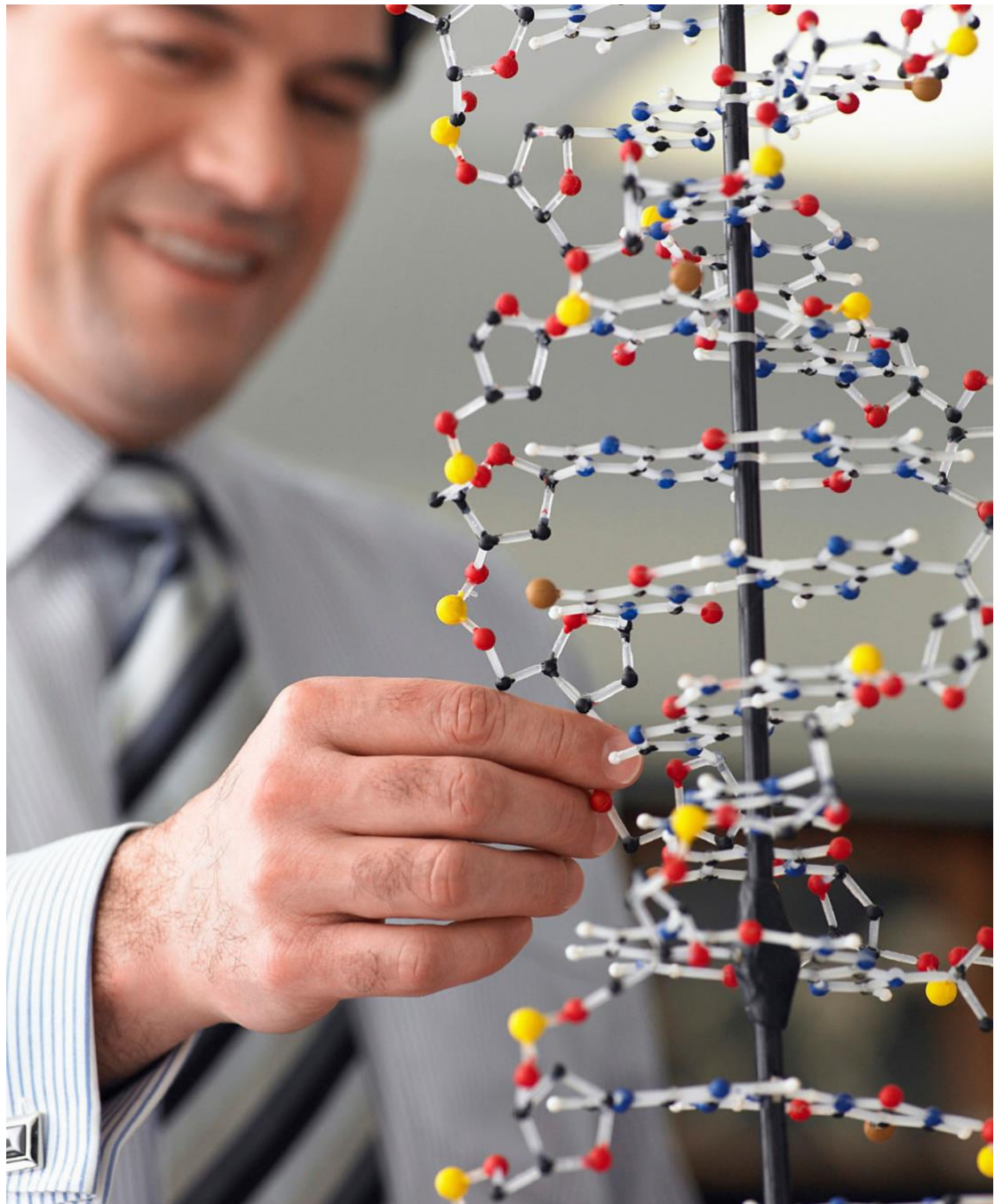




THE UNIVERSITY OF
SYDNEY

Kickstart Biology

Year 12



Year 12 workshops

We currently offer two Year 12 Biology Kickstart workshops focusing on Heredity and Genetic Change.

These hands-on workshops will allow students to learn about these complex areas in an engaging and digestible format. Students will have access to a wide range of instruments and resources from our modern teaching laboratories and knowledgeable demonstrators. Kickstart allows students to have a real university experience in biology as these techniques are currently used in the undergraduate science courses.

1. Heredity: A Case Study of Sickle Cell Anaemia

The *Heredity: a case study of sickle cell anaemia* workshop is available on-campus from Term 1, 2022

Workshop description

In this workshop, students will learn about an inherited disease – sickle cell anaemia and its genetic cause (single-nucleotide polymorphism).

Aligning with inquiry-based learning, students will investigate the genetic cause of sickle cell anaemia with a case study. Their job is to determine whether a child has inherited the disease and to discuss in small groups the steps and experiments that would be needed to answer this question.

Students will perform the following hands-on activities:

- DNA extraction
- Lego-based Polymerase Chain Reaction activity
- paper-based restriction enzyme digest
- Gel electrophoresis and visualisation.

The syllabus points addressed in this workshop are:

Module 5: Heredity

DNA AND POLYPEPTIDE SYNTHESIS

- Model the process of polypeptide synthesis including:
 - Analyzing the function and importance of polypeptide synthesis
 - Assessing how genes and environment affect phenotypic expression

GENETIC VARIATION

- Conduct practical investigations to predict variations in the genotype of offspring by modelling meiosis, including the crossing over of homologous chromosomes, fertilization and mutations
- Model the formation of new combinations of genotypes produced during meiosis, including but not limited to:
 - Interpreting examples of autosomal, sex-linkage, co-dominance, incomplete dominance and multiple alleles
 - Constructing and interpreting information and data from pedigrees and Punnett squares
- Collect, record and present data to represent frequencies of characteristics in a population, in order to identify trends, patterns, relationships and limitations in data, for example:
 - Analysing single nucleotide polymorphisms (SNP)

INHERITANCE PATTERNS IN A POPULATION

- Investigate the use of technologies to determine inheritance patterns in a population using, for example:
 - DNA sequencing and profiling

2. Genetic Change: Biotechnology and Transgenic Organisms

The Genetic change workshop is available on-campus from Term 1, 2022.

Workshop description

In this workshop, students will learn about the importance of biotechnology in several aspects of our society including medicine, agriculture and industry.

Students will be given a quick introductory tutorial on genetic modification, bacterial transformation and research performed at the University of Sydney. They will then be given a scenario where their task is to increase the production of a useful protein using bacteria and plasmids. They will do a paper activity to learn the key principles involved, followed by a protein purification of a fluorescent protein from genetically modified *Escherichia coli* (*E. coli*). This will be followed by a quality check of the protein using a spectrophotometer.

Students will perform the following hands-on activities:

- Paper activity exploring plasmid design for genetic engineering
- Protein purification from transgenic bacteria
- Confirming protein quality using a spectrophotometer

The syllabus points addressed in this workshop are:

Module 6: Genetic Change

BIOTECHNOLOGY

- Investigate the uses and applications of biotechnology (past, present and future) including:
 - Analysing the social implications and ethical uses of biotechnology, including plant and animal examples
- Evaluating the potential benefits for society of research using genetic technologies

GENETIC TECHNOLOGIES

- Investigate and assess the effectiveness of cloning, including but not limited to:
 - Gene cloning
- Describe techniques and applications used in recombinant DNA technology, for example:
 - The development of transgenic organisms in agricultural and medical applications
- Evaluate the benefits of using genetic technologies in agricultural, medical and industrial applications