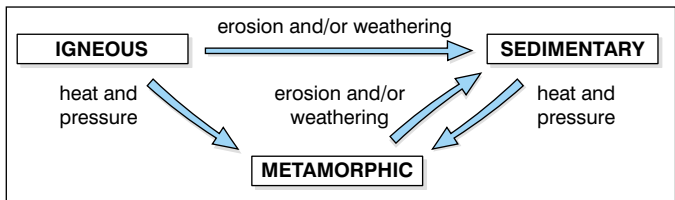


Types of rocks

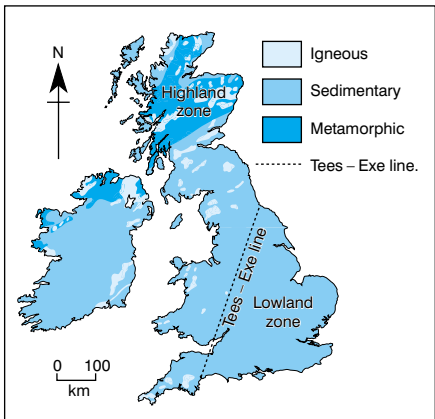
- Rocks can be divided into three main groups: **igneous**, **sedimentary** and **metamorphic**. Igneous rocks are formed as molten **magma** deep in the earth's crust. They cool slowly and solidify underground. They are very resistant to erosion. Most sedimentary rocks consist of mineral particles formed by the breakdown of older rocks. Limestone, chalk and coal are sedimentary rocks formed from the fossilised remains of animals and plants. Metamorphic rocks have been changed as the result of heat, pressure or chemical reactions.



Relationship between rock types

- Rocks can be changed from one group to another by heat, pressure, erosion or weathering.
- **Granite** and **basalt** are examples of igneous rocks. **Chalk**, **limestone** and **clay** are sedimentary rocks. **Marble** and **slate** are metamorphic rocks.

Distribution of major rock groups in the British Isles



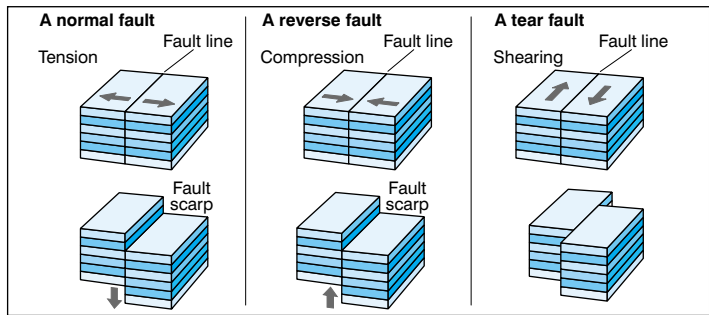
- Igneous and metamorphic rocks are found largely in the north and west of the British Isles to the north and west of the Tees–Exe line. Most of the south and east of the Isles is made up of sedimentary rocks.

Weathering

- **Erosion** and **weathering** both result in the breakdown of rocks. Erosion involves movement whereas weathering takes place 'in situ'. The material that has been broken down by weathering and erosion is removed by **mass movement**. This reveals a fresh rock face to attack from the elements. Weathered and eroded material will form **scree** at the bottom of a slope.
- There are two main types of weathering: **physical** and **chemical**. In high mountains and high latitudes most physical weathering is by **freeze–thaw**. When the temperature drops below 0°C water freezes inside cracks in the rocks. The ice can split the rocks. In deserts the large daily range in temperature produces **insolation weathering** of rocks. Minerals in the rocks expand and contract at different rates setting up internal stresses. The outer rock layers flake off; so-called **exfoliation** or 'onion peeling'.
- **Scree** is the accumulation of small rock fragments at the bottom of a slope. On flatter surfaces, especially where rock joints are widely spaced, freeze–thaw breaks up the rocks into massive boulders to form boulder fields.
- Chemical weathering is most effective in hot, wet climates. The most common forms of chemical weathering are **solution weathering** where rock minerals dissolve in rainwater; **oxidation** where minerals react with oxygen; and **hydration** where minerals absorb water. **Carbonation** causes weathering in carboniferous limestone areas.

Folding and faulting

- Distinctive landscapes develop because of the underlying rock type and as a result of **folding** and **faulting**.
- Massive **tectonic** movements cause folding and faulting. Folding occurs where rocks bend as a result of pressure. This produces upfolds called **anticlines** and downfolds called **synclines**. The Rockies and the Alps are huge, **fold mountains**. Rigid or brittle rocks fault when under pressure. **Rift valleys** and **fault scarps** form as a result of **normal** and **reverse** faulting.



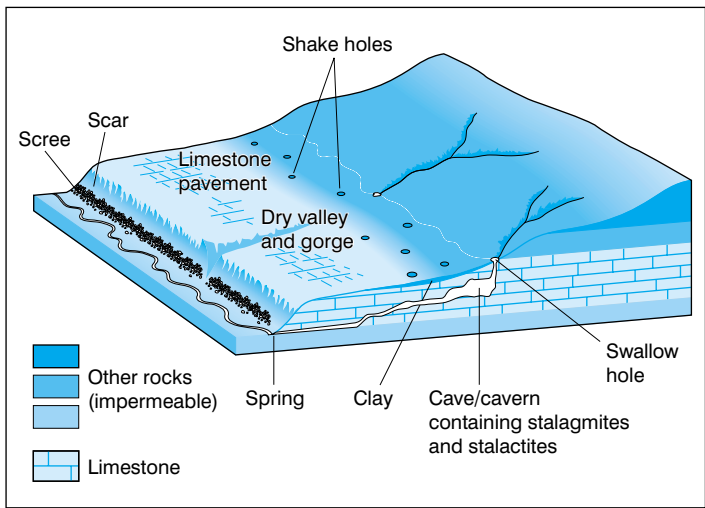
Types of fault

Landforms

- Igneous rocks develop underground as a result of **interior** or **intrusive** vulcanicity. Magma solidifies to form distinctive shapes known as **batholiths**, **dykes** and **sills**.
- Dartmoor is an example of a batholith. The **granite** upland is part of a much larger batholith beneath the earth's surface. Granite forms rugged uplands, which are poorly drained with large expanses of **moorland**. Dominant features are **tors**.
- Dykes run across rock strata whereas sills run parallel to them. Sills often form steep valleys.

ROCKS AND LANDFORMS (4)

- Limestone and chalk are both calcium carbonate. Limestone is **permeable** but chalk is **porous**. Acidic rainwater chemically weathers calcium carbonate by carbonation. **Karst scenery** develops on **carboniferous limestone** in areas such as the Mendips.
- The main features of karst scenery are **limestone pavements**, **swallow holes** or **sinks**, **caves**, **stalactites** and **stalagmites**. There is a lack of surface drainage because of the large number of underground streams and rivers. **Escarpments** with a steep scarp slope and a gentle dip slope are characteristic of chalk scenery. There is a lack of surface water with a complex system of dry valleys.

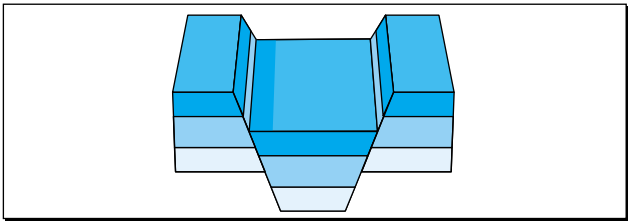


Formation of karst scenery

- Clay is found over extensive areas of lowlands and produces soils that are sticky and heavy when wet. Clay is impermeable, so there are many surface rivers.

Rocks and landforms(1–4)

- 1** Which of the following is the odd one out:
Chalk, clay, granite, sandstone, coal, mudstone, shale? (1)
- 2** What is oxidation? (1)
- 3** Why is chemical weathering uncommon in deserts? (1)
- 4** How can granite appear on the earth's surface even though it is formed underground from the solidification of magma? (1)
- 5** Name an example of an area of chalk scenery. (1)
- 6** Why does karst scenery develop on carboniferous limestone and not on chalk when they are both calcium carbonate? (1)
- 7** Why are villages common at the base of a chalk scarp slope? (1)
- 8** What caused the valleys in chalk to become dry? (1)
- 9** Why is the top of an anticline more likely to erode than the bottom of a syncline? (1)
- 10** What landform does the following diagram show? (1)



- 11** What is the difference between a porous and a permeable rock? (2)
- 12** How can the features of granite scenery be explained in terms of the rock's hardness, its impermeability and its many joints? (3)
- 13** Explain how karst scenery develops. (3)
- 14** How can the human use of granite and limestone areas threaten the beauty of the landscape? (2)

- 1 Granite. (1) It is the only igneous rock.
- 2 The chemical reaction between minerals in rocks and oxygen. (1) Remember it is the minerals that are oxidised.
- 3 Because of the lack of moisture. (1)
Water is required for chemical weathering to take place.
- 4 Less resistant rocks on top of the granite are eroded. (1)
Remember the difference between lava and magma.
- 5 The South Downs. (1)
- 6 Carboniferous limestone has a well developed system of joints and bedding planes. (1) The acid solution formed between rainwater and limestone widens these gaps.
- 7 Springs form there. (1)
- 8 The increase in temperatures at the end of the Ice Age. (1)
During the Ice Age the chalk was impermeable because ice blocked its pores.
- 9 The rock is stretched and therefore weaker. (1) The Weald formed this way.
- 10 Rift valley. (1) There is one in East Africa.
- 11 Permeable rock allows water to move through its joints and bedding planes. (1) Porous rock acts like a sponge retaining water in its pores. (1) Try to use the correct technical terms.
- 12 The rocks are hard and not easily eroded. Granite uplands therefore rise up above the surrounding countryside. (1)
The rock is impermeable so surface water forms marsh and bog. (1) Chemical weathering along the joints produces tors. (1) Refer to all three features in your answer.
- 13 Rainwater and limestone form a weak solution of carbonic acid. This moves underground through joints and bedding planes. (1) The limestone reacts with the acid water to form calcium bicarbonate which is soluble in water. This leads to the formation of caves. (1) Evaporation leaves calcium carbonate deposits, i.e. stalactites and stalagmites. (1)
- 14 Quarrying for building stone is common in granite and limestone areas. (1) Both areas attract tourists who may erode footpaths, cause traffic congestion and drop litter. (1)