

**PROPOSED CURRICULUM FOR ZOOLOGY
IN UNDER GRADUATE DEGREE PROGRAMME
CBCS SYLLABUS SCHEDULE 2016 – 2017**

Submitted to

**Telangana State Council of Higher Education
Hyderabad**

By

**The HODs & Chairpersons of BOS
Department of Zoology,
Telangana University**

**CURRICULUM FOR ZOOLOGY
IN UNDER GRADUATE DEGREE PROGRAMME
CBCS SYLLABUS SCHEDULE 2016 – 2017**

Year	Semester	Paper	Title of the Paper	No. of Credits	Exam Hrs.	Max. Marks		
						I.A	End Exam	Total
I	I	Core-I Theory	Animal Diversity-Invertebrates	3	3	20	40	60
		Core-I Practical	Animal Diversity-Invertebrates	2	3	-	40	40
	II	Core-II Theory	Ecology, Zoogeography and Animal Behavior	3	3	20	40	60
		Core-II Practical	Ecology, Zoogeography and Animal Behavior	2	3	-	40	40
II	III	Core-III Theory	Animal Diversity-Vertebrates and Developmental Biology	3	3	20	40	60
		Core-III Practical	Animal Diversity- Chordates and Developmental Biology	2	3	-	40	40
	IV	Core-IV Theory	Cell Biology, Genetics and Evolution	3	3	20	40	60
		Core-IV Practical	Cell Biology, Genetics and Evolution	2	3	-	40	40
III	V	Core-V Theory	Physiology and Biochemistry	3	3	20	40	60
		Core-V Practical	Physiology and Biochemistry	2	3	-	40	40
	V	Elect-VI Theory	Applied Zoology / Entomology	3	3	20	40	60
		Elect-VI Practical	Applied Zoology / Entomology	2	3	-	40	40
	VI	Core-VII Theory	Immunology and Animal Biotechnology	3	3	20	40	60
		Core-VII Practical	Immunology and Animal Biotechnology	2	3	-	40	40
	VIII	Open Elective I Theory	Medical Transcription	3	3	20	40	60
	VIII	Open Elective I Practical	Medical Transcription	2	3	-	40	40
	IX	Elective-VIII Theory	Public Health and Hygiene / Aquatic Biology	3	3	20	40	60
		Elective-VIII Practical	Public Health and Hygiene / Aquatic Biology	2	3	-	40	40
	X	Open Elective II Theory	Clinical Science	3	3	20	40	60
	X	Open Elective II Practical	Clinical Science	2	3	-	40	40
				50				1000

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

I - SEMESTER

Core Paper – I

Animal Diversity – Invertebrates

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1.1 Brief history of Invertebrates

- 1.1. Kingdom Animalia
- 1.2. Brief history of Invertebrates

1.2 Protozoa:

- 1.2.1 General characters
- 1.2.2 Classification up to classes with examples
- 1.2.3 Type study - *Elphidium*
- 1.2.4 Life cycle of *Plasmodium*.
- 1.2.5 Locomotion, Reproduction and Diseases

1.3 Porifera:

- 1.3.1 General characters
- 1.3.2 Classification of Porifera up to classes with examples
- 1.3.3 Type study - *Sycon*
- 1.3.4 Canal system in sponges and Spicules.

UNIT – II (15 Periods)

2.1. Cnidaria

- 2.1.1 General characters
- 2.1.2 Classification of Cnidaria up to classes with examples
- 2.1.3 Type study - *Obelia*
- 2.1.4 Polymorphism in hydrozoa
- 2.1.5 Corals and coral reef formation

2.2 Platyhelminthes

- 2.1.1 General characters
- 2.1.2 Classification of Platyhelminthes up to classes with examples
- 2.1.3 Type study- *Schistosoma*

2.3 Nematelminthes

- 2.3.1 General characters
- 2.3.2 Classification of Nematelminthes up to classes with examples
- 2.3.3 Type study - *Dracunculus*
- 2.3.4 Parasitic Adaptations in Helminthes

UNIT – III (15 Periods)

3.1 Annelida

- 3.1.1 General characters
- 3.1.2 Classification of Annelida up to classes with examples
- 3.1.3 Type study - *Hirudinaria granulosa*.
- 3.1.4 Evolutionary significance of Coelome and Coelomoducts and metamerism

3.2 Arthropoda

- 3.2.1 General characters
- 3.2.2 Classification of Arthropoda up to classes with examples
- 3.2.3 Type study - Prawn
- 3.2.4 Mouth parts of Insects
- 3.2.5 Insect metamorphosis
- 3.2.6 *Peripatus* - Structure and affinities

UNIT – IV (15 Periods)

4.1 Mollusca

- 4.1.1 General characters
- 4.1.2 Classification of Mollusca up to classes with examples
- 4.1.3 Type study - *Pila*
- 4.1.4 Pearl formation
- 4.1.5 Torsion and detorsion in gastropods

4.2 Echinodermata

- 4.2.1 General characters
- 4.2.2 Classification of Echinodermata up to classes with examples
- 4.2.3 Water vascular system in star fish
- 4.2.4 Echinoderm larvae and their significance

4.3 Hemichordata

- 4.3.1 General characters
- 4.3.2 Classification of Hemichordata up to classes with examples
- 4.3.3 *Balanoglossus* - Structure and affinities

Suggested Readings

1. **L.H. Hyman** '*The Invertebrates*' Vol I, II and V. – M.C. Graw Hill Company Ltd.
2. **Kotpal, R.L. 1988 - 1992** Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. **E.L. Jordan and P.S. Verma** '*Invertebrate Zoology*' S. Chand and Company.
4. **R.D. Barnes** '*Invertebrate Zoology*' by: W.B. Saunders CO., 1986.
5. **Barrington. E.J.W.**, '*Invertebrate structure and Function*' by ELBS.
- 6 **P.S. Dhami and J.K. Dhami.** Invertebrate Zoology. S. Chand and Co. New Delhi.
7. **Parker, T.J. and Haswell** '*A text book of Zoology*' by, W.A., Mac Millan Co. London.
8. **Barnes, R.D. (1982).** *Invertebrate Zoology*, V Edition”

B.Sc. ZOOLOGY MODEL PAPER FOR I SEMESTER
ZOOLOGY – CORE PAPER - I
ANIMAL DIVERSITY - INVERTEBRATES

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)
Answer any FOUR of the following
Draw labeled diagrams wherever necessary

1. Life history of Plasmodium
or
Canal system in sponges
2. Polymorphism in Coelenterates
or
Life history of Fasciola hepatica
3. Reproductive system of Hirudinaria
or
Respiratory system of Prawn
4. General characters of Mollusca
or
Classification of Phylum Echinodermata up to classes

Section- II (Marks: 5x2=10)
Answer any FIVE of the following
Draw labelled diagrams wherever necessary

5. Paramecium/ Vorticella conjugation
6. General characters of Porifera
7. Parasitic Adaptations in Helminthes
8. Formation of Coral reefs
9. Evolutionary significance of Coelomic ducts
10. Explain any two mosquito borne diseases
11. Affinities of Hemichordata
12. Torsion in Gastropods

Section- III (Marks: 10x1=10)
Answer all of the following

- | | |
|-----------------|--------------------------|
| 13. Statocyst | 18. Schizocoel |
| 14. Choanocytes | 19. Rhabditi form larva |
| 15. Auricularia | 20. Jelly fish |
| 16. Mantle | 21. Acronematic flagella |
| 17. Book lungs | 22. Trochophore larva |

ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER
ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - INVERTEBRATES

Periods: 30

Max. Marks: 40

1. Study of museum slides / specimens / models (Classification of animals up to orders)

- i. **Protozoa:** *Amoeba*, *Paramecium*, *Paramecium* Binary fission and Conjugation, *Vorticella*, *Entamoeba histolytica*, *Plasmodium vivax*
- ii. **Porifera:** *Sycon*, *Spongilla*, *Euspongia*, *Sycon* - T.S & L.S, Spicules, Gemmule
- iii. **Coelenterata:** *Obelia* – Colony & *Medusa*, *Aurelia*, *Physalia*, *Velella*, *Corallium*, *Gorgonia*, *Pennatula*
- iv. **Platyhelminthes:** *Planaria*, *Fasciola hepatica*, *Fasciola* larval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus*, *Taenia solium*, *Schistosoma haematobium*
- v. **Nemathelminthes:** *Ascaris*(Male & Female), *Dracunculus*, *Ancylostoma*, *Wuchereria*
- vi. **Annelida:** *Nereis*, *Aphrodite*, *Chaetopterus*, *Hirudinaria*, Trochophore larva
- vii. **Arthropoda:** *Cancer*, *Palaemon*, *Scorpion*, *Scolopendra*, *Sacculina*, *Limulus*, *Peripatus*, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female *Anopheles* and *Culex*, Mouthparts of Housefly and Butterfly.
- viii. **Mollusca:** *Chiton*, *Pila*, *Unio*, *Pteredo*, *Murex*, *Sepia*, *Loligo*, *Octopus*, *Nautilus*, Glochidium larva
- ix. **Echinodermata:** *Asterias*, *Ophiothrix*, *Echinus*, *Clypeaster*, *Cucumaria*, *Antedon*, Bipinnaria larva
- x. **Hemichordata:** *Balanoglossus*, Tornaria larva

2. Dissections:

Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst
Insect Mouth Parts

3. Laboratory Record work shall be submitted at the time of practical examination

4. An “**Animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

5. Computer aided techniques should be adopted – show virtual dissections

Suggested manuals:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma
3. Practical Zoology - Invertebrates K.P. Kurl

ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER
ZOOLOGY - PAPER - I
ANIMAL DIVERSITY - INVERTEBRATES

Time: 3 Hrs.

Max. Marks: 40

1. Identification, labeled diagram and salient features of spots: (7 Museum specimens + 2 slides)		18
2. Dissection (one) (Diagram -02 + Dissection & Display-05) --		07
3. Field Visit & Note Book	----	04
4. Project Work	----	03
5. Certified practical record	----	03
6. Animal Album	----	03
7. Viva voce	----	02

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)
II - SEMESTER
Core Paper – II
Ecology, Zoogeography and Animal Behavior

Periods: 60

Max. Marks: 60

UNIT – I (15Periods)

1.1 Ecology - I

- 1.1.1 Ecosystem structure and functions.
- 1.1.2 Types of Ecosystems –Aquatic and Terrestrial.
- 1.1.3 Biogeochemical cycles - Nitrogen, Carbon, Phosphorus and Water.
- 1.1.4 Energy flow in ecosystem.
- 1.1.5 Food chain, food web and ecological pyramids.
- 1.1.6 Animal Associations - Mutualism, commensalism, parasitism, competition, predation.

UNIT – II (15 Periods)

2.1 Ecology – II

- 2.1.1 Concept of Species, Population dynamics and Growth curves.
- 2.1.2 Community Structure and dynamics and Ecological Succession.
- 2.1.3 Ecological Adaptations.
- 2.1.4 Environmental Pollution – Sources, Effect and Control measures of Air, Water, Soil and Noise pollution,
- 2.1.5 Wildlife conservation - National parks and Sanctuaries of India, Endangered species.
- 2.1.6. Biodiversity and hotspots of Biodiversity in India.

UNIT – III (15 Periods)

3.1 Zoogeography

- 3.1.1 Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities
- 3.1.2 Wallace line, Discontinuous distribution
- 3.1.3. Continental Drift

UNIT – IV (15 Periods)

4.1 Animal Behaviour

- 4.1.1 Types of Behaviour- Innate and Acquired, Instinctive and Motivated behaviour
- 4.1.2 Taxes, Reflexes, Tropisms

- 4.1.3 Physiology and phylogeny of learning, trial and error learning, Imprinting, habituation, Classical conditioning, Instrumental conditioning
- 4.1.5 Social behavior, Communication, Pheromones
- 4.1.6 Biological rhythms, Biological clocks, Circadian rhythms

Suggested Readings

M.P.Arora, '*Ecology*' Himalaya Publishing company.

P.D.Sharma, '*Environmental Biology*'.

P.R.Trivedi and Gurdeep Raj. '*Environmental Ecology*'

Buddhadev Sarma and Tej Kumar, '*Indian Wildlife Threats and Preservation*

Chapman J.L. and Reiss M.J, '*Ecology Principles and Applications*', Second Ed., Cambridge University Press, London.

Benny Joseph, '*Environmental Studies*', TATA McGraw Hill Com., New Delhi.

Eugene P. Odum, '*Fundamentals of Ecology*' Third Ed., NataraJ Publishers, Dehradun.

Veer Bala Rastogi, "Ecology and Animal Distribution"

P.K. Gupta, "Text Book of Ecology and Environment"

Bhatnagar and Bansal, "Ecology and Wildlife biology"

Dasmann, "Wild life Biology"

Reena Mathur, "Animal Behaviour"

Alocck, "Animal Behaviour- an Evolutionary Approach"

**B.Sc. MODEL PAPER FOR II SEMESTER
ZOOLOGY - Core Paper – II
Ecology, Zoogeography and Animal Behavior**

Time: 3 hrs

Max. Marks: 60

Section- I (Marks: 4x5=20)

**Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary**

1. What is Bio-geo chemical cycle? Explain Nitrogen cycle
Or
Describe Pond Ecosystem and its fauna
2. What is ecological Succession? Explain a hydrosere community
Or
Explain various effects of Air pollution and its controlling measures
3. Describe the climatic conditions and faunal peculiarities of Oriental region
Or
Write about Mutualism and Commensalism by taking two examples each
4. Differentiate Classical and Instrumental conditioning citing suitable examples
Or
Explain Biological and Circadian rhythms giving two examples each

Section- II (Marks: 5x2=10)

**Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary**

5. Social Behaviour
6. Brief the Hot spots of Biodiversity in India
7. Energy flow in Agricultural ecosystem
8. Arboreal adaptations
9. Explain Wallace line
10. Role of Decomposers
11. Global warming
12. Reflexes

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|-----------------------|--------------------------------|
| 13. Competition | 18. Discontinuous distribution |
| 14. Natality | 19. Pheromones |
| 15. Eutrophication | 20. Tropisms |
| 16. Soil erosion | 21. Thermocline |
| 17. Pyramid of energy | 22. Biological Clocks |

B.Sc. PRACTICAL SYLLABUS FOR II SEMESTER
ZOOLOGY - Core Paper – II
Ecology, Zoogeography and Animal Behavior

Periods: 30

Max. Marks: 40

1. Determination of pH of Soil and Water
2. Estimation of salinity (chlorides) of water in given samples.
3. Estimation of Carbonates and bicarbonates in the given water samples.
4. Estimation of dissolved oxygen of pond water, sewage water and effluents.
5. Identification of Zooplankton from a nearby water body.
6. Study of Pond Ecosystem / local polluted site - Report submission
7. Study of at least 3 endangered or threatened wild animals of India through photographs / specimens / models
8. Field visit to Zoo Park to study the management, behavior and enumeration of wild animals.
9. Identification of Zoogeographical realms from the Map and identify specific fauna of respective regions.
10. Observe the response of invertebrates in different lightening conditions

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

1. **Robert Desharnais, Jeffrey Bell**, 'Ecology Student Lab Manual, Biology Labs'
2. **Darrell S Vodopich**, 'Ecology Lab Manual'

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

III - SEMESTER

Core Paper – III

Animal Diversity- Vertebrates and Developmental Biology

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1.1. Urochordata, Cephalochordata, Cyclostomata

1.1.1. Salient features of Urochordata

1.1.2. Retrogressive metamorphosis and its significance in Urochordata

1.1.3. Salient features and affinities of Cephalochordata

1.1.4. General characters of Cyclostomata

1.1.5. Comparison of the *Petromyzon* and *Myxine*

1.1.6. General characters and classification of Chordata upto orders with examples.

1.2. Pices

1.2.1. General characters of Fishes

1.2.2. Classification of fishes up to order level with examples

1.2.3. *Scoliodon* – Respiratory, Circulatory and Nervous system.

1.2.4. Types of Scales and types of Fins

UNIT – II (15 Periods)

2.1. Amphibia

2.1.1. General characters of Amphibians

2.1.2. Classification of Amphibians up to orders with examples.

2.1.3. *Rana tigrina* - Respiratory, Circulatory and Nervous system.

2.1.4. Parental care in amphibia, Neotony.

2.2 Reptilia

2.2.1. General characters of Reptilia

2.2.2. Classification of Reptilia up to orders with examples

2.2.3. *Calotes* – Respiratory system, Circulatory and Nervous system.

2.2.4. Temporal fosse in reptiles and its evolutionary importance

2.2.5. Distinguished characters of Poisonous and Non poisonous snakes.

2.2.6. Rhynchocephalia.

UNIT – III (15 Periods)

3.1. Aves

- 3.1.1. General characters of Aves
- 3.1.2. Classification of Aves up to orders with examples.
- 3.1.3. *Columba livia* -, Digestive system, Circulatory systems, Respiratory system and Nervous system.
- 3.1.4. Migration in Birds
- 3.1.5. Flight adaptation in Birds

3.2. Mammalia

- 3.2.1. General characters of Mammalia
- 3.2.2. Classification of Mammalia up to orders with examples
- 3.2.3. Rabbit –Digestive, Respiratory, Circulatory and Nervous system.
- 3.2.4. Dentition in mammals.
- 3.2.5. Aquatic adaptations in Mammals.

UNIT – IV (15 Periods)

4.1 Developmental Biology and Embryology

- 4.1.1 Gametogenesis (Spermatogenesis and Oogenesis)
- 4.1.2 Fertilization
- 4.1.3 Types of eggs
- 4.1.4 Types of cleavages

4.2 Development of Frog up to formation of primary germ layers

4.3 Formation of Foetal membrane in chick embryo and their functions

4.4 Types and functions of Placenta in mammals

4.5 Regeneration in Turbellaria and Lizards

Suggested Readings:

1. **E.L.Jordan and P.S. Verma** ‘*Chordate Zoology*’ -. S. Chand Publications.
2. **Mohan P.Arora.** ‘*Chordata – I*, Himalaya Publishing House Pvt.Ltd.
3. **Marshal, Parker and Haswell** ‘*Text book of Vertebrates*’. ELBS and McMillan, England.
4. **Alfred Sherwood Romer.** Thomas S. Pearson ‘*The Vertebrate Body*, Sixth edition, CBS college Publishing, Saunders College Publishing
5. **George C. Kent, Robert K. Carr.** *Comparative Anatomy of the Vertebrates*, 9th ed. McGraw Hill.
6. **Kenneth Kardong** *Vertebrates: Comparative Anatomy, Function and Evolution*, 4th ed, ‘McGraw Hill.
7. **J.W. Young**, *The Life of Vertebrates*, 3rd ed, Oxford University press.
8. **Harvey Pough F, Christine M. Janis, B. Heiser**, *Vertebrate Life*, Pearson, 6th ed, Pearson Education Inc.2002.

B.Sc. ZOOLOGY MODEL PAPER FOR III SEMESTER
ZOOLOGY - CORE PAPER - III
Animal Diversity- Vertebrates and Developmental Biology

Time: 3 hrs

Max. Marks: 60

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. Describe about migration of Fishes giving suitable examples
Or
What is Retrogressive metamorphosis? Explain in Herdmania
2. Describe the classification of Amphibians up to order level with suitable examples
Or
Discuss the distinguished characters of Poisonous and Non-Poisonous snakes
3. Explain the General characters of Mammals
Or
Write an essay on flight adaptations of Birds
4. Explain the mechanism of Fertilization and its significance
Or
Describe the structure and functions of Placenta

Section- II (Marks: 5x2=10)

Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary

5. Describe the General characters of Cyclostomes
6. Temporal fosse in reptiles
7. General characters of Chordates
8. Parental care in Amphibians
9. Brief account of Dipnoi Fishes
10. Explain briefly about Regeneration
11. Draw a labeled diagram of Respiratory system of Pigeon
12. Describe the dentition in Mammals

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|----------------------|---------------------------|
| 13. Sphenodon | 18. Telolecithal eggs |
| 14. Amnion | 19. Homocercal caudal fin |
| 15. Apoda | 20. Paedogenesis |
| 16. Ductus carotecus | 21. Optic chiasma |
| 17. Quill feather | 22. Ammocoetus larva |

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER
ZOOLOGY - CORE PAPER - III
Animal Diversity- Vertebrates and Developmental Biology

Periods: 30

Max. Marks: 40

Study of museum slides / specimens / models (Classification of animals up to orders)

1. **Protochordata:** *Amphioxus*, *Amphioxus* T.S. through pharynx
2. **Cyclostomata:** *Petromyzon*, *Myxine*, *Ammocoetus* larva
3. **Pisces:** *Sphyrna Pristis*, *Torpedo*, *Channa*, *Pleuronectes*, *Hippocampus*, *Exocoetus*, *Echieneis*, *Labeo*, *Catla*, *Clarius*, *Auguilla*, *Protopterus*, Scales: Placoid, Cycloid, Ctenoid
4. **Amphibia:** *Ichthyophis*, *Amblystoma*, *Siren*, *Hyla*, *Rachophous*, *Bufo*, *Rana*, Axolotal larva
5. **Reptilia :** *Draco*, *Chamaeleon*, *Gecko*, *Uromastix*, *Vipera russeli*, *Naja*, *Bungarus*, *Enhydrina*, *Typhlops*, *Testudo*, *Trionyx*, *Crocodylus*, *Ptyas*.
6. **Aves:** *Archaeopteryx*, *Passer*, *Psittacula*, *Bubo*, *Alcedo*, *Columba*, *Corvus*, *Pavo*, Collection and study of different types of feathers: Quill, Contour, Filoplume, Down
7. **Mammalia:** *Ornithorynchus*, *Tachyglossus*, *Pteropus*, *Funambulus*, *Manis*, *Loris*, Hedgehog;

Histology: T.S. of Liver, Pancreas, Kidney, Stomach, Intestine, Lungs Artery, Vein, Bone T.S., Spinal cord.

Osteology :

1. Rabbit – Axial skeleton system (bones of Skull and Vertebral Column)
2. Varanus, Pigeon and Rabbit – Appendicular skeleton system (bones of limbs and girdles)

Dissections of *Labeo/Tilapia*:

1. Digestive system.
2. Brain, Weberian ossicles
3. V, VII, IX, X cranial nerves

Embryology

1. Study of T.S. of Testis and Ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8, 16 cell stages); Morula, Blastula
3. Study of chick embryos of 18 hours, 24 hours, 33 hours and 48 hours of incubation

Laboratory Record work shall be submitted at the time of practical examination

An “**Animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Computer aided virtual dissections.

Suggested manuals

1. **S.S.Lal**, Practical Zoology – Vertebrata
2. **P.S.Verma**, A manual of Practical Zoology – Chordata
3. **Freeman & Bracegirdle**, An atlas of embryology

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER
ZOOLOGY - CORE PAPER - III
Animal Diversity- Vertebrates and Developmental Biology

Time: 3 Hrs.

Max. Marks: 40

1. Identification, labeled diagram and salient features of spots: (6 Museum specimens + 2 slides)		16
2. Osteology (02 Spots)	----	04
3. Dissection (one) (Diagram -02 + Dissection & Display-05) --		07
4. Embryology (02 Spots)	----	04
5. Certified practical record	----	04
6. Animal Album	----	03
7. Viva voce	----	02

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)

IV - SEMESTER

Core Paper – IV

Cell and Molecular Biology, Genetics, Evolution

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1. Cell Biology

- 1.1. Cell theory, Differences of Prokaryotic and Eukaryotic cells
- 1.2. Ultrastructure of animal cell
- 1.3. Structure and functions of plasma membrane proteins.
- 1.4. Structure and functions of cell organelles –
Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes,
Mitochondria and Nucleus
- 1.1.5 Chromosomes – Structure, types, giant chromosomes
- 1.1.6 Cell Division - Mitosis, Meiosis.
- 1.1.7. Cell cycle and its regulation.

UNIT – II (15 Periods)

2. Molecular Biology

- 2.1 DNA (Deoxyribo Nucleic Acid) - Structure
- 2.2 RNA (Ribo Nucleic Acid) - Structure, types
- 2.3 DNA Replication
- 2.4 Protein Synthesis – Transcription and Translation
- 2.5 Gene Expression – Genetic Code; operon concept
- 2.6 Molecular Biology Techniques- Polymerase Chain Reaction, Electrophoresis

UNIT – III (15 Periods)

3. Genetics

- 3.1 Mendel's laws of Inheritance and Non-Mendelian Inheritance
- 3.2 Linkage and Crossing over
- 3.3. Sex determination and sex-linked inheritance
- 3.4 Chromosomal Mutations- Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy.
- 3.5. Gene mutations- Induced versus Spontaneous mutations.
- 3.6. Inborn errors of metabolism.
- 3.7. One gene one enzyme, one gene one polypeptide theory.

UNIT – IV (15 Periods)

4. Evolution

- 4.1. Theories of evolution – Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism, Modern synthetic theory.
- 4.2. Evidences of Evolution and Hardy Weinberg Law.

- 4.3. Forces of Evolution – mutation, gene flow, genetic drift, and natural selection.
- 4.4. Isolation – Pre-mating and post mating isolating mechanisms
- 4.5. Speciation: Methods of speciation - Allopatric and sympatric
- 4.6. Causes and Role of Extinction in Evolution.

Suggested readings

1. **Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell** ‘*Molecular Cell Biology*’
W.H. Free man and company New York..
2. **Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008).** *Principles of Genetics*. VIII
Edition.Wiley India.
3. **Snustad, D.P., Simmons, M.J. (2009).** *Principles of Genetics*. V Edition.John Wiley and
Sons Inc.
4. **Klug, W.S., Cummings, M.R., Spencer, C.A. (2012).** *Concepts of Genetics*. X Edition.
Benjamin Cummings.
5. **Russell, P. J. (2009).** *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.
6. **Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B.** *Introduction to
Genetic Analysis*. IX Edition. W. H. Freeman and Co.
7. **Ridley, M. (2004).** *Evolution*. III Edition. Blackwell Publishing
8. **Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007).**
Evolution. Cold Spring, Harbour Laboratory Press.
9. **Hall, B. K. and Hallgrimsson, B. (2008).** *Evolution*. IV Edition. Jones and Bartlett
Publishers
10. **Campbell, N. A. and Reece J. B. (2011).** *Biology*. IX Edition, Pearson, Benjamin,
Cummings.
11. **Douglas, J. Futuyma (1997).** *Evolutionary Biology*. Sinauer Associates.
12. **Minkoff, E. (1983).** *Evolutionary Biology*. Addison-Wesley.
13. **James D. Watson, Nancy H. Hopkins** ‘*Molecular Biology of the Gene*’
14. **Jan M. Savage.** *Evolution*, 2nd ed, Oxford and IBH Publishing Co., New Delhi.
15. **Gupta P.K.,** ‘Genetics’

B.Sc. ZOOLOGY MODEL PAPER FOR IV SEMESTER
ZOOLOGY Core Paper – IV
Cell Biology, Genetics and Evolution

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. Describe the fluid mosaic structure and functions of Plasma membrane
Or
Explain different types of chromosomes
2. Describe the different phases in Protein synthesis
Or
Explain in detail about Mitosis
3. Explain Epistasis with a suitable example
Or
What is sex linked inheritance? Explain with Haemophilia and Colour blindness
4. Explain the differences in between Allopatric and Sympatric speciations
Or
Explain briefly the evidences of organic evolution citing suitable examples

Section- II (Marks: 5x2=10)

Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary

5. Describe law of segregation citing an example
6. Structure of DNA
7. Differentiate prokaryotic and eukaryotic cells
8. Explain Hardy Weinberg law.
9. Crossing over
10. Explain briefly about Polyploidy
11. Draw a labeled diagram of Ultra structure of Animal Cell
12. Explain briefly different types of reproductive isolations

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|-------------------|-----------------------------|
| 13. Genetic drift | 18. Inducer |
| 14. Lysosomes | 19. Multiple alleles |
| 15. Translocation | 20. S-phase |
| 16. Co-dominance | 21. Cristae |
| 17. Bar body | 22. Significance of Meiosis |

ZOOLOGY PRACTICAL SYLLABUS FOR III SEMESTER

ZOOLOGY Core Paper – IV Cell Biology, Genetics and Evolution

Periods: 30

Max. Marks: 40

I. Cytology

1. Preparation and Identification of slides of Mitotic divisions with onion root tips
2. Preparation and Identification of different stages of Meiosis in Grasshopper Testes
3. Identification and study of the following slides
 - i). Different stages of Mitosis and Meiosis
 - ii) Lamp brush and Polytene chromosomes

II. Genetics

1. Problems on Genetics - Mendelian inheritance, Linkage and crossing over, Sex linked inheritance

III. Evolution

1. Museum Study of Fossil animals: *Peripatus*, *Coelacanth Fish*, *Dipnoi fishes*, *Sphenodon*, *Archeopteryx*.
2. Study of homology and analogy from suitable specimens and pictures
3. Problems on Hardy-Weinberg Law
4. Macroevolution using Darwin finches (pictures)

Laboratory Record work shall be submitted at the time of practical examination

An “**Album**” containing photographs, cut outs, with appropriate write-up about Genetics and Evolution.

Computer aided techniques should be adopted as per UGC guide lines.

Suggested manuals

Manual of laboratory experiments in cell biology Edward, G.

B.Sc. PRACTICAL MODEL PAPER FOR IV SEMESTER
ZOOLOGY - CORE PAPER - IV
Cell Biology, Genetics and Evolution

Time: 3 Hrs.

Max. Marks: 40

1. Identification, labeled diagram and salient features of spots: (06 spots)	-----	12
2. Prepare and Identify Mitotic divisions with onion root tips:	-----	08
3. One Problem from Genetics	-----	05
4. One Problem from Evolution	-----	05
5. Certified practical record	-----	05
6. Album	-----	03
7. Viva voce	-----	02

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)
V - SEMESTER
Core Paper – V
Physiology and Biochemistry

Periods: 60

Max. Marks: 60

UNIT – I Physiology (15 Periods)

1.1 Digestion

- 1.1.1 Digestion definition and extra and intracellular digestion.
- 1.1.2 Digestion of Carbohydrates, Proteins, Lipids and Cellulose.
- 1.1.3 Absorption and Assimilation of digested food.
- 1.1.4 Role of Gastrointestinal hormones in digestion

1.2 Respiration

- 1.2.1 Definition of Respiration and Respiratory mechanisms – External, Internal and cellular.
- 1.2.2 Respiratory Pigments
- 1.2.3 Transport of oxygen, Oxygen dissociation curves. Bohr's effect.
- 1.2.4 Transport of CO₂ – Chloride shift.
- 1.2.4 Regulation of respiration – nervous and chemical

1.3 Circulation

- 1.3.1 Types of circulation - Open and Closed circulation
- 1.3.2 Structure of Mammalian Heart, Types of hearts – Neurogenic and Myogenic.
- 1.3.3 Heart function – Conduction and regulation of heart beat.
- 1.3.4 Regulation of Heart rate – Tachycardia and Bradycardia
- 1.3.5 Blood Clotting mechanism

UNIT – II (15 periods)

2.1. Excretion

- 2.1.1 Classification of Animals on the basis of excretory products- Ammonotelic, Uricotelic, Ureotelic
- 2.1.2 Structure and function of Nephron; Urine formation, Counter current mechanism.

2.2. Muscle Contraction

- 2.2.1 Types of Muscles
- 2.2.2 Ultra structure of skeletal muscle fibre
- 2.2.3 Sliding Filament theory, muscle contraction mechanism and energetics.

2.3. Nerve Impulse

2.3.1 Structure of Neuron

2.3.2 Nerve impulse - Resting potential and Action potential and Conduction of Nerve impulse

2.3.3 Synapse, types of synapses and Synaptic transmission.

UNIT – III (15 periods)

3.1. Endocrine System

3.1.1 Endocrine glands - Structure, secretions and functions of Pituitary, Thyroid, Parathyroid, Adrenal glands and Pancreas

3.1.2 Hormone action and concept of Secondary messengers

3.1.3 Male and Female Hormones, Hormonal control of Menstrual cycle in humans.

3.2. Homeostasis and Enzymes

3.2.1 Concept of Homeostasis.

3.2.2 Mechanism of Homeostasis.

3.2.3 Osmoregulation - Water and ionic regulation by freshwater, brackish water and marine animals

3.2.4 Enzymes: Definition, Classification, Inhibition and Regulation

Biochemistry

UNIT – IV (15 Periods)

4. Biomolecules and Metabolism

4.1. Carbohydrates: Classification and function of Carbohydrates

4.2. Carbohydrate metabolism - Glycolysis, Krebs cycle, , Electron transport and oxidative phosphorylation.

4.3. Proteins: Classification of proteins based on functions and Chemical nature

4.4. Protein Metabolism - Transamination, Deamination and Urea Cycle

4.5. Lipids: Classification of Lipids

4.6. Lipid Metabolism - Fatty acid synthesis and Fatty acid oxidation.

Suggested readings

Gerard J. Tortora and Sandra Reynolds Garbowski *Principles of Anatomy and Physiology*, Tenth Ed., John Wiley & Sons

Arthur C. Guyton MD, *A Text Book of Medical Physiology*, Eleventh ed., John E. Hall, Harcourt Asia Ltd.

William F. Ganong, *A Review of Medical Physiology*, 22 ed, McGraw Hill, 2005

Sherwood, Klandrof, Yanc, *Animal Physiology*, Thompson Brooks/Coole, 2005.

Sherwood, Klandrof, Yanc, *Human Physiology*, Thompson Brooks/Coole, 2005.

Knut Schmidt-Nielson, *Animal Physiology*, 5th ed, Cambridge Low Price Edition.

Roger Eckert and Randal, *Animal Physiology*, 4th ed, Freeman Co, New York.

Singh. H.R, *Text Book of Animal Physiology and Biochemistry*

Nagabhushanam , *Comparative Animal Physiology*

Veer Bal Rastogi, *Text Book of Animal Physiology*

B.Sc. ZOOLOGY MODEL PAPER FOR IV SEMESTER
ZOOLOGY V - SEMESTER
Core Paper – V
Physiology and Biochemistry

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. Describe the process of carbohydrate digestion in mammals
Or
Explain in detail about transportation of gases in human
2. Write about working mechanism of mammalian Heart
Or
Describe the structure and function of nephron
3. Explain Ultra structure of skeletal muscle fibre
Or
What is Synapse? Explain Synaptic transmission
4. Explain the structure of Thyroid gland , its secretions and functions
Or
Write about the structure and classification of Proteins

Section- II (Marks: 5x2=10)

Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary

5. Types of Hearts
6. Structure of Glucose
7. Labelled diagram of Neuron
8. Explain the role of gastrointestinal hormones.
9. Respiratory pigments
10. Explain briefly about Krebs cycle
11. Draw a labeled diagram of Ultra structure of Animal Cell
12. Explain briefly about Homeostasis

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|--------------------------|---------------------|
| 13. Action potential | 18. Uricotelic |
| 14. Transamination | 19. FSH |
| 15. Hypothalamus | 20. Gluconeogenesis |
| 16. Bradycardia | 21. Dialysis |
| 17. Actin myosin complex | 22. Cretinism |

B.Sc. III Year PRACTICAL SYLLABUS
V - SEMESTER
Core Paper – V
Physiology and Biochemistry

Periods: 30

Max. Marks: 40

1. Qualitative tests for identification of carbohydrates, proteins and lipids.
2. Qualitative tests for identification of ammonia, urea and uric acid (Nitrogenous excretory products)
3. Effect of pH and Temperature on salivary amylase activity.
4. Study of permanent histological sections of Mammalian Endocrine glands - pituitary, thyroid, pancreas, adrenal gland.
5. Estimation of Haemoglobin by Sahlis method.
6. Estimation of total protein by Lowry's method.
7. Estimation of unit Oxygen consumption of fish with reference to body weight.

- **Laboratory Record work shall be submitted at the time of practical examination**
- **Computer aided techniques should be adopted as per UGC guide lines.**

Suggested manuals

Tortora, G.J. and Derrickson, B.H. (2009). *Principles of Anatomy and Physiology*, XII Edition, John Wiley & Sons, Inc.

Widmaier, E.P., Raff, H. and Strang, K.T. (2008) *Vander's Human Physiology*, XI Edition., McGraw Hill

Guyton, A.C. and Hall, J.E. (2011). *Textbook of Medical Physiology*, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company

Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). *Biochemistry*. VI Edition. W.H Freeman and Co.

Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). *Principles of Biochemistry*. IV Edition. W.H. Freeman and Co.

Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009).

Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.

B.Sc. III Year PRACTICAL MODEL PAPER
V - SEMESTER
Core Paper – V
Physiology and Biochemistry

Time: 3 Hrs.

Max. Marks: 40

1. Identification, labeled diagram and salient features of spots: ----- (05 spots)	10
2. Estimation offrom Biochemistry -----	06
3. Identification/Study of.....from Physiology -----	06
4. Qualitative Test -----	06
5. Project Work -----	05
6. Certified practical record -----	05
7. Viva voce -----	02

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

VI - SEMESTER

Elective Paper – VI

Applied Zoology

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1.1. Aquaculture

- 1.1.1. Types of Fisheries
- 1.1.2. Fresh Water Fish and Prawn culture
- 1.1.3. Fresh water fishing gears and crafts.
- 1.1.4. Induced Breeding.
- 1.1.5. Hatchery design and Management of fish and prawn.
- 1.1.6. Transportation of fish and prawn seed.
- 1.1.7. Preservation, Processing and By-products of fishes.
- 1.1.8. Fish Diseases and control measures

UNIT – II (15 Periods)

2.2 Sericulture

- 2.2.1. Life cycle of *Bombyx mori*
- 2.2.2. Structure of silk gland and secretion of silk
- 2.2.3. Silkworm rearing technology.
- 2.2.4. Spinning, harvesting and storage of cocoons.
- 2.2.5. Silk worm Pests and Diseases: Uzi fly; Protozoan, Viral, Fungal and Bacterial; Control and prevention.
- 2.2.6. Prospects of Sericulture in India

UNIT – III (15 Periods)

3.1 Apiculture and Vermiculture

- 3.1.1. Selection of Bee Species for Apiculture.
- 3.1.2. Bee Keeping Equipment.
- 3.1.3. Methods of Extraction of Honey (Indigenous and Modern).
- 3.1.4. Bee Diseases and Enemies.
- 3.1.5. Products of Apiculture Industry and its Uses (Honey, Bees Wax).
- 3.1.6. Introduction of Vermiculture and Vermicomposting.
- 3.1.7. Vermiculture techniques.
- 3.1.8. Bedding, Essential parameters for Vermiculture and Management
- 3.1.9. Methods of Harvesting (Manual & Mechanical).
- 3.1.10. Economic Importance of Vermiculture.

UNIT – IV (15 Periods)

4.1. Poultry Farming & Animal Husbandry

- 4.1.1. Classification of Fowls based on their use – Broilers and Commercial layers.
- 4.1.2. Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs.
- 4.1.3. Poultry diseases - Viral, Bacterial, Fungal, Protozoan
- 4.1.4. Management of a modern Poultry Farm, progressive plans to promote Poultry as a Self-Employment venture
- 4.1.5. Dairy farm and its management
- 4.1.6. Animal Husbandry – Introduction, Preservation of semen, artificial insemination of cattle, Induction of early puberty and synchronization of estrus in cattle

Suggested Readings

1. **Prost, P. J. (1962).** *Apiculture*. Oxford and IBH, New Delhi.
2. **Bisht. D.S.,** *Apiculture*, ICAR Publication.
3. **Singh S.,** *Beekeeping in India*, Indian council of Agricultural Research, NewDelhi.
4. **Ullal S.R. and Narasimhanna, M.N.** Handbook of Practical Sericulture: CSB, Bangalore
5. **Jolly. M. S.** Appropriate Sericultural Techniques; Ed., Director, CSR & TI, Mysore.
6. Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co.
7. **Narasimhanna, M. N.** Manual of Silkworm Egg Production;, CSB, Bangalore 1988.
8. **Wupang—Chun and Chen Da-Chung,** Silkworm Rearing;, Pub. By FAO, Rome 1988.
9. **Sengupta, K.** A Guide for Bivoltine Sericulture; Director, CSR & TI, Mysore 1989.
10. **Krishnaswamy, S.** Improved Method of Rearing Young age silkworm;CSB,Bangalore,1986.
11. **Jhingran. V.G.** Fish and fisheries in India.,
12. **Khanna. S.S,** An introduction to fishes
13. **Santanam, B. et al,** A manual of freshwater aquaculture,
14. **Boyd. C.E. & Tucker.C.S,** Pond aquaculture water quality management,
15. **Biswas.K.P,** Fish and prawn diseases,
16. **Hafez, E. S. E. (1962).** *Reproduction in Farm Animals*. Lea & Fabiger Publisher
17. **Dunham R.A. (2004).** *Aquaculture and Fisheries Biotechnology Genetic Approaches*. CABI
18. **Pedigo, L.P. (2002).** *Entomology and Pest Management*, Prentice Hall.
19. **Lee,** Earthworm Ecology
20. **Stevenson,** Biology of Earthworms
21. **Ranganathan L.S,** Vermicomposting technology- soil health to human health

B.Sc. ZOOLOGY MODEL PAPER FOR VI SEMESTER
ZOOLOGY VI - SEMESTER
Elective Paper – VI
Applied Zoology

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. What is Apiculture? Explain different methods of extraction of Honey
Or
Write about Silk worm rearing technology
2. Write about the general account of Economic importance Vermiculture
Or
What is Hypophysation? Explain in detail about induced breeding in fishes
3. Describe vermiculture technique and their significance
Or
Explain about breeding and management of Broilers
4. Describe the life history of *Bombyx mori*
Or
Describe in detail about preservation and artificial insemination in cattle

Section- II (Marks: 5x2=10)

Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary

5. Preservation techniques of fishes
6. Viral diseases in poultry
7. Nursery ponds
8. Economic importance Apiculture
9. Induction of early puberty
10. Explain social organization of Bee colony
11. Write a brief note the significance of Animal Husbandry
12. Explain briefly about Transportation of Fish seed

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|-------------------------------|--------------------|
| 12. Layers | 18. Ecdysis |
| 13. Hatchery | 19. Stake net |
| 14. Wax | 20. Vaccination |
| 15. Synchronization of estrus | 21. Fish glue |
| 16. Bedding | 22. Pebrin disease |

B.Sc. III Year PRACTICAL SYLLABUS

VI - SEMESTER

Elective Paper – VI

Applied Zoology

Periods: 30

Max. Marks: 40

1. Identification and study of important cultivable and edible fishes - Any five
2. Identification and study of important cultivable and edible crustaceans - Any five
3. Identification different larvae of silk worm- Using specimens / pictures
4. Identification of mulberry and non mulberry silkworms
5. Mounting of mouth parts of adult silk worm and silk gland of larva
6. Estimation of quality of milk from different dairy farm units – specific gravity, fat content, pH viscosity.
7. Identification of purity of Honey in different samples
8. Field visits to a Vermiculture / Sericulture / fisheries / apiculture / poultry / dairy farm-
submission of any 3 Reports

- **Laboratory Record work shall be submitted at the time of practical examination**
- **Computer aided techniques should be adopted as per UGC guide lines.**

B.Sc. III Year PRACTICAL MODEL PAPER
VI - SEMESTER
Elective Paper – VI
Applied Zoology

Time: 3 Hrs.

Max. Marks: 40

1. Identification, labeled diagram and salient features of spots: ----- (05 spots)		10
2. Identification	-----	06
3. Field trip reports (3)	-----	12
4. Project Work	-----	04
5. Certified practical record	-----	04
6. Viva voce	-----	04

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)
V- SEMESTER
Core Paper – VII
Immunology and Animal Biotechnology

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1.1. Immunology

- 1.1. Basic concepts of immunology.
- 1.1.2. Cells of immune system
- 1.1.3. Primary and secondary Organs of immune system
- 1.1.4. Types of Immunity – Innate and acquired

1.2. Antigens and antibodies

- 1.2.1. Basic properties of antigens
- 1.2.2. Structure, function and types of an antibody.
- 1.2.3. B and T cell epitopes, haptens, adjuvants.
- 1.2.4. Antigen-antibody reactions,
- 1.2.5. T-Cell and B-Cell activation
- 1.2.6. Monoclonal antibodies and their production

UNIT – II (15 Periods)

2.1. Working of an Immune system

- 2.1.1. Structure and functions of major histocompatibility complex.
- 2.1.2. Basic properties and functions of Cytokines, Interferons and complement proteins
- 2.1.3. Humoral and Cell mediated immunity.

2.2. Immune system in health and disease

- 2.2.1. Types of hyper sensitivity.
- 2.2.2. Concepts of autoimmunity and immunodeficiency.

2.3. Introduction to Vaccines and types of Vaccines

UNIT – III (15 Periods)

3.1. Animal Biotechnology

- 3.1.1. Concept and Scope of Animal Biotechnology.
- 3.1.2. Cloning vectors - Plasmids, Cosmids, Lambda bacteriophage, YAC,
- 3.1.3. Cloning- Cloning methods (Cell, Animal and Gene cloning)
- 3.1.4. Animal Cell culture - Equipment and materials for animal cell culture, Applications of cell culture techniques

UNIT – IV (15 Periods)

4.1 Genetically modified organisms

- 4.1.1 Recombinant DNA technology and its applications
- 4.1.2 Transgenesis – Methods of Transgenesis.
- 4.1.3 Production of Transgenic animals and Application of Transgenic animals in Biotechnology.
- 4.1.4 Stem cells –types and their applications

Suggested Readings

- Arthur C. Guyton MD**, *A Text Book of Medical Physiology*, Eleventh ed., John E. Hall, Harcourt Asia Ltd.
- William F. Ganong**, *A Review of Medical Physiology*, 22 ed, McGraw Hill, 2005
- Sherwood, Klandrof, Yanc**, *Human Physiology*, Thompson Brooks/Coole, 2005.
- Knut Schmidt-Nielson**, *Animal Physiology*, 5th ed, Cambridge Low Price Edition.
- Richard A. Glodby, Thomas J Kind, Barbara A. Osborne, Janis Kuby**, *Immunology*, 5th ed, Freeman and Co. New York
- Ivan Roitt**, *Immunology*, 4th ed, Johanthan Brostoff, Mosby, London.
- Thomas C. Chung**, *General Parasitology*, Hardcourt Brace and Co ltd. Asia. New Delhi.
- Gerard D. Schmidt and Larry S Roberts**, *Foundations of Parasitology*, McGraw Hill
- Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006)**. VI Edition. Immunology. W.H. Freeman and Company.
- Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006)**. XI Edition. Roitt's Essential Immunology, Blackwell Publishing.

B.Sc. ZOOLOGY MODEL PAPER FOR V SEMESTER
ZOOLOGY V - SEMESTER
Core Paper – VII
Immunology and Animal Biotechnology

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. What is immunity? Explain different types of Immunity
Or
Write about the antigen and antibody reactions
2. Write about the general account of vaccines
Or
What is Hypersensitivity? Explain in detail about Hypersensitivity
3. Define cloning Vector. Describe any two cloning vectors and their significance
Or
What is Transgenesis? Explain any two methods in processing Transgenic animals
4. Define a stem cell. Describe the applications of Stem cells
Or
Describe in detail about PCR technology

Section- II (Marks: 5x2=10)

Answer any FIVE (Short Answer) of the following
Draw labelled diagrams wherever necessary

5. Cell Culture techniques
6. Restriction Enzymes
7. Immunoglobulin –G (Ig-G)
8. Explain the cell mediated immunity.
9. r-DNA Technology
10. Explain basic properties of Antigens
11. Write a brief note the significance of Biotechnology
12. Explain briefly about Gene therapy

Section- III (Marks: 10x1=10)

Answer all of the following

- | | |
|-------------------------|-------------------------|
| 12. Monoclonal antibody | 18. Autoimmunity |
| 13. Heptanes | 19. Plasma |
| 14. Bacteriophage | 20. Nature killer cells |
| 15. Ligation | 21. Dolly |
| 16. Interferons | 22. Parkinson's disease |

B.Sc. III Year PRACTICAL SYLLABUS
V- SEMESTER
Core Paper – VII
Immunology and Animal Biotechnology

Periods: 30

Max. Marks: 40

I. Immunology

1. Identification of Blood groups
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Enumeration of RBC & WBC from a given blood sample
4. Enumeration of Differential count of WBC from a given blood sample
5. Demonstration of
 - a. ELISA
 - b. Immunoelectrophoresis
6. Identification of Autoimmune disease through charts.

II. Animal Biotechnology

1. Study the following techniques through photographs / virtual lab
 - a. Southern blotting
 - b. Western blotting
 - c. DNA sequencing (Sanger's method)
 - d. DNA finger printing
 - e. Identification of Vectors
 - f. Identification of Transgenic animals
2. PCR demonstration /virtual lab

- **Laboratory Record work shall be submitted at the time of practical examination**
- **Computer aided techniques should be adopted as per UGC guide lines.**

Suggested manuals

Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company.

David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition, Mosby, Elsevier Publication.

Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular Immunology. V Edition. Saunders Publication.

B.Sc. III Year PRACTICAL MODEL PAPER
V- SEMESTER
Core Paper – VII
Immunology and Animal Biotechnology

Time: 3 Hrs.

Max. Marks: 40

- | | |
|---------------------------------------------------------------------------------------|----|
| 1. Identification, labeled diagram and salient features of spots: -----
(05 spots) | 10 |
| 2. Identification/Determination from Immunology ----- | 06 |
| 3. Identification/Study the technique from Anima Biotechnology ----- | 06 |
| 4. Demonstration of a technique ----- | 06 |
| 5. Project Work ----- | 05 |
| 6. Certified practical record ----- | 05 |
| 7. Viva voce ----- | 02 |

B.Sc. ZOOLOGY SYLLABUS UNDER CBCS
(With effect from 2016-2017)
VI - SEMESTER
Open Elective Paper – II
Medical Transcription

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

Medical terminology Pharmacology and Anatomy of humans

- 1.1. General medical terms, surgical terms, diseases
- 1.2. Human body parts, systems and functions
- 1.3. Medication terminology, treatments, drug reactions, pharmacology legalities, medication handling and doctor's orders.

UNIT – II (15 Periods)

Medical Theories and Techniques Ethical and Legal Responsibilities Medical Transcription Equipment and Technology

- 2.1. Diagnostic and therapeutic procedure terms and practices
- 2.2. Surgical procedure terms and practices
- 2.3. Lab procedures: patient preparation and blood drawing techniques.

UNIT – III (15 Periods)

Basic Transcription, Medical Grammar and Style, Medical Reports Formatting

- 3.1. Transcribing audio files into typed format.
- 3.2. Healthcare Documentation formats
- 3.3. American Medical Association stylistic standards.

UNIT – IV (15 Periods)

Computer Information Systems, Speech Recognition Editing:

- 4.1. Basics of Microsoft Office software, including Word, PowerPoint, Excel
- 4.2. Basic formatting practices and e-mail and Internet usage and file organization.
- 4.3. Speech recognition software to transcribe dictation and taking dictation with background noise.

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

VI - SEMESTER

Elective Paper – VIII

Public Health and Hygiene

Periods: 50

Max. Marks: 60

UNIT – I (15 Periods)

1.1 Nutrition and health

- 1.1.1 Classification of foods - Carbohydrates, proteins, lipids, vitamins and minerals.
- 1.1.2 Balanced diet and Malnutrition.
- 1.1.3 Nutritional deficiencies and disorders- Carbohydrates, proteins, lipids, vitamins and minerals.

UNIT-II (15 Periods)

2.1 Environment and Health

- 2.1.1. Environment and health Impact assessment: concept, steps and applications.
- 2.1.2. Occupational, Industrial, agricultural and urban Health-Exposure at work place, urban areas, industrial workers, farmers and agricultural labourers, Health workers and health disorders and diseases.
- 2.1.3 Environmental pollution and associated Health hazards
- 2.1.4 Water borne diseases
- 2.1.5 Air borne diseases

UNIT-III (15 Periods)

3.1 Communicable diseases

- 2.1.1 Causes, Symptoms, Diagnosis, Treatment and Prevention - Malaria, Filaria, Measles, Polio, Chicken pox, Rabies, Plague, Leprosy, Tuberculosis and AIDS.

3.2 Non-Communicable diseases

- 3.2.1 Causes, Symptoms, Diagnosis, Treatment and Prevention - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

UNIT-IV (15 periods)

4.1 Health Education in India

- 4.1.1. Health care legislation in India – termination of pregnancy act, Maternity benefit act, Transplantation of human organs act, Child Labour act, Biomedical waste act, ESI act.
- 4.1.2 WHO Programmes – Government and Voluntary Organizations and their health services
- 4.1.3. First Aid and Health awareness, personal health care record maintenance.

Suggested Readings

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur – India.
2. Public Health at the Crossroads Achievements and Prospects. Robert Beaglehole and Ruth
3. Bonita 2nd Edition Cambridge University Press 3. Maxcy Rosenau Last Public Health &
4. Preventive Medicine, Fourteenth Edition Ed Robert Wallace, MD, et al. 4.
5. Epidemiology and Management for Health Care: Sathe, P.V. Sathe, A.P., PopularPrakashan,
6. Mumbai, 1991. 5.
7. International Public Health: Diseases, Programs, Systems, and Policies by
8. Michael Merson, Robert E Black, Anne J Mills Jones and Bartlett Publishers. 6.

B.Sc. ZOOLOGY MODEL PAPER FOR VI SEMESTER
ZOOLOGY VI - SEMESTER
Elective Paper – VIII
Public Health and Hygiene

Time: 3 hrs

Max. Marks: 40

Section- I (Marks: 4x5=20)

Answer any FOUR (Long Answer) of the following
Draw labelled diagrams wherever necessary

1. Explain the symptoms of different vitamin deficiencies
Or
Write about impact of pollution on human health
2. Write about the general account of communicable diseases
Or
Write about Swatch Bharath programme in maintaining public health & hygiene
3. Describe the awareness programmes regarding Health Education by voluntary organizations and Government
Or
Explain about different types of diabetes prevailing in India
4. Describe the role of youth in public health & hygiene
Or
Describe how to control and eradicate mosquitoes propagating Chicken guinea and Malaria

Answer any FIVE (5X2=10) of the following
Draw labelled diagrams wherever necessary

5. Nutritional deficiencies
6. AIDS and its preventing measures
7. Awareness programme on sporadic diseases
8. Polio vaccination
9. Balanced diet
10. Coronary Heart disease
11. Write a brief note on significance of WHO Programmes

Section- III (Marks: 10x1=10)

Answer any SEVEN (Very Short Answer) of the following

- | | |
|------------------------|-----------------------|
| 12. Rabies | 18. First Aid |
| 13. Degradation | 19. Causes of Leprosy |
| 14. Obesity | 20. Mental ill health |
| 15. Symptoms of Plague | 21. Pellagra |
| 16. Rickets | 22. Sanitation |

B.Sc. III Year PRACTICAL SYLLABUS
VI - SEMESTER
Elective Paper – VIII
Public Health and Hygiene

Periods: 30

Max. Marks: 40

1. Medical fitness– Determine the following:
BMI, Blood Pressure, Cholesterol (LDL, HDL) Hemoglobin
Complete Blood Picture; Complete urine examination
 2. Qualitative identification of carbohydrates, Lipids, vitamins, lipids and minerals,
 3. Estimation of fat content and tests milk adulteration.
 4. Qualitative and quantitative survey methods in public health sciences.
 5. Identification of parasitic stages of malaria and filaria through permanent slides
 6. Estimation of blood glucose level in a normal and diabetic persons.
 7. Project report on Epidemiological survey, different diseases such as
Malaria; Chicken gunya; AIDS, Diarrhoea
 8. Epidemiological survey of a slum area to identify the diseases due to poor sanitation
and contaminated drinking water.
 9. Visit to a community water purification and treatment plant.
 10. Visit to an industry to study occupational health hazard and safety of industrial workers
(sugar/milk dairy/textile/cement).
 11. Visit to agricultural fields to study occupational health of farmers and agricultural
laborers.
- **Laboratory Record work shall be submitted at the time of practical examination**
 - **Computer aided techniques should be adopted as per UGC guide lines.**

B.Sc. III Year PRACTICAL MODEL PAPER
VI - SEMESTER
Elective Paper – VIII
Public Health and Hygiene

Time: 3 Hrs.

Max. Marks: 40

- | | |
|---------------------------------------------------------------|----|
| 1. Epidemiological survey report of a slum area health status | 10 |
| 2. Estimation of ----- from food or water or milk | 10 |
| 3. Project work | 10 |
| 4. Certified practical record | 05 |
| 5. Viva voce | 05 |

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

VI - SEMESTER

Elective Paper – VIII

AQUATIC BIOLOGY

Periods: 60 periods

Max. Marks: 60

UNIT – I (15 periods)

1.1 Aquatic Biomes

- 1.1.1 Brief introduction of the aquatic biomes
- 1.1.2 Freshwater ecosystem (lakes, wetlands, streams and rivers),
- 1.1.3 Estuaries, intertidal zones,
- 1.1.4 Oceanic pelagic zone, marine benthic zone.
- 1.1.5 Coral reefs

UNIT – II (15 periods)

2.1 Fresh water Biology

- 2.1.1 Lakes: Origin and classification of lakes,
- 2.1.2 Lake as an Ecosystem, Lake morphometry,
- 2.1.3 Physico-chemical Characteristics of fresh water bodies: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity: dissolved gases (Oxygen, Carbon dioxide).
- 2.1.4 Nutrient Cycles and Lakes- Nitrogen, Sulphur and Phosphorous.
- 2.1.5 Streams: Different stages of stream development, Physico-chemical environment, adaptation of hill-stream fishes.

UNIT – III (15 periods)

3.1 Marine Biology

- 3.1.1. Salinity and density of sea water,
- 3.1.2. Continental shelf,
- 3.1.3. Adaptation of deep sea organisms.
- 3.1.4. Sea weeds.

UNIT – IV (15 periods)

4.1 Management of Aquatic Resources

- 4.1.1. Aquatic pollution - Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills,
- 4.1.2. Eutrophication
- 4.1.3. Management and conservation
- 4.1.4. Water pollution acts of India
- 4.1.5. Sewage treatment and water quality assessment - BOD and COD.

B.Sc. III Year PRACTICAL SYLLABUS

(With effect from 2016-2017)

VI - SEMESTER Elective Paper – VIII AQUATIC BIOLOGY

PRACTICAL

1. Study of the topography of a lake
2. Physico-Chemical and biological analysis of a lake
Physico-Chemical analysis of water - O₂, CO₂, BOD, COD
Biological– Zooplanktons – Identification and population density of Zooplanktons of a lake
3. Determination of - Turbidity / transparency, Dissolved Oxygen, Free Carbon dioxide, Alkalinity (carbonates & bicarbonates) in water collected from a nearby lake / water body.
4. Instruments used in limnology (secchi disc, van dorn bottle, conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.
5. A Project Report on a visit to a Sewage treatment plant / Marine bio-reserve/Fisheries Institutes.

Suggested Readings

1. Ananthkrishnan : Bioresources Ecology 3rd Edition
2. Goldman – Limnology, 2nd Edition
3. Odum and Barrett – Fundamentals of Ecology, 5th Edition\
4. Pawlowski: Physicochemical Methods for water and Wastewater Treatment, 1st Edition
5. Wetzel: Limnology, 3rd edition
6. Trivedi and Goyal: Chemical and biological methods for water pollution studies
Welch: Limnology Vols.I-II

B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS

(With effect from 2016-2017)

VI - SEMESTER

Open Elective – CLINICAL SCIENCE

Periods: 60

Max. Marks: 60

UNIT – I (15 Periods)

1. HAEMATOLOGY

- 1.1. Introduction of Haematology
- 1.2. Structure, Composition and functions of blood
- 1.3. Origin of blood cells (RBC, WBC, PLATELETS)
- 1.4. Blood coagulation and theories of blood coagulation, anticoagulants
- 1.5. Blood groups and Rh factor
- 1.6. Blood Transfusion and Blood Banking
- 1.7. Blood associated disorders – Anaemia, Leucopenia, Leucocytosis, Leukemia and Haemophilia

UNIT – II (15 Periods)

2. TECHNIQUES

- 2.1. Microscopy – Light, phase contrast and Electron Microscopy
- 2.2. Microtomy- Fixation, Section cutting and Staining procedures
- 2.3. Biopsy and Autopsy of normal and affected tissues
- 2.4. Histopathological manifestations in tissues.
- 2.5. Principles of Sterilization, Autoclave, Microbial plating and Antibiotic Sensitivity Tests.
- 2.6. Immunological techniques – Agglutinations, precipitation, complement fixation test and ELISA

UNIT – III (15 Periods)

3. PATHOLOGY AND DISEASES

- 3.1. Introduction to pathology – Definition, Scope and branches\
- 3.2. Health and disease, Types of diseases
- 3.3. Bacterial diseases (Leprosy, Tuberculosis, Syphilis, Rickettsia and Spirochaete diseases).
- 3.4. Viral diseases (Dengue, Hepatitis, Swine flu, Chikun gunya, AIDS).
- 3.5. Protozoan diseases (Trypanosomiasis, Amoebiasis, Giardiasis, Toxoplasmosis).
- 3.6. Helminth diseases (Schistosomiasis, Echinococcosis, Dracunculosis, Ancylostomiasis).
- 3.7. Fungal diseases.

UNIT – IV (15 Periods)

4. IMMUNOLOGY

- 4.1. Types of Immunity – Innate and Acquired
- 4.2. Antigens and Antibodies

- 4.3. Immunoglobulins – Classifications and significance.
- 4.4. Complement system.
- 4.5. Lymphatic system and Lymphoid organs – Spleen, Thymus, Lymph nodes.
- 4.6. T-cells, B-cells and Macrophages.
- 4.7. Immune response – Humoral and cell mediated.
- 4.8. Hypersensitivity – Different types.

REFERENCES:

1. Textbook of Microbiology – R. Anantharayan and CKJ. Paniker
2. A hand book of Medical laboratory technology – V.H. Talib
3. Medical Laboratory technology – (vol-I & vol-II) – Kanai.L. Mukherjee
4. Medical Zoology-Sobti
5. Medical Laboratory Technology-Ramnik Sood
6. Parasitology – Chatterjee
7. Parasitology – Chakraborty.

**B.Sc. III Year ZOOLOGY SYLLABUS UNDER CBCS
PRACTICAL PAPER - CLINICAL SCIENCE**

I. Clinical Haematology

1.1. Total blood count

a) RBC, b) WBC, c) Platelets

1.2. Differential Leucocyte count

1.3. Estimation of Haemoglobin

1.4. Erythrocyte sedimentation rate

1.5. Packed cell volume and Erythrocyte Indices (MCV, MCH & MCHC)

1.6. Bleeding and clotting time

1.7. Blood grouping

II. Estimation of Blood sugar and serum proteins

III. Preparation of blood & faecal smear and identification of protozoan & Helminth parasites

IV. Urine Analysis – Physical, Chemical and Microscope Examination.

V. WIDAL and VDRL tests.