Chemistry for the IB Diploma Programme





Guiding Question revisited

What are the challenges of using chemical energy to address our energy needs?

In this chapter we have explored how potential energy released during combustion as heat can address our energy needs. We have also explored how it can generate electrical energy directly.

Combustion is a reaction in which an element or compound burns in oxygen.
Fossil fuels originate from living organisms that died millions of years ago. They include coal, crude oil or petroleum, and natural gas.
Coal is a black rock that is mainly carbon.
Natural gas is mainly methane, and is the cleanest of the fossil fuels.
Crude oil (petroleum) is a black liquid mixture of mainly hydrocarbons.
The different hydrocarbons in crude oil can be separated by fractional distillation. Longer chain molecules have stronger intermolecular dispersion forces and higher boiling points.
Petrol (gasoline) is separated from crude oil by fractional distillation and is a mixture of hydrocarbons with between five and twelve carbon atoms.
Complete combustion of hydrocarbons breaks the carbon chain and produces carbon dioxide and water. Carbon monoxide and carbon in the form of soot are formed during incomplete combustion.
Carbon dioxide is a greenhouse gas as it absorbs infrared radiation. Its large- scale production due to the combustion of fossil fuels has led to global warming.
Carbon monoxide is a poisonous gas that binds to haemoglobin. This limits the ability of the blood to transport oxygen around the body.
Most of our energy comes from the Sun. Photosynthesis is an endothermic reaction that stores solar energy as chemical energy.
Plants can be grown specifically for use as fuels. Burning biomass can also involve burning paper or other waste organic matter.
Fuel cells generate electricity directly by reacting a fuel such as hydrogen or methanol with oxygen in an electrochemical cell.
Fuels are evaluated according to several criteria including energy density, specific energy or the environmental and economic impact of their use.