GOKUL GLOBAL UNIVERSITY
SIDHPUR, GUJARAT

NAAC A GRADE

SECTION – A

(Common for all candidates)

Total Marks: 50

Ph.D. Entrance Examination Syllabus (Research Methodology)

Unit	Content
1	**Basics of Research:** Research: Meaning, Objective, Characteristics, Steps of research, Methods of research, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.
2	**Research Problem and Research Design:** Introduction to Research Problem, Necessity of Defining the Problem, Selecting the Problem, Techniques Involved in Defining a Problem, Meaning and Types of Research Design, Important Concepts Relating to Research Design
3	**Sampling Design:** Census and sample survey, Implications of a Sample Design, Steps in sampling Design, Criteria of Selecting a Sampling Procedure, Characteristics of a Good Sample Design, Different Types of sample Designs, How to Select a Random Sample?, Random Sample from an Infinite Universe, Complex Random Sampling Designs
4	**Data Collection and Analysis:** Methods of Data Collection- Observation, Interview, Questionnaires, Schedules, Survey and Experimental. Selection of Appropriate Method for Data Collection, Different Techniques of Sampling such as Probability and Non-Probability, Basic Statistical Methods of Data Analysis such as Frequency distribution, Measures of central tendency, Measures of Dispersion, Coefficient of variation, correlation and regression.
5	**Research Ethics and Morals:** Environmental impacts and Ethical issues, Commercialisation, Copy right, Royalty, Intellectual property rights and Patent law, Plagiarism, Citation, Referencing style and acknowledgement.

SECTION – B

Total Marks: 50

Ph.D. Entrance Examination Syllabus (Microbiology)

Molecular and Cell Biology

Structure of atoms, molecules and chemical bonds; Composition, structure and function of biomolecules (nucleic acids, proteins, carbohydrates, lipids and vitamins); Enzymes, biological hierarchy, Organelles, Cell Membrane, Cell cycle and apoptosis, Cytoskeleton, Genome structure and organization, Fundamental processes in Life sciences: Central Dogma, Replication, Transcription, Translation, Post Translational Modifications, DNA damage and repair, RNA synthesis and processing Recombination and transposition, Control of gene expression. Prokaryotic and Eukaryotic cells: Microorganisms, Animal cells, plant cells, viruses.

Cellular communication and Cell Signaling

Types of cellular communications, Cell signaling - Hormones and their receptors, cell surface receptor, signal transduction pathways, second messengers, regulation of signaling pathways, Cellular communication and regulation, Chemotaxis in bacteria, quorum sensing, light signaling in plants, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation, Protein-protein interactions.

Biochemistry, Microbiology and Virology

Enzymology, Metabolism, Bioenergetics,
Thermodynamics, Macromolecular chemistry, secondary metabolites, Plant hormone synthesis pathways, Classification of plant and animal viruses, Classification of microorganisms, Microbial metabolism, antimicrobial agents, Morphology and ultrastructure of viruses, Replication of viruses Retroviruses, Viral vectors, Viral vaccines.

Immunology

Innate & Acquired Immune system, Types of immune cells: B cell, T cell, Antibody structure and classification, Antigen processing and presentation, MHC, Complement activation Hypersensitivity, Autoimmunity, Techniques in cellular Immunology .

Biochemical & Biophysical Techniques

Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). Animal Tissue Culture, Plant Tissue Culture, rDNA Technology, Genomics and Proteomics, Genetic Engineering, Fluorescence and Absorbance Spectroscopy, Microscopy, Separation techniques.

Biostatistics & Ecological Principles
Hypothesis testing, T -test, Anova, Correlation and regression, Distribution, Mean, median, mode, standard deviation, error, Probability. Species interactions, population ecology, community ecology, conservation biology, biodiversity management.

Bioinformatics, Bioimaging and modeling in biology:
Tools and resources and application.

a) **Advance Microbiology**: **Microbial Physiology**: Growth yield and characteristics, strategies of cell division, stress response. Biosensors, Microbial fermentation and production of small and macromolecules, molecular approaches to diagnosis and strain identification, Bioremediation and phytoremediation, Bioresource and uses of biodiversity.

b) **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.

c) **Microbial genetics**: Methods of genetic transfers transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.