

GRE REVISED SYLLABUS 2013

1. GRE GENERAL TEST

ANALYTICAL Writing-

This section grabs an idea of your critical thinking and analytical writing skills, and portrays your ability to articulate and support complex ideas clearly. This section consists of two analytical writing tasks:

- A- 45-minute “Present Your Perspective on an Issue” task, and
- B- 30-minute “Analyze an Argument” task.

VERBAL Test-

It measures your ability to analyze and evaluate written material and synthesize material information obtained from it, analyze relationships among various parts of the sentences and recognize relationships among words and concepts. The Verbal section consists of- Analogies, Antonyms, Sentence Completions and Reading comprehension.

Quantitative Test-

It comes with an idea to measure our PROBLEM-SOLVING skills, focusing on basic concepts of Algebra, Arithmetic, Geometry and Data Analysis.

2. GRE SUBJECT TEST

GRE BIOCHEMISTRY, CELL AND MOLECULAR BIOLOGY SYLLABUS-

I. 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

Structural Biology: Structure, Assembly, Organization and Dynamics

- Small molecules
- Macromolecules (e.g., nucleic acids, polysaccharides, proteins and complex lipids)
- Supramolecular complexes (e.g., membranes, ribosomes and multi-enzyme 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 sulphur assimilation
- Anabolism
- Catabolism
- Synthesis and degradation of macromolecules

Bioenergetics (including respiration and photosynthesis)

- Energy transformations at the substrate level
- Electron transport
- Proton and chemical gradients
- Energy coupling (e.g., phosphorylation and transport)

Regulation and Integration of Metabolism

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

Methods

- Biophysical approaches (e.g., spectroscopy, x-ray, crystallography, mass spectroscopy)
- Isotopes
- Separation techniques (e.g., centrifugation, chromatography and electrophoresis)
- Immune techniques

II. CELL BIOLOGY — 28%

Methods of importance to cellular biology, such as fluorescence probes (e.g., FRAP FRET and GFP) and imaging will be covered as appropriate within the context of the content below.

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

- Cellular membrane systems (e.g., structure and transport across membrane)
- Nucleus (e.g., envelope and matrix)
- Mitochondria and chloroplasts (e.g., biogenesis and evolution)

Cell Surface and Communication

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

Cytoskeleton, Motility and Shape

- Regulation of assembly and disassembly of filament systems
- Motor function, regulation and diversity

Protein, Processing, Targeting and Turnover

- Translocation across membranes
- Posttranslational modification
- Intracellular trafficking
- Secretion and endocytosis
- Protein turnover (e.g., proteasomes, lysosomes, damaged protein response)

Cell Division, Differentiation and Development

- Cell cycle, mitosis and cytokinesis
- Meiosis and gametogenesis
- Fertilization and early embryonic development (including positional information, homeotic genes, tissue-specific expression, nuclear and cytoplasmic interactions, growth factors and induction)

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- environment, stem cells and polarity)

III. MOLECULAR BIOLOGY AND GENETICS — 36%

Genetic Foundations

- Mendelian and non-Mendelian 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
- Epigenetics

Genomics

- Genome structure
- Physical mapping
- Repeated DNA and gene families
- Gene identification
- Transposable elements
- Bioinformatics
- Proteomics
- Molecular evolution

Genome Maintenance

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

Gene Expression

- The genetic code
- Transcription/transcriptional profiling
- RNA processing
- Translation

Gene Regulation

- Positive and negative control of the operon
- Promoter recognition by RNA polymerases
- Attenuation and anti-termination
- Cis-acting regulatory elements
- Trans-acting regulatory factors
- Gene rearrangements and amplifications
- Small non-coding RNA (e.g., siRNA, microRNA)

Viruses

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

Methods

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

GRE LITERATURE IN ENGLISH TEST SYLLABUS-

- **Literary Analysis (40–55%)**

Interpretation of passages of prose and poetry. Such questions may involve recognition of conventions and genres, allusions and references, meaning and tone, grammatical structures and rhetorical strategies, and literary techniques.

- **Identification (15–20%)**

Recognition of date, author or work by style and/or content (for literary theory identifications see IV below).

Cultural and Historical Contexts (20–25%)

Knowledge of literary, cultural and intellectual history as well as identification of author or work through a critical statement or biographical information. Also identification of details of character, plot or setting of a work.

- **History and Theory of Literary Criticism (10–15%)**

Identification and analysis of the characteristics and methods of various critical and theoretical approaches.

The GRE Mathematics Test Syllabus-

- **CALCULUS — 50%**

Material learned in the usual sequence of elementary calculus courses — differential and integral calculus of one and of several variables — includes calculus-based applications and connections with coordinate geometry, trigonometry, differential equations and other branches of mathematics.

- **ALGEBRA — 25%**

Elementary algebra: basic algebraic techniques and manipulations acquired in high school and used throughout mathematics

Linear algebra: matrix algebra, systems of linear equations, vector spaces, linear transformations, characteristic polynomials and eigenvalues and eigenvectors

Abstract algebra and number theory: elementary topics from group theory, theory of rings and modules, field theory and number theory

- **ADDITIONAL TOPICS — 25%**

Introductory real analysis: sequences and series of numbers and functions, continuity, differentiability and integrability, and elementary topology of \mathbb{R} and \mathbb{R}^n

Discrete mathematics: logic, set theory, combinatorics, graph theory and algorithms

Other topics: general topology, geometry, complex variables, probability and statistics, and numerical analysis.

GRE PHYSICS TEST SYLLABUS-

- **CLASSICAL MECHANICS — 20%**

(Such as kinematics, Newton's laws, work and energy, oscillatory motion, rotational motion about a fixed axis, dynamics of systems of particles, central forces and celestial mechanics, three-dimensional particle dynamics, Lagrangian and Hamiltonian formalism, non-inertial reference frames, elementary topics in fluid dynamics)

- **ELECTROMAGNETISM — 18%**

(such as electrostatics, currents and DC circuits, magnetic fields in free space, Lorentz force, induction, Maxwell's equations and their applications, electromagnetic waves, AC circuits, magnetic and electric fields in matter)

- **OPTICS AND WAVE PHENOMENA — 9%**

(Such as wave properties, superposition, interference, diffraction, geometrical optics, polarization, Doppler effect)

- **THERMODYNAMICS AND STATISTICAL MECHANICS — 10%**

(Such as the laws of thermodynamics, thermodynamic processes, equations of state, ideal gases, kinetic theory, ensembles, statistical concepts and calculation of thermodynamic quantities, thermal expansion and heat transfer)

- **QUANTUM MECHANICS — 12%**

(such as fundamental concepts, solutions of the Schrödinger equation (including square wells, harmonic oscillators, and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory)

- **ATOMIC PHYSICS — 10%**

(Such as properties of electrons, Bohr model, energy quantization, atomic structure, atomic spectra, selection rules, black-body radiation, x-rays, atoms in electric and magnetic fields)

- **SPECIAL RELATIVITY — 6%**

(Such as introductory concepts, time dilation, length contraction, simultaneity, energy and momentum, four-vectors and Lorentz transformation, velocity addition)

- **LABORATORY METHODS — 6%**

(Such as data and error analysis, electronics, instrumentation, radiation detection, counting statistics, interaction of charged particles with matter, lasers and optical interferometers, dimensional analysis, fundamental applications of probability and statistics)

- **SPECIALIZED TOPICS — 9%**

Nuclear and Particle physics (e.g., nuclear properties, radioactive decay, fission and fusion, reactions, fundamental properties of elementary particles), Condensed Matter (e.g., crystal structure, x-ray diffraction, thermal properties, electron theory of metals, semiconductors, superconductors), Miscellaneous (e.g., astrophysics, mathematical methods, computer applications)

GRE CHEMISTRY TEST SYLLABUS-

- **ANALYTICAL CHEMISTRY — 15%**

Data Acquisition and Use of Statistics — Errors, statistical considerations

Solutions and Standardization — Concentration terms, primary standards

Homogeneous Equilibria — Acid-base, oxidation-reduction, complexometry

Heterogeneous Equilibria — Gravimetric analysis, solubility, precipitation titrations, chemical separations

Instrumental Methods — Electrochemical methods, spectroscopic methods, chromatographic methods, thermal methods, calibration of instruments

Environmental Applications

Radiochemical Methods — Detectors, applications

- **INORGANIC CHEMISTRY — 25%**

General Chemistry — Periodic trends, oxidation states, nuclear chemistry

Ionic Substances — Lattice geometries, lattice energies, ionic radii and radius/ratio effects

Covalent Molecular Substances — Lewis diagrams, molecular point groups, VSEPR concept, valence bond description and hybridization, molecular orbital description, bond energies, covalent and van der Waals radii of the elements, intermolecular forces

Metals and Semiconductors — Structure, band theory, physical and chemical consequences of band theory

Concepts of Acids and Bases — Bronsted-Lowry approaches, Lewis theory, solvent system approaches

Chemistry of the Main Group Elements — Electronic structures, occurrences and recovery, physical and chemical properties of the elements and their compounds

Chemistry of the Transition Elements — Electronic structures, occurrences and recovery, physical and chemical properties of the elements and their compounds, coordination chemistry

Special Topics — Organometallic chemistry, catalysis, bioinorganic chemistry, applied solid-state chemistry, environmental chemistry

- **ORGANIC CHEMISTRY — 30%**

Structure, bonding and Nomenclature — Lewis structures, orbital hybridization, configuration and stereochemical notation, conformational analysis, systematic IUPAC nomenclature, spectroscopy (IR and ^1H and ^{13}C NMR)

Functional Groups — Preparation, reactions, and inter-conversions of alkanes, alkenes, alkynes, dienes, alkyl halides, alcohols, ethers, epoxides, sulphides, thiols, aromatic compounds, aldehydes, ketones, carboxylic acids and their derivatives, amines

Reaction Mechanisms — Nucleophilic displacements and addition, nucleophilic aromatic substitution, electrophilic additions, electrophilic aromatic substitutions, eliminations, Diels-Alder and other cyclo-additions

Reactive Intermediates — Chemistry and nature of carbocations, carbanions, free radicals, carbenes, benzyne, enols

Organometallics — Preparation and reactions of Grignard and organolithium reagents, lithium organocuprates, and other modern main group and transition metal reagents and catalysts

Special Topics — Resonance, molecular orbital theory, catalysis, acid-base theory, carbon acidity, aromaticity, anti-aromaticity, macromolecules, lipids, amino acids, peptides, carbohydrates, nucleic acids, terpenes, asymmetric synthesis, orbital symmetry, polymers

- **PHYSICAL CHEMISTRY — 30%**

Thermodynamics — First, second, and third laws, thermochemistry, ideal and real gases and solutions, Gibbs and Helmholtz energy, chemical potential, chemical equilibria, phase equilibria, colligative properties, statistical thermodynamics

Quantum Chemistry and Applications to Spectroscopy — Classical experiments, principles of quantum mechanics, atomic and molecular structure, molecular spectroscopy

Dynamics — Experimental and theoretical chemical kinetics, solution and liquid dynamics, photochemistry

GRE PSYCHOLOGY TEST SYLLABUS-

EXPERIMENTAL SUBSCORE — 40%

Learning (3–5%)

- Classical Conditioning
- Instrumental Conditioning
- Observational Learning, Modelling
- Theories, Applications and Issues

Language (3–4%)

- Units (phonemes, morphemes, phrases)
- Syntax
- Meaning
- Speech Perception and Processing
- Reading Processes
- Verbal and Nonverbal Communication
- Bilingualism
- Theories, Applications and Issues

Memory (7–9%)

- Working Memory
- Long-term Memory
- Types of Memory
- Memory Systems and Processes
- Theories, Applications and Issues

Thinking (4–6%)

- Representation (Categorization, Imagery, Schemas, Scripts)
- Problem Solving
- Judgment and Decision-making Processes
- Planning, Metacognition
- Intelligence
- Theories, Applications and Issues

Sensation and Perception (5–7%)

- Psychophysics, Signal Detection
- Attention
- Perceptual Organization
- Vision
- Audition
- Gustation
- Olfaction
- Somatosenses
- Vestibular and Kinaesthetic Senses
- Theories, Applications and Issues

Physiological/Behavioural Neuroscience (12–14%)

- Neurons
- Sensory Structures and Processes
- Motor Structures and Functions
- Central Structures and Processes
- Motivation, Arousal, Emotion
- Cognitive Neuroscience
- Neuromodulators and Drugs
- Hormonal Factors
- Comparative and Ethology
- States of Consciousness
- Theories, Applications and Issues

SOCIAL SUBSCORE — 43%

Clinical and Abnormal (12–14%)

- Stress, Conflict, Coping
- Diagnostic Systems
- Assessment
- Causes and Development of Disorders
- Neurophysiological Factors
- Treatment of Disorders
- Epidemiology
- Prevention
- Health Psychology
- Culture and Gender Issues
- Theories, Applications and Issues

Lifespan Development (Childhood, Adolescence, Aging) (12–14%)

- Nature-Nurture
- Physical and Motor
- Perception and Cognition
- Language
- Intelligence
- Social and Personality
- Emotion
- Socialization, Family and Cultural Influences
- Theories, Applications and Issues

Personality (3–5%)

- Theories
- Structure
- Assessment
- Personality and Behaviour
- Applications and Issues

Social (12–14%)

- Social Perception, Cognition, Attribution, Beliefs
- Attitudes and Behaviour
- Social Comparison, Self
- Emotion, Affect and Motivation
- Conformity, Influence and Persuasion
- Interpersonal Attraction and Close Relationships
- Group and Intergroup Processes
- Cultural and Gender Influences
- Evolutionary Psychology, Altruism and Aggression
- Theories, Applications and Issues

OTHER AREAS — 17%

General (4–6%)

- History
- Industrial-Organizational
- Educational

Measurement and Methodology (11–13%)

- Psychometrics, Test Construction, Reliability, Validity
- Research Designs
- Statistical Procedures
- Scientific Method and the Evaluation of Evidence
- Ethics and Legal Issues
- Analysis and Interpretation of Findings

GRE BIOLOGY TEST SYLLABUS-

CELLULAR AND MOLECULAR BIOLOGY (33–34%)

- Fundamentals of cellular biology, genetics and molecular biology are addressed.
- Major topics in cellular structure and function include metabolic pathways and their regulation, membrane dynamics and cell surfaces, organelles, cytoskeleton, and cell cycle.
- Major areas in genetics and molecular biology include chromatin and chromosomal structure, genomic organization and maintenance, and the regulation of gene expression.
- The cellular basis of immunity and the mechanisms of antigen-antibody interactions are included. Distinctions between prokaryotic and eukaryotic cells are considered where appropriate.
- Attention is also given to experimental methodology.

Cellular Structure and Function (16–17%)

- Biological compounds
- Macromolecular structure and bonding
- Abiotic origin of biological molecules

Enzyme activity, receptor binding and regulation

Major metabolic pathways and regulation

- Respiration, fermentation and photosynthesis
- Synthesis and degradation of macromolecules
- Hormonal control and intracellular messengers

Membrane dynamics and cell surfaces

- Transport, endocytosis and exocytosis
- Electrical potentials and transmitter substances
- Mechanisms of cell recognition, cell junctions and plasmodesmata
- Cell wall and extracellular matrix

Organelles: structure, function, synthesis and targeting

- Nucleus, mitochondria and plastids
- Endoplasmic reticulum and ribosomes
- Golgi apparatus and secretory vesicles
- Lysosomes, peroxisomes and vacuoles

Cytoskeleton, motility and shape

- Actin-based systems
- Microtubule-based systems
- Intermediate filaments
- Bacterial flagella and movement

Cell cycle, growth, division and regulation (including signal transduction)

Methods

- Microscopy (e.g., electron, light, fluorescence)
- Separation (e.g., centrifugation, gel filtration, PAGE, fluorescence-activated cell sorting [FACS])
- Immunological (e.g., Western Blotting, immunohistochemistry, immunofluorescence)

Genetics and Molecular Biology (16–17%)

Genetic foundations

- Mendelian inheritance
- Pedigree analysis
- Prokaryotic genetics (transformation, transduction and conjugation)
- Genetic mapping

Chromatin and chromosomes

- Nucleosomes
- Karyotypes
- Chromosomal aberrations
- Polytene chromosomes

Genome sequence organization

- Introns and exons
- Single-copy and repetitive DNA

- Transposable elements

Genome maintenance

- DNA replication
- DNA mutation and repair

Gene expression and regulation in prokaryotes and eukaryotes: mechanisms

- The operon
- Promoters and enhancers
- Transcription factors
- RNA and protein synthesis
- Processing and modifications of both RNA and protein
- Gene expression and regulation: effects
- Control of normal development
- Cancer and oncogenes
- Whole genome expression (e.g., microarrays)
- Regulation of gene expression by RNAi (e.g., siRNA)
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- Epigenetics

Immune-biology

- Cellular basis of immunity
- Antibody diversity and synthesis
- Antigen-antibody interactions

Bacteriophages, animal viruses and plant viruses

- Viral genomes, replication, and assembly
- Virus-host cell interactions

Recombinant DNA methodology

- Restriction endonucleases
- Blotting and hybridization
- Restriction fragment length polymorphisms
- DNA cloning, sequencing and analysis
- Polymerase chain reaction

ORGANISMAL BIOLOGY (33–34%)

- The structure, physiology, behaviour and development of plants and animals are addressed.
- Topics covered include nutrient procurement and processing, gas exchange, internal transport, regulation of fluids, control mechanisms and effectors, and reproduction in autotrophic and heterotrophic organisms.

- Examples of developmental phenomena range from fertilization through differentiation and morphogenesis.
- Perceptions and responses to environmental stimuli are examined as they pertain to both plants and animals.
- Major distinguishing characteristics and phylogenetic relationships of selected groups from the various kingdoms are also covered.

Animal Structure, Function and Organization (10%)

Exchange with environment

- Nutrient, salt and water exchange
- Gas exchange
- Energy

Internal transport and exchange

- Circulatory and digestive systems
- Support and movement

Support systems (external, internal and hydrostatic)

- Movement systems (flagellar, ciliary and muscular)

Integration and control mechanisms

- Nervous and endocrine systems

Behaviour (communication, orientation, learning and instinct)

Metabolic rates (temperature, body size and activity)

Animal Reproduction and Development (6%)

- Reproductive structures
- Meiosis, gametogenesis and fertilization
- Early development (e.g., polarity, cleavage and gastrulation)
- Developmental processes (e.g., induction, determination, differentiation, morphogenesis and metamorphosis)
- External control mechanisms (e.g., photoperiod)

Plant Structure, Function and Organization, with Emphasis on Flowering Plants (7%)

- Organs, tissue systems, and tissues
- Water transport, including absorption and transpiration

- Phloem transport and storage
- Mineral nutrition
- Plant energetics (e.g., respiration and photosynthesis)

Plant Reproduction, Growth and Development, with Emphasis on Flowering Plants (5%)

- Reproductive structures
- Meiosis and sporogenesis
- Gametogenesis and fertilization
- Embryogeny and seed development
- Meristems, growth, morphogenesis and differentiation
- Control mechanisms (e.g., hormones, photoperiod and tropisms)

Diversity of Life (6%)

Archaea

- Morphology, physiology and identification

Bacteria (including cyanobacteria)

- Morphology, physiology, pathology and identification

Protista

- Protozoa, other heterotrophic Protista (slime moulds and Oomycota) and autotrophic Protista
- Major distinguishing characteristics
- Phylogenetic relationships
- Importance (e.g., eutrophication, disease)

Fungi

- Distinctive features of major phyla (vegetative, asexual and sexual reproduction)
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- Generalized life cycles
- Importance (e.g., decomposition, biodegradation, antibiotics and pathogenicity)
- Lichens

Animalia with emphasis on major phyla

- Major distinguishing characteristics
- Phylogenetic relationships

Plantae with emphasis on major phyla

- Alternation of generations
- Major distinguishing characteristics
- Phylogenetic relationships

ECOLOGY AND EVOLUTION (33–34%)

- This section deals with the interactions of organisms and their environment, emphasizing biological principles at levels above the individual.
- Ecological and evolutionary topics are given equal weight.
- Ecological questions range from physiological adaptations to the functioning of ecosystems.
- Although principles are emphasized, some questions may consider applications to current environmental problems.
- Questions in evolution range from its genetic foundations through evolutionary processes to their consequences.
- Evolution is considered at the molecular, individual, population and higher levels.
- Principles of ecology, genetics and evolution are interrelated in many questions.
- Some questions may require quantitative skills, including the interpretation of simple mathematical models.

Ecology (16–17%)

Environment/organism interaction

- Biogeographic patterns
- Physiological ecology
- Temporal patterns (e.g., seasonal fluctuations)

Behavioural ecology

- Habitat selection
- Mating systems
- Social systems
- Resource acquisition

Population Structure and Function

- Population dynamics/regulation
- Demography and life history strategies

Communities

- Direct and indirect interspecific interactions
- Community structure and diversity
- Change and succession

Ecosystems

- Productivity and energy flow
- Chemical cycling

Evolution (16–17%)

Genetic variability

- Origins (mutations, linkage, recombination and chromosomal alterations)
- Levels (e.g., polymorphism and heritability)
- Spatial patterns (e.g., clines and ecotypes)
- Hardy-Weinberg equilibrium

Evolutionary processes

- Gene flow and genetic drift
- Natural selection and its dynamics
- Levels of selection (e.g., individual and group)
- Trade-offs and genetic correlations
- Natural selection and genome evolution
- Synonymous vs. non-synonymous nucleotide ratios

Evolutionary consequences

- Fitness and adaptation
- Speciation
- Systematics and phylogeny
- Convergence, divergence and extinction
- Coevolution

History of life

- Origin of prokaryotic and eukaryotic cells
- Fossil record
- Palaeontology and paleoecology
- Lateral transfer of genetic sequences

Success Comes in Way...