

Unit – 1

Group – A

1. Organisation of Coelom
 - 1.1. Pseudocoelomates
 - 1.2. Coelomates
2. Locomotion.
 - 2.1. Flagellar and Cilliary movement in Protozoa
 - 2.2. Hydrostatic movement in Coelenterata, Annelida and Echinodermata.
3. Nutrition and Digestion.
 - 3.1. Patterns of feeding and digestion in Lower Metazoans.
 - 3.2. Filter feeding in Polychaeta, Mollusca and Echnodermata.
4. Respiration.
 - 4.1. Organs of Respiration, Gills, Lungs and Trachea.
 - 4.2. Respiration Pigments
 - 4.3. Mechanism of Respiration in Arthropoda, Mollusca
5. Excretion and Osmoregulation.
 - 5.1. Organs of excretion, Coelomoducts, Nephridia and Malpighian tubules
 - 5.2. Mechanism of Excretion in arthropoda
 - 5.3. Osmoregulation in Protozoa.

Group – B

1. Origin of Chordata and concept of Proto-chordata
2. Classification of vertebrates
3. Adaptive radiation in Mammals
 - 3.1. Aquatic
 - 3.2. Aerial
 - 3.3. Terrestrial
4. Sense Organs
 - 4.1. Lateral-line system
 - 4.2. Electroreceptors
5. Nervous System
 - 5.1 Comparative anatomy of the brain in relation to its function.
 - 5.2 Nerves-Cranial, Peripheral and Autonomous nervous system in mammalas
6. Venom in Ophidians.

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Unit – 2

Group – A

1.
 - 1.1. Definition and basic concepts of biosystematics and taxonomy.
 - 1.2. Importance and application of biosystematic in biology.
2. Dimension of speciation and taxonomic characters
 - 2.1. Species concepts species category different species concept, sub species and other infra specific categories.
 - 2.2. Speciation and types of speciation Allopatric, Sympatric, Parapatric.
 - 2.3. Theories of biological classification, hierarchy of categories.
3. Procedures Keys in Taxonomy.
 - 3.1. Taxonomic procedures-taxonomic collections, preservations curating, process of identification.
 - 3.2. Taxonomic keys-different kinds of taxonomic keys their merits and demerits.
 - 3.3. Process of typification and different zoological types
4. Biodiversity indices
 - 4.1. Shanon-Weiner index, dominance index.
 - 4.2. Similarity and dissimilarity
 - 4.3. Association index.

Group – B

1. Probability distribution and their properties.
2. Hypothesis testing
3. Experimental design and sampling theory
4. Analysis of variance (ANOVA)
 - 4.1 Standard deviation
 - 4.2 Standard error
 - 4.3 Tests of significance
5. Correlation
6. Regression.
7. Probability distributions and their properties, Normal, Binomial, Poission distribution.

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Unit – 3

Group – A

1. Leydig cells
 - 1.1. Morphology
 - 1.2. Differentiation
 - 1.3. Function and its regulation.
 - 1.4. Structure and function of sertoli cell
2. Spermatogenesis.
 - 2.1. Spermatogenesis in any vertebrate.
3. Biochemistry of Semen
 - 3.1. Semen composition and formation
 - 3.2. Assessment of sperm functions.
4. Fertilization
 - 4.1. Pre-fertilization events
 - 4.2. Biochemistry of fertilization
 - 4.3. Post-fertilization events
5. Ovarian follicular growth and differentiation.
 - 5.1. Oogenesis
 - 5.2. Recruitment of follicle, its growth and maturation and detailed structure of Graafian follicle.
 - 5.3. Ovulation and ovum transport in mammals.

Group – B

1. Multiple ovulation and embryo transfer technology (MOET) in cattle
 - 1.1. An over view of cyclical changes in hormones and ovulatory responses in spontaneous oestrous cycles.
 - 1.2. Induction of multiple ovulation, retrieval of embryos and their cryopreservation
 - 1.3. Embryo sexing and cloning
 - 1.4. Synchronization of oestrus and embryo transfer
2. ARTs in human beings
 - 2.1. An overview of hormonal interplay in regulation of an unassisted menstrual cycle
 - 2.2. ART protocol for controlled ovarian hyperstimulation, superovulation, retrieval oocyte, oocyte maturation, GIFT, IVF and ZIFT
 - 2.3. ICSI
 - 2.3.1 Advisability
 - 2.3.2 Protocol
3. Screening for Genetic Disorders
4. Contraception
 - 4.1. Surgical methods
 - 4.2. Hormonal methods
 - 4.3. Physical barriers

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Unit – 4

Group – A

1. Principles and uses of analytical instruments-pH Meter, Colorimeter, Spectrophotometer, Ultra centrifuge.
2. Microscopy-Principle of transmission, electron, scanning, fluorescence, phase contrast microscopy
3. Microbiological techniques
 - 3.1. Media preparation and sterilization
4. Cell culture technique
 - 4.1. Design and functioning of tissue culture in laboratory
5. Cryo techniques
 - 5.1. Cryopreservation for cell tissue and organism
 - 5.2. Cryo techniques for microscopy
6. Separation techniques in biology
 - 6.1. Molecular separations by chromatography, electrophoresis
7. Polymerase chain reaction technique and its application
8. Cell imaging and its applications
9. ELISA

Group – B

1. Early vertebrate development
 - 1.1. Morphogenetic movements
 - 1.2. Neuralation and ectoderm
 - 1.3. Mesoderm and Endoderm
2. Hormones as mediators of development
 - 2.1. Amphibian metamorphosis
 - 2.2. Insect metamorphosis
 - 2.3. Ovarian luteinisation and mammary gland differentiation
3. Haemopoetic stem cell
 - 3.1. Stem cell disorders
 - 3.2. Blood cell formation
 - 3.3. Bone marrow transplants
 - 3.4. Gene therapy

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Unit – 5

Group – A

1. Physiology of Respiration
 - 1.1. Hb and associated diseases sickle cell anaemia and thalassemia
2. Comparative physiology of digestion
3. Transmission of Nerve impulse
4. Muscle structure and function
5. Osmoregulation
 - 5.1. Aquatic
 - 5.2. Terrestrial
6. Thermoregulation
 - 6.1. Homeotherms
 - 6.2. Poikilotherms
7. Excretion, pattern of excretion, physiology of urine formation
8. A comparative study
 - 8.1. Photo reception
 - 8.2. Phono reception
 - 8.3. Chemoreception
9. Communication among animals
 - 9.1. Bioluminescence
 - 9.2. Pheromones

Group – B

1. Hormones: Chemical nature, Gross features and Classification of hormones.
2. Neuro endocrine system and neurosecretion
 - 2.1. Characteristics of neurosecretory cells
 - 2.2. Important neurosecretory centre
 - 2.3. Role of neurosecretory systems
3. General principles of hormone action
 - 3.1. Mechanism of peptide and steroid hormone action
 - 3.2. Termination of hormone action
4. Hormones and homeostasis
5. Hormones growth and development
6. Hormones and reproduction
7. Hormonal regulation of implantation of pregnancy, parturition placental Hormones
8. Biosynthesis and secretion of hormones
 - 8.1. Biosynthesis of steroid hormones
 - 8.2. Biosynthesis of amino acid derived small size hormones(T3,T4)
 - 8.3. Biosynthesis of simple peptide hormones-pre and prohormones
9. Hormonal disorders

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Unit – 6

Group – A

1. DNA Replications
 - 1.1. Mechanism of DNA replication in prokaryotes and eukaryotes
 - 1.2. Enzymes and accessory protein involved in DNA replication
2. Transcription
 - 2.1. Prokaryotic transcription
 - 2.2. Eukaryotic transcription
 - 2.3. RNA polymerase
 - 2.4. General and specific transcription factors
 - 2.5. Regulatory elements and mechanism of transcription regulation
 - 2.6. Transcription and post transcriptional gene silencing
3. Translation
 - 3.1. Genetic Code
 - 3.2. Prokaryotic and eukaryotic translation
 - 3.3. The translational machinery
 - 3.4. Mechanisms of protein synthesis-initiation, elongation and termination
 - 3.5. Regulation of translation
4. DNA repair mechanism, Gene organisation of eukaryotic organism
5. Recombination at nucleotide level, construction of recombinant DNA (Vectors + Insert)1

Group – B . Molecular Cell Biology

1. Biomembranes
 - 1.1. Molecular composition, arrangements and functional consequences
 - 1.2. Transport across cell membrane diffusion, active transport pumps
2. Cytoskeleton
 - 2.1. Microfilaments and Microtubules-structure and dynamics
 - 2.2. Cell movements – intra cellular transport, role of kinesin and dynein, signal transduction mechanisms.
3. Apoptosis – its regulation in normal and transformed cells
4. Biology of Cancer
5. Biology of Aging
6. Intracellular protein traffic
 - 6.1. Protein synthesis of free and bound polymers
 - 6.2. Uptake in ER
 - 6.3. Membrane protein, golgi sorting, post translational modifications
 - 6.4. Trafficking mechanism

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Unit – 7

Group - A

1. Chemical foundation of biology
 - 1.1. pH, pK, Acid, Base, Buffer and free energy
2. Energy metabolism
 - 2.1. Redox potentials
 - 2.2. Mitochondrial electron transport chain
3. Protein
 - 3.1. Primary, Secondary, Tertiary and Quaternary structure
4. Nature of enzyme
 - 4.1. Classification and nomenclature
 - 4.2. Mechanism of enzyme action
 - 4.2.1. Active sites, substrate binding transition state, analogues and apozymes
 - 4.2.2. Kinetics of enzyme catalysed reactions
5. Biosynthesis of Urea.
6. Biosynthetic pathways
 - 6.1. Cholesterol
 - 6.2. Purine
 - 6.3. Pyrimidines.

Group – B

1. Biology of Chromosomes
 - 1.1. Molecular anatomy of Eukaryotic chromosomes
 - 1.2. Metaphase: Centromere, Kinetochore, Telomere and its maintenance.
2. Sex Chromosomes: sex differentiation and dosage compensation in C. Elegans, Drosophila and humans
3. Human cytogenetics
 - 3.1. Numerical and structural abnormalities of human chromosomes syndromes.
 - 3.2. Mendelian and chromosome based diseases in human
 - 3.3. Human Genome
 - 3.4. Techniques in Human chromosome analysis-Molecular and Cytogenetic approach
 - 3.5. Human karyotype-Banding-nomenclature
4. Transgenic animals, selection of transferred cell.
5. Significance of transgenic animal.

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UNIT – 8

Group – A

1. Innate and acquired immunity
2. Nature of antigens and super antigens
 - 2.1. Antigenicity and immunogenicity
 - 2.2. Factors influencing immunogenicity
3. Antibody mediated effector functions
4. Antigen-Antibody interaction
5. Organisation and Expression of Ig genes.
 - 5.1. Models of Ig gene structure
 - 5.2. Multiple organization of Ig genes
 - 5.3. Generation of antibody diversity
6. Cytokines: Structure and function
7. Hypersensitivity and immune responses in infection agents especially intracellular Parasites

Group – B

1. Stress physiology
 - 1.1. Basic concept of environmental stress and strain: concept of elastic and plastic strain, stress resistance and stress tolerance
 - 1.2. Concept of steady state and homeostasis
2. Energy flow.
 - 2.1. Concept of energy
 - 2.2. Laws of thermodynamics
 - 2.3. Lindemann's concept of trophic dynamics
 - 2.4. Energy flow models
3. Biogeochemical cycles-Nitrogen, Carbon, Sulphur and Phosphorus cycle
4. Pollution Ecology
 - 4.1. Causes of pollution
 - 4.2. Pollutions, their sources and classification
 - 4.3. Effects of pollutants on the organisms
 - 4.4. Bio-magnification, food additive
 - 4.5. Types of Pollution-Air, Water, Noise, Radiation
 - 4.6. Control of Pollution
 - 4.7. Bio-indicators
 - 4.8. Global scenario consequences and significance of climate changes, Ozone layer, Green house effect
5. Productivity and method of its estimation.

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UNIT - 9

Group - A.

1. Microbial Genetics
 - 1.1. Bacterial chromosome
 - 1.2. Gene transfer in Bacterial
 - 1.2.1. Conjugation
 - 1.2.2. Transduction
 - 1.2.3. Transformation
 - 1.3. Bacteriophages morphology and morphogenesis of T4 phages
2. Genome Analysis
 - 2.1. C-value Paradox
 - 2.2. Viral Genome
 - 2.3. Eukaryotic Genome
 - 2.4. Organisation of genes in organelle
 - 2.5. DNA finger printing

Group - B.

1. Innate behavior
2. Neural and Hormonal control of behavior
3. Ecological aspects of behavior
 - 3.1. Aggression, Homing, Territoriality, Dispersal
4. Social behavior
 - 4.1. Aggregation - Schooling in fishes, flocking in birds, herding in mammals
 - 4.2. Social organization in insects and primates
5. Reproductive behavior
 - 5.1. Evaluation of sex and reproductive strategies
 - 5.2. Mating systems
 - 5.3. Courtship
 - 5.4. Parental care
6. Biological rhythms
 - 6.1. Circadian and Circannual rhythms
 - 6.2. Orientations and navigation
 - 6.3. Migration of fish and birds
7. Learning and Memory
 - 7.1. Conditioning
 - 7.2. Habituation
 - 7.3. Insight learning
 - 7.4. Association Learning
 - 7.5. Reasoning
 - 7.6. Cognitive skills

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UNIT – 10

Group – A.

1. Concepts of evolution and theories of organic evolution with an emphasis on Darwinism and short comings.
 - 1.1. Neo Darwinism
 - 1.2. Synthetic theory of evolution
 - 1.3. Selection in evolution, Types of natural selection artificial selection.
2. Fundamentals of molecular theory of evolution
3. Evolutionary trend
4. Reproductive isolation
5. Population genetics
 - 5.1. Hardy Weinberg law of genetic equilibrium
 - 5.2. Deviation from Hardy-Weinberg equilibrium
 - 5.3. Directed versus random mutation and the fluctuation test
 - 5.4. Mutation pressure as an evolutionary agent
 - 5.5. Mutation load
 - 5.6. Partial selection against recessive.

Group – B.

1. Life table
2. Population growth curves, Carrying capacity
3. Prey-predator dynamics, competition and niche theory
4. Population regulation-extrinsic and intrinsic mechanism
5. Communities
 - 5.1. Type of interaction
 - 5.2. Inter specific and intra specific. Competition
 - 5.3. Diversity
6. Conservation and management of Natural resources
 - 6.1. Soil mineral resources
 - 6.2. Biodiversity: Benefits and threats
 - 6.3. Endangered species management and Biodiversity protection
 - 6.4. National project: Tiger project, Elephant Project.

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