



The Earth in the Universe

C3.1 How old is the Earth?

How can we know about the history of the Earth?

I should be able to:

- recall the Earth is some 4 500 million years old;
- explain how rocks provide evidence for the age of the Earth;
- describe the size and structure of the Earth (radius 6 400 km, crust, mantle halfway down to the centre).

C3.2 Why are mountains only in some places?

Have the continents on Earth always been where they are now?

I should be able to:

- appreciate that some changes in the Earth's surface are very slow;
- explain what would happen to the Earth's surface if new mountains were not being continuously formed;
- *explain why seafloor spreading produces a pattern in the magnetism recorded in ocean floors;*
- explain how Wegener's theory accounted for mountain-building;
- describe Wegener's evidence for his theory and reasons for its rejection.

In the study of Wegener's theory of continental drift, I should be able to:

- show that a theory can be questioned, even though the data can be accepted;
- discuss how the theory arose, recognising that it involved creative thought and imagination;
- give reasons for accepting or rejecting a proposed theory;
- describe in broad outline the ways in which new scientific claims are reported and scrutinised, before being accepted;
- suggest reasons for *and discuss* the positions taken by individual scientists involved.

C3.3 Why do earthquakes happen?

Can we predict earthquakes?

Why do volcanoes happen and can we predict eruptions?

I should be able to:

- label on a given diagram the mantle, oceanic ridge, oceanic plate, continental plate, oceanic trench, mountains;
- explain the process of seafloor spreading, including the role played by the solid mantle;
- recall that the energy that drives the movement of the mantle is from the decay of radioactive elements;
- explain why earthquakes, volcanoes and mountain-building are most likely to occur at the edge of tectonic plates;
- relate the occurrence of earthquakes to the movement of the tectonic plates;
- *relate the process of volcanic eruption to the melting of the mantle when pressure is reduced;*
- describe some actions which public authorities can take to reduce damage caused by geohazards.

With additional information provided about ideas about the formation of the Earth's surface I should be able to:

- give examples of data that are accounted for by a given theory;
- discuss how a given theory arose, recognising that this involved creative thought and imagination;
- give reasons for accepting or rejecting a proposed theory or model;
- use appropriately terms such as 'corroborate', 'confirm', 'falsify', 'prove' in discussing the implications of their own or given data for a given theory.

C3.4 Could the human race be destroyed by an asteroid colliding with Earth?

What will happen to the Earth and the Sun?

I should be able to:

- recall that the Earth is a planet that moves around the Sun. It takes one complete year to make a complete orbit. Other planets also move around the Sun. The Sun, planets and other smaller bodies such as the satellites (moons) of planets, asteroids and comets make up the Solar System;
- discuss the probability and the possible consequences of an asteroid colliding with the Earth;
- recall that the Sun is a star formed about 5000 million years ago;
- describe the process by which the Sun was formed *including the fusion of hydrogen nuclei as the source of the Sun's energy;*
- recall that the expected remaining lifetime of the Sun is 5 000 million years, *by which time its hydrogen will have been used up;*
- describe the remaining stages in the lifetime of the Sun and the predictable effect of its red giant stage on the Earth .

In the study of the controversy surrounding the extinction of the dinosaurs, I should be able to:

- give reasons for accepting or rejecting a proposed theory;
- show that they realise that a theory can be questioned, even though the data can be accepted.

C3.5 What do we know about the Universe?

How did the Universe begin?

How might it end?

I should be able to:

- recall a lightyear is the distance travelled by light in a year;
- recognise the Sun is a star in the *Milky Way* galaxy, which is just one of the many galaxies in the Universe;
- recall that distant galaxies are moving away from us, *the further away the faster they move*;
- *explain how the motions of galaxies mean that space itself is expanding*;
- appreciate that the accepted interpretation of an expanding Universe is that it began with a ‘big bang’ 13 700 million years ago;
- *explain that, if the mass of the Universe is large enough, it will recollapse in a ‘big crunch’*;
discuss a given account of the Universe.