

Biochemistry

The candidate should know the basic concepts of biochemistry included the structure of amino acids and metabolites:

- 1) Protein structure
- 2) ATP structure and function
- 3) Structure of biological membranes
- 4) The glycolysis and gluconeogenesis
- 5) Glycogen, structure, function and metabolism
- 6) Enzyme kinetic
- 7) Coenzymes involved in redox reactions.
- 8) Oxidative phosphorylation
- 9) The lactic fermentation

Developmental Biology

The applicant is expected to have a thorough knowledge of the main issues concerning vertebrate embryo development. These include: a) Descriptive embryology: segmentation, gastrulation, neurulation, body axes determination, tissues and organs derived from each germ layer, generation and role of extraembryonic membranes; b) Concepts of fate map and specification maps, commitment and differentiation; embryonic induction; c) Molecular regulation of embryo development: techniques and strategies used in the main vertebrate model systems (zebrafish, *Xenopus*, chick, mouse) to study gene function during development; molecular pathways involved in body axes determination and pattern formation

Cell Biology

The applicant should have a sound knowledge of the major processes and principles that govern the organization and function of the cell. These include: structure and function of plasma membrane, organelles and cellular macromolecules; protein synthesis, co-translational and post-translational translocation; cytoskeleton and vesicle trafficking; cell adhesion and migration; cell cycle and differentiation; basic features of stem cells.

Molecular Biology

The applicant should have a solid knowledge of the main issues related to Molecular Biology. In particular: - Structure and properties of nucleic acids and proteins. --Mechanisms of DNA replication and associated factors. -Transcription in prokaryotes and eukaryotes and associated factors. -RNA processing- Protein synthesis and genetic code interpretation. - Regulation of gene expression at transcriptional and post-transcriptional levels. Furthermore he/she should know the basic approaches of recombinant DNA technology.

Genetics

The applicant should have solid knowledge of Genetics. In particular: -Mendel's laws -Analysis of linked genes (two-points and three-points crosses) -Analysis of pedigrees for mendelian traits - Population genetics: Hardy-Weinberg equilibrium -Mitosis and meiosis -Main methods of chromosome analysis -The effects of mutations (phenotype-genotype relationship).

Neurobiology

Cellular component of the Nervous System

Organelles, Dendrites, Axons, Axonal transporter, Microtubules, Neurons, Astrocytes, Glia

Excitability of the neuronal membrane and axon.

Electro-tonic property, Ionic Pumps, Nerst Equation,

Origin and propagation of the Action Potential.

Electrical and chemical synapses

Neurotransmitters and Receptors

Ionotropic and Metabotropic Receptors; the Neuro-muscular junction

Synaptic Integration in the Central Nervous System

EPSP and IPSP. Temporal and spatial integration of synaptic signals.