# Catalysts and reaction conditions

***Education in Chemistry***Sustainability in chemistry 2021

Goal 9: build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.  
[**rsc.li/2V7IC2r**](https://rsc.li/2V7IC2r)

**Effective research and presentation are key skills. Practise those skills while learning more about catalysts and reaction conditions in the context of sustainable industry.**

## Research

Research a range of industrial processes and product syntheses using the *The Essential Chemical Industry - online* – [www.essentialchemicalindustry.org](http://www.essentialchemicalindustry.org). Record what you have found out in a table.

* + Identify whether any catalysts are involved in the industrial process or product synthesis.
  + Identify the temperature and pressure conditions needed.
  + Calculate the atom economy of the main reaction
  + Make a note any other points of interest.

#### Suggestions:

Possible products to investigate include ammonia, chlorine, hydrogen, nitric acid, sodium hydroxide and sulfuric acid. Processes that you could research include cracking/refinery, distillation and fracking.

## Evaluate

How will you evaluate your presentation? Ask yourself the following questions – then deliver your presentation and ask your audience the same questions.

* Is the overall message of the presentation clear? Can you summarise it in a couple of sentences?
* Is the chemistry accurate and accessible?
* Is context used to enhance the chemistry or is it distracting?
* Are information sources clearly cited?

## Present

Produce a presentation of your research in one of the following formats:

* a short verbal presentation (5 minutes),
* a poster to present in a poster session,
* a digital presentation.

## Reflect

What have you learnt from this activity? Consider the following questions and set yourself a target for the next time you do a similar task.

* How efficient was I in my research? Did I stick to the task at hand, or did other work/non-work distract me?
* How well did my planning work when putting together my presentation? Did I have to go through multiple drafts?
* How did I feel during the presentation? Was I confident or apprehensive? Did I do sufficient preparation/practice beforehand? How did I regulate my emotions during the stress of presentation?
* What key target will I set myself to improve my work process next time I have a similar task?

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| **Industrial process/product** | **Catalyst(s) involved** | **Temperature and pressure** | **Atom economy** | **Other information** |
| *Example: ammonia* | *Iron oxide (Fe3O4) which is reduced to Fe by the hydrogen reactant* | *600–700 K, 100–200 atm* | *100%* | *Ruthenium coated on graphite is a potentially more useful catalyst* |
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