

Pokhara University
Faculty of Science and Technology
Central Entrance Examination Curriculum
Master of Science in Bioinformatics (M.Sc. Bioinformatics)

Total marks: 150
Time: 3 hrs

Qualifying marks: 75 (Paying) / 53 (Scholarship)

Entrance curriculum mainly covers the fundamental topics of Cell and Molecular Biology, Computer Science, and Mathematics and Statistics as follows.

Section	Course	Weightage (%)
A	Cell and Molecular Biology	50
B	Computer Science	30
C	Mathematics and Statistics	20
Total		100

Section A: Cell and Molecular Biology

1. Structure of the cell, Prokaryotic and eukaryotic cells, Membrane structure and function, Transport across cell membranes, Cell organelles and functions, Chromatin and chromosomes, and Cell division.
2. Properties and functions of carbohydrates, lipids, amino acids, proteins, enzymes, and vitamins. Carbohydrate metabolism and Electron transport system, and Photosynthesis.
3. Nucleic acids, Structure and functions of DNA and RNA, DNA replication, Gene, Genome, Central dogma, Gene transcription, Genetic code, Gene translation, Fundamentals of genetic engineering, Gene cloning vectors, Genetically modified organisms, Gene editing, Gene therapy, Mendel's law of inheritance, Chromosome aberrations, Genetic mutation, and Single Nucleotide Polymorphism, Polymerase chain reaction, Quantitative real time PCR, Gel electrophoresis, DNA fingerprinting.
4. Fundamentals of bioinformatics, Basic principles of genome sequencing, Gene and protein sequence, Human Genome Project, and Genome databases.

Section B: Computer Science

1. **Number System:** Binary systems and hexadecimal, Measurement of the size of computer memories, Example uses of binary and hexadecimal system
2. **Communication and internet technologies:** Introduction, Data transmission, Internet technologies, HTML, Hyperlinks, WWW, Web 2.0, Networks: WAN, LAN.
3. **Basic Logic gates and logic circuits:** Introduction, Logic gates, Truth tables, The function of the six logic gates, Simple Logic circuits, Universal Gates.
4. **Operating systems and computer architecture:** Operating systems, interrupts, CPU, computer memory hierarchy, input and output devices, file format.

5. **High- and low-level languages:** Programming languages types, translators, interpreters, compiling a program, running a program.
6. **Security and ethics:** What is computer security? Introductory concepts (Encryption, firewalls, proxy servers, biometric security) Data security needs and data integrity, cookies, loss of data and data corruption, security protocols, computer ethics, free software, freeware and shareware.
7. **Problem-solving and design:** Flow chart basics, computer program fundamentals, very simple concept of Algorithm design and pseudocode, conditional statements, loop structures, programming concepts (Declaration and use of variables and constants, basic data types) simple data structures, arrays.
8. **Databases:** Introduction, databases uses, structure of a database, role of databases in organizations.
9. **Computer Applications:** Artificial Intelligence and Big Data applications, applications of computer science in biological and medical systems, current trends of artificial intelligence and recent developments.

Section C: Mathematics and Statistics

1. Logarithms, Progressions, Partial Fractions, Binomial Expansion, Equations, System of Linear Equations, Inequalities, Systems of Linear Inequalities and their Graphs, Polynomial Equations, Basics of two-dimensional and three-dimensional coordinate geometry, Permutation and Combination, Set theory, Real Number System, Relation, Functions and Graphs, Limits and continuity, Derivatives, Anti-derivatives, Matrices and Determinants, Complex Numbers
2. Presentation of data, Descriptive statistics, basic probability concepts, Conditional probability, Random variables, Binomial distribution, Poisson distribution, Normal distribution, Terminology used in sampling, Sampling distributions of mean and proportion, Confidence interval, Sample size considerations, Terminology used in testing of hypothesis, Hypothesis testing: z-test, t-test and chi-square test, Correlation and Regression, Coefficient of determination.