THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

F

Friday 15 June 2012 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A171/01 Modules C1 C2 C3 (Foundation Tier)

A135340612

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour

A171101

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is about the gases in the air.

(a) Finish this table to show the percentage of each of the three main gases in the Earth's atmosphere today.

Gas	Percentage in the atmosphere
oxygen	.....%
.....	78%
argon	.....%

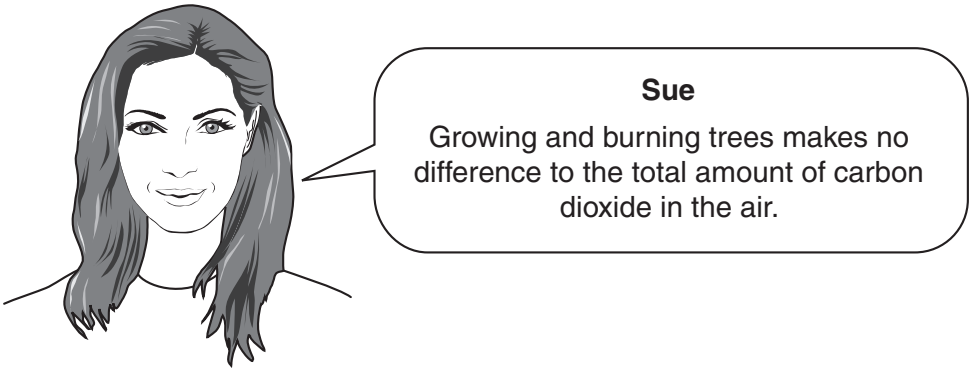
[2]

(b) Many scientists are worried about the rise in carbon dioxide in the air.

One cause of extra carbon dioxide is burning fuels.

Some people grow trees to burn as firewood.

Sue is talking about how growing and burning trees affects the levels of carbon dioxide in the air.



Describe the processes that affect the amount of carbon dioxide in the air when wood burns and when trees grow.

Explain whether you think Sue is correct or not.

The quality of written communication will be assessed in your answer.

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..... **[6]**

(c) Human activities can pollute the air.

Two of the pollutant gases are carbon monoxide and sulfur dioxide.

Describe the harmful effects caused by these two gases.

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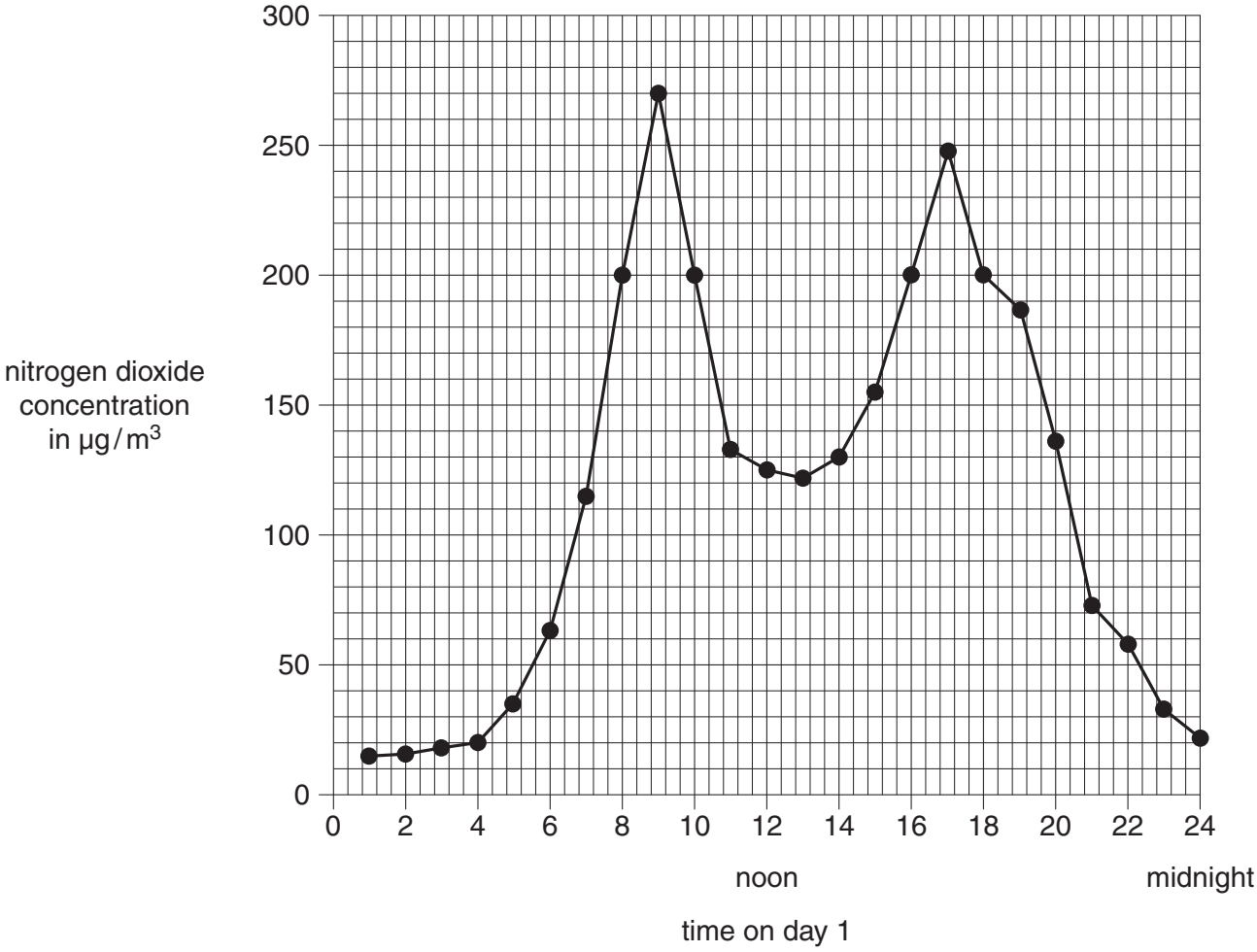
..... **[3]**

[Total: 11]

2 Scientists investigated the nitrogen dioxide concentration in the air next to a city road over a 24-hour period on **day 1**.

Their results are shown in the graph.



(a) The World Health Organisation (WHO) has set guideline limits for nitrogen dioxide concentrations.

These are 200 µg/m^3 for a one-hour average exposure and 40 µg/m^3 for an annual average exposure.

Look at the graph of measurements recorded on **day 1**.

(i) How many readings were above the one-hour average limit?

answer ..... **[1]**

(ii) How many readings were above the annual average limit?

answer ..... **[1]**

(b) The scientists also counted the number of vehicles travelling along the road on **day 1**.

These results are shown in the tables.

Hour of the day	1	2	3	4	5	6	7	8	9	10	11	12 noon
Number of vehicles	2	3	5	9	31	54	242	461	584	472	287	277

Hour of the day	13	14	15	16	17	18	19	20	21	22	23	24 midnight
Number of vehicles	275	285	363	458	566	449	372	163	64	36	22	12

Use information from the tables to suggest an explanation for the shape of the graph.

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..... **[3]**

(c) The scientists repeated this investigation on **day 2**.

They measured the nitrogen dioxide concentration in four samples at the start of each hour.

The table shows the measurements they took at 9 am.

Sample number	1	2	3	4
Nitrogen dioxide concentration in µg/m^3	286	284	285	281

(i) Use the measurements to work out the best estimate of the true value for the nitrogen dioxide concentration at this time on **day 2**.

Show your working.

best estimate = ... µg/m^3 **[2]**

(ii) Look at the nitrogen dioxide concentration for 9 am on the graph for **day 1**.

Compare this with the value that you have calculated for **day 2**.

Suggest reasons for any difference between the two values.

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..... **[2]**

[Total: 9]

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Question 3 begins on page 8

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3 A company plans to make a new rope for sailing boats.

The new rope must be strong and quite stretchy.

Scientists working for the company test ropes made from five polymers, **A**, **B**, **C**, **D** and **E**.

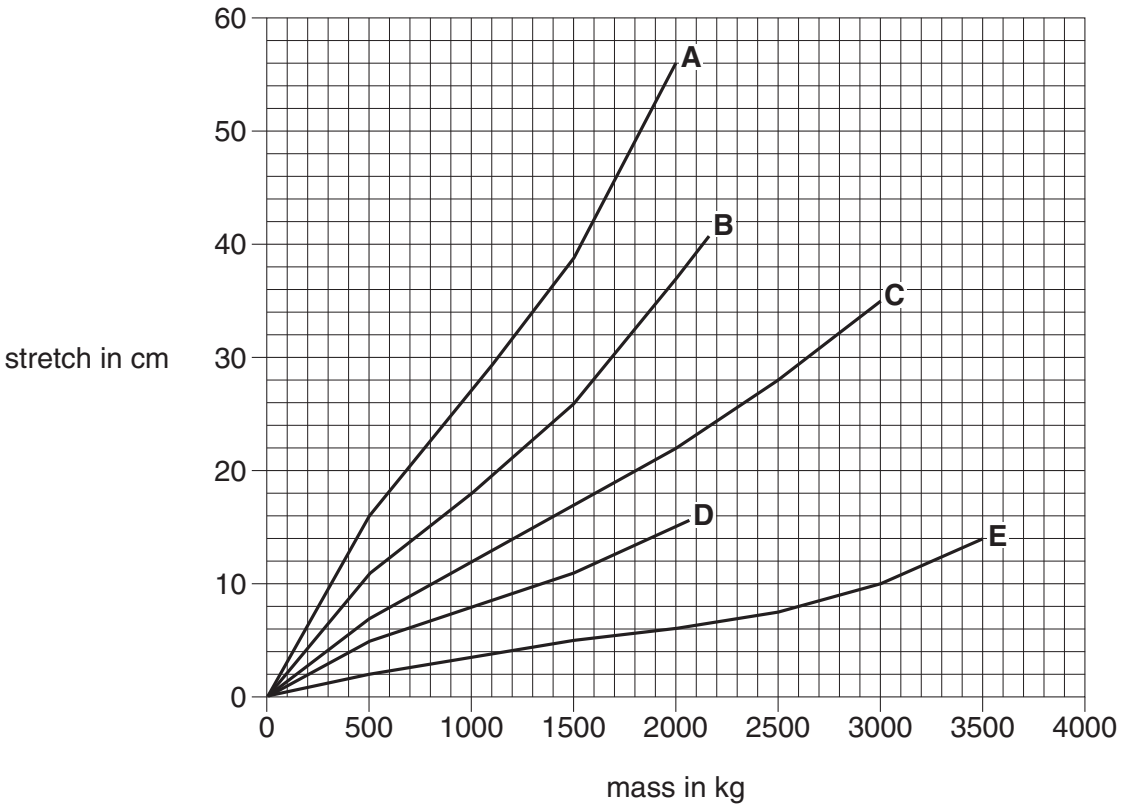
They want to know which is the best polymer to use.

They measure how much each rope stretches as a load is applied to it.

They do this until the rope breaks.

Each rope has the same thickness and the same length.

Their results are shown in the graph. Each line ends when the rope breaks.



(a) Each rope must have the same thickness and length to make it a fair test.

Explain why.

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..... **[2]**

(b) Use the graph to decide which of these statements are **true** and which are **false**.

Put ticks (✓) in the correct boxes to show your choices.

	True (✓)	False (✓)
None of the polymers stretch.		
The polymer that supports the biggest mass breaks at 3000 kg.		
All of the polymers can support a mass of 1500 kg.		
The polymer that supports the biggest mass stretches the least for a mass of 1500 kg.		

[2]

(c) (i) All five lines on the graph show the same pattern.

Finish this sentence to describe the pattern.

As the mass ..... , the polymer stretches ..... . **[1]**

(ii) The graph shows differences between the polymers.

Give **two** differences.

1 .....

2 .....

[2]

(d) The company chooses to make the new rope from polymer **C**.

Suggest why they use this polymer rather than any of the others.

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..... **[3]**

[Total: 10]

4 Crude oil is a mixture of hydrocarbons.

(a) Which elements are found in a hydrocarbon?

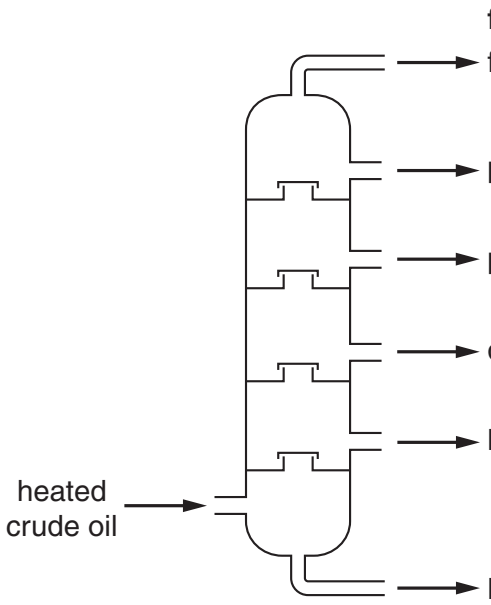
Put (rings) around the names of the two correct elements.

carbon **hydrogen** **nitrogen** **oxygen** **potassium** **sulfur**

[2]

(b) The hydrocarbon molecules in crude oil are of many different sizes and boil at different temperatures.

In a refinery the hydrocarbons in crude oil are separated into fractions.



fractions	Approximate number of carbon atoms per molecule in the fraction	Approximate boiling temperature in °C
fuel gas	1 – 4	below room temperature
petrol	7	50
paraffin	10	150
diesel	15	250
heavy oil	more than 20	400
bitumen	over 70	over 600

Use the information opposite to describe the link between the size of the molecules in each fraction and the temperature at which the fraction boils.

Explain this pattern using ideas about forces, molecular size and the way in which molecules are arranged in liquids and gases.

The quality of written communication will be assessed in your answer.

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..... **[6]**

(c) The sentences describe how some of the hydrocarbon molecules from crude oil are used.

Put a (ring) around the correct word from each pair to complete the sentences.

Polymerisation reactions use many **small** / **big** molecules

called **monomers** / **polymers**.

They join together to make **monomers** / **polymers**

which have very **short** / **long** molecules. **[2]**

[Total: 10]

5 The food industry adds salt when processing foods.

People also add salt to food during cooking and as they eat food.

(a) (i) Give **two** reasons why salt is added to food.

1 .....

2 ..... **[2]**

(ii) Give **two** ways in which eating too much salt can be bad for your health.

1 .....

2 ..... **[2]**

(b) The Department of Health recommends that you should not eat more than 6 g of salt in a day.

Packaged food has labels showing the salt content.

Many people eat much more than the Government's recommended amount of salt, despite the risk.

Suggest reasons why.

The quality of written communication will be assessed in your answer.

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..... **[6]**

[Total: 10]

6 During the 19th century the industrial manufacture of alkalis increased greatly.

(a) (i) What were alkalis made from before industrialisation?

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

lemon juice	☐
stale urine	☐
river water	☐
burnt wood	☐
the air	☐

[2]

(ii) What were the uses of alkalis before industrialisation?

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

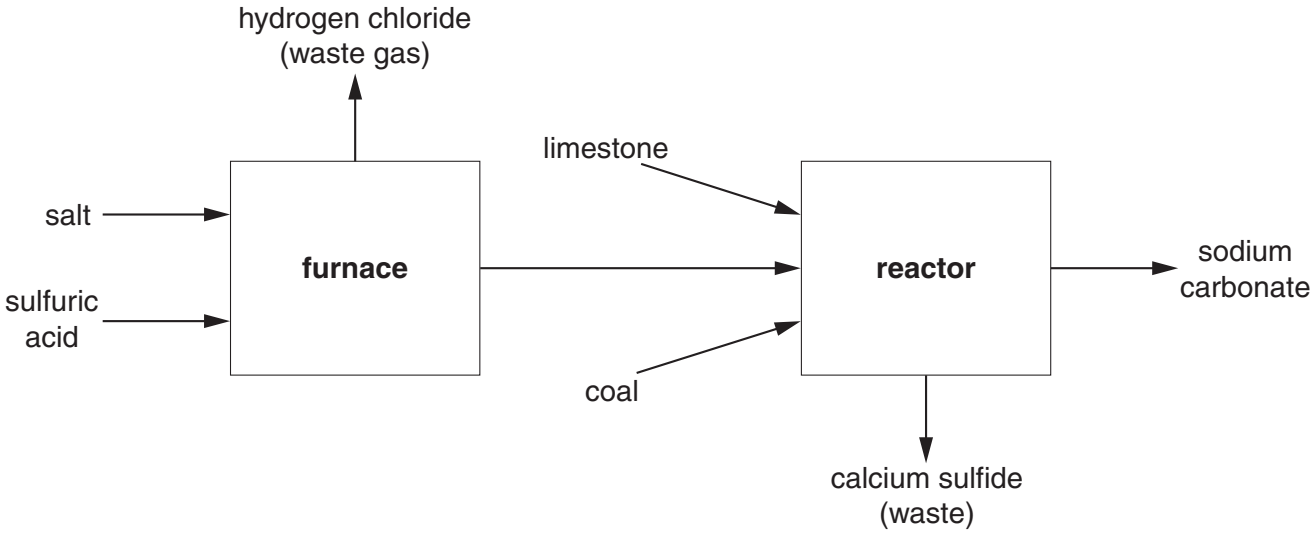
to kill bacteria in drinking water	☐
to neutralise acid soils	☐
to make bleach	☐
to use as fuels	☐
to make soap	☐

[2]

(b) Traditional supplies of alkalis were not large enough to meet the needs of the new chemical industries.

To solve the shortage of alkali a new industrial process was invented.

This process made the alkali, sodium carbonate.



(i) The process used salt, sulfuric acid, coal and one other raw material.

Name this other raw material.

..... **[1]**

(ii) The furnace produced a waste gas.

Identify the gas and suggest why it harmed the environment.

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..... **[2]**

(iii) This problem was overcome by changing the waste gas into a useful product.

Name this product and give one of its uses.

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..... **[2]**

(iv) Sodium carbonate reacts with sulfuric acid to make a salt.

What is the name of this type of reaction?

Put a (ring) around the correct answer.

combustion **neutralisation** **oxidation** **reduction**

[1]

[Total: 10]

END OF QUESTION PAPER

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