



# Hydrocarbon chemistry

Links to the Australian Curriculum: Senior Secondary Chemistry (Unit 1)

### ***Science understanding concepts include:***

#### **Properties and structure of materials**

- Carbon forms hydrocarbon compounds, including alkanes and alkenes, with different chemical properties that are influenced by the nature of the bonding within the molecules (ACSCH035)

#### **Chemical reactions: reactants, products and energy change**

- All chemical reactions involve the creation of new substances and associated energy transformations, commonly observable as changes in the temperature of the surroundings and/or the emission of light (ACSCH036)
- Fuels, including fossil fuels and biofuels, can be compared in terms of their energy output, suitability for purpose, and the nature of products of combustion (ACSCH038)

### ***Science as a human endeavour concepts include:***

- Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability (ACSCH015)

### ***Science inquiry skills concepts include:***

- Identify, research and refine questions for investigation; propose hypotheses; and predict possible outcomes (ACSCH001)
- Design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics (ACSCH002)
- Conduct investigations, including the use of devices to accurately measure temperature change and mass, safely, competently and methodically for the collection of valid and reliable data (ACSCH003)
- Interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments (ACSCH005)

### ***Science understanding concepts include:***

#### **Properties and structure of materials**

- hydrocarbons, including alkanes, alkenes and benzene, have different chemical properties that are determined by the nature of the bonding within the molecules
- molecular structural formulae (condensed or showing bonds) can be used to show the arrangement of atoms and bonding in covalent molecular substances
- IUPAC nomenclature is used to name straight and simple branched alkanes and alkenes from C<sub>1</sub>- C<sub>8</sub>

#### **Chemical reactions: reactants, products and energy change**

- chemical reactions and phase changes involve enthalpy changes, commonly observable as changes in the temperature of the surroundings and/or the emission of light
- fossil fuels (including coal, oil, petroleum and natural gas) and biofuels (including biogas, biodiesel and bioethanol) can be compared in terms of their energy output, suitability for purpose, and the nature of products of combustion

### ***Science as a human endeavour concepts include:***

- There are differences in the energy output and carbon emissions of fossil fuels (including coal, oil, petroleum and natural gas) and biofuels (including biogas, biodiesel and bioethanol). These differences, together with social, economic, cultural and political values, determine how widely these fuels are used.

### ***Science inquiry skills concepts include:***

- identify, research and refine questions for investigation; propose hypotheses; and predict possible outcomes
- design investigations, including the procedure(s) to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
- conduct investigations safely, competently and methodically for the collection of valid and reliable data, including: the use of devices to accurately measure temperature change and mass, flame tests, separation techniques and heat of reaction
- interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments

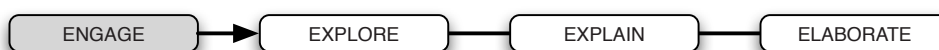
## Background

These SPICE resources can be drawn together into a learning pathway for students to develop their understanding of organic chemistry through a context of hydrocarbon use in Australia. The pathway is structured around a constructivist model based on the 5-Es where teachers can:

- **Engage** students' interest and minds in the concept. Students watch a short film clip about a community producing biodiesel from coconuts.
- provide opportunities for students to **Explore** what they know about the organic substances. Students prepare their own biodiesel in the lab, and compare properties of different hydrocarbon fuels.
- **Explain** concepts. Students use an animation to look at the names and structures of hydrocarbons.
- **Elaborate** on the concepts. Here students can apply their knowledge in different contexts and extend their knowledge of and about science. Students gain an appreciation for ways in which Australia meets its demand for hydrocarbons from diverse sources, both local and imported.
- **Evaluate** students' progress through the pathway.

The pathway has been designed for teachers of Year 11 chemistry.

## Learning pathway



### Hydrocarbon chemistry 1: Coconut oil

*Coconut oil* includes a teacher guide, video, background sheet, fact sheet and student worksheet.

This resource engages students in organic chemistry by showing them how fuel can be made from plants in a very basic home set-up. See the teachers guide for detailed information on the purpose and use of this resource.



### Hydrocarbon chemistry 2: Biodiesel

*Biodiesel* comprises a teacher guide and two procedure sheets.

This resource further explores biodiesel production as students make their own biodiesel and compare its properties with those of other fuels. See the teachers guide for detailed information on the purpose and use of this resource.



### Hydrocarbon chemistry 3: Naming hydrocarbons

*Naming hydrocarbons* comprises a teacher guide, fact sheet, interactive learning object and student worksheet. This resource explains to students how hydrocarbons can be drawn and systematically named. See the teachers guide for detailed information on the purpose and use of this resource..

ENGAGE

EXPLORE

EXPLAIN

ELABORATE

## Hydrocarbon chemistry 4: Hydrocarbon economy

*Hydrocarbon economy* comprises a teacher guide, background sheet, fact sheet, glossary and student worksheet.

Australia uses a wide range of hydrocarbons for domestic and industrial purposes. How is this range supplied from available sources? See the teacher guide for detailed information on the purpose and use of this resource.

### Acknowledgements

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Web: [spice.wa.edu.au](http://spice.wa.edu.au)  
Email: [spice@uwa.edu.au](mailto:spice@uwa.edu.au)  
Phone: (08) 6488 3917

Centre for Learning Technology (M016)  
The University of Western Australia  
35 Stirling Highway  
Crawley WA 6009