



ACADEMICS OF THE FUTURE SPECIALISMS

# Science

The Science specialism is delivered by suitably qualified and / or experienced science teachers and includes 7½ hours of lessons per week.

## COURSE DETAILS 2024

**Centre:** Oundle

**Course:**  
Academics of the future

**Ages:** 12-17yrs

**Academic Levels:**  
GCSE / A Level

**Tuition Ratio:** 1:14

**Tuition Time:**  
7½ hours p/w

**Days:**  
Mon, Tues, Wed, Thurs, Fri

**Times:** 13:00-14:30

**Specialism:** Students study a range of Science subjects every week.

**Syllabus:** An academically challenging syllabus has been designed especially for British Summer School.

## OBJECTIVES

- To increase students' academic and theoretical knowledge in the core science subjects
- To experience studying Science "the UK way"
- To enable students to participate in practical work and experiments, where appropriate
- To develop independent study and research skills
- To improve students' English to help them communicate more freely, accurately, and confidently

## OTHER BENEFITS

Academic study brings many benefits such as:

- Expanding and diversifying students' general knowledge
- Improving time management
- Enhancing critical thinking skills
- Developing self-understanding and perseverance
- Increasing employability and career opportunities

## SUBJECTS COVERED

- Biology
- Chemistry
- Clinical Anatomy
- Maths/Physics

**“To improve students’ English to help them communicate more freely, accurately, and confidently.”**



## BIOLOGY

### Overview

From the plants, animals, and insects in our gardens to the cells that make up our tissues, organs and bodies, biology is all around us and touches every part of our lives. Have you ever wondered how a plant can detect and respond to an insect eating its leaves? How are traits passed down from parents to offspring? How can populations adapt to a changing world? We will explore the diverse areas of study within Biology and how they apply to our lives and society.

### Modules

- Introduction to Biology.
- Cell signalling.
- Heritability: how information and traits are passed on.
- Introduction to evolution.
- DNA in biotechnology.

### Outcomes

- Determine and discuss what characterises life by differentiating between biotic and abiotic things.
- Identify different areas within the field of Biology.
- Describe the different biological levels of organization and classify organisms.
- Define genes, alleles, chromosomes, DNA and how they contribute to heritability.
- Describe how traits are passed from parents to offspring and look at different mutations that cause genetic diseases.
- Identify the different components of a cell and describe the different ways cells receive signals and respond.
- Explain how mRNA and proteins are produced by a cell and why they are important.
- Define evolution and the 5 mechanisms that drive evolution.
- Explain how natural selection acts on populations.
- Discuss how biologists research and communicate information using the scientific method and peer review process.
- Identify the research process to scientific problems.

## CHEMISTRY

### Overview

Do you wonder what exactly chemists do? Or what happens in a chemistry lab? In this subject, you will gain experience in a chemistry lab using practical lab techniques. You will learn how to extract natural products from different plant sources and use anthocyanins as pH indicators to determine the pH of various solutions. Other lab activities will include demonstrations with a rotary evaporator, acid and base experiments, and identifying chemical structures with NMR, IR, and MS spectra. There will be opportunities for you to ask questions and learn about the diverse fields of chemistry.

### Modules

- CO<sub>2</sub> acidification Lecture on glucose dehydration.
- Phase changes and describe H<sub>2</sub>O<sub>2</sub> overall reaction.
- Calorimetry and specific heat capacity and exothermic/ endothermic reactions.
- Recrystallization.
- Natural product extraction.
- Polymers.
- Chromatography.

### Outcomes

- Identify and explain the cause of ocean acidification
- Evaluate and discuss the effect of concentration (dose) on reaction rate
- Describe chemical change from liquid to gas
- Measure the heat capacity change
- Demonstrate purification by recrystallization
- Demonstrate natural product extraction
- Explain how polymers are cross linked to form gelatinous mixture
- Demonstrate and observe paper chromatography
- Describe density differences in liquids



## CLINICAL ANATOMY

### Overview

Have you ever considered a career in healthcare? Are you interested in the structures of the human body and how they affect overall health? In this subject, we will learn about anatomical systems and what happens when something goes wrong. Through module content, clinical cases, readings, and activities, you will learn how anatomy plays a critical role in diagnosis and treatment of patients. Put on your health care professional cap and discover where the world of anatomy can take you!

### Modules

- Discovering Anatomy & Health Care.
- Let's Get Moving: The Musculoskeletal System in Motion.
- Gotta Go: The Digestive & Urinary Systems.
- Catch a Breath: The Cardiovascular & Respiratory Systems.
- Getting on my Nerves: The Nervous System.

### Outcomes

- Describe anatomical systems using anatomical terminology.
- Solve clinically relevant simulated patient cases based on anatomical reasoning and interpretation of medical diagnostics tests.
- Discuss the diversity of healthcare careers involved with optimizing human health.

## MATHS/PHYSICS

### Overview

Monitor and collect data, hypothesize, theorise, and perform mathematical modelling to describe what happened in experiments. Use analytical techniques and computer modelling to share results, promote discussions, and explore beyond the "typical" classroom experience. You will push yourself as you understand the structure of a problem, and then use mathematical tools to prove or disprove ideas and theories.

### Modules

- The Scientific Method
- The Dice Game
- Data Fitting
- Bernoulli's Equation and Finite-Difference Approximations
- Water Tank Problem
- Collision Problem
- Introduction to Python
- Springs Problem

### Outcomes

- Assess complex problems, define thoughtful hypotheses, and conduct experiments to test theories and ideas.
- Work collaboratively to apply creativity to expand reasoning, problem solving, and technical analysis skills.
- Describe and use various experimental designs and materials including physical measuring devices and simulation software.



**“The objective of this specialism is to increase students’ academic and theoretical knowledge in the core science subjects.”**



For all enquiries and to apply, please contact British Summer School:

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