

Name:

Date:

C7 - Test 6  
ORGANIC CHEMISTRY  
Advanced

**GCSE**

CHEMISTRY

AQA - Combined Science

Mark

Grade

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### Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

### Instructions

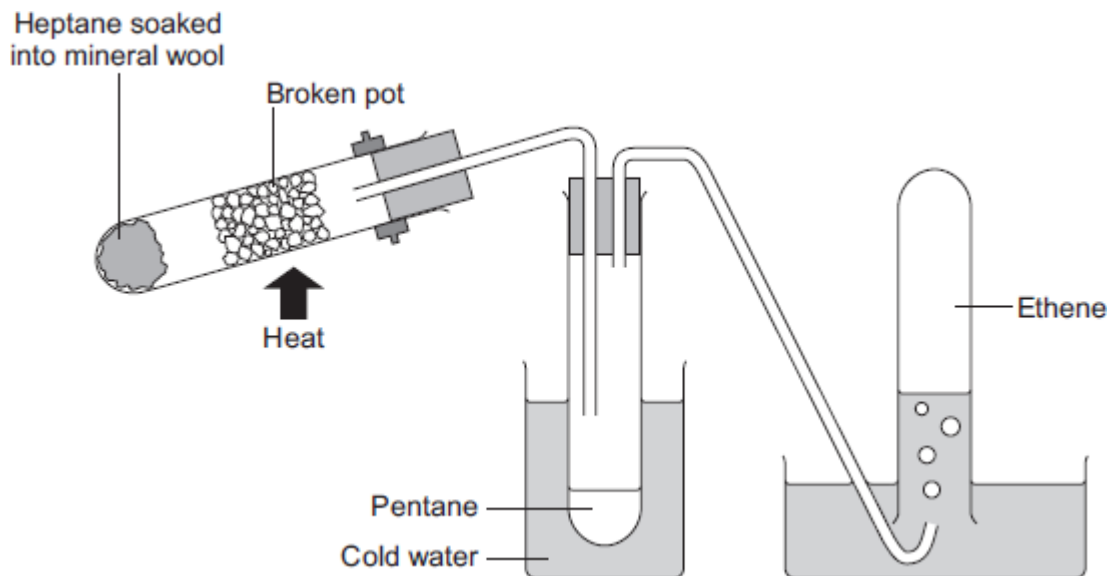
- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

- The marks for the questions are shown in brackets

1.

In the laboratory, ethene can be made using the apparatus shown.



- (a) (i) Complete the symbol equation for this reaction.



(1)

- (ii) Explain how you can tell pentane has a higher boiling point than ethene.

Use information from the diagram.

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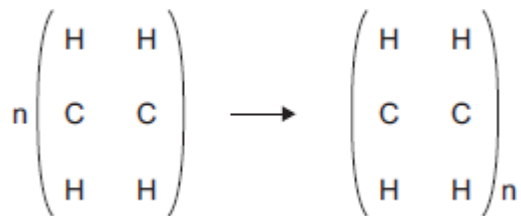
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(1)

- (b) Ethene molecules are polymerised to form poly(ethene).

Complete the displayed (structural) formula of ethene and poly(ethene) in the equation to show this reaction.

Draw lines to represent each bond.



**Ethene**

**Poly(ethene)**

(3)

(Total 5 marks)

2.

Many fuels are obtained from crude oil. Some of these fuels can be used for transport.



Jet © Dimitar Marinov/iStock

Truck © James McQuillan/iStock

Car © tridland/iStock

(a) The table shows different properties of some fuels obtained from crude oil.

Fuel	Size of molecules	Boiling point range in °C	Flash point in °C
Diesel	$C_{15}H_{32} - C_{20}H_{42}$	250–300	63
Kerosene	$C_{10}H_{22} - C_{15}H_{32}$	180–250	38
Petrol	$C_5H_{12} - C_{10}H_{22}$	40–180	-43

Flash point is the lowest temperature at which the fuel will catch fire.

(i) How does increasing the number of carbon atoms in the fuels affect the properties shown in the table?

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(2)

(ii) Which fuel in the table would you expect to be the most viscous?

Give a reason for your answer.

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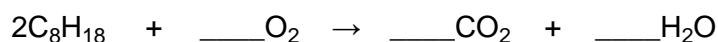
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(2)

(b) (i) Octane is one of the compounds in petrol.

Balance the chemical equation for the complete combustion of octane.



(2)

(ii) Octane is both a hydrocarbon and an alkane.

Explain how the chemical formula of octane,  $\text{C}_8\text{H}_{18}$ , shows this.

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(2)

(Total 8 marks)

3.

Crude oil is a mixture of alkanes from which useful fuel fractions can be obtained.

Fraction	A hydrocarbon in this fraction	Boiling point of alkane in °C
petroleum gases	Propane	-42
petrol (gasoline)	Octane	+126
paraffin (kerosene)	Dodecane	+216
diesel	Eicosane	+344

(a) (i) Suggest the lowest temperature to which crude oil needs to be heated to vaporise all of these fuel fractions.

Temperature \_\_\_\_\_ °C

(1)

- (ii) Dodecane boils at +216 °C. At what temperature will dodecane gas condense to liquid?

Temperature \_\_\_\_\_ °C

(1)

- (iii) Describe what happens in a fractionating column that allows these fractions to be collected.

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(3)

- (b) Propane is a fuel because it burns in air releasing heat energy.

- (i) Complete the balancing of the two chemical equations for propane burning in air.



(2)

- (ii) The products of the two chemical reactions in (b)(i) are different.

Explain why.

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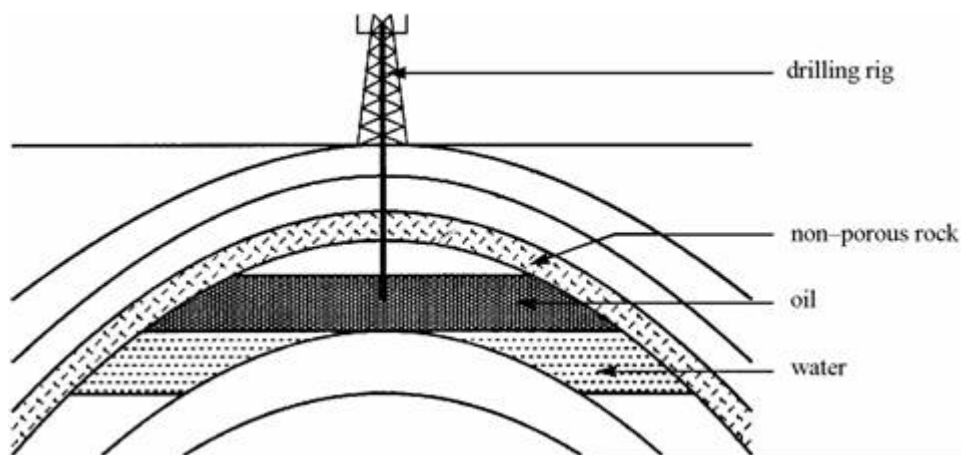
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(2)

(Total 9 marks)

4.

Crude oil is obtained by drilling into the Earth's crust. The diagram shows a section through the Earth's crust to show how this is done.

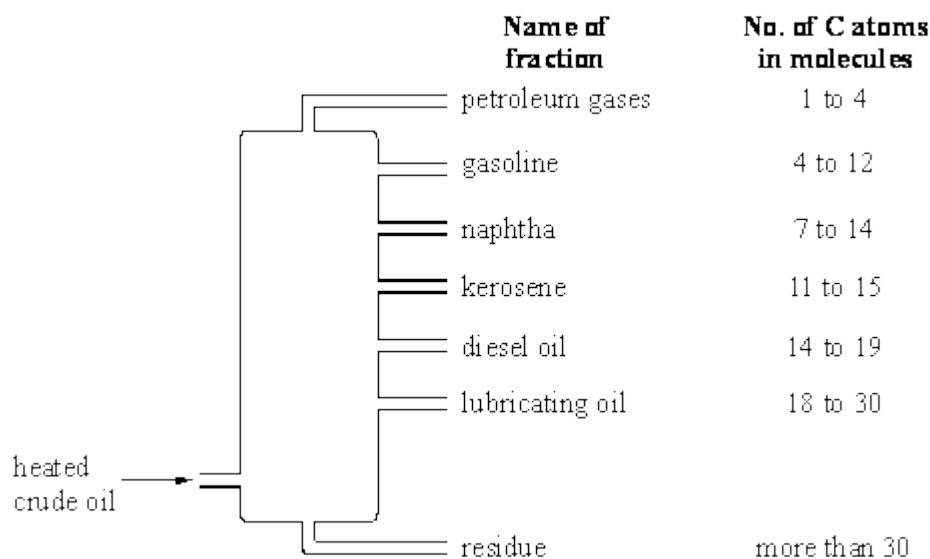


(a) Crude oil contains many hydrocarbons. Which elements do hydrocarbons contain?

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(1)

(b) The crude oil is separated by fractional distillation. The diagram shows a column used for this.



(i) Explain, as fully as you can, how fractional distillation works.

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(3)

(ii) Naphtha burns more easily than diesel oil. Explain why.

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(1)

(iii) Naphtha contains a saturated hydrocarbon with the formula  $C_7H_{16}$ . Draw the structural formula of this compound.

(2)

(Total 7 marks)

5.

The table below shows information about the fractions obtained when crude oil is distilled.

Fraction	Supply from distillation as percentage (%) of crude oil input	Demand by consumers as percentage (%) of crude oil input	Number of carbon atoms in hydrocarbon chain
LPG	2	6	$C_1 - C_4$
Petrol	14	27	$C_5 - C_{10}$
Kerosene	13	8	$C_{11} - C_{15}$
Diesel	21	21	$C_{16} - C_{19}$

(a) Some petrol is produced by cracking.

(i) Why is it necessary to produce some petrol by cracking?

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(1)

(ii) Which fraction is the most suitable to be cracked to produce petrol?

Draw a ring around the correct answer.

**diesel**

**kerosene**

**LPG**

**(1)**

(iii) Give **two** reasons why the fraction you chose in part (ii) is cracked to produce petrol.

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**(2)**

(b) Describe the process used to crack hydrocarbons.

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**(2)**

**(Total 6 marks)**