

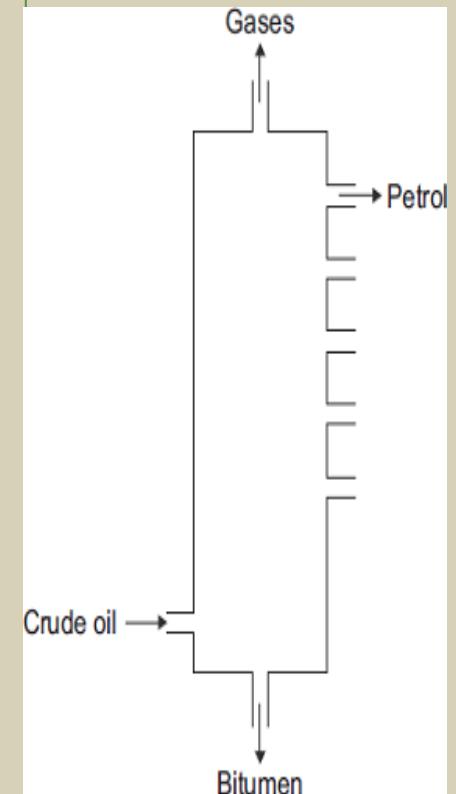
“DESCRIBE AND EXPLAIN” 6 MARK QUESTIONS

C9 Hydrocarbons

Developing a technique to answer a **describe/explain** question

(Describe-recall some facts, events or process in an accurate way, Explain-make something clear, or state the reasons for something happening)

- **Step 1 – read the information supplied**
- Crude oil is a mixture of many different chemical compounds.
- Most of the compounds in crude oil are hydrocarbons.
- Hydrocarbons with the smallest molecules are very volatile.
- Describe and explain how **petrol** is separated from the mixture of hydrocarbons in crude oil.
- Use the diagram and your knowledge to answer this question.



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- **Step 2 – plan your answer**
- Plan your answer by writing logically ordered bullet points for each step in the method
- **Step 3 – write your answer**
- Write in full sentences and link ideas together for top marks

Top tips for planning:

You will need to describe the scientific process of how crude oil is separated in to fractions and explain why the larger fractions are at the bottom of the fractionating column and the smaller fractions are at the top. This links to the carbon chain length and their associative boiling points. Then think about where petrol sits in terms of these properties.

Example answer:

- CRUDE OIL IS SEPARATED BY THE PROCESS OF FRACTIONAL DISTILLATION WHICH INVOLVES HEATING AT AROUND 350 DEGREES CELSIUS. THE SMALLER CHAIN MOLECULES WILL VAPORISE AND RISE TO THE TOP OF THE FRACTIONATING COLUMN WHERE MOST OF THEM THEN CONDENSE AS THEY COOL, SOME WILL REMAIN AS GASES. THOSE WITH LONGER CHAINS AND HIGHER BOILING POINTS MAY REMAIN AS LIQUIDS AND BE COLLECTED AT THE BOTTOM OF THE COLUMN. PETROL HAS A RELATIVELY LOW BOILING POINT AND WILL THEREFORE BE FRACTIONATED TOWARDS THE TOP OF THE COLUMN.

Answer Mark Scheme

- **0 marks**

No relevant content.

- **Level 1 (1-2 marks)**

There is a statement that crude oil is heated **or** that substances are cooled. However there is little detail and any description may be confused or inaccurate.

- **Level 2 (3-4 marks)**

There is some description of heating / evaporating crude oil **and either** fractions have different boiling points **or** there is an indication of a temperature difference in the column.

- **Level 3 (5-6 marks)**

There is a reasonable explanation of how petrol is or fractions are separated from crude oil using evaporating **and** condensing.

Examples of chemistry points made in the response could include:

- Some / most of the hydrocarbons (or petrol) evaporate / form vapours or gases
- When some of / a fraction of the hydrocarbons (or petrol) cool to their boiling point they condense
- Hydrocarbons (or petrol) that have (relatively) low boiling points and are collected near the top of the fractionating column or hydrocarbons with (relatively) high boiling points are collected near the bottom of the fractionating column
- The process is fractional distillation
- Heat the crude oil / mixture of hydrocarbons or crude oil / mixture is heated to about 350°C
- Some of the hydrocarbons remain as liquids
- Liquids flow to the bottom of the fractionating column
- Vapours / gases rise up the fractionating column
- Vapours / gases cool as they rise up the fractionating column
- The condensed fraction (or petrol) separates from the vapours / gases and flows out through a pipe
- Some of the hydrocarbons remain as vapours / gases
- Some vapours / gases rise out of the top of the fractionating column
- There is a temperature gradient in the fractionating column or the fractionating column is cool at the top and hot at the bottom