

# UPSC Mains Zoology Optional Paper-II Syllabus

## **1. Cell Biology:**

- (a) Structure and function of cell and its organelles (nucleus, plasma membrane, mitochondria, Golgi bodies, endoplasmic reticulum, ribosomes and lysosomes), cell division (mitosis and meiosis), mitotic spindle and mitotic apparatus, chromosome movement chromosome type polytene and lampbrush, organization of chromatin, heterochromatin, Cell cycle regulation.
- (b) Nucleic acid topology, DNA motif, DNA replication, transcription, RNA processing, translation, protein foldings and transport.

## **2. Genetics:**

- (a) Modern concept of gene, split gene, genetic regulation, genetic code.
- (b) Sex chromosomes and their evolution, sex determination in *Drosophila* and man.
- (c) Mendel's laws of inheritance, recombination, linkage, multiple alleles, genetics of blood groups, pedigree analysis, hereditary diseases in man.
- (d) Mutations and mutagenesis.
- (e) Recombinant DNA technology, plasmid, cosmid, artificial chromosomes as vectors, transgenics, DNA cloning and whole animal cloning (principles and methods).
- (f) Gene regulation and expression in prokaryotes and eukaryotes.
- (g) Signal molecules, cell death, defects in signaling pathway and consequences.
- (h) RFLP, RAPD and AFLP and application of RFLP in DNA finger-printing, ribozyme technologies, human genome project, genomics and proteomics.

## **3. Evolution:**

- (a) Theories of origin of life.
- (b) Theories of evolution; Natural selection, role of mutation in evolution, evolutionary patterns, molecular drive, mimicry, variation, isolation and speciation.
- (c) Evolution of horse, elephant and man using fossil data.
- (d) Hardy-Weinberg Law.
- (e) Continental drift and distribution of animals.

## **4. Systematics:**

Zoological nomenclature, international code, cladistics, molecular taxonomy and biodiversity.

## 5. Biochemistry:

- (a) Structure and role of carbohydrates, fats, fatty acids, cholesterol, proteins and amino-acids, nucleic acids. Bioenergetics.
- (b) Glycolysis and Krebs cycle, oxidation and reduction, oxidative phosphorylation; energy conservation and release, ATP, cyclic AMP-its structure and role.
- (c) Hormone classification (steroid and peptide hormones), biosynthesis and functions.
- (d) Enzymes: types and mechanisms of action.
- (e) Vitamins and co-enzymes.
- (f) Immunoglobulin and immunity.

## 6. Physiology (with special reference to mammals):

- (a) Composition and constituents of blood; blood groups and Rh factor in man; factors and mechanism. of coagulation; iron metabolism, acid-base balance, thermo regulation, anticoagulants.
- (b) Haemoglobin: Composition, types and role in transport of oxygen and carbon dioxide.
- (c) Digestion and absorption: Role of salivary glands, liver, pancreas and intestinal glands.
- (d) Excretion: nephron and regulation of urine formation; osmoregulation and excretory product.
- (e) Muscles: Types, mechanism of contraction of skeletal muscles, effects of exercise on muscles.
- (f) Neuron: nerve impulse-its conduction and synaptic transmission; neurotransmitters.
- (g) Vision, hearing and olfaction in man.
- (h) Physiology of reproduction puberty and menopause in human.

## 7. Developmental Biology:

- (a) Gametogenesis; spermatogenesis, composition of semen, in vitro and in vivo capacitation of mammalian sperm, Oogenesis, totipotency; fertilization, morphogenesis and morphogen; blastogenesis, establishment of body axes formation, fate map. gesticulation in frog and chick; genes in development in chick homeotic genes, development of eye and heart, placenta in mammals.
- (b) Cell lineage, cell-to-cell interaction, Genetic and induced teratogenesis, role of thyroxine in control of metamorphosis in amphibia, paedogenesis and neoteny, cell death, aging.
- (c) Developmental genes in man, in vitro fertilization; and embryo transfer, cloning.
- (d) Stem cells: Sources, types and their use in human welfare.
- (e) Biogenetic law.