Cracking

Learning objectives

1 Define the term cracking.

2 Interpret and write equations for cracking processes.

3 Explain why cracking is carried out.

4 Describe how to test the products of cracking for unsaturation (C=C double bonds).

Introduction

Crude oil is a mixture of compounds, with long-chain hydrocarbons making up most of this mixture. However, the demand for long-chain hydrocarbons is low, whereas the high demand for short-chain molecules is not met by their supply. Long-chain molecules can be 'cracked' to give shorter chains to meet this demand.

Instructions to learners

1. Stick the structure strip into the margin of your exercise book/paper.
2. Follow the prompts in the structure strip and use your knowledge to write a summary of cracking:
   - Reflect on what you already know about cracking
   - Where have you seen the keywords before?
   - If you'd like more support, what other sources could you use to find the information, e.g. a textbook, online?
3. Complete the extended answer question to apply your knowledge of cracking to a new context.

Keywords

Use these keywords in your responses:

• catalytic cracking • steam cracking • alkane • alkene • saturated • unsaturated • hydrocarbon

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Cracking	Cracking	Cracking	Cracking	Cracking
Compare the supply in crude oil and economic demand for: • short-chain hydrocarbons • long-chain hydrocarbons	Compare the supply in crude oil and the economic demand for: • short-chain hydrocarbons • long-chain hydrocarbons	Compare the supply in crude oil and the economic demand for: • short-chain hydrocarbons • long-chain hydrocarbons	Compare the supply in crude oil and the economic demand for: • short-chain hydrocarbons • long-chain hydrocarbons	Compare the supply in crude oil and the economic demand for: • short-chain hydrocarbons • long-chain hydrocarbons
Describe the process of cracking.	Describe the process of cracking.	Describe the process of cracking.	Describe the process of cracking.	Describe the process of cracking.
Give an example of cracking using hexane as the reactant. Use word and symbol equations.	Give an example of cracking using hexane as the reactant. Use word and symbol equations.	Give an example of cracking using hexane as the reactant. Use word and symbol equations.	Give an example of cracking using hexane as the reactant. Use word and symbol equations.	Give an example of cracking using hexane as the reactant. Use word and symbol equations.
Name the two types of cracking and give the conditions for each.	Name the two types of cracking and give the conditions for each.	Name the two types of cracking and give the conditions for each.	Name the two types of cracking and give the conditions for each.	Name the two types of cracking and give the conditions for each.
State the general formulas of alkanes and alkenes. Draw dot and cross diagrams for ethane and for ethene. Explain how the structures are different.	State the general formulas of alkanes and alkenes. Draw dot and cross diagrams for ethane and for ethene. Explain how the structures are different.	State the general formulas of alkanes and alkenes. Draw dot and cross diagrams for ethane and for ethene. Explain how the structures are different.	State the general formulas of alkanes and alkenes. Draw dot and cross diagrams for ethane and for ethene. Explain how the structures are different.	State the general formulas of alkanes and alkenes. Draw dot and cross diagrams for ethane and for ethene. Explain how the structures are different.
Describe a test for the alkene functional group.	Describe a test for the alkene functional group.	Describe a test for the alkene functional group.	Describe a test for the alkene functional group.	Describe a test for the alkene functional group.

Extended answer question

Octane is a saturated hydrocarbon with the formula C_8H_{18}. When octane is cracked, it can form lots of different alkanes and alkenes.

1. Define the term saturated hydrocarbon.
2. Explain why octane can be cracked to give many products.
3. Give the word and symbol equations for the formation of the following cracking products from octane. Each equation should begin with octane, C_8H_{18}, and form the listed product and an alkene:

- hexane (C_6H_{14})
- pentane (C_5H_{12})
- butane (C_4H_{10})

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