

TANTIA UNIVERSITY, SRI GANGANAGAR

Syllabus Entrance Examination for Ph.D.

Subject- Botany

Maximum Marks-100

Part A- 50 (Research Methodology)

Part B- 50 (Subject Wise)

PART-A

Research Methodology and Statistics

- UNIT 1: Meaning of Research
Aims, nature and scope of research
Prerequisites of research
- UNIT 2: Research Problem
Meaning of research problem Sources of research problem Characteristics of a good research problem
Hypothesis: Meaning and types of hypothesis. Research proposal or synopsis.
- UNIT 3: Types and Methods of Research
Classification of Research
Pure and Applied Research
Exploring or Formulative Research
Descriptive Research
Diagnostic Research/Study
Evaluation Research/Studies
Action Research
Experimental Research
Historical Research
Surveys
Case Study
Field Studies
- Unit 4: Review of Related Literature
Purpose of the review. Identification of the related literature. Organizing the related literature.
- UNIT 5: Data Collection (Sampling) Sampling and Population Techniques of sampling
Selection Characteristics of a good sample Types of data.
- UNIT 6: Tools of Data Collection
Observation, Interview, Questionnaire, Rating scales, Attitude scales, Schedules, Characteristics of good research tools.
- UNIT 7: Statistics
Concept of statistics, relevance in education, parametric and non-parametric data; graphical representation of data: histogram, frequency polygon, ogive and pie chart; Measures of Central Tendency: concept, computation and interpretation; measures of variability: concept,

computation and interpretation; normal probability curve: concept, application and interpretation.

Correlation: concept, computation and interpretation- Product Moment, Rank Order, Biserial, Point Biserial, Phi, Contingency, Tetrachoric; significance of mean: concept, computation and interpretation of significance of t-test(correlated and uncorrelated, matched, paired-unpaired, matching- paired); ANOVA(One way) :concept, computation and interpretation, regression and prediction; chi square: concept, computation and interpretation (equal and normal probability).

UNIT 8: Research Report

Format of the research report Style of writing the report References and bibliography

Reference books:

1. Best John W. and James Kahn, V., 1989, Research in Education, Sixth Edition, Prentice- Hall of India Pvt.Ltd, New Delhi.
2. Sharma R.A., 1992, Fundamentals of Educational Research, Loyal Book Depot, Meerut, UP, India.
3. Kulbir Singh Sidhu, 1990, Methodology of Research in Education, Sterling Publishers Pvt. Ltd., New Delhi.
4. Lokesh Koul, 1997 Methodology of educational Research, third edition, Vikas Publishing House Pvt. Ltd. , New Delhi.
5. Kothari C.R., 1990, Research Methodology Methods and Techniques, Wiley Eastern Limited, New Delhi.
6. Borg Walter R., Gall Meridith D., 1983, Educational Research an Introduction, Fourth Edition, Longaman, New York &London.
7. Nitko Anthony J., 1983, Educational Tests and Measurement an Introduction, Harcourt Brace Jovanovich, Inc., New York.
8. Aggarwal Y.P., 1988, Statistical Methods Sterling Publishers Pvt. Ltd., New Delhi.
9. Garret Hnery E., 1985 Statistics in Psychology and Education, Viakils, Feffer and Simon, Bombay.
10. Guilford, J.P., and Benjamin Fruchter, 1982 Fundamentals of statistics in Psychology and Education, Fifth edition, Mc Graw-Hill Book Company, New York.
11. Gupta S.C. and Kapoor V.K., 1999, Fundamentals of Mathematical Statistics, Sultan Chand& Sons Educational Publishers, New Delhi.
12. Grewal P.S., Methods of Statistics Analysis, Sterling Publishers Pvt. Ltd., New Delhi.
13. Bruce W. Tuckman, Statistics in Psychology and Education.

Part-B

Botany

1. MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY

- A. Structure of atoms, molecules and chemical bonds.
- B. Composition, structure function of biomolecules (carbohydrates, lipids, protein, nucleic acids and vitamins)
- C. Principles of biophysical chemistry
(pH, buffer, reaction kinetics, thermodynamics, colligative properties)
- D. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
- E. Confirmation of nucleic acids (A-, B-, Z-DNA), t-RNA, micro-RNA)
- F. Stability of protein and nucleic acid structures.
- G. Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

2. CELLULAR ORGANISATIONS

- A. **Membrane structure and function** : Structure of model membrane, lipid bilayer and membrane, protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membrane.
- B. **Structural organization and function of intracellular organelles**: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, active transport, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure and function of cytoskeleton and its role in motility.
- C. **Organisation of genes and chromosomes**: Operon, interrupted genes, gene families, structure of chromatin and chromosome, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
- D. **Cell division and cell cycle**: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

3. SYSTEM PHYSIOLOGY- PLANT

- A. **Photosynthesis**: Light harvesting complexes; mechanisms of electron transport photoprotective mechanisms: CO₂ fixation-C₃, C₄ and CAM pathways.
- B. **Respiration and photorespiration**: Citric acid cycle, plant mitochondrial electron transport and ATP synthesis, alternative oxidase: photorespiratory pathway.

- C. Nitrogen metabolism:** Nitrate and ammonium assimilation: amino acid biosynthesis.
- D. Plant hormones:** Biosynthesis, storage, breakdown and transport: physiological effects and mechanism of action.
- E. Sensory photobiology:** Structure, function and mechanisms of action of Phytochromes. Cryptochromes and phototropins: stomatal movement: photoperiodism and biological clocks.
- F. Solute transport and photoassimilate translocation:** uptake, transport and translocation of water, ions, solutes and macromolecules from soil through cells, across membranes, through xylem and phloem, transpiration mechanisms of loading and unloading of photoassimilates.
- G. Secondary metabolites:** biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
- H. Stress physiology:** responses of plants to biotic (pathogen and insects) and abiotic (water temperature and salt) stresses: mechanisms of resistance to biotic stress and tolerance to abiotic stress.

4. SYSTEM PHYSIOLOGY- ANIMAL

- A. Blood and circulation:** Blood corpuscles, haemopoiesis and formed elements plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.
- B. Cardiovascular System:** Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG- its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.
- C. Respiratory system:** Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
- D. Nervous System:** Neurons, action potential, gross neuroanatomy of the brain and spinal cord. Central and peripheral nervous system, nervous control of muscle tone and posture.
- E. Sense Organs:** Vision, hearing and tactile response.
- F. Excretory System:** Comparative physiology of excretion, kidney, urine formation urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

- G. **Thermoregulation:** Comfort zone, body temperature, physical, chemical, neutral regulation, acclimatization.
- H. **Stress and adaptation**
- I. **Digestive System:** digestion, absorption, energy balance, BMR
- J. **Endocrinology and reproduction :** Endocrine glands, basic mechanism of hormone action, hormone and disease, reproductive processes, neuroendocrine regulation.

5. INHERITANCE BIOLOGY

- A. **Mendelian principles:** Dominance, segregation, independent assortment, deviation from Mendelian inheritance.
- B. **Concept of gene:** Allele, multiple alleles, pseudoallele, complementation tests.
- C. **Gene mapping methods:** Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.
- D. **Extra chromosomal inheritance:** Inheritance of mitochondrial and chloroplast genes, maternal inheritance.
- E. **Microbial genetics:** Methods of genetic transfers- transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.
- F. **Human genetics:** Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorder.
- G. **Mutation:** Types, causes and detection, mutant types- lethal, conditional, biochemical, loss of function , gain of function, germinal versus somatic mutants, insertional mutagenesis.
- H. **Structural and numerical alternations of chromosome:** Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
- I. **Recombination:** Homologous and non-homologous recombination, including transposition, site-specific recombination.

6. ECOLOGY PRINCIPLES

- A. **The Environment:** Physical environment: biotic and abiotic interactions.
- B. **Habitat and niche:** Concept of habitat and niche, niche width and overlap, fundamental and realized niche: resource partitioning: character displacement.

- C. Populatrion ecology:** Characterstics of a population, population growth curves, population regulation: life History strategies(r and k selection): concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.
- D. Species interactions:** Types of interactions, interspecific competition, herbivory, carnivory, pollination symbiosis.
- E. Community ecology:** Nature of communities: community structure and attributes: levels of species diversity and its measurement: edges and ecotones.
- F. Ecology succession:** Types, mechanisms, changes,involved in succession: concept of succession.
- G. Ecosystem:** Structure and function: energy flow and mineral cycling (CNP): primary production and decomposition: structure and function of some Indian Ecosystem terrestrial (forest, grassland) andaquatic (freshwater,marine, eustarine).
- H. Biogeography:** Major terrestrial biomes: theory of island biogeography: biogeographical zone of India.
- I. Applied Ecology:** Enviornmental pollution, global environmental change, biodiversity-status, monitoring and documentation: major drivers of biodiversity change,: biodiversity management approaches.
- J. Conservation biology:** Principles of conservation, major approaches to management, Indian case studies on conservation management strategy (Project Tiger Biosphere reserves).
- 7. Applied Biology:**
- A.** Microbial fermentation nad production of small and macro molecules.
- B.** Application of immunological principles (vaccines,diagnostics). Tissue and cell culture methods for plants and animals.
- C.** Transgenic animal and plants, molecular approaches to diagnosis and strain identification.
- D.** Biosource and uses of biodiversity.
- E.** Biosensors.
- 8. Methods in Biology**
- A. Molecular biology and recombinant DNA methods:** Isolation and purification

of RNA, DNA (genomic and plasmid) and proteins, different separation methods, analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing gel: molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems: expression of recombinant proteins using bacterial, animal and plant vectors: isolation of specific nucleic acid sequences: generation of genomic and cDNA libraries in plasmids, phage, cosmid, BAC and YAC vectors

B. Embryology: Elementary Knowledge

C. Economic Botany: Elementary Knowledge

D. Medicinal Plants : General plants of local plants of medical importance along with ocimum, commiphora, convolvulus, centella, chorophytum, perpever Aloe etc.

E. Algae in diversified habitats (terrestrial, fresh water, marine) salient features of proto chlorophyta, chlorophyta, charophyta, xanthophyta, Bacillareophta, Phacophyta and Rhodophyta. Alegal blooms, Alegal biofertilizers, algae as food, feed and uses in industry.

F. Etiology and control of the following crop diseases-

- Paddy-Bacterial and leaf blight.
- Wheat- Tundu disease.
- Bajra- Ergot.
- Sugar Cane- Redrot
- Groundnut- Tikka disease