OCR
RECOGNISING ACHIEVEMENT

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A321/01

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A
Unit 1 Modules C1 C2 C3 (Foundation Tier)

FRIDAY 18 JANUARY 2008

Afternoon
Time: 40 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T46538

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- The Periodic Table is printed on the back page.

FOR EXAMINER'S USE		
Qu.	**Max**	**Mark**
1	9	
2	6	
3	7	
4	5	
5	4	
6	7	
7	4	
TOTAL	42	

This document consists of **17** printed pages and **3** blank pages.

Answer **all** the questions.

1 Cars on motorways use the right hand lane for overtaking. The left hand lanes are used for slower vehicles.

From 2007, car pool lanes will be introduced on some motorways.
Only cars with two or more people in them will be allowed to drive in the right hand lane.

(a) (i) Finish the sentence by choosing the **best** word from this list.

less

more

the same

Car pool lanes should mean that the number of cars on motorways will be

…… . [1]

(ii) Why should people be encouraged to take passengers in their cars?

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

There will be fewer buses on the motorway. ☐

Less fossil fuel will be burned. ☐

It will stop lorries using the motorway. ☐

More people will ride bicycles. ☐ [1]

(iii) Why will people want to use the car pool lane?

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

There is someone to talk to.	☐
It is cheaper per person.	☐
They like to be in the right hand lane.	☐
They won't be stuck in traffic jams.	☐

[2]

(b) Polluting gases from car engines include:

- carbon dioxide
- carbon monoxide
- nitrogen oxides

Which of these will be reduced if there are fewer cars on motorways?

Put a (ring) around the correct answer.

all of them **carbon dioxide only** **none of them** [1]

(c) Pollution from cars is reduced by using catalytic converters.

Catalytic converters change carbon monoxide to carbon dioxide and change nitrogen oxides to nitrogen.

How do the amounts of gases produced by a car change when a catalytic converter is used?

Put ticks (✓) in the correct boxes in the table.

	decreases	**increases**	**stays the same**
carbon dioxide			
carbon monoxide			
nitrogen oxides			

[2]

(d) Petrol is made up of compounds of carbon and hydrogen **only**.

(i) What is the name given to these compounds?

Put a (ring) around the correct answer.

carbohydrates **hydrocarbons** **polymers** [1]

(ii) When petrol burns, the **carbon** atoms react with oxygen to make carbon dioxide.

Finish the diagram to show the reaction.

carbon oxygen carbon dioxide [1]

[Total: 9]

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Question 2 starts on page 6.

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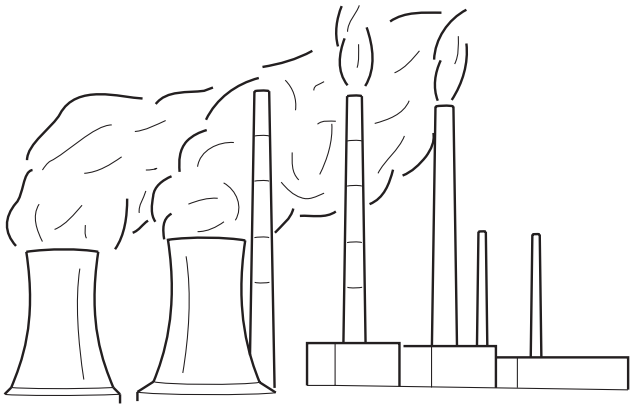
2 This question is about pollution from power stations.



One of the pollutants from power stations is sulfur dioxide.

Sulfur dioxide levels are measured at different distances from a power station. The table shows the results on one day.

distance from power station in metres	concentration of sulfur dioxide in μg / m^3
0	64
500	50
1000	14
1500	8
2000	3

(a) Levels of sulfur dioxide higher than 50 μg / m^3 are considered harmful to humans.

Where was the air harmful?

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

At the power station. ☐

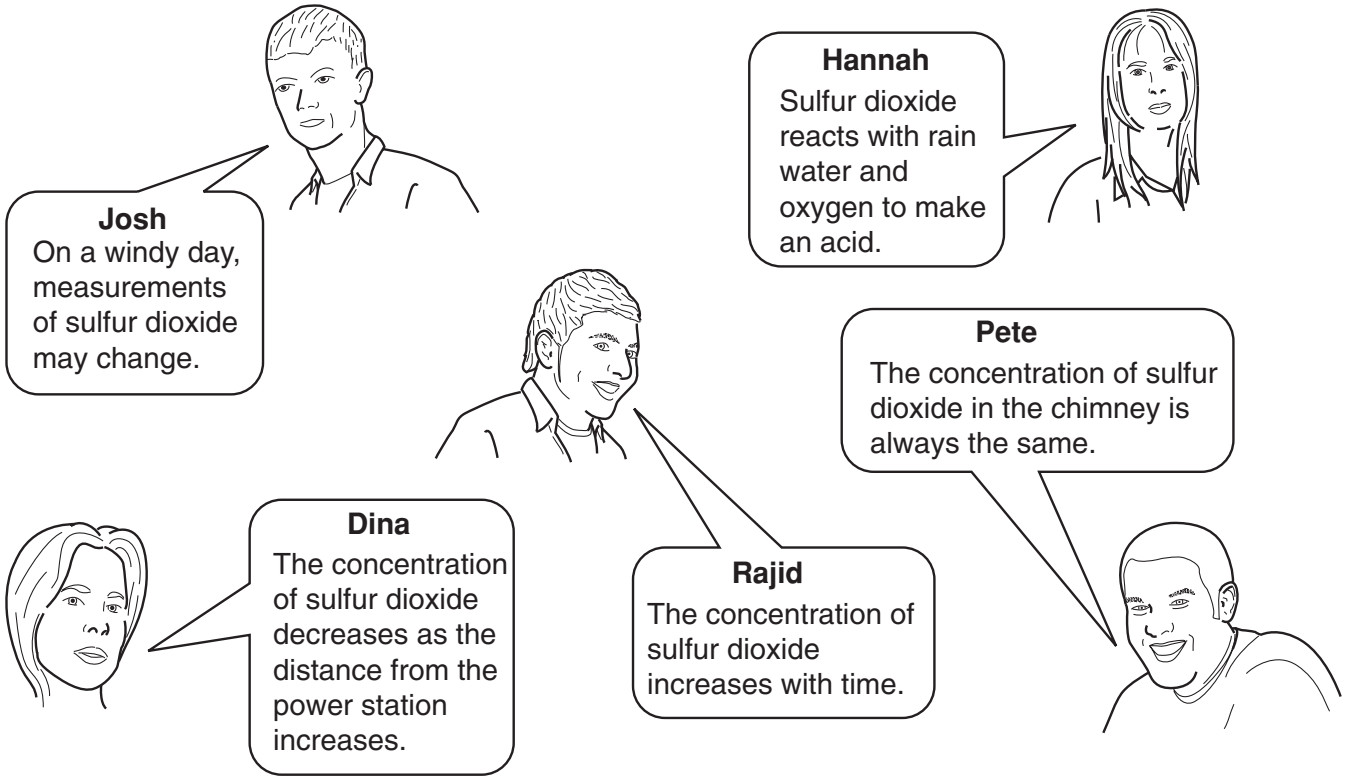
Less than 500 metres from the power station. ☐

More than 500 metres from the power station. ☐

Between 500 metres and 1000 metres from the power station. ☐

[2]

(b) Here is what five students said about the data in the table.



(i) Which **one** person has described the correlation in the table?

..... [1]

(ii) On another day, the concentrations of sulfur dioxide are lower.

Which **two** people have suggested explanations for this change?

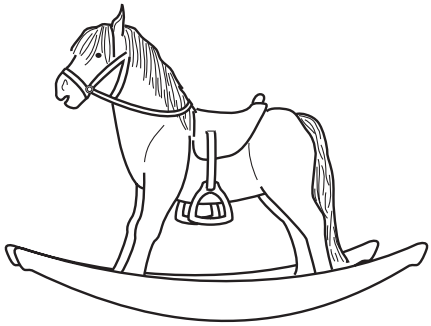
..... [2]

(iii) Who has explained how sulfur dioxide is removed from the air?

..... [1]

[Total: 6]

3 Julie and Sam are designing a new rocking horse for a toy company.



The rocking horse will be used by children between three and eight years old.
They should be able to move it around.
It must be strong enough to sit on.
It must not be dangerous.
It must be cheap to buy.

They test a number of materials.

The table gives the results of these tests.

material	strength	density	flexibility	cost
iron	very strong	high	low	medium
polypropylene	strong	low	high	low
wood	strong	medium	medium	high

They choose to make the rocking horses with polypropylene.

(a) Use the table to answer these questions.

(i) Which **two** properties of polypropylene make it better than iron or wood for making the rocking horse?

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

strength ☐

density ☐

flexibility ☐

cost ☐

[2]

(ii) Which property of polypropylene is the **main** disadvantage for making the rocking horse?

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

strength	☐
density	☐
flexibility	☐
cost	☐

[1]

(b) Julie says it would be better for the environment if the rocking horses were made of wood. Which of the following explains this?

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

Wood is a natural material.	☐
Wood has to be carved into shape.	☐
Wood is strong.	☐
Wood is a renewable material.	☐

[1]

(c) Sam says there are **three** different ways of getting rid of the polypropylene rocking horse at the end of its life. These will also affect the environment.

Finish the sentences. Choose words from this list.

burned
disposed
energy
landfill
products
recycled
rot
rust

The polypropylene rocking horse can be dumped in …… where it will not …… .

It can be put in an incinerator and …… .

It can be …… to make new products. [3]

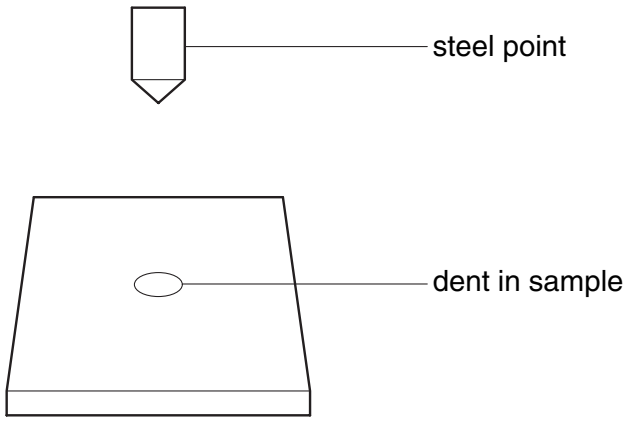
[Total: 7]

4 A scientist measures the hardness of two different materials, X and Y.

A machine presses a steel point into samples of each material.

The machine uses the same force each time.

A hardness number is calculated from the size of the dent in the sample: the higher the number the harder the material.



(a) Each type of material is tested several times. The results are shown in the table.

	hardness number						
material	**sample 1**	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**sample 6**	**mean**
X	8	10	9	8	7	12	9
Y	18	20	16	7	21	20	19

The mean hardness has been calculated for each material.

One result has not been used to calculate the mean for **material Y** because it is an outlier.

(i) Which result is the outlier?

Put a (ring) around the correct sample number.

1 **2** **3** **4** **5** **6** [1]

(ii) Here are four suggestions why this test gave the wrong result.

A	Samples of X and Y had been mixed up.
B	The steel point had been pressed with a larger force.
C	The steel point had been pressed with a smaller force.
D	The steel point had not been pressed into the sample.

Write down the letters of the **two** best suggestions.

answer ..... and ..... [2]

(b) All the test results for material X are reliable, but there are small differences between their values.

Why are these values different?

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

Samples of X and Y had been mixed up. ☐

Samples of X may vary. ☐

It is not a fair test. ☐

The steel point had not been pressed into the samples. ☐

[1]

(c) Complete the table below to show the range of hardness number for material X.

	range
range for X	

[1]

[Total: 5]

5 Read this article.

There will be no more blue Smarties

The manufacturer is removing all artificial colours from Smarties. There is no natural alternative to the blue chemical used now.

The blue will be replaced by a white Smartie.

A recent study showed a possible harmful effect on the nervous system due to artificial colours and chemicals.

The blue colouring may cause hyperactivity and skin rashes. It is also listed as a cancer risk by the US Environmental Protection Agency.

A scientist said 'It is great news for children's health. We would now like to see the Government announce a total ban on the blue colouring.'

(a) Why are blue Smarties no longer being made?

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

Eating a blue Smartie will give all children a rash. ☐

All children who eat blue Smarties will develop health problems. ☐

The blue colouring may make some children hyperactive. ☐

All artificial additives will harm children. ☐ [1]

(b) Why would the scientist like to see the Government ban the blue colour?

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

To stop blue Smarties from being made. ☐

The blue colour is used in other foods. ☐

So the risk can be measured. ☐

To make Smarties cheaper. ☐

To reduce the risk to children's health. ☐ [1]

(c) Here are three statements about food additives.

Put ticks (✓) in the correct boxes to show whether each statement is **true** or **false**.

	true	**false**
Additives with an E number have passed a safety test.		
Preservatives slow down the growth of microbes.		
All natural additives are harmless.		

[2]

[Total: 4]

6 This is a question about farming.

(a) Here are five sentences explaining why a wheat field becomes less fertile each year. They are in the wrong order.

A	Wheat uses these nitrogen compounds to make proteins in the plant.
B	There are nitrogen compounds in water in the soil.
C	Wheat is harvested and taken from the field.
D	Wheat plants take in nitrogen compounds through their roots.
E	The concentration of nitrogen compounds in the soil falls.

Fill in the boxes to show the right order. The last one has been done for you.

				E

[3]

(b) Here are three statements about the advantages and disadvantages of intensive farming.

For each one write **A** if it is an advantage or **D** if it is a disadvantage.

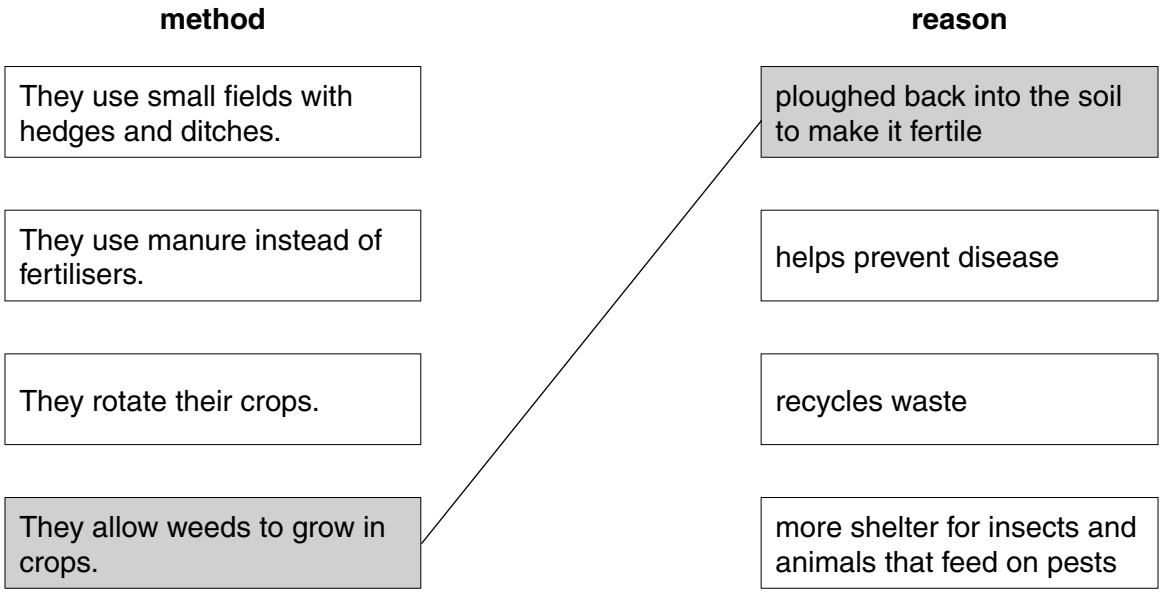
statement	A (advantage) or D (disadvantage)
Food is cheaper.	
Less land is needed.	
Soil structure may be damaged.	

[2]

(c) The lists below show different organic farming methods and the reasons for their use.

Draw a straight line from each **method** to the correct **reason**.

One has been done for you.



[2]

[Total: 7]

7 The Government is worried about the increase in childhood obesity.
The number of 2 to 11 year olds who are obese has risen steadily over the past 10 years.

(a) Here are some sentences about obesity.

Finish the sentences using words from this list.

diabetes

exercise

insulin

measles

protein

Obesity is caused by eating too much food and not getting enough …… .

Obesity increases the risk of heart disease and …… . [2]

(b) Politicians want to pass laws to help reduce childhood obesity.

Here are some actions they could take.

Which **two** actions may help reduce obesity?

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

Banning salads from school lunches. ☐

Banning fizzy drinks machines from schools. ☐

Banning junk food advertising. ☐

Banning the sale of bottled water in schools. ☐

[2]

[Total: 4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
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						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** 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.