Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A321/01

TWENTY FIRST CENTURY SCIENCE

CHEMISTRY A

Unit 1: Modules C1 C2 C3 (Foundation Tier)

FRIDAY 15 JUNE 2012: Afternoon

DURATION: 40 minutes
plus your additional time allowance

MODIFIED ENLARGED

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)

READ INSTRUCTIONS OVERLEAF

DC (CW/SW) 12MEP06160 62994/6

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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).**

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.**

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Answer ALL the questions.

1 This question is about gases in the air.

(a) The table (opposite) shows information about gases in the air.

Complete the table by filling in the empty boxes.

Use the key below the table to help you. [4]

(b) Carbon dioxide is released into the air when fossil fuels burn.

Most of this carbon dioxide does not stay in the air.

Give two natural processes that remove carbon dioxide from the air.

_____

_____

_____ **[2]**

NAME	PERCENTAGE IN AIR	FORMULA	DIAGRAM
	1%	Ar	
carbon dioxide	very low		
nitrogen		N_2	
oxygen	21%	O_2	

Key

 carbon

 nitrogen

 oxygen

 argon

(c) Burning fossil fuels adds other pollutant gases to the air, as well as carbon dioxide.

One of these pollutant gases is sulfur dioxide.

Name two other pollutant gases that are made when fossil fuels burn.

1 _____

2 _____ **[2]**

[Total: 8]

BLANK PAGE

2 Scientists want to know if there is a link between the concentration of sulfur dioxide in the air and the pH of rain water.

They take measurements of the sulfur dioxide concentration in the air just before it rains on several days. On the same days they also collect some rain water and measure its pH.

They use these measurements to work out the mean values for sulfur dioxide concentration in the air and the pH of rain water.

They plot their results on a scatter graph (opposite).

(a) The scatter graph shows a correlation.

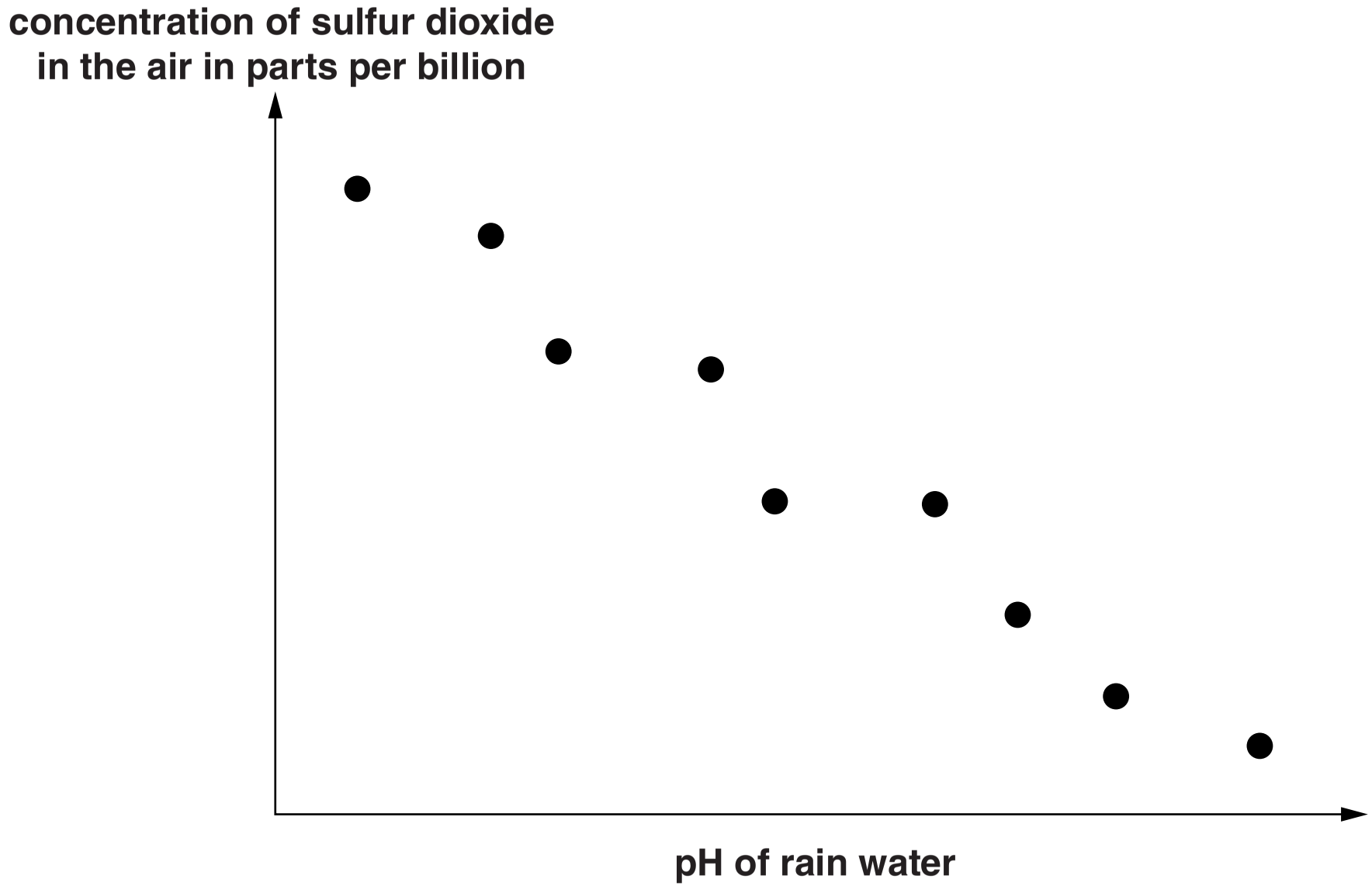
Finish this sentence to describe this correlation.

As the sulfur dioxide concentration

_____ the pH of the rain water

_____ . [2]

6


concentration of sulfur dioxide
in the air in parts per billion
pH of rain water

(b) On each day the scientists take several measurements of sulfur dioxide concentration and pH.

The measurements taken on one day are shown in the table (opposite).

They were all taken in the same place at the same time.

(i) Work out a best estimate for the pH.

Show your working.

best estimate for the pH = _____ [2]

(ii) Measurements taken at the same place but one hour later were different.

Suggest reasons why.

_____

_____

_____

_____ **[2]**

[Total: 6]

	SAMPLE 1	SAMPLE 2	SAMPLE 3	SAMPLE 4	SAMPLE 5	BEST ESTIMATE
CONCENTRATION OF SULFUR DIOXIDE IN PARTS PER BILLION	35	32	31	33	34	33
pH	5.3	5.4	5.0	5.1	5.2	

3 Both polythene and glass are materials which can be used for making bottles to contain milk.

Scientists carry out Life Cycle Assessments to decide which type of material is better.

Table 1 shows part of the Life Cycle Assessment for the bottles.

It gives the mass of pollutant gases released into the air as each bottle is made.

Table 1

POLLUTANT GAS		MASS OF POLLUTANT PRODUCED AS BOTTLES ARE MADE IN g	
		POLYTHENE	GLASS
carbon dioxide	CO_2	1792	490
nitrogen oxides	NO_x	1.091	1.586
sulfur dioxide	SO_2	0.987	2.652
carbon monoxide	CO	0.670	0.057

(a) Use this data to suggest which type of bottle is likely to cause more acid rain as a result of its manufacture.

Explain your answer.

_____

_____

_____

_____ **[2]**

(b) Glass bottles are collected, washed and refilled.

Polythene bottles are used only once.

Table 2 shows the energy used in making, filling and delivering bottles.

Table 2

	POLYTHENE	GLASS
Energy used to make one bottle in MJ	4.7	7.2
Energy used to fill and deliver one bottle in MJ	2.2	2.5

(i) Work out how much energy is used to make, fill and deliver five polythene bottles.

energy = _____ MJ [1]

(ii) Work out how much energy is used to make one glass bottle, then fill and deliver this five times.

energy = _____ MJ [1]

(iii) What do your calculations suggest about the sustainability of using these two types of bottle?

_____

_____

_____

_____ **[2]**

(iv) Which parts of a Life Cycle Assessment can be looked at using the data in Table 2?

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

The environmental impact of making the material.	☐
The energy input for making the material.	☐
The cost of disposal of the product.	☐
The energy input for making the product.	☐
The environmental impact of using the product.	☐
The energy input for using the product.	☐

[2]

[Total: 8]

4 (a) Some of the materials we use are made of one chemical and others are made of MIXTURES of chemicals.

Put a tick (✓) in each row of the table to show whether each material is ONE CHEMICAL or a MIXTURE OF CHEMICALS.

	ONE CHEMICAL	MIXTURE OF CHEMICALS
Copper		
Milk		
Paint		
Petrol		

[2]

(b) Many of the materials we use are made from crude oil.

Fill in the blanks to finish the sentences opposite about crude oil.

Use words from the list.

ANTIOXIDANTS

CARBOHYDRATES

CARBON

HEIGHTS

HYDROCARBONS

HYDROGEN

LENGTHS

NITROGEN

OXYGEN

SULFUR

Crude oil is a mixture of compounds called

_____ .

These compounds are made of the elements

_____

and _____ .

These compounds have chain molecules with

different _____ . **[4]**

[Total: 6]

5 The chemical metaldehyde kills slugs and helps to protect crops from damage.

In the United Kingdom farmers spread about 250 tonnes of metaldehyde pellets on their land every year.

Water companies measure the metaldehyde concentration in drinking water.

The European limit for metaldehyde is 0.1 micrograms/litre.

Levels found are sometimes close to the European limit and, on a few occasions, are slightly above the European limit.

(a) Which of these statements suggest that there is very little risk to health from metaldehyde in drinking water?

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

Metaldehyde helps to protect crops. ☐

The European limit is set well below the level that could cause harm to people. ☐

It is not possible for anything to be completely safe. ☐

People do not drink very much water. ☐

Water samples are rarely above the limit. ☐

[2]

(b) Use ideas of risk and benefit to suggest why metaldehyde is used by farmers.

_____

_____

_____

_____

_____

_____ **[3]**

(c) (i) Some crop treatments are not allowed in organic farming.

Put a tick (✓) in each row of the table to show which crop treatments CAN BE USED in organic farming and which CANNOT BE USED.

CROP TREATMENT	CAN BE USED	CANNOT BE USED
spread manure		
spread synthetic fertiliser		
spray synthetic pesticides and herbicides		
weed by hand		

[2]

(ii) Farmers using organic farming methods do not use metaldehyde.

Suggest an alternative method they could use to prevent slugs eating their crops.

_____ **[1]**

[Total: 8]

6 There are natural polymers in the food we eat.

Digestion breaks down these polymers into smaller molecules.

(a) Explain why we have to break food down into smaller molecules.

_____

_____

_____

_____

_____ **[3]**

(b) The flow chart (opposite) shows the digestion of protein and what happens to the smaller molecules that are made.

Fill in the gaps to complete the flow chart.

Use words from this list.

AMINO ACIDS

CARBOHYDRATES

KIDNEYS

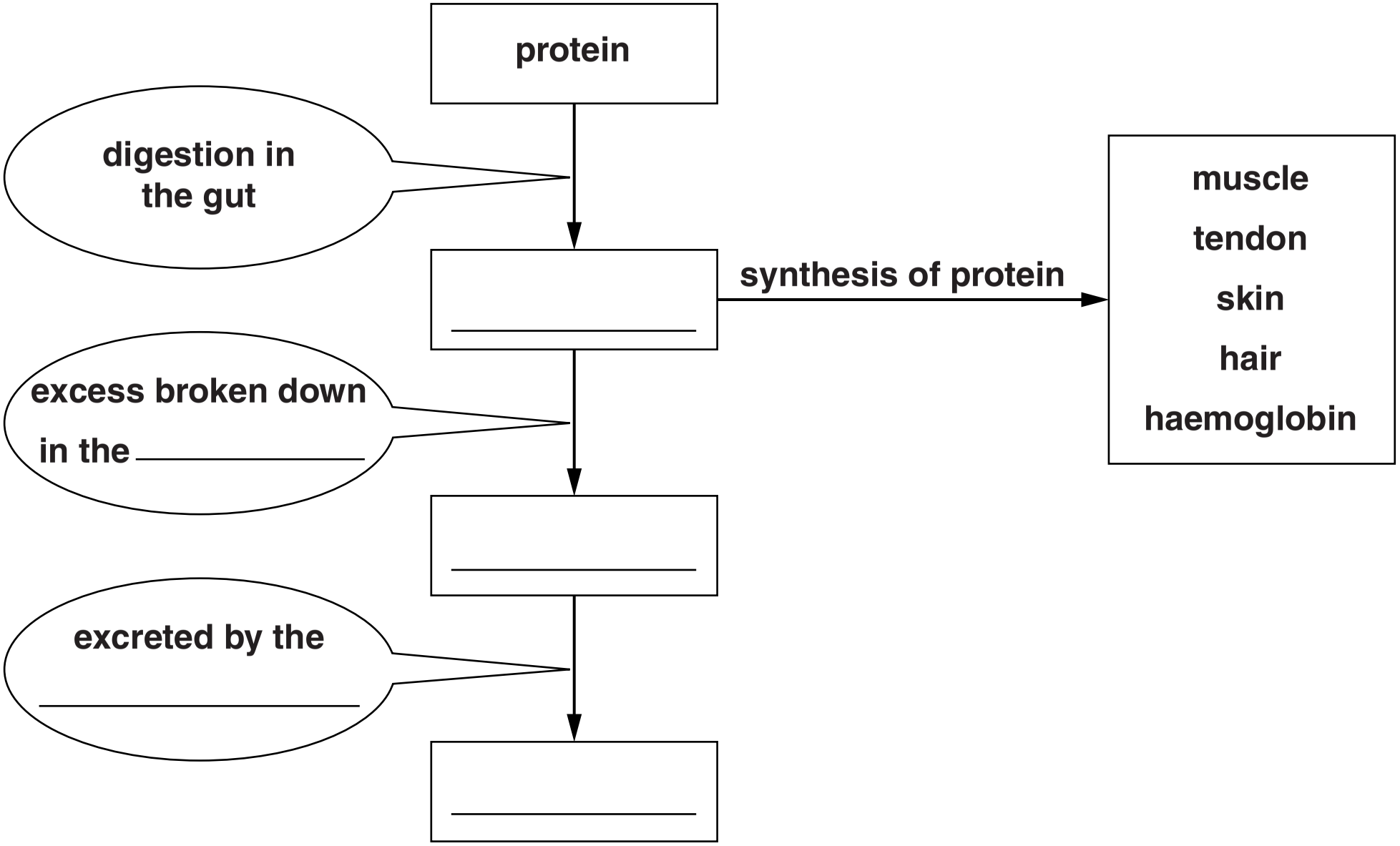
LIVER

UREA

URINE

[3]

[Total: 6]


protein
digestion in the gut
synthesis of protein
muscle
tendon
skin
hair
haemoglobin
excess broken down in the _____
excreted by the _____

END OF QUESTION PAPER