GCSE Combined Science: Fractional Distillation & Petrochemicals

AQA Specification 5.7.1.2

Name: _____ Class: _____ Date: _____

Part 1: Key Terminology

Match the terms with their definitions.

1.	Fractional Distillation	A. Industry producing chemicals from petroleum
2.	Fraction	B. Process of vaporising then condensing a liquid
3.	Petrochemical	C. Separating crude oil using boiling points
4.	Distillation	D. Chemical derived from petroleum
5.	Feedstock	E. Group of hydrocarbons with similar boiling points
6.	Petrochemical Industry	F. Raw material for industrial processes

Answers: 1. _ , 2. _ , 3. _ , 4. _ , 5. _ , 6. _

Part 2: Gap Fill

Complete using words from the box.

> **Word Bank:** boiling, carbon, condensation, distillation, evaporation, fractions, fuels, petrochemical, refinery, similar

1. Crude oil is separated by fractional _____.
2. It is separated into _____ with _____ numbers of carbon atoms.
3. Separation works due to different _____ points.
4. The process involves _____ and _____.
5. Fractions are processed to produce _____ and _____ products.
6. The _____ industry makes solvents, lubricants and polymers.

Part 3: Multiple Choice

Circle the correct answer for each question.

1. How does fractional distillation separate hydrocarbons?
A. By their chemical reactivity
B. By their boiling points
C. By their density
D. By their colour

2. What happens to smaller hydrocarbon molecules?
A. They condense at the bottom
B. They rise to the top
C. They collect in the middle
D. They evaporate at the top

3. Which is NOT a petrochemical product?
A. Solvents
B. Polymers
C. Lubricants
D. Electricity

4. Why do fractions condense at different heights?
A. Different boiling points
B. Different colours
C. Different densities
D. Different chemical formulas

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Part 4: Process & Applications

1. Describe what happens during the evaporation stage:

2. Explain why smaller hydrocarbon molecules rise higher in the column:

3. Name two fuels produced from crude oil fractions:

4. What is meant by 'feedstock' in the petrochemical industry?

Part 5: Challenge Question (6 marks)

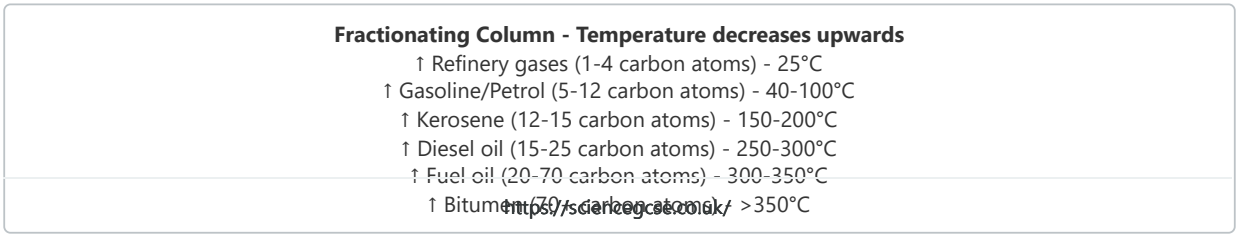
Fractional distillation is a crucial process in the petroleum industry with wide-ranging applications.

• Explain how fractional distillation separates crude oil into different fractions. **(2 marks)**

• Describe two important products of the petrochemical industry and their uses. **(2 marks)**

• Explain why modern society depends heavily on products derived from crude oil. **(2 marks)**

Fractional Distillation Column



GCSE Combined Science: Fractional Distillation - ANSWER SHEET

AQA Specification 5.7.1.2

FOR TEACHER USE ONLY

Part 1: Key Terminology

1. Fractional Distillation → C. Separating crude oil using boiling points
2. Fraction → E. Group of hydrocarbons with similar boiling points
3. Petrochemical → D. Chemical derived from petroleum
4. Distillation → B. Process of vaporising then condensing a liquid
5. Feedstock → F. Raw material for industrial processes
6. Petrochemical Industry → A. Industry producing chemicals from petroleum

Part 2: Gap Fill

1. Crude oil is separated by fractional **distillation**.
2. It is separated into **fractions** with **similar** numbers of carbon atoms.
3. Separation works due to different **boiling** points.
4. The process involves **evaporation** and **condensation**.
5. Fractions are processed to produce **fuels** and **petrochemical** products.
6. The **petrochemical** industry makes solvents, lubricants and polymers.

Part 3: Multiple Choice

1. B. By their boiling points

Different hydrocarbons have different boiling points

2. B. They rise to the top

Smaller molecules have lower boiling points

3. D. Electricity

Electricity is not a chemical product

4. A. Different boiling points

Each fraction condenses at its specific boiling point

GCSE Combined Science: Fractional Distillation - ANSWER SHEET

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Part 4: Process & Applications

1. Crude oil is heated until it vaporises (evaporates) into a gas. **(1 mark)**

2. Smaller hydrocarbon molecules have lower boiling points, so they remain as vapour longer and rise higher before condensing. **(1 mark)**

3. Any two from: petrol, diesel, kerosene, heavy fuel oil, liquefied petroleum gases. **(1 mark)**

4. Raw material used as input for industrial processes to make other chemicals. **(1 mark)**

Part 5: Challenge Question **(6 marks)**

• Crude oil is heated until it evaporates. The vapour rises up a fractionating column where temperature decreases with height. Different hydrocarbons condense at different levels based on their boiling points - larger molecules (higher boiling points) condense lower down, smaller molecules (lower boiling points) condense higher up. **(2 marks)**

1 mark for evaporation, 1 mark for condensation at different levels

• Any two from: Polymers (plastics, synthetic materials), Solvents (cleaning products, paints), Lubricants (engine oils, greases), Detergents (cleaning products). **(2 marks)**

1 mark for each correct product with use

• Modern society depends on crude oil for transportation fuels (petrol, diesel), heating, electricity generation, and countless petrochemical products including plastics, medicines, cosmetics, synthetic fabrics, and agricultural chemicals that are essential to contemporary lifestyles. **(2 marks)**

1 mark for fuels, 1 mark for other petrochemical products

Total marks: 20 *- Part 1 (6) + Part 2 (6) + Part 3 (4) + Part 4 (4) + Part 5 (6) =* ***26 marks total***

Additional Marking Guidance

- Accept equivalent wording for all answers
- For products, accept any valid petrochemical products with uses
- Key concepts: boiling point separation, evaporation/condensation, petrochemical uses
- Award partial marks for correct understanding even if terminology is imperfect