

Part-A

Research -Methodology

Unit-01: Research methodology

Research methodology- definition, Meaning of research in biological science-Objective, purpose, characteristics, Types of research, importance of research, Method of research- Survey, observation, Case study, Experimental, Historical and Comparative methods Research problem- Identification and formation of research problem, Formation of Hypothesis.

Elements in research methodology-Research design, different types of research design, Basic principles of experimental designs. Methods for Data collection –Types of data- Primary and secondary data. tools of data collection.

Unit-02: Qualitative method for Data analysis:

Qualitative method for Data analysis: Standard test for hypothesis-ANOVA and Co-variance, Measurement of central tendency, measurement of dispersion and measurement of relationship, Test for significance – student t-test, f-test chi- square test, measurement of relations- co-relation coefficient, regression, multiple range test, least significant difference test.

Literature collection and citation, Concept of bibliography and references. Writing skills - Preparation of research report, presentations, and writing scientific paper. Journals, Impact factor, Citation factor, patents, copyright, Plagiarism, ISBN, ISSN. funding agencies: UGC, DBT, ICMR, CSIR, DST.

Unit-03: Publication ethics:

Publication ethics: definition, introduction and importance. Best practices *I* standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types. Violation of publication ethics, authorship and contributorship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals

Open Access Publishing: Open access publications and initiatives. SHERP A/RoMEO online resource to check publisher copyright and self-archiving policies. Software tool to identify predatory publications developed by SPPU. Journal finder *I* journal suggestion tools.

Part-B

Cognate Subject (Zoology)

Unit-04: Biology of Non-Chordates and Chordates:

Organization of coelom- Acoelomata, Pseudocoelomata, Locomotion-Amoeboid, Ciliary and Flagellar movements in Protozoa. Locomotion in arthropods. Filter feeding in polychaeta, mollusca and Echinodermata, symbiotic nutrition. Pattern of reproduction in invertebrates. Origin of chordates-origin, evolution and adaptive radiation in Cyclostomata. Reptilia- Origin and evolution of temporal arcades and fossae, extinct reptiles, adaptive radiation in living reptiles, poisonous and non-poisonous snakes in India. Pisces- Chondrichthyes, Osteichthyes, and Dipnoi. Scales in fishes, Migration in Fishes. Aves-Aerial adaptations and mechanisms of flight, courtship and breeding behaviour, migration.

Unit-05: Cell Biology and Genetics

Structure and function of cells and intracellular organelles (of both prokaryotes and eukaryotes). cell cycle. Mechanism of cell division (mitosis and meiosis) and cell differentiation. Structure of prokaryotic and eukaryotic cell, Membrane structure and function, protein sorting, secretory and endocytic pathways, Cytoskeleton, Structure and organization of chromatin, polytene and Lampbrush chromosomes, Biochemistry and molecular biology of cancer, Oncogenes, Chemical carcinogenesis.

Principles of Mendelian inheritance, chromosome structure and function, Gene Structure and regulation of gene expression, Linkage and genetic mapping, Extrachromosomal inheritance (episomes, mitochondria and chloroplasts), Chromosome aberrations, Sex-linked inheritance and genetic disorders, Somatic cell genetics, Genome organization (in both prokaryotes and eukaryotes). Genetic and metabolic disorders. Mutation,

Unit-06: Physiology and Biochemistry:

Response to stress, Active transport across membranes, hormones, Nutrition (including vitamins), Circulation. Respiration, Transport of respiratory gases. Composition of blood, Cardiac cycle, Osmoregulation and Thermoregulation. Neurophysiology and Muscle physiology. Structure, function and metabolism of carbohydrates, lipids and proteins, Enzymes and coenzyme, Coenzymes, Activators and inhibitors, Isoenzymes, Allosteric enzymes, Ribozyme.

Metabolism: Glycolysis and TCA cycle, Glycogen breakdown and synthesis, Gluconeogenesis, interconversion of hexoses and pentoses, Amino acid metabolism, Coordinated control of metabolism, Biosynthesis of purines and pyrimidines, Oxidation of lipids, Biosynthesis of fatty acids, Triglycerides, Phospholipids, Sterols. Energy metabolism (concept of free energy), Oxidative phosphorylation. Bioenergetics.

Unit-07: Environmental Biology and Biodiversity: Concept and dynamics of ecosystem, components, food chain, trophic levels and energy flow, productivity and biogeochemical cycles, Types of ecosystems. Physical and chemical characteristics of water. Radiation and Chemical hazards. Environmental disaster and management-effect of climate change, global warming and its effect on living organisms.

Biodiversity concept, biodiversity hotspots. In-situ management of biodiversity, Reserve forests, Sanctuaries, National Parks. Ex-situ management of biodiversity. Role of zoos, biodiversity parks,

gene banks, tissue culture in biodiversity management. Wild Life Conservation and its management.

Unit-08: Reproductive Biology and Endocrinology: Male reproduction- Histoarchitecture of testis, biology of spermatozoa, spermatogenesis, hormonal control of spermatogenesis. Female reproduction- Histoarchitecture of ovary, folliculogenesis, ovulation. Implantation- types of implantations, sequence of events during implantation, delayed implantation, hormonal regulation. Pregnancy-corpora luteum, endocrine control of pregnancy in rat. Parturition-factors involved in parturition. Lactation-morphological and functional development of mammary gland and milk ejection. Reproductive technologies- In vitro fertilization, gamete intrafallopian transfer, surrogate pregnancy, fertility control in male and female.

Pituitary gland- comparative morphology, chemistry and biological actions of anterior and posterior pituitary hormones. Hormones of GI tract and pancreas, chemistry and physiological actions of GI hormones, insulin and glucagon.

Unit-09: Molecular Biology and Recombinant DNA Technology: Fine structure of gene, Eukaryotic genome organisation (structure of chromatin, coding and non-coding sequences, satellite DNA), DNA damage and repair, DNA replication, amplification and rearrangements. Organization of transcriptional units: Mechanism of transcription of prokaryotes and eukaryotes, RNA processing Ribonucleoproteins, Structure of mRNA, Genetic code and protein synthesis. Regulation of gene expression in pro-and eukaryotes, Attenuation and antitermination, Operon concept, DNA methylation, Heterochromatization, Transposition, Regulatory sequences and transcription factors. Genomics, Proteomics.

Recombinant DNA technology - Principles and methods of genetic engineering and Gene targeting, DNA ligases, Topoisomerases, Gyrase, Methylases, Nucleases, Restriction endonucleases, Plasmids and bacteriophage-based vectors for cDNA and genomic libraries. Applications of recombinant DNA technology in agriculture, health, pharmaceutical and other industry. Cell and tissue culture in animals, Primary culture, Cell line, Cell clones, Transgenic biology.

Unit-10: Animal behaviour, Parasitology and Toxicology

Classification and analysis of behaviour patterns, tools and techniques in behaviour study. Learning, social and sexual behaviour of animals, Animal Communication, Parental care, Circadian rhythms, Mimicry. Aggressive behaviour, orientation.

Parasitology: Important human and veterinary parasites (protozoans and helminths), Life cycle and biology of Plasmodium, Trypanosoma, Ascaris, Wuchereria, Fasciola, Schistosoma and Leishmania, Molecular, cellular and physiological basis of host-parasite interactions.

Toxicology: Definition, fundamental and scope of toxicology, types of toxicology, factors modifying toxicology, Toxicology and lethal concentrations. Toxicity by metal and non-metal, drug toxicity and toxicity caused by agro chemicals — organophosphates, carbonates, chlorinated hydrocarbon, fungicide, herbicide and urea. Toxicology caused by food additives and preservatives.

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1. Dr. H.M. Lalitha.

23/4/25

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23/4/26
(Dr. Pavimela B.)