

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education  
November 2008



**SCIENCE A**  
**Unit Chemistry C1b (Oils, Earth and Atmosphere)**

**CHY1BP**

**CHEMISTRY**  
**Unit Chemistry C1b (Oils, Earth and Atmosphere)**

Thursday 20 November 2008 Morning Session

**For this paper you must have:**

- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

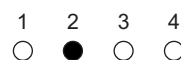
Time allowed: 30 minutes

### Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Chemistry Unit 1b' printed on it.
- Attempt **one Tier only**, **either** the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

### Instructions for recording answers

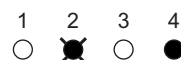
- Use a **black ball-point pen**.



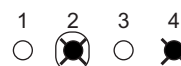
- For each answer **completely fill in the circle** as shown:

- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



### Information

- The maximum mark for this paper is 36.

### Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Higher Tier starts on page 14 of this booklet.

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**FOUNDATION TIER**

**SECTION ONE**

Questions **ONE** to **FIVE**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

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**QUESTION ONE**

This question is about four processes.

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

- A** combustion
- B** condensation
- C** cracking
- D** hardening

<b>1</b>	the change from gas to liquid
<b>2</b>	the burning of hydrocarbons in oxygen
<b>3</b>	the breakdown of large hydrocarbon molecules
<b>4</b>	the conversion of a liquid vegetable oil to a solid fat

**QUESTION TWO**

This question is about four cooking oils.

	Type of cooking oil	Saturated fat %	Unsaturated fat %		Melting point in °C	Energy from 100 g of the oil in kJ
			mono	poly		
<b>A</b>	Corn	13	25	62	-15	3700
<b>B</b>	Olive	11	69	20	-12	3378
<b>C</b>	Rapeseed	12	24	64	5	3696
<b>D</b>	Sunflower	14	19	67	-18	3690

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

<b>1</b>	It has the highest percentage of saturated fat.
<b>2</b>	It has the highest percentage of unsaturated fat.
<b>3</b>	It releases the most energy from 100 g of the oil.
<b>4</b>	It would be the first to turn solid if the oils were cooled from 20 °C.

**Turn over for the next question**

**Turn over ►**

**QUESTION THREE**

This question is about four substances.

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

- A** argon
- B** bromine
- C** ethanol
- D** nickel

<b>1</b>	It is an unreactive gas.
<b>2</b>	It is produced when ethene reacts with steam.
<b>3</b>	It will be turned from red-brown to colourless by unsaturated oils.
<b>4</b>	It acts as a catalyst in the reaction to hydrogenate unsaturated oils.

**QUESTION FOUR**

This question is about extracting oil from olives.

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

- A** crushed
- B** pressed
- C** separated
- D** stirred

The olives are collected from the trees and . . . **1** . . . to split them open. This produces a paste.

Water is then added to this paste and the mixture is . . . **2** . . . for several minutes.  
The mixture is allowed to stand.

To obtain oil and water, the mixture is . . . **3** . . . .

The olive oil and water are left to stand until they have . . . **4** . . . .

---

**QUESTION FIVE**

This question is about some gases found in the Earth's atmosphere.

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

**A** carbon dioxide

**B** helium

**C** nitrogen

**D** oxygen

<b>1</b>	It is in Group 0 of the periodic table.
<b>2</b>	It makes up about 80% of the atmosphere.
<b>3</b>	It is found in today's atmosphere in much smaller amounts than in Earth's early atmosphere.
<b>4</b>	It is used when fossil fuels burn.

**Turn over for the next question**

**Turn over ►**

**SECTION TWO**Questions **SIX** to **NINE**.

Each of these questions has four parts.

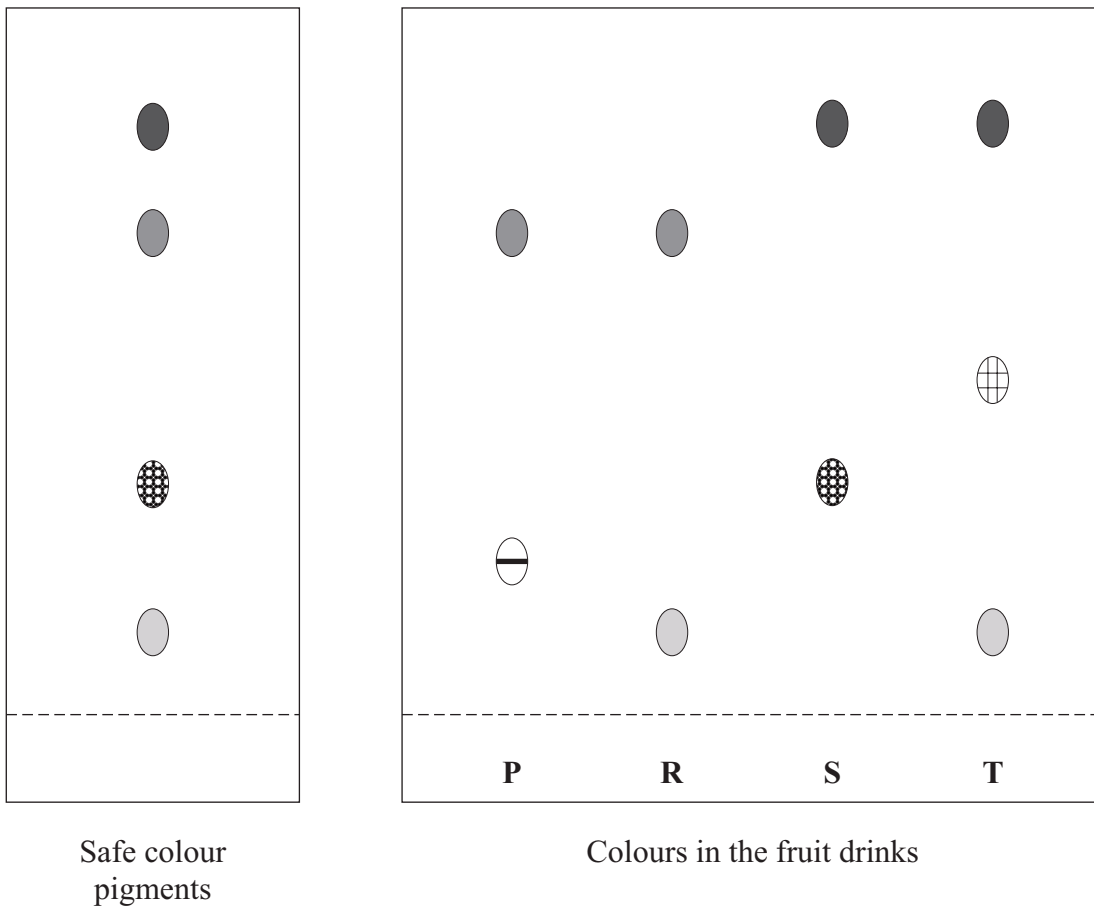
In each part choose only **one** answer.

Mark your choices on the answer sheet.

**QUESTION SIX**

The colour pigments in four fruit drinks, **P**, **R**, **S** and **T**, were examined using chromatography to see if the drinks were safe.

The results are shown below.

**6A** Which fruit drink contains the greatest number of colour pigments?

- 1 P
- 2 R
- 3 S
- 4 T

**6B** The chromatogram shows that . . .

- 1 all the fruit drinks are safe.
- 2 only fruit drink **R** is safe.
- 3 only fruit drinks **R** and **S** are safe.
- 4 only fruit drinks **P** and **T** are safe.

**6C** Manufacturers add colour pigments to fruit drinks to . . .

- 1 make the fruit drinks more attractive to consumers.
- 2 make sure that the fruit drinks contain additives with E-numbers.
- 3 increase the energy content of the fruit drinks.
- 4 make the fruit drinks more healthy.

**6D** A company is told that one of the fruit drinks it manufactures contains a colour pigment that is **not** safe.

What action should the company immediately take?

- 1 Order supplies of a safe colour pigment to use in its place in the fruit drink.
- 2 Tell all shops to stop selling the fruit drink and tell the public **not** to drink it.
- 3 Warn its employees to take precautions when handling the colour pigment.
- 4 Sack the manager of the factory that makes the fruit drink.

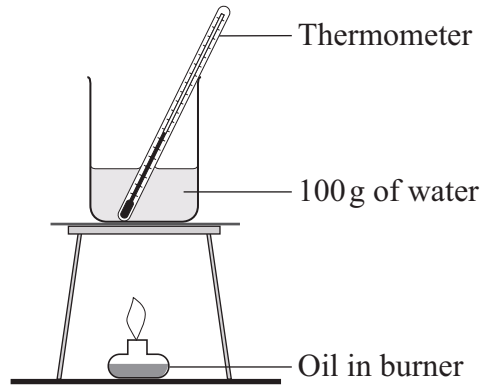
**Turn over for the next question**

**Turn over ►**

**QUESTION SEVEN**

A student was comparing two vegetable oils, **X** and **Y**, to find out how much heat they release when they burn.

She used the apparatus shown in the diagram. The oil was allowed to burn for 6 minutes in each test.



Her results are shown in the table.

	<b>Oil X</b>	<b>Oil Y</b>
Mass of empty oil burner	60 g	60 g
Mass of oil burner + vegetable oil	67 g	66 g
Mass of oil burner + vegetable oil after burning	62 g	63 g
Initial temperature of water in the beaker	24 °C	24 °C
Final temperature of water in the beaker after heating	49 °C	42 °C

**7A** How many grams of oil **X** were burned during the experiment?

- 1 2 g
- 2 4 g
- 3 5 g
- 4 7 g



---

**7B** Oil **X** produced a temperature rise of 5 °C per gram of oil burned.

What rise in temperature was produced by burning 1 g of oil **Y**?

- 1 3 °C
- 2 6 °C
- 3 18 °C
- 4 42 °C

**7C** How could the student improve the reliability of the results for each oil?

- 1 Repeat the experiment several times and take the mean (average) value.
- 2 Burn the same mass of oil **X** and oil **Y** in the tests.
- 3 Burn the same mass of oil **X** and oil **Y** but for a shorter length of time.
- 4 Use several other oils and compare the results with those for oil **X** and oil **Y**.

**7D** The student could get more accurate results if she improved the design of her apparatus.

One improvement would be to . . .

- 1 use a larger beaker.
- 2 use a thermometer with a larger range of temperatures.
- 3 burn a smaller quantity of oil each time.
- 4 protect the flame from draughts.

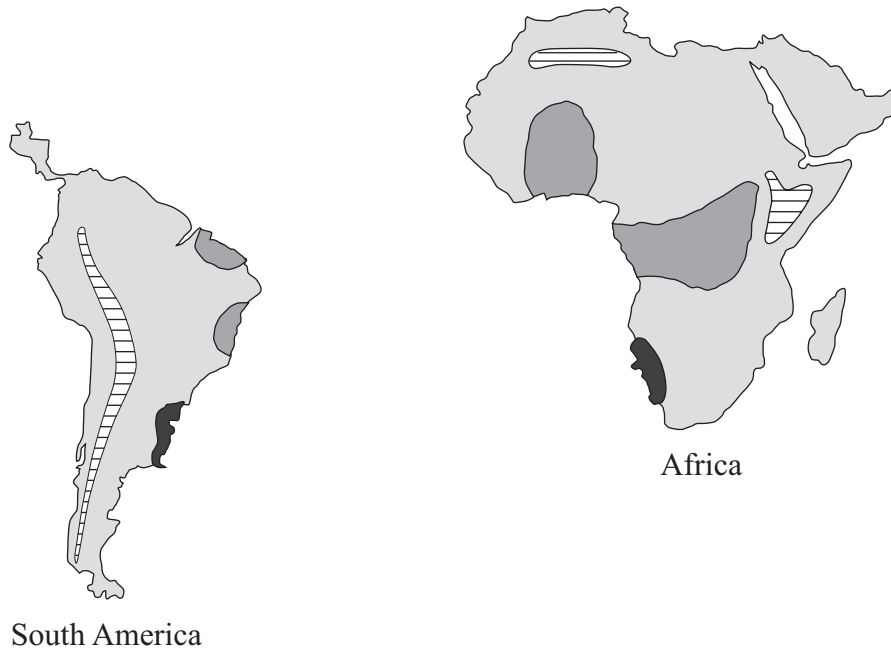
**Turn over for the next question**

**Turn over ►**

## QUESTION EIGHT

The diagram shows the positions of the South American and African continents today.

Some of the rock formations are also shown.



<b>Key</b>	
■	Ancient rocks about 2000 million years old
■	Sandstone containing similar fossils
▨	Mountains

- Similar fossils are found in some rocks in South America and Africa.
- Animals living now in South America and Africa show many differences.

In the early 20th century, most scientists explained these observations by suggesting that there had been a land bridge between the two continents.

In 1920, the German scientist Alfred Wegener suggested that the two continents had once been joined together and had slowly moved apart over millions of years.

---

**8A** One piece of evidence, shown on the diagram, that Wegener used to support his theory was that . . .

- 1 there are different fossils in sandstone rocks.
- 2 the same types of ancient rocks are in matching positions.
- 3 the two continents are similar in shape.
- 4 the two continents are a similar size.

**8B** Many scientists did **not** accept Wegener's theory.

This was because . . .

- 1 they thought that the continents were fixed to a solid Earth.
- 2 some of the mountains were **not** in matching positions.
- 3 the animals on the two continents were different.
- 4 some of the rocks on the two continents were different.

**8C** Many years later, scientists came to accept Wegener's theory.

This was because they understood that . . .

- 1 climate change was affecting the position of the continents.
- 2 the Earth's crust is divided into plates that can move.
- 3 volcanic activity could cause continents to move.
- 4 earthquakes could cause continents to move.

**8D** At what rate do these two continents move apart?

- 1 a few millimetres a year
- 2 a few centimetres a year
- 3 a few metres a year
- 4 a few kilometres a year

Turn over ►

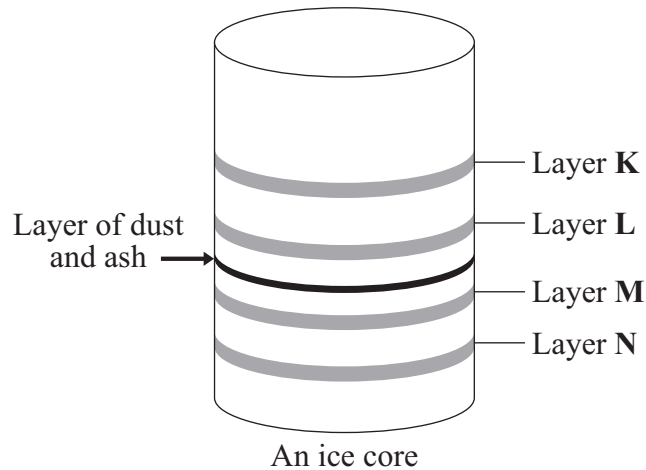
## QUESTION NINE

The North Pole is situated on a thick sheet of ice, floating on sea water. There has never been vegetation here. The ice took a very long time to form.

Substances trapped in the ice can provide evidence about the atmosphere in the past.

Cores of ice are drilled out of the ice sheet and analysed.

One of the cores of ice is shown in the diagram.



Layer	Approximate age of the ice in years	Carbon dioxide gas content in ppm
<b>K</b>	100	850
<b>L</b>	300	525
<b>M</b>	500	520
<b>N</b>	700	518

**9A** There was a large amount of carbon dioxide gas in the atmosphere 100 years ago.

An explanation for this is . . .

- 1 an increase in global warming.
- 2 that carbon dioxide was lost from the ice over time.
- 3 the increased burning of fossil fuels.
- 4 that plants started to release more carbon dioxide as the Earth warmed up.

- 9B** Which statement best describes the variation of carbon dioxide gas in the four layers?
- 1 There is a slow steady rise from **N** to **K**.
  - 2 There is no overall pattern.
  - 3 It is constant from **N** to **L** followed by a sharp rise in **K**.
  - 4 There is a very slow rise from **N** to **L** followed by a sharp rise in **K**.
- 9C** What is the most likely reason why a layer of dust and ash is found between layers **L** and **M**?
- 1 Explorers spilled dust and ash in the area.
  - 2 The dust and ash were blown here from elsewhere.
  - 3 There was a forest fire here.
  - 4 There was volcanic activity 300 years ago.
- 9D** The age of the ice could be estimated by . . .
- 1 chemical analysis of the dust and ash layer and linking it with a known historical event about 400 years ago.
  - 2 finding fossil plants and relating them to samples found elsewhere.
  - 3 comparing the ice core with others taken from near the North Pole.
  - 4 comparing the ice core with others from around the world.

**END OF TEST**

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You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.  
The Foundation Tier is earlier in this booklet.

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**HIGHER TIER**

**SECTION ONE**

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

---

**QUESTION ONE**

This question is about some gases found in the Earth's atmosphere.

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

**A** carbon dioxide

**B** helium

**C** nitrogen

**D** oxygen

<b>1</b>	It is in Group 0 of the periodic table.
<b>2</b>	It makes up about 80% of the atmosphere.
<b>3</b>	It is found in today's atmosphere in much smaller amounts than in Earth's early atmosphere.
<b>4</b>	It is used when fossil fuels burn.

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**QUESTION TWO**

This question is about the uses of polymers.

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

- A** bag for frozen food
- B** memory polymer
- C** hydrogels in plant pots
- D** dental fillings

<b>1</b>	It is transparent, waterproof and flexible over a wide range of temperatures.
<b>2</b>	It absorbs and releases large quantities of water and can be used in horticulture.
<b>3</b>	It sets to form a very hard material.
<b>4</b>	It is placed into a collapsed human artery which is opened up as the polymer returns to its original shape.

**Turn over for the next question**

**Turn over ►**

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**SECTION TWO**

Questions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.

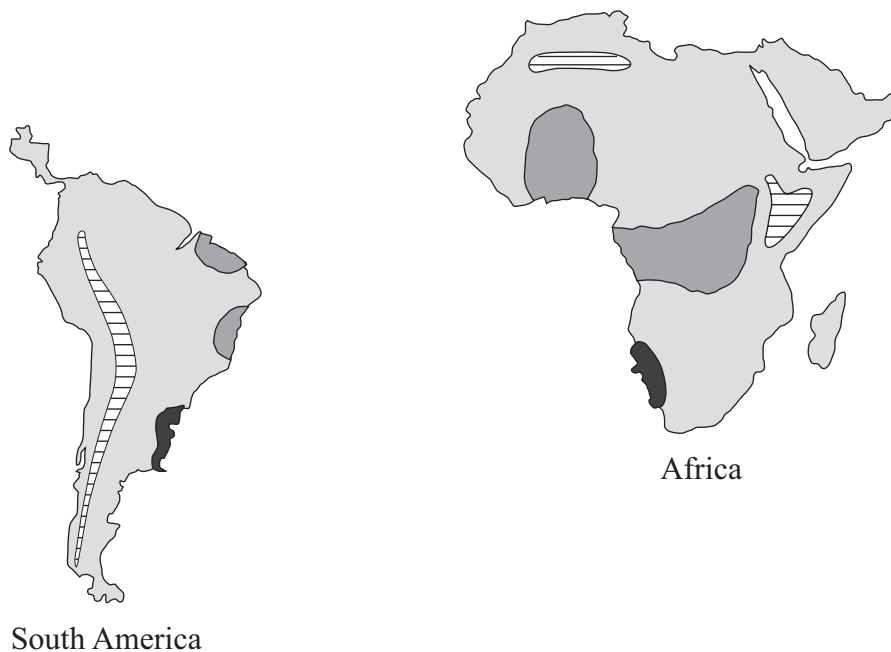
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**QUESTION THREE**

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---

**3A** One piece of evidence, shown on the diagram, that Wegener used to support his theory was that . . .

- 1 there are different fossils in sandstone rocks.
- 2 the same types of ancient rocks are in matching positions.
- 3 the two continents are similar in shape.
- 4 the two continents are a similar size.

**3B** Many scientists did **not** accept Wegener's theory.

This was because . . .

- 1 they thought that the continents were fixed to a solid Earth.
- 2 some of the mountains were **not** in matching positions.
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**3C** Many years later, scientists came to accept Wegener's theory.

This was because they understood that . . .

- 1 climate change was affecting the position of the continents.
- 2 the Earth's crust is divided into plates that can move.
- 3 volcanic activity could cause continents to move.
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**3D** At what rate do these two continents move apart?

- 1 a few millimetres a year
- 2 a few centimetres a year
- 3 a few metres a year
- 4 a few kilometres a year

Turn over ►

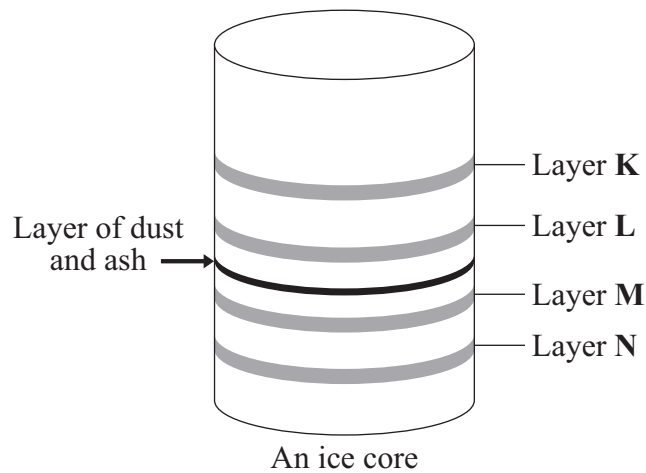
## QUESTION FOUR

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  - 4 There is a very slow rise from **N** to **L** followed by a sharp rise in **K**.
- 4C** What is the most likely reason why a layer of dust and ash is found between layers **L** and **M**?
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  - 4 comparing the ice core with others from around the world.

**Turn over for the next question**

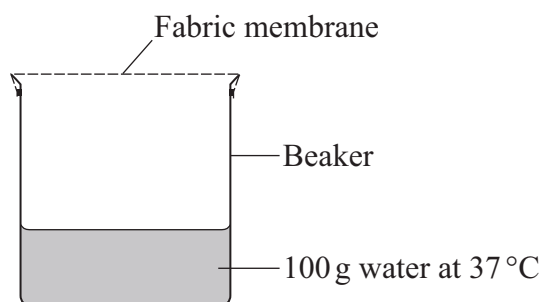
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**QUESTION FIVE**

Some waterproof coats have fabric membranes that are breathable. This means that the fabric membrane allows body perspiration to escape, while the person wearing the coat stays dry.

A scientist tested four types of fabric membrane, **W**, **X**, **Y** and **Z**.

100 g of water in a beaker was kept at a constant 37°C (body temperature). The top of the beaker was covered with a piece of fabric membrane **W**. After 24 hours, the membrane was removed and the mass of water remaining in the beaker was measured.



The test was carried out three more times using fabric membrane **W**.

The experiment was then repeated using fabric membranes **X**, **Y** and **Z**.

Test	Mass of water left in the beaker after 24 hours in g			
	Fabric W	Fabric X	Fabric Y	Fabric Z
1	92.45	98.78	95.46	99.12
2	92.45	98.89	94.67	94.56
3	93.56	98.23	95.12	94.83
4	94.23	98.65	94.56	95.01

**5A** The most *breathable* fabric membrane was . . .

- 1 **W**
- 2 **X**
- 3 **Y**
- 4 **Z**

**5B** In these tests, temperature is . . .

- 1 an independent variable.
- 2 a dependent variable.
- 3 a categoric variable.
- 4 a control variable.

**5C** For which fabric membrane is the range of results largest?

- 1 Fabric **W**
- 2 Fabric **X**
- 3 Fabric **Y**
- 4 Fabric **Z**

**5D** Which one of the following may have caused an anomalous result?

- 1 Using a beaker with thicker glass.
- 2 Some water may have spilled.
- 3 Water only evaporates at 100°C.
- 4 Carrying out the tests more than three times.

**Turn over ►**

**QUESTION SIX**

Biodiesel is a fuel made from vegetable oils. It can be mixed with or it can entirely replace petroleum diesel fuel in vehicles.

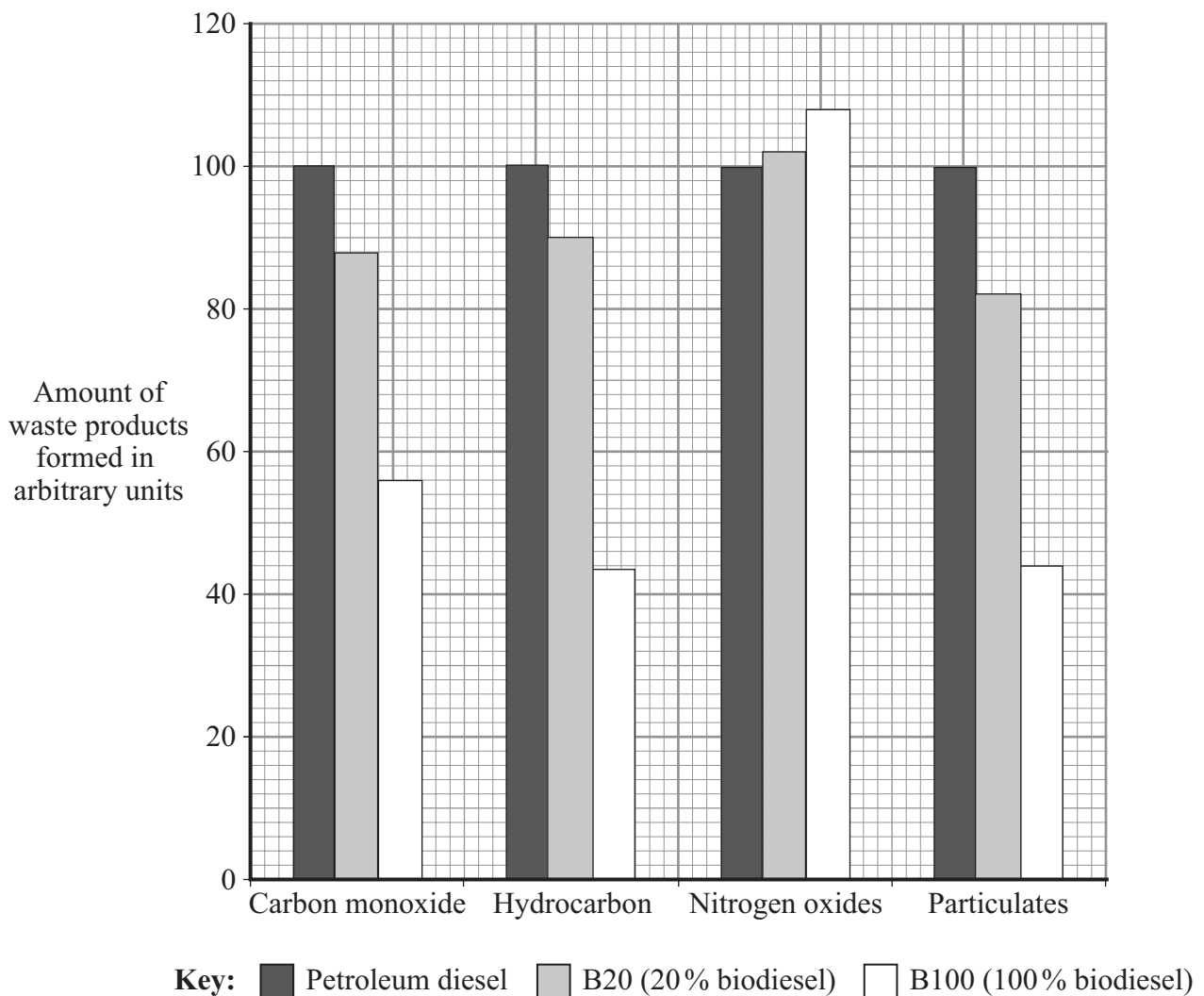
B20 is petroleum diesel with 20% biodiesel.

B100 is 100% biodiesel.

Petroleum diesel is made from crude oil.

In a car engine, the fuel ignites and burns in air. The waste products formed leave the engine through the exhaust system.

The bar graph compares the quantities of four different waste products formed by burning B20 and B100 with the quantities formed by burning petroleum diesel.

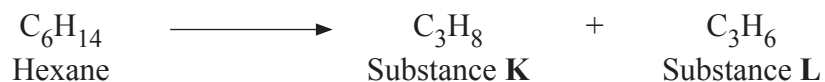


- 
- 6A** From the information on the chart, the use of B100 instead of B20 will reduce particulates by about . . .
- 1 5 times.
  - 2 half.
  - 3 20 %
  - 4 35 %
- 6B** Which of the following is a correct statement about the waste products formed by burning these fuels?
- 1 They are all oxides.
  - 2 They are all reduced when B20 is used instead of petroleum diesel.
  - 3 Water vapour is also produced.
  - 4 No carbon dioxide is produced with B100.
- 6C** The main advantage of B100 over petroleum diesel is that B100 . . .
- 1 is non-biodegradable.
  - 2 is renewable.
  - 3 is unsaturated.
  - 4 is hydrogenated.
- 6D** Why are net carbon dioxide emissions lower for biodiesel than for petroleum diesel?
- 1 Plants use carbon dioxide for photosynthesis.
  - 2 There are fewer alkanes in biodiesel.
  - 3 Biodiesel does **not** contain any hydrocarbons.
  - 4 Plants produce carbon dioxide in respiration.

**QUESTION SEVEN**

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

An example is shown in the equation below:



**7A** What are the conditions needed for this breakdown of hexane?

- 1 heat at 60 °C
- 2 heat the vapour with hydrogen
- 3 heat with hydrogen in the presence of a nickel catalyst
- 4 heat and pass the vapour over a hot catalyst

**7B** The mixture of substances **K** and **L** could be separated by condensation if they . . .

- 1 were of different density.
- 2 ignited at different temperatures.
- 3 had different boiling points.
- 4 were both gases.

**7C** Substance **L** is . . .

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



**7D** One difference between the molecules of substances **K** and **L** is that . . .

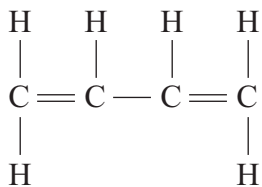
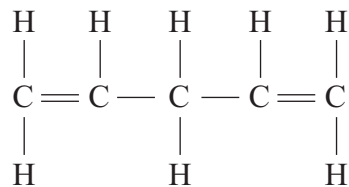
- 1 in **K** there is a higher ratio of carbon to hydrogen atoms.
- 2 in **L** the carbon atoms have fewer bonds.
- 3 in **K** there are fewer single bonds.
- 4 in **L** there is a double bond.

**Turn over for the next question**

**Turn over ►**

**QUESTION EIGHT**

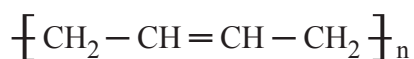
Butadiene and pentadiene both contain two double carbon carbon bonds. Their structures are shown below.

**Butadiene****Pentadiene**

**8A** Butadiene and pentadiene would belong to a family of compounds having the general formula . . .

- 1  $\text{C}_n\text{H}_{2n-2}$
- 2  $\text{C}_n\text{H}_{2n}$
- 3  $\text{C}_n\text{H}_{2n+2}$
- 4  $\text{C}_2\text{H}_{2n-4}$

Butadiene can be polymerised to form a polymer, poly(butadiene) whose structure is represented by



**8B** Which one of the following statements regarding butadiene and poly(butadiene) is **not** true?

Both would . . .

- 1 be classed as unsaturated.
- 2 react with bromine and iodine.
- 3 be formed by cracking certain oil fractions.
- 4 react with hydrogen in the presence of a catalyst.

**8C** Butadiene is called the monomer in the polymerisation reaction because it . . .

- 1 has two double carbon carbon bonds.
- 2 forms the repeat unit in the polymer.
- 3 is an unsaturated hydrocarbon.
- 4 is obtained from oil.

**8D** Poly(butadiene) is used to make tyres for motor cars.

The most environmentally friendly way to get rid of used tyres is . . .

- 1 to burn them.
- 2 to dissolve them in a solvent and dispose of the solution.
- 3 to break down the long polymer chains into smaller molecules.
- 4 to put them in landfill sites.

**Turn over for the next question**

**Turn over ►**

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**QUESTION NINE**

Here is an extract from a newspaper report on food additives.

## **Evidence highlights new fear over drink additives**

Like most children, Daniel enjoys fizzy drinks, but consuming these drinks can make him aggressive.

A doctor suggested that his mother should stop giving him any drinks with additives that have E-numbers. When this was tried, the improvement in his behaviour was remarkable.

The fizzy drinks that Daniel had enjoyed each contained at least one of three additives. The additives were E110, E104 and E102.

- 9A** Which statement about the *E-numbers* mentioned in the article is true?
- 1 E-numbers are used to label saturated and unsaturated fats.
  - 2 E-numbers are given only to food additives which could cause aggression in children.
  - 3 Manufacturers do **not** have to tell you that they use these food additives.
  - 4 E-numbers are used to show permitted food additives.
- 9B** Which type of substance found in drinks is **not** likely to have an E-number?
- 1 preservatives
  - 2 artificial colourings
  - 3 artificial flavourings
  - 4 common salt

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**9C** The doctor cannot be sure that Daniel’s symptoms are caused by any of the three additives in his drinks.

This is because . . .

- 1 the drinks may have other ingredients in common.
- 2 the water in each drink may come from a different natural source.
- 3 Daniel is only unwell after he has consumed the drinks.
- 4 Daniel is otherwise fit and healthy.

**9D** Which of the following studies on ten-year-old schoolchildren would give researchers the best evidence that Daniel’s symptoms are caused by one or more of the three additives?

- 1 Give all three additives together to 1000 ten-year-old schoolchildren and check their symptoms. Check the symptoms of another 1000 ten-year-old schoolchildren who do **not** use any of the additives.
- 2 Give a different additive to three separate groups of 1000 ten-year-old schoolchildren and check their symptoms.
- 3 Give a different additive to three separate groups of 1000 ten-year-old schoolchildren and check their symptoms. Check the symptoms of another 1000 ten-year-old schoolchildren who do **not** use any of the additives.
- 4 Give a different additive to three separate ten-year-old schoolchildren. Check the symptoms of another ten-year-old schoolchild who does **not** use any of the additives.

**END OF TEST**

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