THIS IS A LEGACY SPECIFICATION

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RECOGNISING ACHIEVEMENT

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Thursday 26 January 2012 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A321/01 Unit 1: 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: 40 minutes

A321012

04412728388

Candidate forename		Candidate surname	

Centre number						Candidate number				

MODIFIED LANGUAGE

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 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 **42**.
- The Periodic Table is printed on the back page.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 In the centre of Town **A** people can walk in the streets but cars cannot drive along the streets.

In the centre of Town **B** cars can drive along the streets.

Scientists compare the concentration of carbon particulates in samples of air from the centres of these two towns.

Samples were collected at one place in each town. The samples were collected at the same time on the same day.

The results are shown in the table.

	concentration of carbon particulates in µg/m^3						
	sample 1	sample 2	sample 3	sample 4	sample 5	sample 6	best estimate
Town **A**	13	11	14	10	12	24	12
Town **B**	64	66	66	65	67	68	

(a) For Town **A**, the scientists work out the mean (average) of the concentration of carbon particulates. They use this as the best estimate.

They decide that sample 6 for Town **A** is an outlier. They do not use this measurement when working out the mean for Town **A**.

(i) Why do the scientists think that the measurement for sample 6 for Town **A** is an outlier?

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

It is the highest measurement. ☐

It is the last sample that they measured. ☐

It is higher than the mean. ☐

It is well outside the range of the other measurements. ☐

[1]

(ii) Why do the scientists not use the outlier when working out the mean for Town **A**?

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

It would make the best estimate less accurate.	☐
It is the highest value in the range.	☐
They only need five measurements to calculate the mean.	☐
It is likely to have resulted from an error in measurement.	☐
The last measurement is never used to work out the mean.	☐
It is easier to divide by 5 than divide by 6.	☐

[2]

(b) (i) What is the range of the results for Town **B**?

The range is from ..... to ..... $\mu g/m^3$. **[1]**

(ii) For Town **B**, work out the best estimate for the concentration of carbon particulates.

Show your working.

best estimate = ... $\mu g/m^3$ **[2]**

(c) The scientists think that carbon particulates come from cars.

How do their results support this idea?

.....

.....

.....

.....

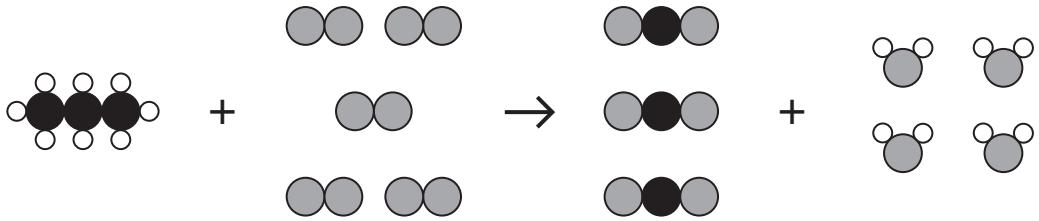
..... **[3]**

[Total: 9]

2 Propane is a fuel used for central heating.

When propane burns completely it produces carbon dioxide, CO_2, and water, H_2O.

The diagram shows this reaction.



propane oxygen carbon dioxide water

(a) Finish this table to show the number of **molecules** of reactants and the number of molecules of products, when **one** molecule of propane burns completely.

	reactants		**products**	
	propane	oxygen	carbon dioxide	water
number of molecules	1		3	

[2]

(b) Finish this table to show the total number of **atoms** of each element, in the reactants and in the products, when **one** molecule of propane burns completely.

	elements		
	carbon	hydrogen	oxygen
total number of atoms in reactants	3	8	10
total number of atoms in products			

[1]

(c) When there is not enough air, propane does not burn completely.

Carbon dioxide and water are formed, and two other products.

These two other products cause air pollution.

Name these two other products.

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

[Total: 5]

3 This question is about the chemicals in crude oil and polymers made from the chemicals.

(a) The chemicals in crude oil are hydrocarbons.

Name the elements in hydrocarbons.

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

(b) Some of the chemicals in crude oil are used to make polymers such as poly(ethene).

(i) What is the name of the process used to make polymers?

Put a (ring) around the correct answer.

combustion **crystallisation** **polymerisation** **photosynthesis**

[1]

(ii) Describe what happens to the molecules in the process used to make polymers.

.....

.....

.....

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

(c) Some older materials have been replaced by new polymers made from crude oil.

(i) Give an example of something that was made from an old material that is now made from a new polymer material.

example .....

old material .....

new material ..... **[3]**

(ii) Explain how the new material is better than the old material for making your example.

.....

.....

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

[Total: 9]

4 (a) (i) Different types of additives are sometimes added to food.

For each **additive** (in the first column) draw a straight line to its best **description** (in the second column).

additive	description
preservative	has passed a safety test
artificial sweetener	mixes ingredients together
emulsifier	reduces the amount of sugar
additive with an E number	prevents growth of microbes

[3]

(ii) Antioxidants are added to some foods.

Explain why.

Your answer should include

- the type of food that antioxidants are added to
- why it is necessary to add antioxidants to this type of food
- what reaction antioxidants prevent.

.....

.....

.....

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

(b) Some processed foods contain high levels of sugar.

Complete the sentences about what happens to sugar after it is eaten.

Use words from this list.

Each word may be used once, more than once or not at all.

absorbed **air** **blood** **condensed** **decrease**

evaporated **fall** **rise** **urine**

Sugar is quickly ..... into the ..... stream.

This causes a rapid ..... in ..... sugar level. **[3]**

[Total: 9]

5 Some farmers use pesticides to increase crop yield.

(a) Explain how pesticides increase crop yield.

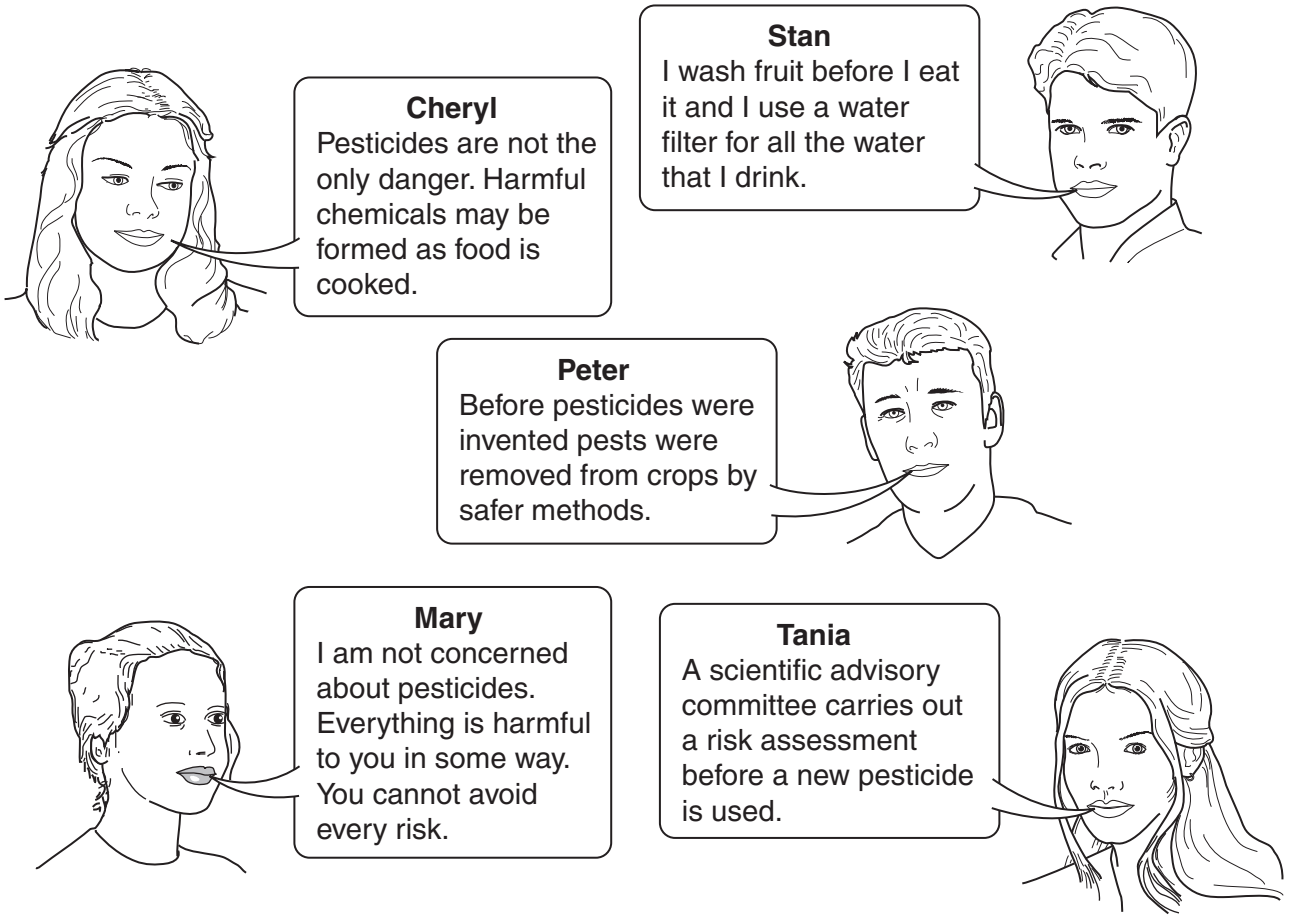
.....

.....

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

(b) Pesticides can stay on food or get into water supplies.

Some students are talking about the risk of using pesticides.



(i) Who explains why nothing can be completely safe?

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

(ii) Who suggests ways to reduce the risk from pesticides on food?

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

(iii) Who describes how the safe levels of chemicals in food are decided?

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

[Total: 5]

6 Window frames can be made from wood or uPVC (unplasticized polyvinylchloride).

The table shows data from a Life Cycle Assessment (LCA) for window frames of the same size, made from each of these two materials.

part of LCA		wood	uPVC
A	total energy used	9150 MJ	9700 MJ
B	fossil fuel used	5.6 kg	18.2 kg
C	carbon dioxide produced	450 kg	500 kg
D	air pollutants formed (arbitrary units)	890	380
E	acid rain formed (arbitrary units)	29	38
F	water pollution (arbitrary units)	67	2

(a) The results of the LCA can help to decide whether it is more sustainable to make window frames from uPVC rather than wood.

Look at the data in the table.

Which two parts of the table show that it may be more sustainable to make a window frame from uPVC?

Put a (ring) around each of the **two** correct letters.

A **B** **C** **D** **E** **F**

[2]

(b) Which of the following statements support the idea that making window frames from wood is more sustainable than making window frames from uPVC?

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

Wood can be painted or stained to the required colour.	☐
Wood can be cut and joined to make window frames.	☐
Trees can be grown to get more wood.	☐
uPVC can be coloured as it is made.	☐
uPVC is made from chemicals in crude oil, which is not renewable.	☐
uPVC can be moulded to make any shape.	☐

[2]

(c) PVC is much more flexible than uPVC because it contains a plasticizer.

PVC is used to make covering material for sofas and chairs.

Which statement explains why the plasticizer makes this PVC more flexible than uPVC?

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

The polymer chains are shorter.	☐
There are fewer cross-links between polymer chains.	☐
The forces of attraction between polymer chains are reduced.	☐
Different molecules are joined together to make the polymer.	☐

[1]

[Total: 5]

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.