GRE Subject Test: Biochemistry, Cell and Molecular Biology

GRE will be comprised of 180 multiple choice questions, A number of which are grouped in sets toward the end of the test and based on descriptions of laboratory situations, diagrams or experimental results.

The test content is being categorized into three core areas namely: Biochemistry, cell biology and molecular biology and genetics.

In the entire test, Focus will be on the questions relating with the problem solving skills as well as the content knowledge.

While only two content areas in the outline particularly mention methodology, questions on methodology and data interpretation are included in all sections. While preparing the questions for the test, the test development committee considers both the content of typical courses taken by undergraduates and the knowledge and abilities required for graduate work in the fields related to the test.

The three sub score areas are related with each other. Because of these interrelationships, individual questions or sets of questions may test more than one content area. The relative focus of the three areas in the following outline should not be taken definitive. Also, the topics listed are not intended to be covered but for the representation of the specific undergraduate experience.

Biochemistry-36%

Chemical and Physical Foundations-

- Thermodynamics and kinetics
- Redox states
- Water, pH, acid-base reactions and buffers
- Solutions and equilibria
- Solute-solvent interactions
- Chemical interactions and bonding
- Chemical reaction mechanisms

Biomolecules: Structure, Assembly, Organization and Dynamics-

- Small molecules

- Macromolecules (e. g nucleic acids, polysaccharides, proteins and complex Lipids)
- Supramolecular complexes (e. g membranes, ribosomes, and multienzyme complexes)

Catalysis and Binding-

- Enzyme reaction mechanisms and kinetics
- Ligand-protein interaction (e. g hormone receptors, substrates and effectors, transport proteins and antigen-antibody interactions)

Major Metabolic Pathways-

- Carbon, nitrogen and sulfur assimilation
- Anabolism
- Catabolism
- Synthesis and degradation of macromolecules

Bioenergetics (consisting respiration and photosynthesis) -

- Energy transformations at the substrate level
- Electron transport
- Proton and chemical gradients
- Energy coupling i.e.. Phosphorylation and transport

Regulation and Integration of Metabolism-

- Covalent modification of enzymes
- Allosteric regulation
- Compartmentation
- Hormones

Methodology

- Spectroscopy
- Isotopes
- Separation techniques (e. g centrifugation, chromatography and electrophoresis)
- Immunotechniques

Cell Biology-28%

Cellular Compartments of Prokaryotes and Eukaryotes: Organization, Dynamics and Functions-

- Cellular membrane systems (structure and transport)
- Nucleus (envelope and matrix)
- Mitochondria and chloroplasts (consisting biogenesis and evolution)

Cell Surface and Communication-

- Extracellular matrix (consisting cell walls)
- Cell adhesion and junctions
- Signal transduction
- Receptor function
- Excitable membrane systems

Cytoskeleton, Motility and Shape-

- Actin-based systems (consisting muscle contraction)
- Microtubule-based systems
- Intermediate filaments
- Prokaryotic systems

Protein Synthesis and Processing-

- Regulation or translation
- Posttranslational modification
- Intracellular trafficking
- Secretion and endocytosis

Cell Division, Differentiation and Development-

- Bacterial division
- Meiosis and gametogenesis
- Eukaryotic cell cycles, mitosis, and cytokinesis
- Fertilization and early embryonic development (consisting positional information, homeotic genes, tissue-specific expression, nuclear and cytoplasmic interactions, growth factors and

induction, environment and polarity)

Molecular Biology and Genetics-36%

Genetic Foundations-

- Mendelian and non-Mendalian inheritance
- Transformation, transduction, and conjugation
- Recombination and complementation
- Mutational analysis
- Genetic mapping and linkage analysis

Chromatin and Chromosomes-

- Karyotypes
- Translocations, inversions, deletions and duplications
- Aneuploidy and polyploidy
- Structure

Genomics

- Genome structure
- Physical mapping
- Repeated DNA and gene families
- Gene identification
- Transposable elements

Genome Maintenance-

- DNA replication
- DNA damage and repair
- DNA modification
- DNA recombination and gene conversion

Gene Expression-

- The genetic code

- Transcription
- RNA processing
- Translation

Gene Regulation in Prokaryotes-

- Positive and negative control of the operon
- Promoter recognition by RNA polymerases
- Attenuation and antitermination

Gene Regulation in Eukaryotes-

- Cis-acting regulatory elements
- Trans-acting regulatory factors
- Gene rearrangements and amplifications

Bacteriophages and Animal and Plant Viruses-

- Genome replication and regulation
- Virus assembly
- Virus-host interactions

Methodology-

- Restriction maps
- Nucleic acid blotting and hybridization
- DNA cloning in prokaryotes and eukaryotes
- Sequencing and analysis
- Protein-nucleic acid interaction