

Surname	Centre Number	Candidate Number
Other Names		0



New GCSE

4461/01

**SCIENCE A
FOUNDATION TIER
BIOLOGY 1**

A.M. WEDNESDAY, 9 January 2013

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	4	
2	8	
3	8	
4	4	
5	5	
6	7	
7	6	
8	6	
9	3	
10	3	
11	6	
Total	60	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

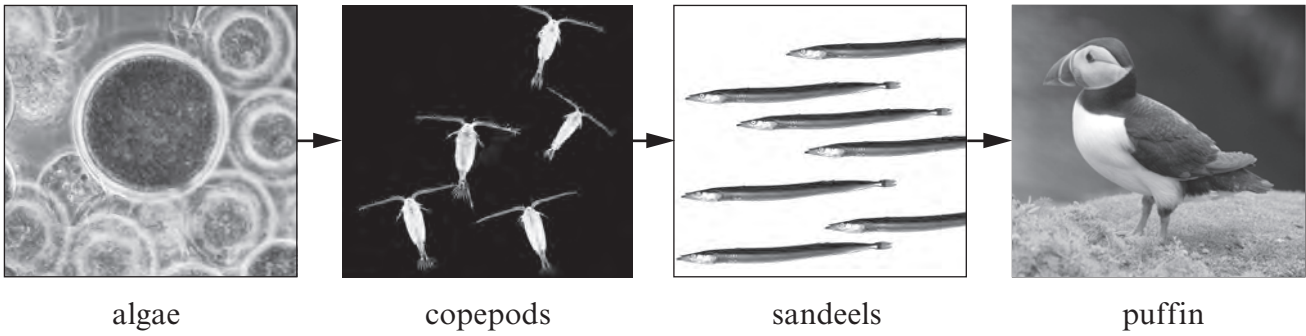
The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **11**.

Answer **all** questions.

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1. The diagram below shows a food chain from the North Sea.



From the information in the food chain above:

- (a) State the herbivore. [1]
- (b) State the second stage consumer. [1]
- (c) In recent years, the number of copepods has decreased. There has also been a decrease in the number of puffins.

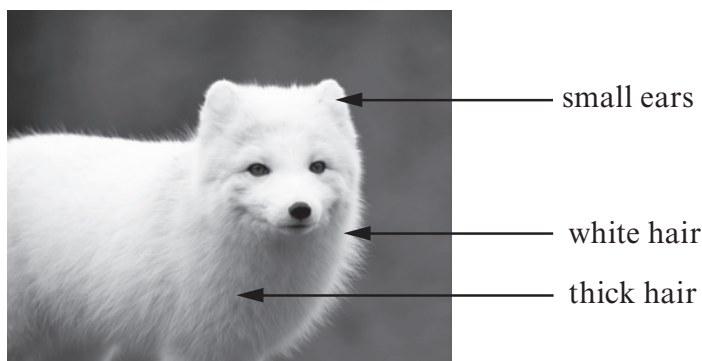
Suggest an explanation for the decrease in the number of puffins. [2]

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2. The photograph below shows an arctic fox.



(a) The arctic fox (*Alopex lagopus*) is a mammal belonging to the Phylum Vertebrates.

Use the given information and your own knowledge to complete the classification of this animal. [4]

- Kingdom
- Phylum Vertebrates
- Class
- Order Carnivores
- Family Canidae
- Genus
- Species

(b) The arctic fox hunts its prey. The fox lives in the Arctic where the land is covered in snow. Explain how each of the labelled adaptations help the arctic fox survive in the cold climate of the Arctic. [3]

white hair

thick hair

small ears

(c) The arctic fox lives in many countries. It is also known as the white fox and polar fox. Why is it important for scientists to use the scientific name of the arctic fox? [1]

3. The list below describes processes involved in the control of blood glucose but they are in the wrong order.

1. the hormone enters the bloodstream
2. the pancreas detects the rise
3. blood glucose level rises
4. the glycogen is stored
5. the pancreas releases insulin
6. the liver turns excess glucose into glycogen

(a) Write down the numbers of the processes above in the right order to complete the sequence correctly. Two have been done for you. [3]

3 6

(b) State the name of the substance in urine which shows a person may have diabetes. [1]

.....

(c) The table below shows the percentage of people in Wales with diabetes between 2006 and 2010.

Year	Percentage of people in Wales with diabetes (%)
2006	4.1
2007	4.2
2008	4.4
2009	4.6
2010	4.9

(i) Calculate the increase in diabetes between 2006 and 2010. [1]

.....%

(ii) Most of the increase in diabetes is due to a rise in Type 2 diabetes. One doctor working with diabetics in South Wales has called for a tax on chocolate.

How could a person's lifestyle possibly lead to Type 2 diabetes? [3]

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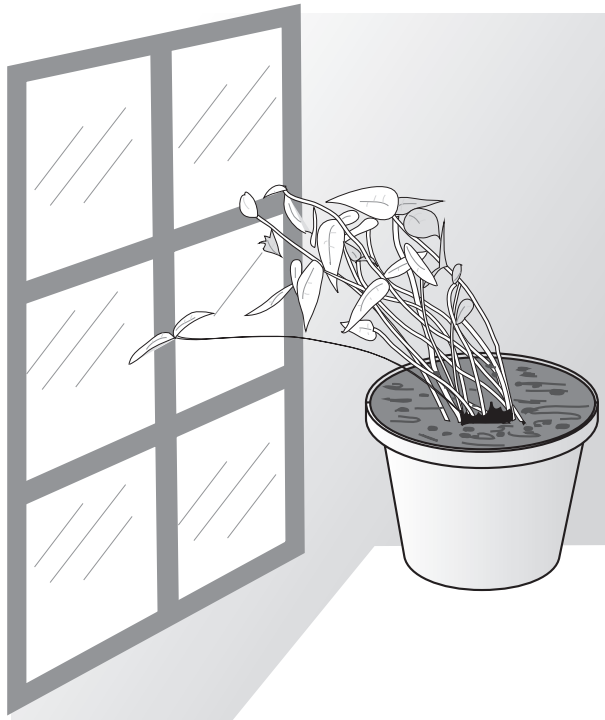
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4. The plant in the diagram below shows positive phototropism.



- (a) In a phototropic response, state what is:
 - (i) the stimulus; [1]
 - (ii) the response. [1]
- (b) **Circle** the correct answer below to complete the following sentence. [1]
 The response is due to **gravity** / **a hormone** / **an impulse**.
- (c) State the advantage of phototropism to the plant. [1]

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5. Scientists investigated how crop yields (mass of crops produced per m^2) vary when plants are grown at different densities in a field. The results are shown in the table below.

Density (number of plants per m^2)	Crop yield (kg per m^2)
1	20
5	85
10	92
15	90
20	90
25	80

- (a) Which density gives the greatest crop yield? plants per m^2 [1]
- (b) Complete the table below by calculating the yield per plant. The first four have been done for you. [2]

Density (number of plants per m^2)	Crop yield (kg per m^2)	Yield per plant (kg)
1	20	20.0
5	85	17.0
10	92	9.2
15	90	6.0
20	90	
25	80	

- (c) Suggest **two** reasons why the yield per plant decreases as the number of plants per m^2 increases. [2]

1.
2.



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6. The diagram below shows a section through a pond on a farm in April 2010.



Students carried out an investigation to see if the types of organism in the pond changed over time. They also measured the pH of the pond water.

Their results are shown in the table below.

Observations	April 2010	July 2012
Plants: algae	✓	✓
pondweed	✓	✓
waterlily	✓	✓
reed	✓	✓
Animals: snail	✓	×
leech	✓	✓
tadpole	✓	×
newt	✓	×
pH of pond water	7	4

Key:

present	✓
absent	×

- (a) One student said the water was too acidic for most of the pond animals in 2012. Explain how information in the table supports the student's idea. [2]

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(b) The list below describes some of the features of the investigation. Suggest **one** improvement for each feature. [3]

(i) The students studied the pond in April 2010 and in July 2012.

Improvement

.....

(ii) The students noted their results using a key: ✓ = present ✗ = absent

Improvement

.....

(iii) The students noted their results after a ten minute search of the pond.

Improvement

.....

(c) In March 2012, nitrates from fertiliser used on the farm spilled into the pond. By July, many animals in the pond had suffocated.

(i) Complete the sentences below to show how the nitrates resulted in the death of the animals. **Circle** the **three** correct answers. [1]

I The numbers of algae in the pond **increased** / **decreased**.

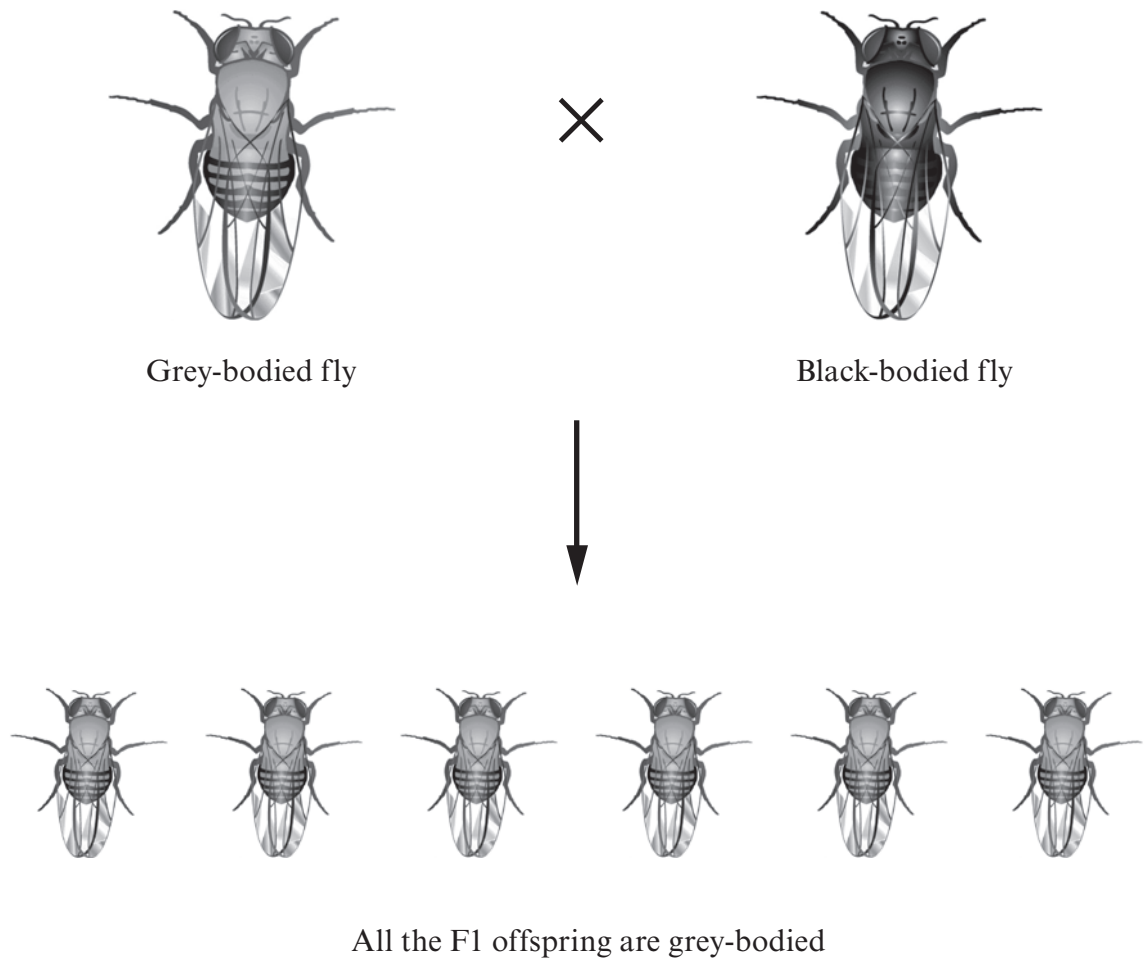
II The number of decay causing microorganisms **increased** / **decreased**.

III Oxygen levels in the water **increased** / **decreased**.

(ii) Name **one** type of microorganism that causes decay. [1]

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7. A grey-bodied fruit fly was mated with a black-bodied fruit fly. All the F1 offspring were grey-bodied.



- (a) Using the letters **A** and **a** to represent the alleles for the two different body colours, complete the Punnett square below to show the offspring produced from the mating between the grey-bodied and black-bodied fruit flies. [2]

	Gametes		
F1			

- (b) (i) Complete the Punnett square below to show the offspring produced when two of the F1 offspring are selfed (bred together). [2]

	Gametes		
F2			

- (ii) What is the ratio of the different phenotypes in the F2 offspring? [1]

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- (c) Name the 19th Century scientist whose work on garden pea plants led to the understanding of the mechanism of inheritance. [1]

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8. A scientist investigated the range of heights of a flowering plant species at two different locations; in the middle of a woodland and in a hedgerow. He measured the heights of 20 plants in each location.

Heights of plants from woodland (mm)			
125	134	139	126
135	149	144	135
130	137	128	136
136	141	143	133
131	129	133	138

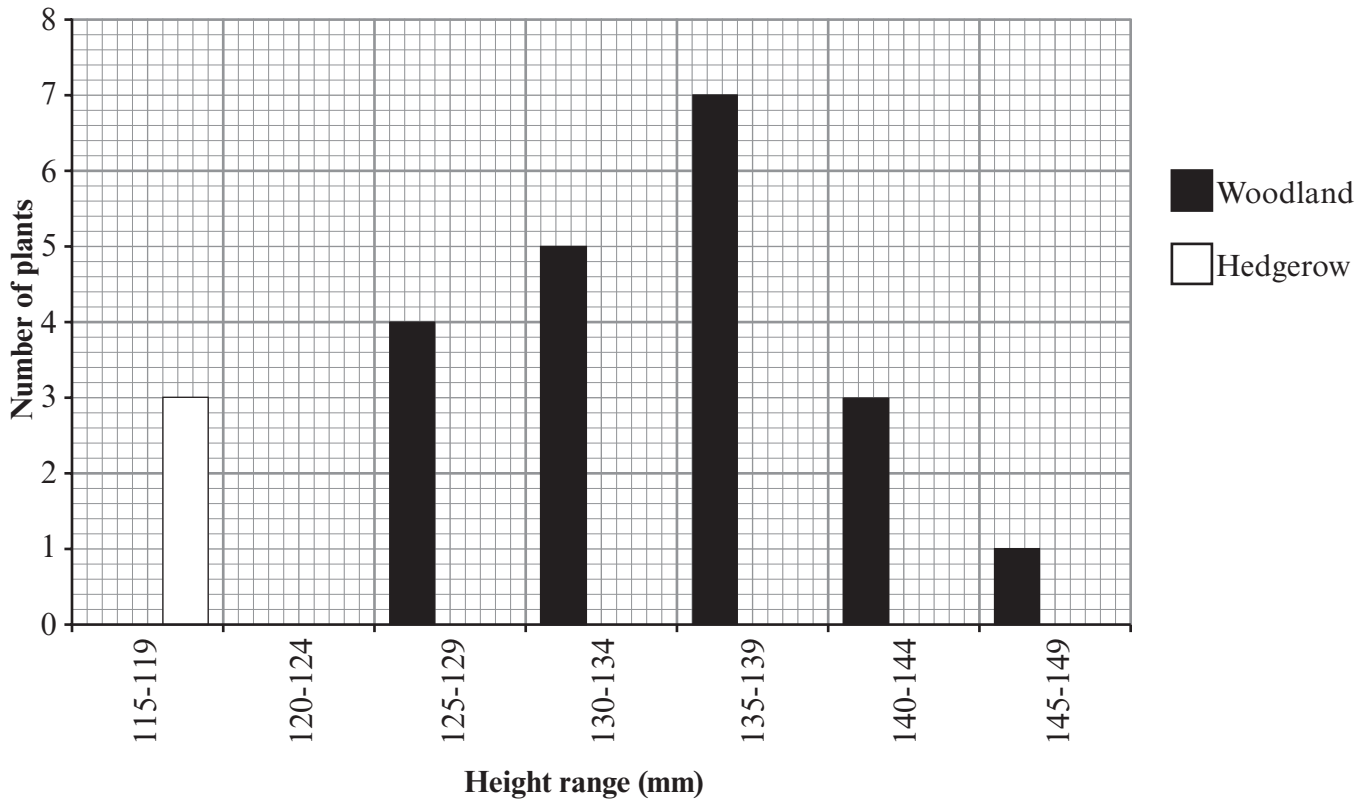
Heights of plants from hedgerow (mm)			
115	134	127	117
127	123	131	122
132	126	118	123
121	125	124	128
134	137	129	138

- (a) (i) Complete the tally chart below by scoring the height ranges of the **hedgerow** plants. Some have been done for you. [1]

Range (mm)	Tally of plants at each location	
	Woodland	Hedgerow
115-119	0	
120-124	0	
125-129		
130-134	+++	
135-139	+++	
140-144		
145-149		

(ii) The woodland data have been plotted below. Complete the bar chart by plotting the data for hedgerow plants. One bar has been done for you. Use a ruler to carefully draw the bars. [2]

Examiner only



(iii) Using the data and graph only what conclusion can you make about the plants growing in the hedgerow? [1]

(b) Suggest a way in which the scientist could find out whether the difference in height of the flowering plant species found at the two locations is due to environmental or genetic causes. [2]

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9. (a) Explain what is meant by the term *genetic profiling*. [1]

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(b) State **two** uses of genetic profiling. [2]

(i)

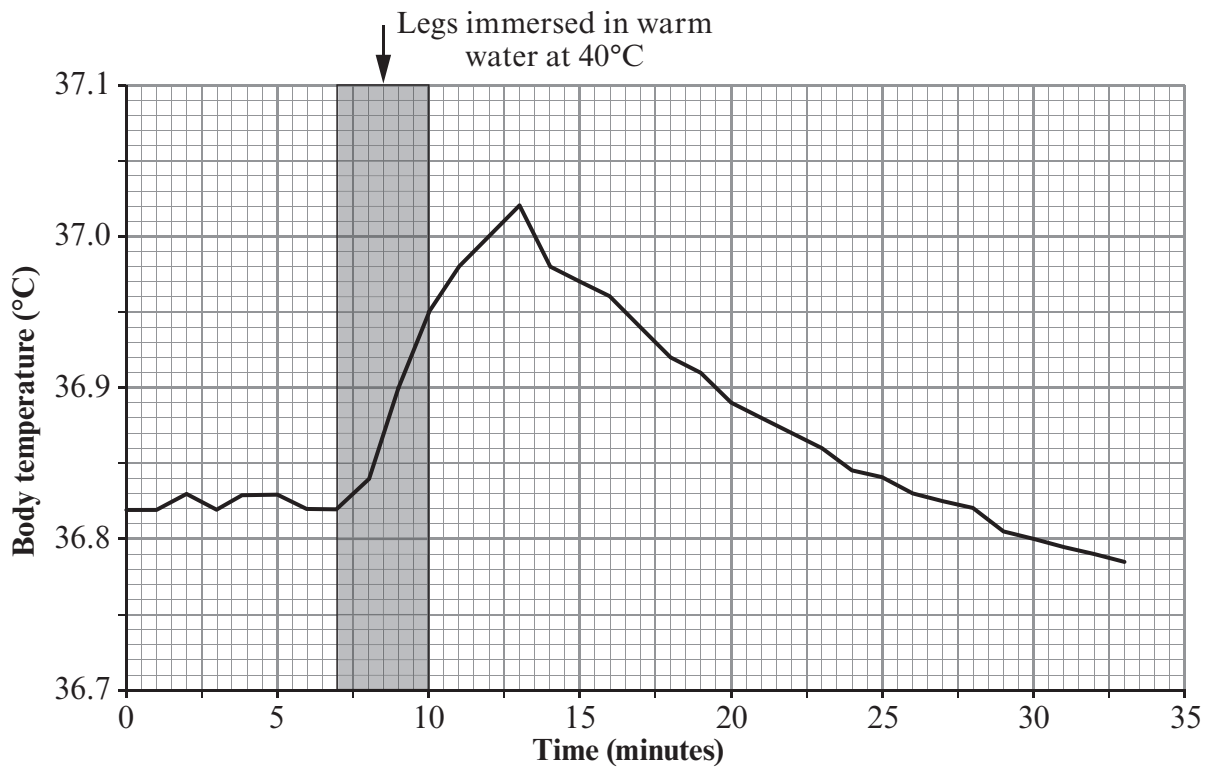
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(ii)

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10. A scientist carried out an investigation into the body temperature of a man. The changes in the man's body temperature were measured by a clinical thermometer in his mouth. The graph below shows his body temperature over a 35 minute period. Between 7 and 10 minutes he immersed his legs, from the knees downwards, in a bath of warm water at 40°C. He then stepped out of the bath and dried his legs.



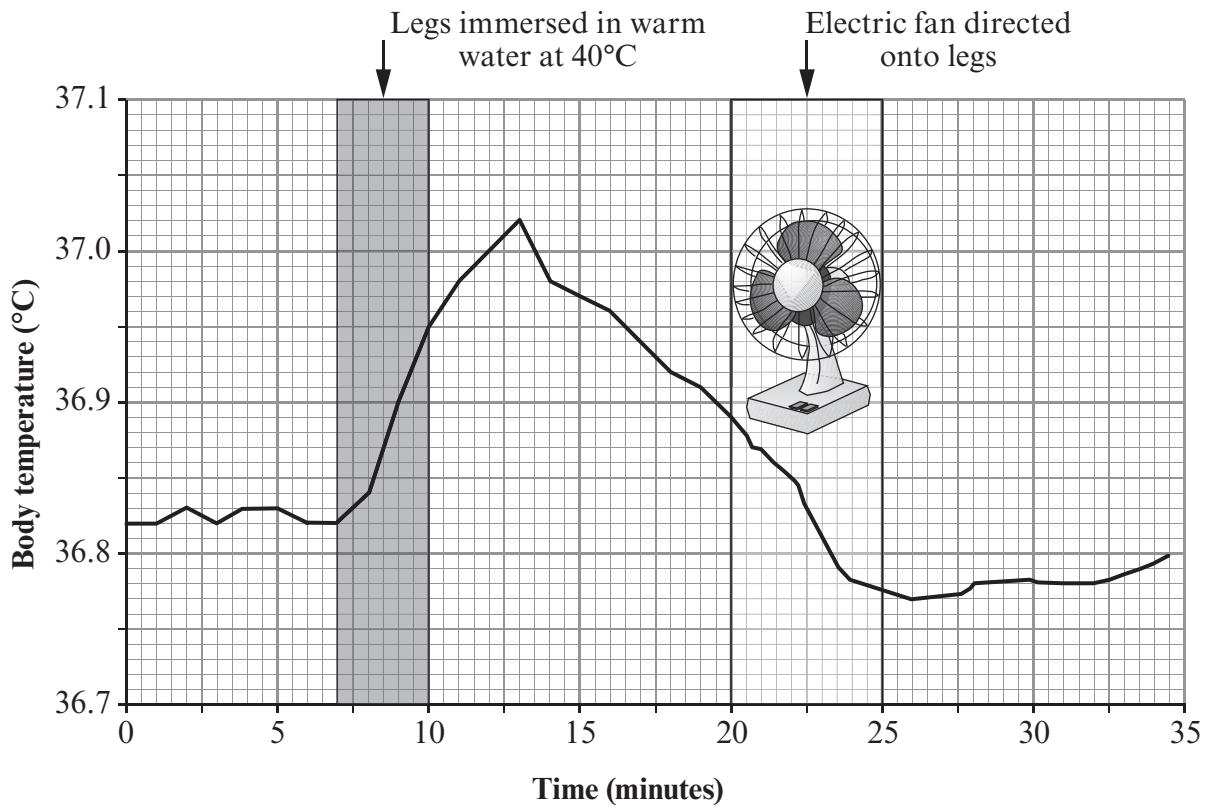
(a) Explain why the body temperature increased even though it was only the legs which were immersed in the warm water. [1]

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(b) The experiment was repeated. After 20 minutes an electric fan was directed onto the man's legs. The results are shown in the graph below.



Explain why the body temperature of the man dropped more quickly between 20 and 25 minutes when the fan was used. [2]

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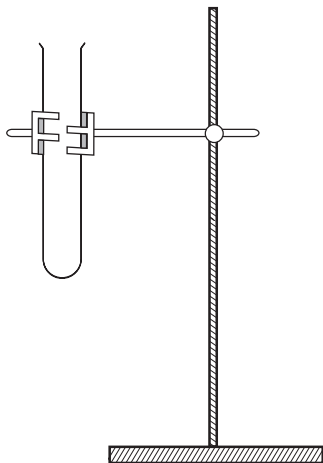
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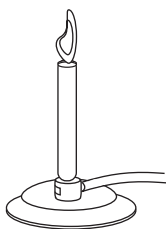
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11. Describe how the apparatus and materials shown below could be used to compare the energy content of two different food samples A and B. [6 QWC]

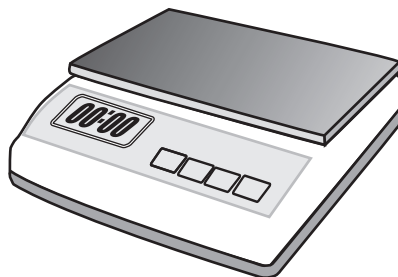
stand and boiling tube



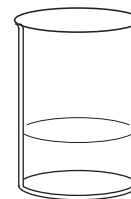
lit Bunsen burner



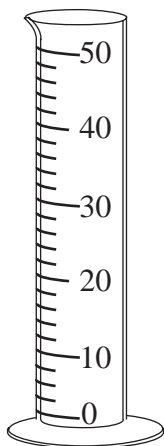
digital balance



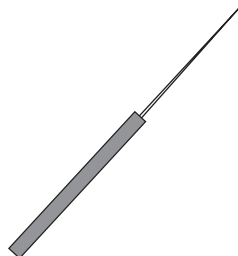
beaker of water



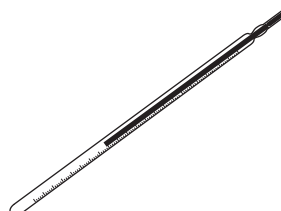
50 cm³ measuring cylinder



mounted needle with wooden handle



thermometer



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Images

Question 1 - ©Steve Pleydell/Shutterstock (*Puffin*)

Question 2 - ©Jean-Edouard Rozey