SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – III
ZOOLOGY – 201
Animal Diversity, Cytology and Genetics

Unit – 1: Animal Diversity (Nonchordates) – Type study and General Topics

A) Type Study:

- *Plasmodium vivex*: Classification, Structure, Life cycle, Pathogenicity
- *Ascaris lumbricoides*: Life cycle and Pathogenicity

B) Generaltopics:

- Porifera: Types of spicules and its importance
- Polymorphism in coelenterate

Unit – 2:Animal Diversity (Nonchordates) - Type Study

- Type – Earthworm (*Pheritima posthuma)* - Classification, External features, Body wall, Coelom, Locomotion, Digestive system, Excretory system, Circulatory system (blood glands, circulatory system of anterior and posterior parts), Nervous system with receptors, Reproductive system, Economic importance

Unit – 3:Cytology

- Microscopy (structure & significance of…..)
    - Phase contrast microscope
    - Fluorescent microscope
    - Electron microscope (SEM & TEM)
- Study of cell organelles(Ultra structure and functions)
    - Lysosome,
    - Golgi body
- Cell cycle, Mitosis, Meiosis

Unit – 4: Genetics

- Molecular structure of DNA (Watson Crick Model), Molecular structure of RNA, Types of RNA and its significance
- Chromosome: Classification on the basis of centromere location, Ultra structure of chromosome, Giant (Polytene) chromosome
- Sex determination in animals (Mechanism)
    - Sex determination in Drosophilla (Genic balance theory & XX, XO, XY method), Gynandromorph
    - Sex determination in man

Suggested Reference Books:

1. Invertebrate Zoology, Ruppert and Barnes, R.D., VIII Edition, Holt Saunders International Edition.
2. *The Invertebrates: A New Synthesis,* Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I., III Edition, Blackwell Science.
3. Textbook of Invertebrates, R. L. Kotpal, Rastogi Publications, Meerut.
4. Invertebrate Zoology, E.L. Jordan and P.S. Verma, S. Chand & Company, Delhi.
5. *Medical Parasitology,* Arora, D. R and Arora, B., II Edition. CBS Publications and Distributors.
6. Cell and Molecular Biology, E.D.P. De Robertis and E.M.F. De Robertis, Lippincott Williams & Wilkins.
7. Cytology, P. K. Gupta, S. Chand & Company, Delhi.
8. Cell Biology, C. B. Power, Himalaya Publishing House.
9. *Principles of Genetics,* Gardner, E.J., Simmons, M.J., Snustad, D.P., VIII Edition, Wiley India.
10. Textbook of Genetics, VeerbalaRastogi, KedarNath Ram Nath, Meerut.
11. Genetics, P.S. Verma & V.K. Agarwal, S. Chand & Company, Delhi
12. Text book of Genetics – Winchester.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – III
ZOOLOGY: 202
Animal diversity, Biochemistry, Animal adaptation, Animal behaviour and Evolution

Unit – 1:Animal Diversity (Chordates) - Type study

- Type – Shark (*Scoliodon sorrakowah*) -Classification, External characters, Placoid scales, Digestive system, Circulatory system (Heart & Arterial system only), Nervous system (Brain), Receptors (Ampullae of Lorenzini, Internal ear), Urinogential system (Male & Female)

Unit – 2: Biochemistry

- **Biochemistry of Carbohydrates:**
  - Introduction, Classification & Significance of Carbohydrates.
  - Structure and physical properties of Mono, di &Polysaccharides with suitable examples.
  - Asymmetry & Isomerism.

Unit – 3: Animal Adaptation and Behaviour

- Animal adaptations: Curssorial, Arboreal, Volant, Desert, Deep sea
- Animal Behaviour: Introduction, Learning behaviour (Habituation, classical conditioning, trial & error, Latent learning, Imprinting, Insight learning), Social life of Termites

Unit – 4: Evolution

- Evolutionary theories
  - Origin of Life
  - Lamarckism
  - Darwinism
  - Neo Darwinism
  - Phylogeny of horse

Suggested Reference Books:

1. Textbook of Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut.
2. Chordate Zoology – E.L. Jordon, P.S. Verma, S. Chand & Co., Delhi.
3. *Principles of Biochemistry*. IV Edition., D. L., Cox, M. M. and Lehninger, A.L.W.H. Freeman and Co. Nelson
4. Elementary Biochemistry, J. L. Jain, S. Chand & Company, Delhi.
5. Fundamentals of Ecology, P. S. Odum, Saunders.
6. Concepts of Ecology, N. Arumugam, Saras Publication, Nagercoil.

7. Ecology and Environment, P. D. Sharma, Rastogi Publications, Meerut.
8. Animal Behaviour, Mohan P. Arora, Himalaya Publishing House.
9. An Introduction to Animal Behaviour, Manning, Addition Wesley.
10. *Evolution,* Hall, B. K. and Hallgrimsson, B., IV Edition. Jones and Bartlett Publishers.
11. *Biology*, Campbell, N. A. and Reece J. B., IX Edition, Pearson, Benjamin, Cummings.
12. *Evolutionary Biology,* Douglas, J. Futuyma, Sinauer Associates.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – III
ZOOLOGY: 203 (A)
(Practical based on Theory Paper No. 201)

Animal Diversity (Nonchordates):

- Study of life cycle of *Plasmodium*through chart/permanent slides
  - In man
  - In mosquito
- Study of signet ring stage in human blood through permanent slide
- Study of *Ascaris lumbricoides* through permanent slides/charts/specimen/model
  - *Ascaris*– male and female (W.M.)
  - T.S. through mature male
  - T.S. through mature female
  - Lifecycle
- Study of different types of spicules in sponges through permanent slides
- Study of polymorphic stages in Porpita, Physalia, Obelia (W.M. & Medusa)
- Study of Earthworm through charts/models/permanent slides
  - External characters
  - Digestive system and Nervous system
  - Setae, septal nephridia, blood glands, and ovary
  - T.S. passing through pharynx, T.S. passing through gizzard, T.S. passing through typhlosole

Cytology:

- Study through charts/models with brief description & applications of:
  - Phase contrast microscope
  - Fluorescent microscope
  - Electron Microscopes (TEM, SEM)
- Study of Cell cycle through charts/model
- Preparation of temporary slides of Mitosis – onion root tip
- Study of Meiosis through permanent slides

Genetics:

- Study of double helix structure of DNA (Watson crick Model) throughchart/model
- Study of classification of chromosomes based on location
- Study of Polytene chromosome through chart

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – III
ZOOLOGY: 203 (B)
(Practical based on Theory Paper No. 202)

Animal Diversity (Chordates):

- Study of Shark through charts/models
  - External characters
  - Digestive system
  - Arterial system
  - L.S. of Heart
  - Urinogenital systems (male and female)
  - Brain
  - Placoid scales, ampullae of lorenzini and internal ear

Biochemistry:

- Study of atomic structure of Glucose and Fructose Lactose, Maltose and Sucrose through charts/models

Animal Adaptation and Behaviour:

- Cursorial: Ostrich, Horse
- Arboreal: Squirrel, Hyla, Chameleon
- Volant: Bat, Birds
- Desert: Phrynosoma, Camel
- Deep sea: Blue Whale, Sole fish

Evolution:

- Study of Evolution of horse through chart
- Examples supporting Lamarkism and Darwinism.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – IV
ZOOLOGY – 204
Animal diversity, Cytology, Genetics and Biotechnology

Unit – 1: Animal Diversity (Nonchordate) - Type study

- Type – Cockroach *(Periplaneta americana*): Classification, External characters, Body wall, Digestive system, Circulatory system, excretory system, Respiratory system, Nervous system, Reproductive system.
- Metamorphosis in insects

Unit – 2: Cytology

- Cell organelles: Centriole (ultrastructure& function)
- Cytoskeleton
- Morphological characteristics of cancer cell
- Physiological characteristics of cancer cell

Unit – 3: Genetics

- Epistasis – Dominance & Recessive epistasis (Recessive: 9:3:4 & 9:7; Double recessive)
- Linkage & Crossing over (w.r.t. Drosophilla)
- Sex Linked inheritance
    - X-linked (e.g. colour blindness in man, eye-colour in *Drosophila*)
    - Y-linked (Holandric genes)

Unit – 4: Biotechnology

- A brief account of laboratory equipments for animal cell culture: Waterbath, Magnetic stirrer, Variable volume micropipettes, Cryostorage containers, Inverted microscope
- pH meter (Mechanism, structure, principal, calibration, significance/uses)

Suggested Reference Books:

1. Invertebrate Zoology, Ruppert and Barnes, R.D., VIII Edition, Holt Saunders International Edition.
2. *The Invertebrates: A New Synthesis,* Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I., III Edition, Blackwell Science.
3. Textbook of Invertebrates, R. L. Kotpal, Rastogi Publications, Meerut.
4. Invertebrate Zoology, E.L. Jordan and P.S. Verma, S. Chand & Company, Delhi.
5. Cell and Molecular Biology, E.D.P. De Robertis and E.M.F. De Robertis, Lippincott Williams & Wilkins
6. Cytology, P. K. Gupta, S. Chand & Company, Delhi.

7. Cell Biology, C. B. Power, Himalaya Publishing House.
8. *Principles of Genetics,* Gardner, E.J., Simmons, M.J., Snustad, D.P., VIII Edition, Wiley India.
9. Textbook of Genetics, Veerbala Rastogi, Kedar Nath Ram Nath, Meerut.
10. Genetics, P.S. Verma& V.K. Agarwal, S. Chand & Company, Delhi
11. Text book of Genetics – Winchester.
12. Fundamentals of Biotechnology, P.K. Gupta, S. Chand & Company, Delhi.
13. Culture of Animal 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 – IV
ZOOLOGY – 205
Animal diversity, Fishery biology, Histology and Animal physiology

Unit – 1: Animal Diversity (Chordate) - Type study

- Type – *Calotes*: Classification, External characters, Digestive system, Circulatory system (Blood, Heart, Arterial, venous system), Nervous system (Brain), Urinogenital system (Male & Female)

Unit – 2: Fishery Biology

- Study of fishing gears
    - Nets: Gill net, Cast net, Drag net, Trawl net
    - Boats: Non Mechanized (Macchawa, Rampani boat) & Mechanized (Trawler)
- Identification & Classification of fishes up to Family as per Day (Catla, Rohu, Mrigal, Hilsa, Dara, Ghol, Bombay duck, Pomfret
- Home aquarium: Introduction, construction, general maintenance, popular aquarium fishes (ornamental fishes)

Unit – 3: Mammalian Histology

- Histology of Cancellous bone, Cartilage, Stomach, Small Intestine, Liver, Pancreas, Kidney (L.S.), Lungs

Unit – 4: Physiology

- Digestion (ingestion, digestion, absorption, assimilation, ejection)of organic food stuff
- Blood Physiology
    - Composition of blood,
    - Detail study of cellular components of blood(amount, structure, importance)
    - Life cycle of RBC (erythropoiesis)
    - Mechanism of coagulation of blood
    - Brief account of factors associated with blood coagulation

Suggested Reference Books:

1. Textbook of Vertebrates, R. L. Kotpal, Rastogi Publication, Meerut.
2. Chordate Zoology – E.L. Jordon, P.S. Verma, S. Chand & Co., Delhi.
3. Fish & Fisheries of India, V. B. Jhingran, Hindustan Pub., Meerut.
4. Fishery Science and Indian Fisheries, Srivastav, Kitab Mahal Pub., Delhi.
5. Fishes, Chandy.
6. Principles of Anatomy and Physiology, Tortora and Grabowski, HarperCollins College Publications.
7. A Textbook of Animal Histology, A. K. Berry, Emkay Publications, Delhi.
8. Bailey's Textbook of Histology, The Williams & Wilkins Company, Baltimore.
9. Animal Physiology and Related Biochemistry, H. R. Singh, Shobhan Lal Nagin Chand & Co., Educational Publishers, Jalandhar.
10. A Textbook of Animal Physiology, A. K. Berry, Emkay Publications, Delhi.

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – IV
ZOOLOGY: 206 (A)
(Practical based on Theory Paper No. 204)

Animal Diversity (Nonchordates):

- Study of Cockroach through charts/permanent slides:
  - External characters
  - Digestive system
  - Nervous system
  - Reproductive system
  - Salivary glands, Thoracic spiracle, Abdominal spiracle, cornea of compound eyes and leg
  - Permanent slides of T.S. of gizzard and Mouth parts

Cytology:

- Study through charts/models with brief description:
  - Centriole

Genetics:

- Study of Genetics throughcharts
  - Epistasis - Dominant (e.g. Dog), Recessive (e.g. Mice)
  - Sex-linked inheritance :
    - X-linked (e.g. colour blindness in man, Haemophilia in man)
    - Y-linked (Holandric genes)
- Genetics problems:

1. When dogs from a true breeding brown coat line were mated to dogs from a true breeding white coat line, all the F1 progeny were white coat colour. Male and female mating of F1 progeny produced F2 progeny in the ratio of 130. white :35 black :11 brown. Explain these results

   Solution – 130:35: 11=12:3:1, Dominant epistasis.

2. Mating between two agouti Guinea pigs of the same genotype produced offsprings in the ratio of 45 agouti : 15 black :19 albino.

   a) Give the approximate phenotypic ratio of these offsprings.

   b) Give the type of interaction between the non-allelic genes responsible for the ratio calculated in (a).

   c) Give the genotype of the parents and offspring.

   Solution-a) 9:3:4, b)Supplementary gene, interaction, recessive epistasis,c)CcAa CcAa

3. From a marriage, all the daughters are normal sighted whereas all the sons are colourblind.

   a) Give the genotype of the parents.

   b) If both the parents were colourblind, hildren. they give rise to normal children?

   Solution-a) Genotype of parents: Mother-XcXc-colourblind .

   Father-XY-Normal, b) If both are colourblind, they cannot give rise to normal children

4. In man, haemophilia is sex-linked and recessive. What offspring phenotype ratio would be expected from a marriage between:

   a) A haemophilic man and carrier woman, and

   b) A normal man and a carrier woman?

   Solution- a) Ratio in woman = Haemophilic : Carrier is 1 :1;Ratio in man = Haemophilic : Normal is 1:1; b) Ratio in woman = Carrier : Normal is 1 : 1; Ratio in man= Haemophilic : Normal is 1: 1

Biotechnology:

- Study of instruments used in animal biotechnology through charts/specimens**:**
  - Water bath
  - Magnetic stirrer
  - Variable volume micropipettes
  - Cryostorage containers
  - Inverted microscope.
  - pH meter

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SHRI GOVIND GURU UNIVERSITY, GODHRA
B.Sc. SEMESTER – IV
ZOOLOGY: 206 (B)
(Practical based on Theory Paper No. 205)

Animal Diversity (Chordate)

- Study of Calotes through charts/permanent slides
  - External characters
  - Digestive system
  - Arterial and Venous systems with L.S. of Heart
  - Brain
  - Urinogenital system (male and female)

Fishery Biology:

- Study of fishing gears through charts/models:
  - Fishing nets: Gill net, Cast net, Drag net, Trawl net
  - Non mechanized boats: Machchva and Rampani
  - Mechanized boats: Trawlers
- Identification of fishes by fin formula
  - Rohu, Catla, Pomfret (or any other fishes as per local availability)

Mammalian Histology:

- Study through permanent slides/charts:
  - T.S. of Stomach
  - T.S. of Small intestine
  - T.S. of Liver
  - T.S. of Pancreas
  - L.S. of Kidney
  - T.S. of Lungs
  - T.S. of Cancellous bone
  - T.S. of Cartilage

Physiology:

- To study action of salivary amylase on starch
- To study differential WBC through human blood smear preparation/permanent slide

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