ONCAMPUS
Cambridge Education Group

# Undergraduate Foundation Programme
# Life Sciences

## Programme details

### Who is this programme designed for?
This programme is designed to prepare international students, who have completed senior secondary education, for entry to undergraduate studies at one of our partner universities. All students who successfully complete the UFP are guaranteed placement on a suitable programme of undergraduate study. The UFP is set at level 3, which is equivalent to A-level standard in the UK.

### How long will I study for?
This programme lasts one academic year (nine months). The year is divided into three terms of seven to eight teaching weeks and one reading week. You will undertake up to 25 hours of classroom-based study per week.

### What will I study?
This programme includes English and three academic subject modules. English will be integrated into the teaching of academic subjects, as well as being taught separately if you need additional support to develop your English language.

There are five academic pathways to choose from and you will study the pathway most suited to your chosen progression degree. Academic skills relevant to the specific subject area will be taught to fully prepare you for university study. The pathways are: Business, Economics, Finance and Management, Engineering and Sciences, Humanities and Social Sciences, Life Sciences and Art and Design.

### How will I be assessed?
You will be assessed at regular intervals throughout the programme to ensure you are making the progress required to successfully complete the programme. Full assessment of the programme will take place in the final term. Assessment methodologies are aligned to those that will be experienced in the University environment, and include project work, essays, presentations and unseen examinations.

## Life Sciences

### • Molecular Biology

Molecular biology is the study of the molecular basis of biological activity and overlaps biology and chemistry. This course aims to develop knowledge and understanding of molecular biology through the key biomolecules involved in building and maintaining cells. It explores some applications of biology from the biochemistry that determines an individual, through how this is expressed and looks at the ways in which biochemistry of DNA and protein synthesis is applied in industry and research. It will enable you to recognise the value of molecular biology in personal life and in society at large and promote its responsible use.

**Upon successful completion of this module, you will be able to:**

**• Be suitably prepared for biological studies at a higher level and for professional courses requiring knowledge of biology on admission**

**• Recognise the value of biology, chemistry and molecular biology in personal life and in society at large and be able to promote its responsible use**

### 1. Knowledge and Understanding of science

- Recognise, recall and demonstrate a fundamental understanding of chemistry and chemical principles
- Recognise, recall and demonstrate an understanding of the biochemistry in living systems
- Outline the principles involved in commercial applications of biology and molecular biology
- Analyse and evaluate scientific knowledge and processes.
- Relate scientific evidence to scientific explanations and theories
- Analyse and evaluate scientific knowledge and processes.
- Explain who the Economic Actors are and what are their motives

### 2. Application of science and scientific methodology

- Apply scientific knowledge to processes to unfamiliar situations including those related to issues
- Assess the validity, reliability and credibility of scientific information
- Select, organise and communicate relevant information in a variety of forms

### 3. Scientific methodology

- Demonstrate and describe ethical, safe and skilful practical techniques, selecting appropriate quantitative and qualitative methods
- Make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy
- Analyse, interpret, explain and evaluate the methodology, results and impact of their own or others' experimental investigations

#### Cells

Organs, tissues and cells; Imaging cells using light microscopy and electron microscopy. The structure and key components of prokaryotic cells; organisation of eukaryotic cells;

#### Transport across the cell membrane

The structure of the plasma membrane, diffusion, facilitated diffusion, osmosis, active transport, exocytosis and endocytosis

The Periodic Table, Atomic Structure and bonding

Metals and non-metals, structure of an atom, electronic configuration, chemical bonding, bond polarity, shapes pf simple molecules, chemistry of group 1 and group 7

#### Formulae, Equations and Moles

Empirical and molecular formulae, calculations involving mass, moles and gas volumes, calculations involving concentration

#### Introduction to Redox

Oxidation states and redox reactions

#### Introduction to Organic Chemistry

Nomenclature, isomerism, classification of organic reactions

#### Introduction to the Biomolecules Carbohydrates, Lipids and Proteins

Biomolecules; monomers, dimers and polymers; condensation and hydrolysis reactions in biology

Carbohydrates; monosaccharides, disaccharides and polysaccharides; glycosidic bonds

Lipids; fats, oils and waxes; ester bonds; roles of lipids as energy stores; general formula of amino acids; peptide bonds; protein structure: primary, secondary, tertiary and quaternary structure; fibrous and globular proteins

### Enzymes as catalysts

Collision Theory, enthalpy level diagrams, rate of reaction, order of reaction

Calculating: rate of reaction, half-life and activation energy

Enzymes as catalysts; active site and specificity; factors which affect activity including inhibition; commercial uses of enzymes

### Introduction to DNA

DNA as the genetic material. Composition of DNA and RNA; base pairing, backbone, the double helix. DNA replication, PCR and forensics

### The genetic code and chromosomes

DNA transcription and translation. DNA mutations

### Genetics

Genes, variation and inheritance

Construct monohybrid crosses or Punnett squares to illustrate and interpret the potential results of breeding organisms with particular genetic characteristics. Using genetic fingerprinting to determine paternity

### Cell division

The process of cell division by mitosis and meiosis

Karyotyping and chromosomal abnormalities

### Genetic engineering

Outline the principles involved in commercial applications of biology such as the production of recombinant insulin by bacteria and the use of GMOs

### Uses of Spectroscopy in Biomedical Sciences

Electromagnetic spectrum and its effects on molecules, infrared spectroscopy (IR), nuclear magnetic resonance spectroscopy (NMR) and mass spectroscopy

## • Biology and Biochemistry

Living organisms are complex combinations of molecules, cells and organs all working in concert in order to successfully maintain that organism within its environment and to pass on genetic information to the next generation. By studying the different aspects of biology you will understand how each part of the whole works, how they are all interconnected and the impact on the whole when one part malfunctions. This module also studies the biochemistry of energy production and the pathways through which the energy is transferred in the biome and ways in which we seek to control the outcomes.

**Upon successful completion of this module, you will be able to:**

- **Be suitably prepared for biological and biomedical studies at a higher level and for professional courses requiring knowledge of biology on admission**
- **Recognise the value of biology and biochemistry in personal life and in society at large and be able to promote its responsible use**

### 1. Knowledge and Understanding of science

- Recognise, recall and demonstrate an understanding of the biochemistry in living systems
- Consider aspects of nervous and hormonal control
- Define heterotrophic nutrition and nutritional strategies adopted by mammals
- Describe and explain how homeostatic mechanisms function to maintain the body in a state of equilibrium and so allow a degree of independence from the external environment
- Analyse and evaluate scientific knowledge and processes.
- Relate scientific evidence to scientific explanations and theories
- Analyse and evaluate scientific knowledge and processes

# Life Sciences

## 2. Application of science and scientific methodology

- Apply scientific knowledge to processes to unfamiliar situations including those related to issues
- Assess the validity, reliability and credibility of scientific information
- Select, organise and communicate relevant information in a variety of forms

## 3. Scientific methodology

- Demonstrate and describe ethical, safe and skilful practical techniques, selecting appropriate quantitative and qualitative methods
- Make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy
- Analyse, interpret, explain and evaluate the methodology, results and impact of their own or others' experimental investigations

### Levels of Biological Organisation

Organ systems and their specific functions, tissue types and specialised cells

Contrast key features of plant and animal cells

### The reproductive system

Processes of male and female gametogenesis, fertilisation, foetal development, birth, lactation and sources and roles of some key hormones involved in human reproduction

### The nervous system

Compare nervous and hormonal control systems

Neurones and nerve impulses. Describe the structure of a myelinated neurone and explain the formation and propagation of an impulse. Describe the features of synapses and relate to function

Fight or flight –hormones and the nervous system working in concert

### Breathing

Structure and function of the respiratory system
Gaseous exchange in the lungs and lung disease

### The heart

The structure of the heart and regulation of the cardiac cycle.

### Vascular system

Structure of the blood vessels and their contents, diversity of transport functions of blood

### Immunity

The roles of the different components of the immune system

Blood clotting, phagocytosis, inflammation response. Cell mediated and antibody mediated immune responses

Vaccination

### Disease

Distinguish between illness and disease, infectious and non-infectious disease – symptoms and causes of disease

### Energy flow and biogeochemical cycles

Trace the flow of energy through a food web and recognise the significance of carbon and nitrogen cycles. Why food must be digested

### The digestive system

Heterotrophic nutrition and nutritional strategies adopted by mammals

The structure of the human digestive system, the initial processing of food items and different roles played by enzymes

The absorption of digested food

The roles of insulin and glucagon

### Homeostasis, Kidneys and the liver

Regulation of body processes – temperature, Water, respiratory gases, glucose

The structure and function of the kidneys

Identify gross structure kidneys, describe terms 'homeostasis' and 'negative feedback' explain important functions of the liver and the role of ADH

Identify gross structure of liver and its role in homeostasis and detoxifying the body

Role of the circadian rhythm

### Cellular respiration

The chemistry of glycolysis, citric acid cycle and the electron transport chain. The structure and function of mitochondria in ATP production

### Photosynthesis

The light and dark cycles, electron transport chain, c3 vs C4 plants, chloroplasts

## • Skills for Science

Progress in the sciences is made through scientific experimentation and interpretation of the results. In order to complete this accurately and safely it is important to understand experimental design and methodology and how to analyse results. This module aims to prepare you for laboratory work, develop your data analysis skills and teach you how to report and critique your findings. It will also introduce you to regulation of scientific and medical research and medical ethics.

### 1. Scientific communication

- Understand that scientific writing should present facts and their interpretation
- Understand how writing style and language is altered for different audiences
- Understand the differences the two main types of scientific writing style: Laboratory reports and Essays
- Understand that essays must have an introduction at the beginning and a conclusion at the end
- How to communicate your findings and knowledge with non-scientists as well as other scientists

### 2. Basic mathematical skills

- Make use of appropriate units in calculations
- Use expressions in decimal and standard form
- Ratios, fractions and percentages
- Understand the terms mean, median and mode
- Understand measures of dispersion, including standard deviation

### 3. Scientific methodology

- Describe how and why appropriate control experiments should be used
- Identify the dependent and independent variables
- Identify the limitations of the material, apparatus and techniques used in chemistry and biology experiments

#### Handling data

Collect and present raw data in a suitable table

Plot two variables from experimental or other data on a suitable graph

Construct and interpret frequency tables and diagrams, bar charts and histograms

#### Laboratory safety

How to make and record observations

How to perform an investigation in a methodical and organised way showing full regard for the safety of the investigator and others potential affected by said investigation

How to identify which part(s) of an investigation carries potential risk to the investigation and/or the environment

#### Laboratory reports

Understand that laboratory reports have the following sections: Introduction, Materials, Methods, Diagram, Results, Discussion and Conclusion

#### Selecting and using a statistical test

Construct an appropriate null hypothesis

Calculate the test statistic given a standard scientific calculator and understand how to use probability for acceptance or rejection of the null hypothesis

The chi-squared test to test the significance of the difference between observed and expected phenotypic ratios

The Student's t-test

#### Introduction to medical ethics

Outline the role of regulation in scientific and medical research

Consequences of misrepresenting scientific and medical information

Clinical trials; regulation, recruitment and consent

Patient confidentiality

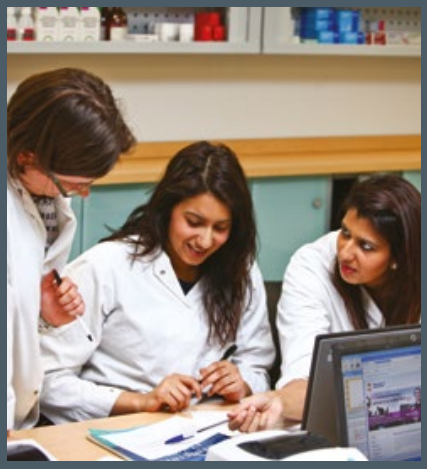
Three core concepts of best interests, autonomy and rights of the patient

The ethical criticism and defence of research on biological, animals and humans and how it is publicised

# Life Sciences

## Sample timetable

| | 9-10 | 10-11 | 11-12 | 12-1 | 1-2 | 2-3 | 3-4 | 4-5 |
|---|---|---|---|---|---|---|---|---|
| **Mon** | EAP and English test prep | EAP and English test prep | | Lunch | Subject 2 | Subject 2 | | Personal tutorial |
| **Tues** | | Subject 1 | Subject 1 | Lunch | EAP and English test prep | EAP and English test prep | | |
| **Wed** | Skills for ... | EAP and English test prep | EAP and English test prep | Lunch | Subject 2 | Subject 2 | | |
| **Thur** | | Subject 1 | Subject 1 | Lunch | EAP and English test prep | EAP and English test prep | | Skills for ... |
| **Fri** | Subject 2 | Subject 2 | Skills for ... | Lunch | Subject 1 | Subject 1 | EAP and English test prep | EAP and English test prep |



**ONCAMPUS**
Kett House, Station Road, Cambridge, CB1 2JH, United Kingdom

**Telephone:** +44 (0)1223 345698
**Email:** admissions@oncampus.global **Web:** www.oncampus.global
**Facebook:** www.facebook.com/oncampusglobal