# Entrance Examination Syllabus
## MSc Bioinformatics (part-B) comprising of 75 MCQs (Domain Knowledge)

**The distribution of 75 questions will be as follows**

**Biology**          **40**
**Stats & Math**    **10**
**Chemistry**       **10**
**Physics**          **10**
**CS & IT**         **5**
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**Total**           **75**

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### Biology

- Basic aspects of Prokaryotic and eukaryotic cells (plant and animal cells); membranes and cellular compartments, cell organelles their structure and function.
- Cell motility and shape: cytoskeletal elements, cilia and flagella; motor proteins
- Cell cycle and its regulation, events during mitosis and meiosis.
- Concepts of respiration, electron transport systems.
- Concepts of gene: Allele, multiple alleles, pseudoallele, complementation tests.
- Mendelian principles : Inheritance, sex linked inheritance, Dominance, segregation, independent assortment.
- Mutations : Types, causes and detection, germline versus somatic mutations, point/deletion/insertional mutations, DNA repair.
- Chromosomal Variations: Structural and numerical abnormalities: Aneuploidy, Euploidy, Polypoidy, Trisomy, monosomy.
- DNA and RNA: Structure, physical and chemical properties, Types of DNA and RNA. DNA as a genetic material.
- Basic concepts of replication-Experiments to prove Semi conservative replication, Prokaryotic-rolling circle replication and Eukaryotic replications, Prokaryotic gene expression-Lac operon, trp operan, factors involved in gene regulations, mechanisms of gene expression in Eukaryotes, basic mechanisms of transcription and translation.
- Carbohydrates and lipids, their importance in cells
- Proteins: Amino acids and their physico-chemical properties, peptide bond and peptides
- Enzymes: Units of activity, coenzymes and metal cofactors, temperature and pH effects, Michaelis-Menten kinetics, inhibitors and activators, active site

### Physical Science syllabus:

- Particle dynamics, Newtons laws of motion, velocity, acceleration, momentum. Conservative forces, Conservation of Energy.

- First law of thermodynamics, second law of thermodynamics, reversible and irreversible processes, Isothermal, isobaric and quasistatic processes. Concepts of Enthalpy and Entropy, Interrelation between potential energy and force. Thermodynamic, Gibbs and Helmholtz free energies.
- Chemical potential. First-order phase transitions
- Equation of state for ideal gases. Departures from ideality. Maxwell-Boltzman Distribution
- Concept of Reduced Mass

## Chemical Science Syllabus :

- Hybridization states of atoms. Electronic structure of molecules, Chemical bonding (ionic bonds, covalent bonds, hydrogen bond, hydrophobic effects, coordinate bonds). Basic Molecular orbital theory. Valence bonds. Non-covalent bonding in protein structure.
- Tautomerization, geometrical isomerism, inductive effect, stereochemsitry (R/S,D/L); nucleophile, electrophile, nucleophilic substitution, electrophilic substitution, nomenclature of organic compounds. Bioisosterism.
- First law of thermodynamics, isothermal process, entropy and second law of thermodynamics, reversible and irreversible processes; Concepts of enthalpy, internal energy and potential energy; Inter-relation between potential energy and force, heat of formation.
- Concept of pH, pK, chemical equilibrium.

## Mathematics and Statistics Syllabus :

- Functions and Graphs of polynomial, logarithm, exponential and trigonometric functions.
- 2D co-ordinate geometry: Equation of a line, circle, ellipse, parabola, hyperbola; focal point, eccentricity and other properties.
- 3D geometry: Equation of sphere.
- Solution of simultaneous and quadratic equations
- Sequences and series.
- Limits.
- Differentiation and integration of the above mentioned functions.
- Matrix algebra: Multiplication, inverse and solution of linear equations.

- Discrete random variables, their probability mass function, probability distribution function, mean and variance.
- Binomial and Poisson random variables and their properties.
- Continuous random variable, their probability density function, probability distribution function, mean and variance.
- Normal random variable and its properties.
- Conditional probability and Bayes' theorem.

## Information Technology Syllabus

- Fundamentals in Computing
- Types of Processing: Batch, Real-Time, Online, Offline.
- Types of modern computing: Workstations, Servers, Parallel Processing Computing, Cluster computing, Grid computing
- Memory and Storage Devices, Network, Internet-Basics
- Introduction to operating systems: Operating System concept, UNIX/LINUX.
- Basic Programming Concepts: sequential, conditional and loop constructs, Arrays, Strings, Object Oriented Programming Concepts-Classes, Objects, Inheritance, Polymorphism; File Handling