



St. Xavier's College – Autonomous Mumbai

Syllabus For IV Semester Courses in Zoology (November 2016 onwards)

Contents:

Theory Syllabus for Courses:

S.Zoo.4.01- Developmental Biology and Information Flow

S.Zoo.4.02 - Cell Biology

S.Zoo.4.03 – Biochemistry and Applied Biology

Practical Syllabus for Course: S.Zoo.4.PR

S.Y.B.Sc. Zoology

S.ZOO.4.01

DEVELOPMENTAL BIOLOGY AND INFORMATION FLOW

Learning Objectives:

- This course aims at laying strong foundation for developmental biology with regard to the principles and the study of model organisms.
- This course lays the basic framework for transcription and translation

Number of lectures: 45

Unit 1

Developmental Biology 1:

(15 lectures)

Introduction to developmental biology

- Early theories of Developmental biology
- Concept of model organisms

Model Organisms: A closer look

- Amphibians: *Xenopus laevis*
- Birds: Chicken
- Mammals: Mouse
- Invertebrate: *Drosophila melanogaster*
- Invertebrate: *Caenorhabditiselegans*

Regeneration: Remembering previous existence

- Limb regeneration: Salamander
- Regeneration in Hydra

Unit 2

Developmental Biology 2:

(15 lectures)

Body Plan: Setting up the vertebrate body axes

- Animal vegetal axis : Amphibians
- Dorsal ventral axis: Amphibians
- Antero-posterior axis: Chick

Fertilization: The Genesis

- Concept of fertilization
- Fertilizin, Resact, ZP3
- Slow and fast block to polyspermy

Morphogenesis

- Cleavage: Holoblastic and Meroblastic
- Blastulation: *Drosophila*, Frog, Chick
- Gastrulation: *Drosophila*, Frog, Chick

Unit 3

Information Flow:

(15 lectures)

DNA transcription:

- RNA polymerase and Transcription Cycle
- Prokaryotic and Eukaryotic transcription
- Post-transcriptional modifications
- Regulation

Translation:

- Genetic Code
- Main players in translation
- Prokaryotic and Eukaryotic translation
- Regulation

Recommended References:

1. Principles of developmental Biology: Lewis Wolpert. 3rd ed. Oxford University Press
2. Developmental Biology: Scott Gilbert. 10th ed. Sinauer associates
3. Molecular Biology of the Gene: Watson et al. Pearson International Ed.
4. Molecular Biology: Robert Weaver.
5. Mark's Basic Medical Biochemistry: A clinical Approach: Leiberman and Marks. 4th ed. Lippincott, Williams and Wilkins

Practical Course:

1. Chick embryo permanent slides (18, 24, 36, 48, 72 hours)
2. Blastula of Frog, Gastrula of Frog
3. Egg of Frog, Bird, reptile, Fish
4. Temporary preparation of Chick embryo
5. Temporary preparation of Drosophila embryo
6. Regeneration in hydra
7. Understanding Transcription and Translation using presence and absence of antibiotic markers

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S.ZOO.4.02

CELL BIOLOGY

Learning Objectives:

- To learn fundamental biochemical and physiological concepts that governs cell function and its application to understand health and disease.

Number of Lectures: 45

Unit 1

Introduction Membranes and Endomembrane Systems: (15 lectures)

- Introduction to basic cell structure
- Membrane structure, Transport through membranes Diffusion and Facilitated Diffusion
- Osmosis, Active transport, Bulk transport.
- Endo membrane systems-Endoplasmic reticulum Types of Endoplasmic reticulum and Functions
- Golgi-complex and cell secretion
- Lysosomes – types of lysosome and function

Unit 2

Cell Energetics And Regulation: (15 lectures)

- Mitochondria: Structure and ATP Synthesis
- Nuclear structure-Nuclear envelope, Nuclear Pore complex, Nucleolus
- Chromatin structure and compaction
- Giant chromosomes - Polytene chromosomes and Lampbrush chromosomes

Unit 3

Cell Cycle and Cancer Biology: (15 lectures)

- Cell cycle – regulation of cell cycle
- Cell division- Mitosis and Meiosis
- Cell culture - Primary cell culture, organ culture, cell lines, cell viability
- Cancer Biology: Cancer and Types of Cancer, Characteristics of Cancer Cells
- Carcinogens: Physical, Chemical and Biological
- Genes and Cancer: Oncogenes and Tumor Suppressor Genes

Recommended References:

1. Molecular cell Biology Harvey Lodish David Baltimore Arnold Berk et al Scientific American books
2. Cell Biology, Genetics and Evolution By Verma and Aggarwal S.Chand Publication
3. Cell Biology by Pollard
4. The World of Cell Wayne M. Becker, Lewis J. Kliensmith Jeff Hardin Pearson Publication
5. Principles of Anatomy and Physiology Gerald J Tortora and Sandra Reynolds Grabowski Harper and Row Publisher
6. Biology of Disease Jonathan Phillips and Paul Murray Published by Blackwell science Ltd

Practical Course:

1. Study of Osmosis using Erythrocytes
2. Electron micrographs of ER, Golgi Complex, Lysosomes and Mitochondria
3. Vital staining of Mitochondrion
4. Study of Mitosis using Onion Root Tip
5. Study of polytene chromosomes from Chironomous larvae
6. Shell less embryo culture
7. Characteristics of Cancer Cells – Slides / Electron Micrographs
8. Primary Cell Culture / Cell Line Culture

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S.Y.B.Sc. Zoology

S.ZOO.4.03

BIOCHEMISTRY AND APPLIED ZOOLOGY

Learning Objectives:

- To emphasize the commercial aspect of the pure science of zoology
- To learn the various commercial applications of zoology
- To learn concepts used in biochemistry and their applications

Number of Lectures: 45

UNIT 1

Biochemistry

(15 lectures)

Molecular structure of water: tetrahedral geometry, Hydrogen bond and flickering → clusters, macromolecular association

- Physical and chemical properties of water: Density, specific heat, heat of vaporization, → heat of fusion, surface tension. Hydrogen bonds with solutes. Interaction with non-polar compounds. Water as a reactant.
- Ionization of water, K_w ion product of water, pH scale.
- Dissociation of weak acids and weak bases, pK_a ,
- Henderson – Hasselbach equation.
- Titration curves of weak acids
- Buffers in biological system

UNIT 2

Metabolism

(15 lectures)

Physiologic regulation

- Carbohydrate metabolism
- Lipid metabolism
- Nitrogen and Amino Acid Metabolism
- Metabolic Integration, Adaptation and Disease

UNIT 3

Applied Zoology

(15 lectures)

- Introduction to fisheries – Types of fisheries and recent techniques- SONAR, GPS, Remote Sensing
- Fish uses and fish processing industries
- Dairy Science – including cattle diseases
- Aquaculture – Prawn culture, Pearl culture, Fish culture (including fish diseases)

Recommended References:

1. Biochemistry - Lehninger
2. Biochemistry – Harper
3. Biochemistry – Conn & Stumpf
4. Biochemistry – Deb
5. Biochemistry – Satyanarayan
6. A text book of Animal Husbandry – G.C. Banerjee. Oxford Publishers.
7. Wealth of India – VI: Livestock CSIR
8. Wealth of India – IV: Fish and Fisheries CSIR
9. General and Applied Ichthyology: Fish and Fisheries – SK Gupta & PC Gupta. S. Chand Publishers
10. Economic Zoology – Shukla, Upadhay. Rastogi Publications.

Practical Course:

1. Identification of: Crafts and gears.
2. Identification of: Fish, Crustaceans and Molluscs.
3. Estimation of total cholesterol from the given milk sample.
4. Estimation of total lipids from the given milk sample.
5. Estimation of reducing sugars from the given milk sample.
6. Estimation of calcium content in milk.
7. Study of cattle breeds.
8. pH metry
9. Preparation of Buffers and pKa
10. Titration curves
11. Biometric study in Fish
12. Field Trip for Applied Zoology

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