

Subject Areas for MSc Admission Interview

Study Programme: Applied Life Sciences

Purpose and expected level. The admission interview verifies whether the applicant has a sound bachelor-level foundation on which the MSc programme can build. The emphasis is on understanding fundamental principles, a general overview of the subject, basic quantitative reasoning and the ability to apply knowledge to simple practical situations. Applicants should be able to explain basic concepts across chemistry, biology, biotechnology and food science. The interview may include a specific calculation. Applicants should also know the purpose and appropriate use of basic laboratory equipment and the fundamental rules of safe work in chemical, biochemical and biological laboratories.

1. Chemistry

Chemical structure and interactions

Chemical bonds, molecular polarity, hydrophilic, hydrophobic and amphiphilic behaviour; basic structure and properties of common inorganic and organic compounds and their functional groups.

Basic chemical calculations

Amount of substance, molar mass, mass and volume fractions, molar and mass concentration, dilution, stoichiometry and mass balances.

Reactions, equilibrium and kinetics

Understanding of chemical reactions (including catalysed reactions), reaction rates and the factors affecting them, chemical equilibrium, acid-base equilibria and pH.

Thermodynamics and physical chemistry

Basic meaning of energy, heat, work, enthalpy and entropy. States of matter and elementary phase behaviour: basic properties and behaviour of solids, liquids and gases. Ideal gas behaviour and the ideal gas equation of state, including simple calculations. Basic understanding of phase changes and phase equilibria.

Basic laboratory practice and safety

Recognition and appropriate use of common laboratory glassware and equipment, use of personal protective equipment, chemical labelling and hazard awareness, safe handling of chemicals, appropriate waste disposal and elementary response to spills or exposure.

2. Biology and Biochemistry

Biomolecules and enzymes

Basic nomenclature, structure, properties and biological roles of proteins, peptides, carbohydrates, lipids and nucleic acids. Principles of enzyme function, enzyme kinetics and inhibition.

Eukaryotic cell biology

Structure and organisation of eukaryotic cells. Organelles and their functions, intracellular compartmentalisation, cytoskeleton, biological membranes and membrane transport. Structural and functional differences between animal and plant cells.

Prokaryotic cell biology

Structure and organisation of prokaryotic cells. Characterisation of Bacteria and Archaea. Basic structure and function of cellular components, architecture of Gram-positive and Gram-negative bacterial cell envelopes.

Molecular biology and genetics

DNA as genetic information; replication, transcription, translation and regulation of gene expression at a basic level.

Metabolism and bioenergetics

General principles of metabolism, major metabolic pathways and their regulation; basic understanding of cellular energy metabolism.

Microbiology

Growth and reproduction of microorganisms, cultivation, basic identification principles and the influence of environmental conditions on microbial growth.

3. Biotechnology and Food-related Disciplines

Biotechnology and bioprocesses

Basic principles of using microorganisms and other biological systems in biotechnology. Characterisation of cultivation processes (batch, fed-batch, continuous); components of a stirred tank reactor; parameters affecting cell cultivation; composition of the cultivation medium for microorganisms; and examples of biotechnological production. Fundamentals of recombinant DNA technology and its applications.

Process engineering

Basic understanding of material flows and simple mass balances. Purpose and principles of common unit operations used in biotechnology and food processing, such as mixing, filtration, extraction, membrane separation, heat exchange and drying.

Analytical and experimental methods

Basic principles and purpose of common analytical, separation, microbiological and molecular-biological methods, e.g. chromatography, electrophoresis, PCR and membrane separations. Ability to interpret simple graphs, tables and experimental results; elementary awareness of experimental design and basic statistical evaluation.

Food science, quality and safety

Basic food constituents and raw materials, changes during processing and storage, principles of food preservation, microbiological and chemical food safety, food quality and elementary links between food, nutrition and health.

Note for applicants. The list defines the minimum foundation expected for successful entry into the programme. The admission interview is not intended to test detailed knowledge of individual topics, but to assess the applicant's overall academic foundation across the relevant disciplines and their readiness for the Master's study programme Applied Life Sciences. The programme builds on fundamental knowledge assumed from the beginning and does not systematically revisit it during the two-year curriculum. Therefore, a sound understanding of fundamental principles is essential to successfully complete the programme.