VCE Chemistry

Examples of learning activities specific to the circular economy

A move from a linear economy to a circular economy is evident in many chemical industries. The circular economy utilises green chemistry principles and is one strategy in working towards the achievement of the United Nations’ Sustainable Development Goals.

The table below provides examples of learning activities that apply to different stages of the linear economy.

*Table of examples of learning activities (with description and external links to teaching resources) relevant to a component of the circular economy.*

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| Circular economy components | Learning activities |
| Recycle / Re-purpose | Polylactic acid is an increasingly biodegradable polymer used in commercial products. However, rather than leaving it to degrade (albeit far faster than other non-biodegradable polymers), students can [chemically convert the plastic material back to its lactic acid form](https://www.beyondbenign.org/bbdocs/curriculum/high-school/Recycling_Polylactic_Acid.zip) via a simple base hydrolysis. A subsequent reaction step can form an antimicrobial cleaning solution of lactic acid, and its cleaning ability (wiping a dirty surface) can be compared with other non-green and green cleaning products. The pH of the depolymerised lactic acid could also be determined by titration against a strong base. |
| Re-make / Enrich | Making materials from mushrooms (or more specifically, *Mycelium* – essentially mushroom roots) is an ideal example of ‘cradle to cradle design’ that students can replicate. With a suitable ‘starter’ material, students can grow their own [mushroom-based material in a mould](https://www.beyondbenign.org/bbdocs/curriculum/high-school/Mushroom_Materials-Ecovative_Industry_Example.zip) in just a few days. Students can then compare the strength of this material as a packaging material, compared to traditional lightweight non-biodegradable packaging such as polystyrene. |
| Natural resources / Re-use | Students can prepare a [basic solution from a waste material, namely wood ash](https://www.beyondbenign.org/bbdocs/curriculum/high-school/Wood_Ash_Titration.doc). Students can undertake an acid-base titration to determine the concentration of the resultant ‘ash water’ and compare this to the basic strength of a traditional base, such as sodium hydroxide. To extend this, students can calculate the amount of wood ash that would be needed to form a defined mass of biodiesel that is normally prepared by using sodium hydroxide as a base catalyst, and consider the feasibility of using ash water to produce biodiesel. |