

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

A171/01

TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A/SCIENCE A

Modules C1 C2 C3 (Foundation Tier)

THURSDAY 14 MAY 2015: Morning

DURATION: 1 hour
plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	
-------------------------------	--	------------------------------	--

Centre number						Candidate number				
--------------------------	--	--	--	--	--	-----------------------------	--	--	--	--

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

OCR SUPPLIED MATERIALS:
A copy of the Periodic Table

OTHER MATERIALS REQUIRED:
Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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).

INFORMATION FOR CANDIDATES

The 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.

Any blank pages are indicated.

BLANK PAGE

Answer ALL the questions.

1 This question is about materials.

(a) Some materials are made from living things and some materials are synthetic.

Put rings around the TWO materials that are made from living things.

cotton glass iron

paper polythene pottery

[2]

(b) Synthetic materials are often made from the hydrocarbons in crude oil.

How many different elements are there in hydrocarbons?

Put a ring around the correct answer.

1 2 3 10

[1]

- (c) Some of the materials we use are pure chemicals and some are mixtures of chemicals.

Which of these are pure chemicals and which are mixtures of chemicals?

Put ticks (✓) in the correct boxes.

	PURE CHEMICALS	MIXTURES OF CHEMICALS
copper		
crude oil		
sodium chloride		

[2]

[TOTAL: 5]

2 Coal is mainly carbon.

- (a) (i) When carbon burns completely carbon dioxide gas is made.

Which diagram shows a carbon dioxide molecule?

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



[1]

- (ii) Carbon makes a different gas when it burns in less oxygen.

What is the name of this other gas?

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

argon

carbon monoxide

nitrogen

sulfur dioxide

[1]

- (b) Beijing is a city in China where there are many coal-fired power stations.
Coal-fired power stations pollute the air with solid particles.**

**The table shows the amount of coal burned in power stations near Beijing.
It also shows the number of days in each year when solid particles were above the World Health Organisation (WHO) safe level.**

	2008	2010	2012
Coal burned in power stations in thousands of tonnes per year	630	750	900
Days when pollution from solid particles was above the safe level	150	175	230

Joe and Tanya talk about the data in the table.

Joe says ‘Burning coal in power stations affects the amount of pollution each year.’

Tanya says ‘It might not all be from power stations.’

**Both Joe and Tanya could be correct.
Explain why.**

[3]

(c) The chart opposite shows pollution from solid particles in Beijing for the first 12 days of January 2013.

- (i) The safe level for solid particles is $25 \mu\text{g}/\text{m}^3$. This is shown on the chart.

Use the chart to find out if these statements are TRUE or FALSE over these 12 days.
Put ticks (✓) in the correct boxes.

	TRUE	FALSE
The MAXIMUM on 6 th January was $400 \mu\text{g}/\text{m}^3$.		
The MEAN on 9 th January was $100 \mu\text{g}/\text{m}^3$.		
The highest value on any day was $600 \mu\text{g}/\text{m}^3$.		
There are only 5 days when the MEAN was BELOW the safe level.		

[3]

- (ii) The table shows solid particles in six samples of air taken on 13th January.

Solid particles in $\mu\text{g}/\text{m}^3$	150	200	250	500	400	300
---	-----	-----	-----	-----	-----	-----

What is the mean of this data?
Show your working.

_____ [1]

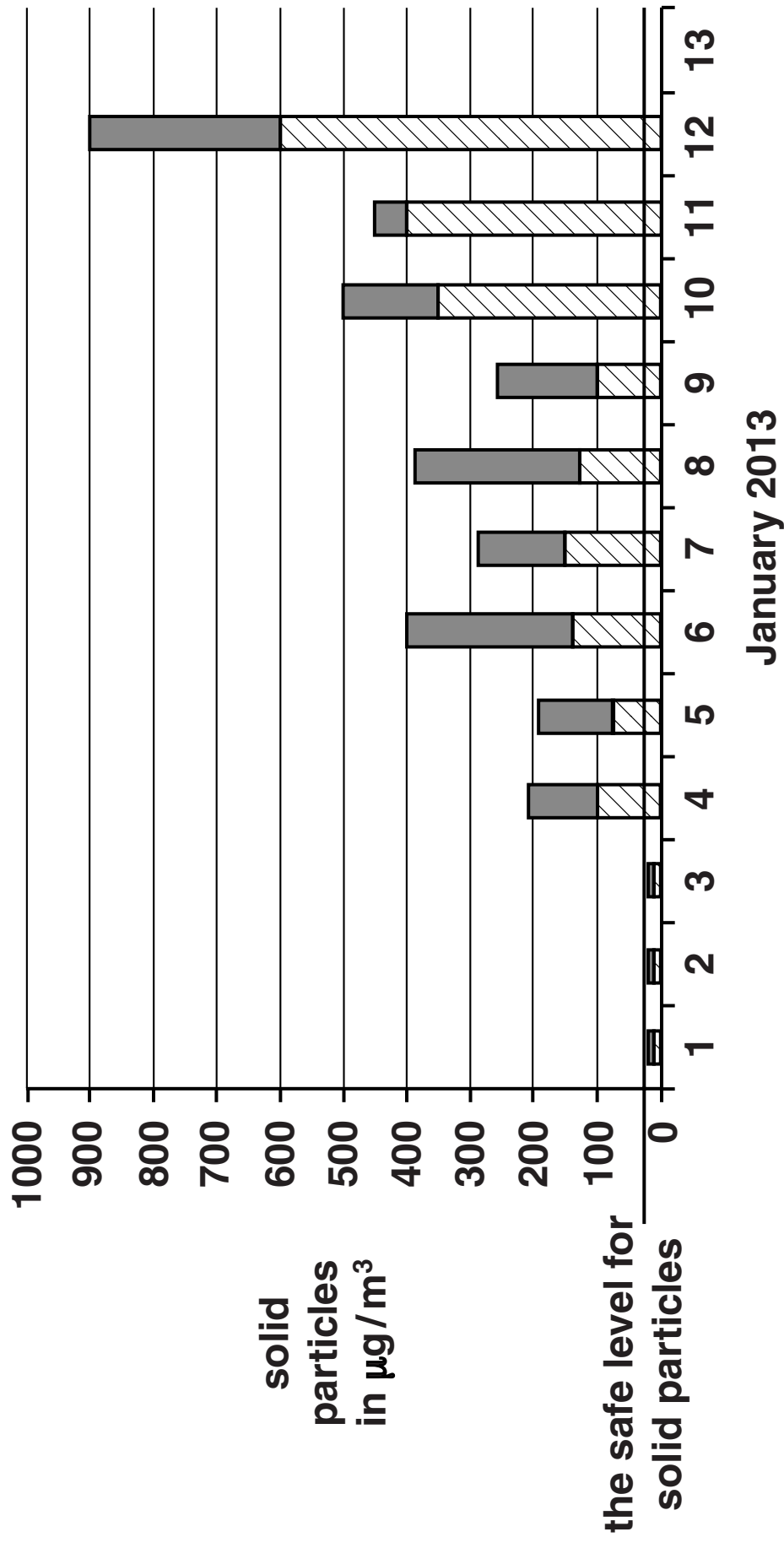
- (iii) Use data in the table and your answer to (ii) to complete the chart on the OPPOSITE PAGE.

Show MAXIMUM and MEAN solid particles for 13th January. [2]

[TOTAL: 11]

KEY:

 maximum amount

 mean amount


- 3 (a) The table shows the percentage of the three main gases in air.

Complete the table.

NAME OF GAS	PERCENTAGE IN AIR
_____	78%
oxygen	21%
argon	_____ %

[2]

- (b) The **EARLY ATMOSPHERES** on Earth and on Mars contained **CARBON DIOXIDE** and **WATER VAPOUR**.

	Early atmospheres of Earth and Mars	Atmosphere of the Earth today	Atmosphere of Mars today
Carbon dioxide	75%	0.04%	95%
Water vapour	20%	very little	very little

How have the atmospheres of Earth and Mars changed over time?
Give reasons for the changes to the Earth's atmosphere. [6]



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

[TOTAL: 8]

- 4 Tennis balls used in competitions must have a similar bounce.**
The balls are dropped onto concrete and the height of the bounce is measured.

(a) Why must the tennis balls be dropped onto the same surface?

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

Tennis courts are made of different materials.

☐

Changing the surface affects the outcome.

☐

So that the bounce height can be measured accurately.

☐

So that the balls do not bounce too high.

☐

[1]

- (b) Ben measures the bounce of 50 tennis balls.
This is what he finds.

HEIGHT OF BOUNCE	NUMBER OF TENNIS BALLS
up to 130 cm	2
131 to 135 cm	8
136 to 140 cm	26
141 to 145 cm	14
146 to 150 cm	0
greater than 150 cm	0

He rejects all the tennis balls that bounce **HIGHER** than 146 cm or **LOWER** than 136 cm.

- (i) How many of the 50 tennis balls can he use?

_____ [1]

- (ii) Ben needs 120 tennis balls for a competition.
He wants to know how many tennis balls he must test.

He uses this equation:

Number of tennis balls he must test

$$= \text{Number of tennis balls needed} \times \frac{50}{\text{answer to part (i)}}$$

Work out how many tennis balls Ben must test.

_____ [2]

- (iii) Josie watches Ben test the tennis balls.
Josie says he should test each tennis ball more than once.
Is she right? Explain why.

[1]

- (c) Tennis balls are made from rubber.
Many small molecules react together to make long-chain molecules of rubber.

What is the name for this type of reaction?

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

oxidation

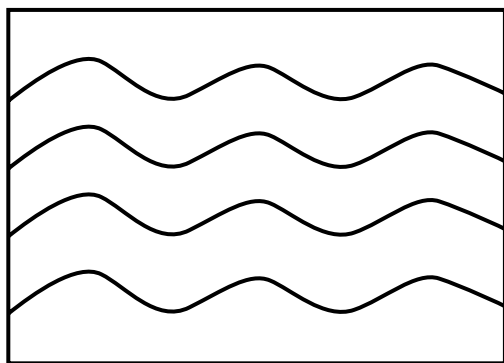
polymerisation

reduction

refining

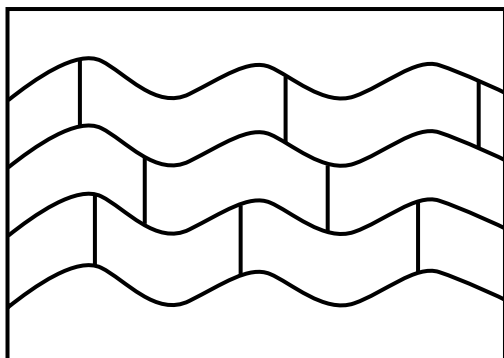
[1]

(d) This diagram shows molecules of rubber.

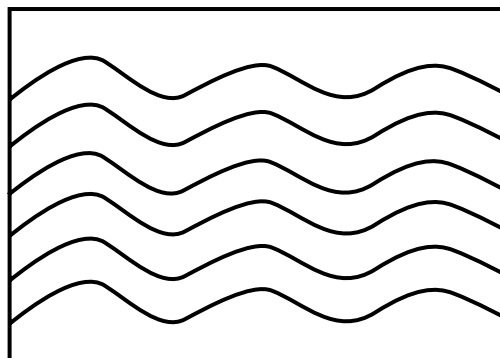


(i) Which of the diagrams A, B, or C shows rubber that has been CROSS-LINKED?

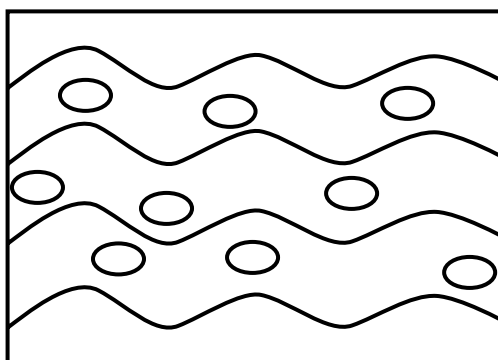
A



B



C



_____ **[1]**

- (ii) The properties of rubber are changed by cross-linking or by adding plasticiser. Complete these sentences by putting a tick (✓) in the correct box.

Cross-linking makes the rubber

harder.	<input type="checkbox"/>
softer.	<input type="checkbox"/>
weaker.	<input type="checkbox"/>

Adding a plasticiser makes the rubber

have a higher melting point.	<input type="checkbox"/>
more flexible.	<input type="checkbox"/>
much stronger.	<input type="checkbox"/>

[2]

[TOTAL: 9]

BLANK PAGE

5 (a) Dave is buying new ropes for his boat.

Look at the properties of four synthetic fibres used to make ropes.

	Kevlar	Nylon	Polyester	Polypropene
Tensile strength in N/mm²	210	70	70	65
Stiffness in MNm/kg	80	2	3	1
Density in g/cm³	1.44	1.14	1.38	0.91
Floats on water or sinks	sinks	sinks	sinks	floats
Water absorbency in %	4.5	6.0	0.5	almost 0

The best ropes are made from fibres which are strong, flexible and light, even when wet.

Which fibre would make the best rope for Dave's boat?

Use the data to help you explain why you would choose that fibre and not the others. [6]



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

- (b) In countries where there is no chemical industry, ropes are made from plant material.**

Which TWO statements show the advantages of using plant material?

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

Ropes from plants will rot.

☐

Buying rope from other countries is expensive.

☐

Ropes from plants absorb more water than synthetic ones.

☐

There is a limited supply of plants.

☐

Making rope from plants uses local materials.

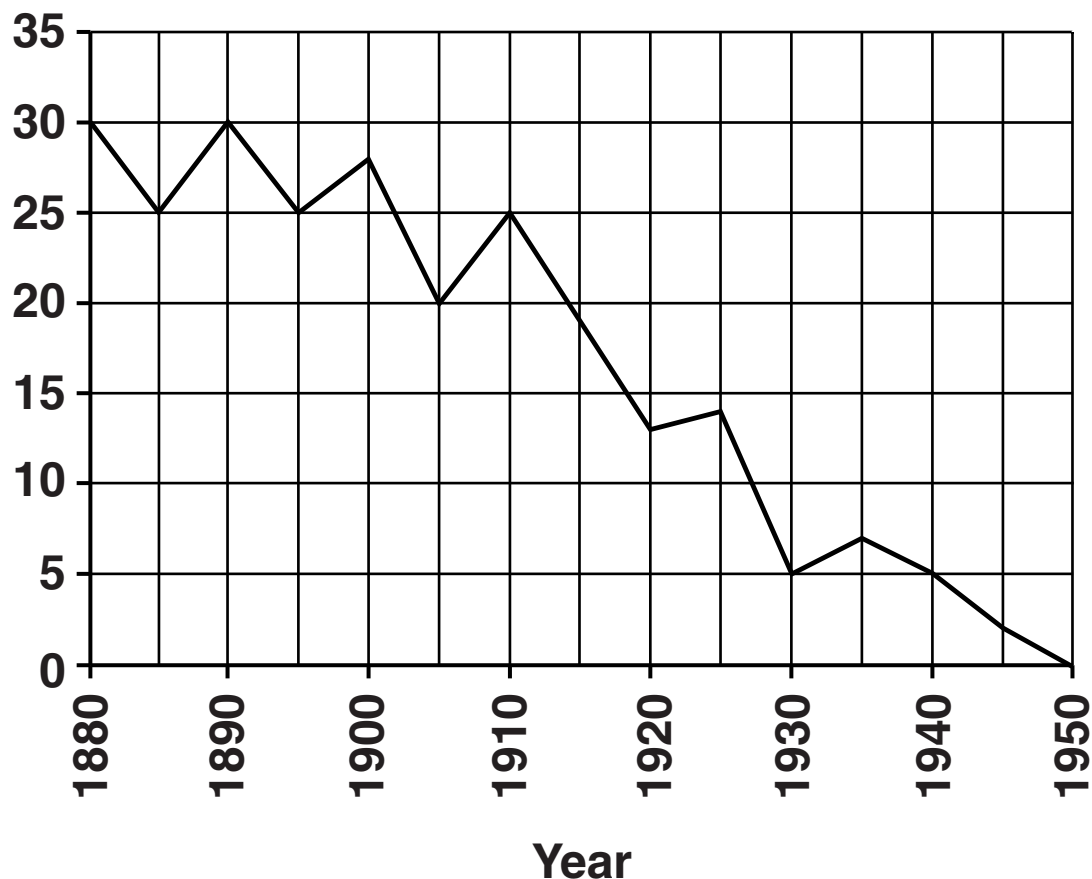
☐

[2]

[TOTAL: 8]

6 The graph shows the deaths from typhoid in a UK city.

**Deaths from
typhoid per
100 000 people**



(a) (i) Complete the table which shows the deaths from typhoid in 1890 and 1930.

Year	Total population of city	Deaths from typhoid per 100 000 people	Total deaths from typhoid
1890	60 000	_____	18
1930	200 000	5	_____

[2]

(ii) What does the graph show about the deaths from typhoid between 1880 and 1950?

[2]

**(b) From 1910 onwards chlorine was added to the water supply of the city.
Beth and Zac look at the graph.
They talk about the effects of adding chlorine to water.**

Beth says that deaths from typhoid fell before chlorine was added to water so chlorine has no effect.

Zac says that adding chlorine to water lowers deaths from typhoid.

Who is right? Explain your answer. [6]



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

[TOTAL: 10]

- 7 (a) Most breakfast cereals contain salt.
The table shows the salt content of four brands of breakfast cereals, A, B, C and D in 2005 and 2013.

Cereal	Salt content in g per 100 g	
	2005	2013
A	2.9	1.3
B	2.6	1.2
C	1.4	0.6
D	0.6	0.2

The cereals are labelled to show how much salt is in 100 g of cereal:

HIGH salt = more than 1.5 g

MEDIUM salt = 0.3 g to 1.5 g

LOW salt = less than 0.3 g

- (i) Which cereal, A, B, C or D, has changed from MEDIUM to LOW salt between 2005 and 2013?

_____ [1]

- (ii) Which cereal, A, B, C or D, has NOT changed its salt label between 2005 and 2013?

_____ [1]

(b) These students are talking about salt in food.

Anna says ‘The Food Standards Agency sets targets for salt in foods.’

Ben says ‘I know there are health problems with eating salt but food tastes awful without salt.’

Carlos says ‘The more salt you eat the higher your blood pressure.’

Debbie says ‘I don’t want to take the chance of having heart disease.’

(i) Who talks about a correlation?

_____ **[1]**

(ii) Who talks about risk and benefit?

_____ **[1]**

- (c) Government departments give advice about food. They do risk assessments.**

Why do they do risk assessments?

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

To set the safe levels of chemicals in food. ☐

To check that food is clearly labelled. ☐

To make sure there are no microbes in food. ☐

To lower the amount of salt in food. ☐

[1]

[TOTAL: 5]

**8 Mercury has been used in the chemical industry for hundreds of years.
Nowadays its use is strictly regulated because it is toxic.**

(a) How do some toxic chemicals cause environmental and health problems?

[2]

**(b) Mercury was known to harm humans 150 years ago.
It was widely used until very recently.**

Suggest reasons why people continued to use mercury even though they knew it was harmful.

[2]

[TOTAL: 4]

END OF QUESTION PAPER

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

