

## Fuels

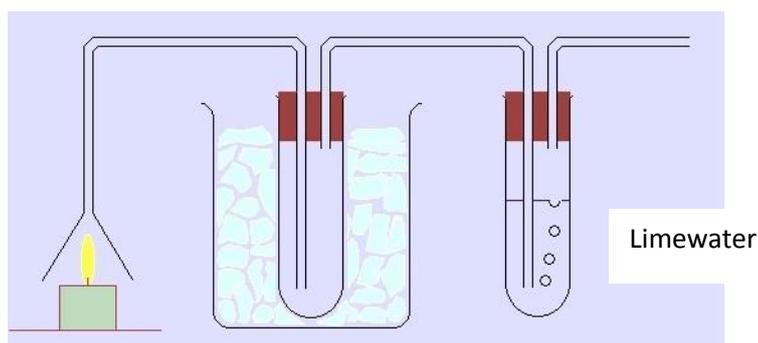
State a fuel is a chemical, which burns giving out energy.

State combustion is another word for burning.

State when a substance burns it reacts with oxygen.

When fuels burn, a pollutant gas called carbon dioxide is produced.

The experiment below shows that the products in the combustion of fossil fuels are carbon dioxide and water.



- The **carbon dioxide** that is formed during the combustion of fuel can be tested with **limewater** (carbon dioxide will turn limewater milky (cloudy) when bubbled through it).
- The **water** that is formed can be tested by measuring the freezing point and boiling point and comparing it to that of pure water, (or by using **cobalt chloride paper** which turns from blue to pink in the presence of water).

If there is insufficient oxygen (air) during combustion **incomplete combustion** occurs so carbon (soot) and carbon monoxide is produced.

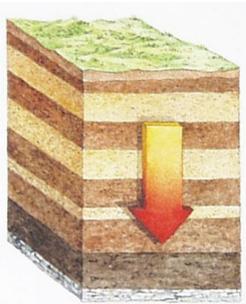
State that the three fossil fuels are coal, oil and gas

Describe how the fossil fuels were formed.

### COAL FORMATION

Coal was formed from the **dead remains of trees and plants** that lived in forests and swamps **about 300 million years ago**, during a time called the **CARBONIFEROUS AGE**.

When the trees and plants died they formed layers. These layers became covered with mud, which protected them from the atmosphere, and this prevented them rotting away.



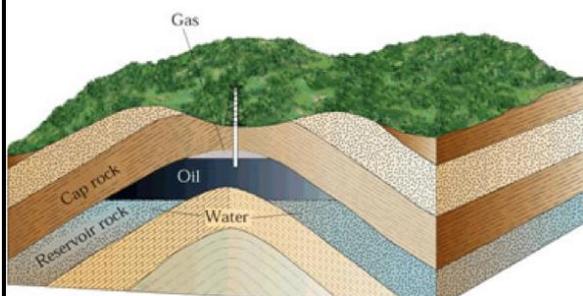
These layers became buried deep underground and with **PRESSURE, HEAT** and the **action of bacteria**, the layers of dead trees and plants changed into coal.

## OIL & NATURAL GAS FORMATION

Oil and natural gas was formed from the **dead remains of sea animals and plants** called **PLANKTON** that lived about **300 - 400 million years ago**.

When the plankton died they fell to the sea floor and became buried amongst layers of sand.

With pressure, the sand was compressed into a porous rock called sandstone.



With **PRESSURE, HEAT** and the **action of bacteria** the plankton changed into oil and natural gas, which was trapped in the sandstone.

With movements in the Earth's crust the layers of rock folded and a dome formed. This dome is an oil and gas well.

Fossil fuels are a **non-renewable** energy. They are a **finite** resource, which means once they are used up they cannot be replaced.

Fuels can be used in transportation, to generate electricity and to make other products like plastics and synthetic fibres ( Nylon, Polyester)

To conserve our supply of fossil fuels we could cycle, car share, recycle plastics, turn off appliances than run on electricity when not in use.

**Renewable** sources of energy include: solar, wind, wave, tidal, hydroelectric, geothermal and biomass.

An **advantage** of these sources of energy are that they are non-pollutant and never run out.

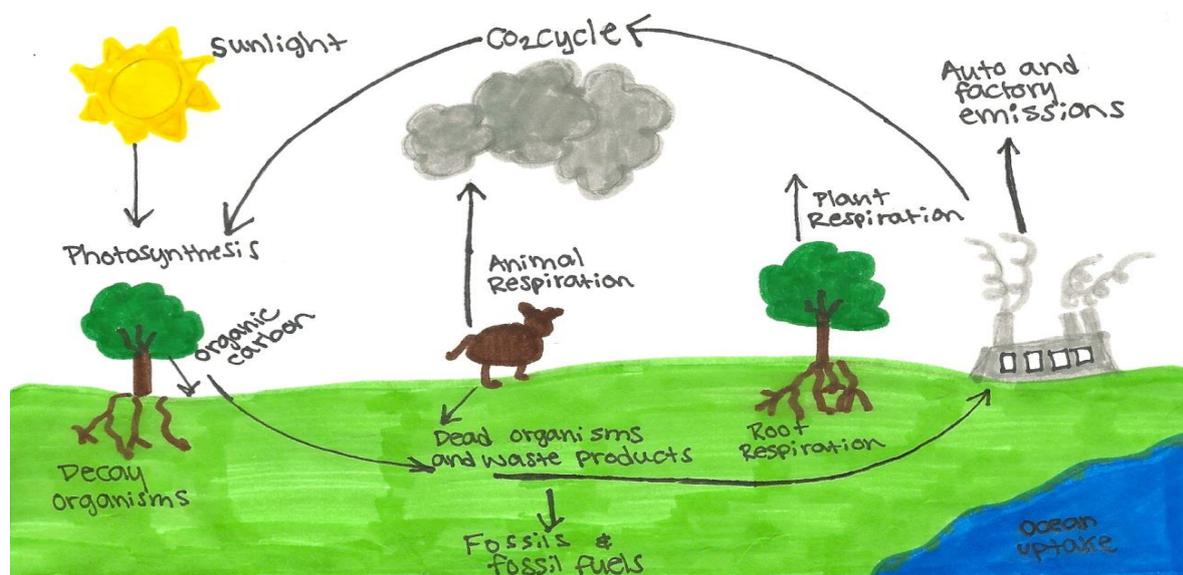
A **disadvantage** of these sources of energy is that they are often expensive to install and can be quite noisy. They also are not very nice to look at.

**Biomass** is a renewable fuel that comes from plants. Some examples are: bioethanol, biodiesel, wood and biogas.

Carbon dioxide is heat from the sun being trapped in the Earth's atmosphere. This is called the **greenhouse effect**.

The level of CO<sub>2</sub> emission has increased over the past due to deforestation and an increase in the usage of burning fossil fuels. This increased CO<sub>2</sub> has had a negative effect on our climate, causing floods and droughts.

The **carbon cycle** is the series of processes by which carbon compounds are changed in the environment, involving carbon dioxide into living tissue by photosynthesis and its return to the atmosphere through respiration, the decay of dead organisms, and the burning of fossil fuels



## Fertilisers

**Photosynthesis** word equation

Carbon dioxide + water + energy (light) → oxygen + glucose

**Respiration** word equation

oxygen + glucose → Carbon dioxide + water + energy

Plants also need nutrients. Compounds containing Nitrogen, Phosphorus and Potassium are essential to healthy plants/crop growth. Also known as NPK

**Nitrogen - green foliage**

**Phosphorus - strong roots**

**Potassium - healthy growth**

**Natural fertilisers - compost and manure**

**Artificial fertilisers - made by industry**

A good fertiliser has to have nitrogen, phosphorus and potassium elements in the compound and have to be soluble to be taken up by the plant roots.

Some plants (**leguminous**) can make their own fertilisers by **nitrogen fixation**. Nodules on the roots of plants have nitrifying bacteria to convert nitrogen into nitrogen compounds.

Lightning storm can also increase the fertility of soil by providing enough energy to fix atmospheric nitrogen.