OCR
RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A
Unit 1 Modules C1 C2 C3
FOUNDATION TIER
THURSDAY 21 JUNE 2007

F **A321/01**

Afternoon
Time: 40 minutes

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

CUP/T45563

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**9**	
2	**5**	
3	**9**	
4	**5**	
5	**8**	
6	**6**	
TOTAL	**42**	

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

[Turn over

Answer **all** the questions.

1 In February 2003 a traffic Congestion Charging Scheme (CCS) was introduced in London.

Drivers have to pay if their vehicles enter central London.

These tables show how the traffic and the air quality in central London changed from 2002 to 2003.

type of vehicle	change in distance travelled
cars	29% decrease
buses	20% increase
motorcycles	3% increase
lorries	11% decrease
taxis	13% increase

type of pollution	change in air quality
carbon dioxide	20% decrease
nitrogen dioxide	16% decrease
particulates	16% decrease

(a) (i) Which types of vehicles travelled **less** distance after the Congestion Charging Scheme (CCS) was introduced?

Put a (ring) around the **two** correct answers.

cars **buses** **motorcycles** **lorries** **taxis**

[2]

(ii) Which of these statements describes how the air quality changed after the CCS was introduced?

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

Carbon dioxide, nitrogen dioxide and particulates all increased.	☐
Carbon dioxide decreased more than nitrogen dioxide and particulates.	☐
Carbon dioxide increased but nitrogen dioxide and particulates decreased.	☐
Carbon dioxide, nitrogen dioxide and particulates all decreased by the same amount.	☐

[1]

(iii) The data shows correlations between travel by some types of vehicles and air quality.

Complete this sentence to describe the correlation for **one** type of vehicle.

As the distance travelled by vehicles such as ..... decreased,

the percentage of nitrogen oxides in the air ...... [2]

(iv) The distance travelled by buses and taxis increased after CCS was introduced.

How may this have helped to reduce air pollution?

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

Buses and taxis use less fuel per kilometre than cars.	☐
Buses and taxis now travel a greater number of kilometres.	☐
Buses and taxis carry more people in each vehicle than cars.	☐
Buses and taxis do not give out carbon dioxide, nitrogen dioxide and particulates.	☐

[1]

(b) Carbon dioxide and nitrogen oxides produced by vehicles do not stay in the air.

Which of these statements describes one way that **both** of these gases are removed from the air?

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

They are both lost into space.	☐
They both dissolve in rain water.	☐
They are both deposited on surfaces, making them dirty.	☐
They are both used by plants in the process of photosynthesis.	☐

[1]

(c) The main gases in non-polluted air are argon, nitrogen and oxygen.

Finish the table below to show the percentage of each of these gases in non-polluted air.

Write the name of each gas, **argon**, **nitrogen** or **oxygen**, next to its correct percentage.

name of gas	percentage
	78
	21
	1

[2]

[Total: 9]

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Question 2 starts on page 6

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2 Many power stations burn natural gas to generate electricity.

Natural gas contains methane, which is made of hydrogen and carbon atoms only.

(a) What scientific term can be used to describe a compound that is made of hydrogen and carbon atoms only?

Put a (ring) around the correct answer.

carbohydrate **hydrocarbon** **hydroxide** **polymer**

[1]

(b) When methane burns completely in air, the hydrogen and carbon atoms combine with oxygen to form products.

Draw a straight line from each **atom** to the correct **product of complete combustion**.

atom	**product of complete combustion**
	carbon monoxide
carbon	carbon dioxide
	hydrogen peroxide
hydrogen	sodium hydrogencarbonate
	water

[2]

(c) (i) Fossil fuels such as natural gas and coal may contain sulfur.

When these fuels are burned, the sulfur reacts with oxygen to make sulfur dioxide.

Finish the diagram to show this reaction.

sulfur + oxygen → sulfur dioxide

[1]

(ii) Sulfur dioxide is a pollutant gas released from power stations that burn fossil fuels.

It forms acid rain which corrodes buildings and statues.

How can the **public** help to reduce the amount of sulfur dioxide released from these power stations?

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

People could use their cars less.	☐
People could use electricity instead of gas to heat their homes.	☐
People could turn down the gas central heating in their homes.	☐
People could use less electricity by switching off appliances when they are not being used.	☐

[1]

[Total: 5]

3 Read this article about diabetes.

Number of diabetes cases rises

More than 2 million people in the UK now have diabetes. Experts blame the growing obesity problem for the increase in the number of people who have this condition. About 75% of all cases are type 2 diabetes and 25% are type 1.

More than 65% of men and 55% of women in the UK are overweight or obese, which is a major cause of type 2 diabetes. Experts blame an increase in obesity on the high levels of sugar and fat in the diets of many people.

There has been a large increase in the number of children with type 2 diabetes. Very few children had type 2 diabetes a decade ago.

Diabetes is a serious illness. People with diabetes must get the care and education they need because diabetes can lead to heart disease, strokes, kidney disease, amputations and blindness.

(a) The table gives information about the two types of diabetes.

Put ticks (✓) in the correct boxes to show whether each of the statements best applies to type 1 **or** type 2 diabetes.

statement	type 1 diabetes	type 2 diabetes
controlled by insulin injections		
controlled by diet and exercise		
usually occurs in people over 50		
the body no longer responds to its own insulin		

[3]

(b) Which chemicals in our food may be the cause of the increase in diabetes described in the article?

Put a (ring) around the **two** correct answers.

fat **fibre** **minerals** **protein** **sugar**

[2]

(c) Give **two** examples of health problems that people with diabetes may suffer.

Use examples from the article.

1 .....

2 ..... [2]

(d) Many people continue to eat a poor diet, despite the increased chance of getting diabetes.

Which statements offer reasons for why people are willing to take this risk?

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

Most people are not overweight.	☐
Diabetes is not a serious illness.	☐
Most people will not get diabetes.	☐
Poor diet does not cause diabetes.	☐
Most people are not aware of how serious diabetes is.	☐

[2]

[Total: 9]

4 Sam and Zoe are shopping in a supermarket.

Sam looks at the ingredients on the label of a packet of 'instant' onion soup.

(a) (i) What is the job of the preservative in this product?

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

to make the product taste sweeter	☐
to give the product a better flavour	☐
to give the product an attractive colour	☐
to stop microbes from growing on the product	☐

[1]

(ii) When soup powder is mixed with hot water, the ingredients may separate. The emulsifier stops this happening.

Which substances in the soup are likely to separate if no emulsifier is present?

Put a (ring) around the **two** best answers.

flavour **enhancer** **preservative** **starch** **vegetable oil** **water**

[2]

(b) Zoe says that they should buy fresh onions and use them to make soup.

She says that this soup will contain fewer harmful additives.

(i) Sam says that additives with an E number are safe to eat.

Which of these statements suggests he may be correct?

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

Additives with an E number have passed a safety test.	☐
Additives with an E number have been used for many years.	☐
Additives with an E number are approved for use in the UK and Europe.	☐
Additives with an E number cause problems for people with food allergies.	☐

[1]

(ii) Zoe says that they should buy organically grown vegetables because these contain no harmful chemicals.

She says that other farmers may use pesticides that remain in the onions.

Organic farmers do not use pesticides. What other chemicals are **not** used by organic farmers?

Put a (ring) around the **two** best answers.

lime **manure** **synthetic fertiliser** **weedkiller**

[1]

[Total: 5]

5 Scientists working for a plastics company test samples of poly(ethene) to see how much they stretch before breaking.

They measure what percentage of the original length each sample will stretch to.

Their results are shown in the table.

sample	1	2	3	4	5	6	7
percentage (%)	237	293	243	242	238	239	241

(a) The scientists got a best estimate for the stretching of this poly(ethene) by working out the mean (average) of these results.

They did not include the result for sample 2 when they made this calculation.

(i) What term can be used to describe the result for sample 2?

Put a (ring) around the correct answer.

mean **optimum** **outlier** **range**

[1]

(ii) Why did the scientists **not** include the result for sample 2 in their calculation of the mean?

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

It is the highest value. ☐

They only needed six results. ☐

It is much higher than all of the other results. ☐

It is higher than the mean of the other results. ☐

[1]

(iii) What is the mean (average) of the other six results?

Put a (ring) around the correct answer.

237 **240** **248** **293**

[1]

(iv) The scientists measured the stretching of several samples rather than just one.

They did this because they thought that it would lead to a better estimate of the percentage of stretching.

Why might this lead to a better estimate?

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

Measurements can vary due to human error.	☐
The scientists are learning how to take the measurements.	☐
The more measurements that are made, the more accurate they are.	☐
There may be small variations between different samples of the material.	☐

[2]

(b) This poly(ethene) is used to make cling film.

Cling film can be used to wrap up food such as sandwiches.

Before cling film was invented, sandwiches were usually put into paper bags.

(i) The Life Cycle Assessments (LCAs) for sandwich wrapping made from poly(ethene) and from paper are different.

Choose the two rows of information in this table that show why these LCAs are different.

Put ticks (✓) next to the **two** correct rows.

poly(ethene)	paper	tick (✓) two rows
used for the past 50 years	used for hundreds of years	
non-biodegradable	biodegradable	
stretches when pulled hard	breaks when pulled hard	
transparent	opaque	
made from crude oil	made from trees	

[2]

(ii) The poly(ethene) that is used to make cling film has a plasticizer added to it.

How does the plasticizer change the properties of poly(ethene)?

Finish the sentence by choosing the **best** word from this list.

darker **harder** **softer** **stronger**

The plasticizer makes the poly(ethene) ..... [1]

[Total: 8]

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Question 6 starts on page 16

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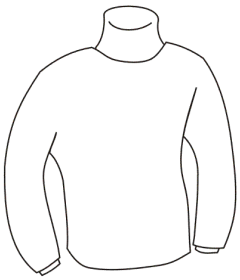
6 A wide variety of fibres can be used to make clothes.

cotton



wool

nylon

The table shows properties of some fibres, and the clothes made from them.

Each property has been scored from 0 (low) to 9 (high).

fibre	property				
	stretchiness	**heat insulation**	**water absorbance**	**strength**	**comfort when worn next to skin**
cotton	4	8	9	4	7
PVC	9	2	0	8	1
nylon	9	2	0	9	2
silk	2	4	4	3	9
wool	6	9	4	4	2

(a) Look at the table.

Which of the fibres are **synthetic**?

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

(b) (i) Suggest which fibre in the table would be the **best** choice for making clothes to keep you warm in the winter.

..... [1]

(ii) Which **property** of this fibre shows that it is a good choice **for this use**?

..... [1]

(c) Cotton is used to make underwear.

Which statement best describes the advantage of cotton for this use?

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

Cotton is very strong.	☐
Cotton will make you too hot.	☐
Cotton will absorb a lot of sweat.	☐
Cotton does not stretch very much.	☐

[1]

(d) Silk is a very expensive material. Cotton is a cheap material.

Some people pay a high price for silk underwear.

Which statement gives the best reason for their choice?

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

Cotton stretches more.	☐
Silk absorbs less water.	☐
Cotton gives more heat insulation.	☐
Silk is more comfortable next to the skin.	☐

[1]

[Total: 6]

END OF QUESTION PAPER

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Acknowledgements:
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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.