

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS FOR CBCS AND SEMESTER SYSTEM

B.Sc. SEM – I

(Effective from June 2016)

ZOOLOGY PAPER – I (Z – 101)

UNIT – 1

- (a) Scope and branches of zoology
- (b) Science of classification (Taxonomy) of animals and its significance.
- (c) Taxonomy:
 - i. Nonchordates - Hemichordates: general characters with examples.
 - ii. Chordates: Protochordata to mammals - general characters with examples

UNIT – 2

Tissue systems: Study of various types, their structure and functions.
Epithelial, connective, nervous and muscular tissue

UNIT – 3

Rabbit: External features, structure & functions of following systems

- i. Digestive system
- ii. Respiratory system
- iii. Circulatory system (Including heart)
- iv. Urinogenital system
- v. Brain

UNIT – 4

Genetics:

- i. Mendelian principles– Dominance, segregation, independent-assortment, deviation from Mendelian inheritance. Heredity of some human traits , Pedigree analysis
- ii. Concept of gene, multiple alleles (ABO blood groups), pseudo alleles

B.Sc. SEM – I

ZOOLOGY PRACTICAL – I (Based on paper -I)

- (1) Study of Classification of Invertebrate :
Phylum- Protozoa, Porifera and Coelenterates (cnidaria):
Amoeba, Paramecium, Bath sponge, Leucosolenia, Hydra, Aurelia,
- (2) Study of Classification of Invertebrate:
Phylum - Platyhelminthes, Nematelminthes and Annelida
Liver fluke, Planaria, Ascaris, Earth worm, Leech.
- (3) Study of Classification of Invertebrate :
Phylum -Arthropoda, Mollusca, Echinodermata and Hemichordates
Cockroach, Centipede, Crab, Spider, Bivalve, Sepia, Star fish, Sea cucumber, Sea urchin, Balanoglossus.
- (4) To study the Classification of Protochordata, Pisces and Amphibia:
Ascidian, Amphioxus, Lamprey, Scoliodon, Sea horse, Labeo, Frog, Bufo, Hyla, Ichthyophis,
- (5) To study the Classification of Class - Reptilia, Aves and Mammalia
Tortoise, Dhaman, Calotes, Sparrow, Parakeet, Cuckoo, Bat, Rat, Rabbit, Whale
- (6) Rabbit: Digestive system, Heart, Respiratory system and urinogenital system (To be studied through photographs/ models / charts etc.).
- (7) Tissue System: Study of various types of tissues with the help of permanent slides-areolar tissue, adipose tissue, Hyaline Cartilage, Mammalian bone, Medulated and non Medulated nerve fiber.

B.Sc. SEM – I
ZOOLOGY PAPER – II (Z – 102)

UNIT - 1

Cytology: Structural organization of cells- Prokaryotes and Eukaryotes,
Introduction to cell organelles and cell inclusions.

UNIT- 2

Immunology: Introduction and basic concepts of immunology. Cells and organs of immune system. Humoral and cellular immune response. Innate and acquired immunity.

UNIT - 3

Parasitology: Basics of parasitology and parasitism. Type study and life history of Ascaris.

UNIT- 4

- i. Evolution: Evidence of evolution from comparative functional anatomy
Homologous, Analogous and vestigial organs, connecting link, Atavism
(Reversion)
- ii. Ethology: Introduction, Scope and patterns of behavior. Nesting behavior
(Weaver bird, Horn bill) and social behavior (honeybee) Behavioral disorders.

B.Sc. SEM – I

ZOOLOGY PRACTICAL – II (Based on paper – II)

- (1) Microscopes: principle, working, magnifications and different types: Dissecting, compound, electron and fluorescent microscopes.
- (2) Life cycle of Ascaris
- (3) Prepare blood smear and blood grouping (A, B, O)
- (4) To study homologous and analogous and vestigial organs
- (5) To study nesting behavior (Weaver bird, Horn bill) and social behavior (Honey bees).
- (6) To study structure of typical animal cell and cell organelles with the help of chart/ photograph/model etc.

B.Sc. SEM – II
(Effective from Oct-Nov 2016)
ZOOLOGY PAPER – I (Z – 201)

UNIT – 1

Earthworm:

Systematic position, Habit and Habitat, External features, body wall and its function, Coelom – composition and function, food and feeding mechanism, Digestive system, and digestion, Circulatory system, Excretory system-and excretion, Nervous system-(central, peripheral and sympathetic), Sense organs-epidermal receptors, buccal and photoreceptors, Reproductive system-copulation, cocoon formation and development.

UNIT – 2

Life Processes: Nutrition/ Digestion in Human –

- i. Buccal digestion: Salivary secretion and digestion.
- ii. Gastric digestion: Gastric secretion and digestion
- iii. Intestinal digestion: Pancreatic secretion, bile secretion, digestion in small intestine, digestion and absorption in large intestine.
- iv. Reproduction and its types. Role of hormones in sexual reproduction.

UNIT – 3

- i. Human diseases: causes, symptoms, prevention and cure: AIDS, tuberculosis, Filaria and Malaria.
- ii. Applied Zoology: Importance of poultry farming-Breeds of poultry, Egg As food, Care of egg laying hen, poultry appliances. Excreta as manure

UNIT-4

Biotechnology: Introduction and Scope, Basic idea of cell, tissue and organ culture in-vitro. Recombinant DNA, gene cloning, gene therapy, application of recombinant DNA technology, basic idea of human genome project.

B.Sc. SEM – II

ZOOLOGY PRACTICAL – I (Based on paper -I)

The following practicals of **Earthworm** to be taught/studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

- (1) Earthworm: External features, Digestive System, Mounting of blood gland, Spermatheca.
- (2) Earthworm: Reproductive system, Mounting of setae and septal nephridia
- (3) Earthworm: Nervous system
- (4) Permanent Slides of earthworm: testis, ovary, pharyngeal nephridia, integumentary nephridia, T.S. passing through pharynx, T.S. passing through gizzard and T.S. passing through typhlosolar region.
- (5) To study the control of food ingestion in animals and T.S. of intestine of mammals to show villi for absorption with help of charts/ slides/models.
- (6) To study Different types of reproduction and role of sexual hormones (charts/slides/photographs/models etc.).
- (7) Human Diseases – AIDS, Filaria, Malaria, Tuberculosis
- (8) Poultry appliances: Brooder, feeder, water appliances and candling instrument.

B.Sc. SEM – II
ZOOLOGY PAPER – II (Z – 202)

UNIT – 1

Taenia solium : Systematic position, Life cycle, Pathogenicity (effect on host) and parasitic adaptation

UNIT - 2

Biological Chemistry: Definition of Ph. Buffers in Biological Systems.

Introduction to constituents of balanced diet – sources, functions and deficiency status.

UNIT - 3

Wild life biology: Definition of national park, sanctuary and wild life

- i. Concept, importance and perspective – Introduction of need for wildlife conservation and management in India, causes of depletion of wild life in India.
- ii. Study of Gir national park, marine national park and Nal sarovar bird sanctuary.
- iii. Wildlife Protection Act (1972) and its amendments.

UNIT – 4

- i. **Fisheries:** Study of following different fishes with reference to its fisheries:
Bombay duck,
Pearl oyster,
Prawn
- ii. **Adaptations in animals:** Arboreal, aquatic, Volant and desert.

B.Sc. SEM – II

ZOOLOGY PRACTICAL – II (Based on paper - II)

- (1) Life cycle of *Taenia solium* (Charts/models/slides etc.).
- (2) Feedback control and regulation of hormones (charts/models/photographs).
- (3) **Wild life Biology:** Gir national park, Marine national park and Nalsarovar bird sanctuary of Gujarat.
- (4) **Ecological adaptations:** (With the help of charts/ Photographs/models)
 - i. Arboreal: Chameleon, Squirrel
 - ii. Aquatic: Sucker fish, Flat fish
 - iii. Volant: Draco, Exocoetus
 - iv. Desert: *Phrynosoma*, *Uromastix*.
- (5) **Fisheries:** Pearl oyster, Bombay duck, Prawn.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS FOR CBCS AND SEMESTER SYSTEM

B.Sc. SEM – III

(Effective from June 2016)

ZOOLOGY PAPER – III (Z – 301)

(Non-chordates, Evolution and Economic Zoology)

UNIT - 1

Introduction to classification: General study of Non-Chordate Phyla up to Subclass with examples: - Protozoa, Porifera, Coelenterata (Cnidaria), Helminthes, Annelida.

UNIT - 2

Study of the following animal types with reference to the structure and functions of various organs of all systems of Leech.

UNIT - 3

Evolution and Adaptations:

- i. Variation
- ii. Fossorial, Cursorial, Deep sea & Cave Dwelling Adaptations

UNIT - 4

Economic Zoology:

- (i) Sericulture: - Life-History of Indian species of Mulberry silk-worm (*Bombyx mori*); Management of Silk industry including rearing, spinning and reeling; Types and Economic importance of silk.

(ii) Apiculture :- Life-history of Honey- bees, types, castes, structure of honeycomb, economic importance of honey, venom and wax.

B.Sc. SEM – III

ZOOLOGY PRACTICAL – I (Based on paper - III)

(Non-chordates, Evolution and Economic Zoology)

1- Classification of following animals up to--sub-class.

Amoeba, Euglena, Monocystis, Paramoecium, Leucosolenia, Hyalonema, Spongilla, Hydra, Porpita, Aurelia, Gorgonia, Sea-anemone, Planaria, taenia, Liver-fluke, Ascaris, Earthworm
Leech, Nereis

2- The following practicals of **LEECH** to be taught/studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

- a) Digestive system and mounting of salivary gland.
- b) Reproductive system mounting of jaws.
- c) Nervous system and mounting of testicular nephridia.

3- **Adaptations:** Fossorial adaptations-Arenicola and Talpa; Deep sea adaptations-giant squid, Octopus, flat fish, arrow fish; Cave dwelling adaptations- Troglodyte, Proteus (proteus anguinus);Cursorial adaptations- Cheetah, Horse, Wolves, Deer; Variation- Digits in man, giraffe.

4- Life history of Indian mulberry silk worm (Bombyx mori). Api culture: To study Life history, queen, drones, workers, wax, modern movable beehive.

B.Sc. SEM – III
ZOOLOGY PAPER – IV (Z – 302)
(Chordates, Histology and Osteology)

UNIT - 1

Introduction to classification: General study of the following protochordates and chordates up to subclass with examples: Urochordata, Cephalochordate, Cyclostomes, Pisces.

UNIT – 2

Study of the **Scoliodon (Dog Fish)** with reference to their structure and functions of various organs of all systems.

UNIT - 3

Histology:

Study the Ultra structure following mammalian tissues– stomach, intestine, liver, Salivary gland, pancreas, kidney and gonads.

UNIT - 4

Osteology:

Study of girdles in Frog, Scoliodon, varanus, pigeon and rabbit.

B.Sc. SEM – III
ZOOLOGY PRACTICAL - II (Based on paper -IV)
(Chordates, Histology and Osteology)

1- Classification upto sub-class (with the help of specimens, photographs, models etc.)

Ascidian, amphioxus, lamprey, myxine, Scoliodon, electricray, protopterus, clarius, seahorse, ophi
ocephalus, labeo.

2- The following practicals of **SCOLIODON** to be taught/studied **only** with the help of
charts, models, videos, photographs, permanent slides, working models, simulators etc.

a) Digestive system and temporary mounting of placoid scales.

b) Urino-genital system and mounting of ampulla of lorenzini.

c) Circulatory system

d) Brain-dorsal and ventral view.

3-Mammalian Histology: Study of permanent histological slides of salivary gland, liver,
stomach, pancreas, intestine, kidney, gonads.

4-Osteology: Study of girdles in Scoliodon, frog, varanus, pigeon and rabbit.

B.Sc. SEM – III
ZOOLOGY PAPER – V (Z – 303)
(Animal Physiology)

UNIT – 1

Muscle coordination: Types and structure of muscle fibers; Physiology of muscle contraction and energetic.

UNIT – 2

Nervous coordination: Synapse and mechanism of nerve impulse conduction. Structure and function of sense organs (human) eye & ear.

UNIT – 3

Excretion and osmoregulation: Structure of uriniferous tubule physiological process of excretion (including counter current mechanism) and urine formation; hormonal control (rennin angiotensin system and ADH); Osmoregulation in fresh and marine waters; osmosis; diffusion and Donnan's equilibrium.

UNIT – 4

Hematology: Composition of blood, Haemopoiesis and blood groups.

B.Sc. SEM – III
ZOOLOGY PRACTICAL – III (Based on paper V)
(Animal Physiology)

1. To study Haemin crystals from human blood.
2. Total count of WBC from human blood.
3. Estimation of Hemoglobin from human blood.
4. To determine normal and abnormal constituents of urine.
5. To study different types of muscle fibres- striated, nonstriated, medulated, non medulated and cardiac. Sensory organs –human eye and ear. Different types of nerve cells.

B.Sc. SEM – III
MARINE SCIENCE (EG)

UNIT - 1

Scope of marine science:

- 1) Introduction to marine science and career.
- 2) Evolution and biological classification
- 3) Prokaryotes, eukaryotes-fungi, Protista, plant, animalia-five kingdoms

UNIT - 2

Geology of the ocean:

- 1) Zonations of ocean
- 2) List of Indian oceans-Andaman sea, Arabian Sea, bay of Bengal, gulf of Eden, gulf of Oman, Mozambique channel, Persian gulf, Red sea, Timor sea.

UNIT - 3

Types of seashores and their fauna:

- 1) Sandy shore 2) Rocky shore 3) Estuaries

UNIT - 4

Marine organisms:

- 1) Microorganisms: - phytoplanktons, zooplanktons, red algae, brown algae, green algae, multicellular algae. Economic importance of algae.
- 2) Macro organisms: - Invertebrates-commercial importance of marine sponges, Mollusca, arthropods (crab and prawns).
Vertebrate: economic importance of Scoliodon (sharks) and marine mammals.

B.Sc. SEM – IV

(Effective from Oct-Nov 2016)

ZOOLOGY PAPER – III (Z – 401)

(Non-chordates, Evolution and Economic Zoology)

UNIT – 1

Introduction to classification: General study of Non-Chordate Phylas up to Subclass with examples: Arthropoda, Mollusca, Echinodermata and Hemichordata.

UNIT - 2

Study of the following animal types with reference to the structure and functions of various organs of all systems of Cockroach.

UNIT – 3

Evolution and adaptations:

- i. Isolation & Speciation
- ii. Protective coloration and mimicry

UNIT – 4

Economic Zoology:

- i. Lac culture
- ii. Vermi culture

B.Sc. SEM – IV

ZOOLOGY PRACTICAL – I (Based on paper - III)

(Non-chordates, Evolution and Economic Zoology)

1- Classification of following animals up to--sub-class.

Peripetus, Crab, Palaemon, Lobster, Grasshopper, Termite, Silverfish, Centipede, millipede, Spider, Scorpion, , Butterfly, Chiton, Unio, Aplysia, Sepia, Starfish, Brittle star, Sea cucumber, Feather star, Balanoglossus.

2- The following practicals of **COCROACH** to be taught/studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

a) Digestive system and mountings of Ist and IInd thoracic spiracles.

b) Reproductive system and mounting of gizzard.

c) Nervous system and mounting of abdominal spiracle.

3- Protective coloration and mimicry (with the help of charts/models/museum specimens/photographs etc.): Leaf insect, Stick insect, Lantern fly, Eyespot butterfly, Australian seahorse, rattle snake.

4- Study of Life History of Lac insect (with the help of charts, photographs etc.)

Vermiculture (with the help of charts/ photographs/ models etc.)- types of earthworms, vermicompost practices.

B.Sc. SEM – IV
ZOOLOGY PAPER – IV (Z – 402)
(Chordates, Embryology and Osteology)

UNIT – 1

Introduction to **classification**: General study of the following protochordates and chordates up to subclass with examples: Amphibians, Reptilians, Aves and Mammals

UNIT - 2

Study of the following animal type with reference to their structure and functions of various organs of all systems of **Pigeon**.

UNIT - 3

Embryology: Different types of eggs and cleavage patterns, development in amphioxus (up to tabulation).

UNIT - 4

Osteology: Comparative Study of Fore limbs and hind limbs in frog, varanus, pigeon and rabbit.

B.Sc. SEM – IV

ZOOLOGY PRACTICAL - II (Based on paper -IV)

(Chordates, Embryology and Osteology)

1- **Classification** up to sub-class (with the help of specimens/ photographs/ models etc.)

Frog, hyla, bufo, salamander, amblystoma, caecilian, calotes, varanus, turtle, dhaman, russel viper, cobra, krait, pigeon, koel, sparrow, platypus, bat, rat.

2- The following practicals of **PIGEON** to be taught/studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

a) Digestive system and mounting of Hyoid apparatus.

b) Circulatory system

c) Urino-genital system and mounting of pecten.

d) Brain and air sacs.

3-**Embryology**: Study of amphioxus embryology (with the help of

models/charts/photographs/specimens/permanent slides etc).: Uncleaved egg, 2, 4, 8, 16 & 32 cell stage, blastula, gastrula, t.s. passing through pharynx, intestine, testis, ovary & caudal region.

4-**Osteology**: Study of fore limbs and hind limbs in Frog, varanus, pigeon & rabbit

B.Sc. SEM – IV
ZOOLOGY PAPER – V (Z – 403)
(Cytogenetics and Biochemistry)

UNIT - 1

General Cytology:

Tool and techniques used in cytology

Cell cycle and cell division - mitosis and meiosis.

UNIT - 2

Genetics:

Structure and function of genetic material,

Control of gene expression: Control in prokaryotes and eukaryotes.

Chromosome mapping. Linkage, crossing over, Types of RNA.

UNIT – 3

Sex determination and dosage compensation (Heteropycnosis), Sex-linked inheritance, Cytoplasmic inheritance: Sigma substance, milk factor in mice, kappa particles, coiling of shell in *Lymnaea*, Modified Mendalian ratio 9:7, 9:3:4, 9:6:1, 12:3:1, 13:3, 15:1, 9:3:3:1 (in cock comb) Simple examples based on above types.

UNIT - 4 Biochemistry: Introduction and structure of carbohydrates, proteins and lipids.

B.Sc. SEM – IV
ZOOLOGY PRACTICAL – III (Based on paper V)
(Cytogenetics and Biochemistry)

- 1- Demonstration of microtome and microtechnique.
- 2-Preparation and study of different stages of mitosis from onion root tip.
- 3- Preparation and study of different stages of meiosis from cockroach testis.
- 4- Permanent slides of cell division.
- 5- Cytoplasmic inheritance: Coiling of Shell in lymnaea.
- 6- Structure of carbohydrates- Triose, Pentose, Hexose sugar, Lipid & glycerol.

B.Sc. SEM – IV
MARINE SCIENCE (EG)

UNIT-1

Marine Biology:

- 1) Adaptations- bony fish surviving in near freezing water, sea birds, whales and their relations.
- 2) Voyage of green sea turtle.
- 3) General characters of bony and cartilaginous fishes.
- 4) Coral and coral reefs: types, economic importance and threats.

UNIT-2

Marine Pollution -Causative factors and impacts

UNIT- 3

Introduction to aqua culture-History, scope and present status.

UNIT-4

General idea of different aquaculture practices-mono culture, poly-culture, extensive culture and intensive culture.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

SYLLABUS FOR CBCS AND SEMESTER SYSTEM

B.Sc. SEM – V

(Effective from June 2016)

ZOOLOGY PAPER – VI (Z – 501)

(Non-chordates)

UNIT - 1

Taxonomy of non-chordates phyla to be studied up to order.

Structural organization of different classes of non-chordates. (Protozoa to Annelida)

UNIT – 2

Study of the following animal types with reference to the structure and functions of various organs of all systems :**Scorpion**

UNIT - 3

Amplification of non-chordate phyla

- i. Protozoa : Locomotion, Nutrition & Economic Importance.
- ii. Porifera : Canal system, skeletal system & reproduction.
- iii. Coelenterata : Polymorphism, coral & coral reefs.
- iv. Helminthes : Parasitism & morphological adaptations.
- v. Annelida : Metameric segmentation, coelomoducts & nephridia.

UNIT - 4

Phylogenetic relationships of the following minor phyla and General organization :Brachiopoda, Chaetognatha,

B.Sc. SEM – V
Zoology Practical – I (Based on paper VI)
(Non-chordates)

1. Classification of following animals up to order:
Volvox, ceratium, entamoeba, polystomella, plasmodium, opalina, balantidium, leucosolenia, hyalonema, euspongia, obelia, millipora, physalia, valella, rhizostoma, tubipora, alcyonium, cerianthus, pennatula, virgularia, adamsia, zoanthus, favia, fungia, astrea, clinorches, trichinella, sabella, serpula, arenicola, eurythoe, polynoe, acanthobdella,
2. Study of some aquatic invertebrates like euglena, paramoecium, vorticella, hydra, daphnia & Cyclops from the culture.
3. Study of permanent slides:
L. S. & T. S. of sycon & leucosolenia, sponge spicules and gemmules.
4. The following practicals of **Scorpion** to be studied/taught **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.
 - 1) Digestive system
 - 2) Nervous system
 - 3) Reproductive system & Pectin as a mounting

B.Sc. SEM – V
ZOOLOGY PAPER – VII (Z – 502)
(Chordates)

UNIT – 1

Taxonomy of chordate to be studied up to order, including
Protochordata, cyclostomes, Pisces & Amphibia.

UNIT – 2

Study of the following animal types: **Labeo**

UNIT – 3

Comparative Anatomy:

- i. Aortic arches
- ii. Vertebral column
- iii. Heart.

UNIT – 4

Amplification of Chordates:

- i. Protochordata: Origin of chordates.
- ii. Cyclostomes: Phylogeny & Affinities.
- iii. Pisces: Dipnoi, Types of scales, Air bladder.
- iv. Amphibia: Origin and evolution, Parental care in amphibian, Neoteny.

B.Sc. SEM – V
Zoology Practical – II (Based on paper VII)
(Chordates)

1. Classification of following animals up to order.

Oikopleura, Salpa & Doliolum, Lamprey & Myxine.

Pristis, Anabas, Polyodon, Eel, Pterois, Siren, Uraeotyphlus, Bufo.

2. Study of Bony fish as animal types

1) Digestive system.

2) Urinogenital system.

3) Brain.

4) Prepare temporary mounting of scales from scoliodon (placoid), Labeo (cycloid), mullet (ctenoid)

3. Study of parental care in Amphibia (charts/models/photographs)

4. Comparative Study of Vertebral column in Shark, Frog, Varanus, Pigeon and Rabbit.

B.Sc. SEM – V
ZOOLOGY PAPER – VIII (Z – 503)
(Biochemistry)

UNIT - 1

Enzymes:-

- Definition and chemical nature, Properties, nomenclature and classification,
- Mechanism of enzyme action, Factors affecting enzyme action
- Enzyme inhibition, Co-enzymes.

UNIT - 2

Carbohydrates:-

- Definition Classification monosaccharide, disaccharides, oligosaccharides and polysaccharides.

Metabolism: - Glycolysis, TCA & oxidative phosphorylation ((ETS or Biological oxidation), gluconeogenesis, Glycogenesis, Glycogenolysis.

UNIT - 3

Proteins:-

- Definition , classification -simple , conjugated and derived proteins,
- Structure of proteins: - Primary, secondary, tertiary and quaternary.
- Metabolism: - Deamination and transamination. Ornithine cycle
- Hormonal control of protein metabolism

UNIT - 4

Lipids: -

- Definition, classification- simple, compound and derived lipids.
- Metabolism: - β oxidation and synthesis of long chain fatty acids
- Glycerol metabolism, Hormonal control of lipid metabolism.

B.Sc. SEM – V

ZOOLOGY P PRACTICAL - III (Based on paper VIII)

(Biochemistry)

1. Qualitative test for organic compound.
 - a. carbohydrates - glucose, fructose, maltose, lactose & sucrose
 - b. proteins: - albumin and casein.
2. Preparation of atomic models :-
 - a. glucose, fructose, galactose, maltose, lactose, sucrose, valine,
 - b. threonine, glycine, alanine & glycerol.
3. Factors affecting enzymes activity (temperature and pH).
4. To study the digestive enzymes from Human Saliva
5. Detection of amino acid by paper chromatography.

B.Sc. SEM – V
ZOOLOGY PAPER – IX (Z – 504)
(Embryology and Wild life Biology)

UNIT - 1

The Nature and Scope of embryology

The importance of developmental Zoology, Branches of embryology & applications.

UNIT - 2

Gametogenesis and fertilization:

(i) Spermatogenesis: Formation of spermatids, Spermiogenesis, Factors controlling spermatogenesis, Structure of a typical sperm. Significance of spermatogenesis.

(ii) Oogenesis: Formation of egg (ovum)-multiplication phase , growth phase (previtellogenesis and vitellogenesis) ,maturation phase.

(iii) Fertilization : External and internal fertilization - mechanism of Fertilization , - capacitation and contact – acrosomal reaction and penetration – activation of ovum migration of pronuclei and amphimixis –theories of fertilization -significance of fertilization.

(iv) Estrous and menstruous cycles, placenta and placentation

UNIT – 3

Study and development of chick

(i) fertilization, cleavage, blastulation, gastrulation, formation of germ layers and primitive streak

(ii) structure of 24,36,42,48,50,60 &72 hours of chick embryo

UNIT - 4

Wild life Biology

(i)Introduction, wild life conservation and management

(ii) Conservation projects: wild ass, tiger, crocodile, black buck.

(iii) Endangered, vulnerable, threatened species

B.Sc. SEM – V

ZOOLOGY PRACTICAL - IV (Based on paper - IX)

(Embryology and Wild life Biology)

To study the following practicals with the help of charts/models/photographs/specimens/slides/simple methods without dissecting live animals.

1. Different types of mammalian placenta.
2. **Chick embryology:** Unfertilized egg, different stages cleavage, morula, blastula, gastrula, primitive streak, development of 24, 36, 42, 48, 50, 60 and 72 hrs.
3. **Study of projects** – wild ass, lion, tiger, crocodile, and black buck-their locations in map of India, present status and significance.

B.Sc. SEM – V
ZOOLOGY PAPER – X (Z – 505)
(Forensic science and Toxicology)

UNIT - 1

Definition, scope, history and development of forensic science, basic principles, dactylography, foot prints, tattoo marks, occupational marks, speech and voice

UNIT - 2

Morphology and Biochemistry of human and other animal hair, DNA fingerprinting, wildlife and forensic science.

UNIT - 3

Concept and scope of toxicology: Introduction, history, disciplines of toxicology, toxicants and their classification, toxicity

UNIT - 4

Food-Additives: General account, incidental(indirect) additives, intentional(direct) additives, terms related to adverse reactions to food, food-borne molds and mycotoxins (food contaminants),testing of food additives.

B.Sc. SEM – V

ZOOLOGY PRACTICAL - V (Based on paper - X)

(Forensic science and Toxicology)

To study the following practicals with the help of charts/models/photographs/specimens/slides/simple methods without using live animals.

- 1) Study of different types of finger prints and tattoo marks .
- 2) Study the morphology of different hairs- man,dog,horse,cow,buffalo,goat.
- 3) Study of various samples of food additives/preservatives and their usages.
(vinegar, benzoic acid,formic acid,citric acid,gelatin)
- 4) Study of food contaminants on - bread, chapati, curd, fruits.
- 5) Tests (only two tests to be performed) of adulterated milk, black pepper, khoya (maava of milk),edible oil, coconut oil, ghee, rabdi, butter.
- 6) To study DNA finger printing method through chart.

B.Sc. SEM – V
ZOOLOGY PAPER – XI (Z – 506)
(Genetics and Molecular Biology)

UNIT -1

Gene structure and functions:

Gene concept, location of and size of genes, role of genes, chemical composition and numbers of genes, ultra structure of genes, jumping genes, split genes, sex chromatin.

UNIT -2

Mutations:

Human cytogenetics- Techniques in human chromosomal analysis-

Human Karyotype-chromosomal aberrations and syndromes, Polyploidy, Metabolic disorders, gene mutations. Genetic code and protein synthesis.

UNIT -3

Molecular biology:

- (i) Structure of atoms, molecules and chemical bonds
- (ii) Composition , structure and formation of biomolecules [proteins, nucleic acids, vitamins]
- (iii) Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, catalysis, mechanism of enzyme, isoenzyme

UNIT - 4

Biophysical chemistry

- (i) Principles of biophysical chemistry[pH, buffer, reaction kinetics, thermodynamics, colligative properties]

B.Sc. SEM – V

ZOOLOGY PRACTICAL – VI (Based on paper - XI)

(Genetics and Molecular Biology)

1. Karyotyping (Aberrations in human chromosomes by charts.

(Klinefelter's syndrome, Down's syndrome, Philadelphia's syndrome, Turner's syndrome, Cri-du-chat syndrome)

2. Preparation of A-----, T-----, G-----, C-----

By models

3. Preparation of DNA, RNA by models

4. Preparation of Triose, Tetrose, Pentose, Hexose, Triglycerides, Casin, Mucin,
water soluble vitamins, fat soluble vitamins

5. Study of Transgenic animal (dolly sheep)

B. Sc. SEM – V

FISHERIES (EG)

UNIT- 1 Natural and cultivated ponds-construction, layout, management& productivity.

UNIT- 2 Induced breeding methods in major carp.

UNIT- 3 Fish seed collection and transportation

UNIT- 4 Study of aquarium fishes and its management.

UNIT- 5 Crafts and gears used in fresh and marine water fisheries.

UNIT- 6 Sea / marine pollution

B.Sc. SEM – VI
(Effective from Oct-Nov 2016)
ZOOLOGY PAPER – VI (Z – 601)
(Non chordates)

UNIT - 1

Taxonomy of non-chordates phyla to be studied upto order. Structural organization of different classes of nonchordates. (Arthropoda to Echinodermata)

UNIT - 2

Study of the following animal types with reference to the structure and functions of various organs of all systems : **Sepia & Sea star.**

UNIT - 3

Amplification of non-chordate phyla.

- Arthropoda: Respiration, excretion, Neurohormonal regulation of moulting and ecdysis, crustacean larvae and significance thereof, Social Insects: Hony Bee, Termite, Ant & Wasp.
- Mollusca: Economic Importance
- Torsion and detorsion in gastropoda.
- Echinodermata : Water - vascular system, larval forms & evolutionary significance .

UNIT - 4

Phylogenetic relationships of the following minor phyla and General organization

- Endoprocta
- Ectoprocta.

B.Sc. SEM – VI
ZOOLOGY PRACTICAL – I (Based on paper VI)
(Non chordates)

1 - Classification of following animals up to order.

Apus, Daphnia, Cyclops, Cypris, Squilla, Hippa, Sacculina, Limulus, Mantis, Dragon fly, Ear-wig, Mosquito, Ant, Beetle, Tick, Mite, Dentalium, Heliotis, Patella, Nautilus, Oyster, Mytilus, Doris, Cyprea, Tereido, Solen, Octopus, Loligo, Astropecten, Strongylocentrotus, Synapta, Sand-dollar, Holothurian, Sagitta, Bugula

2 -The following practicals of **Sepia** to be studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

1) Digestive system, Mountings of Chromatophores and Spermatophores

2) Nervous system, Mountings of jaws & radula

3 - Study of permanent slides :

Crustacean larvae & Echinoderm larvae

B.Sc. SEM – VI
ZOOLOGY PAPER – VII (Z – 602)
(Chordates)

UNIT - 1

Taxonomy of chordate to be studied up to order, including Reptilia, Aves & mammalia.

UNIT - 2

Study of the following **animal types: Calotes.**

UNIT - 3

Amplification of chordates:

- Reptilia:- Mesozoic reptiles, Rhyncocephalia and its phylogenetic importance., Poisonous & non poisonous snakes
- Aves :- Bird Migration , Types & development of feathers
Modifications of beak & feet, Ratitae
- Mammals: - Dentition, Structure & development of tooth, Metatheria, Cetacea, Proboscidea, Primates.

UNIT - 4

Mammalian Histology:

- Pituitary,
- Thyroid,
- Parathyroid
- Adrenal,
- Thymus,
- Gonads

B.Sc. SEM – VI
ZOOLOGY PRACTICAL – II (Based on paper - VII)
(Chordates)

1. Classification of following animals up to order:

Tortoise, Uromastix & Sphenodon, Kite, Robin & Kiwi, Scaly anteater, Porcupine & Loris,

2. The following practicals of **SCOLIODON** to be taught/studied **only** with the help of charts, models, videos, photographs, permanent slides, working models, simulators etc.

1) Cranial nerves.

2) Internal ear and

3) Eye muscles,

3. Study of Mesozoic reptiles (by Models/charts/photographs etc.) like Brontosaurus, Stegosaurus, Iguanodon, Dimetrodon, Allosaurus and Rhamphorhynchus.

4. Poisonous & nonpoisonous snakes

5. Types of feather & Dentition in Dog, Cat, Horse, Rabbit, Rat & man.

6. Study of permanent slides of pituitary, Thyroid, Thymus, Parathyroid, Adrenal, ovary & testis

B.Sc. SEM – VI
ZOOLOGY PAPER – VIII (Z – 603)
(Animal Physiology)

UNIT - 1

Respiration:-

Aquatic & terrestrial respiratory mechanism, Hypoxia, O₂ dissociation Curve. Respiratory quotients ,BMR Transport of gases, exchange of gases, Respiratory pigments, Neural and chemical regulation of respiration.

UNIT - 2

Circulation:-

Structure of mammalian heart, Properties of cardiac muscles , internal circulation (systemic, pulmonary & coronary) Cardiac-cycle and cardiac output, Stroke volume, Blood pressure, ECG ,Blood coagulation, Hormonal, ionic & nervous regulation of heart beat.

UNIT - 3

Chemical coordination:-

Chemical nature and kinds of hormones, Mechanism of hormone action, Regulation of hormone, secretions.

Introduction: - Definition of endocrine, Paracrine and Autocrine system. Significance of endocrine and neuro-endocrine system. Hormones of pituitary gland, thyroid gland, Parathyroid gland, pancreas, adrenal gland, gastrointestinal hormones, testis and ovary.

UNIT - 4

Thermoregulation:-

Heat production and heat loss, Temperature regulating Mechanism

B.Sc. SEM – VI

ZOOLOGY PRACTICAL - III (Based on paper - VIII)

(Animal Physiology)

1. Study of **analytical instrument** principle and applications.

pH meter, Colorimeter, Centrifuge, Waterbath, lactometer,

sphygmomanometer, Thomas pipette of haemocytometer,

RBC count, microtome, balance.

2. **Hematology:-**

- (a) Total RBC count in human blood

- (b) WBC differential count.

3. **Experiments on Human:** Measurement of systolic blood pressure, diastolic pressure, pulse pressure, mean pressure of an individual with the help of sphygmomanometer and stethoscope.
4. Preparation of buffers : Measurement of pH of acid, milk, water, Iso Electric point of casein.

B.Sc. SEM – VI
ZOOLOGY PAPER – IX (Z – 604)
(Entomology)

UNIT – 1

Introduction to Entomology

- History, development, scope & applications of Entomology
- Branches of Entomology
- Evolution of Insects & their position in animal kingdom
- General characteristics of phylum Arthropoda.

UNIT - 2

Agricultural Entomology

- Pests of field crops & their management
 - Sugarcane** – stem borer, leaf aphids, shoot borer
 - Cotton** – spotted ball worm, leaf roller, red cotton bug, jassids,
 - Oilseed** - mustard (aphids and saw fly), sunflower (sucking pest and borer)
- Pests of horticultural crops & their management
 - Fruits:** apple (plum curculio, codling moth, aphids, tree borer)
Mango (mango hopper, mealy bug, stem borer, eating caterpillar)
 - Vegetables:** brinjal (shoot and fruit borer, leaf eating beetles, jassids, leaf roller), Cabbage (moth and maggot fly)
- Insect pests of stored grains & their management (rice weevil, saw toothed grain beetle, Khapra beetle, rice moth, lesser grain borer)

UNIT – 3

Medical Entomology

- Morphology, Vectorship, Pathogenicity & Control of : Mosquito, housefly, Ratfleas, head louse.
- Morphology, Vectorship, Pathogenicity & Control of: Pests of domestic animals, Horse and Cattles.

UNIT - 4

Economic Entomology

- Beneficial Insects (economic importance of honey bee, silkworm, lac insect, pollinators, scavengers, Insect as a source of drugs and dyes)
- Household pests: Morphology, damage caused & Control measure of: Cockroach, Ants and termites & Bed bugs
- Insect pest control methods (Bio control, Integrated pest management, insecticides, pesticides)

➤ Appliances used for pest management

B.Sc. SEM – VI

ZOOLOGY PRACTICAL – IV (Based on paper - IX)

(Entomology)

To study the following practicals with the help of charts/ models/ photographs/ specimens/ slides etc.

- 1) Branches of entomology, its scopes, applications, development.
- 2) Identification, pathogenicity and control of pests
 - 1) Cereals - Khapra beetle (*Trogoderma granarium*), Locust.
 - 2) Tobacco - Rove beetle (*Bledius latiusculus*), Mole cricket.
 - 3) Sugarcane - *Saccharum officinarum*.
 - 4) Fruits- *Drosophila melanogaster*
 - 5) Vegetables - *Hellula undalis*.
- 3) Morphology, Vectorship, pathogenicity and control of – *Anopheles* (male – female), *Culex* (male-female) and *Aedes* (male-female).
- 4) Pests of domestic animals: dogs- dog flea (*Ctenocephalides canis*), *Trichodectes canis*. Cats- cat flea (*Ctenocephalides felis*). Cattles – Cattle tick (*Boophilus microplus*), *Haemaphysalis cuspitate*, *H.minuta*.
- 5) Economic importance of arthropods /insects – silk worm, lac insects, honey bees and butterflies as pollinators; lady bug and dermestid beetle as scavengers; Cochinal insects and kermes insects(of oak tree) as dyes; Honey bees, blow fly maggots, centipedes and cantharis fly (*Canth vesictoria*) as drugs /medicines; Ants, termites, dermestid beetles and bed bugs as harmful insects.
- F) Pests management appliances- foggers, insect repellents, sprayers (agri.use and household uses), traps (electric and chemical). Biological pests controller- lizards, frogs, bee eater birds, ladybug beetle and bats.

B.Sc. SEM – VI
ZOOLOGY PAPER – X (Z – 605)
(Cell Biology and Bioinstrumentation)

UNIT - 1

Tools and Techniques:

- (i) Electron microscope
- (ii) Fluorescence microscope
- (iii) Phase contrast microscope
- (iv) Paper chromatography
- (v) Electrophoresis
- (vi) Centrifugation
- (vii) DNA Staining

UNIT - 2

Methods for cytology and cytochemical analysis:

- (i) Examination of living cells
- (ii) Fixation
- (iv) Embedding and sectioning
- (iv) Cytological staining

UNIT - 3

Cellular organization:

- (i) Cell membrane structure and function: structure of cell membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport.
- (ii) Ultra structure and function of intracellular organelles: nucleus, mitochondria, golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles.

UNIT - 4

Cell ageing and cell death:

Ageing in cells-mechanism of cell death- purpose of cell death.

B.Sc. SEM – VI

ZOOLOGY PRACTICAL - V (Based on paper -X)

(Cell Biology and Bio instrumentation)

1. Study of cell organelles by microphotographs: nucleus, mitochondria, golgi bodies, endoplasmic reticulum, chloroplasts.
2. Microtechnique preparation of permanent slides of different organs,
3. Whole mounting of invertebrates and vertebrates
4. Paper chromatography

B.Sc. SEM – VI
ZOOLOGY PAPER – XI (Z – 606)
(Ecology, Evolution and Ethology)

UNIT - 1

Species interactions: Types of interactions, interspecific competition,
Herbivory, carnivory, symbiosis

UNIT - 2

Biogeography: Major terrestrial biomes, theory of island biogeography,
biogeographical zones of India

UNIT - 3

Emergence of evolutionary thoughts: Lamarck; Darwin-concepts of variation, adaptation,
struggle, fitness and natural selection

UNIT - 4

Approaches and methods in study of behavior, insect pheromones, bioluminescence,
biological clocks, development of behavior, social communication, social dominance.

B.Sc. SEM – VI
ZOOLOGY PRACTICAL – VI (Based on paper - XI)
(Ecology, Evolution and Ethology)

1. Estimation of Alkalinity and Total hardness of water sample.
2. Estimation of free CO₂ and dissolved O₂ of water sample.
3. Study of Habituation of mosquito larva
4. Study of Antennal grooming behavior (chemotaxis)
5. Study of alarming, attractant, aggression behavior
6. Educational tours/excursions/ visits/primary project write up/other submissions etc.

Important note: Educational tours/excursions/ visits can be conducted during SEM-V OR SEM-VI, but will be considered in Sem-VI (Zoology Practical –VI-based on paper- XI) for markings/evaluation.

B. Sc. SEM-VI
FISHERIES (EG)

UNIT -1 Fish migration

UNIT- 2 Parental care in fishes

UNIT- 3 Electric organs in fishes

UNIT- 4 Preservation, processing and by-products of fishes.

UNIT- 5 Fish pathology: bacterial, fungal, ectoparasitic and protozoan diseases of fishes.

UNIT- 6 Dangerous and Venomous fishes.

ZOOLOGY PRACTICALS

B. Sc SEM I, II, III, IV, V, VI

1. B. Sc SEM – I
ZOOLOGY PRACTICALS (Z – 100 P)
(Based on paper I and II)
2. B. Sc SEM – II
ZOOLOGY PRACTICALS (Z – 200 P)
(Based on paper I and II)
3. B. Sc SEM – III
ZOOLOGY PRACTICALS (Z – 300 P)
(Based on paper III, IV & V)
4. B. Sc SEM – IV
ZOOLOGY PRACTICALS (Z – 400 P)
(Based on paper III, IV, V)
5. B. Sc SEM – V
ZOOLOGY PRACTICALS (Z – 500 P)
(Based on paper VI, VII, VIII, IX, X & XI)
6. B. Sc SEM – VI
ZOOLOGY PRACTICALS (Z – 600 P)
(Based on paper VI, VII, VIII, IX, X & XI)