

# WJEC (Wales) Chemistry

## A-level

### Topic 2.3 - The Wider Impact of Chemistry

#### Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



# What is chemical synthesis?



# What is chemical synthesis?

Chemical synthesis is the process of carrying out specific chemical reactions in order to produce a desired compound.



# What does sustainable chemistry mean?



# What does sustainable chemistry mean?

Sustainable chemistry is chemistry that is carried out with the intention to not use up the earth's resources and to limit the amount of pollutants released.



What should be considered when choosing a reaction pathway to synthesise a desired product?



# What should be considered when choosing a reaction pathway to synthesise a desired product?

- Availability of reactants.
- Least waste produced (high atom economy).
- Fewest stages possible.
- Fastest rate of reaction.
- Safe reaction conditions.



# How do you calculate atom economy?





# How do you calculate atom economy?

Atom economy =

$(\text{Mr of desired product} / \text{Total Mr of reactants}) \times 100$



How does atom economy relate to sustainable chemistry?



How does atom economy relate to sustainable chemistry?

The higher the atom economy, the more sustainable the reaction is. This is because there is less waste being produced.



# Explain the economic impacts of chemical synthesis



## Explain the economic impacts of chemical synthesis

- The chemical synthesis process provides jobs for people involved in the production.
- There is a demand for the chemical being produced, like medicine, so the product will generally be economically valuable.



# Explain the social impacts of chemical synthesis



Explain the social impacts of chemical synthesis

Chemical synthesis allows for important products like drugs and polymers to be produced which help people in everyday life.



# Explain the environmental impacts of chemical synthesis





# Explain the environmental impacts of chemical synthesis

The synthesis route with the lowest environmental impact should be chosen:

- The route which has renewable reactants should always be chosen if available as this improves sustainability.
- The route with the highest atom economy and minimum waste should be chosen. Some synthesis routes may have a fast rate of reaction but produce lots of pollutants.
- The route which has conditions which do not require a lot of energy is desirable as it means less energy has to be produced so less pollutants are released.



# Explain the environmental effects of energy production



# Explain the environmental effects of energy production

Energy is commonly produced from the burning of fossil fuels. Fossil fuels are a finite resource so they are not a sustainable source of energy. They also release harmful gases like carbon dioxide when they are burned. These gases contribute to global warming.

Energy can be produced from renewable sources like solar and tidal, which is good as it is sustainable and does not release harmful gases. However these energy sources are much less common.



# What is a catalytic converter?



## What is a catalytic converter?

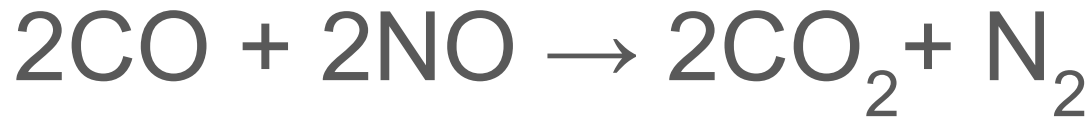
A catalytic converter is fitted in a car to convert the harmful carbon monoxide (CO) and oxides of nitrogen ( $\text{NO}_x$ ) emissions to less harmful carbon dioxide ( $\text{CO}_2$ ) and nitrogen ( $\text{N}_2$ ).



What is the chemical equation for the reaction that takes place in a catalytic converter?



What is the chemical equation for the reaction that takes place in a catalytic converter?



# How is acid rain produced?





## How is acid rain produced?

Sulfur dioxide gas (produced during the combustion of impure hydrocarbon fuels) is released into the air. It reacts with water in the clouds to form sulfuric acid. This falls as 'acid rain'.



# What are the environmental impacts of acid rain?



## What are the environmental impacts of acid rain?

- Corrodes buildings and statues made of limestone.
- Kills vegetation.
- Lowers the pH of large bodies of water, killing the wildlife.



# What is meant by 'carbon neutral'?



## What is meant by 'carbon neutral'?

A fuel is carbon neutral if it contributes to no net increase of carbon dioxide levels in the atmosphere.

For example, bioethanol is often said to be carbon neutral because it is produced from crops which absorb carbon dioxide to grow. This balances out the carbon dioxide produced when the fuel is burnt.

