9G Summary Sheets

Environmental chemistry

Types of soil

Soil is a mixture of:

- broken up bits of rock (including sand and/or clay)
- **humus** (the decaying remains of plants and animals)
- air, water and dissolved chemicals
- plants and animals.

Different soils will contain different chemicals and can be acidic, alkaline or neutral. Universal indicator can be used to test the **pH** of soil.

Farmers and gardeners need to know the pH of their soil so their plants will grow well. Acids can cancel out alkalis. This is called **neutralisation**. If a soil is too acidic then **lime**, an alkali, is added to neutralise the acid.

Rocks and building materials

Different rocks are formed in different ways. Many rocks are used as building materials. Both natural rocks and those used as building materials wear away over time. This is called **weathering** and can occur in different ways:

- The rain and wind slowly break up the rocks (**physical weathering**).
- Changes in temperature cause cracks in the rock (**physical weathering**).
- Acids, and other chemicals in rain or soil, damage rocks (**chemical weathering**).
- Plants and animals damage rocks (**biological weathering**).

The sand and clay that make up the soil are produced by weathering and erosion.

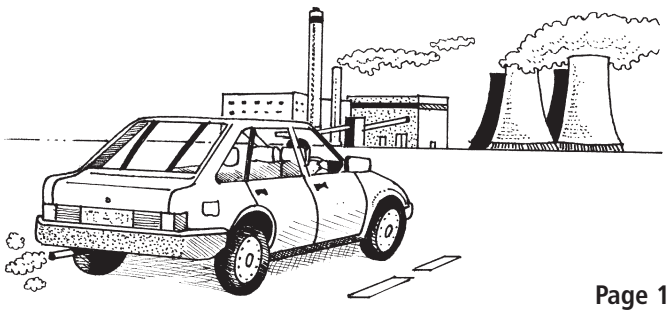
Acid rain

The air contains small amounts of the following gases:

- **carbon dioxide**, produced by **combustion** of fuels and **respiration**
- **sulphur dioxide**, formed when sulphur burns in volcanoes
- **nitrogen oxides**, produced during lightening storms.

These gases dissolve in water to form acids, so rainwater is naturally acidic (pH between 5.6 and 5.9).

Our rainwater has become even more acidic (pH between 3 and 5.5) due to air pollution from burning fossil fuels. This is what we call **acid rain**. The main sources of this pollution are **power stations** and **cars**. Both burn large amounts of fossil fuels and release more carbon dioxide, sulphur dioxide and nitrogen oxides. Sulphur dioxide and nitrogen oxides are the main contributors to acid rain.



Problems caused by acid rain

Acid rain causes damage to our environment in several ways:

- Metals and carbonate rocks (like limestone and marble) react faster with acid rain than with normal rainwater.
- Plants and water life are damaged and killed by acid rain.

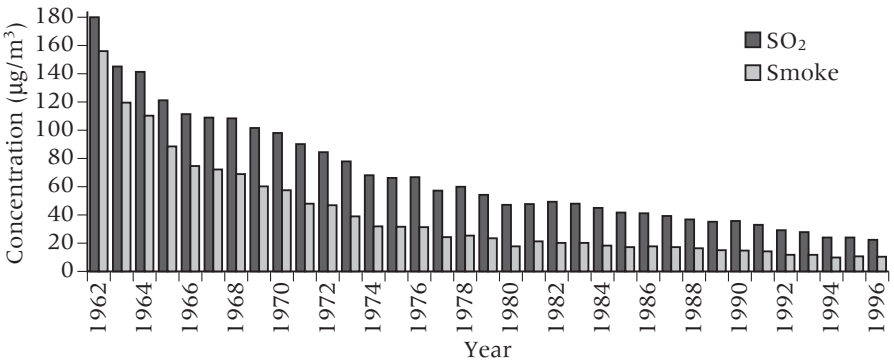
Pollution has been reduced by several actions:

- reducing the sulphur content in diesel and petrol so less sulphur dioxide is produced by combustion
- fitting **catalytic converters** in car exhausts, which change harmful gases into harmless gases
- spraying the gases from power station chimneys with an alkaline mixture to remove sulphur dioxide.

Measuring air pollution

A network of air quality monitoring stations provides us with information on levels of air pollution. A range of pollutants is measured, including rainwater pH. The data collected tells us that our air quality is improving but there are still serious problems.

Using less energy would help reduce pollution as we would burn less fossil fuels.

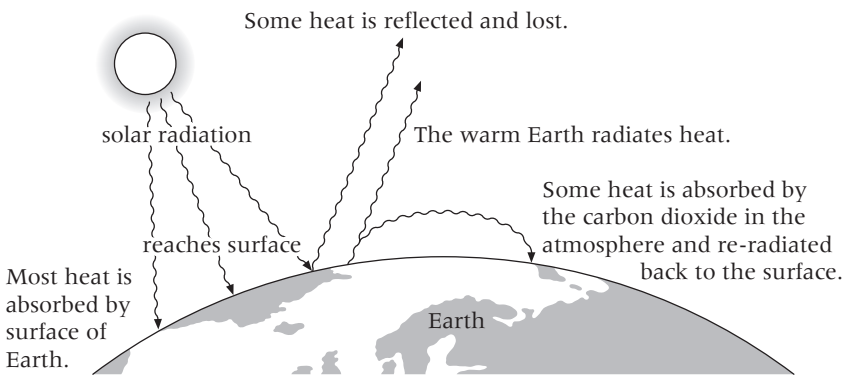


Annual mean concentrations of black smoke and sulphur dioxide (1962–1996).

Global warming

There has been a small, but steady increase in mean world temperatures in the last 100 years. These rising temperatures have been linked to increasing levels of carbon dioxide in the atmosphere. Carbon dioxide and other gases trap the Sun's energy. This is sometimes called the **greenhouse effect**.

Some scientists believe that this will lead to **global warming**. This means that there will be even greater rises in mean world temperatures in the future. If global warming does happen it will cause changes in weather and rising sea levels.



The increased levels of carbon dioxide in the atmosphere are caused by burning more fossil fuels, and destroying large areas of forest. Scientists and politicians are trying to find ways to reduce the amount of carbon dioxide that is produced and so reduce the chances of global warming. The situation is complex, however, and not all scientists agree that global warming will definitely occur.

