organs of the Immune System

Haematopoiesis, Cells of immune system and organs (primary and secondary lymphoid

organs) of the immune system

Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

Unit II: Antibodies **15Hrs**

Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis

Vaccines

General introduction to vaccines, Various types of vaccines

Unit III: Working of the immune system **15Hrs**

Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing, Basic properties and functions of cytokines, Complement system: Components and pathways.

Unit IV: Immune system in health and disease **15Hrs**

Gell and Coombs' classification and brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency,

PRACTICAL-7B

IMMUNOLOGY

1. Demonstration of lymphoid organs.
2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
3. Preparation of stained blood film to study various types of blood cells.
4. Ouchterlony's double immuno-diffusion method.
5. ABO blood group determination.
6. Cell counting and viability test from splenocytes of farm bred animals/cell lines.
7. Demonstration of
 - a) ELISA
 - b) Immunoelectrophoresis

Reference:

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
- 2, David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and Molecular Immunology*. V Edition. Saunders Publication.

CME30608/CME30405

**SKILL ENHANCEMENT COURSE
MEDICAL DIAGNOSTICS**

Theory

Credits -2(30 hrs)

Course outcome

After completion of the course the student is able to:

CO1. Write down the characteristics of medical diagnostics

CO2. Write down in depth medical diagnostics

CO3. Specify the details of non infectious diseases

Unit I

10 hrs

Introduction to Medical Diagnostics and its Importance

Diagnostics Methods Used for Analysis of Blood

Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

Unit II

10 hrs

Non-infectious Diseases

Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

Infectious Diseases

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis

Unit III:

10 hrs

Diagnostic Methods Used for Urine Analysis

Urine Analysis: Physical characteristics; Abnormal constituents

Tumours

Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone

fracture, PET, MRI and CT Scan (using photographs).

Reference:

1. Asis. Das. (2012). Medical Physiology, Books & Allied Pvt. Ltd
2. Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses.
3. Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House.
4. Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
5. Park, K. (2007), and Social Medicine, B.B. Publishers.

6. Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S.Chand and Co.

B.Sc. Examinations

Zoology Question Paper pattern

I to VI semesters

Duration: 03 Hours

Maximum Marks: 70

I . Answer any Five of the following

1X 5 = 05

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

II. Write short note on any Five of the following

3X 5 = 15

- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

III. Write Explanatory note on any Four of the following

5X 4 = 20

- 13.
- 14.
- 15.
- 16.
- 17.

IV. Write an essay on any Three of the following

10X 3=30

- 18.
- 19.
- 20.
- 21.
- 22.

B.Sc, Examinations (SEC)

Zoology Question Paper

Duration: 02 Hours

Maximum Marks: 50

I. Answer all Five of the following

1X 5 = 05

- 1.
- 2.
- 3.
- 4.
- 5.

II. Write short note on any Five of the following

3X 5 = 15

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.

III. Write Explanatory note on any Four of the following

5X 4 = 20

- 13.
- 14.
- 15.
- 16.
- 17.

IV. Write an essay on any one of the following

10X1 = 10

- 18.
- 19.