

**Syllabus of Research Eligibility Test-2019**  
**Department of Physiology**  
**University of Gour Banga**

<i>Unit</i>	<i>Topics</i>	<i>Full Marks (100)</i>
<b>Unit –I</b> <b>(Research Methodology)</b>	<i>Research Aptitude, Teaching Aptitude, Information and Communication Technology (ICT), People and Environment, Higher Education System, Governance, Polity and Administration, Biostatistics.</i>	<i>MCQ 50 marks 2 marks each) 2X25 =50</i>
<b>Unit-II</b> <b>(PG Physiology)</b>	<i>Biomolecules and their properties, System Physiology, Cell biology, Cell signalling, Immunology, Microbiology, Molecular biology, Biochemistry &amp; Bioenergetics, Methods In Biology, Sports Physiology and Ergonomics, Clinical and Therapeutic nutrition.</i>	<i>MCQ 50 marks (2 marks each)2X25 =50</i>

## ***Unit –I***

(MCQs – 50 Marks)

*Research Aptitude:* Research Meaning, Characteristics and Types; Steps of Research; Methods of Research; Research Ethics; Paper, Articles, Workshop, Seminar, Conference and Symposium; Thesis Writing : Its characteristics and format.

*Teaching Aptitude:* Teaching : Nature, Objectives, Characteristics and Basic Requirements. Learner's Characteristics. Factors affecting Teaching. Methods of Teaching. Teaching aids. Evaluation Systems.

*Information and Communication Technology (ICT):* ICT: Meaning, Advantages, Disadvantages and Uses. General Abbreviation and Terminology, Basics of Internet and E – mailing. Computer hardware and software.

*People and Environment:* People and Environment Interaction. Sources of Pollution. Pollutants and their impact on Human Life, Exploitation of Natural and Energy Resources. Natural hazards and mitigation.

*Higher Education System, Governance, Policy and Administration:* Structure of the Institutions for Higher Learning and Research in India; Formal and Distance Education; Professional / Technical and General Education; Value Education; Governance, Polity and Administration; Concept, Institutions and their Interactions.

*Biostatistics:* Probability distributions; Sampling distribution; Difference between parametric and non-parametric statistics; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance; Statistical software.

## ***Unit –II***

(MCQs – 50 Marks)

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

*b. System Physiology:*

*Blood and circulation:* Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemostasis. *Cardiovascular System:* anatomy, myogenic heart, specialized tissue, ECG cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above. *Respiratory system:* Anatomy, transport of gases, neural and chemical regulation of respiration. *Nervous system:* Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system.

*Excretory system:* Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination. *Thermoregulation:* Comfort zone, body temperature –

physical, chemical, neural regulation, acclimatization. Stress and adaptation *Digestive system*: Digestion, absorption, BMR. Acid base in digestion.

*c. Cell Biology*: Membrane structure and function: Structure of model membrane, diffusion, osmosis, ion channels, transports, ion pumps, electrical properties of membranes. Structures and functions of cellular components. structure & function of cytoskeleton and its role in motility. Operon concept, gene families, unique and repetitive DNA, heterochromatin, euchromatin, transposons. Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

*d. Cell Signalling*: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction, second messengers, regulation of signaling pathways, quorum sensing. General principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. 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.

*e. Immunology*: Innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, antibody molecules & diversity, antigen-antibody interactions, MHC molecules, antigen processing and presentation, B and T cell biology. Immune modulation, 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 immuno deficiencies, vaccines. Tumor immunology.

*f. Microbiology*: Classification of micro organisms, Growth and nutritional requirements of bacteria: Study of some important genus of bacteria of medical importance: staphylococci, streptococci, clostridia, neisseria, mycobacteria, salmonella, vibrio, shigella. Study of some important groups of viruses: herpes viruses. hepatitis viruses, orthomyxoviruses, paramyxoviruses, picornaviruses; retroviruses: HIV and AIDS. Study of some important groups of protozoa: general characteristics, the traditional groups of protozoa: sarvodina, ciliophora, mastigophora, sporozoa, some common protozoa mediated diseases: amebiosis, giardiasis, trypanosomiasis, leishmaniasis, malaria.

*g. Molecular Biology and Biotechnology*: DNA replication, repair and recombination, replication origin and fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms. RNA synthesis and processing, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport. Protein synthesis and processing, translational proof-reading, translational inhibitors, post- translational modification of proteins. Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing. Plasmid, Cosmid, Vector, Cloning.

*h. Biochemistry & Bioenergetics*: Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes. Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure;

domains; motif and folds). Conformation of nucleic acids (A-, B-, Z-,DNA), t-RNA, micro-RNA). Stability of protein and nucleic acid structures. Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

*i. Methods In Biology:* Recombinant DNA technology, Isolation and purification of RNA , DNA, proteins; 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; cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; gene knock out DNA sequencing, micro array, RFLP, RAPD and AFLP techniques, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, floweytometry and immunofluorescence microscopy, detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH. Biophysical methods: UV/visible, FTIR, XRD NMR. Microscopic techniques: microscopy of living cells, scanning and transmission microscopes, Electrophysiological methods: ECG, EMG, MRI, CT scan.

*j. Sports Physiology and Ergonomics:* Anthropometry: Definition of anthropometry; Static, dynamic & Newtonian anthropometry; Application of anthropometry in design; Nutrition in sports and exercise; Cardio-respiratory changes in sedentary and trained persons during exercise; Concept of physical fitness; Physiological effects of doping/drug abuse. Ergonomics, Safety & Exercise Physiology Management of systems; Work, time and motion study; Ergonomics & safety: Application of ergonomics for the development of safety; Analysis of accident; Unsafe conditions; Personal protective device; Occupation health and safety norms; Comfort, Productivity, Man-machine Interaction, Injury.

*k. Clinical and Therapeutic nutrition:* Diet, Nutrient and Drug Interaction. Effect of foods, nutrients and nutritional status on drug dosage and efficacy. Nutritional care in Weight Management. Weight imbalance. Guidelines for calculating ideal body weight. Obesity. Dietary modifications, Lifestyle modifications, Pharmaceutical management, Preventive aspects Underweight – Etiology, Metabolic aberrations & clinical manifestations, Dietary management. Nutrition in Eating Disorders, Nutritional assessment, Nutrition management, Nutrition education. Nutrition Therapy for Upper and lower Gastro Intestinal Tract, Therapy for Liver, Biliary System and Exocrine Pancreas. Disorders: types. Etiology, signs & symptoms, complications, Nutritional care & medical management. Nutritional management in Hypertension and Coronary Heart Diseases, Alzheimer's disease Parkinson's disease, Renal Diseases: Glomerulonephritis, Nephrotic Syndrome, Acute Renal Failure.