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Syllabus for Ph.D. Entrance Examination

PAPER-I

(RESEARCH METHODOLOGY)

1. Basic concept of research problem

- Rationale of research
- Identification of research problem
- Research objective
- Types of research- fundamentals/applied/action/quantitative/qualitative

2. Review of literatures

- Primary source
- Secondary source
- Searching e-resources, using research engines
- Searching database
- Writing literature review

3. Methods of research

- Concept and formulation of hypothesis
- Survey method
- Experimental method (variable, designs)
- Historical methods
- Content analysis

4. Sampling of data

- Concept of sampling
- Probability sampling techniques
- Non probability sampling techniques
- Sampling error

5. Collection of data

- Primary data generation
- Secondary data collection
- Methods of data generation/collection- by experiments, questionnaire, interview schedule, focus groups etc.

6. Analysis of data

- Statistical analysis techniques
- Qualitative analysis techniques
- Application of computer in research data analysis

7. Reports preparation

- Structure and component of research report
- Organization of data

- Indexing of journal and research output
- Citation, reference, bibliography
- Copyright, plagiarism, originality of research work

8. Research ethics

- Ethics in research
- National and International regulations/law/ethics related to research on human, Animals and Environments

PAPER-II

(BOTANY)

UNIT-I

Cell Biology: Prokaryotic and eukaryotic cells with emphasis on their structural organization and functional differences. It includes the ultrastructure of the cell membrane, structure and functions of the cell wall, and organization of chromosomes. The unit also covers the structure and functions of major cell organelles such as nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi apparatus, ribosomes, lysosomes and peroxisomes. An introduction to the cytoskeleton including microtubules and microfilaments is also included.

Cell Division: Cell cycle and its regulation. It covers mitotic and meiotic divisions, their stages and significance, along with a comparative account of mitosis and meiosis. Abnormalities in cell division and their biological consequences are also discussed.

UNIT-II

Molecular Biology: Structure and functions of nucleic acids, including DNA and RNA. It covers DNA replication, transcription, translation, genetic code, protein synthesis, and regulation of gene expression with special reference to operon models.

Genetics: Mendelism and its applications, linkage and crossing over, chromosomal mapping, and non-Mendelian inheritance such as incomplete dominance, co-dominance and epistasis. It also covers cytoplasmic inheritance, quantitative inheritance, concept of gene and gene action, mutation and its significance, regulation of the genome, and an introduction to bacterial and viral genetics.

Biochemistry: The structure and biological significance of carbohydrates, proteins and lipids. It includes enzymes, their classification, mechanism of action and regulation, and vitamins with special reference to their role in plant life.

UNIT-III

Evolution, Plant Breeding and Biostatistics: Classical theories of evolution and the modern synthetic theory, including mechanisms of evolution and speciation. It also includes principles, objectives and methods of plant breeding with special emphasis on breeding for disease resistance. Elementary biostatistics including collection and classification of data, mean, median, mode, standard deviation and correlation are also included.

Plant Physiology: Water relations of plant cells, absorption of water and minerals, translocation of organic and inorganic solutes, mineral nutrition, and the mechanism of stomatal opening and closing. It also includes photosynthesis, respiration, nitrogen metabolism, plant growth regulators, growth and movements, stress physiology, biorhythms, anti-transpirants, photomorphogenesis, vernalization, and an introduction to tissue culture and its applications.

UNIT-IV

Lower Plants (Algae and Fungi): Classification, range of structure and reproduction in algae such as Fritschiella, Coleochaete, Oedogonium, Chara, Acetabularia, Vaucheria, Chlorella, Sargassum, Dictyota, Batrachospermum and Polysiphonia, along with a general account of Myxophyceae. The unit also covers fungi including Saprolegnia, Pythium, Phytophthora, Albugo, Peronospora, Mucor, Saccharomyces, Aspergillus, Penicillium, Claviceps, Neurospora, Peziza, Morchella, Puccinia, Ustilago, Alternaria and Cercospora, along with heterothallism, parasexuality, physiological specialization and modes of nutrition.

Bryophytes and Pteridophytes: The study of bryophytes with reference to range of sporophyte and vegetative reproduction. It also covers pteridophytes including stelar organization, telome theory, gametophytes, fossil pteridophytes, and detailed study of Psilophyta, Lycopodium, Isoetes, Equisetum, Ophioglossum, Osmunda and Marsilea.

Gymnosperms and Angiosperms: Gymnosperms including origin of seed and detailed study of Lyginopteris, Caytonia, Cycas, Williamsonia, Ginkgo, Pinus and Ephedra. Angiosperms include criteria and systems of classification, International Code of Botanical Nomenclature (ICBN), detailed study of selected families, anatomy and embryology of angiosperms, and morphology of stamen and carpel.

UNIT-V

Applied Botany and Plant Ecology: Origin and evolution of angiosperms, botanical gardens and herbaria, economic botany covering medicinal, fibre, timber, oil-yielding and cereal plants, and ethnobotany in India. Plant ecology includes ecosystem structure and function, pollution ecology, conservation of natural resources, principles of phytogeography, and vegetation types of India.

Plant Biotechnology: The principles and scope of plant biotechnology. Topics include recombinant DNA technology, gene cloning, vectors and host systems, plant tissue culture techniques, micropropagation, somaclonal variation, haploid and doubled haploid production, genetic transformation methods, transgenic plants, molecular markers, and applications of biotechnology in agriculture, medicine and industry. Biosafety issues, bioethics and intellectual property rights are also included.

Microbiology: Classification of microorganisms, their role in industry and sewage disposal, and plant and human diseases caused by microorganisms. A detailed study of bacteria, viruses and lichens is included.

Plant Pathology: The nature and concept of plant diseases, classification of plant diseases, and host-pathogen interactions. It includes symptoms, etiology and control of plant diseases caused by fungi, bacteria, viruses, nematodes and mycoplasma-like organisms. Principles of disease resistance, epidemiology, plant quarantine, integrated disease management, and the role of plant pathology in sustainable agriculture are also covered.

IMPORTANT NOTE

There will be a total of 50 multiple choice questions (MCQs) for each of the two papers. Paper-I will focus on Research Methodology and Paper-II will cover specific Subject.

Each question in both papers carries 1 mark and will have a total of 50 marks for each paper. The duration for solving each paper is 1 hour. Students must appear for both Paper-I and Paper-II as specifies for the entrance. After completion and submission of Paper-I, the question Paper-II will be provided to the students.

Scheme:

Paper-I Research Methodology

Number of questions- 50 MCQs covering whole syllabus

Maximum Marks- 50

Duration- 1 hr

Paper-II Botany

Number of questions- 50 MCQs covering whole syllabus

Maximum Marks- 50

Duration- 1 hr