

Wednesday 18 January 2012 – Morning

## GCSE TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

**A171/01** Modules C1 C2 C3 (Foundation Tier)

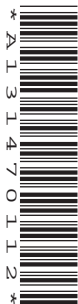
Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Duration:** 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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### 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

-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- The Periodic Table is printed on the back page.
- 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 The table gives information about dry air from two different places.

One is in a town and the other is in the countryside.

gas present	town %	countryside %
argon	1.00	1.00
nitrogen	78.00	78.00
oxygen	20.80	20.96
carbon dioxide		0.04
carbon monoxide	0.10	0
nitrogen oxides	0.05	0
Total	100.00	100.00

- (a) Work out the percentage (%) of carbon dioxide in the town.

Show your working.

Write your result in the table.

[2]

- (b) (i) The carbon dioxide concentration is higher in the town.

Suggest why.

.....

.....

..... [2]

- (ii) Some of the carbon dioxide in air is used by plants.

What is the name for this process?

Put a ring around the correct answer.

combustion

electrolysis

photosynthesis

polymerisation

respiration

[1]

(c) The nitrogen oxides in the town come from car engines.

Describe how nitrogen oxides are made in car engines.

.....

.....

.....

.....

.....

..... [3]

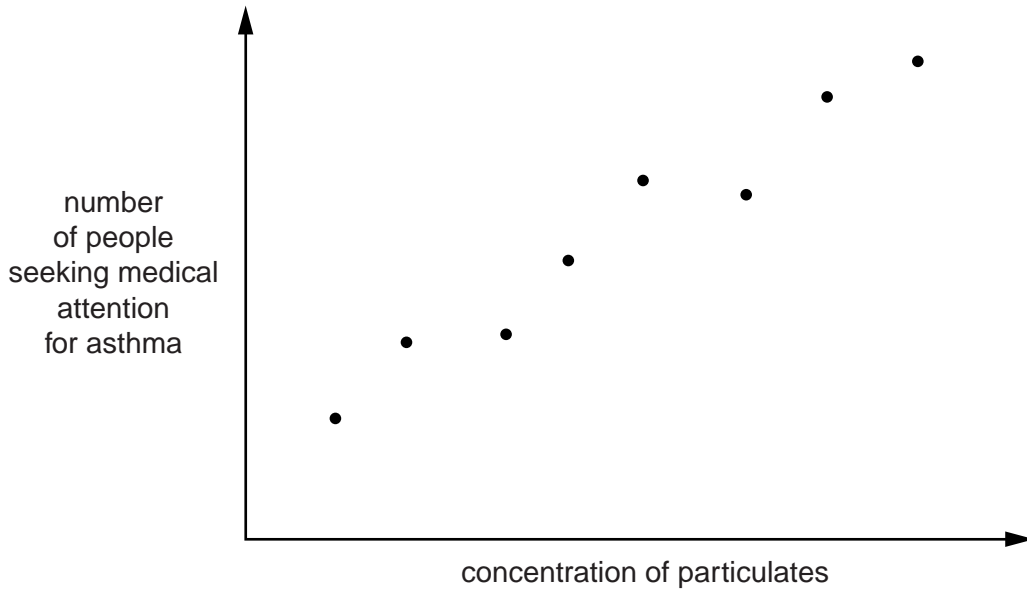
[Total: 8]

2 Scientists measure the concentration of particulates in the air in a town centre.

They do this on several days.

They also count the number of people seeking medical attention for asthma on the same days.

They plot their results on a scatter graph.



(a) The data show a correlation.

Complete the sentence to describe this correlation.

As the concentration of particulates increases, the number of people seeking

medical attention for asthma .....

[1]

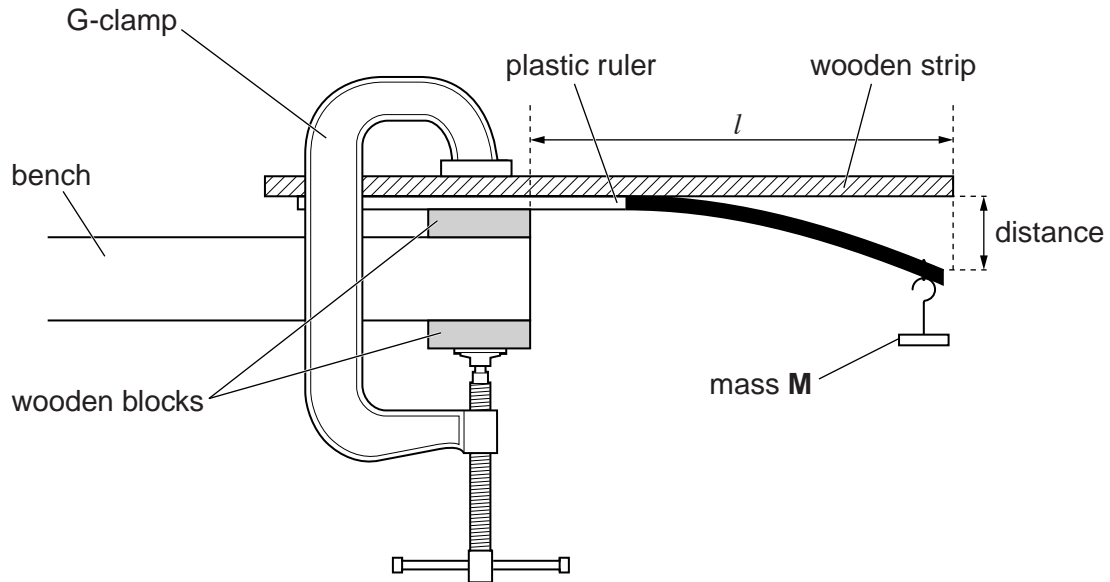


3 A company wants to make rulers from a polymer.

The company wants to know if the polymer is suitable for this job.

Scientists test sample rulers made from this polymer.

They use this apparatus.



The scientists hang a mass, **M**, from the end of each sample.

They measure the distance that each ruler bends.

Their results are shown in the table.

distance ruler bends in mm					
sample 1	sample 2	sample 3	sample 4	sample 5	sample 6
34	32	34	35	33	36

(a) The apparatus contains a horizontal wooden strip.

Explain why this is important.

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

**(b) (i)** The scientists make sure that mass **M** is the same size for each sample.

Explain why this makes it a fair test.

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

**(ii)** State one other factor that should also be kept the same for each sample.

..... [1]

**(c) (i)** The true value for the distance the ruler bends lies within a range.

What is this range?

The range is from ..... to ..... mm. [1]

**(ii)** Work out a best estimate for the distance the ruler bends.

best estimate = ..... mm [2]

**(iii)** How likely is it that your best estimate is the true value for the distance the ruler bends?

Use the data to explain your answer.

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

(d) The company want the rulers to be more flexible.

Suggest how the polymer could be made more flexible.

Explain how this makes the polymer more flexible.



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

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[6]  
**[Total: 15]**



4 Most tennis racquets are made from a polymer reinforced with carbon fibres.

Nanotechnology is used to make better tennis racquets.

Nanoparticles are added to fill gaps in the reinforced polymer.

(a) Explain the meaning of the term **nanotechnology**.

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

(b) Suggest how these new tennis racquets are better than those that do not contain nanoparticles.

..... [1]

(c) Nanoparticles are used in a wide variety of products.

Some scientists are worried about this.

Which two statements give reasons for their concern?

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

Nanoparticles do not occur in nature.

Nanoparticles have a smaller surface area than larger particles.

The effects of nanoparticles have not yet been fully investigated.

Nanoparticles are larger than 1000 nm.

Nanoparticles may be harmful to health.

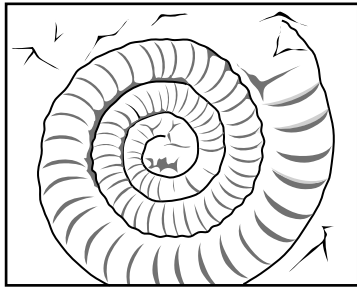
Nanoparticles are too small to be seen by the unaided eye.

[2]

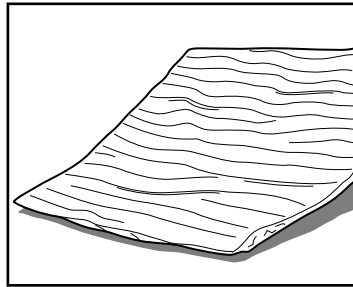
[Total: 5]

5 A new chemical industry developed in the North West of England because that region has large deposits of useful rocks.

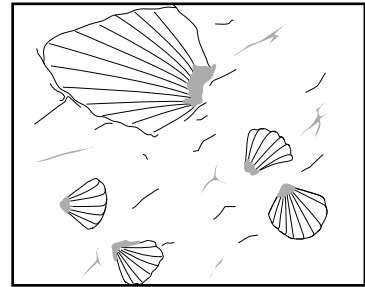
(a) The diagrams show three samples of the same rock (not drawn to scale).



A



B



C

Explain what these diagrams tell you about the rock and how it was made.

Suggest what further evidence might be found in the rock to support your ideas.



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

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

(b) The new chemical industry makes alkalis from local deposits of salt (sodium chloride).

This new industry uses two other resources that are found locally.

What are these **two** resources?

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

- coal**     **granite**     **iron ore**     **limestone**     **oil**     **sandstone**

[2]

(c) Sodium chloride can be used to make sodium carbonate, a valuable chemical.

In the 19th century sodium carbonate was made by the Leblanc process.

This process has two stages

- sodium chloride reacts with sulfuric acid to make sodium sulfate and hydrogen chloride gas
- sodium sulfate reacts with calcium carbonate and carbon to make sodium carbonate, calcium sulfide and carbon dioxide.

(i) The Leblanc process caused a great deal of pollution to the local area.

Which of these statements explain why?

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

Sulfuric acid is a strong acid that harms living things.

Hydrogen chloride is an acidic gas that is very harmful.

Sodium sulfate is a poisonous chemical.

The carbon used was in the form of coke.

Calcium sulfide is a solid waste that gives off poisonous hydrogen sulfide gas.

Carbon dioxide is an acidic gas that is toxic.

[2]

(ii) Pollution problems can sometimes be solved by turning waste materials into useful chemicals.

One of the waste materials from the Leblanc process was used to make the useful chemical chlorine.

Which waste material was this?

..... [1]

(d) Chlorine is added to drinking water.

(i) Describe and explain one advantage of adding chlorine to drinking water.

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

(ii) The addition of chlorine to drinking water may be harmful to health.

Which statement describes why?

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

The water may give off poisonous chlorine gas.

Chlorine can react with organic materials to produce toxic chemicals.

Chlorine reacts with water to form an acidic solution.

Chlorine can react with and damage water pipes.

[1]

[Total: 14]

**PLEASE DO NOT WRITE ON THIS PAGE**

**Turn over for question 6**

6 Many foods contain salt that was added during manufacture.

(a) Why is salt added to food?

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

(b) The Department of Health recommends that no more than 6.0g of salt should be eaten each day.

The table shows how much salt is in a number of everyday foods.

food	mass of salt in g
baked beans, 100 g	1.0
baked potato, 100 g	0
cornflakes, 30 g	0.5
crisps, 25 g	0.5
chips, 100 g	0.5
hamburger, 200 g	2.0
green beans, 100 g	0
steamed fish, 200 g	0.5
pizza, 200 g	3.0

This list shows the meals eaten by Sam during one day.

**breakfast**

30 g cornflakes

**lunch**

200 g hamburger

25 g crisps

**dinner**

100 g chips

200 g pizza

100 g baked beans

- (i) Work out the mass of salt eaten by Sam for each meal and the total mass of salt he eats on this day.

Write your answers in the table.

	mass of salt eaten in g
breakfast	
lunch	
dinner	
total for the day	

[2]

- (ii) How does the amount of salt that Sam eats in these meals compare with the maximum intake recommended by the Department of Health?

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

more than the recommended daily intake

equal to the recommended daily intake

less than the recommended daily intake

[1]

- (iii) Sam wants to lower his total daily intake of salt whilst still eating the same amount of food.

Use the tables to suggest ways he could do this.

.....

.....

..... [2]

[Total: 6]

**END OF QUESTION PAPER**



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