SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 301
Ecology, Environmental Pollution and Histology

Unit – 1: Ecology

A. Biotic Community
    - Concept of community
    - Community stratification in terrestrial habitat
    - Community periodicity
B. Ecological Succession
    - Kinds of succession
    - Process of succession
    - Patterns of succession (Hydrosere, Xerosere)
    - Significance of ecological succession

Unit – 2: Ecosystem and Bioms

A. Marine Ecosystem:
    a. Physico-chemical parameters: Light, Temperature, Pressure, Salinity, Currents and Tides
    b. Zonations in Marine Environment
    c. Types of coral reefs and its ecological importance
B. Fresh water ecosystem:
    a. Characteristics: Salinity, pH, water current, transparency, dissolved gases (oxygen and carbon dioxide), pressure, density, light, temperature and thermal stratification (summer and winter stratification)
    b. Lentic system: Ponds – Characteristics, types, zonations; Lakes – Characteristics and types
    c. Lotic system: Rivers – Characteristics (current, land-water interchange, and oxygen), Zonation (flowing water, rapid/riffle, pool zones)
C. Terrestrial ecosystems (Biomes): Tundra, Savana, Grassland, Desert and Tropical Rain Forests

Unit – 3: Environmental Pollution

A. Various pollutants and their effects on animal life
    a. Air pollutants
        i. Gaseous – CO_2, SO_2, NO_2
        ii. Particulate – Dust, Lead, Aerosol

b. Water pollutants: Biological organisms (bacteria and protozoa), acids, alkalies, dyes, hydrogen sulphide, pesticides, fertilizers, toxic metals (Fluoride, Hg, Arsenic), faeces, domestic wastes and suspended matters
c. Soil/land pollutants:
    i. Industrial solid wastes – Toxic metals i.e. Cu, Pb, Ni
    ii. Urban wastes – Garbage, paper, glasses, metal cans, plastics and faeces
    iii. Agricultural wastes – Wastes from cattle sheds and poultry farms, fertilizers, pesticides and fumigants.
d. Radioactive Pollutants

B. Biological treatment of effluents:
    a. Trickling filters system
    b. Stabilization ponds
    c. Aerated lagoons

Unit – 4: Histology

- Structure of some major endocrine glands:
    - Pituitary, Thyroid, Parathyroid, Adrenal, Thymus, Pineal, Testis, Ovary

Suggested Reference Books:

1. Fundamentals of Ecology, P. S. Odum, Saunders.
2. Concepts of Ecology, N. Arumugam, Saras Publication, Nagercoil.
3. Ecology and Environment, P. D. Sharma, Rastogi Publication, Meerut.
4. Environmental Pollution (Popular Science), N. Manivasakan, National Book Trust, New Delhi.
5. Animal Physiology, P. S. Verma, B. S. Tyagi and V. K. Agrawal, S. Chand Co. New Delhi.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 302
Animal Diversity and Physiology

Unit – 1: Animal Diversity (Non-chordate) – Type study

Type – Starfish (*Asterias*) – Classification, habit and habitat, external characters, body wall, digestive system, water vascular system, reproductive system, life history and development (life cycle)

Unit – 2: General topics

- Ecology of polychaeta, nephredia and coelomducts
- Crustecian larvae and excretory systems
- Larval forms of Echinodermata
- Shell, foot, torsion and detorsion
- Minor Phyla: General characters of Phoronida, Brachiopoda and Echiuroidea, Ctenophera and Rotifera

Unit – 3: Physiology – Muscle Contraction and Reproduction

A. Muscle Contraction:
    a. T.S. of a skeletal muscle
    b. Histology of a striated muscle fibre
    c. Motor unit, Neuro-muscular junction
    d. Mechanism of muscle contraction and relaxation
B. Reproduction:
    a. Sprermatogenesis and Oogenesis
    b. Androgen cycle
    c. Menstrual cycle
    d. Menopause

Unit – 4: Physiology – Enzymes

- Introduction and classification of enzymes
- Nomenclature, properties of enzymes, mechanism of enzyme action, effect of various conditions on enzymatic activity, co-enzymes (pro-enzymes, anti-enzymes) iso-enzymes

Suggested Reference Books:

1. Textbook of Invertebrates, R. L. Kotpal, Rastogi Publications, Meerut

2. Manual of Zoology, E. K. Ayyer, Vol. I and II.
3. Animal Physiology and Related Biochimistry, H. R. Singh, Shobhan Lal Naginchand and Co. Edu. Pub. Jalandhar.
4. Animal Physiology, P. S. Verma, B. S. Tyagi and V. K. Agrawal, S. Chand Co. New Delhi.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 303
Animal Biochemistry

Unit – 1: Carbohydrates

A) Chemical properties:
   a. Reaction involving glycosidic –OH group
   b. Reaction involving alcoholic –OH group (Etherification)
   c. Reactions involving both, glycosidic as-well-as alcoholic –OH groups (Esterification)
   d. Reactions involving both, –OH as-well-as –CHO/-C=O groups:
      i. Oxidation : Sugar acids, Oxidation with metal hydroxides
      ii. Reduction : Reduction with sodium amalgam
      iii. Reduction with strong mineral acids
      iv. Reduction with dilute alkalis
   e. Osazone test: Reaction with phenyl hydrazine

B) Disaccharides :
   a. Definition
   b. Flow-chart of classification, based upon the type of glycosidic linkages
   c. Occurrence, formation, structure and general properties of Maltose, Lactose, Cellobiose and Sucrose

Unit – 2: Proteins

A) Introduction and Definitions
B) Amino acids:
   a. General Structure
   b. Classification (based upon the composition of the side chain/R group)
C) Peptides:
   a. N- and C- terminals
   b. Naming of peptide chain
D) Protein structure:
   a. Chemical Bonds : a) Primary - Peptide bond, b) Secondary - Disulfide, Hydrogen, Hydrophobic and Ionic
E) Protein Configuration:
   a. Primary structure (Amino acid sequence)
   b. Secondary structure (Only α-helix formation)
   c. Tertiary structure (Folding of the peptide chain)
   d. Quaternary structure (Protein-protein interactions)

Unit – 3: Proteins

A) Classification of proteins:
   a) Based upon shape - Globular and Fibrillar

b) Based upon composition & solubility - Simple, Conjugated and Derived.

B) Properties:

a) Physical - Colour & Taste, Shape & Size, Molecular weight, Colloidal nature, Denaturation, Amphoteric nature and Solubility
b) Chemical –
    a. Hydrolysis
    b. Reactions involving -COOH group:
        i. Reaction with alkalies (Salt formation)
        ii. Reaction with alcohols (Esterification)
    c. Reactions involving -NH2 group:
        i. Reaction with mineral acids (Salt formation)
        ii. Reaction with formaldehyde

C) Biological significance of proteins

Unit – 4: Lipids

A. Introduction and definition
B. Components:
    a. Alcohols
    b. Fatty acids
C. Types of Fatty acids:
    a. Saturated acids: Butyric, Palmitic, Stearic and Archidic
    b. Unsaturated acids: Monoethenoid, Diethenoid, Triethenoid and Tetraethenoid
D. Classification of lipids:
    a. Simple: Triglycerides (Fats), Waxes (formulae not required)
    b. Compound: Phospholipids: Phosphoglycerides: Lecithins, Cephalins, Plasmalogens
    c. Derived lipids: Steroids (basic steroid nucleus and Cholesterol only)
E. Properties:
    a. Physical: Colour, odour, taste, solubility, melting point, specific gravity, insulation and emulsification
    b. Chemical:
        i. Reaction involving –COOH group: Hydrolysis, Saponification and Hydrolytic rancidity
        ii. Reaction involving double bonds: Hydrogenation, Halogenation and Oxidative rancidity
F. Biological significance of lipids

Suggested Reference Books:

1. Principles of Biochemistry, Lehninger, CBS Publication
2. Harper's Biochemistry, Lange, McGraw-Hill

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 304
Cytology, Biostatistics and Evolution

Unit – 1: Cytology

- Ultra structure and functions of Plasma membrane:
    - Brief introduction of chemical composition
    - Ultra structure – Fluid Mosaic model
    - Specialized structures of plasma membrane
        - Specialization due to outpushings/evaginations
        - Specialization due to inpushings/invaginations
        - Specialization due to contact
            - Desmosomes, Hemi-desmosomes, Septal desmosomes, Tight junctions, Gap junctions, Terminal bars and Interdigitation
- Ultra structure and general functions of Cilia/Flagella
- Karyotyping

Unit – 2: Microscopy, Cytological techniques

- Dark field microscopy and Polarized microscopy
- Centrifugation – Low speed and Ultra centrifugation (Differential, Density Gradient)
- Paper Chromatography (Ascending and Descending)
- PAGE - Tube Gel electrophoresis

Unit – 3: Biostatistics

- Importance of statistics in biological sciences
- Classification and tabulation of data
    - Types of classification
    - Tabulation types
- Measures of central value
    - Types of average
    - Mean, Median, Mode
- Standard deviation (SD)
- Types of Diagram
    - One dimensional, two dimensional, three dimensional, picture diagrams

Unit – 4: Evolution

- Variation: Types of variation, Causes of variation
- Isolation: Mechanism of isolation, Types of isolation, Geographical isolation, Reproductive isolation, Prezygotic isolation, Post zygotic isolation, Origin of isolation.
- Speciation: Definition, Allopatric, Peripatric, parapatric, sympatric
- Role of Mutation in speciation

Suggested Reference Books:

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, P. S. Verma, V. K. Agrawal, S. Chand Co. New Delhi
2. Cell Biology, C. B. Power, Himalaya Publishing House
3. Cellular and Molecular Biology, De Robertis and De Robertis, Saunders Pub.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 305
Poultry Science

Unit – 1: Introduction, history and importance

- History and importance of poultry farming
- Different breeds of poultry (Indigenous, American Class, Asiatic Class, English Class and Mediterranean Class)
- Food composition for poultry

Unit – 2: Housing for birds and associated infrastructure

- Different housing methods
  - Free range system
  - Semi-intensive system and
  - Intensive system (Cage system and Deep litter system)
- Brooders, feed hopper/turf, water turf/fountain, egg lying utensils, incubators

Unit – 3: Breeding and hatching

- Selection methods for breeding (Tandem method, independent culling, selection index)
- Breeding methods
- Selection of eggs for hatching
- Hatching and hatching failures
- Sexing, grading, debeaking, dubbing and vaccination of chicks

Unit – 4: Management of poultry house and disease management

- Management of poultry house
- Common poultry diseases and mitigations (Ranikhet, Fowl Pox, Avian Leucosis, Coryza)
- External Parasites

Suggested Reference Books:

1. A handbook on economic zoology, Ahsan J and Singha S. P.
2. Poultry Science, Maheta, N. T and Ghasura M. I.

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Note: Students should make a visit to nearby poultry farm and develop understanding of poultry management.

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 306 (A-1) (Practicals)
(Based mainly on theory paper 301)

1. To study types of coral reefs (fringing reef, barrier reef, atolls) through charts
2. To study various bioms using charts: Tundra, Savana, Grassland, Desert and Tropical Rain Forests
3. To estimate following physico-chemical parameters of pond water by titrimetric method
    a. Acidity
    b. Alkalinity
    c. Chlorinity
    d. Calcium Hardness
    e. Total Hardness
4. To Estimate Phophate and Sulphate using colorimetric method
5. To study trickling filter system by chart
6. To study histology of following endocrine glands by charts/permanent slides
    a. Pituitary gland
    b. Thyroid gland
    c. Parathyroid gland
    d. Adrenal gland
    e. Thymus gland
    f. Pineal gland
    g. Testis
    h. Ovary

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
Skeleton Question Paper for Practical Examination
ZOOLOGY – 306 (A-1)
(Based mainly on theory paper 301)

Date: Marks: 35 Time:

Q.1: Estimate the _____ from the given sample water. 08

(Any one from Acidity, Alkalinity)

Q.2: Estimate the _____ from the given sample water. 08

(Any one from Calcium Hardness, Chlorinity, Total hardness)

Q.3: Identify specimens as per instructions 16

Sp.1 Identify and describe (Any one from bioms/reefs)

Sp.2 Identify and describe (Any one from bioms/reefs)

Sp.3 Identify and comment (Any one waste water treatment charts)

Sp.4 Identify and comment (Any one from endocrine glands)

Sp.5 Identify and comment (Any one from endocrine glands)

Sp.6 Identify and comment (Any one from endocrine glands)

Sp.7 Identify and comment (Any one from endocrine glands)

Sp.8 Identify and comment (Any one from endocrine glands)

Q.4: Journal 03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 306 (A-2) (Practicals)
(Based mainly on theory paper 302)

1. To study external characters of starfish by chart
2. To study water vascular system in starfish by chart
3. To study structure of tube feet by chart
4. To study larval form in crustacea by charts
5. To study larval form in echinodermata by charts
6. To study minor phyla by charts/models
7. To study structure of striated muscle by chart
    a. T.S. of striated muscle
    b. Ultra structure of sarcomere
    c. Ultra structure of Neuro-muscular junction
8. To study menstrual cycle by chart with T.S. of uterus
9. To study molecular structure of Testosterone, Estrogen and Progesterone by charts
10. To study following factor affecting enzyme activity by chart
    a. Temperature
    b. pH
    c. Graph showing effect of [S] on the velocity of an enzyme catalyzed reaction

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
Skeleton Question Paper for Practical Examination
ZOOLOGY – 306 (A-2)
(Based mainly on theory paper 302)

Date: Marks: 35 Time:

Q.1: Draw labelled diagram of _____ system in Starfish and show it to the examiner. 10

(Any one from water vascular system/external features)

Q.2: Make temporary mounting of _____ from Starfish. 04

Q.3: Identify specimens as per instructions 12

Sp.1 Identify and describe (Any one from crustacean larvae)

Sp.2 Identify and describe (Any one from echinoderm larvae)

Sp.3 Identify and describe (Minor phyla as per theory)

Sp.4 Identify and describe physiologically (Muscle, menstrual cycle, uterus)

Sp.5 Identify and draw a labelled diagram (Muscle, menstrual cycle, uterus)

Sp.6 Identify and describe (Any from practical syllabus point 9 and 10)

Q.4: Viva Voce 06

Q.5: Journal 03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 306 (B-1) (Practicals)
(Based mainly on theory paper 303)

1. Detection of carbohydrates
    a. Monosaccharides – Glucose and Fructose
    b. Disaccharides – Lactose, Maltose and Sucrose
2. Detection of protein
    a. Albunin
    b. Casein
3. Colorimetric estimation of
    a. Proteins (Preparation of Std. Curve by Biuret method)
    b. Glucose (Nelson-Somogyi method)
4. Preparation of atomic models of carbohydrates
    a. Acyclic as well as all cyclic structures of Ribose, Arabinose, Ribulose, Glucose, Mannose, Galactose, Psicose, Fructose and Tagatose
    b. Maltose, Lactose and Sucrose
5. Preparation of atomic models of proteins
    a. All amino acids except heterocyclic amino acids
    b. Glysyl-Alanine, Glysyl-Valine, Ala-ser and Glu-Lys
6. Calorimetric estimation of
    a. Cholesterol in Serum/Plasma (Ferric chloride method)
    b. Creatinine in urine
7. Study of basic steroid nucleus and Cholesterol by charts
8. Preparation of atomic models of Gycerol, Butyric acid, Crotonic acid, Tribuyrin, Lecithins, Cephalins and Plasmalogens

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
Skeleton Question Paper for Practical Examination
ZOOLOGY – 306 (B-1)
(Based mainly on theory paper 303)

Date: Marks: 35 Time:

Q.1: Detect any two constituents from the given unknown solution and show your tests to the examiner.	10
Q.2: Estimate colorimetrically the concentration of _____ from the Given unknown solution and submit your results to the examiner.	10
Q.3: Prepare the atomic models of carbonydrates. (Any two)	06
Q.4: Prepare the atomic models of Proteins. (Any two)	06
Q.5: Journal	03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
ZOOLOGY – 306 (B-2) (Practicals)
(Based mainly on theory paper 304)

1. Study by charts/models of
    a. Fluid Mosaic model of Plasma membrane
    b. Specialized structures of plasma membrane
        i. Specialization due to outpushing/evaginations
        ii. Specialization due to inpushing/invaginations
        iii. Specialization due to contact: Desmosomes, Hemi-desmosomes, Septal desmosomes, Tight junctions, Gap junctions, Terminal bars and Interdigitation
2. Study by charts/models of Cilia/Flagella
3. Human Karyotyping (preparation of chart only)
4. Study of work principal of Dark field microscopy and Polarized microscopy by chart
5. Study of centrifuge by chart/model/instrument
6. Study Ascending Paper Chromatography
7. Study of central values (Mean, Median and Mode) with suitable data set
8. To derive SD value for given data
9. Preparation of pi-chart, bar diagrams and pictogram using suitable data set

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – V
Skeleton Question Paper for Practical Examination
ZOOLOGY – 306 (B-2)
(Based mainly on theory paper 304)

Date: Marks: 35 Time:

Q.1: Make a temporary char of _____ from the given material and Submit it to the examiner. 06

Q.2: Find out the Rf value, identify the unknown amino acid and submit your results to the examiner. 06

Q.3: Tabulate and find out _____ value from the given data/material. (Mean, Median, Mode, SD) 06

Q.4: Identify and describe specimen/chart 08

Sp.1 Fluid Mosaic model/Cilia/Flagella

Sp.2 Dark field microscopy/Polarized microscopy

Sp.3 Centrifuge/Paper chromatography

Sp.4 Pi-chart/Bar diagram/Pictogram

Q.4: Viva Voce 06

Q.5: Journal 03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 307
Animal Diversity, Economic Zoology and Entomology

Unit – 1: Animal Diversity (Chordates) – Type Study & General topics

A) General structure and morphology with functional anatomy of the following animal: Mammalia : Type - Rat (*Rattus rattus*) - External characters, Digestive system, Respiratory system, Heart, Arterial & Venous systems, Brain, Excretory System and Reproductive systems
B) General topics:
    a. Dentition in mammals (dental formulae of Human, Cow, Horse, Rat, Elephant, Dog, Cat)
    b. Derivatives of mammalian skin (Claw, Nail, Hoof, Horn and Hair)

Unit – 2: Animal Diversity (Chordates) General topics

- Neoteny and Parental care in Amphibians
- Origin of reptiles
- Identification of venomous and non venomous snakes of India
    - Venomous: Russel's viper, Krait, Cobra, King Cobra, Marine Snake
    - Non-venomous: Boa, Python, Rat snake
- Types of snake venom (Neurotoxic, Haemotoxic)

Unit – 3: Economic Zoology – Apiculture

- Introduction and classification of Apis
- Different species of honey bees
- Castes in honey bees and their structure and function
- Structure of a typical bee hive
- Life history of honey bee
- Apiculture methods: Old and Modern methods
- Honey and Bee Wax

Unit – 4: Entomology

- Harmful insects
- Type of mouth parts (butterfly, housefly, mosquito, honeybee)
- Role of insects in forensic sciences (life cycle of blow fly)

Suggested Reference Books:

1. Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut
2. Chordate Zoology, E. L. Jordan, P. S. Verma, S. Chand Co. New Delhi
3. A hand book on economic zoology, J. Ahsan, S. P. Sinha, S. Chand Co. New Delhi
4. Arthropoda, R. L. Kotpal, Rastogi Publication, Meerut

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 308
Ornithology, Zoogeography, Immunology and Biotechnology

Unit – 1: Ornithology

- Birds as glorified reptiles
- Flight adaptation in bird (morphological only)
- Type of feet and beaks
- Bird migration
    - Kinds of migration
    - Modes of flight in migration
- Importance of bird watching and bird watching etiquette and tools (Binoculars, Spotting Scope)

Unit – 2: Zoogeography

- Introduction
- Brief account of Zoogeographical realms with reference to mammalian fauna
    - Australian region
    - Oriental region
    - Neotropic region
    - Ethopian region
    - Nearctic region
    - Palaearctic region

Unit – 3: Immunology

- Brief introduction. (can be asked only as objective questions in Q. 5 only)
- Immunity (Specific Resistance to Disease)
    - Antigens/Immunogens:
        - Definition
        - Characteristics
    - Antibodies/Immunoglobulins:
        - Definition
        - Structure
    - Cellular & Humoral Immunity:
        - Formation of T cells & B cells
        - T cells & Cellular Immunity
        - B cells & Humoral Immunity
        - Monoclonal antibodies
    - Disorders, Homeostatic Imbalances:
        - Hypersensitivity (Allergy)
        - Tissue rejection
        - Autoimmune diseases
        - AIDS
    - Functions of Immunity.

Unit – 4: Biotechnology

- Brief history of biotechnology
- Advantages and disadvantages of Tissue Culture
- Substrates on which cells grow and Gas phase for Tissue Culture – in brief
- Some important requirements for cell and tissue culture: pH, CO_2 and Bicarbonate, Buffer, O_2, Temperature, Balanced Salt Solution (BSS), Antibiotics, Serum
- Tissue Culture techniques
- Organ Culture techniques
- Whole Embryo Culture techniques

Suggested Reference Books:

1. Chordate Zoology, E. L. Jordan, P. S. Verma, S. Chand Co. New Delhi
2. Zoogeography, V. C. Sony, Gujarat Grandh Nirman Board, Ahmedabad
3. Animal Physiology and Related Biochemistry, H. R. Sing, Shobhan Lal Naginchand and Co. Edu. Pub. Jalandhar
4. Text book of Animal Physiology, A. K. Berry, Emkay Pub., New Delhi
5. Elements of Biotechnology, P. K. Gupta, Rastogi Publication, Meeruth
6. Culture of Aimal Cells – A manual of Basic Technique, R. Ian Freshney, 5th Ed. A John Wiley & Sons Inc. Pub.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 309
Molecular biology, Toxicology, Animal Behaviour and Endocrinology

Unit – 1: Molecular biology and Genetics

- Modes of DNA replication: Semiconservative, Conservative and Dispersive
- DNA Synthesis (*in vitro*): Basic idea of DNA polymerases, primer DNA, template DNA, Proof-reading by polymerases, Continuous and Discontinuous synthesis, DNA ligase, DNA helicases, DNA-binding proteins and DNA topoisomerases.
- Types of DNA: A-DNA, B-DNA, Z-DNA
- Linkage and Crossing over
- Protein synthesis
- Polymerase Chain Reaction
- DNA Fingerprinting

Unit – 2: Toxicology

- Introduction, definition of toxicology, toxicity, toxicants and xenobiotics
- Areas of toxicology: Mechanistic, Regulatory, Forensic, Clinical and Environmental
- Classification of toxicants: Corrosives, irritants, neurotics and cardiac poisons
- Types of toxicity: Acute, Subacute, Chronic
- Factors affecting Toxicology: Size of animal, age, sex, species, strain, feed and feeding, changes in internal environment, habitually used drugs, route and rate of administration, environment and plasma-protein binding
- Entry of toxicants into the animals' body: Gastro-intestinal route, skin, lungs, parenteral administration

Unit – 3: Animal Behaviour

- Communication in animals
    - Components of communication (Sender, Receiver, Channel, Noise, Context, Signal, Code)
    - Types of Communication (Visual, Olfactory, Auditory, Tactile, as a language)
- Reproductive behaviour patterns
    - Mating systems: Monogamy, Promiscuity, Polygyny, Polyandry
    - Courtship:
        - Introduction and requirement,

        - Mechanism of courtship (mate finding, persuation, synchronization, reproductive isolation)
    - Courtship and mating in scorpions and fish (threespined stickleback)
- Biological Rhythms:
    - Circardian, Circalunar and Circannual Rhythms and Biological clocks

Unit – 4: Endocrinology

- Introduction to endocrine and neuroendocrine system
- Functions of some major endocrine secretion
    - Pituitary gland (GH, TSH, ACTH, GT)
    - Thyroid gland hormones (Thyroxin hormone)
    - Parathyroid gland (Parathormone)
    - Adrenal gland (Adrenaline and Noradrenaline, Mineralocorticoied)
    - Thymus (Thymosin, Thymin 1 and Thymin 2)
    - Pineal gland (Malatonine)
    - Testis (Testosterone)
    - Ovary (Estrogen and Progesterone)

Suggested Reference Books:

1. Molecular Cell Biology, Lodish et. Al, Scientific American Books
2. Fundamentals of Toxicology, Pandey, Shukla and Trivedi, New Central Book Agency (P) Ltd. Kolkata.
3. Modern Toxicology, Vol. 1-3, P. K. Gupta and D. K. Salunkhe, Metropolitan Book Co. Pvt. Ltd. New Delhi
4. Animal Behaviour, V. K. Agrawal, S. Chand Co. New Delhi
5. Animal Behavirou, Mohan P. Arora, Himalaya Publishing House
6. A Textbook of Animal Histology, A. K. Berry, Emkay Publication, New Delhi

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 310
Fishery Biology, Developmental Biology, Wildlife and Histological techniques

Unit – 1: Fish biology and Fisheries

- Types of Caudal fins in fishes
- Types of scales in fishes
- Types of swim bladders in fishes
- Accessory respiratory organs in fishes
- Parental care and migration in fishes
- Economic importance of fisheries
- Fish products

Unit – 2: Developmental Biology

- Types of eggs depending upon the quantity of yolk (Microlecithal/Oligolecithal, Mesolecithal and Polylecithal/Macrolecithal/Megalecithal)
- Types of eggs depending upon the distribution of yolk. (Homolecithal/Isolecithal, Centrolecithal and Telolecithal)
- Patterns of cleavage - radial, spiral(dextral, sinistral), bilateral, incomplete/meroblastic and complete/holoblastic
- Embryology of Chick (up to 72 hours):
    - Structure of a hen's unfertilized egg
    - Fertilization, cleavage, blastulation, gastrulation
    - Development of brain upto 72 hrs
    - Development of heart upto 72 hr
    - Flexion & Torsion
    - Extra-embryonic membranes
    - Diagrams of 21 hr, 33 hr, 48 hr and 72 hr old chick embryos
- Types of Placentation in mammals (histological)

Unit – 3: Wildlife and its management

- Introduction to wildlife and its importance
- Threats to wildlife and its conservation
- Protected Areas: National Parks, Sanctuaries and Biosphere Reserve
- Conservation status of wildlife as per IUCN: Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in Wild and Extinct.
- Some endangered fauna of India:
- Asiatic lion, Tiger, Leopard, Snow Leopard, Black buck, Indian Bison, Indian wildass, Indian One-horned Rhino, Great Indian Bustard, Great Indian Hornbill, Peacock, Gangetic dolphin and Vultures

Unit – 4: Histological techniques

- Histological techniques for preparation of permanent slides (section)
    - Fixation and fixatives: Purpose, commonly used chemical fixatives (Acetic acid, Potassium dichromate, Enthanol, Formaldehyde, Bouin's fixative)
    - Dehydration
    - Embedding
    - Sectioning by ordinary (rotary) microtome
    - Stains and staining procedures for light microscopy

Suggested Reference Books:

1. Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut
2. Chordate Zoology, E. L. Jordan, P. S. Verma, S. Chand Co. New Delhi
3. Introduction of Embryology, Balinsky, CBS College Publishers.
4. Developmental Biology, V. B. Rastogi, Rastogi Publications, Meerut.
5. Animal Embryology, G. T. Pandya, Y. M. Dalal, University Grandhnirman Board, Ahmedabad
6. Handbook of Basic Microtechnique, Peter Gray, McGraw-Hill Book Co.

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Note: Students should make a visit to a national part or a sanctuary and discuss issues of the protected area and conservation practices carried out by managers of the protected area. Students are required to prepare a report of their visit to PA.

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 311
Research Methodology

Unit – 1: Foundation of Research

- Objectives of research
- Types of research: Analytical, Descriptive, Quantitative and Qualitative, Basic, Applied

Unit – 2: Research Proposal writing

- Developing hypothesis
- Parts of project proposal
- Major funding agencies of India (UGC, DST, MoEF, MoES, GUJCOST)

Unit – 3: Ethical Issues

- Intellectual property rights
- Plagiarism
- Citation
- Acknowledgement

Unit – 4: Ecological sampling methods

- Introduction to sampling
- Various sampling methods used in field of ecological research
    - Direct count
    - Random sampling
    - Line-Intercept transect
    - Belt transect
    - Quadrates

Suggested Reference Books:

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 312 (A-1) (Practicals)
(Based mainly on theory paper 307)

1. To study following systems in Rat using charts/models
    a. Digestive system
    b. Arterial system
    c. Venous system
    d. Brain
    e. Reproductive systems of male and female
2. To study Striated muscle fibre and modulated nerve fibre in rat using charts
3. To study identification of venomous and non-venomous snakes by charts
    a. Venomous: Russel's viper, Krait, Cobra, King Cobra, Marine Snake
    b. Non-venomous: Boa, Python, Rat snake
4. To study structure castes in honey bee and structure of typical bee hive through charts
5. To study life cycle of honey bee by charts
6. To study life cycle of Blow fly by charts
7. To study different types of mouth parts by charts/permanent slides (butterfly, housefly, mosquito, honeybee)
8. To study dentition of human, cow, horse, rat, elephant, dog, cat
9. To study parental care in amphibians through charts (ichthiophis, alytes, hyla, rhynoderma)
10. To study derivatives of mammalian skin through charts (claw, nail, hoof, horn and hair)

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
Skeleton Question Paper for Practical Examination
ZOOLOGY – 312 (A-1)
(Based mainly on theory paper 307)

Date: Marks: 35 Time:

Q.1: Draw a labelled diagram of the _____ system in rat and show 08
It to the examiner (from digestive, arterial, venous, brain, reproductive m/f)

Q.2: Make a temporary mounting of _____ from the given rat 04

Q.3: Identify the given venomous and non venomous snakes and comment 08
On its peculiarities

Q.4: Identify and describe the given chart of insect 04

Q.5: Identify specimens 1 to 4 as per instructions 08

1. Identify and write dental formula
2. Identify and describe (parental care/ skin derivatives)
3. Identify and draw a labelled diagram (mouth parts)
4. Identify and describe (life cycle of honey bee, was, blowfly)

Q.6: Journal 03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 312 (A-2) (Practicals)
(Based mainly on theory paper 308)

1. To study the avifaunal diversity of college campus and prepare a checklist report
2. To study types of feet and beaks in birds
3. To study tools used in bird watching through charts
4. To study different zoogeographical realms with charts as per theory paper
5. To study structure of antibody, T-cells and cellular immunity, B-cells and humoral immunity, AIDS, hyper sensitivity
6. To study by charts
    a. Balanced Salt Solution (BSS)
    b. Antibiotics
    c. Serum
    d. Tissue culture
    e. Whole embryo culture

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
Skeleton Question Paper for Practical Examination
ZOOLOGY – 312 (A-2)
(Based mainly on theory paper 308)

Date: Marks: 35 Time:

Q.1: Submission of the avifaunal checklist report	14
Q.2: Identify the specimen 1 to 6 as per instructions	12
1. Identify and describe (types of beaks and feet)	
2. Identify the tool and write its significance	
3. Identify and describe (Zoogeographical realms)	
4. Identify and describe (Immunology)	
5. Identify and describe (Animal biotechnology)	
6. Identify and mention its uses (Any)	
Q.3 Viva Voce	06
Q.4 Journal	03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 312 (B-1) (Practicals)
(Based mainly on theory paper 309)

1. To study modes of DNA replication through chart
2. To study types of DNA through chart
3. To study PCR through chart
4. To study DNA finger printing through chart
5. To study linkage and crossing over through chart
6. To study LD50 and LC50 through chart
7. To study communication between bats and moths through chart
8. To study social organization in baboons through chart
9. To study courtship in balloon fly, persuasion in appeasmnt, stickle bakes, harrin gulls, scorpion fly, false information
10. To study endocrine functions of hormonal glands as per theory
11. To study human behaviour by trial and error

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
Skeleton Question Paper for Practical Examination
ZOOLOGY – 312 (B-1)
(Based mainly on theory paper 309)

Date: Marks: 35 Time:

Q.1: Biological rhythms 08

Q.2: Identify and draw a labelled diagram and mention the function of permanently stained mounting of the mammalian glands 08

Q.3: Solve the given genetic problem 04

Q.4 Identify specimen 1 to 6 as per instructions 12

1. Identify and describe (Molecular biology)
2. Identify and describe (Genetics)
3. Identify and describe (Genetics and Toxicology)
4. Identify and comment (communication, social organisation in baboon)
5. Identify and describe the reproductive behaviour pattern
6. Identify and mention its functions (mammalian glands)

Q.5: Journal 03

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
ZOOLOGY – 312 (B-2) (Practicals)
(Based mainly on theory paper 310)

1. To study different types of caudal finds in fishes by charts
2. To study scales in fishes by charts
3. To study types of swim bladders in fishes by charts
4. To study accessory respiratory organs in fishes by charts
5. To study parental care in fishes by charts
6. To study types of eggs through charts
    a. depending upon the quantity of yolk (Microlecithal/Oligolecithal, Mesolecithal and Polylecithal/Macrolecithal/Megalecithal)
    b. depending upon the distribution of yolk. (Homolecithal/Isolecithal, Centrolecithal and Telolecithal)
7. To study patterns of cleavage through chart
8. To study chick embryo of 21 hrs, 33 hrs, 48 hrs and 72 hrs by charts/models
9. To study types of placentation in mammals through charts (histological aspect)
10. To study endangered fauna through charts/pictures as per theory
11. To study staining methods by passing permanent slides (2 w.m. and 2 histology)

SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – VI
Skeleton Question Paper for Practical Examination
ZOOLOGY – 312 (B-2)
(Based mainly on theory paper 310)

Date: Marks: 35 Time:

Q.1: Identify and sketch a labelled diagram of the chick embryo 06

of _____ hrs and show it to the examiner

Q.2: submission of 5 permanent slides (3 wm +2 Histological slides) 10

Q.3: Identify the specimens 1 to 5 as per instructions 10

1. Identify and describe (fish biology/fishery)
2. Identify and describe (developmental biology)
3. Identify and comment (developmental biology)
4. Identify and comment of its conservations status (wild life)
5. Identify and write its scientific name (wild life)

Q.4: Viva Voce 06

Q.5 Journal 03