

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2005



**BIOLOGY (HUMAN)
FOUNDATION TIER**

3415/F

Monday 6 June 2005 1.30 pm to 3.45 pm

F

In addition to this paper you will require:
a ruler.
You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1		16	
2		17	
3		18	
4		19	
5		20	
6		21	
7		22	
8		23	
9		24	
10		25	
11			
12			
13			
14			
15			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: 2 hours 15 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

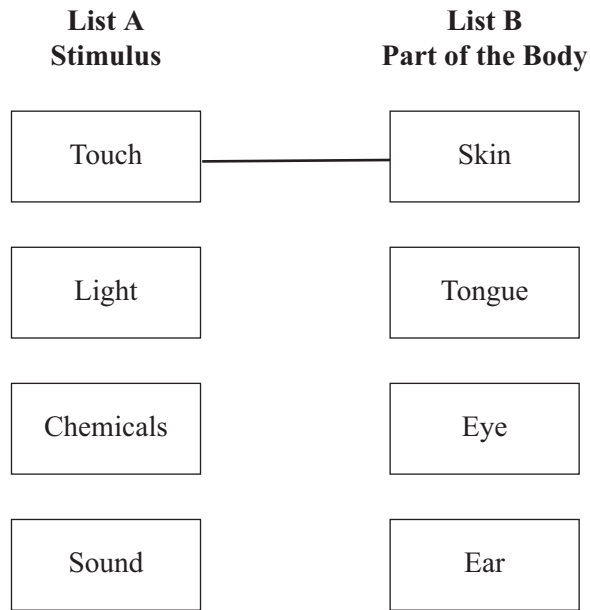
- The maximum mark for this paper is 135.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

Answer **all** questions in the spaces provided.

- 1 (a) List **A** gives the names of four stimuli. List **B** gives four parts of the human body.

Draw a straight line from each stimulus in List **A** to the part of the body in List **B** which has receptors for that stimulus.

(One has been done for you.)



(3 marks)

- (b) Complete the following sentence by choosing the correct words from the box.

brain	glands	motor	sensory
--------------	---------------	--------------	----------------

To make us aware of a stimulus, impulses are sent along a neurone
to the

(2 marks)

5

2 Complete the table by writing the correct process next to its description.

Choose your answers from the list in the box.

breathing	diffusion	digestion	osmosis	respiration
------------------	------------------	------------------	----------------	--------------------

Description	Process
Moving air in and out of the lungs	
The movement of particles of a substance from high to low concentration	
The release of energy from glucose	

(3 marks)

$\frac{\quad}{3}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

3 In recent years, trees have been cut down to create more farm land. More cattle are kept and more rice is grown.

(a) (i) Which gas has increased in the air as a result of trees being cut down?

Draw a ring around **one** answer.

carbon dioxide

oxygen

sulphur dioxide

(1 mark)

(ii) Which gas has increased in the air as a result of keeping more cattle and growing more rice?

Draw a ring around **one** answer.

carbon monoxide

hydrogen

methane

(1 mark)

(b) What effect may increases in these gases have on global temperatures?

Draw a ring around **one** answer.

decrease

increase

stay the same

(1 mark)

(c) List **three** ways in which humans have destroyed the habitats of other animals.
Do **not** include cutting down trees in your answer.

1

.....

2

.....

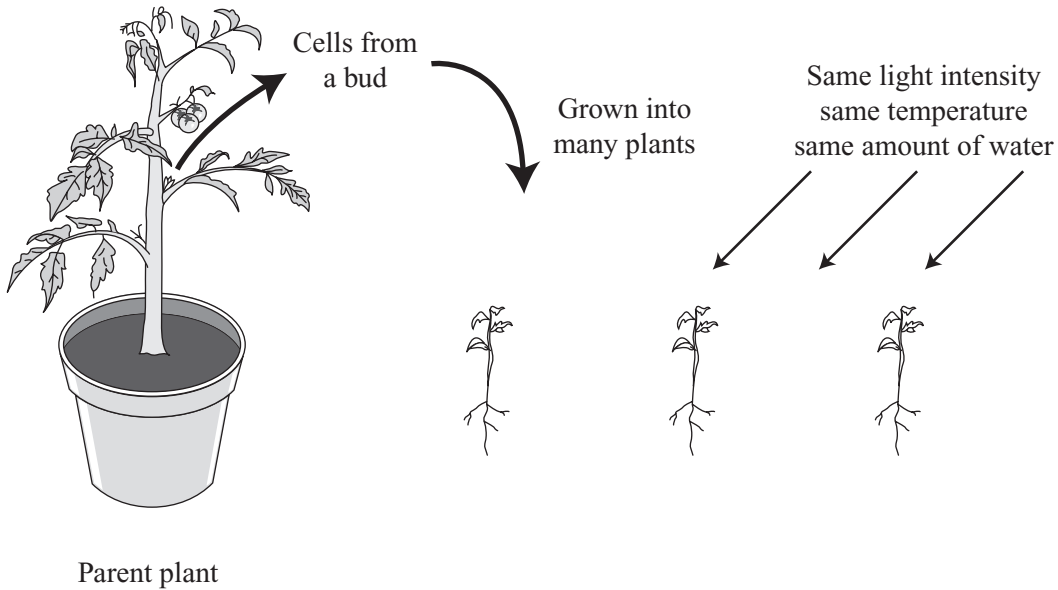
3

.....

(3 marks)

6

4 The diagram shows a method of producing a large number of plants which all look the same. Cells taken from the bud can be split into many groups. Each group of cells is then grown under the same conditions.



(a) (i) What do scientists call organisms which are all produced from one parent and which all look the same?

Draw a ring around **one** answer.

clones

communities

populations

(1 mark)

(ii) Give **two** reasons why plants produced by this method will all look the same.

1

.....

2

.....

(2 marks)

(b) Give **two** reasons why plants need roots.

1

.....

2

.....

(2 marks)

Turn over ►

5 **Figure 1** shows a food chain containing three organisms.

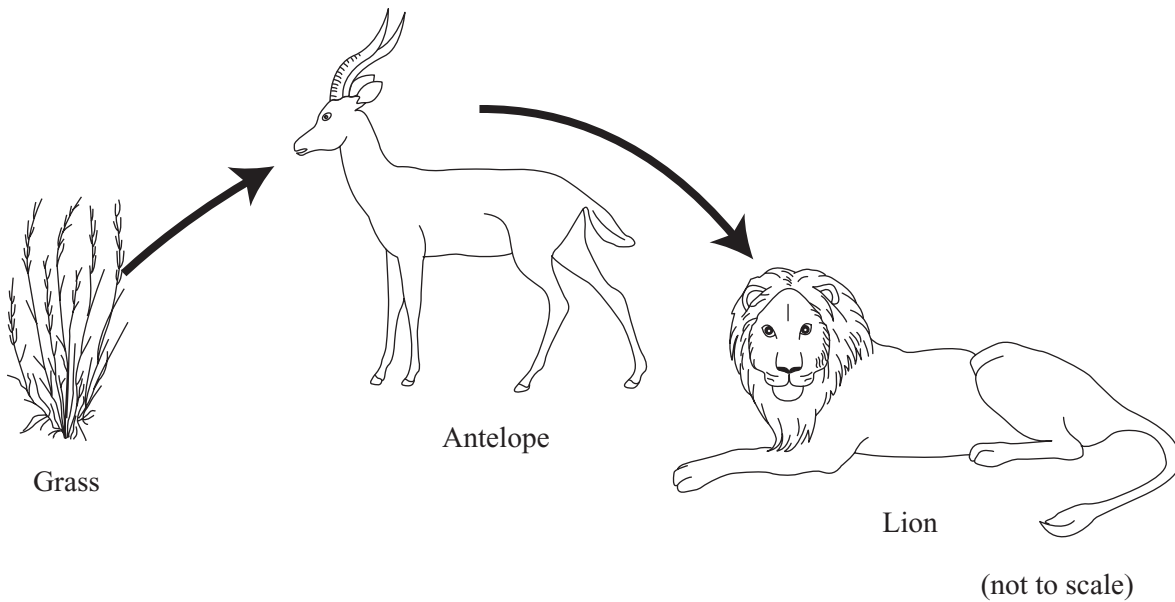


Figure 1

- (a) (i) In this food chain, name:
the predator;
- the prey.
- (2 marks)*

- (ii) What is the source of energy for the grass?

Draw a ring around **one** answer.

carbon dioxide

light

nitrates

water

(1 mark)

- (iii) **Figure 2** shows a pyramid of biomass for the organisms in **Figure 1**.

Write the names of the organisms on the correct lines in **Figure 2**.

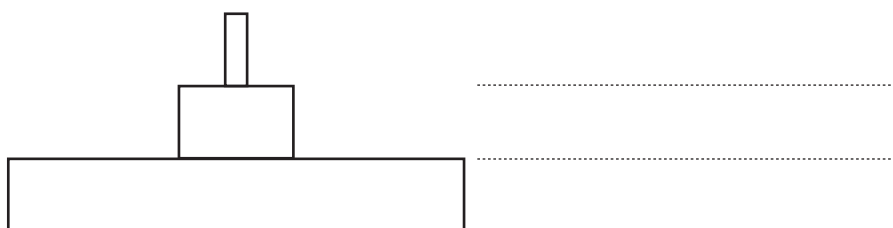


Figure 2

(1 mark)

(b) Waste materials, like faeces from the animals, will decay.

(i) What sort of organisms cause decay?

.....
(1 mark)

(ii) **Three** of the following conditions help decay to occur rapidly.

Which conditions do this?

Draw a ring around each of the **three** answers.

aerobic anaerobic cold dry moist warm

(3 marks)

(iii) The list below gives four substances. Two of these substances are produced by decay and can be used by the grass.

Which **two** substances are these?

Tick (✓) **two** boxes.

Carbon dioxide

Mineral salts

Oxygen

Protein

(2 marks)

10

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 6 (a) Alleles are different forms of the same gene.

Why does a person usually inherit **two** alleles of each gene?

.....
(1 mark)

- (b) Some humans are albino (they have white hair and pale skin). This condition is caused by a recessive allele, **n**. The other allele, **N**, causes a coloured pigment to be made.

There are three possible combinations of these alleles:

NN Nn nn

- (i) Which **one** of these combinations will an albino person have?

.....
(1 mark)

- (ii) Two non-albino parents can sometimes have an albino child.

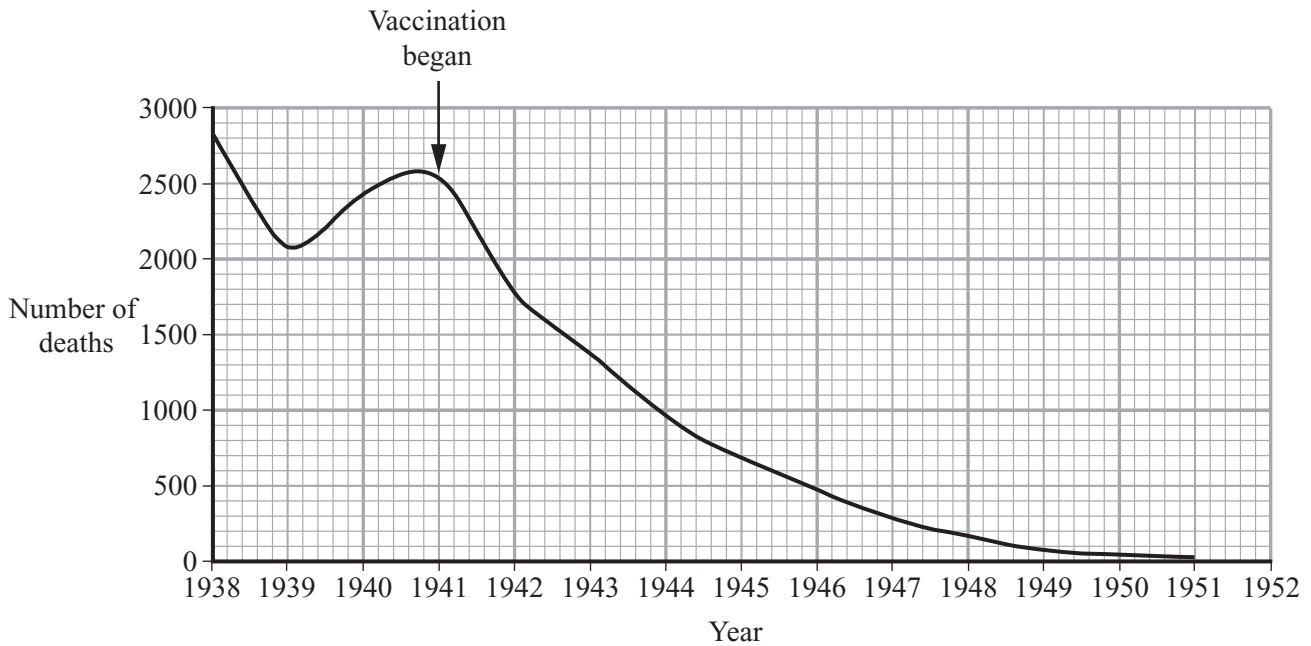
Which **one** of the following combinations of alleles must these two parents have?

Tick (✓) the box next to the correct answer. Tick **one** box only.

Parent 1	Parent 2	
NN	NN	<input type="checkbox"/>
NN	Nn	<input type="checkbox"/>
Nn	Nn	<input type="checkbox"/>
nn	nn	<input type="checkbox"/>

(1 mark)

7 Diphtheria is a disease of the human breathing system. The graph shows the number of deaths from diphtheria in the United Kingdom between 1938 and 1951. Vaccination against diphtheria was begun in 1941.



(a) What evidence in the graph suggests that vaccination protects people from diphtheria?

.....
(1 mark)

(b) Complete the passage by choosing the correct words from the box.

antibodies	bacteria	platelets
red blood cells	white blood cells	

During vaccination, harmless are injected into the body.

This causes to make which help to protect the body against diphtheria.

(3 marks)

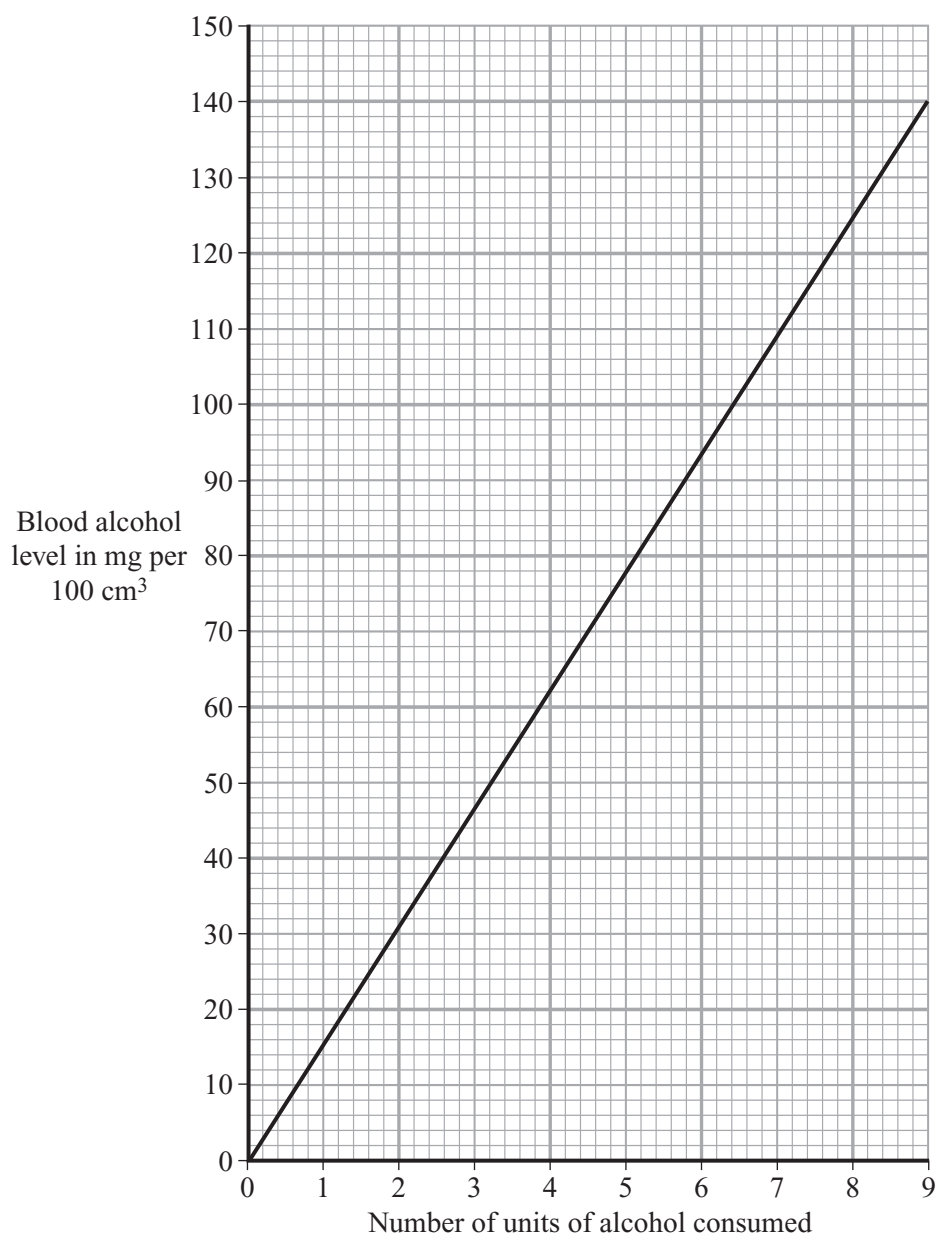
4

Turn over ►

- 8 In the United Kingdom, the legal limit for alcohol in the blood of a person driving a car is 80 milligrams per 100 cm³. The table shows the number of 'units' of alcohol in different drinks.

Drink	Units of alcohol
One can of strong lager	4
One pint of bitter beer	2
One glass of wine	1
One single measure of whisky	1

The graph shows how much alcohol would be found in the blood when a person drinks different amounts of alcohol.



(a) A person drinks two cans of strong lager.

(i) How many units of alcohol are there in two cans of strong lager?

..... units
(1 mark)

(ii) What would this person's blood alcohol level be?

..... mg per 100 cm³
(1 mark)

(b) It is dangerous to drive a car after drinking two cans of strong lager. Explain why.

.....
.....
.....
.....
.....
.....

(3 marks)

(c) Alcohol is transported round the body in the same way as the products of digestion.

Complete the passage, by choosing the correct words from the box, to explain how a person who has drunk too much alcohol would give a positive result in a police 'breathalyser' test.

blood plasma	diffusion	lungs	osmosis
red blood cells	stomach	white blood cells	

Alcohol is absorbed from the digestive system into the by the process of

The alcohol is carried to the where it is then breathed out.
(3 marks)

(d) Give **one** effect on the body of drinking a lot of alcohol over many years.

.....
.....

(1 mark)



Turn over ►

9 The table gives information about a geranium plant and a cactus plant.

The geranium grows in gardens in the UK. The cactus grows in hot deserts.

Feature	Geranium	Cactus
Thickness of waxy cuticle in micrometres	5	15
Total leaf surface area in cm ²	1800	150
Percentage of water storage tissue in stem	50	85
Number of stomata per mm ²	59	13
Time of day when stomata open	daylight	at night
Horizontal spread of roots in metres	0.2	5

Using only information in the table, explain how the cactus is better adapted for living in hot, dry conditions.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)



10 Calcium and vitamin D are needed in the diet to keep the bones of the skeleton healthy.

Complete the table by entering the reasons they are needed.

Nutrient	Reason needed to keep bones healthy
Calcium
Vitamin D

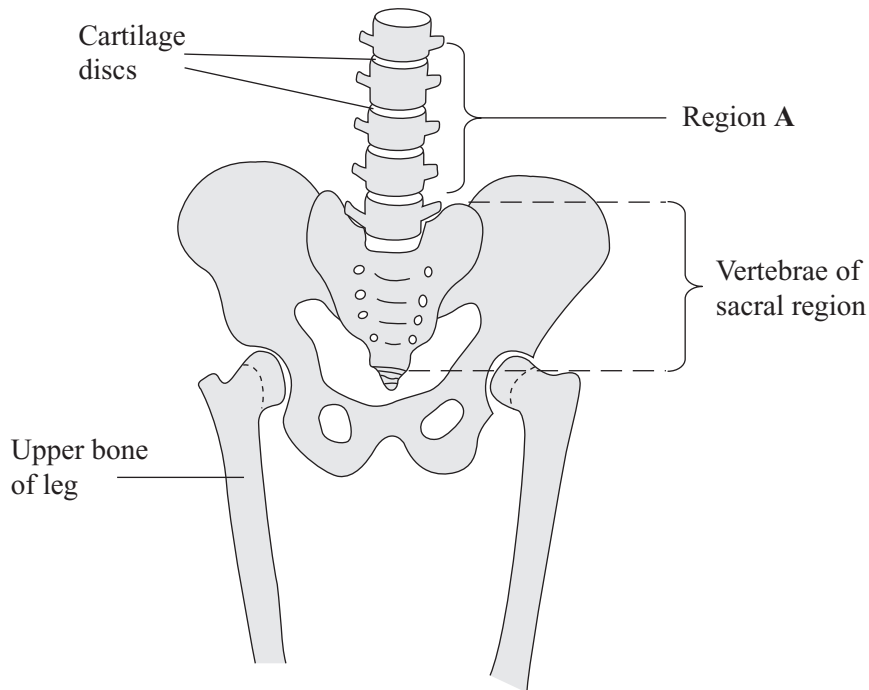
(2 marks)

2

TURN OVER FOR THE NEXT QUESTION

Turn over ►

11 The diagram shows the skeleton of the lower part of the body.



(a) What is the name of the region of the spine labelled A?

.....
(1 mark)

(b) The vertebrae of region A have more bony projections than the vertebrae of the sacral region.

(i) Suggest why region A has more projections.

.....
(1 mark)

(ii) Use the diagram to describe **one** other way in which the sacral region is different from region A.

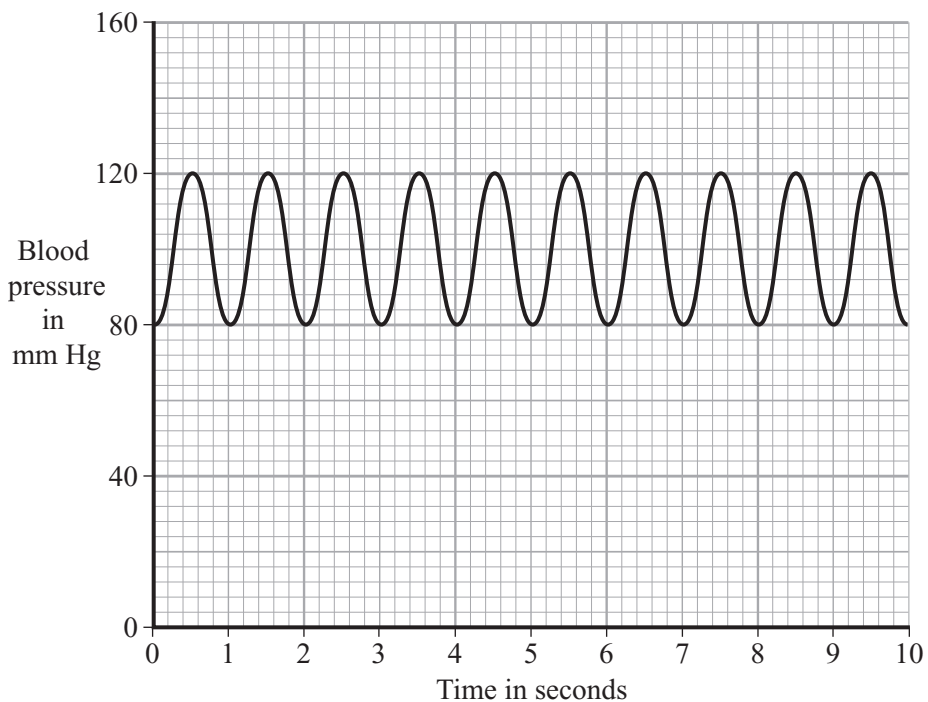
.....
.....
(1 mark)

(c) The sacral region forms a firm link between the spine and the bones to which the legs are joined.

How does this help when a person is walking or running?

.....
.....
(1 mark)

12 The graph shows the results of measuring the blood pressure in an artery of a person.



(a) Explain why it is possible to find the heart rate from the information in the graph.

.....
.....
(1 mark)

(b) What was the heart rate of this person? Show clearly how you work out your answer.

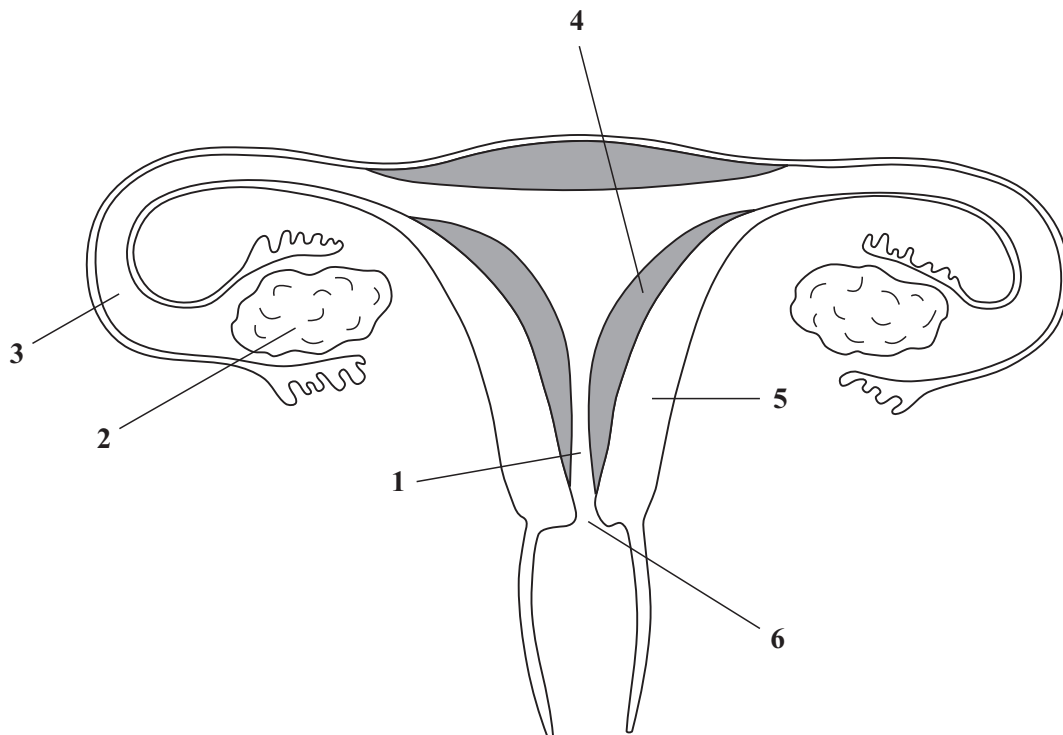
.....
.....
.....
.....

Heart rate beats per minute
(2 marks)

3

Turn over ►

13 (a) The diagram shows the female reproductive system.



Enter the number of each of the following in the correct box.

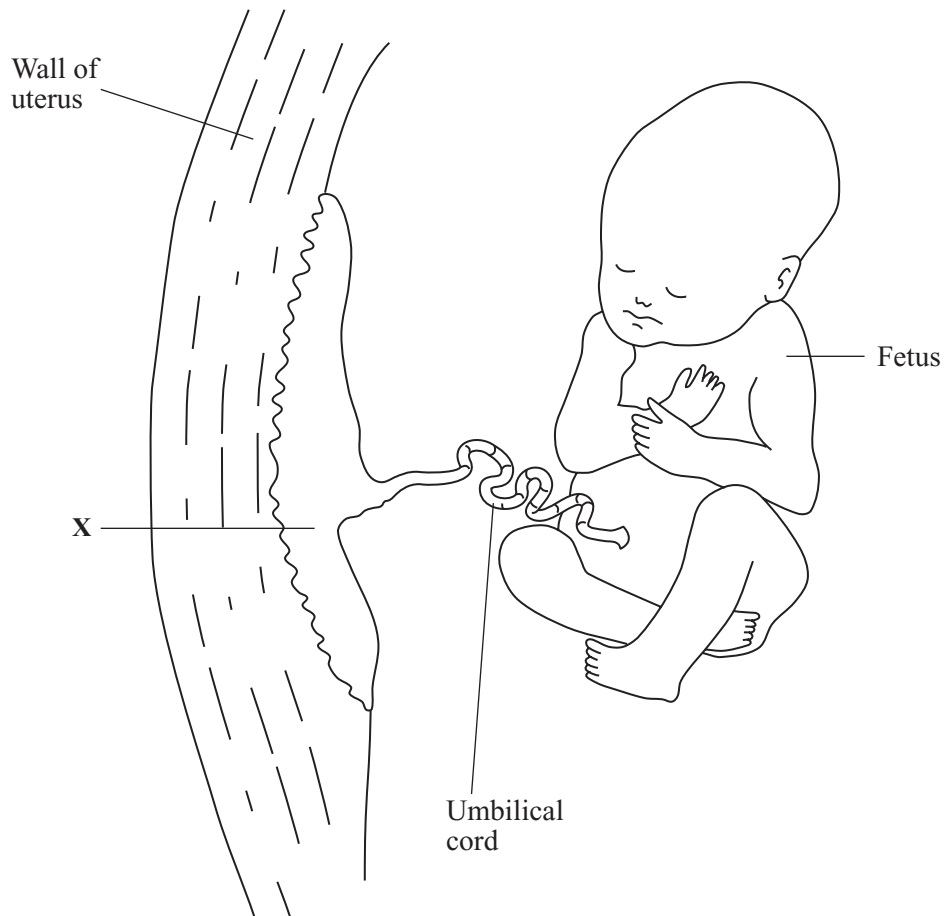
A muscular structure which contracts at birth

A structure which contains follicles that form eggs

A place where fertilisation normally occurs

(3 marks)

(b) The diagram shows a fetus.



(i) The structure labelled **X** contains blood vessels of the mother and fetus.

What is the name of structure **X**?

.....
(1 mark)

(ii) The membrane between the mother's blood and the blood of the fetus is very thin.

Explain how this helps a fetus to receive oxygen.

.....
.....
.....
(2 marks)

6

Turn over ►

- 14 (a) Place a tick (✓) in the box to show the first humans to use fire for cooking and defence.

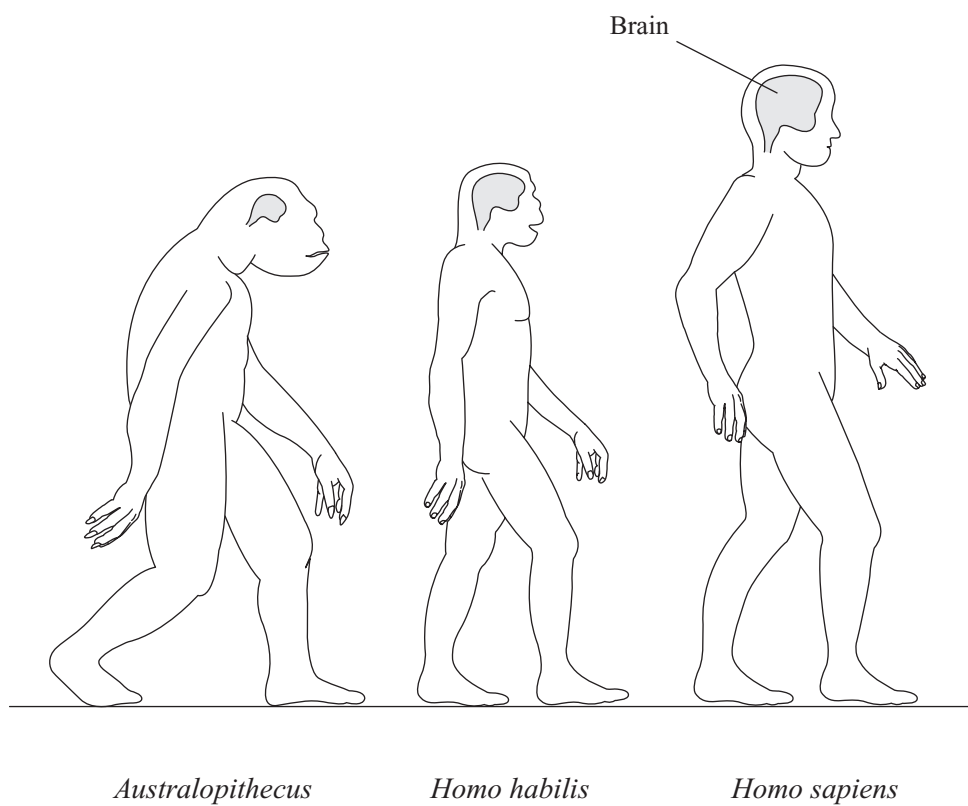
Homo erectus.....

Homo habilis.....

Homo sapiens.....

(1 mark)

- (b) The diagram shows the bodies and brains of three primates. They have been drawn to the same scale.



- (i) Give **one** way, shown in the diagram, in which these three primates are different from most other mammals.

.....

(1 mark)

- (ii) *Australopithecus* had hands which could handle objects with a precision grip, as in *Homo sapiens*.

How does the diagram show that such a grip is possible?

.....

(1 mark)

- (iii) Describe **two** features of the evolution of modern humans which can be seen in the diagram.

.....

(2 marks)

- (iv) In which position in the diagram should a drawing of Neanderthal Man be placed?

Give a reason for your answer.

Position.....

Reason.....

.....

(1 mark)

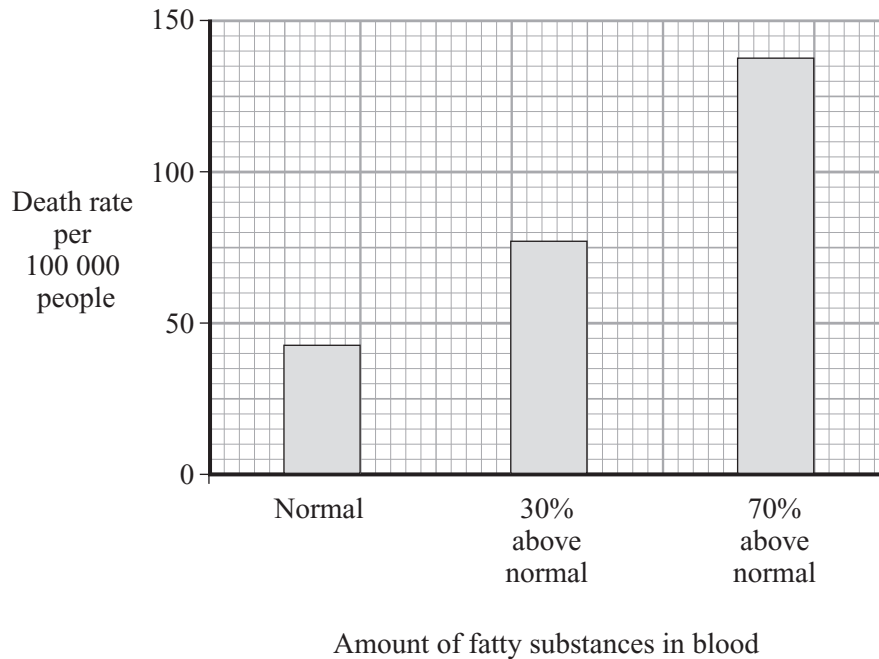


TURN OVER FOR THE NEXT QUESTION

Turn over ►

15 People have different amounts of fatty substances in their blood.

An investigation compared death rates with different amounts of fatty substances. The chart shows the results.



- (a) Describe the effect on the death rate of increasing amounts of fatty substances in the blood.

.....

(1 mark)

- (b) Draw a ring around the correct ending for each of the following sentences.

- (i) Too much fatty substances in the blood may form a layer on the inside of the

arteries **lungs** **nerves** **veins**

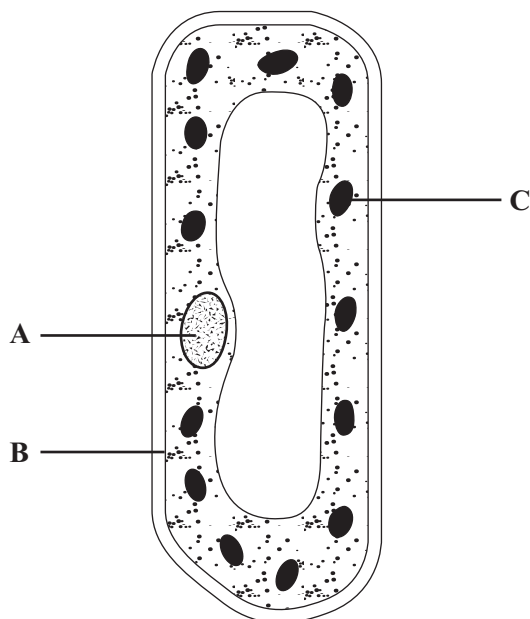
(1 mark)

- (ii) If the blood supply to the heart muscles is reduced they will lack energy because of a shortage of

carbon dioxide **hydrogen** **nitrogen** **oxygen**

(1 mark)

16 The diagram shows a cell from a plant leaf.



(a) Name structures **A** and **B**.

A

B

(2 marks)

(b) Structure **C** is a chloroplast. What is the function of a chloroplast?

.....

(1 mark)

(c) The table gives one difference between a plant cell and an animal cell.

Complete the table to give **two** more differences.

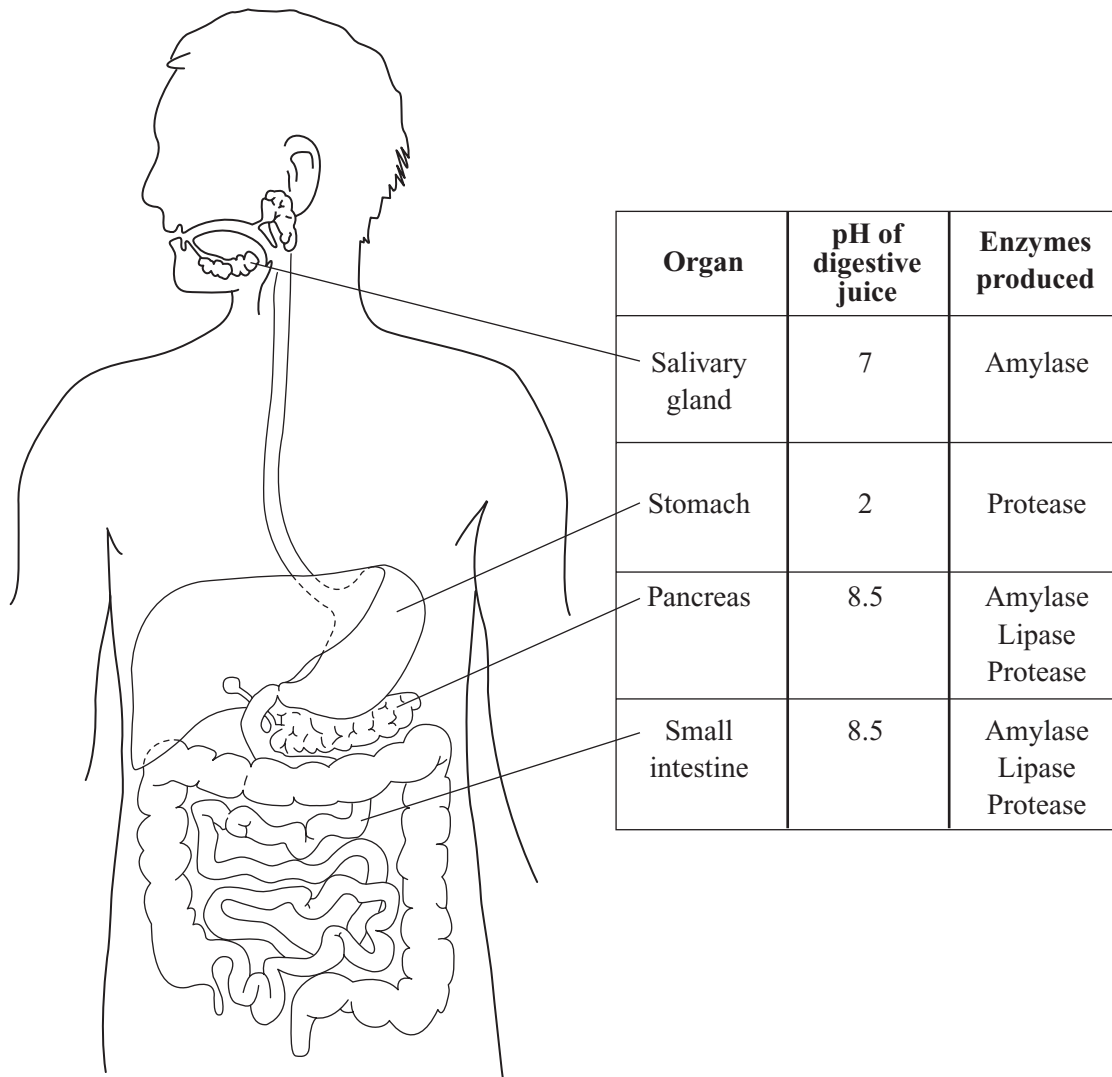
Plant cell	Animal cell
1. Has chloroplasts	1. No chloroplasts
2.	2.
3.	3.

(2 marks)

5

Turn over ►

17 The diagram gives information about some parts of the human digestive system.



- (a) (i) Name the organ which **makes** bile.

.....
(1 mark)

- (ii) Label this organ with the letter **X** on the diagram.

(1 mark)

Information in the table may help you to answer parts (b) and (c).

(b) Name **two** parts of the digestive system where protein is digested.

1

2

(2 marks)

(c) Suggest **two** reasons why starch is not digested in the stomach.

1

.....

2

.....

(2 marks)

(d) The contents of the small intestine are liquid but the faeces are much more solid.

Explain what causes this to happen.

.....

.....

.....

.....

.....

.....

.....

(3 marks)

9

TURN OVER FOR THE NEXT QUESTION

Turn over ►

18 Auxin is a hormone made by the tips of plant shoots.

Figure 1 shows the movement of auxin in two young shoots, A and B, which were treated in different ways. 'X' shows where auxin was made. Both shoots were kept in the dark.

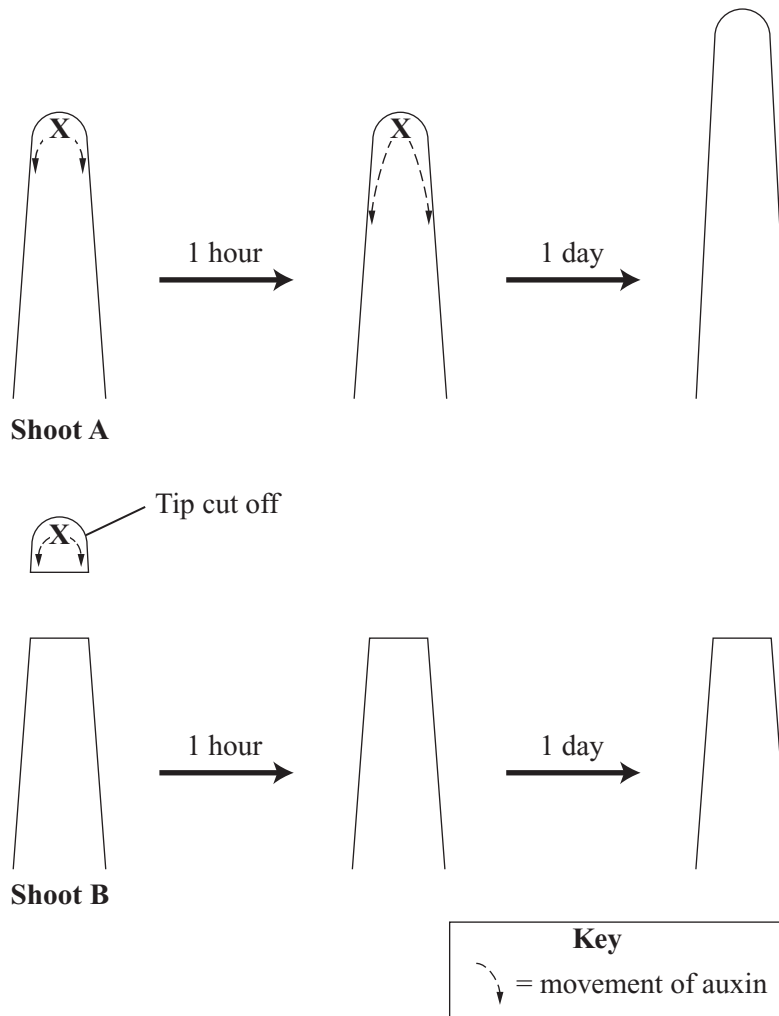


Figure 1

(a) Explain the difference in the growth of shoot A and shoot B at the end of one day.

.....

.....

.....

.....

.....

(4 marks)

- (b) A third shoot, **C**, was grown in a box so that light shone onto it from only one side. **Figure 2** shows movement of auxin in this shoot and the result of the experiment.

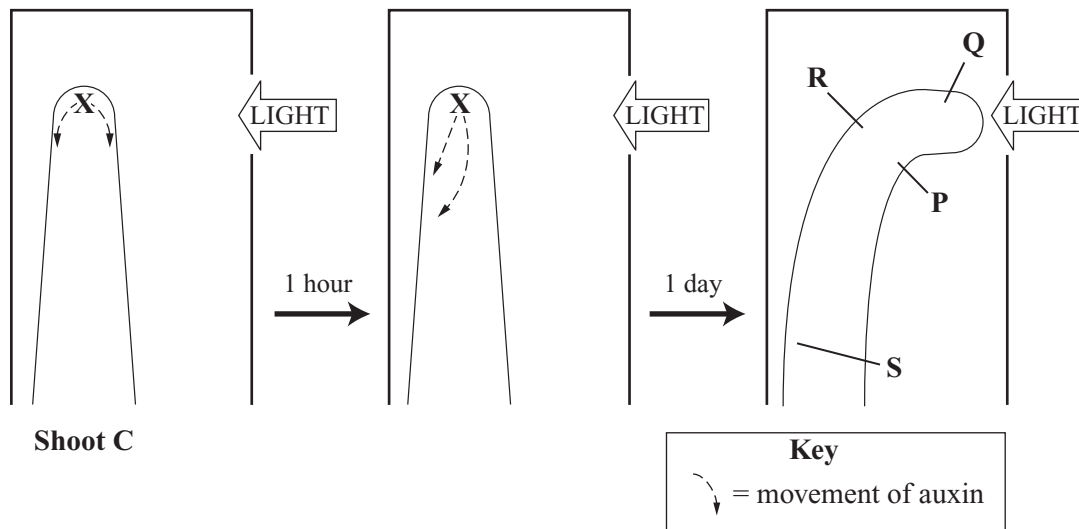


Figure 2

- (i) Describe the movement of auxin in shoot **C** after one hour.

.....
(1 mark)

- (ii) Auxin causes plant cells to elongate (grow longer).

At which point, **P**, **Q**, **R** or **S**, would cells have elongated the most?
Draw a ring around **one** answer.

P **Q** **R** **S**

(1 mark)

- (c) Plant hormones are sometimes used by humans to control plant growth. Give **two** examples of this.

1

.....

2

.....

(2 marks)

- 19 The table shows the effects that two different concentrations of sulphur dioxide in the air had on the growth of rye grass plants.

Sulphur dioxide concentration in the air in micrograms per m ³	9.0	191.0
Number of leaves per plant	85.6	47.3
Total leaf area in cm ²	417.2	203.6
Dry mass of stubble in grams	0.48	0.22

- (a) What human activity releases sulphur dioxide into the air?

.....
(1 mark)

- (b) (i) What effect does sulphur dioxide have on rainwater?

.....
.....
(1 mark)

- (ii) Use information from the table to describe **one** effect of sulphur dioxide on the leaves of the grass plants.

.....
.....
(1 mark)

- (c) The stubble consists of the bases of the stems of the plants and the roots left in the soil after harvesting.

Use your answer to part (b) to explain why the dry mass of the stubble was less at the higher concentration of sulphur dioxide.

.....
.....
.....
.....
(2 marks)

20 (a) Fossils provide evidence for evolution.

(i) What is a fossil?

.....
(1 mark)

(ii) How do fossils provide evidence for evolution?

.....
.....
.....
.....
(2 marks)

(b) Doctors give antibiotics to patients to kill bacteria in their bodies.

Explain how the overuse of antibiotics has led to the evolution of antibiotic-resistant bacteria.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

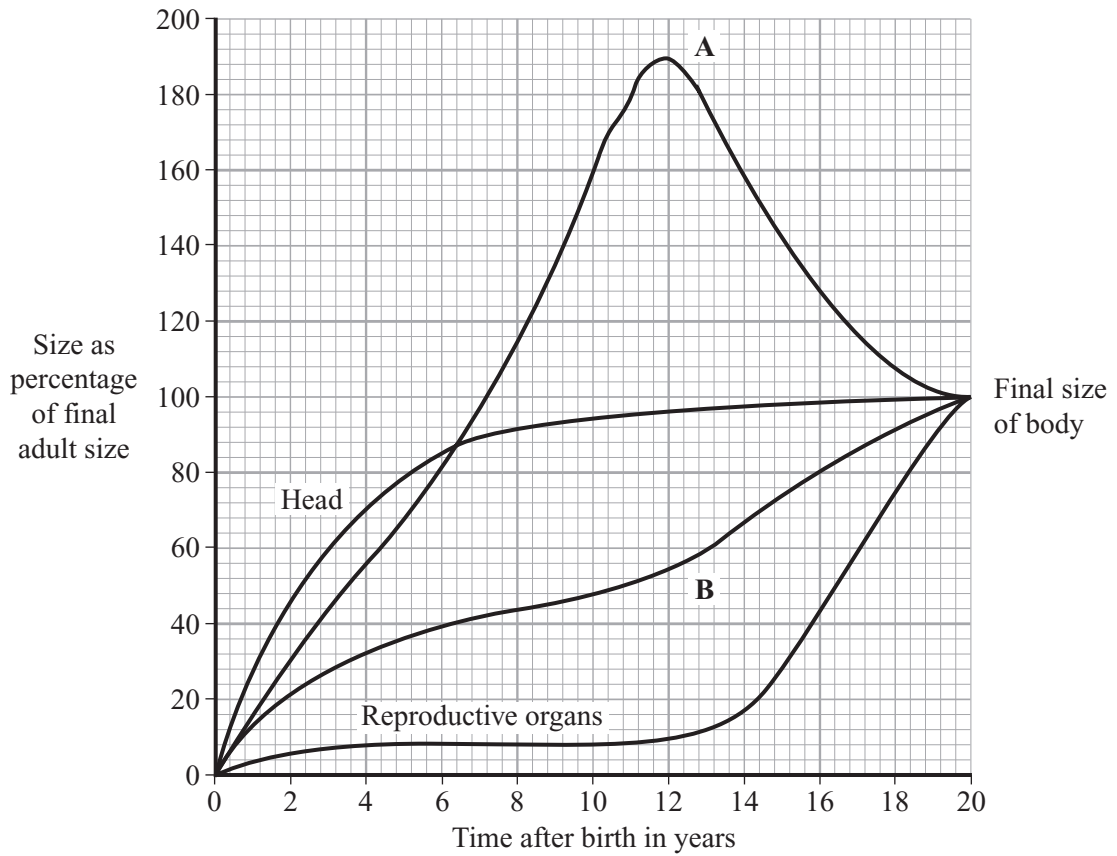
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(3 marks)

6

TURN OVER FOR THE NEXT QUESTION

Turn over ►

21 (a) The graph shows the relative growth rates of three parts of the body compared with the whole body.



(i) Which of the two lines, **A** or **B**, represents the size of the body?

Explain the reason for your answer.

.....

 (1 mark)

(ii) What is the percentage size of the head when a person is aged four years?

.....
 (1 mark)

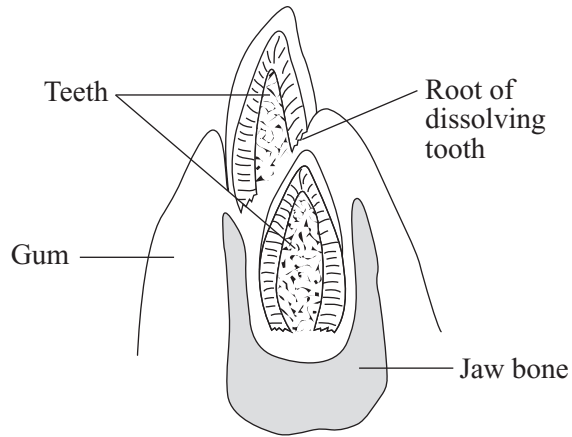
(iii) At what age does the graph show puberty starting?

Explain the reason for your answer.

.....

 (1 mark)

(b) The diagram shows a section of a child's lower jaw.



Describe how the diagram shows that it is the jaw of a child aged more than six years.

.....

.....

.....

.....

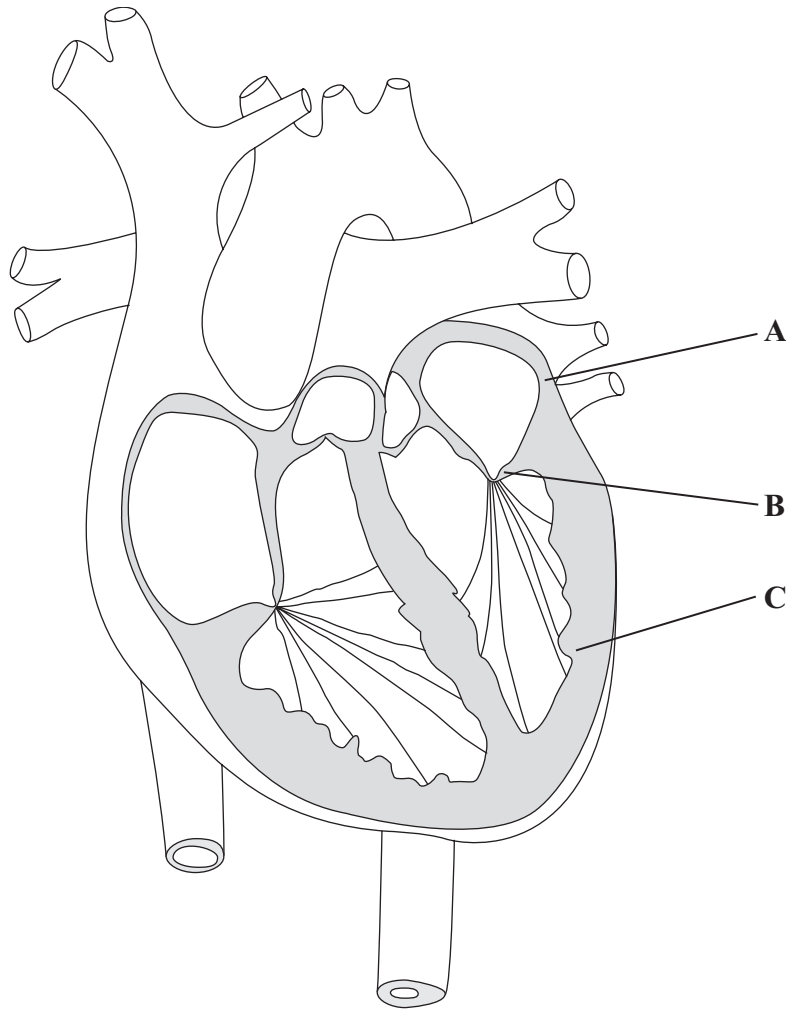
(2 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 22 (a) The diagram shows a section of the heart.



- (i) One stage of the heart cycle is the contraction of the part labelled **A**.

What is the effect of this contraction?

.....
(1 mark)

- (ii) In some people the flaps of the part labelled **B** do not fit together properly. This causes the heart to be less efficient in pumping oxygenated blood to the organs of the body.

Suggest the reason for this.

.....
.....
(1 mark)

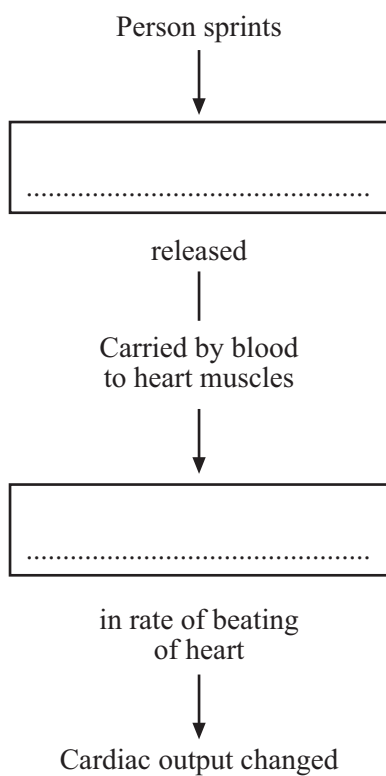
(iii) Explain how the action of the part labelled **C** helps to cause the blood pressure.

.....
(1 mark)

(b) When a person starts to run fast there is a change in the cardiac output of the heart. The flow diagram below shows one way in which the body can cause this change.

Choose words from the box to complete the flow diagram. Enter the words that you choose in the boxes on the diagram.

adrenalin	decrease	impulse
increase	insulin	oestrogen



(2 marks)

5

Turn over ►

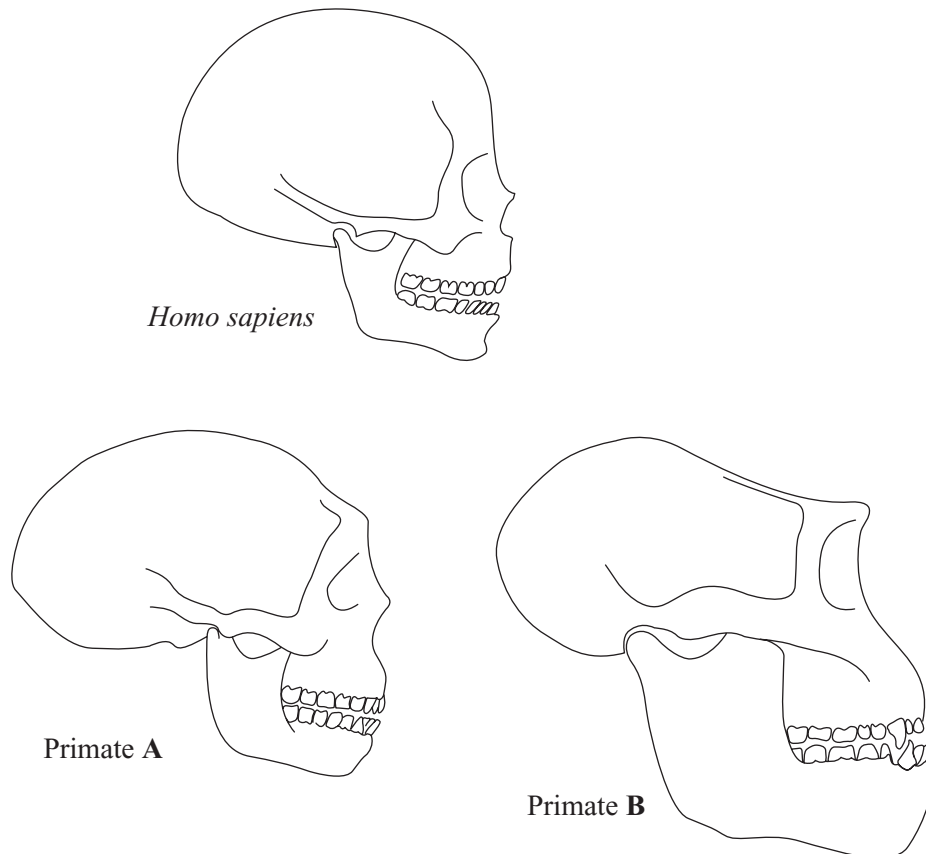
- 23 (a) (i) Human fossils normally consist only of bones and teeth. Explain the reason for this.

.....
.....
(1 mark)

- (ii) How can the use of radioisotopes help in the study of human fossils?

.....
.....
(1 mark)

- (b) The diagram shows a skull of *Homo sapiens* and the fossil skulls of two other primates.



Not drawn to scale

It was once thought by some scientists that both primates **A** and **B** were direct ancestors of *Homo sapiens*. It is now thought that only primate **A** is an ancestor.

Use information in the diagram to help suggest an explanation for this change of opinion.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

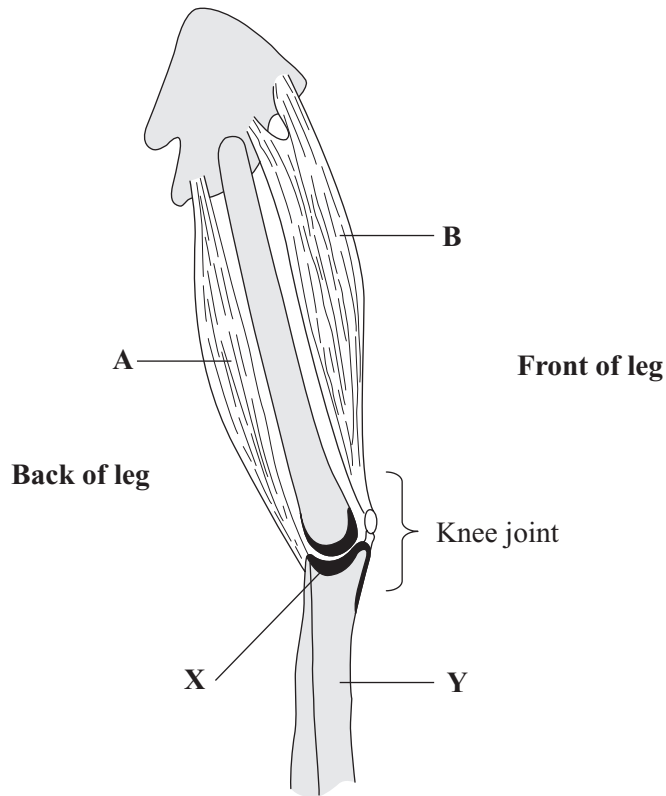
(3 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

24 (a) The diagram shows some of the bones and muscles of the leg.



(i) The structures labelled **A** and **B** are *antagonistic* muscles. Use the diagram to help explain what is meant by the term *antagonistic* muscles.

.....

.....

.....

(2 marks)

(ii) The part labelled **X** may develop osteoarthritis due to general wear and tear. The part labelled **Y** may develop osteoporosis with increasing age.

Explain how each of these conditions could make it difficult for a person to use the leg.

X – osteoarthritis.....

.....

Y – osteoporosis.....

.....

(2 marks)

(b) Ligaments are part of the skeleton of a living person. They are very strong and slightly elastic.

Explain why each of these properties is necessary for the efficient functioning of the skeleton.

Very strong

.....

Slightly elastic

.....

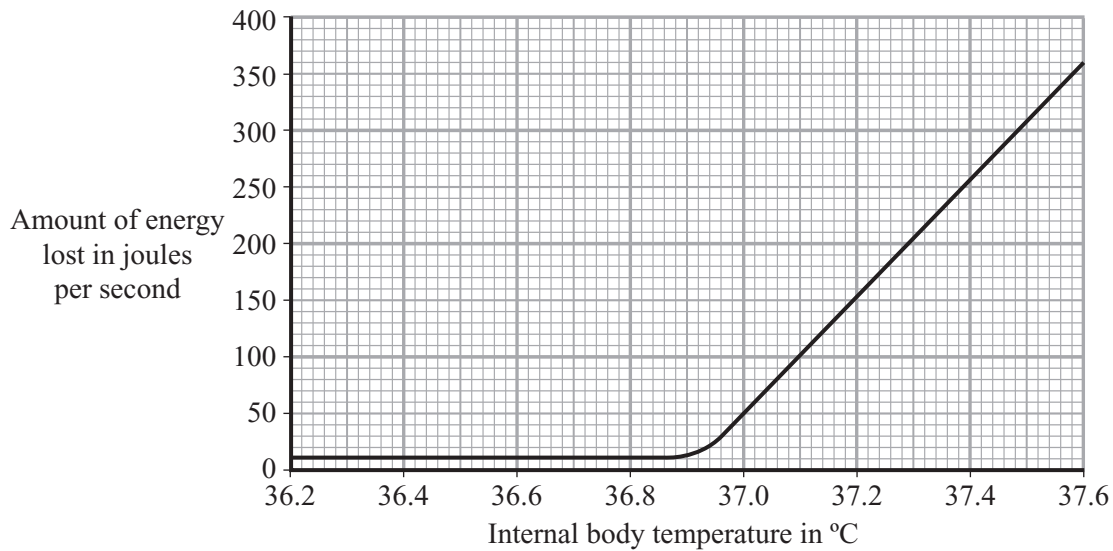
(2 marks)

$\frac{\quad}{6}$

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 25 The internal body temperature determines how much a person sweats. The graph shows the effect of different internal body temperatures on a person’s rate of energy loss by sweating.



- (a) How much more energy was lost from the body each second by sweating when the body temperature was 37.6°C than when it was 36.6°C? Show clearly how you work out your final answer.

.....

Amount of energy = joules per second
 (2 marks)

- (b) Explain why a person would feel more thirsty when the body temperature was 37.6°C than when it was 36.6°C.

.....

(2 marks)

- (c) Explain how sweating helps to control body temperature.

.....

(3 marks)