Plant-based plastics – evaluate

Education in Chemistry
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Evaluating evidence and drawing a reasoned conclusion is a key critical thinking skill.

Scaffolding helps students overcome the fear of a blank page. Structure strips provide suitable prompts for a piece of writing. The student sticks the strip into the margin of their exercise book and writes alongside it. This structure strip will support students to answer the question:

Evaluate the use of products made from lignin and cellulose to replace products commonly made from crude oil.

Evaluation is a key skill and 'evaluate' is a command word commonly used in exam questions. An 'evaluate' question requires students to give examples of both advantages and disadvantages and draw a reasoned conclusion supported by those examples. Use this activity with 11–14 students to help them practise evaluation and learn to set out answers which evaluate two different sides of an argument. You can also use the activity with your 14–16 students for exam practise. Students should be able to find all the scientific evidence for their answers in the article.

Getting started

Before attempting to answer the question, students should read the final section of the article from the heading 'The silver bullet'.

Encourage students to make a list of the arguments for and against making products from lignin and cellulose. They could lay this out using a table like the one below or use different coloured highlighters to identify the arguments in the text.

For	Against

This activity could also be used as a follow up to the 'Plant based plastics – talking heads' activity where students are invited to debate and discuss their own opinions on the use of biomass.

Terminology

Some students will recognise the term 'biomass' from biology and may be confused. It may help to address this issue using the following questions.

Read the opening paragraph of the article. What is the word 'biomass' used to describe in the context of the article?

What is the definition of 'biomass' in biology?

Why do you think Tom Welton describes chemists as 'lazy' for using the term biomass?

Can you think of any other scientific words which might mean different things in different contexts?

When scientific terms are used in other contexts what problems could this cause?

Biopolymers structure strip	**Biopolymers structure strip**	**Biopolymers structure strip**	**Biopolymers structure strip**	**Biopolymers structure strip**
Explain why there is a demand for biodegradable plastics. What are the environmental issues associated with crude oil?	Explain why there is a demand for biodegradable plastics. What are the environmental issues associated with crude oil?	Explain why there is a demand for biodegradable plastics. What are the environmental issues associated with crude oil?	Explain why there is a demand for biodegradable plastics. What are the environmental issues associated with crude oil?	Explain why there is a demand for biodegradable plastics. What are the environmental issues associated with crude oil?
Give examples of products that could be made from dissolved lignin and cellulose.	Give examples of products that could be made from dissolved lignin and cellulose.	Give examples of products that could be made from dissolved lignin and cellulose.	Give examples of products that could be made from dissolved lignin and cellulose.	Give examples of products that could be made from dissolved lignin and cellulose.
Outline the advantages of using 'biomass' over crude oil.	Outline the advantages of using 'biomass' over crude oil.	Outline the advantages of using 'biomass' over crude oil.	Outline the advantages of using 'biomass' over crude oil.	Outline the advantages of using 'biomass' over crude oil.
Outline the arguments against using 'biomass'.	Outline the arguments against using 'biomass'.	Outline the arguments against using 'biomass'.	Outline the arguments against using 'biomass'.	Outline the arguments against using 'biomass'.
Extension: Describe some of the technical difficulties that chemists have faced in making products from 'biomass'.	*Extension: Describe some of the technical difficulties that chemists have faced in making products from 'biomass'.*	*Extension: Describe some of the technical difficulties that chemists have faced in making products from 'biomass'.*	*Extension: Describe some of the technical difficulties that chemists have faced in making products from 'biomass'.*	*Extension: Describe some of the technical difficulties that chemists have faced in making products from 'biomass'.*
Based on what you have said above, do you think products from biomass are a good idea? Why?	Based on what you have said above, do you think products from biomass are a good idea? Why?	Based on what you have said above, do you think products from biomass are a good idea? Why?	Based on what you have said above, do you think products from biomass are a good idea? Why?	Based on what you have said above, do you think products from biomass are a good idea? Why?