



CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY ISLAMABAD

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PhD Comprehensive Examination – Spring 2022 (Faculty of health & Life Sciences)

PhD Biosciences

General

Sr. No	Subjects	Duration of the Written Paper	Max Marks
1	Molecular Genetics	50 Minutes	60
2	Bioinformatics	50 Minutes	60
3	Biotechnology	50 Minutes	60
4	Microbiology and Immunology	90 Minutes	120
Total : -		240 Minutes (04 Hours)	300

Minimum passing marks in written examination are 60 %.

PhD - Biosciences Comprehensive Examination – Syllabus

Subject Name: Molecular Genetics	
Relevant Book: Molecular Biology of the Gene by James D. Watson and Tania A. Baker and Stephen P. Bell (Fifth Edition)	
Objectives:	
1	Understand the technological and laboratory skills in molecular genetics
2	Analyze the process and mechanism of transfer of genetic information
List of Topics	
Sr. #	Topic
1	Introduction
2	Molecular basis of heredity
3	The replication of DNA in prokaryotes and eukaryotes
4	Gene expression in prokaryotes and eukaryotes
5	Post transcriptional modifications
6	Translation of the message
7	Post translational modifications

8	DNA damage and repair mechanisms
9	Current developments in molecular genetics: molecular techniques
10	Southern, Northern and Western blotting
11	PCR, RFLP, AFLP's, RAPDs,
12	Micro-satellites, SNPs, Gene cloning.

Subject Name: Bioinformatics	
Relevant Book: Bioinformatics for Dummies by Jean-Michel Claverie and Cedric Notredame (Second Edition)	
Objectives:	
1	Understand parameters of different databases and tools used for biological data
2	Analyze sequence and structure of biological molecules using bioinformatics tools
List of Topics	
Sr.#	Topic
1	What Bioinformatics can do for you
2	Nucleotide sequence databases
3	Protein and Specialized sequence databases
4	Working with single DNA sequence
5	Working with single protein sequence
6	Similarity searches
7	Comparing two sequences
8	Multiple sequence alignment
9	Editing and Publishing alignments
10	Working with protein 3D structure
11	Working with RNA
12	Building Phylogenetic Trees

Subject Name: Biotechnology	
Relevant Book: Advances in Applied Biotechnology by Marian Peter (Fifth Edition)	
Objectives:	
1	Understand the technical, ethical and social Impacts of Biotechnology
2	Analyze the process and mechanism of Biotechnological Process
List of Topics	
Sr.#	Topic
1	Biotechnology of Agriculture
2	Food Biotechnology
3	Green Biotechnology
4	Fermentation
5	Food Processing
6	Recombinant Protein Products

7	Protein Engineering
8	Cell Free Protein expression
9	Synthetic Gene
10	Environmental Stress Management
11	Magnetic Particles and nanoparticles
12	Health Implications

Subject Name: Microbiology and Immunology	
<p>1. Relevant Books: Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. Prescott's Microbiology, Eighth Edition. McGraw- Hill.</p> <p>2. Abdul K. Abbas and Andrew H. Lichtman, Basic Immunology: Functions and Disorders of the Immune System. Third Edition, Elsevier.</p> <p>3. Book: Owen, Punt and Strandford. Immunology, Kuby, Seventh Edition, W.H Freeman and Company. New York</p>	
Objectives:	
1	Understand the impact and the importance of the activity of microorganisms on health and on other living organisms.
2	Appreciate the intimate connection between the knowledge of molecular mechanisms underlying the interaction between microorganisms and the immune response.
List of Topics:	
Sr.#	Topic
1	Microbial Growth
2	Introduction to Metabolism
3	Catabolism: Energy Release and Conservation
4	Anabolism: The Use of Energy in Biosynthesis
5	Microbial Interactions
6	Infection and Pathogenicity
7	Clinical Microbiology and Immunology
8	Epidemiology and Public Health
9	Microbiology of Food
10	Industrial Microbiology
11	Applied Environmental Microbiology
12	Introduction to the immune system: The nomenclature, general properties, and Components of the immune system
13	Innate immunity: The early defense against infections
14	Antigen capture and presentation to lymphocytes
15	Major Histocompatibility Complex
16	T cell activation, Differentiation and Memory
17	Allergy, Hypersensitivities and Chronic Infection