



UNIT III

اردو شاعری میں جدید رجحانات

- (۱) انجمن پنجاب : حالی اور آزاد کی خدمات، موضوعاتی نظموں کا آغاز
- (۲) منتخب نظمیں : برکھارت، حب وطن، رسم و انصاف
- (۳) جدید شعرا : اکبر الہ آبادی، اسماعیل میرٹھی، چکبست، اقبال
- (۴) ترقی پسند تحریک اور جدیدیت
- (۵) ترقی پسند اور جدیدیت کے شعرا
فیض، مجاز، خدوم، کنتی، اعلیٰ، جان نثار، اختر، علی سردار جعفری، ساحر لدھیانوی، جوش،
ن م راشد، میراجی
- (۶) نئی شاعری : نظم عمری، نظم آزاد، نثری نظم
- (۷) جدید غزل گو شعرا : حسرت موہانی، شاد، فائق، صفی کھٹوی، امیر گوٹوی

UNIT IV

اردو نثر کی نشو و نما

- (۱) فورٹ ولیم کالج کی ادبی خدمات :
- (۲) میرامن، شیر علی افسوس، میر بہادر علی حیدر، حیدر بخش حیدری، مرزا علی لطف، لٹو لال جی
دلی کالج : ماسٹر رام چندر اور مولانا سہیانی کی ادبی خدمات
- (۳) علی گڑھ تحریک : سر سید، آزاد، ذمیر احمد، حالی، شبلی، وحید الدین سلیم، ذکا، اللہ
- (۴) خاکہ : فرحت اللہ بیگ، رشید احمد صدیقی، مشتاق احمد یوسفی، عبدالحق،
خواجہ احمد فاروقی
- (۵) انشائیہ اور طنز و مزاح : بطرس بناری، کشمیلال کپور، ملا رموزی
- (۶) تنقید : حالی، شبلی، مجنون گوکھپوری، اہتاشام حسین، آل احمد سرور، کلیم الدین احمد،
عظمت اللہ خان، شمس الرحمن فاروقی
- (۷) خطوط : غالب، ابوالکلام آزاد، اقبال

UNIT V

افسانوی ادب

خصوصی مطالعہ

- (۱) داستان : ملا وجہی، میرامن، رجب علی بیگ سرور
- (۲) ناول نگار : نذیر احمد، رموا، سرشار، شرر، پریم چند، کرشن چندر، قرۃ العین حیدر
- (۳) ناولوں کا خصوصی مطالعہ : توہید الصواع، امراء جان ادا، گودان
- (۴) افسانہ نگار : پریم چند، بیڈی، منٹو، عصمت چغتائی، خواجہ احمد عباس،
حیات اللہ انصاری
- (۵) افسانوں کا خصوصی مطالعہ : نمک کا داروغہ، گرمی، ٹوبہ ٹیک سنگھ، کالو بنگل

- (۶) ڈراما نگار : محمد حسن، حبیب الرحمن
- (۷) ڈراموں کا خصوصی مطالعہ : رستم و سہراب، خانہ جنگی

UNIT VI

قواعد

- (۱) اسم اور اس کی قسمیں، واحد جمع، مذکر و مؤنث، حالت
- (۲) صفت اور اس کی قسمیں
- (۳) ضمیر اور اس کی قسمیں
- (۴) فعل : حال، ماضی، مستقبل، لازم، متعذر، ناقص، معروف، مجہول
- (۵) مشابہ فعل
- (۶) حروف اور اس کی قسمیں : حروف ربط، حروف عطف، حروف جار، حروف تہجیہ
- (۷) تشبیہ، استعارہ، مجاز اور کنایہ

35. Zoology

Unit I

Taxonomy, Animal Diversity and Applied Zoology

Module 1. Taxonomy

- Classical taxonomy; Modern trends in taxonomy (numerical, cladistics, molecular taxonomy); phylogenetic tree.
- Scientific classification of organisms (five kingdom and three-domain systems);
- Biological nomenclature; ICZN. Homonymy and Synonymy ; Law of priority.
- Concepts of species and hierarchical taxa.
- Molecular Systematics (Mitochondrial DNA and Ancestral Polymorphisms, RFLP,
- RAPD, AFLP & VNTR, Alternate Molecular Approaches, Allozyme polymorphism, Microsatellite Loci.) DNA barcoding and tree of life.

Module 2. Animal Diversity

- Prokaryotes and Eukaryotes.
- Levels of organization-cellular, tissue and organ. Symmetry, Coelom and Metamerism.
- Broad classification of animal kingdom: Mesozoa, Parazoa and Eumetazoa (Radiata, Bilateria); Protostomia (Acoelomata, Pseudocoelomata and Eucoelomata), Deuterostomia.



- Salient features of the phyla: Mesozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda, Nematomorpha, Rotifera, Annelida, Echiurida, Mollusca, Onychophora, Arthropoda, Echinodermata, Chaetognatha, Phoronida, Hemichordata,
- Chordata : Cephalochordates and Urochordates, Pisces, Amphibians, Reptiles, Birds and Mammals-origin, adaptive radiation and distribution.

Module 3. Applied Zoology

- Insect pests: Pests of crops (coconut, paddy, rubber, sugar cane), Pests of stored food grains, Pest control - chemical, biological and Integrated Pest Management.
- Sericulture, Species of silkworms, Composition of silk, Silkworm rearing techniques.
- Apiculture, Species of honey bees, Beekeeping methods, Useful products from honey bees.
- Fisheries and aquaculture: Marine and Fresh water fishes, Fish breeding techniques, Finfish and Shell Fish culture, Different types of fish farming, Ornamental fishes and Aquarium keeping, Fishing crafts and gears.

Unit II Evolution, Ecology, Biodiversity and Ethology

Module 1. Evolution

- Origin and evolution of life
- Evolutionary time scale
- Theories and modern concepts of organic evolution: Classical and synthetic theories of evolution.
- Mechanisms of evolution, Micro and Macro evolution, Co- evolution.
- Genetic drift; Bottle-neck effect; Punctuated equilibrium, Neutral theory, Molecular Clock.
- Species and speciation, Adaptive radiation and Animal distribution.
- Human Evolution-hominid fossils and cultural evolution.

Module 2. Ecology

- Ecosystem: Characteristics of ecosystem, Concepts of Habitat and Niche.
- Structure and Stability of ecosystem.
- Food chain and food web; Biological magnification and its effects.
- Energy flow, Productivity and Ecological pyramids.
- Biogeochemical cycles: gaseous cycles and sedimentary cycles.
- Ecological succession: Types, changes involved in succession, concept of climax.
- Population ecology: characteristics of populations and population growth curves.
- Community ecology: community structure and attributes; edge effects and ecotone.
- Animal interactions: Positive, negative and neutral interactions.
- Pollution: Water, Air, Soil, Noise, and Radioactive pollution- causes and consequences.
- Solid waste management.
- Major Environmental Issues: Green house effect, Acid rain, Ozone depletion, Global warming and Climate change; causes and consequences.
- Conventional and Non-Conventional Energy Resources.
- Environmental Impact Assessment; ecosystem monitoring and applications of remote sensing in environment management.
- Major international environmental conventions/ treatises and organisations

Module 3. Biodiversity

- Concepts and levels of biodiversity.
- Measurement of biodiversity and biodiversity hotspots.
- Values and threats to biodiversity.
- Conservation strategies (*in-situ* and *ex-situ* conservation).
- Forest conservation, Wildlife management, Sustainable Development.

Module 4. Ethology

- Motivation and Learning: Imprinting, habituation, imitation, classical conditioning,



instrumental/operant conditioning, cognitive learning, latent learning, insight learning.

- Complex Behaviour: Orientation, Navigation and Homing, Migration (Fishes and Birds), Biological rhythms-biological clock, Circadian, Circannual, Lunar, Tidal and Seasonal periodicities. Pheromones and chemical communication.

Unit III

Physiology, Immunology and Developmental Biology

Module 1. Physiology

- Nutrition: Types of nutrition, Digestion: mechanical and chemical digestion, Digestive glands and enzymes. Neural and hormonal control of digestion, Absorption of sugars, amino acids and fats.
- Respiration: Respiratory pigments, Transport of O₂ and CO₂, Bohr Effect, chloride shift. Neural and chemical respiratory disturbances.
- Body fluids and Circulation: Types of heart, hear beat, conducting system and pace makers. Common cardiovascular diseases. Composition of blood and Blood groups, Physiology of blood clotting, Control of cardiac activity. Lymph and lymphatic system
- Excretion: Patterns of nitrogen excretion, Structure of kidney, Ultrastructure of nephron, Mechanism of urine formation, Normal and Abnormal constituents of urine and renal disorders. Osmoregulation and regulation of kidney function.
- Muscle physiology: Types of muscles, Ultrastructure of skeletal muscle, Muscle contraction and properties of cardiac and smooth muscles. Simple muscle twitch, summation, tetanus, tonus and fatigue.
- Neurophysiology- Structure of neuron, Generation and transmission of nerve impulse, Synapses, Synaptic transmission and Neurotransmitters, Reflex action.

- Endocrine system: Endocrine glands and hormones, classification of hormones, Mode of action of hormones, Hormone disorders and Feedback control.
- Sense organs: Structure of eye, Physiology of vision, Visual elements and pigments; Eye defects. Structure of ear, mechanisms of hearing and balancing. Hearing impairments. Olfactory, gustatory and tactile senses.
- Reproductive Physiology: Male and female reproductive organs, Puberty, Adolescence, Menstrual cycle, Pregnancy, Parturition, Lactation and Birth control. Hormonal control of reproduction.

Module 2. Immunology

- Organs and tissues of immune system.
- Types of immunity: Innate, acquired, Humoral and cell-mediated immunity.
- Antigens and antibodies: Structure of antibodies, Antigen-antibody interactions.
- Complement system, General features, MHC, General organization and inheritance of MHC.
- Hypersensitivity, Immunodeficiency and Autoimmunity.

Module 3. Developmental Biology

- Gametes and gametogenesis, Types of eggs, Fertilization and Fertilization events.
- Cleavage, Blastulation and Gastrulation: Types of cleavage, Cleavage patterns, Types of blastula, Fate map, Cell movements and Organogenesis.
- Basic concepts of development: Potency of embryonic cells, Competence, determination and differentiation, Genomic equivalence, Cytoplasmic control of nuclear activity, Primary embryonic induction, Nieukoop centre and mesodermal polarity.
- Different types of Placenta.
- Parthenogenesis: Natural and artificial parthenogenesis, Factors inducing parthenogenesis.
- Experimental embryology: Constriction experiments, Experiments on embryonic induction and competence, Cloning



experiments in animals, Medically assisted reproductive techniques.

- Prenatal diagnosis and Teratogenesis.
- Basic biology of stem cells: Types and sources of stem cells with characteristics; Induced pluripotent stem cells and stem cell therapy.

Unit IV Biochemistry, Biophysics and Biostatistics

Module 1. Biochemistry

- Water as a biological solvent: Biological importance, pH and Acid - base balance. Buffers and its biological significance.
- Classification and Structure of Carbohydrates.
- Metabolism of Carbohydrates: Glycolysis, Krebs cycle, electron transport chain, Pentose phosphate pathway, Gluconeogenesis, Glycogenolysis, Glycogenesis, biological significance.
- Classification, Structure and Biological Importance of Lipids.
- Metabolism of Lipids: Beta-oxidation of fatty acids, Biosynthesis of fatty acids. Biologically important Steroids, Prostaglandins.
- Proteins: Structure, classification and properties of amino acids, Proteins: Structure and Classification-Primary, Secondary and tertiary structure, Ramachandran plot.
- Metabolism of Amino acids and Proteins: Metabolism of Amino acids, Urea cycle, regulation of urea cycle, Deamination, Transamination and Decarboxylation.
- Vitamins: Classification, Function and Deficiency disorders.
- Enzymes: Classification and Nomenclature, Enzyme Kinetics, Regulation of enzyme activity, Enzyme inhibition, Zymogenes, Isozymes, Coenzymes and Ribozymes,

Module 2. Biophysics

- Diffusion, Osmosis and Viscosity
- Bioenergetics: Laws of Thermodynamics (Entropy, Enthalpy, Concept of Free energy, ATP as a free energy carrier)
- Radiation Biology: Ionizing radiation, units

and measurement, exposure and radiation dosimeter, autoradiography, Liquid Scintillation counter.

- Microscopy, Light, Phase Contrast, Fluorescent Microscopes, Transmission and Scanning electron microscopes.
- Chromatography: Principles and Application, Column, Ion exchange, TLC, HPLC, Gas and Affinity chromatography.
- Electrophoresis: Paper, SDS -PAGE and Agarose Gel electrophoresis.
- Colorimeter, Spectrophotometer, Flame photometer, Atomic absorption spectrophotometer, Infra-red spectrophotometry, NMR and EMR spectroscopy
- Centrifuge: Ordinary, high speed centrifuges, Density gradient centrifugation, Ultracentrifugation
- Radioimmunoassay: ELISA, Electrophysiological methods: ECG, EEG, MRI

Module 3: Biostatistics

- Measures of central tendency: Arithmetic mean, median and mode
- Measures of dispersion : Mean and Standard deviation, Standard error
- Testing of hypotheses: Concepts of Normal, Binomial and Poisson distribution; Student's -t test, One-way ANOVA, Concepts and applications of correlation and regression, Chi-square test.

Unit V Genetics, Biotechnology and Microbiology

Module 1. Genetics

- Mendelian principles: critical evaluation.
- Interaction of genes: Allelic interactions: incomplete dominance, codominance, Non-allelic interactions: complementary gene action, epistasis, duplicate gene and polygenes.
- Multiple alleles: coat colour in rabbits, Rh blood group inheritance.
- Linkage and crossing over: Linkage groups,



complete and partial linkage, Crossing over and recombination –Mechanisms of crossing over, kinds of crossing over.

- Mutation- Chromosomal aberrations and gene mutations, molecular basis, causes and significance.
- Extra chromosomal inheritance: Characteristics; maternal inheritance of cytoplasm, plastid genome, mitochondrial genome, Kappa particles in *Paramecium*, Maternal effects.
- Sex linked inheritance: characteristics, examples: haemophilia, colour blindness;

holandric genes.

- Sex determination: Chromosomal basis and genic balance theory, Types of chromosomal mechanism, Dosage compensation, Barr bodies, Lyon hypothesis.
- Human genetics: Genetic disorders in man, Chromosomal anomalies (autosomal and sex chromosomal), Single gene disorders (autosomal and sex linked, inborn errors in metabolism).
- Human genome project.

Module 2. Biotechnology

- History and concept of biotechnology, Vectors, Plasmids, Bacteriophage, Cosmids, Shuttle vectors, Yeast vectors, Minichromosomes, Artificial chromosomes, Probes and molecular markers,
- Properties and type of Isozymes, RFLP, RAPD, AFLP, VNTR, Minisatellites, Microsatellites
- Techniques in Genetic Engineering: Selection and isolation of desired genes, Gene splicing, Introduction of rDNA into host, Selection of clone containing DNA insert, DNA Finger printing, DNA sequencing, Chromosome jumping, Genomic library, cDNA library.
- Gene cloning: Cloning techniques in animals, cloning in bacteria and eukaryotes, Amplification of DNA by PCR, gene transfer technology, and expression of induced genes, Restriction enzymes its applications and ligases.

- Applications of Biotechnology: Blotting techniques (Southern, Northern, Western), Genetic engineering and its applications. Diagnosis of diseases, Detection of genetic disorders, Gene therapy, Metabolites production, Bio controls agents, Biofuel, biogas Transgenic animals- Production and use; Ethics in biotechnology, Patenting, biological materials and IPR.

Module 3. Microbiology

- Diversity and Ultra structure of Bacteria.
- Microbial Nutrition and Growth, Use of microbes in medical, biotechnological, industrial and agricultural fields.
- Antibiotics and antimicrobial drugs.
- Virology : classifications, structure and replication, Strategies, Viral pathogens, infections, symptoms, Anti-viral strategies- prevention and control of viral diseases.

Unit VI

Cell Biology, Molecular Biology and Bioinformatics

Module 1. Cell biology

- Cell and cell theory, Structure and function of cell membrane, Organization based on fluid mosaic model.
- Membrane transport - diffusion, active transport, ion pumps, bulk transport.
- Differentiation of cell membrane: microvilli, tight junctions, belt and spot desmosomes, gap junctions.
- Cell organelles: Structure and function, Nucleus - nuclear envelope, nuclear pore complex, Mitochondria , Golgi apparatus, Ribosomes, Lysosomes, Endoplasmic reticulum, Peroxisomes and Centriole.
- Cytoskeleton: Microtubules, microfilaments and intermediate filaments; molecular motors.
- Cell Division- Mitosis, meiosis, Cell cycle and regulation of cell cycle, Cancer – Types and causes, Oncogenes and Tumour suppresser genes.
- Cell signalling, signalling molecules, second messengers, ligands and receptors.



- Chromosome-Structure, types, Euchromatin, heterochromatin, Nucleosome, condensation and coiling.

Module 2. Molecular biology

- Nucleic acids: DNA - structure and Conformations of DNA
- DNA replication in prokaryotes and eukaryotes, replication machinery, mechanisms and repair.
- RNA - Types of RNA and functions.
- Genome organisation- Exons, introns, overlapping genes and transposons.
- Genetic code- characteristic features, deciphering genetic code, reading frame and frame shift.
- Protein synthesis: Central dogma, Transcription, Transcription factors, Transcription activators and repressors, RNA polymerases, capping, elongation and termination. Post-transcriptional processing in eukaryotes. Translation: Mechanism, initiation complex, elongation and termination, Post-translational modifications of proteins.
- Regulation of gene expression in bacteria. Operon model: lac operon, constitutive mutants, Catabolite repression.
- Regulation of gene expression in eukaryotes. Transcription factors, histones, acetylation and de acetylation. Regulation at transcriptional and translational level. Antisense RNA strategies- siRNA, miRNA.

Module 3. Bioinformatics

- Nature and scope of Bioinformatics: Biological databases-DNA, RNA and Proteins- PDB, Swiss-PROT, GenBank, EMBL, NCBI and Entrez.
- Sequence alignment and use of BLAST, FASTA and CLUSTALW; Homology modeling, molecular phylogenetics and tree construction. Searching of database for sequence similarity.
- Introduction to genomics and proteomics- DNA and protein Microarrays.
- Computational tools for gene finding, protein structure prediction, RNA structure prediction; computational drug discovery.