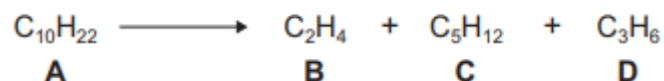


# HYDROCARBONS 6

**Q1.** Large hydrocarbon molecules can be broken down to produce smaller molecules.

An example is shown below.

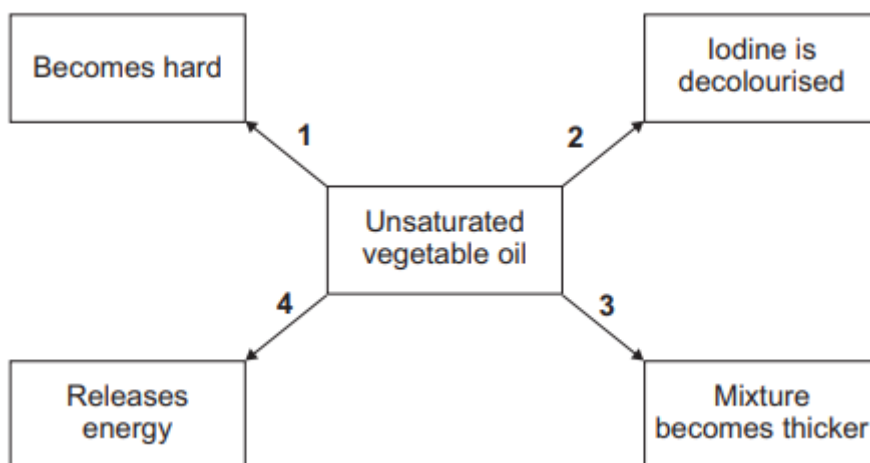


Match hydrocarbons, A, B, C and D, with the numbers 1– 4 in the table.

<b>1</b>	It has molecules with 17 atoms.
<b>2</b>	It is ethene.
<b>3</b>	It can be represented by $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\   \quad   \quad   \\ \text{H}-\text{C}-\text{C}=\text{C} \\   \quad \quad   \\ \text{H} \quad \quad \text{H} \end{array}$
<b>4</b>	It is the alkane with the largest molecules.

(4 marks)

**Q2.** The diagram shows what happens to an unsaturated vegetable oil when it is treated in different ways.



Match processes, A, B, C and D, with the numbers 1– 4 in the diagram.

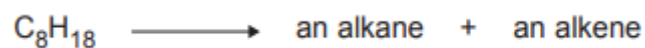
- A Burn in oxygen
- B Test for unsaturation

C Add water and shake vigorously

D React with hydrogen

(4 marks)

**Q3.** This equation shows the thermal decomposition of a hydrocarbon.



**(a)** What is the name of this process?

1 polymerisation

2 cracking

3 combustion

4 hydrogenation

(1 mark)

**(b)** In this decomposition, . . .

1 the hydrocarbon vapour is heated with iodine.

2 the hydrocarbon is mixed with hydrogen and heated.

3 the hydrocarbon vapour is passed over a hot catalyst.

4 the hydrocarbon is liquefied, then passed over a catalyst.

(1 mark)

**(c)** The alkene produced . . .

1 is an unsaturated compound.

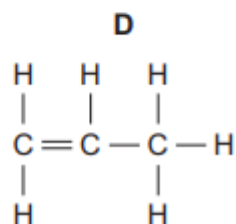
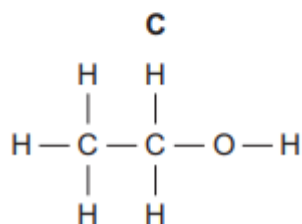
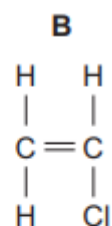
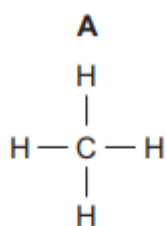
2 has molecules in which each carbon atom has two bonds.

3 is unreactive.

4 will burn to produce carbon dioxide and hydrogen.

(1 mark)

**Q4.** This question is about the formulae of four carbon compounds, A, B, C and D.



Match formulae, A, B, C and D, with the numbers 1– 4 in the table.

<b>1</b>	It is an unsaturated hydrocarbon.
<b>2</b>	It is the alkane that was present in Earth's early atmosphere.
<b>3</b>	It is made by reacting ethene with steam.
<b>4</b>	It is the monomer from which the polymer, poly(chloroethene) is made.

(4 marks)

**Q5.** This question is about four vegetable oils, A, B, C and D.

	Vegetable oil	Mass of the oil that can be extracted from 100 kg of seeds of the plant	Saturated fat %	Unsaturated fat %	
				mono	poly
<b>A</b>	Corn	6 kg	13	25	62
<b>B</b>	Olive	40 kg	11	69	20
<b>C</b>	Rapeseed	35 kg	12	24	64
<b>D</b>	Sunflower	32 kg	14	19	67

Match vegetable oils, A, B, C and D, with the numbers 1– 4 in the table below.

1	It contains the most saturated fat.
2	It contains 88 % unsaturated fat.
3	It contains the largest percentage of unsaturated fat.
4	Its seeds produce the least oil.

(4 marks)

**Q6.** Match words A, B, C and D, with the numbers 1– 4 in the sentences.

- A alkenes
- B polymers
- C monomers
- D alkanes

Hydrocarbons are cracked to produce both saturated and unsaturated hydrocarbons.

The saturated hydrocarbons that are used as fuels are called . . . 1 . . . .

The unsaturated hydrocarbons are called . . . 2 . . . .

Compounds, such as poly(ethene) and poly(propene), that have very long chain molecules are called . . . 3 . . . .

Long chain molecules are made when many small molecules join together. These small molecules are called . . . 4 . . . .

(4 marks)

**Q7.** This question is about unsaturated oils.

A student tested four oils, K, L, M and N, to find out which was the most unsaturated.

The student:

- used the same volume of each of the oils for all the tests.
- added bromine water from a burette to oil K and shook the mixture.
- continued until the bromine water was no longer decolourised.
- recorded the volume of bromine water added.
- repeated this two more times for oil K.

He then repeated the same procedure for oils L, M and N.

His results are given in the table.

Oil tested	Volume of bromine water added in cm <sup>3</sup>		
	Test 1	Test 2	Test 3
K	20.1	20.2	20.2
L	42.2	44.2	46.2
M	25.6	26.3	27.0
N	15.8	16.5	14.3

(a) The student used the burette to measure the volume of bromine water to the nearest . . .

- 1 0.1 cm<sup>3</sup>
- 2 0.2 cm<sup>3</sup>
- 3 1.0 cm<sup>3</sup>
- 4 2.0 cm<sup>3</sup>

(1 mark)

(b) The student obtained the largest range of burette readings for oil . . .

- 1 K
- 2 L
- 3 M
- 4 N

(1 mark)

(c) The student obtained the most precise results for oil . . .

- 1 K
- 2 L
- 3 M
- 4 N

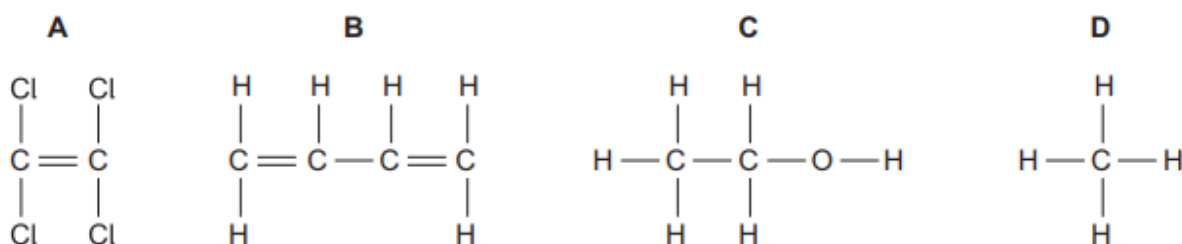
(1 mark)

(d) A valid conclusion from his experiment is that . . .

- 1 four oils were tested.
- 2 oil N was the most unsaturated.
- 3 all four of the oils were unsaturated.
- 4 all oils react with bromine.

(1 mark)

Q8. Match compounds, A, B, C and D, with the numbers 1– 4 in the table.



	Description
1	It is not a hydrocarbon but burns to give carbon dioxide and water.
2	It is a saturated hydrocarbon used as a fuel.
3	It will not produce water vapour if it burns.
4	It belongs to a group of compounds with the general formula $\text{C}_n\text{H}_{2n-2}$

(4 marks)

Q9. The question is about vegetable oils.

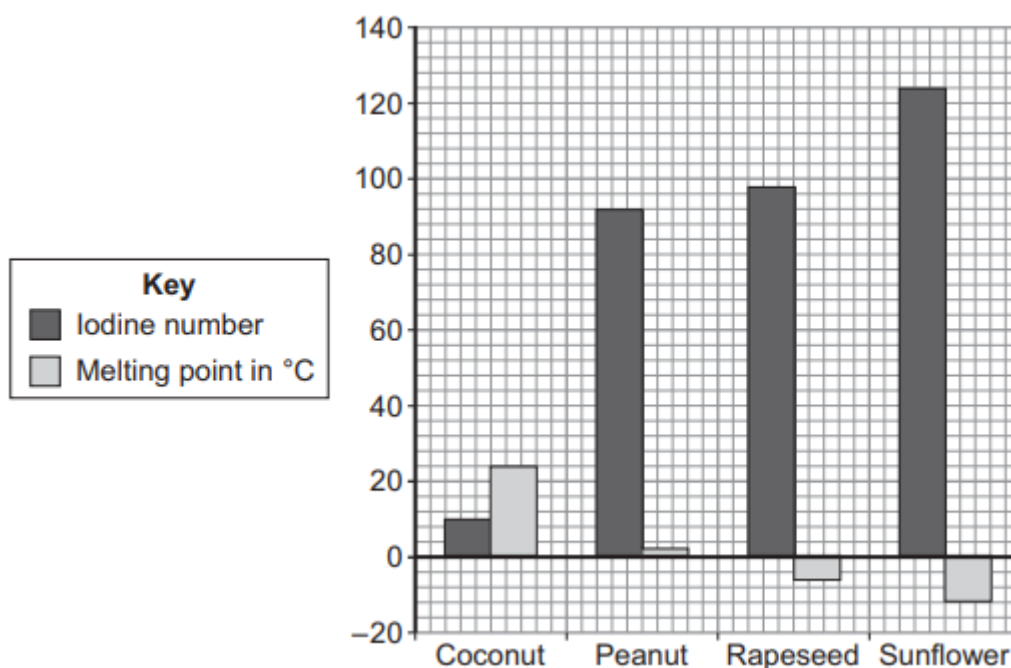
(a) Many vegetable oils contain unsaturated compounds.

This means that . . .

- 1 they are soluble in water.
- 2 they can form an emulsion with water.
- 3 they contain double carbon carbon bonds.
- 4 they do not contain single carbon carbon bonds.

(1 mark)

The chart shows some information about four vegetable oils.



The iodine number of a vegetable oil is the number of grams of iodine that will react with 100 g of the oil. The higher the iodine number, the more unsaturated the compounds are in the vegetable oil.

(b) The bar chart indicates that the lower the melting point of a vegetable oil, . . .

- 1 the less iodine it will react with.
- 2 the more unsaturated compounds are in the oil.
- 3 the lower the iodine number.
- 4 the more saturated compounds are in the oil.

(1 mark)

(c) How much iodine will 1 g of coconut oil react with?

- 1 0.01 g
- 2 0.1 g
- 3 1.0 g
- 4 10.0 g

(1 mark)

- (d) Which row in the table describes what happens when a vegetable oil reacts with hydrogen and correctly describes how the product is different from the vegetable oil?

	Reaction of vegetable oil with hydrogen	Product
1	increase in compounds with C = C	harder
2	increase in compounds with C ≡ C	softer
3	decrease in compounds with C = C	harder
4	decrease in compounds with C ≡ C	softer

(1 mark)

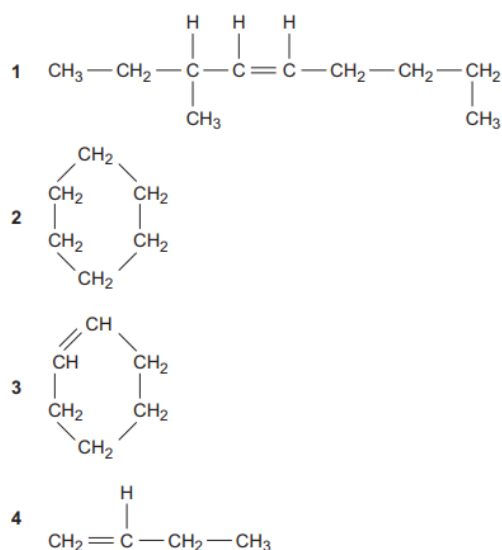
**Q10.** This question is about the cracking of hydrocarbons.

- (a) Which of the following is a correctly balanced equation for the cracking of C<sub>15</sub>H<sub>32</sub> in which two different alkenes are produced?

- 1  $C_{15}H_{32} \rightarrow 2C_2H_4 + C_3H_6 + C_8H_{18}$
- 2  $C_{15}H_{32} \rightarrow 2CH_4 + C_3H_6 + C_4H_{10} + C_6H_{12}$
- 3  $C_{15}H_{32} \rightarrow 2C_3H_6 + C_9H_{20}$
- 4  $C_{15}H_{32} \rightarrow C_4H_{10} + C_5H_{10} + C_6H_{14}$

(1 mark)

- (b) Which of the following hydrocarbons that could be produced by the cracking of C<sub>9</sub>H<sub>20</sub> has the general formula C<sub>n</sub>H<sub>2n</sub> and decolourises bromine water?



(1 mark)



**Q11.** This question is about four substances.

Match substances, A, B, C and D, with the descriptions 1– 4 in the table.

- A bromine
- B ethene
- C poly(propene)
- D water

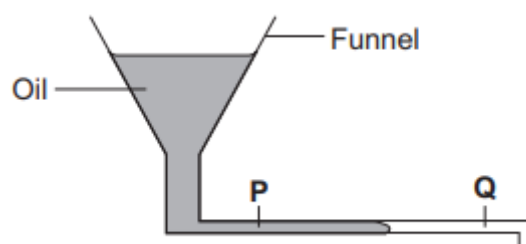
	Description
1	It forms an emulsion if shaken with an oil
2	It is a polymer
3	It is an unsaturated hydrocarbon
4	It reacts with unsaturated oils to form a colourless compound

(4 marks)

**Q12.** Viscosity is a measure of how easily a liquid flows.

The more viscous an oil is, the more slowly it will flow.

A student compared the viscosities of four different oils, W, X, Y and Z, at different temperatures. He used the apparatus shown in the diagram.



First, he used oil W.

- Oil W was heated to 20 °C and was then poured into the funnel.
- The time taken for oil W to flow from P to Q was recorded.
- The student repeated the procedure for oil W at temperatures of 30 °C, 40 °C and 50 °C.

The student then used oils X, Y and Z in the same way.

Match variables, A, B, C and D, with the numbers 1– 4 in the sentences.

- A the colour of the oil
- B the time the oil takes to flow from P to Q
- C the distance between P and Q
- D the four temperatures used for each oil

An independent variable is . . . 1 . . . .

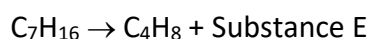
The dependent variable is . . . 2 . . . .

A control variable used to make the investigation fair is . . . 3 . . . .

A variable that does not affect the result of the investigation is . . . 4 . . . .

(4 marks)

**Q13.** The equation for the thermal decomposition of a hydrocarbon is:



**(a)** What name is given to this process?

- 1 combustion
- 2 condensation
- 3 cracking
- 4 hydrogenation

(1 mark)

**(b)** In this process, . . .

- 1 hot gases are mixed with water.
- 2 hot vapours are passed over a hot catalyst.
- 3 liquids are mixed with water.
- 4 liquids are passed over a catalyst.

(1 mark)

**(c)** Substance E will have the formula . . .

- 1 CH<sub>4</sub>
- 2 C<sub>3</sub>H<sub>6</sub>
- 3 C<sub>3</sub>H<sub>8</sub>
- 4 C<sub>9</sub>H<sub>20</sub>

(1 mark)

**(d)** The substance with the formula  $C_4H_8$  is . . .

- 1 an alkane.
- 2 an alkene.
- 3 a saturated hydrocarbon.
- 4 a polymer.

(1 mark)

Total marks (49)