

Name: \_\_\_\_\_

Date: \_\_\_\_\_

# AQA A-LEVEL CHEMISTRY

## Fractional Distillation: Separating Crude Oil into Fractions

### Learn Pack

*Guided notes, worked examples and practice questions to be completed alongside the lesson.*



## Crude Oil

Crude oil is a naturally occurring \_\_\_\_\_ mixture of \_\_\_\_\_. Crude oil contains hundreds (or even thousands) of different hydrocarbon molecules with different \_\_\_\_\_ and therefore different \_\_\_\_\_.

Because they are all mixed together, crude oil cannot be used efficiently until the hydrocarbons have been separated into \_\_\_\_\_ by fractional distillation.

### Lesson Objectives:

- Know what crude oil is and why it must be separated before it can be used.
- Understand how fractional distillation separates hydrocarbons into useful fractions.
- Understand why hydrocarbons condense at different heights within a fractionating column.

## Fractional Distillation

What is fractional distillation?

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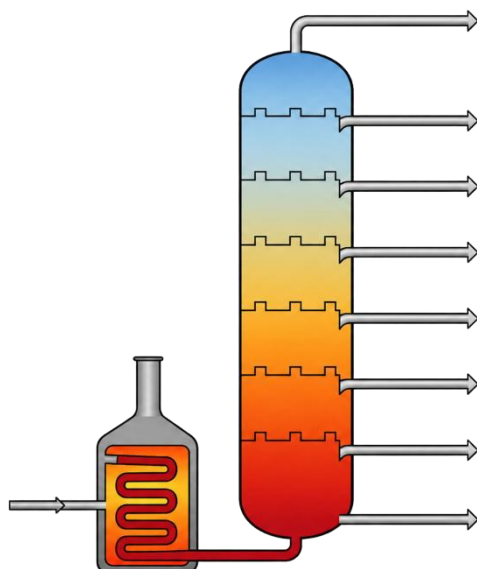
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Define the term fraction:

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Annotate the diagram below to describe how fractional distillation works:



## How Fractional Distillation Works

Fractional distillation works because of two key scientific ideas:

1. Hydrocarbon molecules have different \_\_\_\_\_.

This is because as the carbon chain length \_\_\_\_\_ the molecules get larger. This means that the number of van der Waals' forces acting between the molecules \_\_\_\_\_, therefore \_\_\_\_\_ energy is needed to overcome them and so the boiling point \_\_\_\_\_.

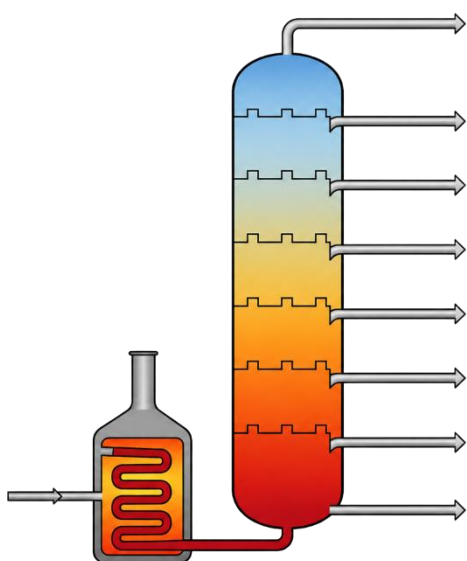
2. The fractionating column has a \_\_\_\_\_.

The column is \_\_\_\_\_ at the bottom and \_\_\_\_\_ at the top. This means that hydrocarbons reach temperatures below their boiling points at different \_\_\_\_\_ or levels within the column.

Larger hydrocarbon molecules with their \_\_\_\_\_ boiling points will therefore condense \_\_\_\_\_ whilst smaller hydrocarbon molecules with the \_\_\_\_\_ boiling points will condense \_\_\_\_\_.

## Fractions of Crude Oil

Label the fractions on the diagram below before annotating the diagram to show the trends in molecule size, boiling point, viscosity, volatility and combustibility:



## Fractional Distillation vs Laboratory Distillation

Complete the table below:

|           | Laboratory Fractional Distillation | Industrial Fractional Distillation |
|-----------|------------------------------------|------------------------------------|
| Separates |                                    |                                    |
| Produces  |                                    |                                    |

What is the same about both processes?

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What is different about both processes?

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## Practise Questions – Fact Recall

1. What is crude oil?

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2. Define the term *fraction*.

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3. Describe the process of fractional distillation.

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4. Identify the two key features that allows the separation of crude oil by fractional distillation.

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5. Explain why larger hydrocarbons have higher boiling points.

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### Practise Questions – Application

1. A hydrocarbon condenses near the top of the fractionating column. Predict whether it has; a high or low boiling point, a short or long carbon chain, a high or low viscosity, a high or low volatility. Explain your reasoning.

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