

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

A321/01

Unit 1: 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)

**Wednesday 17 June 2009
Morning**

Duration: 40 minutes



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

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**.
- This document consists of **16** pages. Any blank pages are indicated.





Answer **all** the questions.

1 This question is about gases that may be found in the air.

(a) The table shows the names and formulas of four gases. It also shows diagrams representing a molecule of each gas.

Draw straight lines to join each **name** with the correct **formula** and correct **molecule**.

Use the key below the table to help you.

name	formula	molecule
nitrogen monoxide	CO	
carbon monoxide	NO	
water vapour	SO ₂	
sulfur dioxide	H ₂ O	

Key: ● carbon ○ hydrogen ◐ nitrogen ● oxygen ◑ sulfur

[4]

(b) Choose from the four gases in the table

(i) a gas that causes acid rain [1]

(ii) a gas made when a hydrocarbon burns with a poor supply of oxygen, but not made when there is plenty of oxygen [1]

(iii) a gas that does not cause pollution [1]

[Total: 7]

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4

- 2 A power station burning coal releases sulfur dioxide into the air.

On most days, wind blows fumes from the power station across a nearby town.

A new device is fitted to reduce the amount of sulfur dioxide released into the air.

A scientist takes measurements of the sulfur dioxide concentration in the air.

He does this for five days **before** and five days **after** this device is fitted.

He takes each measurement in the same part of the town and at the same time on each day.

These results are shown in the table.

	sulfur dioxide concentration in $\mu\text{g}/\text{m}^3$				
day of sample	1	2	3	4	5
before device fitted	644	578	355	613	593
after device fitted	322	318	297	307	311

- (a) Why did the scientist take measurements on more than one day before and more than one day after the device was fitted?

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

to make sure his measuring device was working

☐

to get practice in using his measuring device

☐

to obtain a more reliable set of results

☐

to use one of the results as a control

☐

[1]

5

- (b) Look at the results taken **before** the device was fitted.

Sample 3 is much lower than the other four measurements.

- (i) The scientist says that this result is an outlier.

Which of these statements describes why this result is an outlier?

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

This is the lowest of the five results.

☐

This result is well outside the range of the other four results.

☐

This result is lower than the mean of the other four results.

☐

The other four results are all within a narrow range.

☐

[1]

- (ii) Which of these statements give the best explanations of why this result for sample 3 was lower?

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

The device was fitted on that day.

☐

There were more cars driven in the town on that day.

☐

It did not rain on that day.

☐

The wind changed direction on that day.

☐

The power station burned less coal during that day.

☐

[2]

- (c) Discarding the outlier, the measurements taken **before** the device was fitted have a mean of 607 and a range of 578 to 644

Work out the mean and the range for the measurements taken **after** the device was fitted.

mean =

range = to

[2]

6

(d) The scientist measures the mean sulfur dioxide concentration in six other towns.

He also monitors the number of children treated for asthma in these towns.

town	sulfur dioxide concentration in $\mu\text{g}/\text{m}^3$	children treated for asthma
A	153	33
B	539	84
C	328	56
D	182	37
E	452	73
F	275	49

The scientist decides that these results show a correlation.

Use words from the list to fill in the blank spaces to describe this correlation.

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

increases

decreases

stays the same

As the concentration of sulfur dioxide the number of children
treated for asthma

[1]

[Total: 7]

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- 3 Sam and Julie want to buy a large stirring spoon for making jam.

They choose from spoons made from three different materials. These are metal, plastic and wood.

They use ideas about the Life Cycle Assessment (LCA) for each spoon to help them choose.



- (a) Which of these parts of a Life Cycle Assessment will be the **same** for each type of spoon?

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

- | | |
|--|--------------------------|
| the environmental impact of making the material | <input type="checkbox"/> |
| the environmental impact of making the spoon from the material | <input type="checkbox"/> |
| the environmental impact of using the spoon | <input type="checkbox"/> |
| the environmental impact of disposing of the spoon | <input type="checkbox"/> |

[1]

- (b) Julie says that the wooden spoon is more sustainable than the other two spoons.

Which of these statements support her idea?

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

- | | |
|---|--------------------------|
| Metal spoons last a long time. | <input type="checkbox"/> |
| The supply of metal ores is finite. | <input type="checkbox"/> |
| Trees have to be chopped down to make wood. | <input type="checkbox"/> |
| More trees can be planted to replace those used for wood. | <input type="checkbox"/> |
| Some plastics can be recycled. | <input type="checkbox"/> |
| Plastics are made from crude oil, which will one day run out. | <input type="checkbox"/> |
| Plastic and metal spoons can be cleaned easily. | <input type="checkbox"/> |

[3]

- (c) Sam and Julie look at some of the properties of the materials used to make the three spoons.

type of spoon	material	melting point	density in g / cm ³	resistance to staining
metal	stainless steel	1400°C	8.0	very good
plastic	poly(ethene)	softens at 110°C	0.8	fair
wood	wood	burns at 300°C	0.6	poor

To make jam, fruit and sugar are stirred at about 110°C.

Julie thinks that the metal spoon would be best for making jam.

Which statements support her idea?

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

The metal spoon is the heaviest.

☐

The metal spoon is not stained by the fruit juice.

☐

The plastic spoon may get too soft to use.

☐

The plastic spoon is too heavy to stir for a long time.

☐

The wooden spoon is stained by the fruit juice.

☐

The wooden spoon may catch fire.

☐

The wooden spoon is too heavy to stir for a long time.

☐

[3]

[Total: 7]

10

4 This question is about materials used to make clothes.

(a) Which material in this list is **synthetic**?

Put a ring around the correct answer.

cotton

polyester

silk

wool

[1]

(b) Materials used to make clothes are made up of polymer molecules.

Complete the sentences about polymer molecules by putting a tick (✓) next to the correct word in each set.

When a polymer is made some

small	
large	
round	

molecules can join together to make very

short	
long	
circular	

molecules. This process is called

photosynthesis.	
polymerisation.	
neutralisation.	

[3]

(c) Most of the synthetic materials used to make clothes contain polymer molecules made from the hydrocarbons in crude oil.

(i) Which **two** elements are hydrocarbons made from?

Put a tick (✓) next to each correct element.

carbon

☐

copper

☐

helium

☐

hydrogen

☐

oxygen

☐

[2]

11

- (ii) Only a small percentage of these hydrocarbons are used as the raw materials for chemical synthesis.

What is the main use for the hydrocarbons in crude oil?

Put a ring around the correct answer.

food

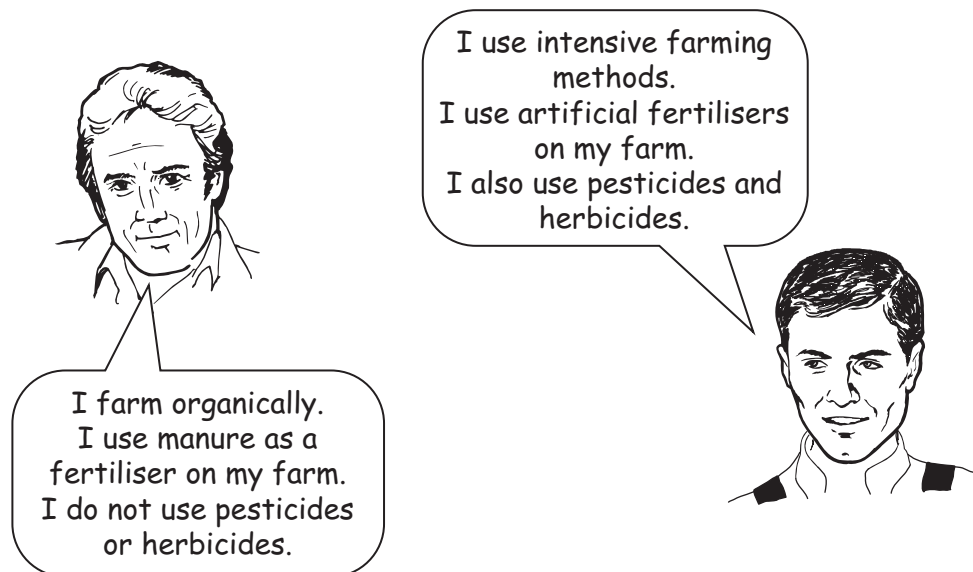
fuels

lubricants

[1]

[Total: 7]

5 Look at the comments made by these two farmers.



(a) (i) Both manure and artificial fertilisers contain compounds of nitrogen.

Why is it important for farmers to add nitrogen to the soil?

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

Adding nitrogen reduces the acidity of the soil.

☐

Plants take nitrogen from the soil as they grow.

☐

Plants use nitrogen in the process of photosynthesis.

☐

Nitrogen kills pests that attack the crops.

☐

When crops are harvested nitrogen is not replaced in the soil.

☐

[2]

(ii) Plants use nitrogen to make protein.

What other elements are contained in protein?

Put a ring around each of the **three** correct answers in this list.

calcium

carbon

chlorine

hydrogen

neon

oxygen

sodium

[2]

13

- (b) (i) Some organically grown food may contain harmful chemicals.

Which of these statements give the best explanations of how this may happen?

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

Some crops naturally contain toxic chemicals which cause harm if they are not cooked properly. ☐

Harmful chemicals from manure may be absorbed into the crops. ☐

Pesticides sprayed onto the crops may be left on the outside or absorbed into the food. ☐

Crops may take in toxic chemicals from the air. ☐

During storage, crops may be contaminated by a mould that produces toxic chemicals. ☐

[2]

- (ii) It is the job of scientific advisory committees to carry out risk assessments on food products.

Why do they carry out these risk assessments?

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

to find out if the food tastes good ☐

to find out if the food is organically grown or not ☐

to determine the safe levels of chemicals in food ☐

to see if the food contains any artificial colouring ☐

[1]

[Total: 7]

6 (a) Proteins are formed and broken down in the body.

The diagram shows how material for protein synthesis is brought to cells. It also shows how proteins are broken down and the waste material excreted.

Use terms from this list to show the material at each stage.

You may use each term once, more than once or not at all.

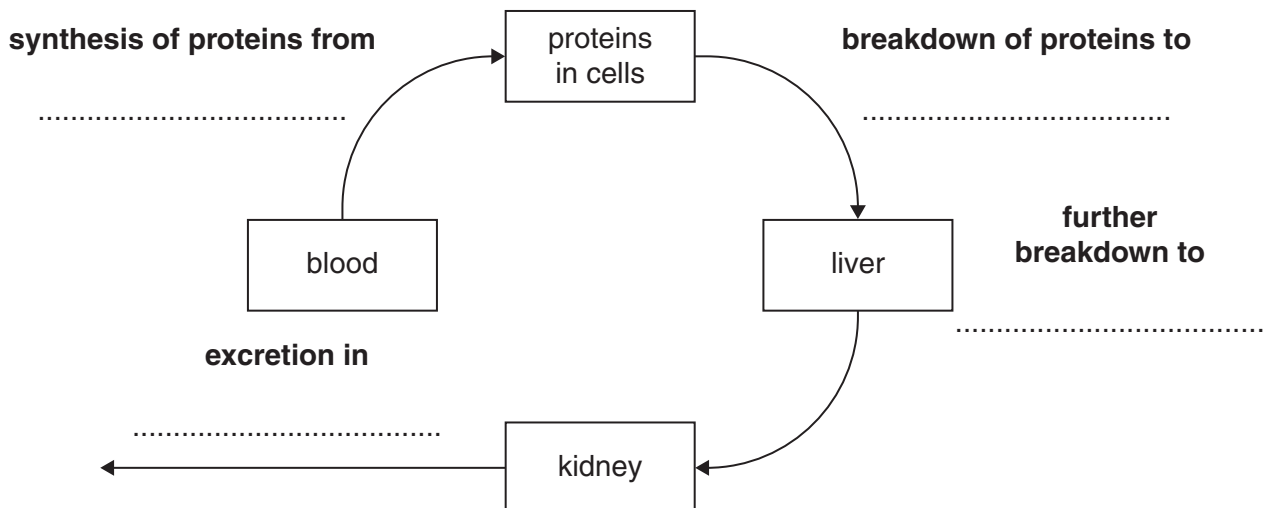
amino acids

carbohydrate

sugar

urine

urea



[4]

(b) There are two forms of diabetes.

Draw lines to join each **type of diabetes** to its **description** and **usual treatment**.

type of diabetes	description	usual treatment
	body no longer responds to its own insulin	penicillin injections
type 1	insulin is destroyed by the pancreas	diet and exercise
type 2	pancreas does not produce enough insulin	insulin tablets
	pancreas produces too much insulin	insulin injections

[2]

15

(c) Which of these is a major risk factor for type 2 diabetes?

Put a ring around the correct answer.

anorexia

asthma

obesity

sunburn

[1]

[Total: 7]

END OF QUESTION PAPER

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