

Wednesday 18 January 2012 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

A171/01 Modules C1 C2 C3 (Foundation Tier)

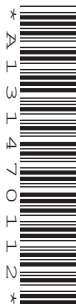
Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour



Candidate forename		Candidate surname	
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

-  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]

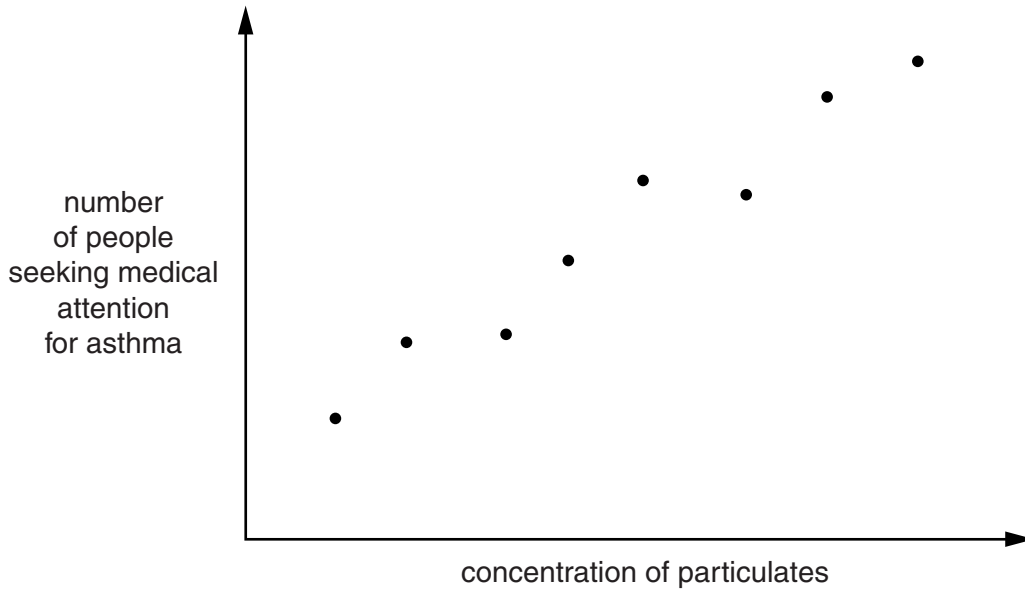
[Total: 8]

- 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

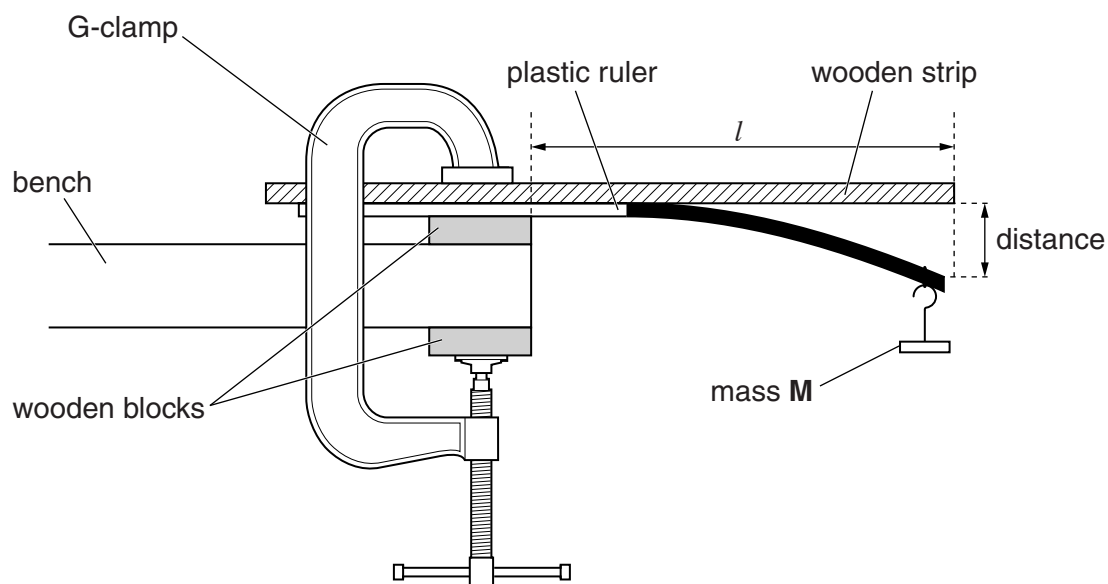
[1]

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.

..... [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.

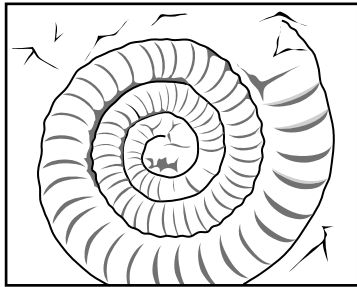
☐

[2]

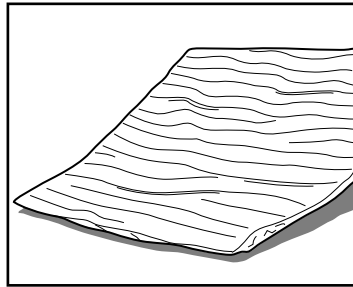
[Total: 5]

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

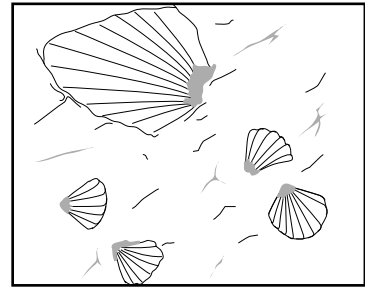
- (a)** The diagrams show three samples of the same rock (not drawn to scale).



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]

13
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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 6.0 g 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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The Periodic Table of the Elements

16

1	2	Key										3	4	5	6	7	0	
		relative atomic mass atomic symbol name atomic (proton) number																
7 Li lithium 3	9 Be beryllium 4																	
23 Na sodium 11	24 Mg magnesium 12																	
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36	
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86	
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated							

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.