

Semester V

P9: Animal Physiology and Biochemistry

Total Credits: 04

Teaching Hours: 60

Course objectives

- To develop in the student an understanding of functioning of an organisms' body
- To develop in the student an understanding of the various homeostatic systems of the body
- To develop in the student an understanding of regulation of function in the body

Unit I

Digestion 4

Physiology of digestion and absorption of protein, carbohydrates and lipid

Respiration

Transport of oxygen and carbon dioxide in blood 4

Respiratory volumes and capacities

Ventilators

Circulation

4

Composition and constituents of blood

Blood groups and Rh factor

Factors and mechanisms of coagulation

Origin and conduction of the cardiac impulse

Cardiac cycle

Excretion

3

Structure of nephron and urine formation

Regulation of water and acid-base balance

Unit II

Nerve Physiology

3

Structure of neuron, conduction of nerve impulse

Synaptic transmission

Neurotransmitters

Muscles

3

Types of muscles and mechanism of contraction of skeletal muscles

Effects of exercise on muscles

6

Endocrine glands

Structure and function of pituitary, pineal, thyroid, parathyroid, pancreas and adrenal glands.

Reproduction

3

Physiology of reproduction, puberty and menopause

Unit III

Proteins: Structure, transamination, deamination and urea cycle 4

Carbohydrates: Structure, Glycolysis, Krebs cycle, Electron transport chain, 7

Glycogenolysis, gluconeogenesis

Lipids: Structure and Beta oxidation of palmitic acid 4

Unit IV

Enzymes: nomenclature and classification; cofactors, coenzymes, ribozymes, isozymes, abzymes; mechanism of action; kinetics
Vitamins and deficiency diseases

15

Course Outcomes:

At the completion of the course, the student will be able to:

1. understand various functional components of the body
2. understand the mechanism underlying maintenance of homeostasis of the body
3. have an enhanced knowledge and appreciation of mammalian physiology;
4. understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems;
5. understand how these separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude, and how they can sometimes fail;
6. understand structure and function of biomolecules.
7. have to a fundamental understanding of Proteins
8. explain Enzyme catalysis and kinetics

Suggested Reading

1. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hecourt Asia PTE Ltd. /W.B. Saunders Company.
2. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
3. Christopher D. Moyes, Patricia M. Schulte 2016 Principles of Animal Physiology. 3rd Edition, Pearson Education,
4. Boyer: Concepts in Biochemistry (3rd ed. 2006, Brooks/Cole)
5. Lehninger, Nelson & Cox: Principles of Biochemistry (4th ed, 2007, Worth),
6. Murray *et al*: Harper's Biochemistry (25th ed. 2000, Appleton & Lange)
7. Stryer: Biochemistry (5th ed. 2001, Freeman)
8. Conn E., Stumpf P. (2009) Outlines Of Biochemistry, 5th edition, John Wiley & Son

Assignments (any one)

1. Project (500 words) highlighting recent advancements.
2. Presentation highlighting recent advancements.
3. Analytical MCQ based questions
4. Biological Crosswords
5. Charts
6. 500 words answer to analytical questions
7. Outreach activities promoting awareness of physiological and immunological diseases and disorders.
8. Surveys on health indices, disease spread in family, neighbours, communities.

Practical Syllabus Semester V

Course Code- P10

Practical I: Animal Physiology and Biochemistry

Course outcome:

The student at the completion of the course will be able to:

- Perform basic hematological laboratory testing
- Distinguish normal and abnormal physiological/hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.

1. Preparation of Haemin crystals
2. Preparation of neuron, cartilage, striated muscle and smooth muscle.
3. Demonstration of use of Respirometer
4. Study of blood film
5. Blood group demonstration
6. Rh factor
7. Bleeding time and clotting time
8. Haemoglobinometer
9. Haemocytometer
10. Kymograph
11. Qualitative tests for presence of glucose, acetone, amino acids and albumin.
12. Preparation of bead and stick models of amino acids and dipeptides
13. Action of salivary amylase under optimum conditions.
14. Effect of pH, and temperature on the action of salivary amylase
15. Demonstration of paper chromatography
16. Detailed description of Paper chromatograph and pH Meter

P11x: Biosystematics

Total Credits: 04

Teaching Hours: 60

Course objectives

To develop:

- understanding of animal taxonomy and systematic and their application
- molecular basis of animal taxonomy.

Unit I

Introduction to taxonomy and biosystematics

15

Definition and basic concepts of taxonomy and systematics

Types and operation of taxonomy

Importance of taxonomy and biosystematics

International Code of Zoological Nomenclature (ICZN)

Aims and tasks of a taxonomist.

Animal diversity: Alpha, Beta and Gamma

Unit II

Biological Classification

15

Kinds of Zoological classification

Taxonomic (Linnean) hierarchy

Concept of species

Mechanism of speciation

Theories of biological classification

Kinds and components of classification.

Unit III

Taxonomic Procedures

15

Collection, preservation, and preparation of specimen

Curation

Process of identification, Description

Process of typification, different zoological types and their significance

Unit IV

Molecular techniques in systematics

15

Genetic polymorphism

Electrophoretic variations

Polymerase chain reaction,

DNA sequencing

Alignment

Phylogenetic construction

Molecular-evolutionary software and tools.

Student learning outcomes

Student will be able to understand:

- the fundamental principles of systematic,
- how to classify animals according to their characters, and
- what are the theories which have to followed to study the classification

Suggested reading

1. Alfred, J.R.B and Ramakrishna. 2004. Collection, Preservation and Identification of Animals. Zoological Survey of India Publications, Calcutta.
2. Anderson T.A.2001. Invertebrate Zoology (2edn). Oxford University Press, New
3. Kapoor V.C. 1991.Theory and Practice of Animal Taxonomy. Oxford and IBH Publishing Co., Pvt. Ltd. New Delhi.
4. Young J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK.
5. Winston J.E.2000. Describing species: Practical Taxonomic Procedures for Biologists. Columbia University Press, Columbia, USA.
6. Simpson G.G. Principle of animal taxonomy. Oxford IBH Publishing company.
7. Mayer E. Elements of Taxonomy. Oxford IBH Publishing company.
8. Minnelli A. (1993). Biological Systematics. Chapman & Hall.

Assignments (any one)

1. Project (500 words) highlighting recent advancements.
2. Presentation highlighting recent advancements.
3. Analytical MCQ based questions
4. Biological Crosswords
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P11y Evolutionary Biology

Total Credit: 04

Teaching Hours: 60

Course objectives

- To provide students with the basic knowledge of evolutionary biology, both presenting the general principles of the discipline and exploring in details theoretical problems and case studies.
- To explore salient features of various theories of evolution comprising of Lamarckism, Darwinism and Neo-Darwinism
- To develop comprehensive knowledge regarding various sources of variations and their role in evolution
- To give detailed explanation of key concepts of Population Genetics in terms of Hardy-Weinberg Law, Genetic Drift and Types of Natural Selection.
- To provide adequate knowledge about Micro-evolutionary changes, Speciation and Adaptive Radiation

Unit 1

Evolutionary concepts

15

Theories of evolution (Lamarckism, Darwinism, Modern synthetic theory),
Mechanism of evolution: mutation, genetic drift, gene flow, non random mating, natural selection, Isolating mechanism, molecular drive
Evidences for evolution, Biogenetic law
Biological species concept, Mode of speciation (allopatric and sympatric)
Hardy-Weinberg law

Unit 2

Evidences of Evolution

15

Paleobiological: Concept of Stratigraphy and geological timescale; fossil study (types, formation and dating methods).
Anatomical: Vestigial organs; Homologous and Analogous organs (concept of parallelism and convergence in evolution).
Taxonomic: Transitional forms/evolutionary intermediates; living fossils.
Phylogenetic: Fossil based (Phylogeny of horse as a model); Molecule based- (Protein model, Cytochrome C; Gene model, Globin gene family).

Unit 3

Animal distribution

15

Zoogeographical Realms
Continental drift and distribution of animals
Animal dispersal and their major barriers

Unit 4

Evolution in action

15

Evolutionary patterns (Divergent, Convergent & Parallel evolution)
Evolution of horse, elephant and man

Course Outcomes:

At the completion of the course, the student will be able to:

1. understand the concept, process and patterns of evolution.
2. acquire knowledge and reasoning skills useful to interpret biological phenomena in the light of evolution.

Suggested Reading

1. Futuyma, Douglas J. and Kirkpatrick Mark. Evolution (4th Edition) Sinauer
2. Veer Bala Rastogi (2017) Organic Evolution. Med Tech
3. Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub. Co.
4. Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
5. Dawkins, Richard. "The selfish gene: with a new introduction by the author." UK: Oxford University Press.
6. Dawkins, R. (1996). The blind watchmaker: Why the evidence of evolution reveals a universe without design. WW Norton & Company.
7. Darwin, Charles (2003). The Origin of Species: 150th Anniversary Edition
8. Huxley Julian. Evolution: The Modern Synthesis. Harper and Brothers
9. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India

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