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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 14 May 2019

Afternoon (Time: 2 hours)

Paper Reference **4BI1/1BR 4SD0/1BR**

Biology

Unit: 4BI1
Science (Double Award) 4SD0
Paper: 1BR

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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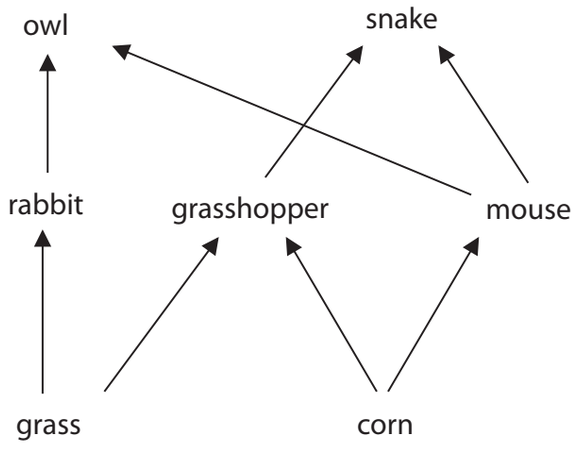
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Answer ALL questions.

1 The diagram shows a food web.



(a) Which of these organisms is a secondary consumer in this food web?

(1)

☒ **A** corn

☒ **B** grasshopper

☒ **C** mouse

☒ **D** owl

(b) Explain why the grass in this food web contains energy.

(2)

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(c) Explain why a large percentage of the energy in rabbits is not available for growth in owls.

(3)

(d) The corn becomes infected by a fungus.

(i) Explain how this fungus feeds on the corn.

(3)

(ii) Which of these organisms will be hunted more often by predators when the corn is infected by a fungus?

(1)

☒ **A** grass

☒ **B** owl

☒ **C** rabbit

☒ **D** snake

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(e) The snake does not chew the mice it eats.

It swallows each mouse whole.

Explain how this method of feeding affects the time taken for the snake to digest a mouse.

(2)

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(Total for Question 1 = 12 marks)

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2 Scientists investigate the effect of pollution on the growth of plant shoots.

This is their method.

- expose a sample of 500 seeds to pollution
- leave another sample of 500 seeds free from pollution
- allow the seeds to germinate and produce shoots
- after one day, squash 100 shoots from each sample
- using a microscope, count the number of cells in each shoot

The scientists squash 100 shoots from each sample every day for five days.

The table shows their results.

Time after germination in days	Mean number of cells in shoot tissue $\times 10^3$	
	Exposed to pollution	Free from pollution
1	45	45
2	38	120
3	40	150
4	38	140
5	42	145

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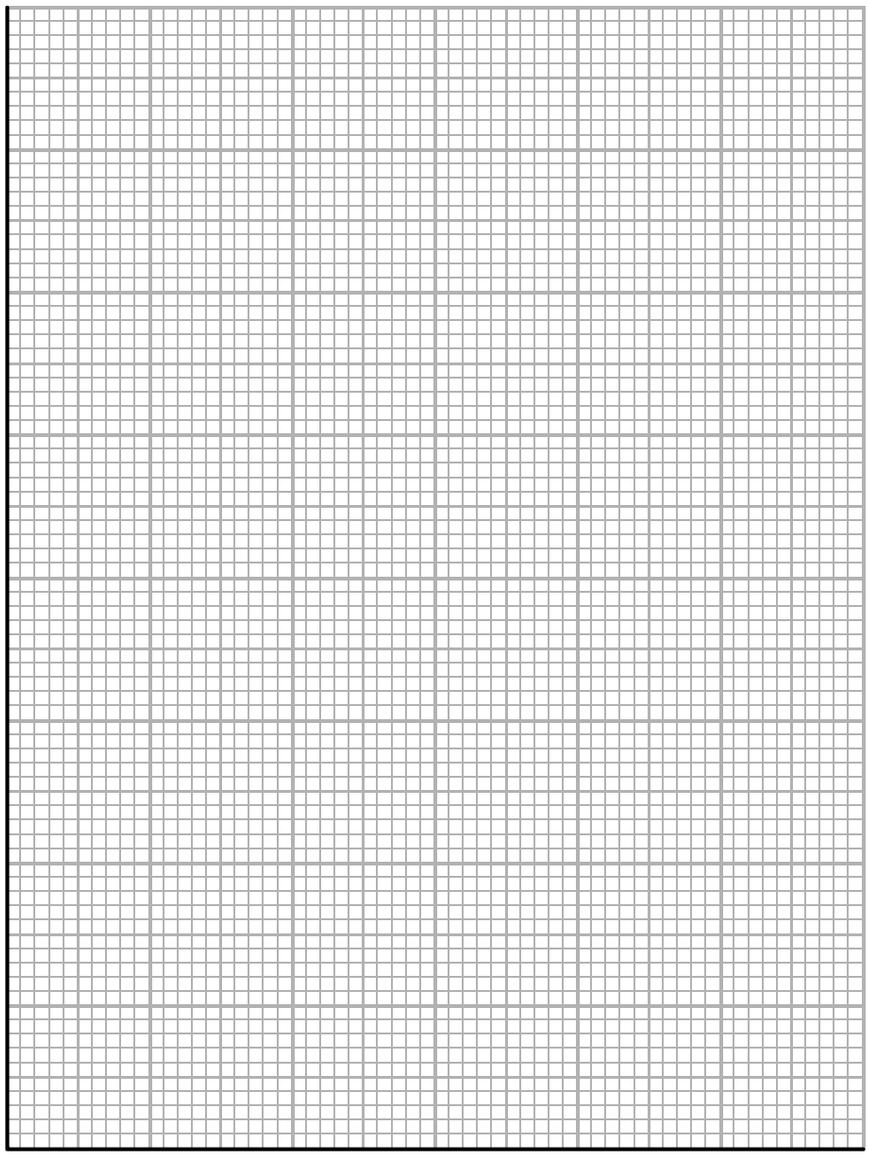
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(a) Plot a line graph of this data on the grid.

Use a ruler to join the points with straight lines.

(5)



(b) What is the dependent variable in this investigation?

(1)

☒ **A** germination rate

☒ **B** number of cells

☒ **C** pollution level

☒ **D** time after germination

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(c) The scientists conclude that pollution reduces the growth of shoots by affecting cell division.

(i) Name the type of cell division affected by pollution in this investigation.

(1)

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(ii) To make sure their conclusion is valid, the scientists control abiotic variables while the seeds are germinating.

Discuss two abiotic variables that the scientists control.

(4)

1 .....

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(iii) State one biotic factor that the scientists should control.

(1)

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(Total for Question 2 = 12 marks)

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3 The passage describes how plants respond to stimuli.

Complete the passage by writing a suitable word in each blank space.

(6)

Plant responses to directional stimuli are known as ..... .

Plant shoots respond to light coming from one direction by growing

..... the light. This is known as a positive

..... response. It is caused when a plant growth substance

called ..... diffuses away from the light. This increases the

rate of growth on the side of the shoot furthest away from the light.

Shoots also respond to ..... . This is known as

a ..... geotropic response.

(Total for Question 3 = 6 marks)

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4 Fertilisers contain mineral ions to increase crop yield.

(a) Explain the role of the mineral ion nitrate in the growth of crops.

(2)

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(b) These crops can be used to feed farm animals.

Mineral ions are absorbed by the animal's gut.

This is because mineral ions are

(1)

☒ **A** small and soluble

☒ **B** small and insoluble

☒ **C** large and soluble

☒ **D** large and insoluble

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(c) If the mineral ions are not absorbed, they are egested in the faeces.

The faeces of genetically modified (GM) farm animals contain less phosphate than the faeces of normal farm animals.

(i) Some people catch fish from rivers near farm land.

Discuss why these people might support the genetic modification of farm animals.

(4)

(ii) Describe the role of enzymes in genetic modification.

(2)

(Total for Question 4 = 9 marks)

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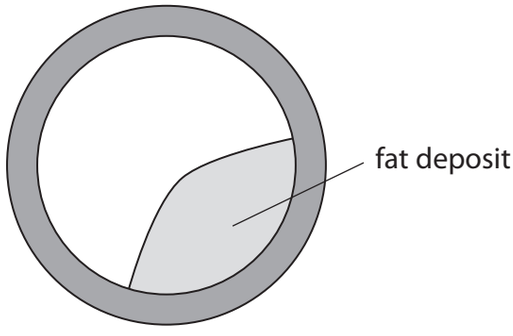
5 Arteries and veins are involved in the circulation of blood.

(a) How do arteries differ from veins?

(1)

- ☒ **A** arteries transport blood to the heart
- ☒ **B** arteries have a wider lumen
- ☒ **C** arteries contain valves
- ☒ **D** arteries have thicker walls

(b) The diagram shows a section through a coronary artery from a person who has heart disease.



(i) Using measurements from the diagram, calculate the percentage decrease in the diameter of the lumen where the fat deposit is thickest.

(3)

percentage decrease = ... %

(ii) Explain how the fat deposit would affect the type of respiration in the heart muscle.

(2)

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(c) A high fat diet increases the risk of heart disease.

Give two other factors that can increase the risk of heart disease.

(2)

1 .....

2 .....

(d) Small arteries in the skin have a role in homeostasis.

In an investigation, the diameter of a small artery in the skin is measured in a cold environment and then in a warm environment.

The blood flow in this artery is also measured.

The table shows the results.

Environment	Diameter of small artery in μm	Blood flow in cm^3 per minute
cold	280	0.50
warm	320	1.65

Explain these changes in diameter and blood flow when moving from a cold environment to a warm environment.

(4)

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(Total for Question 5 = 12 marks)

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6 Yoghurt is made when bacteria are added to milk.

These bacteria produce an acid that gives yoghurt its taste.

(a) Name a bacterium used to make yoghurt.

(1)

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(b) Name the acid produced when making yoghurt.

(1)

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(c) A student investigates the production of acid when making yoghurt.

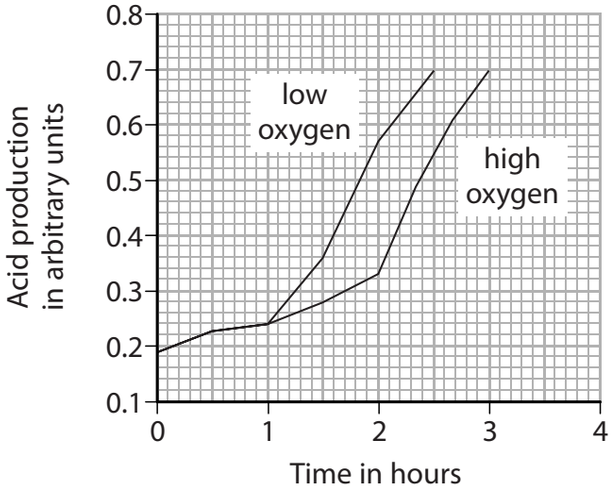
The student observes the effect of temperature and dissolved oxygen on acid production.

He uses milk kept in four different conditions.

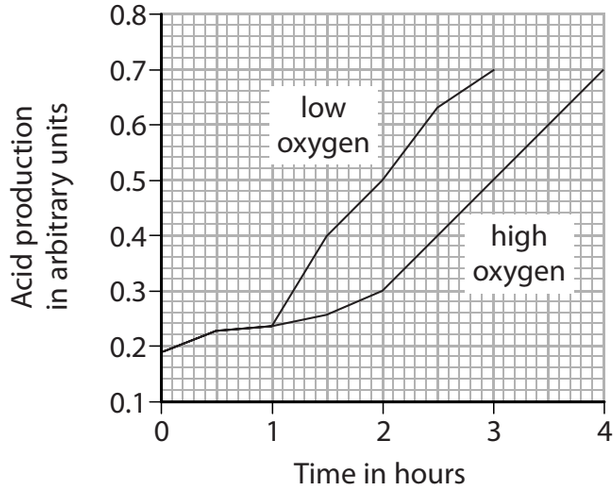
- at 43 °C and low oxygen
- at 43 °C and high oxygen
- at 37 °C and low oxygen
- at 37 °C and high oxygen

The graphs show the results of his investigation.

Temperature of 43 °C



Temperature of 37 °C



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(i) Calculate the rate of acid production between 2 and 4 hours at 37 °C and high oxygen.

(2)

rate = ... arbitrary units per hour

(ii) Using information from the graphs, give three conclusions about the effects of temperature and the effects of dissolved oxygen on acid production in yoghurt.

(3)

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2 .....

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(Total for Question 6 = 7 marks)

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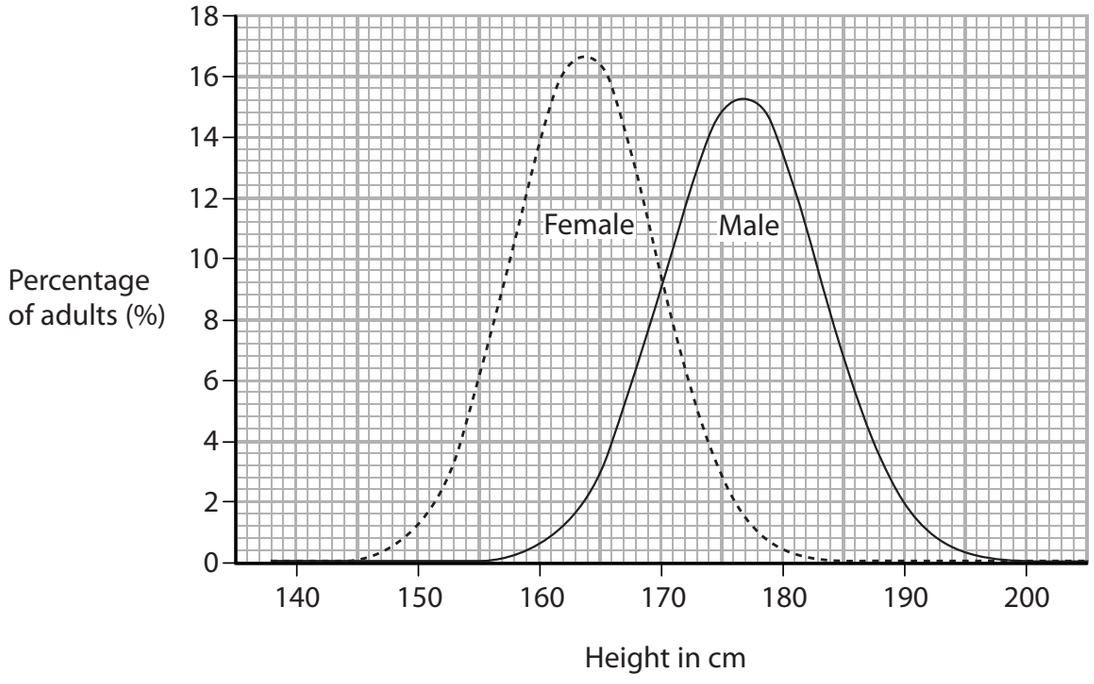
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7 (a) The graph shows the height distribution in an adult population.



(i) Human height is under polygenic control.

State the meaning of the term **polygenic**.

(1)

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(ii) Using the graph, determine the mode and median heights for males and females.

(2)

	Mode	**Median**
Females		
Males		

(iii) Suggest two reasons why the mean height for males is greater than the mean height for females.

(2)

1 .....

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2 .....

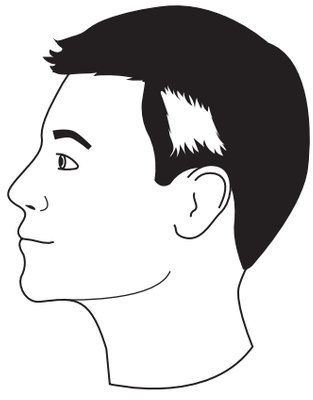
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(b) Some genetic characteristics show a different pattern of inheritance to height.

One example of this is piebaldism. In this condition, a person has a white patch of hair.

The diagram shows a person with piebaldism.



Piebaldism is controlled by a single dominant allele.

A man with a white patch of hair and a woman with a white patch of hair have two children.

The first child was born without a white patch of hair.

The second child was born with a white patch of hair.

(i) Use your knowledge of genetics to explain the phenotypes of these children.

Use H to represent the allele for a white patch of hair and h to represent the allele for no white patch of hair.

(4)

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(ii) Another condition, called vitiligo, produces similar symptoms to piebaldism but is not genetically controlled.

Suggest how a doctor could diagnose whether a new patient has piebaldism or vitiligo.

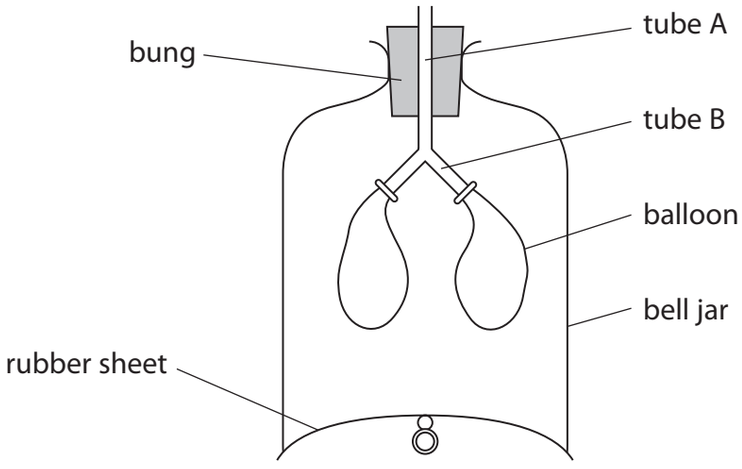
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(Total for Question 7 = 11 marks)

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8 A teacher uses this bell jar model of the thorax to show the process of ventilation.



(a) (i) State how the teacher could demonstrate breathing in using this model.

(1)

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(ii) Explain why the balloons inflate during this demonstration.

(3)

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(b) Evaluate whether the bell jar model can completely demonstrate the process of ventilation.

(4)

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(c) Some people have problems with their breathing system.

They struggle to breathe and can become breathless.

These people may use inhalers to reduce their symptoms.

The inhalers deliver drugs called bronchodilators into their lungs.

The photograph shows a person using an inhaler.



(Source: © Ljupco Smokovski/Shutterstock)

(i) Suggest how bronchodilators help these people to breathe.

(2)

(ii) Explain why these people can become more breathless during exercise.

(2)

(Total for Question 8 = 12 marks)

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9 Plants manufacture carbohydrates by photosynthesis.

(a) Write the balanced chemical symbol equation for photosynthesis.

(2)

(b) A student investigates the need for light and carbon dioxide in photosynthesis.

This is his method.

- keep three plants, X, Y and Z, in the dark for 24 hours
- place plant X in a bell jar with a watch-glass containing potassium hydroxide
- leave plants Y and Z exposed to the atmosphere
- place plants X and Y in the light
- place plant Z in the dark



(i) Explain why the student keeps all three plants in the dark for 24 hours at the beginning of the investigation.

(2)

(ii) State the function of the potassium hydroxide.

(1)

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(c) The student tests leaves from plants X and Y for starch using iodine solution.

(i) What is the colour of the leaves from plant X after the test?

(1)

- ☒ **A** white
- ☒ **B** orange
- ☒ **C** blue-black
- ☒ **D** brick red

(ii) What is the colour of the leaves from plant Y after the test?

(1)

- ☒ **A** white
- ☒ **B** orange
- ☒ **C** blue-black
- ☒ **D** brick red

(d) The student sets up another plant in the same conditions as plant X, but replaces the potassium hydroxide with water.

Explain why this improves the student's investigation.

(2)

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(Total for Question 9 = 9 marks)

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10 A balanced diet should include the correct proportions of each component.

(a) Two of these components are vitamins and minerals.

Describe the functions of the **other** components of a balanced diet.

(5)

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(b) Explain why a pregnant woman may need to take extra minerals and vitamins.

(4)

(c) People can be put into body mass categories by comparing their body mass to their height.

Categories include overweight, ideal weight and underweight.

The table shows the recommended daily energy requirement for each body mass category.

Body mass category	Recommended daily energy requirement per kg of body mass in kJ
overweight	84
ideal weight	126
underweight	167

(i) Person A has a mass of 70 kg and is categorised as ideal weight.

Calculate the recommended daily energy requirement for person A.

(1)

energy requirement = ... kJ

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(ii) Person B has a mass of 80 kg but, because he is tall, he is categorised as underweight.

Person C also has a mass of 80 kg but, because he is short, he is categorised as overweight.

Calculate the percentage increase in the recommended daily energy requirement of person B compared to person C.

(2)

percentage increase = ... %

(iii) Explain why a person's body mass decreases if they do not have their recommended daily energy requirement.

(2)

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(Total for Question 10 = 14 marks)

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11 The diagram shows an insect called a wasp.



Wasps kill their prey by injecting a poison called venom through a small tube called a stinger.

Some scientists believe that the smell of venom attracts other wasps.

Design an investigation to find out if the smell of venom attracts other wasps.

Include experimental details in your answer and write in full sentences.

(6)

(Total for Question 11 = 6 marks)

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