SECOND SEMESTER:

ZOOLO. 201: GENERAL AND COMPARATIVE ANIMAL PHYSIOLOGY

UNIT I
1. Blood and circulation: Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis
2. Respiratory system: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination
3. Respiratory pigments through different phylogenetic groups
4. Neural and chemical regulation of respiration.

UNIT II
5. Excretory system: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, & micturition.
6. Regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.
7. Digestive system: Digestion, absorption, energy balance, BMR.
8. Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

UNIT III
9. Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissues.
10. ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.
11. Nervous system: Neurones, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.
12. Physiology of impulse transmission through nerves and synapse

UNIT IV
13. Comparative study of mechanoreception
14. Comparative study of photoreception
15. Comparative study of phonoreception
16. Comparative study of chemoreception

UNIT-V
18. Stress and adaptation
19. Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes.
20. Neuroendocrine regulation of Hormones: their classification and chemical nature

Suggested Readings:
Prosser, C.L. Comparative animal physiology. W.B. Saunders and Co.
Hoar, W.S. General and Comparative Animal Physiology.
Prosser, C.L. Environmental and Metabolic Physiology. Wiley-Liss, New York
ZOOE. 202: BIOMOLECULES, STRUCTURE & FUNCTIONS

1. Primary, secondary, tertiary and quaternary structures of proteins
2. Protein folding and denaturation
3. DNA: Double helical structure of DNA; Replication & Recombination
4. RNA: Types and structure of RNA; Cellular functions of different RNAs

UNIT II

5. Basic concept of metabolism: Coupled and interconnecting reactions of metabolism; cellular energy resources and ATP synthesis
6. Glycolysis and glyconeogenesis
7. Citric acid cycle; Oxidative phosphorylation
8. Pentose Phosphate Pathway and Glyconeogenesis.

UNIT-III

9. Functional importance of lipid storage & membrane lipids; lipid storage diseases
10. Fatty acid metabolism: Synthesis and degradation of fatty acids
11. Protein Synthesis
12. Bile: Composition and functions; bile dysfunction associated diseases

UNIT IV

13. RNA synthesis and splicing
14. Biosynthesis of amino acids
15. Biosynthesis of nucleotides
16. Biosynthesis of membrane lipids and steroids

UNIT V

17. Enzymes: Basic concepts and kinetics
18. Mechanism and Regulation of enzyme catalysis
19. Concept of free energy and thermodynamic principles in biology
20. Energy rich bonds, compounds and biological energy transducers

Suggested Readings:

Segal, I.H. Biochemical Calculations. John Wiley and Sons
Freiefelder, D. Essentials of Molecular Biology.
Cooper, T.G. Tools of Biochemistry.
Hawk. Practical Physiological Chemistry.
ZOOLO. 203: POPULATION ECOLOGY AND ENVIRONMENTAL BIOLOGY

UNIT I
1. Biodiversity Conservation
2. Biodiversity laws, significance and management approaches.
3. Population ecology: Characteristics of a population: population growth curves; population regulation; life history strategies (r and K selection)
4. Concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.

UNIT II
5. Case studies in population dynamics with two examples from areas such as fisheries and wildlife
6. Adaptation: Levels of adaptation, mechanisms and significance of body size
7. Biogeography: Major terrestrial biomes; biogeographical zones of India
8. Aquatic environments: Freshwater, marine and estuarine environments

UNIT III
9. Eco-physiological adaptations to terrestrial, fresh water and marine water environments
10. Ecological succession: Types; mechanisms; changes involved in succession; concept of climax
11. Environmental limiting factors
12. Concept of homeostasis

UNIT IV
13. Inter and intra specific relationship competition
14. Predatory-prey relationship, predator dynamics, optimal foraging theory
15. Mutualism, evolution of plant-pollinator interaction
16. Environmental pollution: global environmental change; Environmental impact assessment

UNIT V
17. Biodiversity-status, monitoring and documentation; major drivers of biodiversity change:
19. Sustainable development
20. Ecological modeling: Fundamentals of constructing models

Suggested Readings:

ZOO 204: BIOSYSTEMATICS, TAXONOMY AND EVOLUTION

UNIT I
1. Definition and basic concepts of biosystematics and taxonomy
2. Trends in biosystematics: Chemotaxonomy, cytotaxonomy and molecular taxonomy
3. Dimensions of speciation and taxonomic characters
4. Species concept: Different species concepts

UNIT II
5. Species category, sub-species and other infra-specific categories
6. Theories of biological classification
7. Taxonomic categories & Hierarchy of categories
8. Taxonomic characters: Different kinds, origin of reproductive isolation, biological mechanism of genetic incompatibility

UNIT III
9. Taxonomic procedures: Taxonomic collections, preservation, curetting, process of identification
10. Taxonomic keys: Different kinds of keys, their merits and demerits
11. International code of Zoological nomenclature (ICZN): Operative principles. Interpretation & application of important rules. Formation of scientific names of taxa
12. Concepts of evolution and theories of organic evolution

UNIT IV
13. Neo-Darwinism and population genetics:
    Hardy-Weinberg Law of genetic equilibrium: Gene frequency and the destabilizing forces (natural selection, mutation, genetic drift, migration & meiotic drive)
14. Molecular population genetics: Pattern of changes in nucleotide and amino acid sequences Ecological significance of molecular variations (genetic polymorphism)
15. Speciation: Patterns and mechanisms of reproductive isolation: Modes of speciation; Allopatry & Sympatry
16. Zoo-geological time scale

UNIT V
17. Trends in evolution
18. Molecular evolution: Gene evolution & Evolution of gene families
19. Molecular phylogenetics: Construction of phylogenetic trees, Amino acid sequences and phylogeny
20. Nucleic acid phylogeny: DNA-DNA hybridization, restriction enzyme sites, nucleotide sequence comparison and homologies

Suggested Readings:
Mayor, E. Elements of Taxonomy.
LIST OF PRACTICAL EXERCISES FOR LABORATORY COURSE

ZOOL - 205: PHYSIOLOGY AND BIOCHEMISTRY

• Detection of carbohydrates, proteins and lipids in the given sample
• Demonstration of salivary digestion
• Demonstration of gastric digestion
• Demonstration of pancreatic digestion
• Detection of urea, uric acid, ammonia in the given sample
• Counting of red blood corpuscles in the blood of rat or man
• Counting of white blood corpuscles in the blood of rat or man
• Determination of haemoglobin percentage in the blood of rat or man
• Detection of blood groups and Rh factor in rat or man
• Determination of rate of respiration in an insect, mammal or fish
• Determination of blood clotting time
• Preparation of haemin crystals
• Determination of Erythrocyte sedimentation rate (ESR)
• Separation of Serum and tissue protein with the help of electrophoresis
• Demonstration of reflex action
• Quantitative determination of biological parameters (protein, cholesterol and blood sugar, RNA and DNA etc.) with the help of colorimeter

SCHEME OF PRACTICAL EXAMINATION

1. Experiment on hematological parameter (Three) 30
2. Experiment on biochemical parameter (Two) 20
3. Qualitative enzymatic assay 10
4. Quantitative assay of a biochemical parameter (Two) 20
5. Viva voce 10
6. Practical record 10

TOTAL MARKS 100
DURATION (HOURS) 06