Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2010

Science A

Unit Chemistry C1b (Oils, Earth and Atmosphere)

Chemistry

Unit Chemistry C1b (Oils, Earth and Atmosphere)

CHY1BP

F&H

Thursday 11 November 2010 Afternoon Session

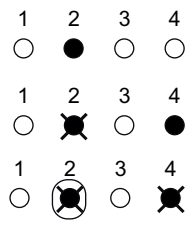
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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.

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

FOUNDATION TIER

Section One

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

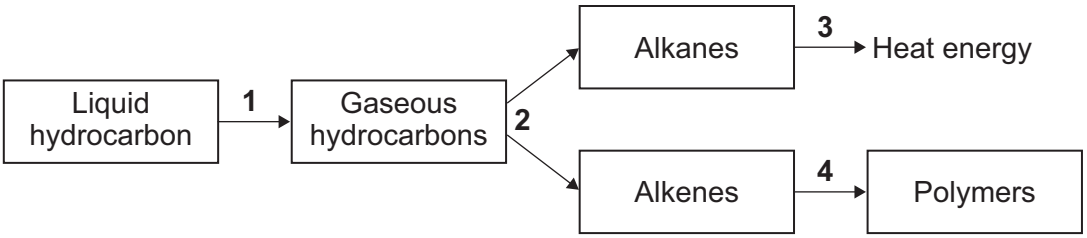
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The flow chart is about hydrocarbons.



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

A Crack

B Evaporate

C Polymerise

D Burn

QUESTION TWO

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

	Gas	Percentage (%) in the atmosphere	Melting point in ºC	Boiling point in ºC	Density in g per cm^3
A	Argon	0.9	–189	–186	0.0037
B	Helium	0.0005	–272	–269	0.0002
C	Neon	0.002	–248	–246	0.0009
D	Xenon	0.000009	–112	–109	0.0059

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

The noble gas with the highest density is . . . **1** . . . .

The most abundant noble gas is . . . **2** . . . .

The noble gas with the smallest temperature range between melting point and boiling point is . . . **3** . . . .

The noble gas with the lowest boiling point is . . . **4** . . . .

Turn over for the next question

QUESTION THREE

We can get plant oils from crushed plants.

This is a two-stage process.

Stage 1

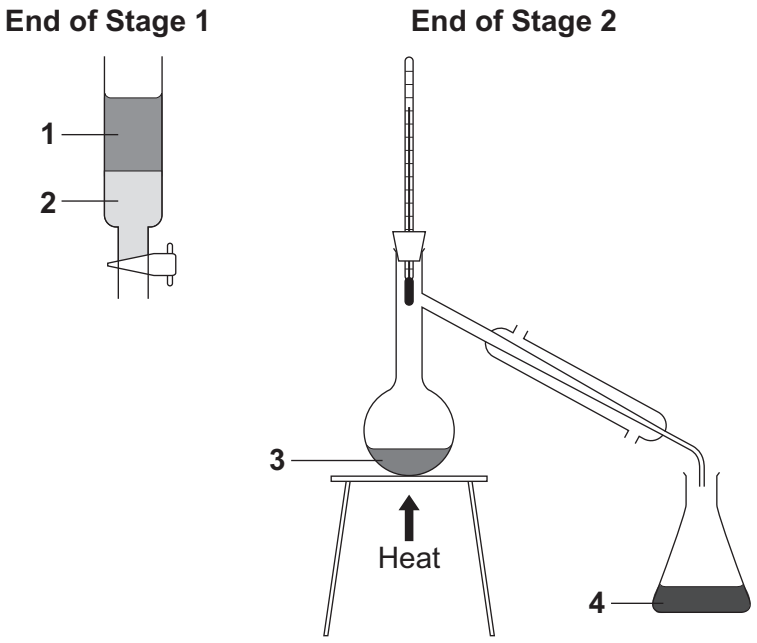
Shake up the crushed mixture with a solvent and water. This separates the oil from the crushed mixture.

- Only the oil dissolves in the solvent.
- The liquids are filtered from the solids.
- The oil and solvent mixture floats on water.

Stage 2

Use simple distillation to separate the oil from the solvent.

- The solvent has a lower boiling point than the oil.



Match words, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagrams.

A the oil and solvent mixture

B the plant oil

C the water

D the solvent

QUESTION FOUR

This question is about four planets, **A**, **B**, **C** and **D**, in the Solar System.

	Planet	Atmosphere	Average surface temperature in °C
A	Venus	97 % carbon dioxide, 3 % nitrogen	460
B	Earth	78 % nitrogen, 21 % oxygen, 1 % noble gases	14
C	Mars	96 % carbon dioxide, 2 % nitrogen, 2 % noble gases	–46
D	Jupiter	87 % hydrogen, 13 % helium	–121

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

1	Its atmosphere has the highest percentage of carbon dioxide.
2	It has green plants growing on its surface.
3	It has the lowest surface temperature.
4	Its atmosphere contains nitrogen, but at the lowest percentage.

QUESTION FIVE

This question is about vegetable oils.

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

A chromatography

B combustion

C hydrogenation

D unsaturation

Vegetable oils are important foods and fuels.

Artificial colours in foods are usually detected by . . . **1** . . . .

Reacting oils with bromine will show the degree of . . . **2** . . . in the oil.

The melting points of vegetable oils can be increased by . . . **3** . . . .

Oils release heat energy by the process of . . . **4** . . . .

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

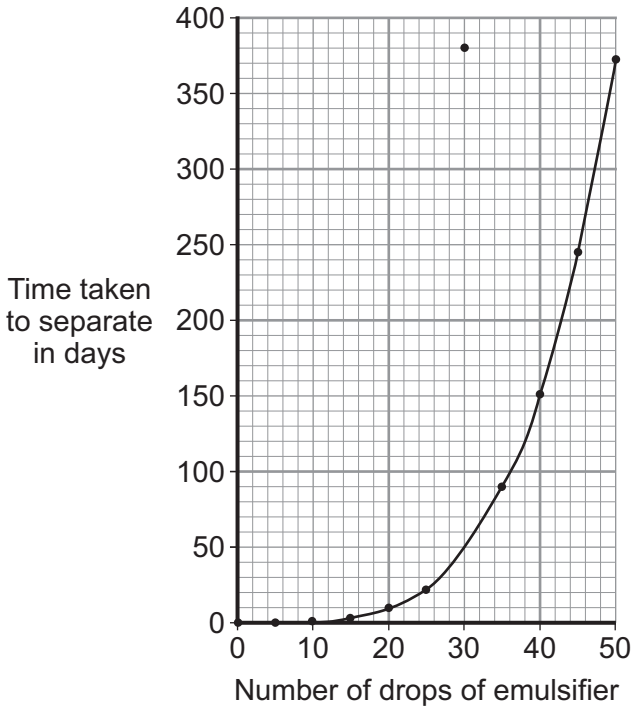
The water and oil used in making a salad dressing will separate if the salad dressing is left to stand.

A scientist at a food company wanted to know how much emulsifier she needed to add to prevent oil and water from separating.

- She mixed equal volumes of oil and water.
- Then she added drops of emulsifier.
- She shook the mixture and timed how long it took for the mixture to begin separating.

She recorded her results in a table and plotted a line graph.

Number of drops of emulsifier	0	5	10	15	20	25	30	35	40	45	50
Time taken to separate in days	0	0	1	3	10	23	380	90	152	244	372



6A The scientist decided to ignore her result for 30 drops of emulsifier.

This was because . . .

1 380 is not on the 'Time taken to separate in days' axis on the graph.

2 the result does not fit the pattern.

3 the result was lower than expected.

4 380 days was the highest value recorded.

6B Using her graph, she decided that an accurate time of separation for 30 drops of emulsifier was . . .

1 27 days.

2 30 days.

3 50 days.

4 380 days.

6C To make all her results more reliable, she should . . .

1 repeat only the 30 drops of emulsifier experiment.

2 not use her first results and repeat the whole investigation.

3 repeat the whole investigation and compare both sets of results.

4 measure the drops of emulsifier more accurately.

6D The salad dressing has a shelf-life of 120 days.

The graph shows that the minimum amount of emulsifier needed to prevent the salad dressing from separating before 120 days is . . .

1 18 drops.

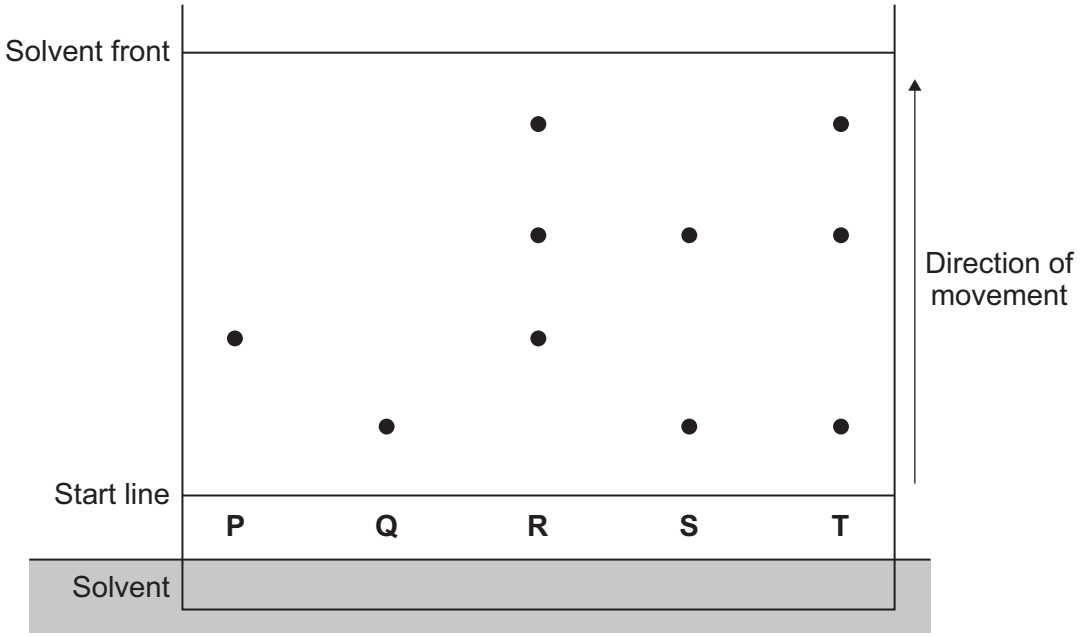
2 28 drops.

3 38 drops.

4 48 drops.

QUESTION SEVEN

Chromatography is used to identify and compare five food colourings, **P**, **Q**, **R**, **S** and **T**.
The five food colourings are used to coat chocolate sweets.



7A Which food colourings are mixtures of three colours?

1 **P** and **R**

2 **Q** and **S**

3 **R** and **T**

4 **S** and **P**

7B Food colouring **P** was analysed and was found to be toxic.

Which other food colouring is toxic?

1 **Q**

2 **R**

3 **S**

4 **T**

7C Food colourings are used to coat chocolate sweets . . .

1 to make the sweets cost more.

2 to increase the shelf-life.

3 to make the sweets more attractive.

4 to increase the number of additives.

7D An E-number is used to identify a permitted food . . .

1 additive.

2 element.

3 mixture.

4 oil.

Turn over for the next question

QUESTION EIGHT

There are radioactive substances inside the Earth.

Radioactive substances decay (break down). The decay of radioactive substances releases heat.

8A This information disproves a theory that scientists used to believe.

What was this theory?

1 Mountains formed when the Earth's crust was shrinking.

2 The Earth is not a sphere but is a cube.

3 The Earth's crust is made of tectonic plates.

4 The Earth has several layers.

8B The release of heat . . .

1 reduces the rate of weathering and erosion of old mountain ranges.

2 causes the Earth's crust to get thinner.

3 causes convection currents in the Earth's mantle.

4 causes the Earth to decrease in size.

Earthquakes often happen at various points close to the line shown on the map.

8C Earthquakes probably happen in this region because . . .

1 the Earth's crust is very thick.

2 there are large oilfields.

3 the Earth's crust is shrinking.

4 there is a boundary between two tectonic plates.

8D Scientists expect more earthquakes in this region.

Scientists are unable to predict exactly when the next earthquake will happen because . . .

1 earthquakes happen every two or three years.

2 earthquakes happen at random intervals.

3 earthquakes often happen in areas a long way from cities.

4 earthquakes usually happen under the sea.

Turn over for the next question

QUESTION NINE

The equation shows the thermal decomposition of a hydrocarbon.

$$C_6H_{14} \longrightarrow \underset{\text{Ethene}}{C_2H_4} + \text{Substance } \mathbf{K}$$

9A What is the formula for substance **K**?

1 CH_4

2 C_2H_6

3 C_4H_{10}

4 C_8H_{18}

9B Ethene, C_2H_4 is . . .

1 an alkane.

2 an alkene.

3 a saturated hydrocarbon.

4 a polymer.

9C Ethene, C_2H_4 can form polymers because . . .

1 it contains both carbon atoms and hydrogen atoms.

2 it contains twice as many carbon atoms as hydrogen atoms.

3 the carbon atoms and hydrogen atoms are linked by single bonds.

4 there is a double bond between the carbon atoms.

9D Poly(ethene) is used to make shopping bags.

A problem with poly(ethene) is that . . .

1 it is not waterproof.

2 it cannot be coloured.

3 it is not broken down by microorganisms.

4 it is a thermosetting polymer.

END OF TEST

There are no questions printed on this page

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

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 vegetable oils.

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

A chromatography

B combustion

C hydrogenation

D unsaturation

Vegetable oils are important foods and fuels.

Artificial colours in foods are usually detected by . . . **1** . . . .

Reacting oils with bromine will show the degree of . . . **2** . . . in the oil.

The melting points of vegetable oils can be increased by . . . **3** . . . .

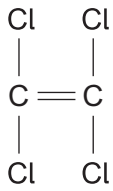
Oils release energy by the process of . . . **4** . . . .

QUESTION TWO

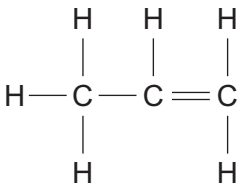
Plastic waste was taken to a recycling centre. At the recycling centre, the plastic was sorted and treated chemically. The chemical treatment broke down the plastic.

Breaking down the plastic produced new substances. The formulae for some of the substances produced are shown below.

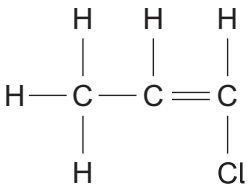
A



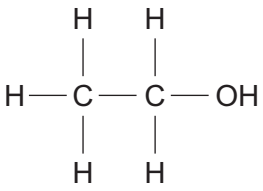
B



C



D



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

1	It is a hydrocarbon.
2	It could be made from propene, C_3H_6
3	It is formed by reacting ethene with steam, H_2O
4	It would not produce water vapour if burnt in air.

Turn over for the next question

Section Two

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

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

There are radioactive substances inside the Earth.

Radioactive substances decay (break down). The decay of radioactive substances releases heat.

3A This information disproves a theory that scientists used to believe.

What was this theory?

1 Mountains formed when the Earth's crust was shrinking.

2 The Earth is not a sphere but is a cube.

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3B The release of heat . . .

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Earthquakes often happen at various points close to the line shown on the map.

3C Earthquakes probably happen in this region because . . .

1 the Earth's crust is very thick.

2 there are large oilfields.

3 the Earth's crust is shrinking.

4 there is a boundary between two tectonic plates.

3D Scientists expect more earthquakes in this region.

Scientists are unable to predict exactly when the next earthquake will happen because . . .

1 earthquakes happen every two or three years.

2 earthquakes happen at random intervals.

3 earthquakes often happen in areas a long way from cities.

4 earthquakes usually happen under the sea.

QUESTION FOUR

The equation shows the thermal decomposition of a hydrocarbon.

$$C_6H_{14} \longrightarrow \underset{\text{Ethene}}{C_2H_4} + \text{Substance } \mathbf{K}$$

4A What is the formula for substance **K**?

1 CH_4

2 C_2H_6

3 C_4H_{10}

4 C_8H_{18}

4B Ethene, C_2H_4 is . . .

1 an alkane.

2 an alkene.

3 a saturated hydrocarbon.

4 a polymer.

4C Ethene, C_2H_4 can form polymers because . . .

1 it contains both carbon atoms and hydrogen atoms.

2 it contains twice as many carbon atoms as hydrogen atoms.

3 the carbon atoms and hydrogen atoms are linked by single bonds.

4 there is a double bond between the carbon atoms.

4D Poly(ethene) is used to make shopping bags.

A problem with poly(ethene) is that . . .

1 it is not waterproof.

2 it cannot be coloured.

3 it is not broken down by microorganisms.

4 it is a thermosetting polymer.

QUESTION FIVE

This question is about recycling plastic.

5A Many people think that plastic products should be recycled because . . .

1 plastics are made from non-renewable resources.

2 recycling will encourage more people to use paper bags.

3 all plastics can be easily melted.

4 all plastics give off toxic chemicals if buried in the ground.

5B To decide if recycling plastic is the best way to dispose of plastic waste, we should . . .

1 ask people shopping at a local supermarket that sells products wrapped in plastic packaging.

2 ask a company that recycles plastics.

3 compare the environmental and cost implications of recycling with the use of new plastic.

4 read articles in an environmental magazine.

5C Many plastic products, such as computer keyboards, are sent to China for recycling. Workers separate valuable components from the plastics. The plastics are used to make toys.

The plastic products are sent to China because . . .

1 British workers do not have the correct equipment to remove the valuable components.

2 wages are generally lower in China than in Britain.

3 there are social issues concerning the recycling of plastic in Britain.

4 Britain has enough plastic reserves.

5D Some environmentalists are concerned about British waste plastic being recycled in China to make toys because . . .

1 we make better quality toys in Britain.

2 the recycling will take much longer.

3 China makes large quantities of plastic toys.

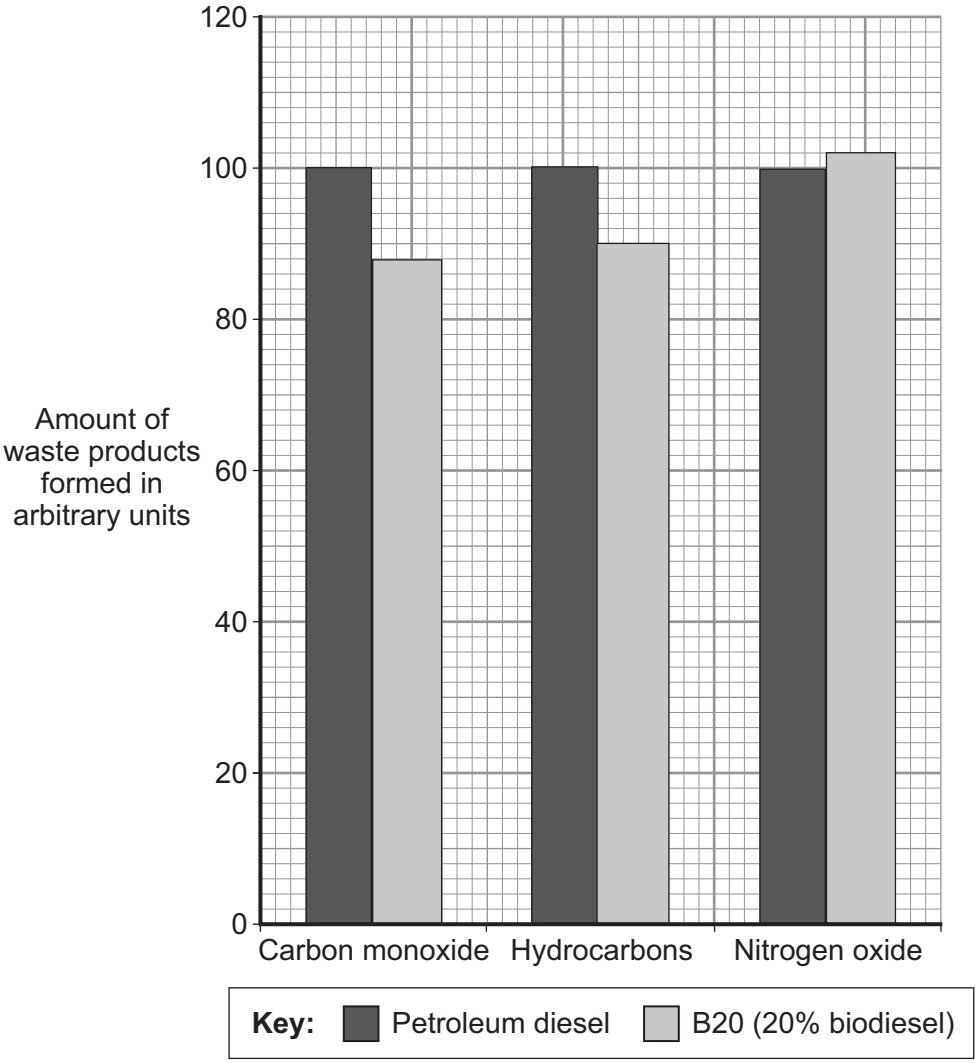
4 transporting plastic waste to China will increase carbon dioxide emissions.

QUESTION SIX

Petroleum diesel fuel is made from crude oil. Biodiesel fuel is made from vegetable oils.

Some diesel cars can use petroleum diesel mixed with different amounts of biodiesel.
For example, B20 is 20 % biodiesel and 80 % petroleum diesel.

The bar chart shows the waste products from burning petroleum diesel and B20. The amounts of the three waste products are shown for each fuel.



6A Which of the following is a correct statement about these waste products?

1 They are all oxides.

2 They all contain carbon.

3 They are all elements.

4 They are all compounds.

6B When B20 burns in a diesel engine, the other waste products are likely to be . . .

1 carbon dioxide, oxygen and water vapour.

2 nitrogen, water vapour and sulfur dioxide.

3 carbon dioxide, water vapour and sulfur dioxide.

4 oxygen, water vapour and sulfur dioxide.

6C Which row in the table shows a correct advantage and a correct disadvantage of using B20 instead of petroleum diesel?

	Advantage of using B20	**Disadvantage of using B20**
1	It is partly renewable.	It produces a greater amount of all harmful waste products.
2	It is unsaturated.	It is non-biodegradable.
3	It is partly renewable.	It produces an increased amount of nitrogen oxide.
4	It is hydrogenated.	It produces more carbon monoxide.

6D B100 is 100 % biodiesel. Net carbon dioxide emissions are lower for B100 than for petroleum diesel.

This is because . . .

1 the carbon dioxide is used by plants for photosynthesis.

2 vegetable oils produce very little carbon dioxide when they burn.

3 biodiesel does not contain any hydrocarbons.

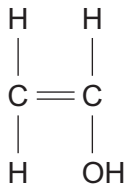
4 carbon dioxide dissolves in the oceans.

QUESTION SEVEN

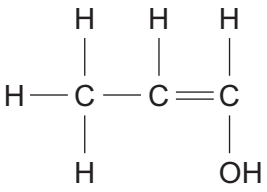
This question is about compounds that contain a double carbon carbon bond.

7A The structures of ethenol and propenol are shown below.

Ethenol



Propenol



Ethenol and propenol belong to a family of compounds with the general formula . . .

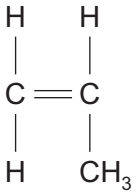
1 C_nH_nOH

2 $C_nH_{2n}OH$

3 $C_nH_{2n-1}OH$

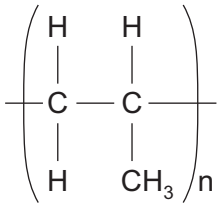
4 $C_nH_{2n+1}OH$

The formula for propene can be shown as:



7B The polymer, poly(propene), will have the formula:

1



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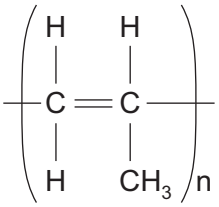

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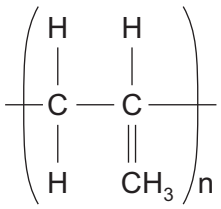
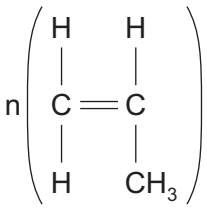


4



7C Which statement about propene and poly(propene) is correct?

1 Both compounds are unsaturated.

2 Only poly(propene) reacts with bromine.

3 Only poly(propene) could be produced by cracking oil fractions.

4 Only propene reacts with hydrogen.

7D Poly(propene) is a thermosoftening polymer.

This means that . . .

1 it can be moulded into many shapes.

2 it softens when heated and hardens when it cools.

3 it hardens when it is heated to give a rigid structure.

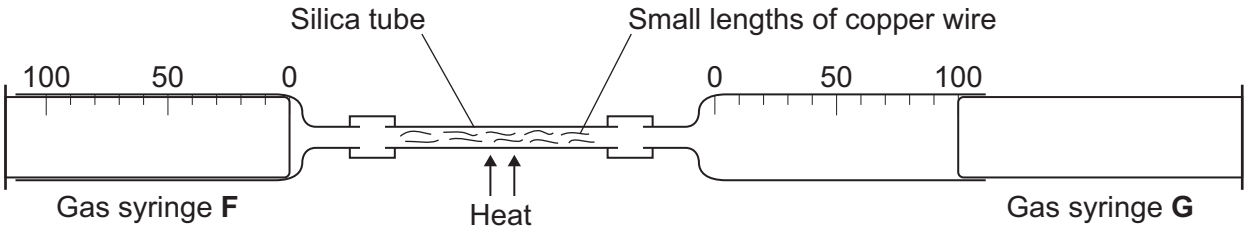
4 it is resistant to heat.

Turn over for the next question

QUESTION EIGHT

Some students used this equipment to find the answer to the question:

What percentage (%) of the air is oxygen?



The students heated the copper wire inside the silica tube. The syringes were used to push air backwards and forwards between the two syringes, until the volume of gases in the syringes stopped changing.

The equation for the reaction is:

$$\underset{\text{(Pink)}}{2Cu} + O_2 \longrightarrow \underset{\text{(Black)}}{2CuO}$$

They pushed all the gas that remained into gas syringe **G**. When the gas had cooled to room temperature, they measured its final volume.

8A The equipment was cooled to room temperature before the final volume was measured . . .

1 to make sure that there were no other variables affecting the measurements.

2 to make sure that all of the oxygen in the sample was used up.

3 to make the measurements more precise.

4 to stop any further reaction.

8B The most accurate answer to the question 'What percentage (%) of the air is oxygen?' would be obtained . . .

1 by weighing the amount of solid product that remained at the end of the experiment.

2 by repeating the experiment using different diameters of copper wire.

3 when all the copper in the silica tube had turned black by the end of the experiment.

4 when there was still some pink copper left in the silica tube at the end of the experiment.

8C In the students' first experiment, the final volume they recorded was 82 cm^3. When the students repeated the experiment with a new 100 cm^3 sample of air, the final volume was 72 cm^3.

The difference in final volume was because . . .

1 there was a leak from the apparatus.

2 the students did not put enough new copper in the tube in the repeat experiment.

3 there was more oxygen in the second sample.

4 the students did not heat the copper for long enough in the repeat experiment.

8D If the experiment could be carried out with an air sample similar to that of the Earth's early atmosphere, we would expect . . .

1 a larger decrease in the volume of the air sample.

2 an increase in the volume of the air sample.

3 no change in the volume of the air sample.

4 more copper wire would be needed to use all the oxygen in the air sample.

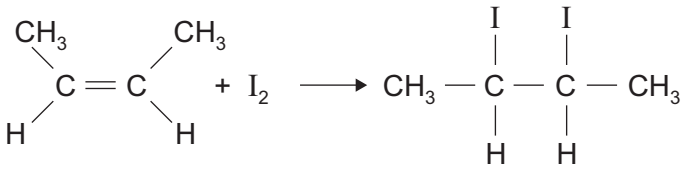
Turn over for the next question

QUESTION NINE

Unsaturated oils have double carbon carbon bonds. Most vegetable oils are unsaturated.

9A Iodine reacts with the double carbon carbon bonds in unsaturated compounds.

For example:



The more iodine that reacts, the higher the iodine number of the unsaturated compound.

Which of the following statements is true?

1 The higher the iodine number, the fewer double bonds in each oil molecule.

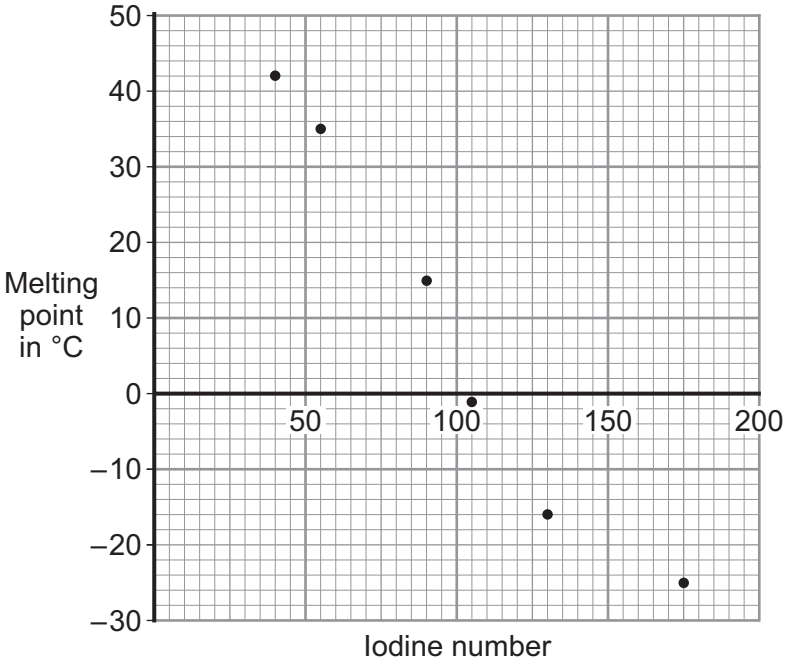
2 The higher the iodine number, the more double bonds in each oil molecule.

3 The higher the iodine number, the shorter the oil molecules.

4 The higher the iodine number, the longer the oil molecules.

9B Student **X** collects some data about the melting points and iodine numbers of several vegetable oils.

The graph shows the data of student **X**.



What conclusion can student **X** make from this data?

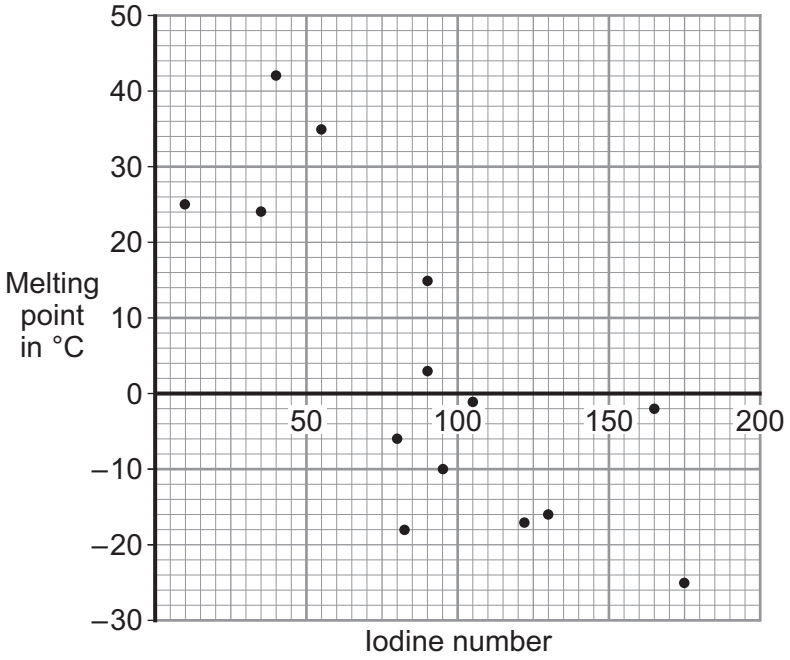
1 There is no relationship between iodine number and melting point.

2 There is a trend for oils with high iodine numbers to have high melting points.

3 There is a trend for oils with high iodine numbers to have low melting points.

4 Vegetable oils do not have iodine numbers greater than 200.

9C Student **Y** does the same task. He collects data from a greater number of vegetable oils and draws the graph below.



What conclusion can you make by comparing the graphs of the two students?

1 Some of the data collected by student **X** is anomalous.

2 Student **X** has collected enough data to make a valid conclusion.

3 Student **X** has experimented with only selected vegetable oils.

4 Student **Y** can predict the melting point of a vegetable oil from its iodine number.

9D Oils with a high iodine number are often called *drying oils*. This is because they tend to harden in contact with air. The hardening is caused when unsaturated molecules join together.

What sort of reaction is this?

1 evaporation

2 hydrogenation

3 polymerisation

4 cracking

END OF TEST

There are no questions printed in this page