

## Subject Area: Geology

**Curriculum Intent:** Geology is often a misunderstood and overlooked subject. Commonly when Geology is suggested as a subject people will reply a long the lines of 'it's just rocks' questioning the validity and importance of the subject. In Geology A-level students will learn and reinforce principals from Chemistry, Biology and Physics to learn about the Earth's past and present processes in order to infer what the future could hold for our planet, finding resources, predicting hazards, civil engineering and managing the physical environment just to name a few. These are particularly pertinent due to our present-day climate crisis. Academic Geologists are some of the scientists at the forefront of mitigating and adapting to climate change, and for informing governments on what the implications for the Earth could be if net zero is not reached. We know this because in Geology scientists research what the Earth's climate was in the past, and the resulting changes to Earth processes. For example, Geologists have proven that in past climates when we did not have ice caps the world's oceans became anoxic due to resulting changes in Ocean Circulation, resulting in mass extinctions for the Earth. If this were to happen today, there would be major food shortages due to damaged fish stocks. Examples of mitigation strategies that Geologists are important for are Carbon and Capture and Storage- the process which catches carbon dioxide as it is released from into the atmosphere. Geologists are key to identifying suitable reservoirs to store our caught carbon dioxide. Aside from being a key part to the battle against climate change, Geologists are a key part to meeting the needs of our growing population. Mines can only access crustal rocks. 99% of the crust is made of just 8 elements. Modern day society needs vast quantities of elements such as Lithium, Copper and Cobalt which are incredibly rare in the crust. Geologists learn the processes required for these elements to become concentrated into economically viable resources to be exploited. These rarer elements are key in building renewable energy resources and mobile devices. Therefore, Geologists are key to solving the Energy Crisis and meeting the needs of the Growing Population.

In building our curriculum in Geology we have formulated the following principals in order to breakdown the misconception of Geology being 'just rocks.'

1. Where possible using a careers-orientated approach to the subject e.g. linking each lesson to careers, having external speakers talk about their work.
2. A research orientated department, where current research is incorporated into lesson planning and updating. Linking our department to universities.
3. A practical approach allowing students to physically see geological processes in the field.

Geologists are on the UK skills shortage list, proving how employable people with knowledge of the subject are. There has been a trend since the introduction of linear A-levels of a reduction in students opting to study the subject, both at A-level and University. If this trend is not reversed the UK is going to have major issues with meeting the needs of its population.

Dates	Content	Assessment	Rationale
Year 12 Terms 1 and 2	Introduction to Geology: Breaking misconceptions.  F4: Earth Structure and Global Tectonics.  F1: Elements, Minerals and Rocks.  F2: Sedimentary Processes and Maps.	In class assessment through spaced rep quizzing and 2-weekly marking cycle. <b>Specified Practicals:</b> 18 1 3 2 4 5a 5b 6 7 12  <b>PC1 – F4</b>	We begin with F4 in order to break down misconceptions from GCSE science and Geography regarding the Earth's structure. This gives students an understanding to question what they have been taught and are being taught within scientific processes. From there we begin with the F1 topic as mineralogy and basic rock formation is the foundation on top of which F2, F3 and G1-G4 can be understood. Finally we finish with F2 as this nicely links to GCSE Geography, a subject commonly took by Geologists at GCSE, to give a foundation upon which the students can build their schema. In order to breakdown misconceptions about Geology as a subject, the first session will be on the importance of Geology and common careers, with students investigating a Geological Career of their choosing for independent study.  <b>CEIAG:</b> Environment agency, flood management, local environmental monitoring groups, university research- seismology, geophysics, geochemistry, turbidity currents.  <b>PS/CV's:</b> Democracy in team work for practical exercises. Rule of Law for recording results honestly.
Year 12 Terms 3 and 4	F2: Igneous and Metamorphic Processes and Maps  F3: Fossils and Dating	In class assessment through weekly spaced rep quizzing and 2-weekly marking cycle. <b>Specified Practicals:</b> 8 9 10 11 12 16 17 18  <b>PC2 – Sediments and minerals.</b>  <b>Formal In class assessment:</b> Igneous and metamorphics	This topic follows on from what has come before by continuing to deepen understanding of the Rock Cycle. Sedimentary rocks are made up of broken up rocks, therefore it is important to understand how they first form from volcanoes in igneous processes. Contrastingly metamorphic rocks are sometimes created by igneous processes. Metamorphic rocks are altered igneous and more commonly sedimentary rocks, therefore metamorphic petrology needs to come last in our sequence of understanding basic rock formation. Now that the students have a basic understanding of rock processes they can apply this to maps, a skill that working Geologists use commonly. In their exams students will have to make cross sections and decipher information about the geological history of an area from a 2D map. Finally, because students will now have a concept about how rocks are formed and cycle between each other, students can begin to learn the basics of fossils. Fossils are linked closely to sedimentary environments and therefore must come after them as fossils are influenced by the environments that the organisms lived within, both with their deposition and morphology. Lastly students will use their knowledge of fossils to learn absolute dating mechanisms and due to the development the students' mathematical skills within Geology students will learn about radiometric dating. For Igneous and Metamorphic Processes we will have a guest speaker discuss current ongoing research in the field at universities. Finally once we have studied all F-topics we will go to the University of Leeds to observe what studying Geoscience at University is like and to able to see rocks in thin section.  <b>CEIAG:</b> university research (volcanology, seismology, meteorology), environmental consultancy, mining, civil engineering, Oil and Gas. Hydrology.  <b>PS/CV's:</b> PS/CVs: perseverance in understanding complex processes that they'll have little background knowledge on. Democracy in their team work for practicals.
Year 12 Terms 5 and 6	G1: Advanced Rock forming processes  G2: Advanced Rock deformation	In class assessment through spaced rep quizzing and 2-weekly marking cycle. SP 20 (SPs to be updated when fieldwork locations decided) PC3 – Fossils and Maps  PC4- AS mock	This topic introduces more advanced sedimentary, igneous and metamorphic petrology, creating a schema based upon understanding the AS content of the course. It involves the further progression of the students' mathematical skills for Geology, linking to applying radiometric dating to xenoliths. This will also build upon chemistry learned at GCSE such as metastability and the implications of this for metamorphic processes. This is when students will design their own experiment for contact metamorphism. During this term students will sit an AS paper for their Trial Exam as the AS Geology can be taught directly alongside the A-level and covers the F1-F4 topics which the students will have already studied. During this term students will also complete their fieldwork, experiencing Geology in the field. This is necessary for the students to meet the full practical endorsement requirements for the course and will help the students apply and therefore cement in content. During Deformation we will invite in a Guest Speaker from WSP Consulting to discuss the work that Engineering Geologists do. Lastly during these Terms we will complete the fieldwork element of the course with a 4 day residential trip to the Lake District. Here Geologists will learn practical skills and apply the theory they have learned in lessons to decipher the Geological History of an area. We need to complete fieldwork towards the end of Y12 to make sure they have enough theoretical knowledge to benefit from the trip.

			<p>CEIAG: Environmental radiogenic for nuclear industry, civil engineering, exploration and geological mapping.</p>	<p>PS/CV's: conducting themselves in public, perseverance on scientifically complicated topics.</p>
Year 13 Term 1 and 2	G3: Advanced Past Life and Climates G4: Earth Materials and Natural Resources. T1: Geohazards	In class assessment through spaced rep quizzing and 2-weekly marking cycle.  PC1 – G3  PC2: G4  SP: 19	<p>This topic builds upon the introduction to fossils given in Y12 to give a detailed knowledge of and evidence for the Geological History of the Earth. This involves students practising their critical analysis skills when considering the evidence for the formation of the Earth, its geological and climatic history and its life. This will also further build upon their knowledge of radioactivity, through using isotope ratios and fractionation to interpret past climates. We will then investigate Earth Materials and Resources where the students will apply their knowledge of advanced igneous and sedimentary processes to learn how metallic and non-metallic ores form, hydrocarbon formation and formation of hydrocarbon deposits. Coal and Hydrocarbon industries are declining, but because of this they need to be monitored for environmental pollution once closed which is a growing sector in the UK economy. For jobs in this sector a knowledge of how coal, oil and gas deposits form is necessary. Lastly in the investigation of natural resources they will learn the exploration techniques to find these deposits, which will draw upon their knowledge from the F4 topic. For the final part of this segment of learning students will learn Geohazards, focusing primarily on those applicable to the UK such as Earthquakes, Landslides, and mine waste which will overlap with geographical learning and build upon knowledge of plate tectonics from F4 and G4. For G4 and T1 we will invite in speakers from Magnox as the decommissioning of Nuclear Sites in the UK is a big career pathway for graduate geologists.</p> <p>CEIAG: museum curating, research at university level into origins of life and extinction event, climate change research, mining, exploration, environmental care of former mines, Oil and Gas, Hydrology</p>	<p>PS/CVs: mutual respect for those who have a creationist/similar faiths, democracy for critiquing the evidence.</p>
Year 13 Terms 3 and 4	T2: Geological Map Application T3: Quaternary Geology	In class assessment through spaced rep quizzing and 2-weekly marking cycle.  PC3 – Full papers except T3.  PC4- Full paper	<p>In their final terms, students will build upon their map skills learned during the F2 part of the course and fieldwork, to be able to read full Geological maps and interpret geological histories. They will also investigate making maps using GIS. They will then apply their advanced knowledge of geological maps to predict subsurface geological conditions, construction projects, hazards, resource locations and landfill/waste storage locations. Finally students will apply their full knowledge of plate tectonics, isotopes, fossils, landforms, petrology and geological history to investigate how Climate has changed during the quaternary period and apply this knowledge to Hominin evolution. This is an elective module chosen due to its overlaps with Geography and is most applicable for understanding climate science which is more important for people to understand compared to the other options for the elective module. For T3 we will invite in a Guest Speaker who is currently doing university level research on the Drakes Passage to discuss the applications for T3.</p> <p>CEIAG: Exploration, Mining, Oil and Gas, Environmental Consultancy, Civil Engineering, GIS analyst, university climatic research, oceanography.</p>	<p>PS/CVs: Democracy and rule of law for appreciating and critiquing evidence.</p>