

જાહેરાત ક્રમાંક -૯૫/૨૦૧૮-૧૯

સરકારી વિનયન, વાણિજ્ય અને વિજ્ઞાન કોલેજો ખાતે પ્રાણીશાસ્ત્ર વિષયના મદદનીશ પ્રાધ્યાપક, વર્ગ-૨ પ્રાથમિક કસોટીનો

અભ્યાસક્રમ ભાગ -૧

માધ્યમ:ગુજરાતી

કુલ ગુણ :૧૦૦

૧	ભારતની ભૂગોળ - ભૌગોલિક, આર્થિક, સામાજિક, કુદરતી સંસાધન અને વસ્તી અંગેની બાબતો- ગુજરાતના ખાસ સંદર્ભ સાથે
૨	ભારતનો સાંસ્કૃતિક વારસો- સાહિત્ય, કલા, ધર્મ અને સ્થાપત્યો- ગુજરાતના ખાસ સંદર્ભ સાથે
૩	ભારતનો ઈતિહાસ- ગુજરાતના ખાસ સંદર્ભ સાથે
૪	ભારતની અર્થવ્યવસ્થા અને આયોજન
૫	<u>ભારતીય રાજનીતિ અને ભારતનું બંધારણ:</u> (૧) આમુખ (૨) મૂળભૂત અધિકારો અને ફરજો (૩) રાજ્યનીતિના માર્ગદર્શક સિદ્ધાંતો (૪) સંસદની રચના (૫) રાષ્ટ્રપતિની સત્તા (૬) રાજ્યપાલની સત્તા (૭) ન્યાયતંત્ર (૮) અનુસૂચિત જાતિ, અનુસૂચિત જનજાતિ અને સમાજના પછાત વર્ગો માટેની જોગવાઈઓ (૯) એટર્ની જનરલ (૧૦) નીતિ આયોગ (૧૧) પંચાયતી રાજ (૧૨) નાણા પંચ (૧૩) બંધારણીય તથા વૈધનિક સંસ્થાઓ- ભારતનું ચૂંટણી પંચ, સંઘ લોક સેવા આયોગ, રાજ્ય લોક સેવા આયોગ, કોમ્પ્યુટર એન્ડ ઓડિટર જનરલ; કેન્દ્રીય સતર્કતા આયોગ, લોકપાલ તથા લોકાયુક્ત અને કેન્દ્રીય માહિતી આયોગ
૬	સામાન્ય બૌદ્ધિક ક્ષમતા કસોટી
૭	સામાન્ય વિજ્ઞાન, પર્યાવરણ અને ઈન્ફર્મેશન એન્ડ કોમ્યુનિકેશન ટેકનોલોજી
૮	ખેલ જગત સહિત રોજબરોજના પ્રાદેશિક, રાષ્ટ્રીય અને આંતરરાષ્ટ્રીય મહત્વના બનાવો

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Assistant Professor of Zoology in Govt. Arts, Science, Commerce College Class-II

Syllabus of Preliminary Test

Paper-1

Medium:Gujarati

Total Marks- 100

1	Geography of India-Physical, Economic, Social, Natural Resources and population related topics- with special reference to Gujarat
2	Cultural heritage of India-Literature, Art, Religion and Architecture- with special reference to Gujarat
3	History of India with special reference to Gujarat
4	Indian Economy and Planning
5	<u>Indian Polity and the Constitution of India:</u> (1) Preamble (2) Fundamental Rights and Fundamental Duties (3) Directive Principles of State Policy (4) Composition of Parliament (5) Powers of the President of India (6) Powers of Governor (7) Judiciary (8) Provisions for Scheduled Castes, Scheduled Tribes and backward classes of the society (9) Attorney General (10) NITIAayog (11) Panchayati Raj Institutions (12) Finance Commission (13) Constitutional and Statutory Bodies: Election Commission of India, Union Public Service Commission, State Public Service Commission, Comptroller and Auditor General; Central Vigilance Commission, Lokpal and Lokayukta, Central Information Commission
6	General Mental Ability
7	General Science, Environment and Information & Communication Technology
8	Daily events of Regional, National and International Importance including Sports

**Syllabus for the Preliminary Examination for the
recruitment of Assistant Professor (Zoology), Class-II**

1. DIVERSITY OF ANIMAL FORMS

- A. Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy.
- B. Outline classification of animals: Important criteria used for classification in each taxon. Classification of animals. Evolutionary relationships among taxa.
- C. Organisms of conservation concern: Rare, endangered species.

2. ECOLOGICAL PRINCIPLES

- A. The Environment: Physical environment; biotic 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. Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemec 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 Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems:

terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).

- 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.
- J. Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

3. 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. Paleontology and Evolutionary History: The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Major groups of animals; Stages in primate evolution including Homo.
- C. 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.
- D. 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; Isolating mechanisms;

Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

- E. 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.

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, 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. Digestive system - Digestion, absorption, energy balance, BMR.

H. Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation

5. INHERITANCE BIOLOGY

A. Mendelian principles: Dominance, segregation, independent assortment.

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 sexduction or F-duction, mapping genes by interrupted mating, fine structure analysis of genes.

G. Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

H. Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

- I. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
- J. Recombination: Homologous and non-homologous recombination including transposition.

6. FUNDAMENTAL PROCESSES

- A. DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination.
- B. RNA synthesis and processing: transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and 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, and translational proof-reading, translational inhibitors, Post-translational modification of proteins.
- D. Control of gene expression at transcription and translation level: Regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing.

7. 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
- C. Morphogenesis and organogenesis in animals: 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 - regeneration, larval formation, metamorphosis; environmental regulation of normal development; sex determination.

8. CELL COMMUNICATION AND CELL SIGNALING

- A. Cell signaling Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways
- B. 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.
- C. 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, congenital and acquired immunodeficiencies, vaccines.

9. CELLULAR ORGANIZATION

- A. Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane 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, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons.
- D. Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle.

10. MOLECULES AND THEIR INTERACTION RELEVANT TO ZOOLOGY

- A. Structure of atoms, molecules and chemical bonds
- B. Composition, structure and function of biomolecules: carbohydrates, lipids, proteins, nucleic acids and vitamins.
- C. Stabilizing interactions: Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.
- D. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).

- E. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
- F. Enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
- G. Conformation of proteins (Primary and secondary structure, domains, motif and folds).
- H. Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).
- I. Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

11. APPLIED BIOLOGY

- A. Fermentation and production of small and macro molecules.
- B. Application of immunological principles, vaccines, diagnostics. Tissue and cell culture methods.
- C. Transgenic organisms, molecular approaches to diagnosis and strain identification.
- D. Bioremediation and phytoremediation
- E. Biosensors

12. 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 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 knockout 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, 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, fluocytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.
- C. Biophysical Method: Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy Molecular structure determination using X-ray diffraction and NMR, Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.
- D. Radiolabeling techniques: Detection and measurement of different types of radioisotopes normally used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.
- E. Microscopic techniques: Visulization 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.
- F. Electrophysiological methods: Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.

G. Methods in field biology: Methods of estimating population density of animals, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization: ground and remote sensing methods.

13. Current Trends and Recent Advancements in Zoology