

Thursday 15 May 2014 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A/SCIENCE 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

- The quality of written communication is assessed in questions marked with a pencil (✎).
- 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 **24** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is about fuels that burn in car engines.

These fuels are hydrocarbons.

(a) (i) Hydrocarbons burn in plenty of air to make two products.

One product is carbon dioxide.

What is the **other** product?

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

chlorine

nitrogen

oxygen

water

[1]

(ii) Which diagram shows a molecule of carbon dioxide, CO_2 ?

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



[1]

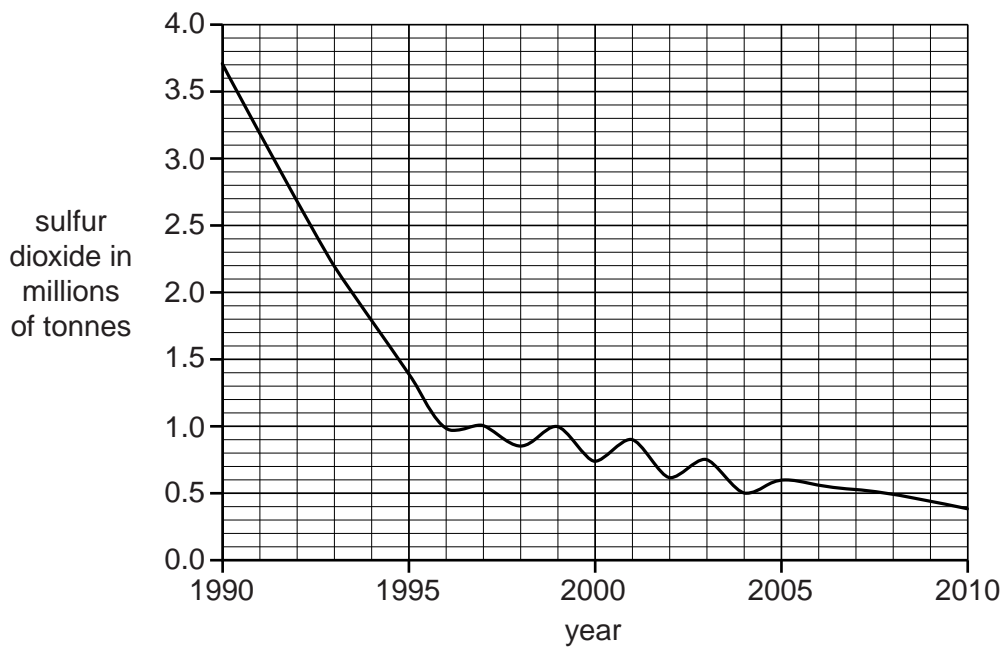
2 Sulfur dioxide is a pollutant from coal-fired power stations.

(a) Sulfur dioxide is made from two elements.

Name these elements and say where they come from in a coal-fired power station.

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

(b) The graph shows the amount of sulfur dioxide put into the air from 1990 to 2010.



Write **three** things that this graph shows about the amount of sulfur dioxide put into the air.

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

(c) (i) Jake is a scientist.

Jake says, "Sulfur dioxide pollution has decreased as coal-fired power stations have shut down."

This statement is an example of

a correlation an estimation an evaluation a prediction

Put a ring around the correct answer. [1]

(ii) Shutting down coal-fired power stations is one way to lower the amount of sulfur dioxide put into the air.

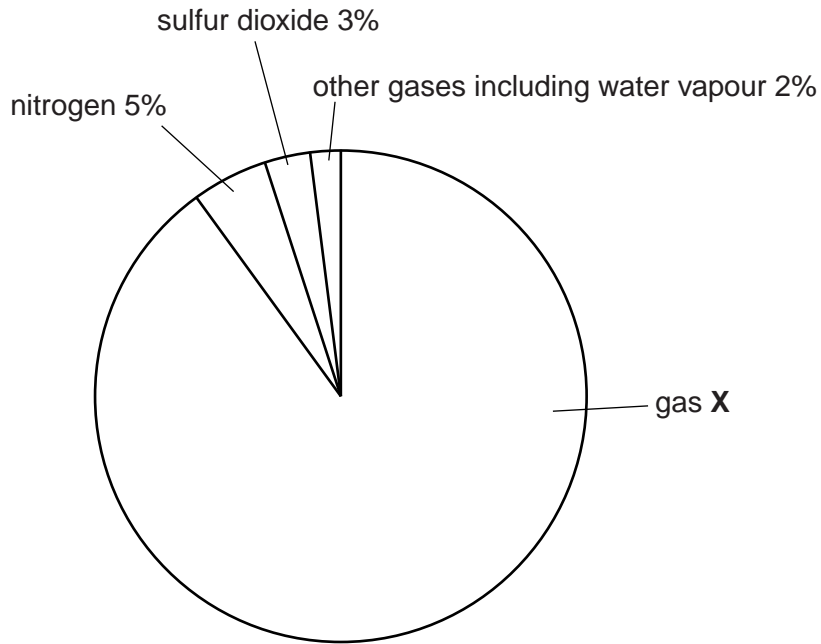
Describe and explain **another** way.

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

[Total: 8]

- 3 Scientists have estimated the percentage of different gases in the atmosphere before plant life on Earth began.

The pie chart shows this estimation.



- (a) What is the gas X that made up most of the atmosphere before there was life on Earth?

Put a ring around the correct answer.

argon **carbon dioxide** **nitrogen oxide** **oxygen** [1]

- (b) Explain why the composition of the Earth's atmosphere changed after plant life on Earth began.

.....

.....

.....

..... [2]

[Total: 3]

4 A supermarket uses plastic carrier bags.



The handles of some of a **new** set of bags break when customers carry their shopping away.

The supermarket complains to the company that makes the bags.

The company tests 5 of the new set of bags.

They find the mass that will break each bag.

Here are their measurements.

Bag number	1	2	3	4	5
Mass to break handle in kg	6.5	8.2	6.1	10.2	9.0

(a) (i) Use **all** their measurements to find the mean value of the mass to break the handles.

Show your working.

..... kg [2]

(ii) What is the range of these measurements?

..... to kg [1]

(iii) Measurements on older bags have the same mean value.

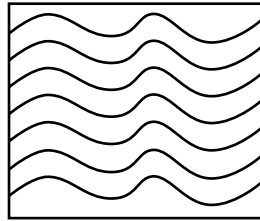
The range for the older bags is 7.4 to 8.6 kg.

Use this information and your answer to part (ii) to suggest why some of the new bags are breaking more easily than the old ones.

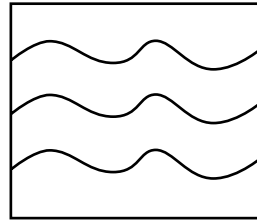
.....
 [1]

(b) Carrier bags are made of polythene.

The diagrams show how the molecules are arranged in two types of polythene.



polythene **A**



polythene **B**

(i) Put a tick (✓) in the box next to the correct words to complete the sentence.

The density of polythene A is	higher than	<input type="checkbox"/>	the density of polythene B .
	lower than	<input type="checkbox"/>	
	the same as	<input type="checkbox"/>	

[1]

(ii) Molecules that are **closer** together have **bigger** forces between them.

Put a tick(✓) in the box next to the correct words to complete the sentence.

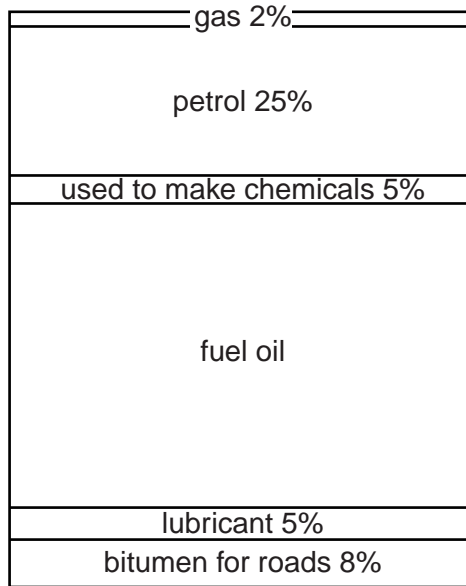
The breaking strength of polythene A is	higher than	<input type="checkbox"/>	the breaking strength of polythene B .
	lower than	<input type="checkbox"/>	
	the same as	<input type="checkbox"/>	

[1]

[Total: 6]

5 An oil refinery separates crude oil into different fractions.

This diagram shows the amount of each fraction made from a barrel of crude oil.



(a) (i) Here are some statements about the fractions in crude oil.

Use the diagram to find out if the statements are true or false.

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

	true	false
The smallest fraction of crude oil is gas.		
There is more lubricant than petrol.		
The amount of crude oil used to make chemicals is the same as the amount of lubricant.		

[2]

(ii) Show that more than half of the crude oil is used as fuel oil.

.....

..... [2]

(b) Complete the sentences to explain why gas boils at a lower temperature than fuel oil.

Put a tick (✓) in the box next to the correct words to complete the sentences.

Gas molecules are	smaller than	<input type="checkbox"/>	molecules of fuel oil.
	the same size as	<input type="checkbox"/>	
	larger than	<input type="checkbox"/>	

The forces between gas molecules are	smaller than	<input type="checkbox"/>	the forces between molecules of fuel oil.
	the same size as	<input type="checkbox"/>	
	larger than	<input type="checkbox"/>	

The energy needed to overcome the forces between gas molecules is	less than	<input type="checkbox"/>	the energy needed to overcome the forces between molecules of fuel oil.
	the same as	<input type="checkbox"/>	
	more than	<input type="checkbox"/>	

[2]

[Total: 6]

Question 6 begins on page 12

PLEASE DO NOT WRITE ON THIS PAGE

(b) Give **one** other use of nanoparticles and say how nanoparticles improve the properties.

.....

.....

.....

..... [2]

[Total: 8]

7 Some people are talking about the Government's advice on eating salt.

This is what they say.

Dr Abbott

Salt has been used as a preservative for centuries. My company makes foods that use salt in this way. Sickness from food poisoning is much more common than high blood pressure.

Mr Collins

Government scientists set a target to eat less than 6 g per day of salt. I eat 0 g per day because I never put salt on my food.

Miss Brown

A great deal of evidence that eating less salt lowers blood pressure has been published in scientific journals.

Mrs Evans

I look on packet labels and try to keep my salt intake as low as possible.

Professor Derry

I went to a conference where scientists showed evidence that a low sodium diet could be harmful to some people.

(a) (i) Who is talking about information that has been **peer reviewed**?

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

- Dr Abbott
- Miss Brown
- Mr Collins
- Professor Derry
- Mrs Evans

[1]

(ii) Who is saying that a benefit of salt in food, outweighs a risk from eating too much salt?

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

Dr Abbott

Miss Brown

Mr Collins

Professor Derry

Mrs Evans

[1]

(iii) Mr Collins and Mrs Evans have different ways of assessing the amount of salt they eat.

Who is correct and why?

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

(iv) Companies add salt to foods to preserve them and for one other reason.

What is that other reason?

..... [1]

(b) (i) People with high blood pressure can use potassium chloride as a substitute for salt (sodium chloride).

Rocks containing potassium chloride are found deep underground and mined in the same ways as those containing sodium chloride.

Companies make potassium chloride using solution mining.

Suggest reasons why they might use solution mining rather than digging rocks out of the ground.

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

(ii) Potassium chloride solution is electrolysed to make different products.

It is similar to the electrolysis of sodium chloride.

Hydrogen, chlorine and one other product are made.

What is the other product?

Put a ring around the correct answer.

**potassium
carbonate**

**potassium
hydroxide**

**potassium
oxide**

**sodium
chloride**

[1]

[Total: 8]

Question 8 begins on page 18

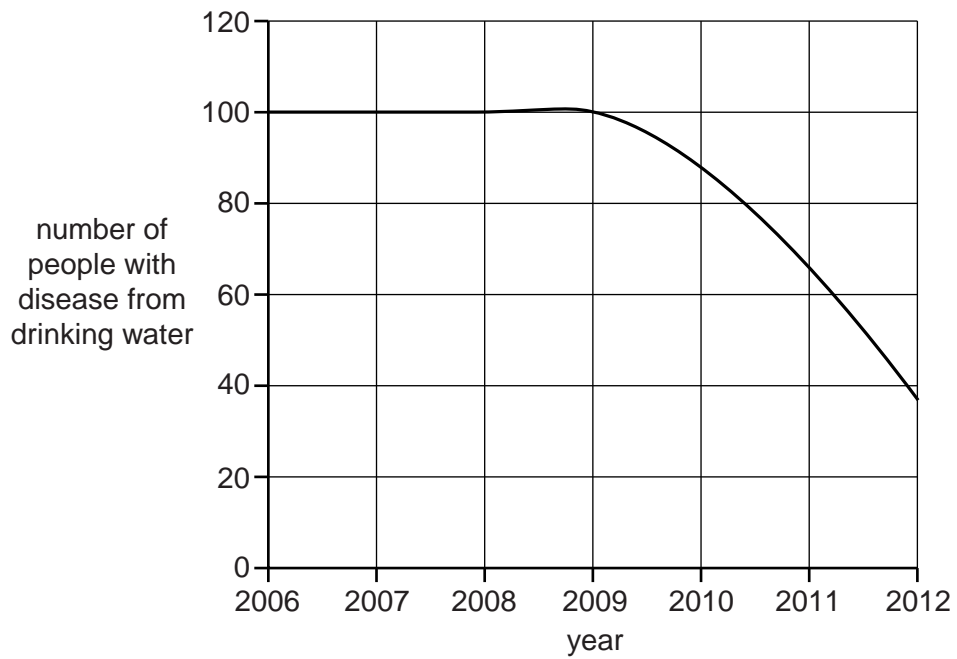
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8 In remote parts of a developing country, the drinking water causes diseases that kill people.

In one area people started to add chlorine to drinking water from 2009.

A charity raised the money to pay for this.

Look at the graph.



Should chlorine be added to drinking water in other remote areas?

In your answer you should:

- describe what the graph shows you about adding chlorine
- explain why the chlorine has an effect
- write about the advantages and disadvantages of adding chlorine to drinking water in other parts of the developing country.



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

.....

.....

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.....

.....

.....

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.....

.....

.....

.....

[6]

[Total: 6]

9 This is a question about poly vinyl chloride (PVC).

(a) PVC contains carbon, hydrogen and one other type of atom.

What is the other type of atom?

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

chlorine

nitrogen

sodium

sulfur

[1]

(b) PVC is used to make window frames and bags for blood transfusions.

Life Cycle Assessments (LCA) for these two uses are different.

Which **two** statements about LCAs explain this difference?

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

Crude oil is used to make the PVC.

Energy is used to make PVC from crude oil.

There is an environmental impact when PVC is made from crude oil.

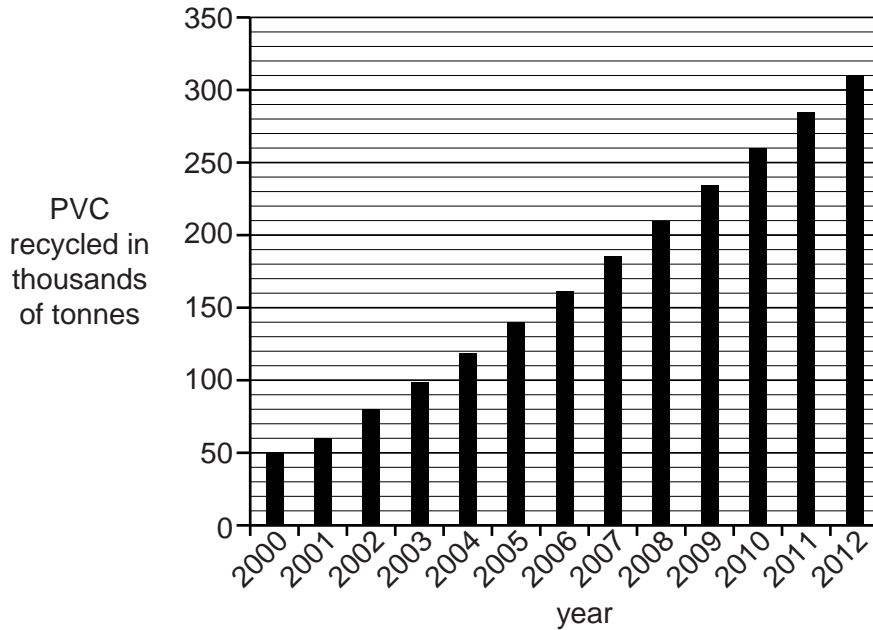
There is an environmental impact when each product is made from PVC.

The length of time each product is in use.

[2]

(c) PVC can be disposed of in landfill or recycled.

The graph shows the amount of PVC recycled in Europe since the year 2000.



(i) The European target was to recycle 200 000 more tonnes of PVC in 2010 than in 2000.

Was this target reached?

Explain your answer.

.....

.....

.....

..... [2]

(ii) Suggest **two** advantages of recycling **more** PVC.

.....

.....

.....

..... [2]

[Total: 7]

END OF QUESTION PAPER

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The Periodic Table of the Elements

	1	2	3	4	5	6	7	0																								
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18																						
	19 K potassium 19	20 Ca calcium 20	21 Sc scandium 21	22 Ti titanium 22	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36														
	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54														
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	58 Ce cerium 58	59 Pr praseodymium 59	60 Nd neodymium 60	61 Pm promethium 61	62 Sm samarium 62	63 Eu europium 63	64 Gd gadolinium 64	65 Tb terbium 65	66 Dy dysprosium 66	67 Ho holmium 67	68 Er erbium 68	69 Tm thulium 69	70 Yb ytterbium 70	71 Lu lutetium 71	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 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																				

1	H	1
	hydrogen	

relative atomic mass
atomic symbol
name
atomic (proton) number

Key

* 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.