

विज्ञापन क्रमांक-03/चयन/2012 दिनांक 31.12.2012 के अंतर्गत
जिला मलेरिया अधिकारी लिखित परीक्षा-2012 की
परीक्षा योजना एवं पाठ्यक्रम

1. जिला मलेरिया अधिकारी के रिक्त पदों की परीक्षा में सिर्फ एक प्रश्न पत्र होगा जिसमें वस्तुनिष्ठ प्रश्न होंगे।
2. इस प्रश्न पत्र में प्राणीशास्त्र विषय के 70 प्रश्न एवं प्राणीशास्त्र के कीट विज्ञान विषय के 30 प्रश्न इस प्रकार कुल 100 प्रश्न होंगे। इस प्रश्न पत्र में सभी प्रश्न वस्तुनिष्ठ प्रकार के **A,B,C, D** संभावित उत्तरों वाले होंगे। प्रत्येक प्रश्न 2 अंकों का होगा, तथा समयावधि 2 घंटे होगी। इस प्रकार कुल पूर्णांक 200 अंकों का होगा।
3. प्रश्न पत्र अंग्रेजी भाषा में होगा।
4. लिखित परीक्षा में आवश्यक उत्तीर्णांक :-

लिखित परीक्षा में उत्तीर्ण होने हेतु अनारक्षित आवेदकों को प्रश्नपत्र में 40 प्रतिशत अंक प्राप्त करना अनिवार्य होगा। मध्यप्रदेश के अधिसूचित अनुसूचित जाति, अनुसूचित जनजाति तथा अन्य पिछड़ा वर्ग श्रेणी एवं निशक्त के आवेदकों को लिखित परीक्षा में उत्तीर्ण होने हेतु 10% की छूट अर्थात् 30% प्राप्तांक आवश्यक हैं। इस छूट का लाभ मध्यप्रदेश के मूल निवासी को ही मिलेगा। इसमें लिखित परीक्षा में प्राप्त अंकों के आधार पर श्रेणीवार गुणानुक्रम में विभिन्न वर्गों से भरी जाने वाली कुल रिक्तियों की पद संख्या के तीन गुना तथा समान अंक प्राप्त करने वाले आवेदक साक्षात्कार हेतु आमंत्रित किये जावेंगे।

5. साक्षात्कार के लिए कुल 25 अंक निर्धारित है।
6. साक्षात्कार उपरान्त चयनफल साक्षात्कार एवं लिखित परीक्षा में प्राप्त कुल अंकों के योग के मेरिट क्रमानुसार घोषित किया जायेगा।
7. लिखित परीक्षा, संभागीय मुख्यालय इंदौर में आयोजित होगी।

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District Malaria officer Exam

Syllabus of Zoology

(A) (प्राणीशास्त्र विषय से 70 प्रश्न होंगे)

1. MOLECULES AND THEIR INTERACTION :

- A. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).
- B. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).
- C. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
- D. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
- E. Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds).
- F. Conformation of nucleic acids (A-, B-, Z-DNA), t-RNA, micro-RNA).
- G. Stability of protein and nucleic acid structures.
- H. Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

2. CELLULAR ORGANIZATION

- 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 membranes.
- B. Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.
- C. Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, 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.
- E. Microbial Physiology: Growth, yield and characteristics, strategies of cell division, stress response.

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3. FUNDAMENTAL PROCESSES

- A. DNA replication, repair and recombination: Unit of replication, enzymes involved replication, origin and replication fork, extrachromosomal replicons, DNA damage and repair mechanisms.
- B. RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.
- C. Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post-translational modification of proteins.
- D. Control of gene expression at transcription and translation level: Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing.

4. CELL COMMUNICATION AND CELL SIGNALING

- A. Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.
- B. Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signalling pathways, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing.
- C. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
- D. Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

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- E. **Innate and adaptive immune system:** Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity, B and T cell epitopes, structure and function of antibody molecules, generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies, vaccines.

5. DEVELOPMENTAL BIOLOGY

- A. **Basic concepts of development:** Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.
- B. **Gametogenesis, fertilization and early development:** Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.
- C. **Morphogenesis and organogenesis in animals:** Cell aggregation and differentiation in *Dictyostellium*; axes and pattern formation in *Drosophila*, amphibia and chick; organogenesis - vulva formation in *Caenorhabditis elegans*; eye lens induction; limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.
- E. **Programmed cell death, aging and senescence.**

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Structure and Function of Invertebrates:-

- A. Origin of metazoa, organization of coelom (Acoelomates, Pseudocoelomates and coelomates).
- B. Locomotion – Amoeboid, flagellar and ciliary movement in protozoa, Hydrostatic movement in coelenterata, Annelida and Echinodermata.
- C. Nutrition & Digestion- Patterns of feeding and digestion in lower metazoa, Mollusca, Echinodermata, Fitter, feeding in Polychaeta.
- D. Respiration – Organs of respiration : Gills, lungs and trachea, respiratory pigments, mechanism of respiration.
- E. Excretion – Excretion in lower and higher invertebrates.
- F. Mechanism of Osmoregulation.
- G. Nervous system – primitive and advanced nervous system.
- H. Larval forms and their evolutionary significance in helminths, Arthropodes, Molluscs and Echinodermates.
- I. Structure, affinities and life history of – Rotifera, Entoprocta, Phoronida and Ectoprocta.

7. Structure and functions of Lower & Higher Vertebrates-

- 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.

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- D. **Nervous system:** Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural 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, neural 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, hormones and diseases; reproductive processes, neuroendocrine regulation.
 - Embryology : Principle, Development & Functions.

8. INHERITANCE BIOLOGY

- A. **Mendelian principles:** Dominance, segregation, independent assortment, deviation from Mendelian inheritance.
- B. **Concept of gene:** Allele, multiple alleles, pseudoallele, complementation tests.
- C. **Extensions of Mendelian principles:** Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
- D. **Gene mapping methods:** Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.
- E. **Extra chromosomal inheritance:** Inheritance of mitochondrial and chloroplast genes, maternal inheritance.
- F. **Microbial genetics:** Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.
- G. **Human genetics:** Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

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- H. **Quantitative genetics:** Polygenic inheritance, heritability and its measurements, QTL mapping.
- I. **Mutation:** Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants, insertional mutagenesis.
- J. **Structural and numerical alterations of chromosomes:** Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
- K. **Recombination:** Homologous and non-homologous recombination, including transposition, site-specific recombination.

9. DIVERSITY OF LIFE FORMS

- A. **Principles and methods of taxonomy:** Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of plants, animals and microorganisms.
- B. **Levels of structural organization:** Unicellular, colonial and multicellular forms; levels of organization of tissues, organs and systems; comparative anatomy.
- C. **Outline classification of plants, animals and microorganisms:** Important criteria used for classification in each taxon; classification of plants, animals and microorganisms; evolutionary relationships among taxa.
- D. **Natural history of Indian subcontinent:** Major habitat types of the subcontinent, geographic origins and migrations of species; common Indian mammals, birds; seasonality and phenology of the subcontinent.
- E. **Organisms of health and agricultural importance:** Common parasites and pathogens of humans, domestic animals and crops.

10. ECOLOGICAL PRINCIPLES

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

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- C. **Population ecology:** Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemtic 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. **Ecological succession:** Types; mechanisms; changes involved in succession; concept of climax.
- G. **Ecosystem:** Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems; terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). Food Chain.
- H. **Biogeography:** Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
- I. **Applied ecology:** Environmental pollution; global environmental change; biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches, Remote sensing.
- J. **Conservation biology:** Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves). Life Conservation of Forest.

11. EVOLUTION AND BEHAVIOUR

- A. **Emergence of evolutionary thoughts:** Lamarck; Darwin—concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; spontaneity of mutations; the evolutionary synthesis.
- B. **Origin of cells and unicellular evolution:** Origin of basic biological molecules; abiotic synthesis of organic monomers and polymers; concept of Oparin and Haldane; experiment of Miller (1953); the first cell; evolution of prokaryotes; origin of eukaryotic cells; evolution of unicellular eukaryotes; anaerobic metabolism, photosynthesis and aerobic metabolism.
- C. **Paleontology and evolutionary history:** The evolutionary time scale; eras, periods and epoch; major events in the evolutionary time scale; origins of unicellular and multicellular organisms; major groups of plants and animals; stages in primate evolution including Homo.

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- D. **Molecular Evolution:** Concepts of neutral evolution, molecular divergence and molecular clocks; molecular tools in phylogeny, classification and identification; protein and nucleotide sequence analysis; origin of new genes and proteins; gene duplication and divergence.
- E. **The Mechanisms:** Population genetics -- populations, gene pool, gene frequency; Hardy-Weinberg law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; adaptive radiation and modifications; isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution; sexual selection; co-evolution.
- F. **Brain, Behavior and Evolution:** Approaches and methods in study of behavior; proximate and ultimate causation; altruism and evolution-group selection, kin selection, reciprocal altruism; neural basis of learning, memory, cognition, sleep and arousal; biological clocks; development of behavior; social communication; social dominance; use of space and territoriality; mating systems, parental investment and reproductive success; parental care; aggressive behavior; habitat selection and optimality in foraging; migration, orientation and navigation; domestication and behavioral changes.

12. **APPLIED BIOLOGY:**

- A. Microbial fermentation and production of small and macro molecules.
- B. Application of immunological principles (vaccines, diagnostics). tissue and cell culture methods for plants and animals.
- C. Transgenic animals and plants, molecular approaches to diagnosis and strain identification.
- D. Genomics and its application to health and agriculture, including gene therapy.
- E. Bioresource and uses of biodiversity.
- F. Breeding in plants and animals, including marker - assisted selection.
- G. Bioremediation and phytoremediation.
- H. Biosensors.

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13. 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 gels; 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 plasmid, phage, cosmid, BAC and YAC vectors; *in vitro* mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms; protein sequencing methods, detection of post-translation modification of proteins; DNA sequencing methods, strategies for genome sequencing; methods for analysis of gene expression at RNA and protein level, large scale expression analysis, such as micro array based techniques; isolation, separation and analysis of carbohydrate and lipid molecules; RFLP, RAPD and AFLP techniques
- B. **Histochemical and immunotechniques:** Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH.
- C. **Biophysical methods:** Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.
- D. **Statistical Methods:** Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; χ^2 test; basic introduction to Multivariate statistics, etc.
- E. **Radiolabeling techniques:** Properties of different types of radioisotopes normally used in biology, their detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.
- F. **Microscopic techniques:** Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.
- G. **Electrophysiological methods:** Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.

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11. **Methods in field biology:** Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.
1. **Computational methods:** Nucleic acid and protein sequence databases; data mining methods for sequence analysis, web-based tools for sequence searches, motif analysis and presentation.

(B) SYLLABUS –ZOOLOGY-ENTOMOLOGY

(प्राणीशास्त्र के कीटविज्ञान विषय से 30 प्रश्न होंगे)

Unit-1	<ol style="list-style-type: none"> 1. Insect head types and modification as per their habit and habitat 2. Modification of mouth parts and feeding behavior 3. Structure types and function of antennae 4. Hypothetical wing venation
Unit-2	<ol style="list-style-type: none"> 1. Structure of cuticle and pigment 2. Sclerotisation and tanning of the cuticle 3. Structure of alimentary canal and Physiology of digestion 4. Malpighian tubules- anatomical organization , Transport
Unit-3	<ol style="list-style-type: none"> 1. Structure of circulatory system 2. Cellular elements in the haemolymph 3. Cell mediated and humoral immunity <p>Structure of compound eye and Physiology of Vision</p>
Unit-4	<ol style="list-style-type: none"> 1. Sound Production in insect 2. Structure and function of endocrine glands 3. Pheromones 4. Embryonic membranous up to the formation of blastoderm
Unit-5	<ol style="list-style-type: none"> 1. Metamorphosis 2. Insecticide effects on CNS 3. Important pest of Soybean <p>Modern concept of pest management</p>

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