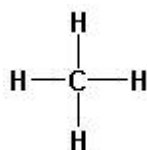


Worksheet 1: Information on the 3 fuel types

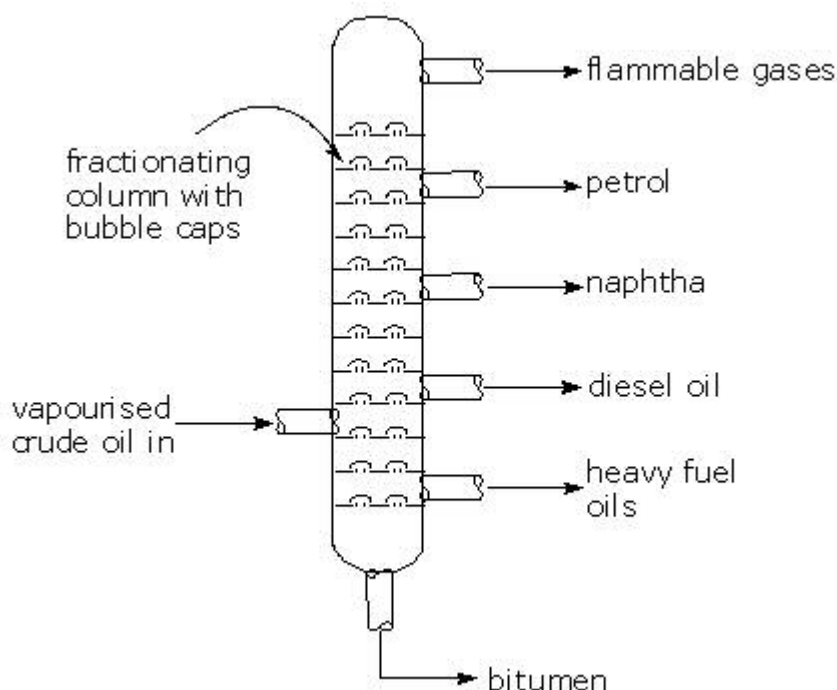
Hydrocarbon fuels

Hydrocarbons are molecules which contain only hydrogen and carbon. Many are important as fuels as crude oil is a mixture of hydrocarbons with different sized molecules.

A simple hydrocarbon



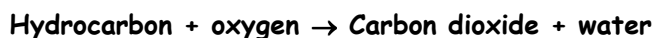
Fractional distillation is used to split crude oil up into its useful separate fractions.



The fractional distillation column works continuously. Heated crude oil is piped in at the bottom. The fractions are separated according to their different boiling points.

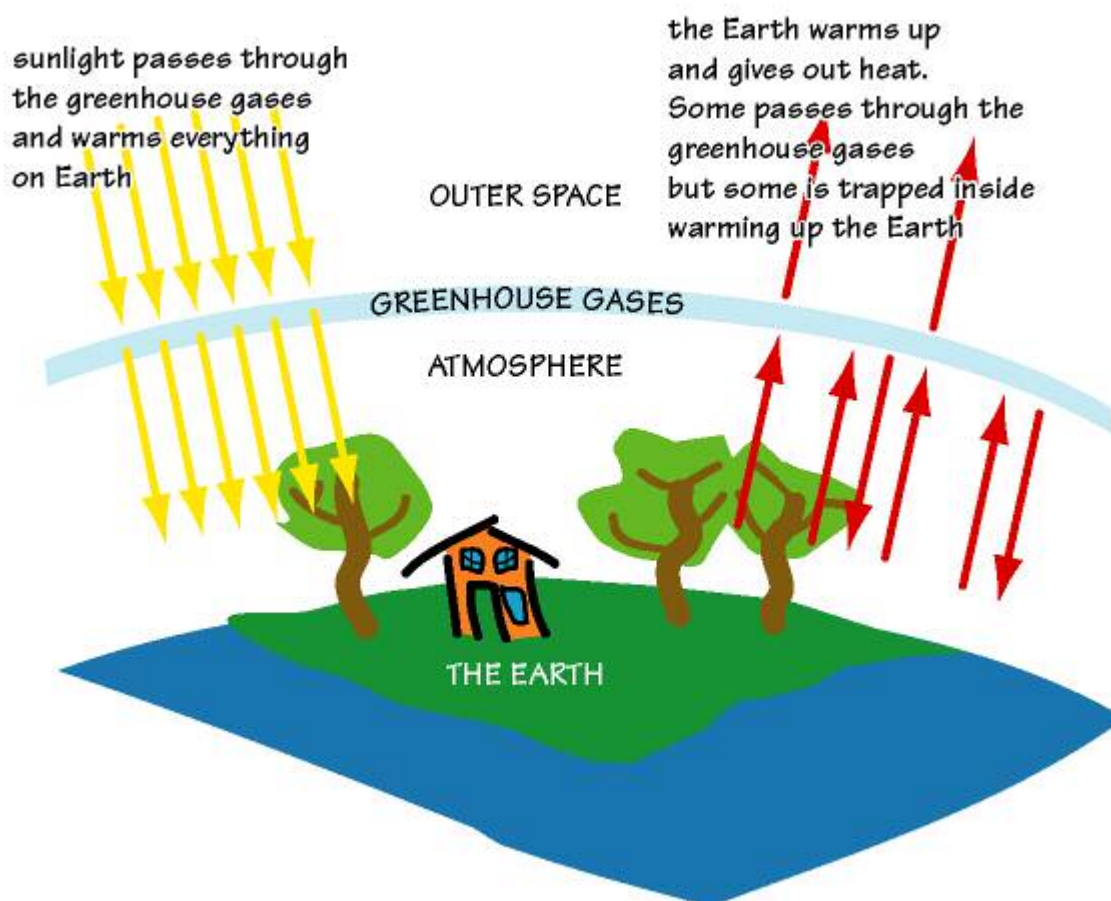
Crude oil provides the fuel for most modern transport and for much of the world's electricity generation. There is a massive industry built around crude oil and companies invest many millions in locating new reserves of crude oil, as crude oil is a non-renewable fuel and reserves are gradually running out.

Burning fossil fuels has an environmental impact. Complete combustion of any hydrocarbon in a plentiful supply of oxygen produces carbon dioxide.



Carbon dioxide is a greenhouse gas which is very good at trapping heat energy from the sun- the atmosphere around earth acts as an insulating layer trapping heat energy from the sun. Without it earth would be too cold for life to exist. Therefore if there is too much carbon dioxide in the atmosphere, more heat energy is trapped and the climate warms up. This has major environmental effects and has been linked to increased extreme weather conditions and flooding.

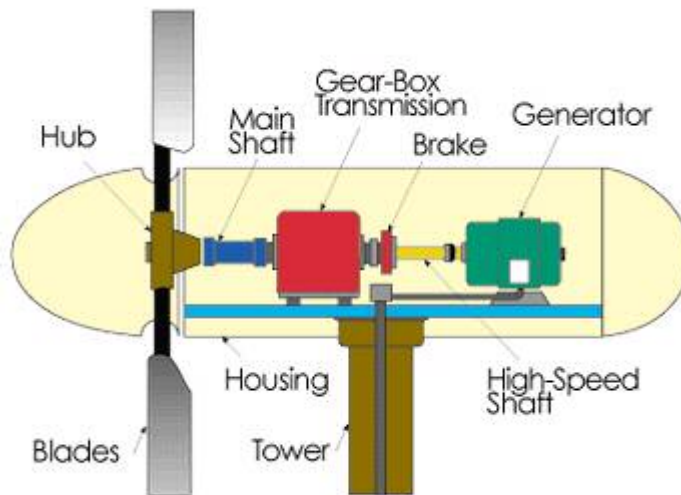
There are also concerns that increasing sea levels caused by the melting of polar ice caps will lead to some areas of land being lost under water forever.



Some fossil fuels contain sulphur impurities which produce sulphur dioxide gas when burnt. Sulphur dioxide reacts with water in the atmosphere to form acid rain, which causes damage to forests, lakes and rivers and buildings.

Wind power

Wind power involves generating electricity using wind turbines. The basic principle behind a wind turbine is very simple. The wind causes the blades to rotate, which in turn turn the generator which generates electricity.



Wind is extremely unpredictable. It varies depending on location and general weather conditions. Because it is invisible it is not easily measured without special instruments. Wind speed is affected by a number of other factors such as trees, buildings, hills and valleys around us.

Wind cannot be contained or stored for use elsewhere or at another time. To be economically practical, a wind turbine should experience year-round average wind speeds of at least 12 mph. A careful wind survey should be made before buying a wind system.

The wind turbines used to produce wind power need to be located where there is most wind. They are often found on top of hills or out at sea. These extreme locations present a challenge in themselves and it requires the co-ordinated efforts of skilled engineers to ensure the wind turbines are secure in their location and able to withstand the often harsh conditions surrounding them.

Approximately 7000 wind turbines are needed to produce the same amount of power as one nuclear power station, so wind turbines are grouped together in wind farms rather than being placed individually.

The amount of wind is not the only factor to consider when locating wind farms. Wind farms need to be very big to collect enough wind energy and many people find them ugly. They are also extremely noisy.

A wind farm



Hydrogen fuel cells

A fuel cell is a device that uses hydrogen and oxygen to create electricity via a chemical reaction.

A hydrogen fuel cell is like a battery but does not run down or need recharging. The chemical energy from the reaction is converted directly to electrical energy, so as long as hydrogen fuel is supplied electricity is produced.

A fuel cell consists of two electrodes, a negative electrode (anode) and a positive electrode (cathode), sandwiched around an electrolyte. Hydrogen is fed to the anode and oxygen is fed to the cathode.

How does it work?

A catalysed chemical reaction occurs at the anode and the hydrogen atoms are split into protons and electrons.



The electrons flow through an external circuit to the cathode, creating an electrical current. At the cathode, the protons react with oxygen and the electrons to produce water.

Hydrogen fuel cells are very environmentally friendly because they only produce heat energy and water as by-products.

There are high hopes that eventually fuel cell technology developments will mean we can abandon fossil fuels entirely, however the technology isn't developed enough yet for us to rely on fuel cell technology.

Some products which rely on hydrogen fuel cells such as hydrogen powered buses are already on the market. However 96% of the hydrogen produced worldwide currently is extracted from fossil fuels, so although the hydrogen fuel cell itself is environmentally friendly, the hydrogen which fuels it comes from fossil fuels. Therefore further research is required to develop alternative methods of producing hydrogen cost effectively.

