

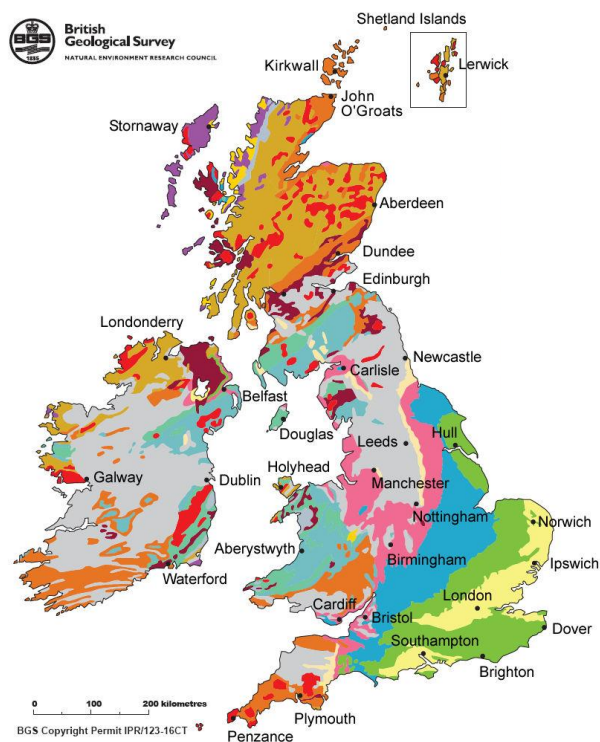
## Geology in Schools

Geology is taught at schools as a GCSE and an A level subject. The A level is currently offered by two examination boards, OCR and Eduqas, as part of their STEM suite of qualifications. Based on the new Department for Education subject content published in March 2016, this updated course was first taught in 2017, with first assessment set for 2019.

## Changes to the Geology A level

Geology remains a wholly unique science subject; students learn to collect, filter and evaluate quantitative and qualitative data from the Earth's crust and surface environment. This requires the development of problem solving skills and thus instils in students the type of critical thinking that forms the core of all STEM subjects. The new subject content has retained these key components, while adding the following changes:

- Modernisation of subject content
- Focus on fieldwork
- Transferable skills in science
- Standardised with other science subjects



A Geological Map of the UK and Ireland.

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## Modernisation of subject content

The subject content for all A level qualifications has undergone change over the last three years. For geology, these changes were welcome as the content had not been revisited in nine years and contained some outdated information. Examples of where the subject content has been modernised are:

- Logarithmic Richter scale has been replaced by the Moment Magnitude scale for earthquake measurement.
- The focus on coal has been removed.
- Global Positioning Systems (GPS), Geographic Information Systems (GIS) and virtual fieldwork are now included in the curriculum.
- Remote sensing of terrestrial planets and the Anthropocene Epoch represent some of the newly introduced, modern concepts.
- Peer reviewed literature published as recently as 2017, has been used to update the subject content.

As well as modernisation in the content, the topics covered in the A level now more closely follow current trends in employment, with more emphasis given to geological industries such as hydrogeology and the management and restoration of contaminated land on brownfield sites.

## Focus on Fieldwork

Problem solving skills are imparted and honed through the fieldwork elements of the curriculum. Michael Bolton, Director of Communications for the Field Studies Council has said that:

***“Field studies enable students to work in three dimensions in the real world, visualizing and manipulating data and building their skills as problem solving geologists. Fieldwork also provides students with the opportunity to develop their work-based skills, such as communication, observation and team work.*”**

The practical endorsement for A level Geology requires a minimum of six days of fieldwork: two at AS and four at A2. Students are then tested on their knowledge of practical fieldwork methods, rather than their personal results, making fieldwork applicable to all.

# Changes to Geology A Level

## Fulfilment of practical endorsement – case studies

Schools are required to take their A level students on 6 days of fieldwork. This is how one school in East Anglia chose to fulfil its practical endorsement:

**Year 12** - One day fieldwork at Highwood Quarry, a local aggregate quarry. Here, the students learn how to describe sedimentary rocks in the field, undertake a graphic log, study unconformities and interpret sedimentary environments. The visit also introduces aspects of economic geology. A second day involves studying coastal exposures at Walton on Naze, Essex. Here, students study contrasting sedimentary environments, allowing development of field sketching skills, and the description and identification of fossils *in situ*.



Year 12 students learning field skills at Highwood Quarry

**Year 13** - For the four days required fieldwork, students travel to the Lochranza Field Centre on Arran, Scotland. This independent Field Centre offers taught geology field courses, tailored to either examination board. At Lochranza, students learn how to: describe and identify a wide range of igneous, sedimentary and metamorphic rocks; interpret geological structures and cross-cutting relationships; construct simple geological maps based on field measurements and recognise Arran's place in the geological history of the UK.

## Transferable skills in science

The new curriculum prepares students for STEM undergraduate degrees through the delivery of numeracy and critical thinking. Having been written in partnership with 29 key stakeholders, including 19 different university departments, the new course provides transferable scientific skills applicable to a wide range of courses.

Quantitative skills learnt in the Geology A level, such as sampling methods, integration of existing data sets and how to evaluate results with reference to uncertainties and errors, can be applied to many other science subjects at university.

More broadly, the qualification develops expertise useful across higher education, such as the ability to cite references correctly, use relevant statistical methods when evaluating data (such as Mann Whitney U and Spearman's rank correlation coefficient) and use a variety of on and offline research techniques.



Students search for copper in a desk activity at the Geological Society.

## Standardised with other science subjects

The Geology A level is now classified as one of OFQUAL's six science subjects. The subject content states that, 'AS and A level geology specifications must build on the skills, knowledge and understanding set out in the GCSE content for science and mathematics'.

The Scientific Method applied to the geology curriculum is recognised and approved by the examination boards, OCR and Eduqas. For OCR, geology is now placed firmly alongside physics, chemistry and biology as one of the four science subjects that it offers. The method of examination for all four subjects is similar for each, ensuring the same level of scientific training across the board.

This consistency has been achieved by focusing on the application of scientific knowledge, rather than simply recalling definitions; a maximum of only 10% of the total marks are available for recall knowledge.

Numeracy is emphasised as a key skill, and examinations now give a greater weighting to the 32 mathematical skills included in the subject content, necessitating a better understanding of mathematics and statistics. This shift reflects the work of professional geologists in industry and academia more realistically.