



DNA Detectives: Forensics Investigation KS3 & KS4

Duration: 1.5 hours, max capacity: 30 students

Students use a range of exciting forensic techniques to examine evidence from a crime scene. Working with real DNA samples and gel electrophoresis to create DNA fingerprints. Using fingerprinting, microscopy, shoeprint, and handwriting analysis to investigate the case. Students use their new skills and work in teams to decide who is charged with the crime.

Key Words:

DNA, Cells, Forensic science, Crime, Evidence, Gel electrophoresis, DNA fingerprinting, Laboratory, Enzymes, Fingerprinting, Microscopy, Applied science

Learning objectives

Learn about the structure of DNA, and how to define chromosomes, genes, and genome.
Gain an understanding of DNA fingerprinting as a tool to differentiate between suspects.
Understand how restriction enzymes are used to cut DNA into fragments.
Develop micro-pipetting and gel loading skills.
Obtain practical experience of running an electrophoresis gel, and interpret results.
Gain an appreciation of the reliability of DNA fingerprinting, including contamination risk.
Learn about modern genetic technologies and DNA forensic science.
Develop problem solving and interpretative skills.
Develop team working skills to solve a problem.

Content

Students are introduced to forensic science and techniques used to examine evidence from a crime scene.
Students examine evidence gathered from a mock crime (theft of mobile phone).
Consider the relevance of modern genetics for the identification of DNA evidence.
Use micropipettes to measure small volumes of liquid and work with real, digested DNA samples.
Load, run, and analyse electrophoresis gels.
Consider the significance of contamination and how this risk might be minimized.
Use DNA fingerprinting to draw conclusions based on evidence, and to attempt to solve a crime.
Use microscopes to analyse hair samples.
Students work with real fingerprint dusting techniques.
Examine shoeprint and handwriting evidence.

Curriculum Links:

KS3 Biology

Cells and organisation

Cells as the fundamental unit of living organisms
The functions of the cell wall, cell membrane, cytoplasm, nucleus

Inheritance, chromosomes, DNA and genes

Heredity as the process by which genetic information is transmitted from one generation to the next
a simple model of chromosomes, genes and DNA in heredity

Working scientifically

Ask questions and develop a line of enquiry based on observations of the real world.
Make predictions using scientific knowledge and understanding.
Use appropriate techniques, apparatus, and materials during laboratory work.



KS4 Biology

Working scientifically

Appreciate the power and limitations of science

Explain everyday technological applications of science

Use scientific theories and explanations to develop hypothesis

Apply knowledge of a range of techniques

Carry out experiments appropriately having due regard to the correct manipulation of apparatus

Make and record observations and measurements using a range of apparatus and methods

AQA Biology

The nucleus of a cell contains chromosomes made of DNA molecules. Each chromosome carries a large number of genes. In body cells the chromosomes are normally found in pairs. The genetic material in the nucleus of a cell is composed of a chemical called DNA. DNA is a polymer made up of two strands forming a double helix. The DNA is contained in structures called chromosomes. A gene is a small section of DNA on a chromosome. Each gene codes for a particular sequence of amino acids, to make a specific protein. The genome of an organism is the entire genetic material of that organism.

DNA is made from four different nucleotides. Each nucleotide consists of a common sugar and phosphate group with one of four different bases attached to the sugar. DNA contains four bases, A, C, G and T. A sequence of three bases is the code for a particular amino acid. In the complementary strands a C is always linked to a G on the opposite strand and a T to an A.

OCR Biology

Learners should be familiar with cells as the fundamental unit of living organisms. Inside every cell is genetic material and this is used as a code to make proteins. Learners should have a simple understanding of the double helix model of DNA. Learners should be familiar with the idea of enzymes as biological catalysts. DNA is a polymer and is made up of two strands forming a double helix

DNA is made from four different nucleotides; each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar. The pairs of complementary bases are A-T and G-C.

Learners should be familiar with the idea of heredity as the process by which genetic information is passed from one generation to the next. They should have a simple model of chromosomes, genes and DNA. Describe the genome as the entire genetic material of an organism

WJEC Biology

The structure of DNA as two long chains of alternating sugar and phosphate connected by bases; the chains are twisted to form a double helix; there are four types of base, A (adenine), T (thymine), C (cytosine) and G (guanine); the order of bases forms a code for making proteins; the code determines the order in which different amino acids are linked together to form different proteins

Complementary base pairing between A and T, C and G and the role of the triplet code during protein synthesis

The process of 'genetic profiling' which involves cutting the DNA into short pieces which are then separated into bands

How 'genetic profiling' can be used to show the similarity between two DNA samples, the pattern of the bands produced can be compared to show the similarity between two DNA samples, for instance in criminal cases, paternity cases and in comparisons between species for classification purposes



Potential Hazards and accessibility

Students will work in a laboratory environment with TAE buffer and gel electrophoresis tanks.

Aluminium dusting powder may aggravate asthma (dust masks are available, or activity can be omitted for individual students if preferred)