

**Thursday 26 January 2012 – Morning**

**GCSE TWENTY FIRST CENTURY SCIENCE  
CHEMISTRY A**

**A321/02** Unit 1: C1 C2 C3 (Higher 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



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 $\mu\text{g}/\text{m}^3$							
	sample 1	sample 2	sample 3	sample 4	sample 5	sample 6	best estimate
Town <b>A</b>	13	11	14	10	12	24	
Town <b>B</b>	64	66	66	65	67	68	66

- (a) The scientists use their results from the centre of Town **B** to work out the best estimate of the concentration of carbon particulates in the centre of Town **B**.

- (i) Work out the best estimate for the concentration of carbon particulates in the centre of Town **A**.

Show your working.

best estimate = .....  $\mu\text{g}/\text{m}^3$  [2]

- (ii) Look at the measurements for Town **B**.

Comment on the repeatability of these measurements. Explain your answer.

.....

.....

.....

..... [2]

(iii) The scientists decide that there is a real difference between the measurements for Town **A** and the measurements for Town **B**.

Which statements support this decision?

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

The mean for Town **B** is higher than the mean for Town **A**.

The ranges for Town **A** and Town **B** do not overlap.

The measurements for Town **B** do not include an outlier.

The range for Town **A** is higher than the range for Town **B**.

None of the measurements for Town **A** are identical, but two of the measurements for Town **B** are identical.

The mean for Town **B** is outside the range of the measurements for Town **A**.

[2]

(b) 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,  $\text{CO}_2$ , and water,  $\text{H}_2\text{O}$ .

This diagram shows the atoms in a molecule of propane.



(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		
total number of atoms in products	3		

[2]

(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: 6]

3 This question is about the chemicals in crude oil.

(a) Crude oil is a mixture of chemicals.

Which two of these statements describe evidence that crude oil is a mixture of chemicals?

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

Crude oil is a viscous, dark-coloured liquid.

Crude oil can be separated into a number of useful fractions with different boiling points.

Crude oil was made from the remains of living organisms.

Only a small percentage of crude oil is used for chemical synthesis.

The molecules in crude oil have different chain lengths.

The molecules in crude oil are all made of the same elements.

[2]

(b) The chemicals in crude oil are hydrocarbons.

Name the elements in hydrocarbons.

..... [1]

(c) Crude oil is refined to make three **types** of useful product.

Fuels are one type of useful product.

What are the other two **types** of useful product?

1. ....

2. .... [2]

[Total: 5]

- 4 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
<b>A</b>	total energy used	9150 MJ	9700 MJ
<b>B</b>	fossil fuel used	5.6 kg	18.2 kg
<b>C</b>	carbon dioxide produced	450 kg	500 kg
<b>D</b>	air pollutants formed (arbitrary units)	890	380
<b>E</b>	acid rain formed (arbitrary units)	29	38
<b>F</b>	water pollution (arbitrary units)	67	2

- (a) Use data from the table to compare the sustainability of making window frames from wood with window frames made from uPVC.

In your answer you should make clear how data in the table help to show why one material may be more sustainable than the other.

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (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]

- (d) Adding plasticizer to a polymer lowers its melting point.

Briefly describe **two** other modifications of polymers that lower the melting point.

1. ....

2. .... [2]

[Total: 9]

5 This question is about some of the chemicals added to food.

(a) (i) Some processed foods contain emulsifiers and stabilisers.

Which of these statements about emulsifiers and stabilisers are **true** and which are **false**?

Put ticks (✓) in the correct boxes to show your answers.

Emulsifiers and stabilisers ...

	<b>true</b>	<b>false</b>
help to mix ingredients together.	<input type="checkbox"/>	<input type="checkbox"/>
prevent the growth of harmful microbes.	<input type="checkbox"/>	<input type="checkbox"/>
reduce the amount of sugar in the food.	<input type="checkbox"/>	<input type="checkbox"/>
prevent ingredients such as oil and water from separating.	<input type="checkbox"/>	<input type="checkbox"/>
help to separate unwanted ingredients from the food.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

(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 food additives are given E numbers.

Which two of these statements about food additives with E numbers are correct?

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

- They have passed a safety test.
- It is impossible for them to do you any harm.
- They cannot be used in food for children.
- Only food colourings have E numbers.
- They are approved for use in the European Union.

[2]

(c) When organic food is eaten, it may contain harmful chemicals.

Suggest **two** ways that organic food may contain harmful chemicals.

- 1. ....
- 2. .... [2]

[Total: 9]

6 Some farmers use synthetic pesticides and herbicides to increase crop yield.

Some of these chemicals may remain on fruit and vegetables or get into water supplies.

(a) Most people will eat fruit and vegetables that have been sprayed with synthetic pesticides and herbicides.

Use ideas about risk to explain why they do this.

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

(b) Some people who eat only organic fruit and vegetables apply the **precautionary principle**.

Which two statements, **when taken together**, describe their use of the precautionary principle?

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

- The residues of pesticides and herbicides left in food are very large.
- We are not sure if synthetic pesticide and herbicide residues in food are harmful.
- The chemicals used in pesticides and herbicides are very poisonous.
- Pesticides and herbicides can harm the environment.
- Organic farming methods do not use synthetic pesticides and herbicides.
- Pesticides and herbicides are made using chemicals from crude oil.

[2]

[Total: 4]

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

