GCSE Combined Science: Cracking & Alkenes

AQA Specification 5.7.1.4

Name: _____ Class: _____ Date: _____

Part 1: Key Terminology

Match the terms with their definitions.

1.	Cracking	A. Breaking down large hydrocarbons
2.	Alkene	B. Unsaturated hydrocarbon with double bond
3.	Catalytic Cracking	C. Test for unsaturation
4.	Bromine Water Test	D. Using a catalyst to break hydrocarbons
5.	Polymer	E. Long chain molecule from many monomers
6.	Unsaturated	F. Contains carbon-carbon double bonds

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

Part 2: Gap Fill

Complete using words from the box.

> **Word Bank:** alkenes, bromine, catalytic, colourless, cracked, demand, fuels, polymers, reactive, steam

1. Large hydrocarbons are _____ to produce smaller ones.
2. There is high _____ for fuels with small molecules.
3. Cracking methods include _____ cracking and _____ cracking.
4. Cracking produces alkanes and _____.
5. Alkenes are more _____ than alkanes.
6. Bromine water changes from orange to _____ with alkenes.

Part 3: Multiple Choice

Circle the correct answer for each question.

1. Why is cracking necessary?
A. To make more crude oil
B. To produce larger molecules
C. To meet demand for small molecule fuels
D. To reduce pollution

2. What is the colour change in the bromine water test?
A. Orange to colourless
B. Colourless to orange
C. Blue to colourless
D. Green to orange

3. Which is NOT a use of alkenes?
A. Making polymers
B. Producing chemicals
C. Direct use as fuels
D. Starting materials

4. What makes alkenes more reactive than alkanes?
A. Single bonds
B. Double bonds
C. Triple bonds
D. No bonds

GCSE Combined Science: Cracking & Alkenes

AQA Specification 5.7.1.4 - Continued

Part 4: Cracking & Reactions

1. Why is there high demand for smaller hydrocarbon molecules?

2. Describe the bromine water test for alkenes:

3. Balance this cracking equation: $C_{10}H_{22} \rightarrow C_8H_{18}$ + _____

4. Name two important uses of alkenes:

Part 5: Challenge Question (6 marks)

Cracking is an essential process that provides important products for modern society.

• Explain why cracking is necessary and describe the two main methods used. **(2 marks)**

• Describe how you would test a hydrocarbon to determine if it is an alkene and explain the chemistry behind the test. **(2 marks)**

• Explain the importance of alkenes in modern society, giving specific examples of their uses. **(2 marks)**

Bromine Water Test

Test for Unsaturation (Alkenes)
Orange bromine water + alkene → Colourless solution
Orange bromine water + alkane → Stays orange (no change)
The double bond in alkenes reacts with bromine, causing decolourisation

GCSE Combined Science: Cracking & Alkenes - ANSWER SHEET

AQA Specification 5.7.1.4

FOR TEACHER USE ONLY

Part 1: Key Terminology

1. Cracking → A. Breaking down large hydrocarbons
2. Alkene → B. Unsaturated hydrocarbon with double bond
3. Catalytic Cracking → D. Using a catalyst to break hydrocarbons
4. Bromine Water Test → C. Test for unsaturation
5. Polymer → E. Long chain molecule from many monomers
6. Unsaturated → F. Contains carbon-carbon double bonds

Part 2: Gap Fill

1. Large hydrocarbons are **cracked** to produce smaller ones.
2. There is high **demand** for fuels with small molecules.
3. Cracking methods include **catalytic** cracking and **steam** cracking.
4. Cracking produces alkanes and **alkenes**.
5. Alkenes are more **reactive** than alkanes.
6. Bromine water changes from orange to **colourless** with alkenes.

Part 3: Multiple Choice

1. C. To meet demand for small molecule fuels

Fractional distillation produces too many large molecules

2. A. Orange to colourless

Alkenes decolourise bromine water

3. C. Direct use as fuels

Alkenes are not typically used directly as fuels

4. B. Double bonds

Double bonds can break open to form new bonds

GCSE Combined Science: Cracking & Alkenes - ANSWER SHEET

AQA Specification 5.7.1.4 - Continued

Part 4: Cracking & Reactions

1. Smaller hydrocarbons are better fuels - more flammable, easier to vaporise, and there's higher demand for petrol than heavy fuel oil. **(1 mark)**

2. Add bromine water to the hydrocarbon. If it is an alkene, the orange colour disappears (decolourises). Alkanes show no colour change. **(1 mark)**

3. $C_{10}H_{22} \rightarrow C_8H_{18} + C_2H_4$ **(1 mark)**

Atoms must balance: 10C → 8C+2C, 22H → 18H+4H

4. Any two from: making polymers (plastics), production of other chemicals, starting materials for synthesis. **(1 mark)**

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

• Cracking is necessary because fractional distillation produces more heavy fractions (large molecules) than needed, but there's higher demand for lighter fractions (small molecules) as fuels. The two main methods are catalytic cracking (using zeolite catalyst at ~500°C) and steam cracking (using high temperature steam at ~850°C). **(2 marks)**

1 mark for reason, 1 mark for describing both methods

• Add orange bromine water to the hydrocarbon sample. If it is an alkene, the solution will decolourise (turn colourless). This happens because alkenes have C=C double bonds that can react with bromine, adding bromine atoms across the double bond. Alkanes have only single bonds and don't react with bromine water. **(2 marks)**

1 mark for test description, 1 mark for chemistry explanation

• Alkenes are crucial for making polymers (plastics like polyethylene, polypropylene), solvents, antifreeze, and many other chemicals. They are essential feedstocks for the chemical industry and are used to produce materials for packaging, textiles, construction, and countless everyday products that modern society depends on. **(2 marks)**

1 mark for specific uses, 1 mark for importance to society

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 equations, check atom balancing on both sides
- Key concepts: cracking necessity, alkene test, uses of alkenes
- Award partial marks for correct understanding even if terminology is imperfect