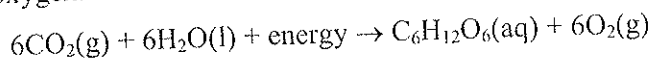


1 Energy from Fossil Fuels

To understand this topic you will need to be able to recall information from the Preliminary course about how we obtain energy from non-renewable fossil fuels. Some of the main points are summarised below.

The energy in fossil fuels originates from the sun, having been converted from solar to chemical energy by the process of **photosynthesis**. During photosynthesis, the red and violet wavelengths of sunlight are absorbed by the pigment chlorophyll and their energy is converted to chemical energy in glucose. Glucose is a carbohydrate, a high energy compound made of carbon, hydrogen and oxygen.



Energy sources are classified as **renewable** (e.g. solar, wind, hydroelectricity, tides, ethanol) or **non-renewable** (e.g. fossil fuels, nuclear fuels and batteries). At present, the world's major energy sources are fossil fuels — crude oil, natural gas, coal and coke — and there is concern that supplies of these fuels are becoming depleted.

Petroleum consists of crude oil and natural gas. It has been formed from the remains of single-celled marine organisms that lived many millions of years ago. Quick burial, decay by bacteria without the presence of oxygen, and millions of years of heat and pressure caused by overlaying sediments has converted them to petroleum. Petroleum contains a mixture of up to 300 hydrocarbons, as well as sulfur and nitrogen compounds. It is separated into components by fractional distillation.

Natural gas is a mixture of methane (75–90%), ethane (5–10%), propane and butane (3–6%) and smaller amounts of other alkanes. It may also contain nitrogen, water vapour, carbon dioxide and traces of hydrogen sulfide. Natural gas is often found with crude oil and is formed in the same way, by heat and pressure acting on buried plant and animal matter for long periods of time, the gas becoming trapped beneath impervious layers of rock.

The following questions are designed to help you check that you have this assumed knowledge. Work through them, check your answers, then let your teacher know of any problem areas.

For You To Do

- Electricity in NSW is mostly generated using:
 - a nuclear reactor
 - coal
 - natural gas
 - hydroelectricity

- Many people want combustion of fossil fuels phased out because:
 - their combustion generates greenhouse gases
 - their supplies are dwindling
 - their combustion contributes to acid rain
 - all of the above
- Which one of the following substances is NOT an example of a fossil fuel?
 - coal
 - hydrogen
 - natural gas
 - petrol
- Outline the meaning of the following terms:
 - fossil fuel
 - renewable fuel
 - hydrocarbon
 - photosynthesis
- Outline the composition of natural gas.
 - Justify the statement that natural gas is a mixture.
- Identify three alternative energy sources that, in the future, might replace fossil fuels.
- Compare renewable and non-renewable fuels and give an example of each.
- Identify the process used to separate the components of petroleum.
 - Identify the property of petroleum components that allows them to be separated by this process.
 - List the main fractions obtained by the fractional distillation of petroleum.
 - Petroleum is classified as a mixture rather than a compound. Explain.
 - Recall your studies of fractional distillation in the Preliminary course. Use diagrams to show how fractional distillation is carried out for:
 - the industrial separation of petroleum into fractions
 - the separation of two liquids in a laboratory.
- Check your knowledge by completing the following statements:
 - Fossil fuels cannot be replaced when they are used, so we say they are _____.
 - Name four fossil fuels.
 - Petroleum forms from the burial of _____.
 - The original source of energy in fossil fuels is the _____.
 - The energy in fossil fuels was converted from solar to chemical energy by the process in green plants called _____.
 - Identify the two main gases in natural gas.
 - Write an equation for photosynthesis.