

**Syllabus for entrance test for admission to PhD programme in Molecular
Medicine at the Watson-Crick Centre for Molecular Medicine, IUST.**

Time Duration – 90 Minutes

Maximum Marks: 80

Part-I — 40 Multiple Choice Questions

40x1=40

Part-II —40 Multiple Choice Questions

40x1=40

Part 1.

I. General Biochemistry

- a. Carbohydrates and Lipids
- b. Amino acids and proteins
- c. Enzymes
- d. Nucleic Acids

II. Cell Biology

- a. Bio-Membranes
- b. Cellular Organelle
- c. Cytoskeleton
- d. Cell cycle and Cellular Signaling

III. Cellular Metabolism

- a. Carbohydrate Metabolism
- b. Lipid Metabolism
- c. Amino Acid Metabolism
- d. Nucleic Acid Metabolism

IV. Genetics

- a. Mendelion and Non- mendelion Genetics
- b. Chromosome Structure
- c. Mutation and Chromosomal Abnormalities
- d. Population Genetics
- e.

V. Protein and Enzyme Technology

- a. Protein Structure
- b. Enzyme Kinetics and Activation
- c. Multi-substrate Enzyme Kinetics
- d. Enzyme Technology

VI. Microbiology

- a. General overview of Microbiology
- b. Bacteriology
- c. Virology
- d. Fungi

VII. Molecular Biology

- a. DNA Replication & Repair
- b. Transcription & its regulation
- c. Posttranscriptional processing
- d. Genetic code & Translation

VIII. Immunology

- a. Immune System: Cells & Organs
- b. Immune response mechanisms
- c. Hypersensitivity
- d. Immunopathology & disease

IX. Recombinant DNA Technology

- a. Tools in Recombinant DNA Technology
- b. Technique in Recombinant DNA Technology
- c. Gene Transfer Techniques
- d. Applications of Recombinant DNA Technology

X. Bio-techniques

- a. Analytical and Separation Techniques
- b. Advanced Molecular Biology Techniques
- c. Immunological Techniques
- d. Microscopy

XI. Molecular Medicine

- a. Molecular basis of Infectious disease
- b. Molecular basis of metabolic disorders
- c. Molecular Diagnostics and treatment

XII. Developmental Biology

- a. History & Basic Concepts of Development
- b. Development In Invertebrate and Vertebrate Models
- c. Germ Cell Specification & Migration
- d. Developmental Disorders

Part 2.

I: Research and Types of research

Research and Types of research: Meaning of Research, Objectives of Research, Motivation in Research; Research methods vs. Methodology. Types of research– Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical; Research Process; Criteria of good Research.

II: Research Formulation

Defining and formulating the research problem; Selecting the problem; Importance of literature review in research; Sources of Literature Review –primary and secondary sources, reviews, treatise, monographs, patents and web; Identifying research gap areas from literature review; Development of working hypothesis.

III: Sampling

Sampling design- Meaning, logic and application of sampling, sampling terminology: Universe, population, sampling frame, Determination of sample size; Methods of sampling random sampling methods and non-random sampling methods; Criteria of choosing an appropriate sampling method.

IV: Statistical Methods-I

Introduction to statistics –Meaning, scope and limitations of statistics – Data: types and sources; Organization and presentation of data: frequency distribution, tabulation, diagrammatic and graphical presentation; Survey techniques- Questionnaire construction and interview schedule.

V: Statistical Methods-II

Measures of central tendency: Mean, median, mode; measures of dispersion and skewness; Correlation Analysis: Tests of Significance and Covariance - Regression Analysis – analysis of variance (ANOVA), Test of Hypothesis - steps involved in hypothesis testing, Methods of hypothesis testing- chi-squared test, t-test and z-test; Nature and methods non-parametric statistical test; Application of Statistical tools with SPSS.