

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

A321/01

Unit 1 Modules C1 C2 C3 (Foundation Tier)

THURSDAY 5 JUNE 2008

Morning
Time: 40 minutes

Candidates answer on the question paper.

Additional materials (enclosed):

None

Calculators may be used.

Additional materials: Pencil
Ruler (cm/mm)



Candidate
Forename

Candidate
Surname

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	6	
2	11	
3	10	
4	4	
5	2	
6	4	
7	5	
TOTAL	42	

This document consists of **18** printed pages and **2** blank pages.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 London City Council are encouraging people to use buses instead of cars to get to work.

The Council says this would improve air quality.



(a) A bus produces more air pollution than a car.

Which two statements **when put together** explain why travelling by bus improves air quality?

Put ticks (✓) in the boxes next to the **two** correct answers.

Each bus carries many people.

Many people need to arrive at work at the same time.

Many people travelling to work in cars make more total air pollutants.

Each bus makes many more journeys per day than each car.

[1]

(b) Buses cause problems because their engines produce pollutants.

This is a list of pollutants and some of the problems that they cause.

Put ticks (✓) in the correct boxes to show the **problems caused** by each **pollutant**.

The first one has been done for you.

pollutant	problems caused		
	acid rain	breathing problems / asthma	makes layer of dirt on buildings
sulfur dioxide	✓	✓	
nitrogen oxides			
carbon particulates (tiny bits of solid in the air)			

[2]

(c) What **other** harmful pollutant do bus engines produce?

Put a tick (✓) in the box next to the correct answer.

carbon monoxide

chlorine

nitrogen

pollen

[1]

(d) Carbon particulates cause serious pollution problems.

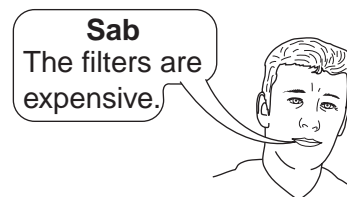
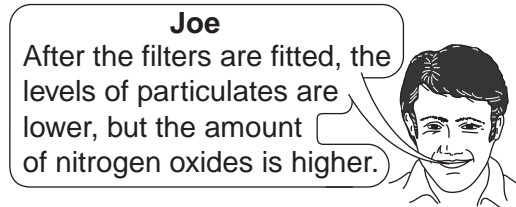
New buses are fitted with exhaust filters that remove particulates.

Scientists test the pollutants that the buses produce before and after the filters are fitted.

The table shows how the pollutants change.

	sulfur dioxide	nitrogen oxides	particulates
change after filter is fitted	stays the same	increase	decrease

This is what the scientists say about the results.



5

(i) Which scientist is describing **data** from the test?

Put a **ring** around the correct answer.

Eve Joe Liz Sab

[1]

(ii) Which scientists are giving **opinions**?

Put a **ring** around each of the **two** correct answers.

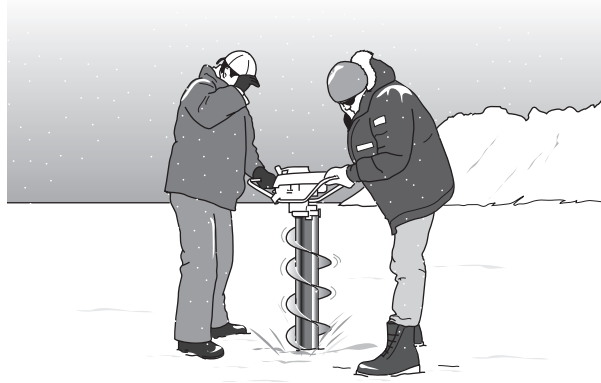
Eve Joe Liz Sab

[1]

[Total: 6]

- 2 Bubbles of air stay trapped in the ice in Antarctica for thousands of years.

Scientists find out about the history of our atmosphere by drilling down into the ice and testing the air in the bubbles.



- (a) This table shows the amounts of some of the gases in our atmosphere today.

Complete the table by filling in the names of the gases.

Choose words from this list.

argon

carbon

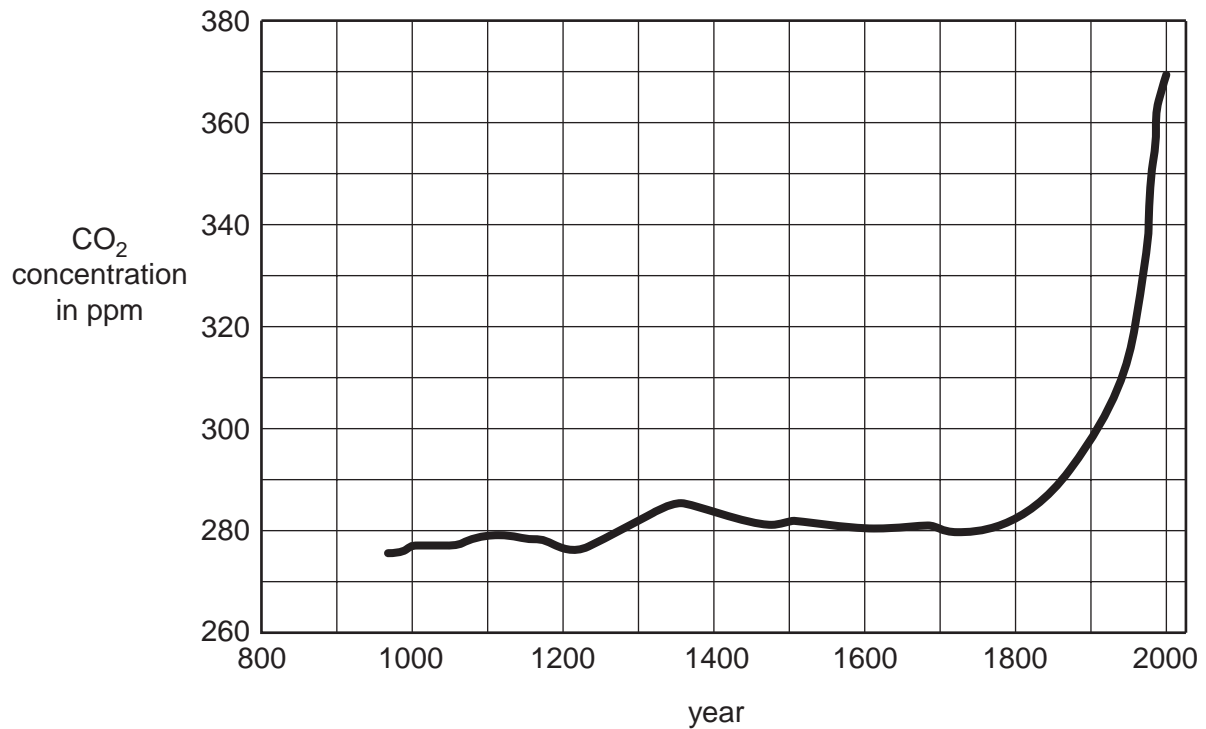
oxygen

nitrogen

name of gas	percentage in atmosphere
	21%
	78%
	less than 1%
carbon dioxide	0.03%

[2]

- (b) The graph shows how the concentration of carbon dioxide in our atmosphere has changed over the last thousand years.



- (i) What does the graph show?

Put ticks (✓) in the boxes next to the **two** correct answers.

- The concentration of carbon dioxide has risen steadily over the last thousand years.
- There has been no decrease in carbon dioxide concentration over the last thousand years.
- The concentration of carbon dioxide has increased very rapidly over the last 200 years.
- Before 1800, there were only small changes in the concentration of carbon dioxide.
- Carbon dioxide concentration increases as the population increases.

[2]

- (ii) The change in the concentration of carbon dioxide over the last 100 years has happened for several reasons.

Put a tick (✓) in the correct box to show one of the **main** reasons for this change.

Farmers now use more artificial pesticides on their crops.

Consumers use more plastic packaging.

There are many more motor vehicles in the world.

People use more aerosol sprays.

[1]

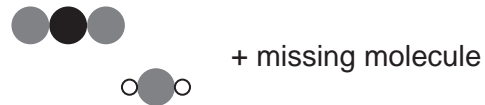
- (c) One way that carbon dioxide enters the atmosphere is by burning fossil fuels such as methane in power stations.

Methane reacts with oxygen when it burns to make carbon dioxide and water.

before the reaction



after the reaction



- (i) Put a ring around a molecule of oxygen in the diagram above.

[1]

- (ii) Which molecule below is the missing molecule?

Put a tick (✓) in the box next to the correct answer.









[1]

- (d) Some of the carbon dioxide made in the power station is removed from our atmosphere by natural processes.

Which of these processes remove carbon dioxide?

Put ticks (✓) in the boxes next to the **three** correct answers.

- | | |
|-------------------------|--------------------------|
| dissolving in rainwater | <input type="checkbox"/> |
| wind and cloud movement | <input type="checkbox"/> |
| dissolving in the sea | <input type="checkbox"/> |
| plant photosynthesis | <input type="checkbox"/> |
| animal respiration | <input type="checkbox"/> |

[2]

- (e) Some power stations burn fuel oil. Fuel oil and methane are hydrocarbons.

What molecules are formed when fuel oil burns?

Put a (ring) around each of the correct answers.

carbon dioxide **nitrogen** **oxygen** **water**

[2]

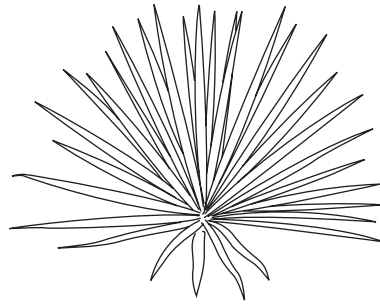
[Total: 11]

3 In Africa, ropes for use on boats are made from natural plant materials.

Some plants used to make rope include hemp, ramie, coir and sisal.



hemp



sisal

property of rope	hemp	ramie	coir	sisal
density in g/cm^3	1.48	1.50	1.25	1.33
tensile strength in N/mm^2	550–900	500	220	600–700
stiffness in kN/mm^2	50	44	6	38
stretch before breaking in %	1.6	2	15–25	3
moisture absorption in %	7	12–17	10	11

(a) A fisherman wants to buy a new rope. He compares ropes that are the same length and thickness.

(i) Which rope is the heaviest?

Put a **ring** around the correct answer.

coir hemp ramie sisal

[1]

(ii) This is the label from one of the ropes.

Super rope!

Super strong
tensile strength $650 \text{ N}/\text{mm}^2$

Stretches up to 3% before breaking!

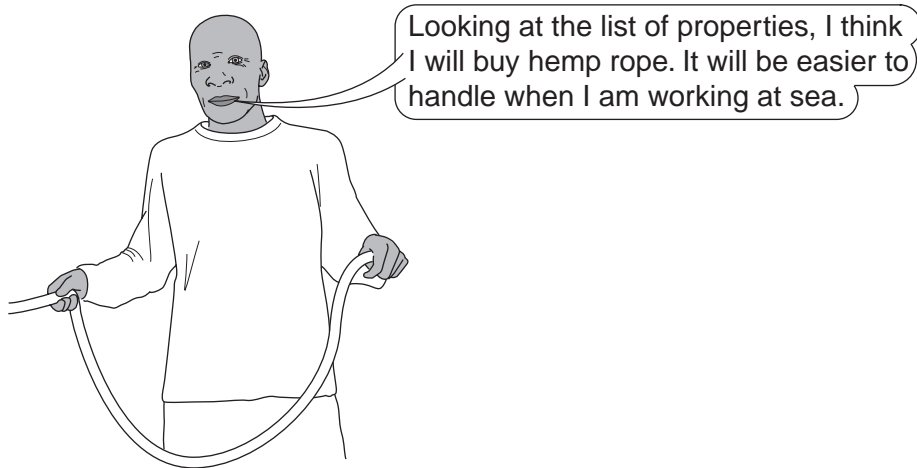
Which rope is the label from?

Put a **ring** around the correct answer.

coir hemp ramie sisal

[1]

(iii) The fisherman chooses a rope.



Which two statements **when put together** explain why hemp ropes are easier to handle at sea?

Put ticks (✓) in the boxes next to the **two** correct answers.

Hemp ropes are stiffer than the other ropes.

Hemp ropes do not absorb water as much as the other ropes.

It is easier to handle light ropes.

The rope needs to be wrapped around a holder on the boat.

The ropes need to be very hardwearing.

[2]

(b) Flax is another plant that can be used to make ropes.

A scientist tests samples of flax to find out its tensile strength.

These are the results.

sample	tensile strength in N/mm^2
1	800
2	1500
3	900
4	1000
5	1100

(i) Why did the scientist repeat the test several times?

Put ticks (✓) in the boxes next to the **two** best reasons.

to use up all the sample

to make it a fair test

to practise the technique

to check the reliability

to calculate a best estimate

[2]

(ii) What is the range of tensile strength for this rope?

The range is from N/mm^2 to N/mm^2 .

[1]

(iii) The scientist notices that there is a lot of variation between the measurements.

Why do the measurements vary?

Put ticks (✓) in the boxes next to the **two** best reasons.

Some of the rope was damp.

Natural materials from plants vary widely in quality.

The scientist has not calculated the mean.

The scientist has not identified the outliers.

[2]

(c) In the UK, most ropes for use on boats are made from a synthetic polymer, poly(propene).

Why is poly(propene) a good material for making ropes?

Put a tick (✓) in the box next to the **best** reason.

Using poly(propene) saves crude oil.

Waste poly(propene) rots away more easily than natural fibres.

Poly(propene) is made from renewable resources.

Poly(propene) is strong and waterproof.

[1]

[Total: 10]

- 4 Eve investigates the properties of five types of polymer. She looks at nylon, poly(ethene), bakelite, PVC and melamine.

These are her results.

polymer	flexibility	effect of heat
nylon	flexible	starts to melt at 213°C
poly(ethene)	flexible	starts to melt at 110°C
bakelite	hard and brittle	starts to burn before it melts
PVC	flexible	starts to melt at 334°C
melamine	hard and brittle	starts to burn before it melts

- (a) (i) Which of the polymers has the weakest forces between its molecules?

Put a **ring** around the correct answer.

nylon poly(ethene) bakelite PVC melamine

[1]

- (ii) Which of the polymers have **cross links** between their molecules?

Put a **ring** around each of the **two** correct answers.

nylon poly(ethene) bakelite PVC melamine

[1]

- (b) Complete the sentences. Choose words from this list.

crude oil natural fibres metal ores

hydrogen carbon dioxide carbon hydroxide

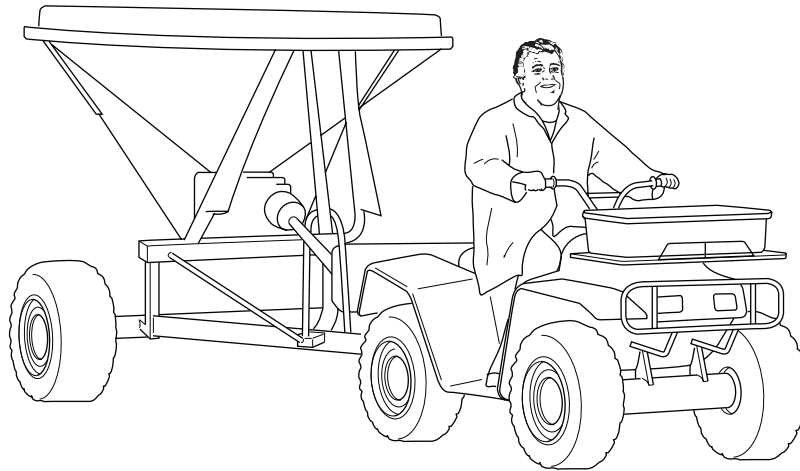
Poly(ethene) is a hydrocarbon polymer. It is made from molecules extracted from

Poly(ethene) contains atoms of and

[2]

[Total: 4]

- 5 Joe is a farmer. He uses intensive farming methods to grow wheat crops on his farm.



Joe says, 'There are good reasons why I use intensive farming methods rather than organic.'

Which of the following statements are **benefits** of using intensive farming?

Put ticks (✓) in the boxes next to the **two** correct answers.

land produces more food per acre

food is generally larger and free of pests

chemical pesticides stay in the crops

artificial fertilisers wash into local rivers

[2]

[Total: 2]

6 The diagram below shows a label from a milk shake.



(a) Each additive in the milk shake has a different purpose.

Draw a straight line from each type of **additive** to its **purpose**.

additive	purpose
colouring	to make the ingredients mix together
preservative	to make the milk shake look more attractive
emulsifier	to prevent the growth of microbes

[2]

(b) Some food additives have E numbers.

What does this tell the consumer?

Put ticks (✓) in the boxes next to the **two** correct answers.

- The additives have passed a safety test.
- The additives are made artificially.
- The additives are completely safe.
- The additives are approved for use in the UK.

[2]

[Total: 4]

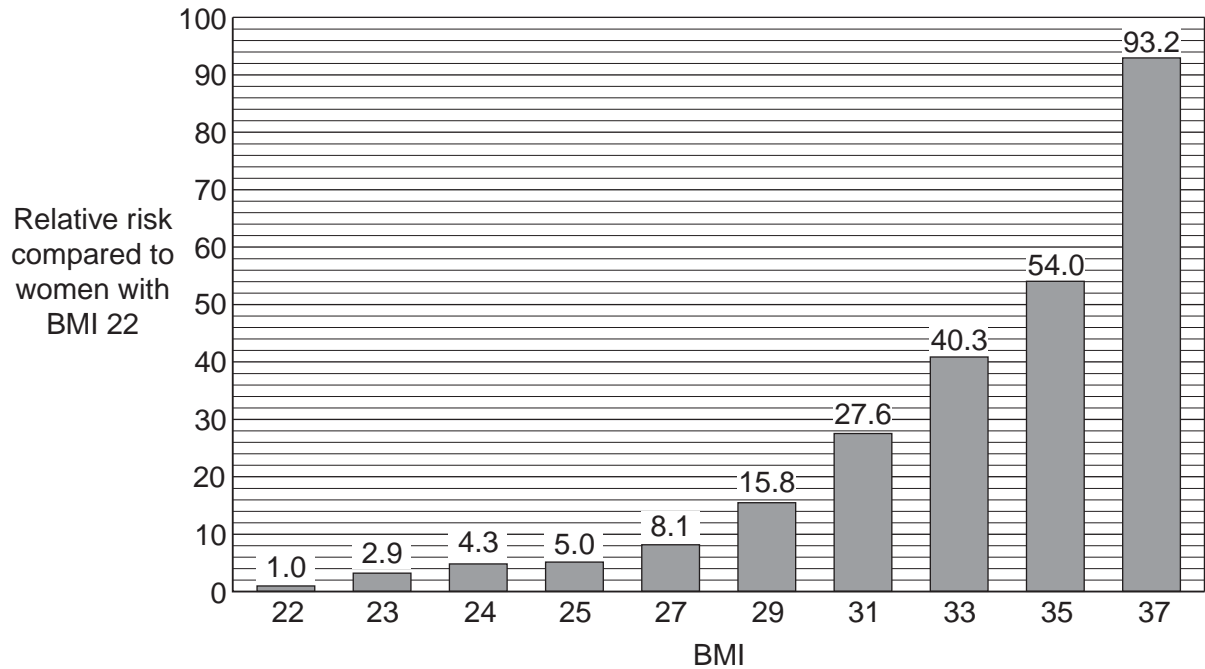
- 7 Body Mass Index (BMI) is a measure of whether or not a person is overweight. People with a BMI greater than 30 are obese (very overweight).

Scientists have carried out research to find out how a person's BMI affects the likelihood that they will have type 2 diabetes.

They studied women aged between 30 and 35.

The recommended BMI for women in this age range is 22.

They produced a graph to show the **relative risk** of these women having diabetes **compared to women with a BMI of 22**.



- (a) Which of the following statements can be made using **only** the information on the graph?

Put ticks (✓) in the boxes next to the **two** correct answers.

- Women with a BMI of 25 are about 5 times more likely to have type 2 diabetes than women with a BMI of 22.
- The higher a woman's BMI the less likely she is to get diabetes.
- Reducing your BMI may reduce your risk of getting type 2 diabetes.
- Women are more likely to get diabetes if they eat too much sugar.

[2]

- (b) Ann is 35 and has a BMI of 34. She does not have diabetes, but her mother and grandmother do.

She sees the graph and talks to her friend.



Her friend makes the following statements to try to make her feel better.

Which of the statements are **true**, and which are **false**?

Put a tick (✓) in the correct box for each statement.

	true	false
Your mother and grandmother having diabetes does not affect your risk of getting the disease.		
You are very active, so you are at less risk from diabetes.		
As you get older, you are less likely to get diabetes.		
The graph shows a correlation between groups of people.		
Individual women may not get diabetes even if they have a very high BMI.		

[3]

[Total: 5]

END OF QUESTION PAPER

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