

## **SUBJECT : ZOOLOGY**

**A general survey**, Classification and relationship of the various phyla.

**Protozoa:** Study of the structure, bionomics and life history of paramoecium, Monocystis, malarial parasite, Trypanosoma and Leishmania.

Locomotion, nutrition and reproduction in protozoa.

**Porifera :** Canal system, skeleton and reproduction.

**Coelenterata:** Structure and life history of Obelia and Aurelia, polymorphism in hydrozoa, coral formation, metagenesis, phylogenetic relationship of Cnidaria & Acnidaria.

**Helminths:** Structure and life history of planaria, Fasciola, Taenia & Ascaris. Parasitic adaptation, Helminths in relation to man.

**Annelida :** Nereis, earthworm and leech: coelom & metamerism: modes of life in polychaetes.

**Arthropoda:** Prawn, Scorpion, Cockroach, larval forms and parasitism in Crustacea, mouth part vision and respiration in arthropods, social life and metamorphosis in insects. Importance of peripatus.

**Mollusca,** unio Pila, Oyster culture and pearl formation, cephalopods, Torsion and Detorsion in Gastropoda.

**Echinodermata:** General organization, larval forms and affinities of Echinodermata.

General organization and characters, outline classification and inter-relationship of protochordata, pisces, Amphibia, Reptilia, Aves and mammalia.

Neoteny and retrogressive metamorphosis.

A general study of comparative account of the various systems of vertebrates.

**Pisces :** Locomotion, migration and respiration in fishes: structure and affinities Dipnoi

**Amphibia:** Origin of Amphibia; distribution, anatomical peculiarities and affinities of urodela and Apoda parental Care.

**Reptiles:** Origin of Reptiles; adaptive radiation in reptiles. Fossil reptiles; poisonous & non poisonous snakes of India; poison apparatus of snake.

**Aves:** Origin of birds; flightless birds; aerial adaptation and migration of birds.

Origin of mammals; homologies of ear ossicles in mammals; dentition and phylogenetic relations of prototheria and Metatheria. Endocrine glands (Pituitary, thyroid, Parathyroid, Adrenal, Pancreas, Gonads).

Comparative anatomy of various system of vertebrates (Integument, Heart, Aortic, Arches, Kidney, Brain)

**Environment** : Abiotic factors and their role; Biotic factors – Intra and inter-specific relations. Biogeochemical Cycles, green house effect, ozone depletion, Ecological succession, Biomes ecotones.

**Animal** : Organisation at population and community levels, ecological successions.

**Ecosystem**: Concept, components, fundamental operation, energy flow, biogeo-chemical cycles food chain and trophic levels.

Adaptation in fresh water, marine and terrestrial habitats.

Pollution in air, water and land.

Wild life in India and its conservation.

Sustainable production in agriculture, Integrated Pest manager.

### **Ethology-**

General survey of various types of animal behaviour.

Role of hormones and pheromones in behavior.

Biological clock, seasonal rhythms, tidal, seasonal and circadian rhythm.

Neuro-endocrine control of behaviour.

Methods of studying animals behaviour.

### **Biostatistics-**

Methods of sampling, frequency distribution and measures of central tendency. Standard deviation, standard error and standard deviation, correlation and regression and chi-square and f-test, student t-test.

### **Economics Zoology-**

Parasitism, commensalism & host parasite relationship.

Parasitic protozoans, helminths and insects of man and domestic animals.

Insect pests of crops and stored products.

Beneficial insects.

Pisciculture and induced breeding, Apiculture, sericulture, Lac culture, pearl culture, prawn culture.

## **Cell Biology Genetics, Evolution & Systematics.**

**Cell Biology-** Structure and function of cell and cytoplasmic constituents; structure of nucleus, Plasma membrane, mitochondria golgibodies, endo-plasmic reticulum and ribosomes, cell division; mitotic spindle and chromosome movements and meiosis.

**Genetics-** Gene structure and function; Watson- Crick model of DNA, replication of DNA Genetic code; protein synthesis cell differentiation; sex chromosomes and sex determination.

Mendelian laws of inheritance recombinations, linkage and linkage maps, multiple, alleles; mutation (natural and induced), mutation and evolution, meiosis, chromosome number and from, structural rearrangements; polyploidy; cytoplasmic inheritance, regulation of gene expression in Prokaryotes and eukaryotes; biochemical genetics, elements of human genetics; normal and abnormal karyotypes; genes and diseases. Eugenics, DNA- finger printing.

**Evolution and Systematic-** Origin of life, history of evolutionary thought Lamarck and his works. Darwin and his works, sources and nature of organic variation, Natural selection, hardy-weinberg law, cryptic and warning colouration mimicry; Isolation mechanisms and their role. Insular fauna. Concept of species and sub- species, principles of classification, phylogeny of horse, elephant, camel, origin and evolution of man, principles and theories of continental distribution of animals, zoogeographical realms of the world.

**Bio-Chemistry, Physiology and Embryology-** Biochemistry: Structure of carbohydrates, lipids, aminoacids, proteins, and nucleic acids, glycolysis and krebs cycle, oxidation and reduction, oxidative phosphorylation, energy conservation and release, ATP, cyclic AMP, saturated and unsaturated fatty acids, cholesterol, steroid, hormones; Types of enzymes, mechanism of enzyme action, immunoglobulin and immunity, vitamins and coenzymes; Hormone, their classification, biosynthesis & functions.

**Physiology with special reference to mammals;** composition of blood, blood groups in man coagulation, oxygen and carbondioxide transport, hemoglobin, breathing and its regulation; nephron and urine formation, acid-base balance and homeostasis, temperature regulation in man, mechanism of conduction along axon and across synapses, neurotransmitters, vision, hearing and other receptors; types of muscles, ultra structures and mechanism of contraction of skeletal muscle; role of salivary gland, liver, pancreas, and intestinal glands, indigestion, absorption of digested food, nutrition and balanced diet of man mechanism of action of steroid and peptide hormones, role of hypo-thalamus, pituitary thyroid, parathyroid, pancreas, adrenal, testis, ovary and pineal organs and their inter-relationships, physiology of reproduction in humans, hormonal control of development in man and insects, pheromones in insects.

**Embryology:** Gametogenesis, fertilization, types of eggs, cleavage, development upto gastrulating in branchiostoma, frog and chick; Fate maps of frog and chick; Metamorphosis in frog; Formation and fate of extra embryonic membranes in chick; Types of placenta in mammals, function of placenta in mammals; organisms. Regeneration, genetic control of development. Organogenesis of central nervous system, sense organs heart and kidney of vertebrate embryos. Aging and its implication in relation to man. Invasiveness of placenta, in vitro fertilization, embryo transfer, cloning.

## SUBJECT : BOTANY

1. **Microbiology and Plant Pathology:** Viruses, bacteria, Plasmids: Structure and reproduction. General account of infection, phytoimmunology. Application of microbes in agriculture, industry, medicine and pollution control in air, soil and water. Important plant diseases in India with special reference to Jharkhand State caused by virus, bacteria, mycoplasma and fungi. Mode of infection and dissemination. Physiology of parasitism and methods of control. Myco-toxin.
2. **Cryptogams:** Range of structure and reproduction, and evolutionary aspects. Ecology and economic importance of algae, fungi bryophytes and pteridophytes.
3. **Phanerogams:** Anatomy: meristem and secondary growth. Embryology: Micro-and megasporogenesis, fertilization, endosperm, apomixis and polyembryony. Palynology and its application. Comparison of the system of classification of angiosperms. Modern trends in bio-systematics. Taxonomic and economic importance of Cycadaceae, Pinaceae, Gnetaceae, Magnoliaceae, Ranunculaceae, Brassicaceae, Rosaceae, Leguminosae, Euphorbiaceae, Malvaceae, Dipterocarpaceae, Umbelliferae, Asclepiadaceae, Verbenaceae, Solanaceae, Rubiaceae, Cucurbitaceae, Asteraceae, Poaceae, Arecaceae (Palmae) Liliaceae, Musaceae and Orchidaceae.
4. **Plant Utility and Exploitation:** Origin of cultivated plants. Study of plant as a source of food, fodder, forage, fatty oils, wood and timber, fibre, paper, rubber, beverage, alcohol, drugs, narcotics, resin and gums, essential oils, dyes, mucilage, insecticides and pesticides, plant indicators, ornamentation; and energy plantation with special knowledge about the conservation of forests of Jharkhand.
5. **Morphogenesis:** Polarity, symmetry, Plant tissue culture technique, differentiation and dedifferentiation of cells and organs, totipotency. Factors of morphogenesis. Protoplast culture and somatic hybridization. Applications of protoplast cell, tissue and organ culture.
6. **Cell Biology:** General knowledge of modern tools and techniques in the study of cytology. Prokaryotic and eukaryotic cell-ultra-structure details. Function of the organelles including membranes. Detailed studies of cell division-Mitosis and Meiosis. Numerical and structural variation in chromosomes and its significance. Study of polytene and lampbrush chromosome-structure, behaviour, cytological significance.
7. **Genetics and Evolution:** Development of genetics, gene concept. Mendelism, post-mendelian development, Structure and role of nucleic acids. Genetic code and regulation of gene expression. Mutation and evolution, Polyploidy and its role in evolution and plant breeding. Multiple factors, linkage and crossing over, Gene mapping, Sex chromosome and sex-linked inheritance. Male Sterility, its significance in plant breeding. Cytoplasmic inheritance, Elements of human genetics. Transgenesis, genetic engineering, organic evolution-evidences, mechanism and theories. Plant genetic resources and their conservation.

- 8. Physiology and Biochemistry:** Detailed studies of plant, soil, and water relations. Mineral nutrition and ion transport. Mineral deficiencies. Photosynthesis. mechanism and importance. Photosystem I and II, photorespiration. Respiration and fermentation. Nitrogen fixation and nitrogen metabolism. Protein synthesis. Enzymes, importance of secondary metabolites. Phytochromes. Physiology of flowering. Growth substances, their chemical nature and application in agriculture and horticulture. Agrochemicals. Stress physiology, dormancy, storage and germination of seeds.
- 9. Ecology:** Ecological factors, concepts and dynamics of community. Plant succession. Concept of biosphere, Conservation of ecosystem. Pollution and its control. Forest types of India. Afforestation, deforestation, social forestry, and endangered endemic plant with special reference to Jharkhand.