Mr Cole Science

Name: _____ Date: _____

AQA A-LEVEL CHEMISTRY

Cracking Hydrocarbons: Thermal and Catalytic Cracking

Learn Pack

This pack is designed to be completed alongside the video to help you build a secure understanding of this topic before moving on to revision and exam practice.

WATCH THE LESSON

Cracking

Cracking is the process of breaking _____ hydrocarbon molecules into _____ hydrocarbon molecules.

The process of cracking hydrocarbon molecules requires lots of _____ due to the strong _____ and _____ bonds present in alkanes.

Lesson Objectives:

- Be able to explain the economic reasons for cracking alkanes.
- Know that cracking involves breaking strong C-C bonds in alkanes.
- Know the conditions for and products of thermal cracking.
- Know the conditions for and products of catalytic cracking and be able to name the catalyst used.

Why carry out Cracking?

Explain why long chain hydrocarbon molecules are cracked.

_____

_____

_____

_____

Products of Cracking

During cracking, large hydrocarbon molecules are broken down into a variety of smaller hydrocarbon molecules, including:

-
-
-
-

However, since during chemical reaction atoms can neither be created nor destroyed. This means that the total number of carbon and hydrogen atoms in the starting hydrocarbon molecules must equal the total number of carbon and hydrogen atoms in the products.

Explain why cracking long chain alkanes cannot only produce short chain alkanes.

During cracking the point at which the hydrocarbon molecule breaks varies, meaning multiple different combinations of products can form. Using decane ($C_{10}H_{22}$) as an example, write balanced symbol equations, using molecular formulae, to show how cracking can produce different products:

1.
2.
3.
4.
5.

Industrial Cracking

Explain why the process of cracking requires high temperatures.

There are two different methods used in industrial cracking; thermal cracking and catalytic cracking. Both methods break large hydrocarbon molecules into smaller, more valuable, hydrocarbon molecules but they do so under different conditions and therefore produce slightly different combinations of products.

Thermal Vs Catalytic Cracking

Complete the table below:

Conditions	Thermal Cracking	Catalytic Cracking
Temperature		
Pressure		
Catalyst		
Favoured Products		

What is the same about both processes?

What is different about both processes?

Why are alkenes valuable products?

Why are branched-chain alkanes valuable products?

Practise Questions – Fact Recall

1. What is cracking?

2. What are the two types of cracking?

3. Explain why heavier petroleum fractions are cracked.

4. State the conditions necessary for, and the products favoured by thermal cracking.

Practise Questions – Application

1. One molecule of C_9H_{20} can be cracked to form one molecule of pentane and one other product. Write an equation for this cracking reaction. State why a high temperature is needed for cracking reactions to occur.

What next?

The next step in the Learn, Revise, Practise Method is Revise, where you'll strengthen your memory through retrieval practice exercises before moving on to Practise and applying your knowledge to exam questions.