

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE  
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU  
Tystysgrif Gyffredinol Addysg Uwchradd

235/02

SCIENCE

**HIGHER TIER (Grades D-A\*)**

**BIOLOGY 1**

A. M. WEDNESDAY, 20 June 2007

(45 minutes)

<b>For Examiner's use only</b>	
<b>Total Marks</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator.

**INSTRUCTIONS TO CANDIDATES**

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

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

You are reminded of the necessity for good English and orderly presentation in your answers.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer **all** questions.

1. During the last 10 years ‘DNA or genetic fingerprinting’ has been increasingly used to prove innocence or guilt in criminal cases. The chart below shows five ‘DNA fingerprints’ produced as evidence in a murder case. It shows the ‘DNA fingerprints’ taken from the victim’s blood and from a blood specimen found at the crime scene. It also shows the ‘DNA fingerprints’ taken from the blood of three suspects.



- (a) (i) Which of the three suspects was eventually convicted of the crime? [1]

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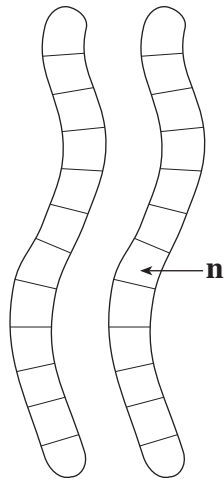
- (ii) Explain your answer. [2]

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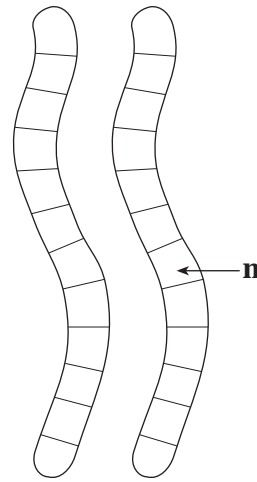
- (b) Two of the suspects in this case were innocent of the crime but their ‘DNA fingerprints’ will not be destroyed by the authorities and will be kept on a DNA database. Suggest **one** ethical issue arising from keeping such records. [1]

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2. The diagram below shows the chromosome pair number 7 from John and Claire both of whom are heterozygous for the cystic fibrosis gene. The allele for cystic fibrosis (**n**) is recessive to the normal allele (**N**).



John's chromosomes



Claire's chromosomes

- (a) Complete the diagram above by **carefully** adding the letter for the normal gene for both John and Claire. [2]
- (b) (i) John and Claire are married. Complete the Punnett square below to show which alleles John and Claire's children may inherit. [2]

	Claire	
	<i>gametes</i>	
John		

- (ii) In this cross, what is the chance of a child being born with cystic fibrosis? [1]

Put a **circle** around the correct answer.

10%      25%      50%      100%

- (c) (i) Gene therapy is used in the treatment of cystic fibrosis. Explain how the gene is given to the patient. [1]

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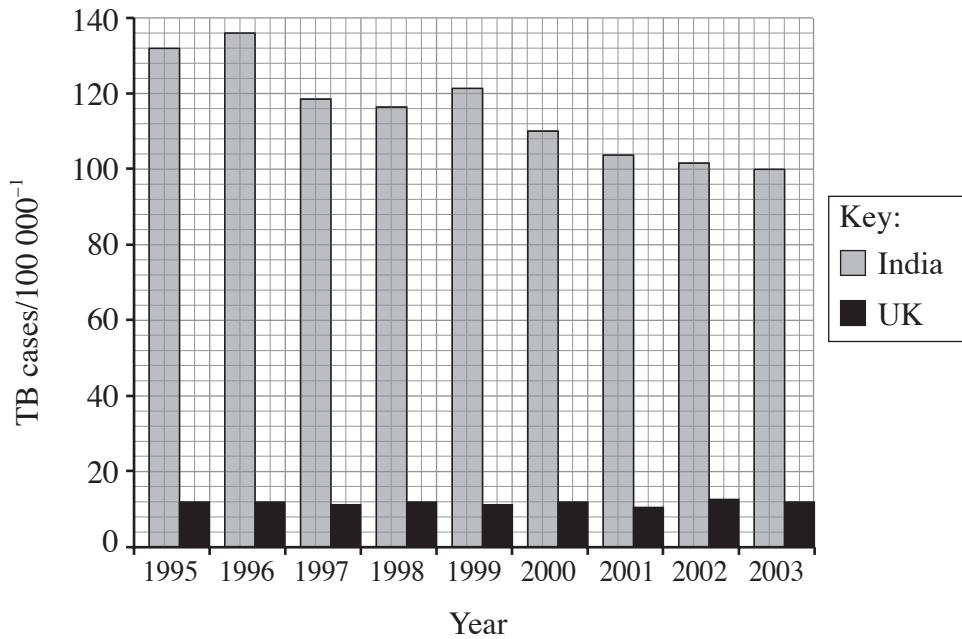
- (ii) State **one** of the problems that is encountered when using gene therapy to treat disease. [1]

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3. Tuberculosis (TB) is an infectious disease caused by bacteria. The bacteria are passed from one person to another in airborne droplets which are coughed into the air by a patient.

The chart below shows the number of cases of TB, **per 100 000 of the population**, in India and the United Kingdom between 1995 and 2003.



(a) What is the **trend** in the number of reported cases of TB in

(i) India;

[1]

(ii) the UK?

[1]

(b) Suggest **one** reason why the number of cases of TB, per 100 000 of the population, is higher in India than the UK. [1]

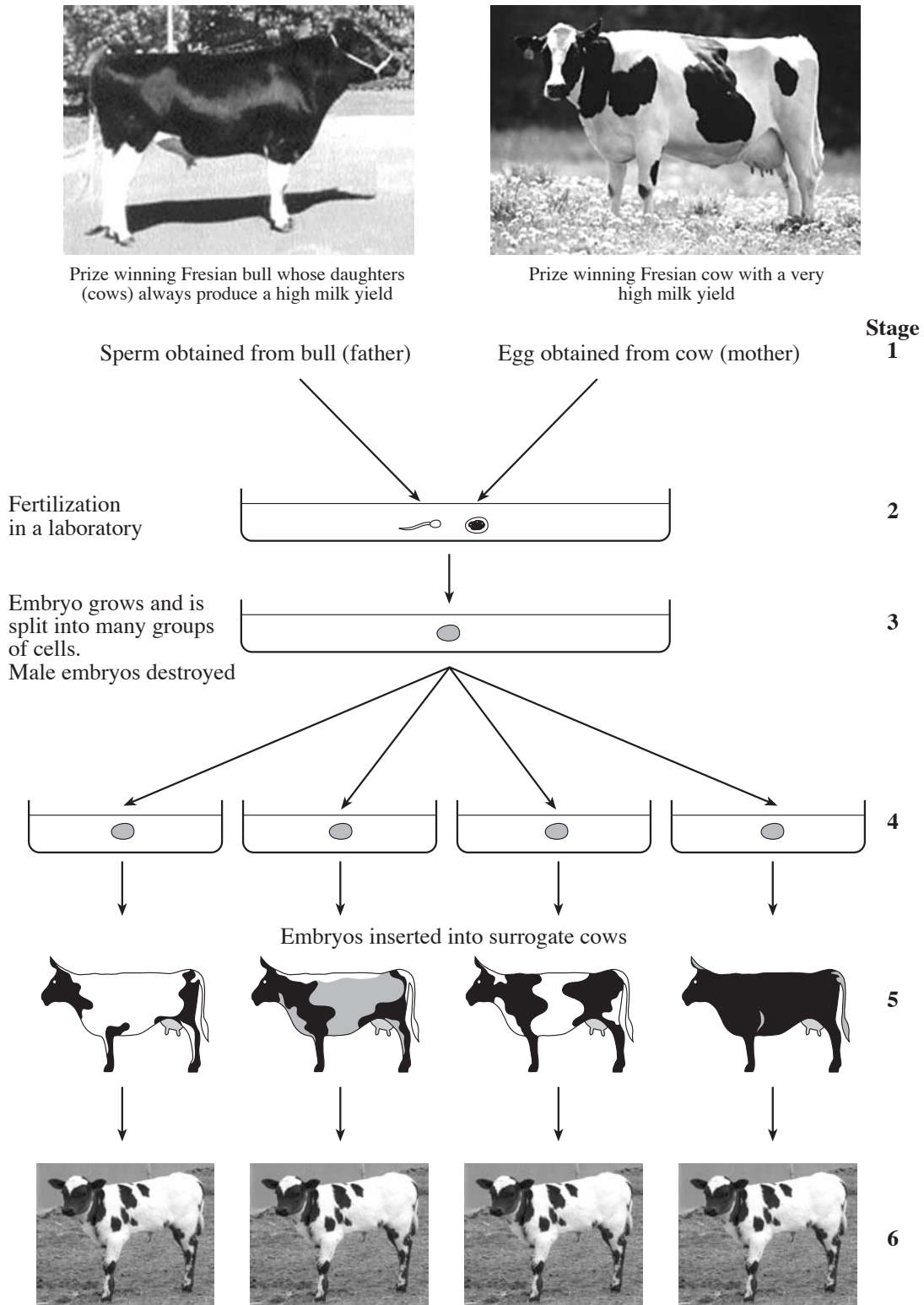
(c) State **one** way in which the number of cases of TB in India could be reduced. [1]

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4. (a) What is meant by a clone?

[2]

(b) The diagram below shows the production of a clone of calves by the process of embryo splitting.



Calves born are a clone of the original embryo

(i) In which stage does asexual reproduction occur? [1]

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(ii) Why are the calves produced in this process **not** clones of either the mother or the father? [1]

.....

(iii) Suggest why the farmer is trying to produce a clone by embryo splitting. [2]

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(c) State **two** commercial advantages of producing cloned calves by embryo splitting. [2]

(i) .....

(ii) .....

(d) State a method by which plants are cloned on a commercial basis and give an example. [2]

Method .....

Example .....

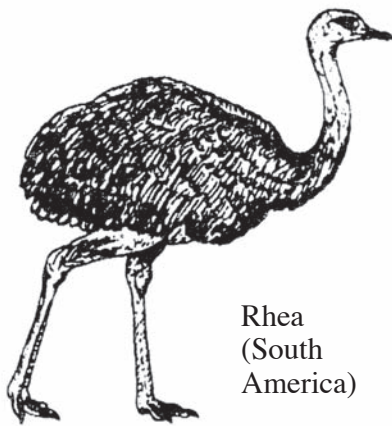
5. (a) (i) Name the theory which states that all living things have a common ancestor. [1]

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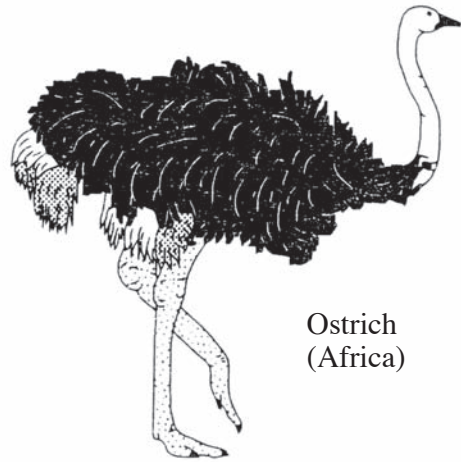
(ii) Which famous scientist proposed this theory in his book *The origin of species* in 1859? [1]

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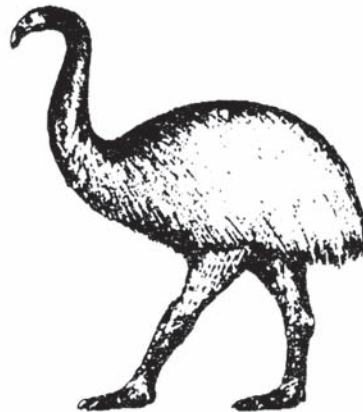
(b) The drawings (not drawn to scale) show three species of bird from three different continents.



Rhea  
(South America)



Ostrich  
(Africa)



Moa  
(New Zealand)

Scientists think that these three birds all developed from the same ancestor. Use the drawings to suggest **three** features of this bird ancestor. [3]

- (i) .....
- (ii) .....
- (iii) .....



(c) The moa once lived in New Zealand but is now extinct.

(i) Suggest how scientists know that the moa once existed.

[1]

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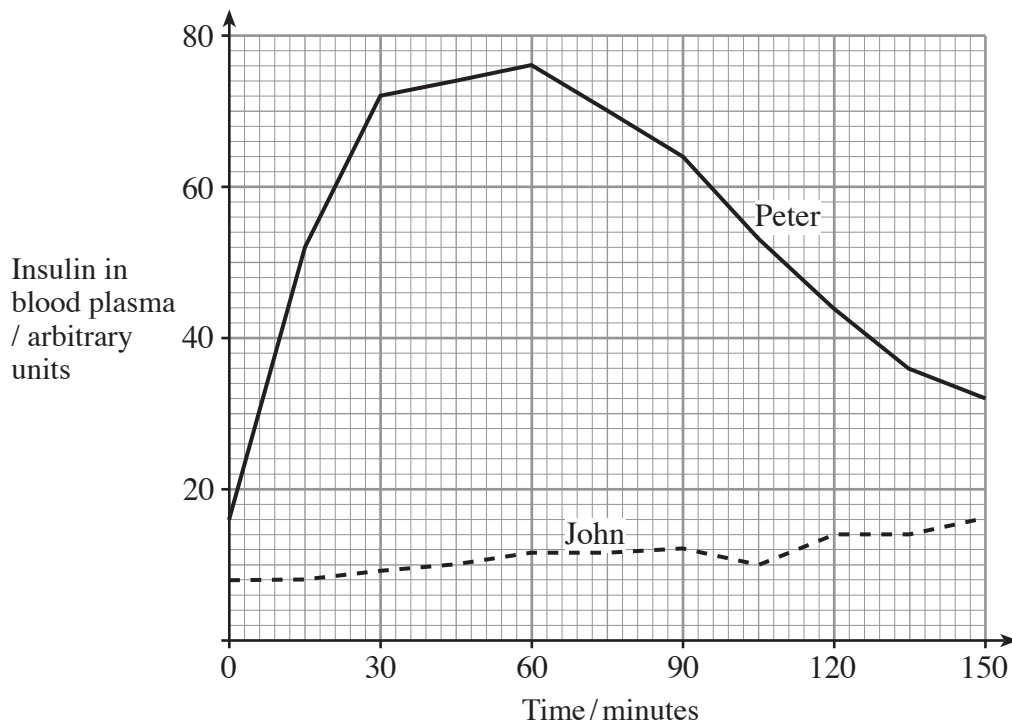
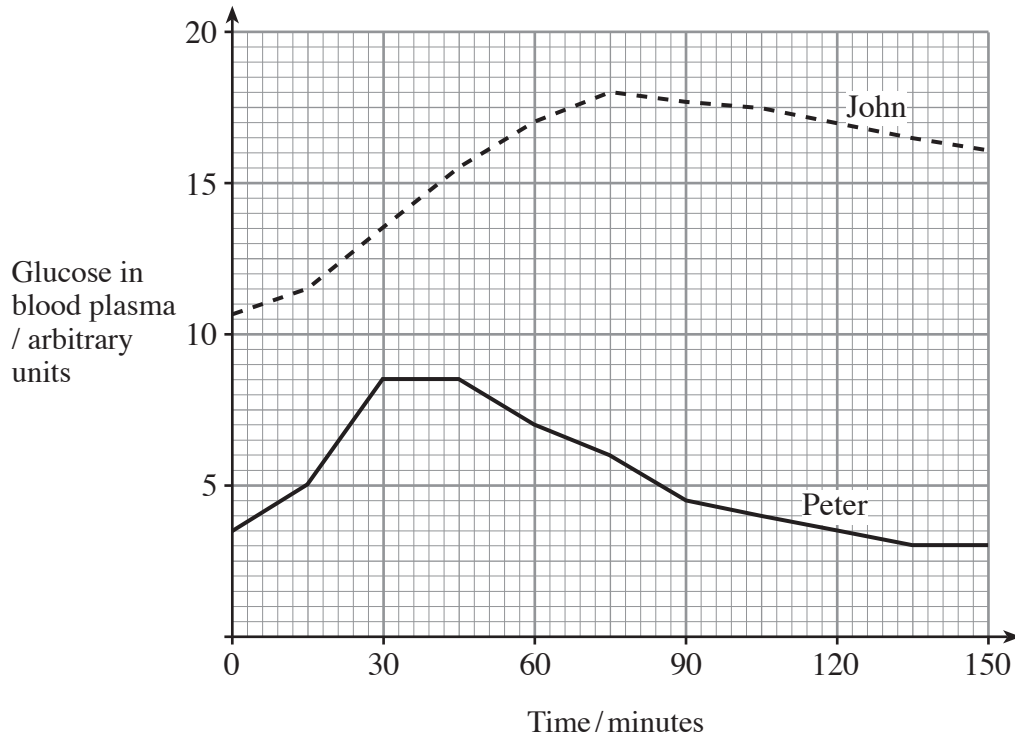
(ii) Suggest **one** reason why the moa became extinct.

[1]

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6. Two people, John and Peter, were each given an identical meal containing a large amount of glucose. The concentration of glucose and of insulin in their blood was measured at regular intervals, over the following 150 minutes. One graph shows the results for glucose and the other for insulin.



(a) One person suffered from diabetes and the other did not. [2]

Which person suffered from diabetes?

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What evidence, shown in the graphs, suggests this?

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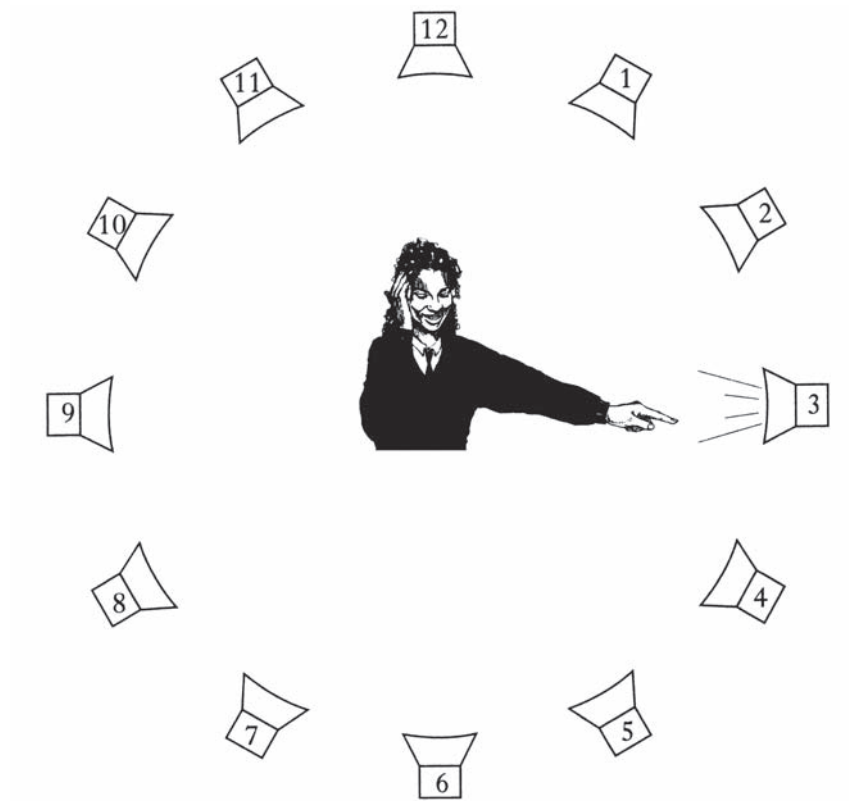
(b) Explain why a person with diabetes should not eat a lot of sugary foods. [1]

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(c) Explain how the body of a person who does not have diabetes controls the blood sugar level when it rises. [3]

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7. The diagram shows an investigation carried out by four pupils into sensitivity and reaction to sound. Each pupil sat in a room with loudspeakers placed all around.



A “beep” was played from each of the loudspeakers in a random order. The pupil was asked to point in the direction of the loudspeaker which had made the sound.

The result was noted, showing if the direction indicated was correct or not for each “beep”.

Each pupil was tested twice,

- (i) with one ear uncovered
- (ii) with both ears uncovered.

Here are the results.

<i>Pupil</i>	<i>One ear uncovered</i>		<i>Both ears uncovered</i>	
	<i>correct</i>	<i>incorrect</i>	<i>correct</i>	<i>incorrect</i>
<b>A</b>	6	6	10	2
<b>B</b>	4	8	7	5
<b>C</b>	7	5	11	1
<b>D</b>	5	7	8	4
<b>Total</b>	22	26	36	12

(a) What conclusion can be made about the use of two ears rather than one? [1]

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(b) Suggest **two** variables which would need to be kept constant to make this a fair test. [2]

(i) .....

(ii) .....

(c) Calculate the ratio of correct to incorrect directions for Pupil A with **both** ears uncovered. Your answer should be the simplest whole number ratio. [1]

correct ..... : incorrect .....

(d) The total number of “beeps” made when the pupils had both ears uncovered was 48. Calculate the percentage of “beeps” for which the correct direction was indicated. [2]

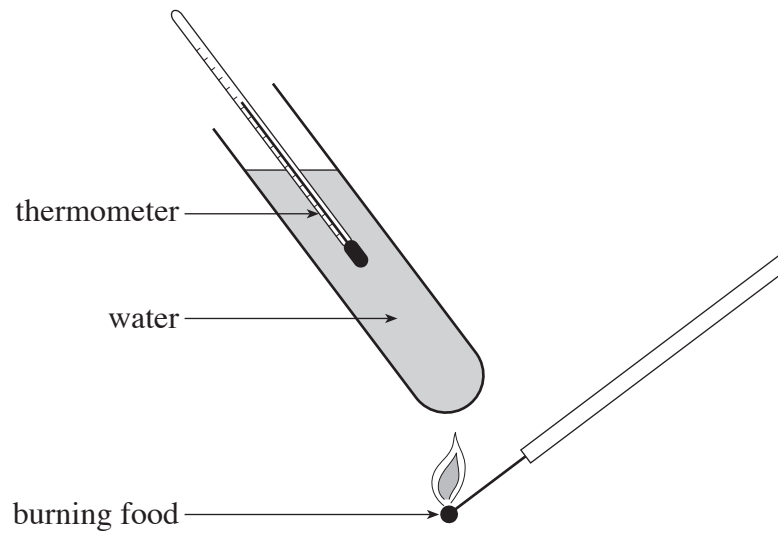
Answer ..... %

(e) Explain why four pupils were tested rather than just one. [1]

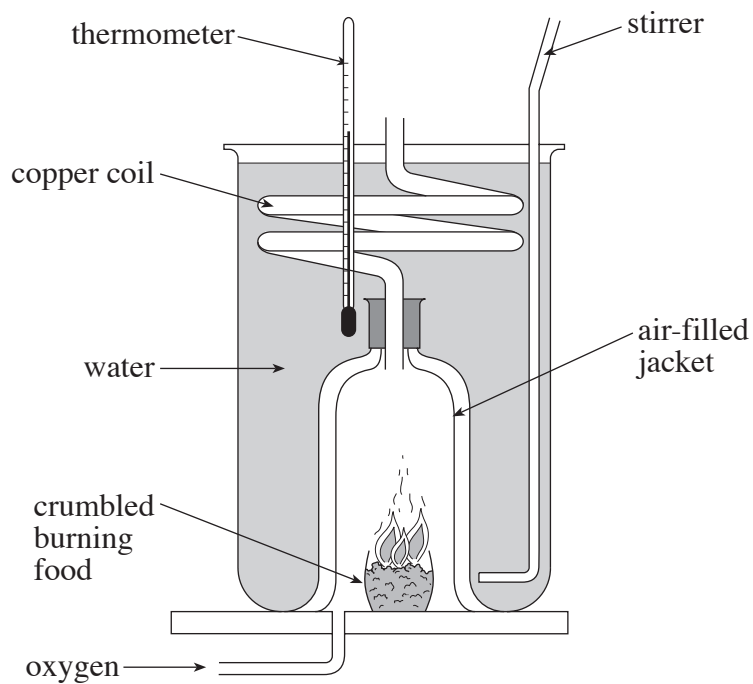
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8. An investigation was carried out into the energy content of three different types of foods using apparatus A and apparatus B. The change in temperature of the water was measured using a thermometer in A and B. The rise in temperature was used to calculate the energy released by the food, in kilojoules.

Apparatus A



Apparatus B



The results were as follows:

<i>Type of food</i>	<i>Energy content / kJ g<sup>-1</sup></i>	
	<i>Apparatus A</i>	<i>Apparatus B</i>
Carbohydrate	10.3	19.3
Fat	21.0	28.0
Protein	10.4	19.3

- (a) Use the diagrams to explain the higher numbers in the results for apparatus B. [3]

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- (b) Why is it important to the health of people that the labels on food containers give information about

- (i) energy content; [1]

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- (ii) food additives? [1]

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