



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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21ST CENTURY SCIENCE

0608/05

Paper 5

For Examination from 2009

SPECIMEN PAPER

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **14** printed pages.



Section A

Read this newspaper articles about a 'food scare' that occurred in February 2005.

Carcinogenic dye causes food scare

More than 400 well-known processed foods have been removed from sale because they are contaminated with an illegal red dye which may cause cancer.

The bright red dye, Sudan 1 had been used to colour a batch of chilli powder used as an ingredient in a brand of Worcester sauce. The sauce in turn was sold on to hundreds of food companies for manufacture into famous brands of food and supermarket ready meals. Sudan 1 is thought to be carcinogenic, which means that it may cause cancer.



Pot noodles were included in the list

Food safety officers warned that the crisis was likely to get worse, as they came under attack for failing to prevent the lapse in food safety and for taking too long to make the information public.

This table shows how the crisis developed.

28 January 2005	Sudan 1 contamination of chilli powder is discovered by a laboratory in Italy.
1 February 2005	Sudan 1 is found in a brand of Worcester sauce. Food safety officers are notified.
7 February 2005	Further tests finally confirm presence of the dye.
10 February 2005	Food safety officers demand a list of the companies which were supplied the Worcester Sauce, for use in other products.
14 February 2005	The list of 200 companies is received by the food safety officers, who begin ringing the companies.
15 February 2005	Food safety officers begin telling the companies and supermarkets that they are planning a recall.
18 February 2005	The food recall is launched, with more than 400 products withdrawn from supermarket shelves.

A health expert criticised food safety officers. "I think it is unacceptable that consumers were left many days still buying these products, unaware that there was an issue," he said.

Banned in 2003 under European Union rules, the harmful Sudan 1 dye, also known as 'scarlet red', has been found in a range of chilli powders and curry powders, as well as more than 200 food products ranging from pesto sauce to chicken tikka masala.

Over 300 food companies were involved in the effort to trace how far the Worcester sauce had spread. Companies involved include all of the leading U.K. supermarkets, and top brand owners such as crisp makers. Food safety officers said they could not guarantee that there were not more contaminated food products in circulation.

"The big supermarkets are all using the same manufacturers, so if there is a problem it spreads very quickly," said a leading food critic.

The food chain is now both highly industrialised and highly centralised. The main supermarket groups depend on a handful of suppliers to provide the ingredients for their processed meals. The use of sauces containing additives to bolster the flavour of factory food is widespread. The result is not just that many ready meals taste the same but also that any breakdown in safety is instantly multiplied.

Sudan 1 is an azo dye, which has been shown to cause liver cancer in animal tests. It has not been shown to cause cancer in humans. It was first used in the US in 1918 but withdrawn from food use the same year. Sudan 1 is not permitted as a dye for foods in the EU but is meant to be used as a colour for shoe polish, industrial solvents and petrol.



Some flavours of crisps were removed from supermarket shelves

"At the low levels present in these foods the risk is likely to be very small but it is sensible to avoid eating any more. There is no risk of immediate ill-health," said a food safety spokesman. "but we cannot exclude the possibility of a risk to human health even at low doses ... all measures should be taken to ensure that the consumer is not exposed to this substance". A further difficulty is that by the time the contaminated chilli has been used in other ingredients such as Worcester sauce it is present only in parts per billion making it virtually undetectable. Public analysts have had to devise new tests to detect it, according to one food safety officer.

This 'food scare' has raised questions about the use of other food additives. In addition to colours a number of other chemicals are added to foods, including preservatives and anti-oxidants.

1 (a) Sudan 1 was added to make the chilli powder bright red.

(i) Suggest why the manufacturers wanted the chilli powder to be bright red.

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

(ii) Why was it not a good idea to add Sudan 1 to chilli powder?

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

(iii) Sudan 1 has a variety of uses that are not connected with food. Describe **one** of these uses.

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

(b) (i) How long did it take from the discovery of Sudan 1 in a brand of Worcester sauce to the recall of contaminated food from UK supermarkets?

..... days [1]

(ii) Suggest why it took so long.

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

(c) Over 400 food products were removed from supermarket shelves.

Explain how modern methods of manufacture, distribution and marketing of food enabled Sudan 1 contamination get into so many food products?

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

(d) A food expert says that the risk of getting cancer after eating the foods contaminated with Sudan 1 is very small, or may not exist at all.

(i) Suggest why the risk 'is very small, or may not exist at all'.

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

(ii) Use the precautionary principle to explain why the contaminated foods were removed from supermarket shelves.

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

(iii) It is possible that, despite the recall, some contaminated chilli remained in circulation.

Use ideas about size of risk to explain why this is an acceptable situation.

.....

 [2]

(iv) Suggest why it may be difficult to find out if some foods on sale contain Sudan 1.

.....

 [2]

(e) Scientists test a brand of meat pie for the presence of Sudan 1.

They test samples from two different supermarkets.

Results of their tests are shown in the table.

	Sudan 1 content in ppm							
sample	1	2	3	4	5	6	range	average
supermarket A	16	13	21	15	12	14	12 to 16	14
supermarket B	12	10	13	14	12	11		

(i) The scientists test several samples from each supermarket.

Suggest why.

.....

 [2]

- (ii) To get a best estimate the scientists work out the average Sudan 1 content for the samples from supermarket **A**. They use values from only five of the six samples in their calculation.

Suggest which sample they ignore and explain why.

.....

 [2]

- (iii) Work out the range and best estimate (average) for the samples from supermarket **B**.

range = to ppm

best estimate = ppm [2]

- (iv) The scientists conclude that there is not a real difference between the content of Sudan 1 in this brand of meat pie from the two supermarkets.

Explain how the data show this.

.....

 [2]

- (f) New, uncontaminated packets of the food items were soon produced by manufacturers.

Despite assurances that they were safe, many customers were reluctant to buy these products.

Use ideas about risk to explain why.

.....

 [2]

(g) Colours are only one type of chemical added to food.

Name another type of food additive **and** explain why it is added to food.

.....

.....

.....

..... [2]

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Section B

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- 2 You are given a strip of vulcanised rubber and a strip of non-vulcanised rubber, each of 1 m length. You are also given a clamp and stand, slotted masses (10 g, 100 g and 1000 g), string, scissors and a metre rule.

You are asked to find if there is a difference in the amount that each type of rubber stretches under a load.

- (a) (i) Draw a diagram to show how you would set up the apparatus.

[2]

- (ii) Which variables would you need to keep constant in this investigation?

.....

.....

.....

[2]

- (iii) The diagram shows a piece of vulcanised rubber strip before it was stretched by the load.

Use the rule in the diagram to measure the length of this rubber strip.



length of rubber strip = cm [1]

(iv) The length of this rubber strip under load was 9.5 cm.

Work out, to the nearest whole number, the percentage that this rubber strip stretched.

percentage =cm [1]

(b) The table shows results for the percentage stretching of vulcanised and non-vulcanised rubber obtained by a student.

sample number	percentage (%) that each sample stretched	
	non-vulcanised rubber	vulcanised rubber
1	78	13
2	82	15
3	80	12
4	79	14
5	81	11
6	80	13
mean		13
range	78–81	11-13

A best estimate of the percentage stretching for each type of rubber can be found by working out the mean (average). This has been done for the vulcanised rubber.

(i) Work out the mean (average) of the results to find the best estimate of percentage stretching for non-vulcanised rubber, and enter it in the table. [1]

(ii) What conclusions can be drawn from the data in the table?

.....

 [1]

(iii) Explain how the data give a very firm support this conclusion.

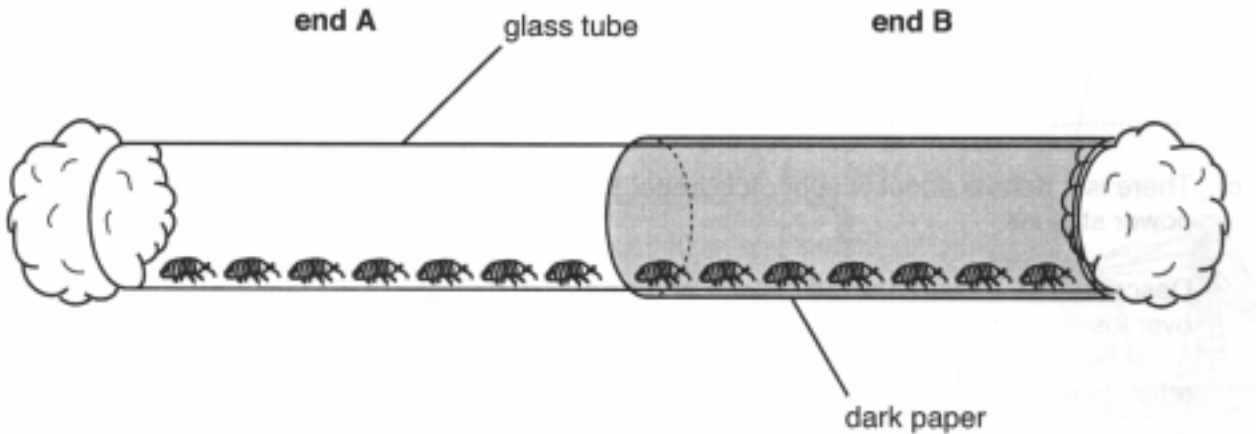
.....

 [2]

3 Woodlice are small invertebrate animals.

The diagram shows an experiment to investigate the habitat preferred by woodlice.

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(a) (i) Describe how you would use this apparatus to investigate whether woodlice prefer to live in a light habitat or a dark habitat.

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

(ii) How could you make sure that the level of light is the only variable that can affect the outcome of this investigation?

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

(iii) A friend tells you that woodlice live under dead wood, so they must prefer dark places.

Suggest how the results of your investigation might support this idea.

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

- (b) (i) Another friend suggests that woodlice prefer to live in dark and damp habitats rather than light and dry habitats.

How could you modify your apparatus to investigate this idea?

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

- (ii) Describe and explain how the results from this second investigation might support the idea that woodlice prefer damp and dark habitats.

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

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- 4 Two students are doing an experiment with strontium-90, a radioactive source which gives out beta radiation.

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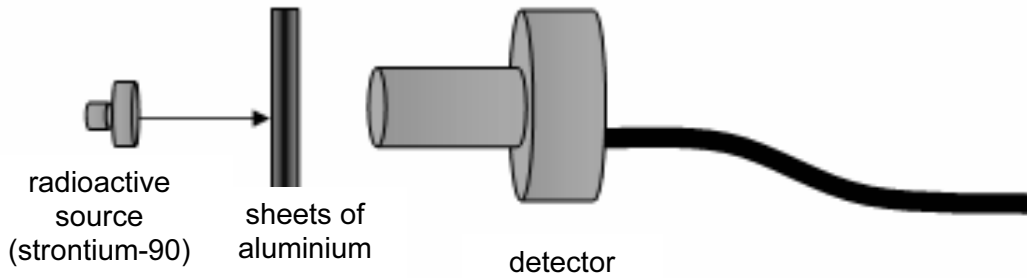


Radioactive sources can be dangerous, because they give out ionizing radiation.

- (a) Suggest **one** way in which the students should work to reduce the risk to themselves and to other people in the laboratory.

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

- (b) Their experiment was to measure the number of counts per second recorded when different numbers of thin sheets of aluminium, each 1 mm thick, were placed between the radioactive source and the detector.



Write down **two** things the students would need to do to get the best possible estimates of the number of counts per second for different numbers of sheets of aluminium.

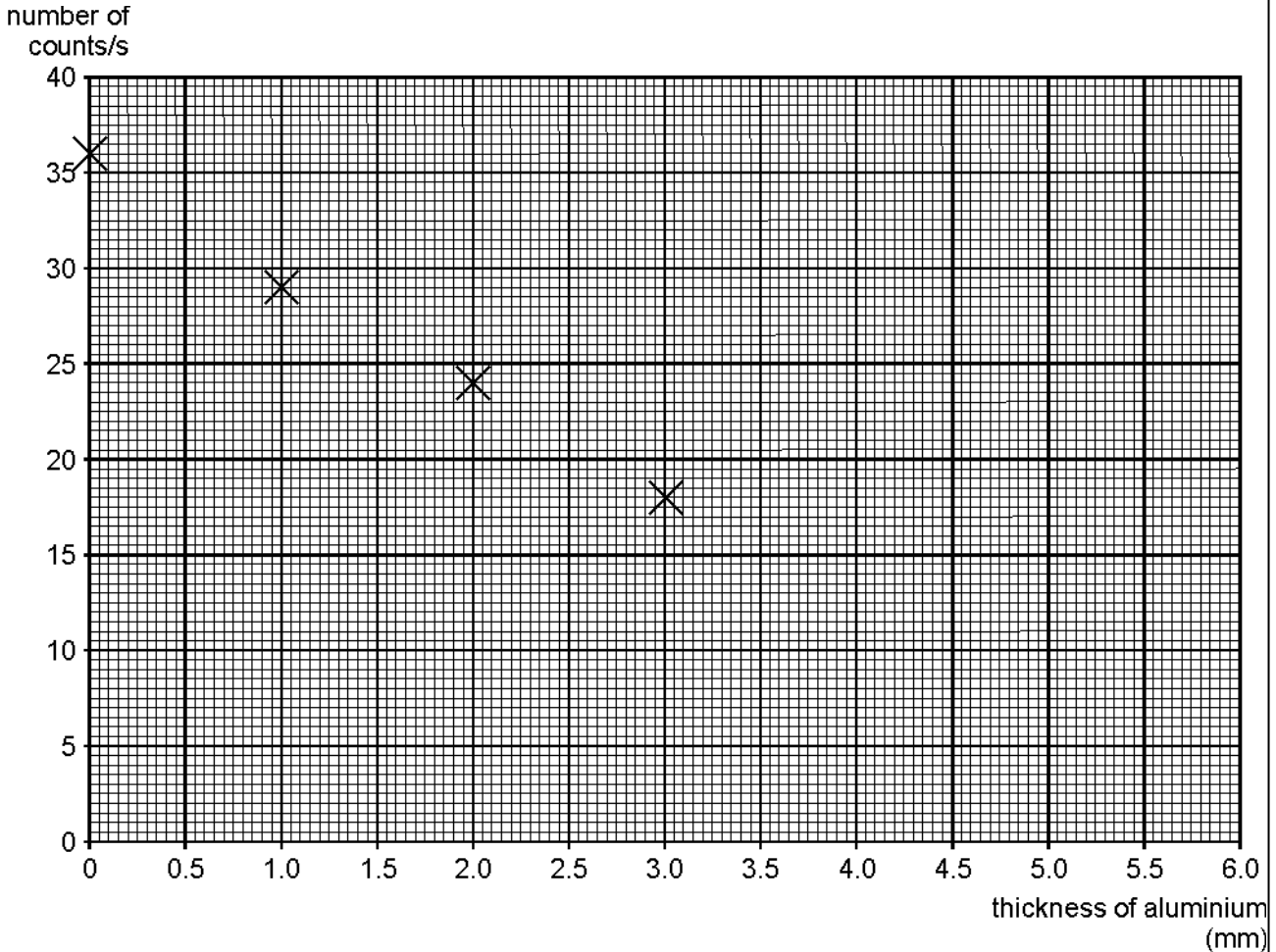
.....
.....
.....
..... [2]

(c) In their experiments, the students obtained the best estimate of counts per second for different thicknesses shown in the table below.

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thickness of aluminium (mm)	0	1.0	2.0	3.0	4.0	5.0	6.0
number of counts/s	36	29	24	18	14	12	10

(i) Plot these data on the axes below. The first four have been done for you. [2]



(ii) Use your graph to find the thickness of aluminium that would be needed to reduce the count to 20 counts/s

number = [1]

(d) The experiment is repeated with a weaker sample of strontium-90.

When the source is placed the same distance from the detector with no aluminium sheets between them, the best estimate of the count rate is 18 counts/s.

Sketch on the graph above a new line to show the results you would expect from this new experiment.

[2]

(e) The experiment is repeated using different materials in place of the aluminium sheets.

Describe how the graph is different to that obtained for aluminium when each of these materials is used.

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(i) paper

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

(ii) lead

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