

RESEARCH METHODOLOGY – M. Phil**UNIT – I**

Research:- Definition; Types of research; Literature review –Selection of problem, defining the problem, **Hypothesis testing:** Framing the objectives, Research design- Execution – Data processing, analysis and Interpretation; Ethics in research.

UNIT – II

Laboratory hazards and safety measures - Hazardous handling, Fire, electrical and radio hazards, Bio-safety equipment; Disposal of various category wastes; **Animal maintenance for research** - CPCSEA guidelines and ethics. **Maintenance of glass wares and instruments** - washing, drying and sterilization; **Preparations of solutions** – Normality, Molarity and Percentage solution.

UNIT – III

Scientific documentation: Drafting of dissertation – Layout- Introduction, Review of literature, Materials and Methods, Results, Discussion, Summary and conclusion, References – Referencing styles – APA, MLA, Oxford, Harvard, Chicago; **Preparation of research articles;** Journals – Scope – National and International, Refereed and Non refereed journals, Predatory journals; Impact factor; Citation index; **Indexing and Abstracting services** –PubMed, Scopus, BIOSIS, AGRICOLA, DOAJ, CAS, CAB, Zoological Record.

UNIT – IV

Statistical Packages: Microsoft Excel – Spreadsheet, Cell, Main menu – File, Edit, View, Insert, Format tools, Data, Window help; **Data entry** – Analysis, Graphical representation, Applications of Microsoft Excel; **SPSS** – Data editor, creating – coding variable, Output viewer, Exploring data with SPSS- Diagrammatic representations, Application of SPSS in biological sciences.

UNIT – V

Intellectual Property Rights: Patent, Copyright, Royalty, Trade marks, Industrial design rights, Plant variety rights, trade dress, Geographic indications; **Objectives of IPR** – Financial incentive, Economic growth, Morality, **Infringement** - Patent infringement, Copyright Infringement, Trade mark infringement; **Misappropriation** – Trade mark misappropriation; Plagiarism – softwares – Turnitin, URKUND, Plagiarism checker.

Textbooks

1. Guramani, N. 2009. Research Methodology for Biological Sciences. MJP Publishers, Chennai.
2. Kothari, C. R. 2008. Research Methodology- Methods and Techniques. New Age International Publishers, New Delhi – 110002.
3. Vijayalakshmi, G., Sivapragasam, C. Research Methods Tips and Techniques. MJP Publishers, Chennai – 600005.

References

1. Leedy, P. D and Ormrod, J.E., 2004 Practical Research: Planning and Design. Prentice Hall.
2. Reviewing Clinical Trials: A Guide for the Ethics Committee –Pfizer.
3. Satarkar. S.V., 2000. Intellectual property rights and copy right. ESS ESS publications.
4. Wadehra, B. I. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. University law publishing.

TECHNIQUES IN BIOLOGY**UNIT – I**

Principles of Microtechniques – Fixatives and Histological stains – Fixation, Tissue processing and staining, Freezing Microtomy (Cryostat); **Histochemistry** – Fixatives, Histochemical stains, Principles involved in identification of Carbohydrates, Proteins, Lipids, Enzymes and DNA. **Electron Microscopy** – SEM, TEM, STEM – Principles and Applications – Histological preparations of tissues for SEM and TEM; **Photography** – Photomicrography – Image analyzer – Principles and applications

UNIT – II

pH meter – Principles and applications; **Centrifuge** – Principles, types and applications; **Chromatography** – Principles, Types and applications – Paper, Column, Ion – exchange, TLC, HPLC, GLC, GC – MS, NMR; **Electrophoresis** – Principles, Types and applications – Paper, Agar Gel, PAGE, SDS – PAGE, Gel documentation – 2D electrophoresis.

UNIT – III

Immunological techniques – Antigen – Antibody preparation and Purification – Immunodiffusion – Immunoelectrophoresis, ELISA, RIA; **Blotting techniques** – Western, Southern and Northern – MALDI and N' terminal sequencing.

UNIT – IV

Spectrophotometry – Principles and applications, UV –Vis Colorimeter, Atomic Absorption Spectrophotometer – Flame photometer; **Calorimetry** – Wet combustion Bomb calorimeter; Manometry – Respirometer – Warburg's apparatus – Oxygen analyser.

UNIT – V

Animal cell culture techniques – Basic equipments and facilities in animal cell culture; Aseptic techniques and good cell culture practices; Cell culture media preparation; Revival of frozen cell lines; Subculture of Adherent cell lines, Cell quantification using Hemocytometer; Cryopreservation of cell lines; MTT cytotoxicity assays; Acridine orange/ ethidium bromide staining.

Textbooks

4. Guramani, N. 2009. Research Methodology for Biological Sciences. MJP Publishers, Chennai.
5. Kothari, C. R. 2008. Research Methodology- Methods and Techniques. New Age International Publishers, New Delhi – 110002.
6. Vijayalakshmi, G., Sivapragasam, C. Research Methods Tips and Techniques. MJP Publishers, Chennai – 600005.
7. Introduction to Biophysics. 2008. Pranab Kumar Banerjee, S. Chand & Company Ltd. New Delhi

References

5. Kumar, H. D.1998. Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Davis, J. M. 2002. Basic cell culture – A practical approach. Oxford University Press Inc., New York.

RECENT TRENDS IN ZOOLOGY AND NANOTECHNOLOGY**UNIT – I**

DNA sequencing - DNA finger printing and foot printing, DNA amplification and RT – PCR, Gene and cDNA Library. **Detection of genetic diseases** using molecular markers , Screening and counseling – **Gene therapy**-Human diseases targeted for Gene therapy, **Types-Ex-vivo** and **In vivo** –In- Utero Gene therapy, **Drug delivery systems for gene therapy** - Non –viral and Viral DNA delivery system, **Human Genome project** - Objectives and Outcomes.

UNIT – II

Cloning technique and its application in Biology: Knock out genes – Ethical issues, Reproductive technologies related to human *in vitro* fertilization. **Organization and Expression of Immunoglobulin gene.** **Vaccines** – Whole organism vaccines, subunit vaccines, Recombinant vaccines, DNA vaccines, Edible vaccines, Synthetic peptide vaccines, Multivalent subunit vaccines, Development of AIDS and malaria vaccines.

UNIT – III

Biofertilizers– Symbiotic and Asymbiotic nitrogen fixers, Algal fertilizers, Phosphate solubilising bacteria, PGPR, Mycorrhiza **Biopesticides**-Microbial biopesticides, Botanical Pest control, IPM , **SCP** – Production and uses. **Genetically Modified Organisms.**

UNIT – IV

Nanotechnology –Definition, characterization of Nanoparticles; **Nanosystems** – properties, synthesis, purification and application of fullerenes carbon nanotubes, Self- assembled monolayer protected metal nanoparticles and nanoshells. **Nanobiology** – Interaction between bio molecules and nanoparticles – surface synthesis of hybrid nano – Bioassemblies of nano in biology.

UNIT – V

Nanomedicines: Approaches to developing nanomedicines. **Kinds of nanosystem in use:** Nanopores, Nanoshells, Tectodendrimers – Protocols for nanodrug administration; nanotechnology in diagnostic applications; **Nanotribology** – definition, current status and future perspectives of nanobiology.

Textbooks

8. Gupta P.K.2004. Biotechnology and Genomics.Rastogi Publications,Meerut, India
9. Abbas, A. K., Lichtman, A. K., Pober, J. S. 1998. Cellular and Molecular Immunology, III Edition, W. B. Saunders Company, U. S. A.
10. Benjamin Lewin. 1999. Genes VII. Oxford University Press,New York.
11. S. Shrivastava. 2013. Introductory Nanobiotechnology. New Central Book Agency (P) Ltd.

References

1. Branden, C., Tooze, J. 1999. Introduction to protein structure, II edition, Garland Publishing, Inc., New York.
2. Desmond, S. T., Nicholl. 1994. An Introduction to Genetic Engineering. Cambridge University Press, New York.
3. Jonathan Graves, Dungan Reavey. 1996. Global Environmental Change. Plant, Animal and Communities. Longman.
4. Hawkins, J. D. 1996. Gene structure and expression, III Edition. Cambridge University Press, New York.
5. Shah, M. A., Shah, K. A. 2013. Nanotechnology – The Science of small. Wiley India Pvt. Ltd.