geography for key stage 3

<rosemarie gallagher> <richard parish>
### Contents

**1 From rock to soil** 4
1.1 Your rocky home 6
1.2 The three rock groups 8
1.3 Weathering 10
1.4 The rock cycle 12
1.5 The British Isles on their travels 14
1.6 Rock around the UK 16
1.7 Rock and landscapes 18
1.8 Soil … and you 20

**2 Living off Earth’s resources** 22
2.1 Earth’s natural resources 24
2.2 Water around the world 26
2.3 What have they done to the Ogallala? 28
2.4 The growing water challenge 30
2.5 Soil … a precious resource 32
2.6 Desertification in the drylands 34
2.7 The fight against desertification 36
2.8 Oil for energy 38
2.9 Renewable sources of energy in the UK 40
2.10 Solar power around the world 42
2.11 But what about other species? 44

**3 Earning a living** 46
3.1 The UK at work 48
3.2 So where are the jobs? 50
3.3 The UK’s changing employment structure 52
3.4 Change in and around Doncaster 54
3.5 Employment structure in other countries 56
3.6 Where did the UK’s factory jobs go? 58
3.7 The clothing industry in Bangladesh 60
3.8 Working to bring you a mobile 62

**4 International development** 64
4.1 Rich world, poor world 66
4.2 So what is development? 68
4.3 Measuring and mapping development 70
4.4 Malawi: a developing country 72
4.5 Singapore: a developed country 74
4.6 How did the development gap grow? – part 1 76
4.7 How did the development gap grow? – part 2 78
4.8 Escaping from poverty 80
4.9 Putting an end to poverty 82

**5 Our restless planet** 84
5.1 A slice through Earth 86
5.2 Our cracked Earth 88
5.3 A closer look at plate movements 90
5.4 Earthquakes 92
5.5 An earthquake in Southwest China 94
5.6 Tsunami! 96
5.7 Volcanoes 98
5.8 Iceland: a country made by volcanoes 100
5.9 Why live in a danger zone? 102

**6 Russia** 104
6.1 Meet Russia 106
6.2 A little history 108
6.3 Russia’s main physical features 110
6.4 Russia’s climate zones and biomes 112
6.5 What about the people? 114
6.6 A tour of European Russia 116
6.7 Sakha: Russia’s biggest region 118
6.8 So … how is Russia doing? 120

**7 The Middle East** 122
7.1 Introducing the Middle East 124
7.2 The Middle East: physical geography 126
7.3 The Middle East: climate zones and biomes 128
7.4 The people of the Middle East 130
7.5 A closer look at the Arabian Peninsula 132
7.6 Conflict in the Middle East 134
7.7 Israel and the State of Palestine 136

Key for OS maps 138
Map of the British Isles 139
Map of the world (political) 140
Glossary 142
Index 144

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**Key for symbols in ‘Your turn’ questions**

- **Literacy**
- **Numeracy**
From rock to soil

The big picture
This chapter is about rocks and weathering and soil. Here’s the big picture …
◆ Rock is made of natural compounds called minerals.
◆ There are many types of rock. But they all fall into just three groups, depending on how they were formed.
◆ Rock changes from one group to another.
◆ Over time, rock gets broken down to form soil.
◆ Different types of rock lead to different scenery.

Your goals for this chapter
By the end of this chapter you should be able to answer these questions:
◆ What is a mineral? Give at least three examples.
◆ What are the three groups of rock? And how were the rocks in each group formed?
◆ What do these terms mean? weathering physical weathering chemical weathering freeze-thaw weathering exfoliation
◆ What is the rock cycle? You should be able to describe it, and sketch it.
◆ What are plates, and why do they move?
◆ The UK has rock which was formed in other parts of the world. Why?
◆ Why does the UK have mountainous areas?
◆ What type of bedrock does the UK have? You should be able to describe the general pattern.
◆ How does rock type influence the landscape? Give at least two examples.
◆ What do these terms mean? soil humus topsoil nutrient fertiliser
◆ Why is soil so important to humans?

And then …
When you finish the chapter come back here, and see if you have met your goals!

Your chapter starter
Look at the photo on page 4. What does it show?
Was it taken in the UK? Yes? No? Maybe?
How do you think those mountains were formed?
Do you think they’ll look the same 20 million years from now?
Would you like to live near them, like the people in that village do? Why?
1.1 Your rocky home

What exactly is rock? Find out here.

It’s everywhere!
Wherever you go, there’s rock all around you. For example this shows Chapel Stile, a village in the Lake District. If you visit it, you’ll find …

Did you know?
- Earth formed when dust, gases, and chunks of rock coalesced, after the birth of the Sun.
- Earth is made up of 61 different elements.

And think about this. The people in Chapel Stile – and all of us – are made up of atoms of 61 different elements. Almost all came from rock, and reached us via food.

So what exactly is rock?
Rock is a mixture of minerals.
A mineral is a natural compound. It has a chemical name and formula, like the compounds you meet in science – but we usually use its geological name. Minerals usually exist in rock as crystals.

Look at these samples of rock:

Granite. The three colours tell us that this rock contains at least three minerals. The pale grey one is silicon dioxide or quartz, which is like glass. Each ‘blob’ is a cluster of crystals.

And precious things obtained from rock … like the diamonds and gold in this ring.

Did you know?
- By far the most common atoms in rock are silicon and oxygen atoms.

Sandstone. This rock is mainly quartz, often mixed with minerals called feldspars (made of silicon, oxygen, and other elements). A magnifying glass would help you see the crystals.

Limestone. It is mainly calcite, or calcium carbonate, often mixed with quartz and other minerals. Calcite is made from the shells of sea creatures. (Find out more later.)

The most common minerals
There are around 5000 known minerals. Most contain silicon and oxygen atoms. But only about ten minerals are common. They are called the rock-building minerals. The most common of all are the feldspars, and quartz. Between them, they make up most of Earth’s crust – the hard outer layer that you live on.

Limestone. It’s made from the shells of sea creatures.

Your turn
1. a What is rock? b Do you think there is rock under the ocean? Explain your answer.
2. Look at the photo on page 6. a Give at least five ways in which we humans use rock. The photo will help. (But try to think of others too.) b Where do we find the rock we need?
3. a What is a mineral? b What’s the geological name for the mineral silicon dioxide?
4. Feldspars and quartz make up most of Earth’s crust. These minerals have something chemical in common. What?
5. Help! A fungus has arrived from outer space. It is eating up rock! Write an article for a news website about how it is affecting people in the UK. At least 70 words. And dramatic!
The three rock groups

All rock belongs to one of three groups. Here you can find out about the groups, and what makes them different.

Putting rock into groups

There are lots of different kinds of rock, with different mixtures of minerals. But they fall into just three groups of rock — sedimentary, igneous, and metamorphic. Each group has been formed in a different way. Let’s look at each in turn.

Sedimentary rock

This forms when particles of minerals which were eroded from rock in one place get stuck together again in another place, to form new rock.

For example, a river carries a load of particles eroded from rock in its banks and bed. It carries them to the ocean and dumps them. They fall … … to the ocean floor as sediment. Over years the layer of sediment builds up. It could be hundreds of metres thick, and very very heavy.

Different sediments give different types of sedimentary rock. For example:

◆ a sediment of mud gives mudstone
◆ a sediment of sand gives sandstone
◆ a sediment of shells that pile up on the ocean floor gives limestone.

Igneous rock

This forms when rock melts, then cools and hardens again.

Far below the ground, it’s so hot that the minerals in rock melt, giving a liquid called magma. The magma may then rise, cooling as it goes.

The magma may cool slowly below ground. The minerals form big crystals which lock together, forming rock such as granite. (See page 7.)

But some magma reaches the surface and shoots out at volcanoes as lava. This cools quickly to form rock such as basalt, with small crystals.

Metamorphic rock

This is rock which has been changed underground, without melting.

Deep underground, it’s hot, and the pressure can be enormous. Together, the heat and pressure can change rock without melting it.

The structure of the minerals usually changes, so the rock looks different. For example this is the sedimentary rock mudstone. Underground, … … heat and pressure cause it to metamorphose to slate, where the crystals are lined up in flat sheets. Slate is used to make roof tiles.

Where the rock groups are

Earth’s crust is the hard outer layer, where you live. It is up to 65 km thick. (It’s thickest at mountains!)

About 65% of the crust is igneous rock. Only about 8% is sedimentary, Look at this simplified cross-section.

Problems

Fossils in metamorphic rock are usually distorted. Why?

You won’t find fossils in igneous rock. Suggest a reason.

Earth’s surface

Barren land

magma

magma cooling

layers of hard rock

magma

magma cooling

layers of hard rock

magma

magma cooling

layers of hard rock

magma

magma cooling

layers of hard rock

magma