

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
Chhatrapati Sambhajinagar-431004.
Syllabus of Ph.D.
Entrance Test 2024**

Subject: Zoology

Unit- I. Research Methodology:

- Quantitative, Methods and fundamental process
- Qualities of Researcher Components of research Problems Characteristics of a good question ,
- Difference between hypothesis and problem , Types of hypothesis , Types of error
- Various steps in scientific research – Types of research – Hypotheses Research Purposes- Research Designs
- Sampling methods, Understanding data, Frequency Distribution, Measure of central tendencies- Mean, Median, mode. Measurement of dispersion or Variability – Measure of dispersion.
- Probability distribution – Binominal, Poisson and Normal distribution
- The Z score Sampling distribution. Estimate and Confidence Interval-
- Correlation–Pearson correlation coefficient, Regression analysis. Chi Square tests, – tests, Analysis of Variance –
- Principles and application of Microscopy ,
- Collection, preservation and identification of Animals from different Taxa. Histopathological and histochemical techniques.
- Application of immunological techniques.
- Principles and applications of various separation techniques.
- Principles and techniques of nucleic acid hybridization and Cot curves,
- Sequencing of proteins and nucleic acids, Blotting techniques, Polymerase chain reaction

Recommended books:

1. Methodology of Research in Social Sciences by O. R. Krishnaswamy and M. Rangnatham Himalaya publication House, 2005, ISBN: 8184880936
2. Research Methodology: Methods and Techniques by C. R. Kothari, New Age International Publishers, ISBN:81-224-1522-9
3. Introduction to mathematics for life scientists By Batschetelet , E. ,Springer – Verlag.Berlin
4. Biometry , by Sokal, R.R. and R.J.Rolf , Freeman, San Francisco
5. Tentative Zoology Syllabus for PG Page 3
6. Statistical methods by Snedecor, G.W. and W.G. Cochran. Affiliated East West Press.New Delhi. (India Ed.)
7. Sampling design and statistical methods for environmental biologist by Green , R.H. ,John Wiley and Sons, New York.
8. Mathematical Biology by Murray , J.D., Springer Verlag, Berlin.
9. The Interpretation of Ecological Data. A Primer on classification and Ordination by Pielou, E.C.

Unit- II. Taxonomy and diversity, Applied Zoology

- Species concept, Biological nomenclature theories of biological classification, Structural biochemical and molecular systematic, DNA finger printing, numerical taxonomy,
- Biodiversity, characterization, generation, maintenance and loss, Magnitude and distribution of biodiversity, economic value, wildlife biology, conservation strategies, cryopreservation.
- Principles of taxonomy as applied to the systematic and classification of the animal kingdom, Classification and interrelationship amongst the major invertebrate phyla, Minor invertebrate phyla, functional anatomy of the non-chordates, Larval forms and their evolutionary significance.
- Important human and veterinary parasites.
- Molecular, cellular and physiological basis of host-parasite interactions.
- Arthropods and vectors of human diseases (mosquitoes, lice, flies, and ticks), Mode of transmission of pathogens by vectors, Chemical biological and environmental control of arthropod vectors.
- Biology and control of chief insect pests of agricultural importance, Plant host-insect interaction, insect-pest management,
- Beneficial /useful insects, Different animal cultures and its significance.

Recommended Books

1. Mayr and Ashock :Principles of systematic Zoology .
2. Simpson :Principle of animal taxonomy. Oxford IBH Pub. Company
3. M. Kato :The Biology of Biodiversity, Springer.
4. Biodiversity ,Academic press Washington – E.O.Wilson
5. Biodiversity Principles and conservation , Kumar and Aseja Agrobios Sidia
6. Biodiversity and Environment Agrawal Tiwari and Dubey
7. E.O. Wilson: Biodiversity, Academic Press, Washington
8. Chatterjee K. D. (1969) –Parasitology (Protozoology and Helminthology)
9. Cheng T.C. (1964)-The Biology of animal parasites, Saunders International Student Edition.
10. The Invertebrates Vol II, McGraw Hill, New York.- Dawes B. (1946).
11. B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta
12. Applied Entomology 2nd edition, P. G Fenemore, Alka Prakash, Publisher : New Age International
13. Introduction to Insect Biology & Diversity” . Daly, H. V., J. T. Doyen & P.R.
14. Ehrilch (1981) : International Student Edn. McGraw- Hill, Kogakusha, Japan.
15. Young, J.Z. :Life of Vertebrates. The Oxford University Press, London.
16. Parker and Haswell : Text book of Zoology vol. II
17. Goodrich.: Structure and Development of Vertebrates Vol.I and II.
18. Watermann, A.J. : Chordate Structure and Function, Mac Millan Co. New York.
19. Weichert C.K. : Anatomy of Chordates 4th edn. MC Graw Hill Books Co. New York.

Unit- III. Biochemistry and Animal Physiology

- Structure of atoms, molecules and chemical bonds,
- Principles of physical chemistry, Thermodynamics, kinetics, dissociation and association constants.
- Nucleic acid structure, genetic code, replication, transcription and translation : Structure, function and metabolism of carbohydrates, lipids and proteins,
- Enzymes and coenzyme, Respiration and photosynthesis. Enzyme kinetics, Regulation of enzymatic activity, Active sites, Coenzymes, Activators and inhibitors, isoenzymes, allosteric enzymes,
- Primary structure of proteins and nucleic acids, Conformation of proteins and polypeptides (secondary, tertiary, quaternary and domain structure), Structural polymorphism of DNA, RNA and three-dimensional structure of tRNA,
- Structure of carbohydrates, polysaccharides, glycoproteins and peptido-glycans.
- Lipid chemistry.
- Response to stress, Active transport across membranes, Plant and animal hormones Nutrition, Reproduction in plants, microbes, plant and animals, Sensory responses in microbes, plant and animals.
- Mammalian organ systems, nutrition, digestion and absorption, Circulation (open and closed circular, lymphatic systems, blood composition and function), Excretion and osmoregulation
- Muscular contraction and electric organs,:
- Nerve conduction and neurotransmitter, major sense organs and receptors, Homeostasis (neural and hormonal),
- Bioluminescence, Reproduction. Glycolysis and TCA cycle, Glycogen breakdown and synthesis, Gluconeogenesis, interconversion of hexoses and pentoses, Amino acid metabolism, Coordinated control of metabolism,
- Thermodynamic principles in biology, Energy rich bonds, Weak interactions, Coupled reactions and oxidative phosphorylations, Group transfers,
- Biological energy transducers, Bioenergetics. Feeding, learning, social and sexual behavior of animals, Parental care, Circadian rhythms, Mimicry, Migration of fishes and birds, Sociobiology, Physiological adaptation at high altitude.

Books Recommended :

1. Principles of Biochemistry by Lehninger
2. Biochemistry by Voet and Voet.
3. Biochemistry by Zubey
4. Biochemistry by Stryer
5. Outline of biochemistry By Cohn and Stump
6. Physiological biochemistry By Harper
7. Comparative Animal Physiology by Prosser C.L.
8. General and Comparative Physiology by Floren W.A.
9. General and Comparative Physiology by Hoar W. B.
10. Animal Physiology by Neilsen K.S.
11. General Physiology by Giese A.C.
12. Principles of Animal Physiology by Wilson J.A.
13. Animal Physiology by Gordon G.L.
14. Modern Physiology by Strang F.L.

15. General Physiology by Guyton
16. Animal Physiology by William and Hoar
17. Molecular biology of the cell By Albert et al
18. Molecular biology of the Gene by Watson et al
19. Genes By Lewin

Unit- IV. Cell and Developmental Biology

- Structure and function of cells and intracellular organelles (of both prokaryotes and eukaryotes),
- Mechanism of cell division including (mitosis and meiosis) and cell differentiation; Cell-cell interaction, Dosage compensation and Structure of pro and eukaryotic cells, Membrane structure and function, Intracellular compartments, Structure and organization of membranes, Glyco-conjugates and proteins in membrane systems, ion transport/Na/K ATPase/Molecular basis of signal transduction in bacteria and animals, Model membranes, Leptosomes. protein sorting, secretory and endocytic pathways, Cytoskeleton, Nucleus, Mitochondria and chloroplasts and their genetic organization, cell cycle,
- Structure and organization of chromatin, polytene and lampbrush chromosomes, Dosage compensation and sex determination and sex-linked inheritance.
- Antigen : Structure and functions of different classes of immunoglobulin, Primary and secondary immune response, Lymphocytes and accessory cells, Humoral and cell mediated immunity, MHC, Mechanism of immune response and generation of immunological diversity; Genetic control of immune response, Effector mechanism,
- Gametogenesis in animals : Molecular events during fertilization, Cleavage patterns and fate maps, Concepts of determination, competence and induction, totipotency and nuclear transfer experiments,
- Cell differentiation and differential gene activity. Morphogenetic determinants in egg cytoplasm,
- Role of maternal contributions in early embryonic development, Genetic regulation of early embryonic development in *Drosophila*,
- Homeotic genes. Mechanism of sex determination.
- Biochemistry and molecular biology of cancer, Oncogenes, Chemical carcinogenesis, Genetic and metabolic disorders,
- Hormonal imbalances, Drug metabolism and detoxification, Genetic load and genetic counseling

Text Books recommended:

1. Molecular Cell Biology : Lodish et al
2. Molecular Cell Biology : J Darnell and others. Fifth Edition
3. Molecular biology of the cell -B. Alberts et al. Gartand publishing Inc. New York
4. Cell and Molecular Biology De robertis and De robertis :
5. Gene VIII -Benjamin Lewin
6. Cell Physiology - Giese A.C. :
7. Molecular biology of the Gene -Watson et al
8. Developmental Biology by Gilbert Scott
9. Molecular biology of the cell By Albert et al
10. Molecular biology of the Gene by Watson et al
- 11 Principle of Development by Wolpert

12. Genes VIII/ IX By Benjamin Lewin
- 13.. Developmental Biology by Balinsky
14. Developmental Biology by Berril
15. Developmental Biology by Waddington

Unit- V. Evolution, Ecology, Animal behaviour and Genetics

- Origin of life (including aspects of prebiotic environment and molecular Evolution), Concepts of evolution, Theories of organic evolution, Mechanisms of speciation,
- Hardy-Weinberg genetic equilibrium, genetic polymorphism and selection, Origin and evolution of economically important microbes, plants and animals.
- Classification and comparative anatomy of protochordates and chordates, Origin, evolution and distribution of chordate groups: Adaptive radiation.
- The law of DNA constancy and C-value paradox, Numerical and structural changes in chromosomes, Molecular basis of spontaneous and induced mutation and their role in evolution, Environment mutagenesis and toxicity testing,
- Population genetics. Concept and dynamics of ecosystem, components, food chain and energy flow, productivity and biogeochemical cycles, Types of ecosystems, Population ecology and biological control,
- Community structure and organization, Environmental pollution, Sustainable development, Economic importance of microbes, plants and animals.
- Ecosystem dynamics and management: Stability and complexity of ecosystems, Speciation and extinction,
- Environmental impact assessment, Principles of conservation, Conservation strategies, Sustainable development.
- Physico-chemical properties of water, Kinds of aquatic habitats (fresh water and marine), Productivity, mineral cycles and biodegradation in different aquatic ecosystems, Fish and Fisheries of India with respect to the management of estuarine, coastal water systems and man-made reservoirs, Biology and ecology of reservoirs. Interactions between environment and biota,
- Concept of habitat and ecological niches, Limiting factors, Energy flow, food chain, food web and trophic levels,
- Ecological pyramids and recycling, Biotic community—concept, structure, dominance, fluctuation and succession, N.P.C. and S Cycles in nature.

Books recommended

1. Hartman and Surkind – Gene action
2. Hexter and Yost – The science of Genetics
3. Sinnot, Dunn and Dobzhansky- Principles of Genetics
4. Alberts B., Bray D., Lewis J., Rabt M., Robert K. and J. D.Watson. Molecular Biology of the Cell, Garland Publishing Inc. London.
5. Simmon, S. and Snustad: Principles of Genetics, 8th Edition, John Wiley and Sons Inc. N.Y.
6. Hartl D.L. and Jones E.W. Genetics: Analysis of gene and genome. Jones and Bartlett publishers . Boston
7. Tamarin R.H. Principles of Genetics. Wadsworth Publishing company ,Belmont, California.

9. Winchester A.M. Genetics Oxford and IBH Publishing co New Delhi.
10. Genetics By Strichberger
12. Futuyama, D.J. Evolution. Surjeet Publication, Delhi.
13. Jha, A.P. Genes and Evolution. John Wiley Publication, New Delhi.
14. Savage J.M Evolution. Amerind Publishing Co. New Delhi.
15. Animal behavior and Evolutionary Approach by Alcock
16. Perspectives in animal behavior Goodenough , Wiley 1993
17. An introduction to animal behavior 5 th ed. Cambridge Univ Press. By Manning Dawkins.
18. Ecology –E.P.Odum
19. Limnology –P.S.Welch
20. Environment and Man –R.H. Wagher
21. Man fresh water ecology –T.T. Macan
22. Biodiversity, Academic press Washington – E.O.Wilson