

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Education
Advanced Subsidiary Examination
January 2011

Human Biology

HBIO2

Unit 2 Humans – their origins and adaptations

Tuesday 18 January 2011 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use accurate scientific terminology.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	



J A N 1 1 H B I O 2 0 1

WMP/Jan11/HBIO2

HBIO2

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

1 (a) Name **two** substances that muscles can use to produce ATP.

1

2 (2 marks)

1 (b) In long distance races, athletes adjust their running speeds so that all the ATP is produced by aerobic respiration.
Explain the benefit of this.

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..... (3 marks)

(Extra space)

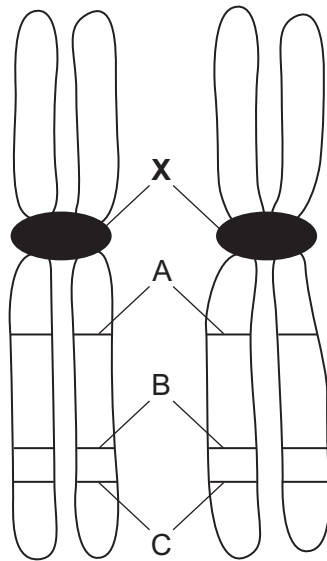
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- 2 The diagram shows two chromosomes in a cell undergoing mitosis.



A – Gene for feature A
B – Gene for feature B
C – Gene for feature C

- 2 (a) Name X.

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(1 mark)

- 2 (b) These are homologous chromosomes. Give **two** pieces of evidence from the diagram that support this.

1

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2

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(2 marks)

- 2 (c) What will happen to these chromosomes in anaphase?

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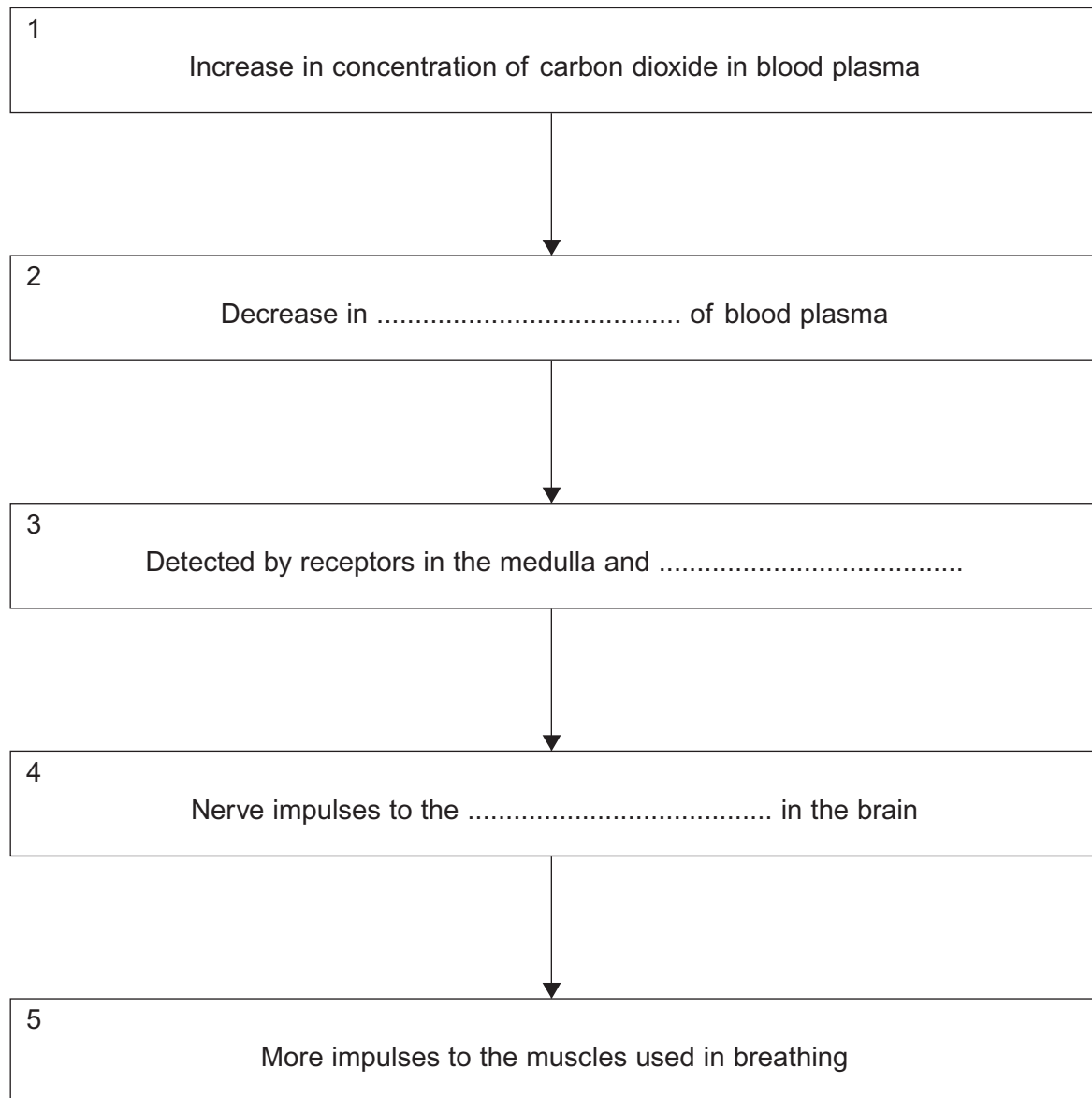
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(2 marks)



3 The flow chart describes one way in which breathing is controlled.



3 (a) Complete boxes 2, 3 and 4 by writing your answers on the dotted lines.

(3 marks)



- 3 (b)** Nerve impulses cause the muscles used in breathing to contract. Give **two** ways in which these muscles respond to the increase in nerve impulses.

1

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2

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(2 marks)

5

Turn over for the next question

Turn over ►



4 *Giardia* is a single-celled parasite of the small intestines.

Figure 1 shows the life cycle of *Giardia*. **Figure 2** shows a cell of *Giardia*.

Figure 1

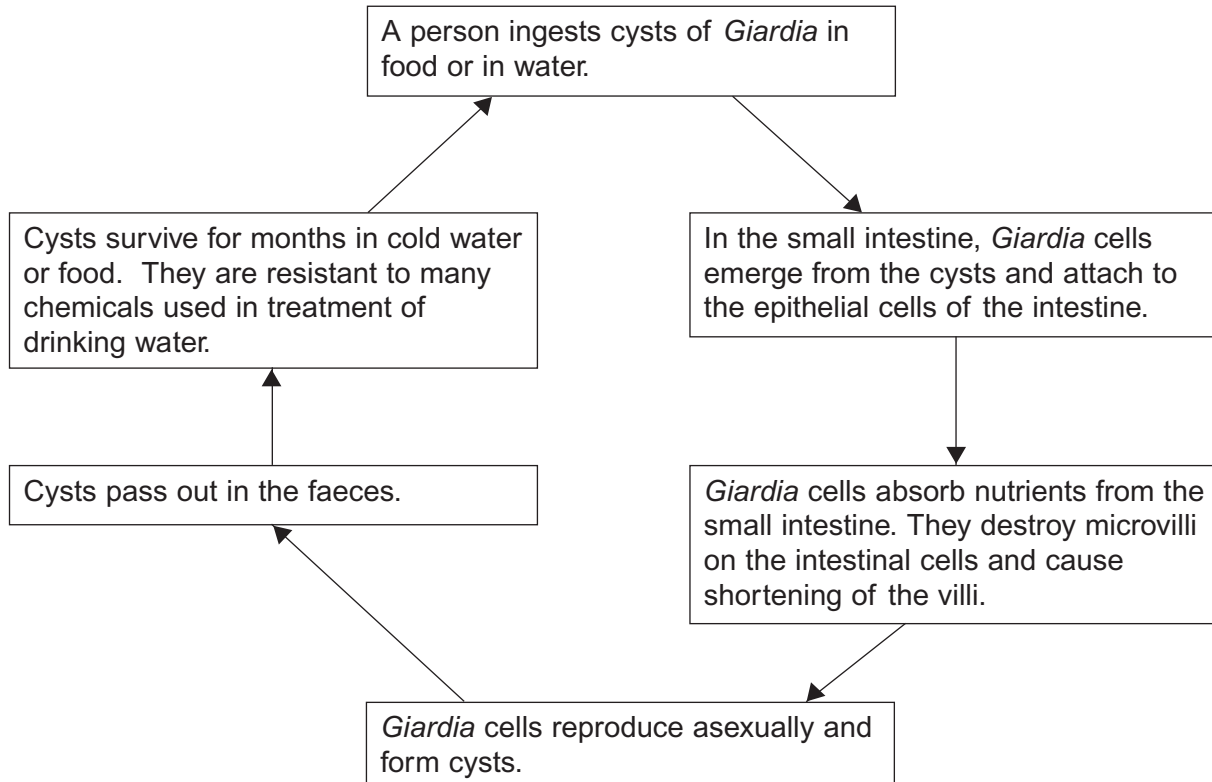
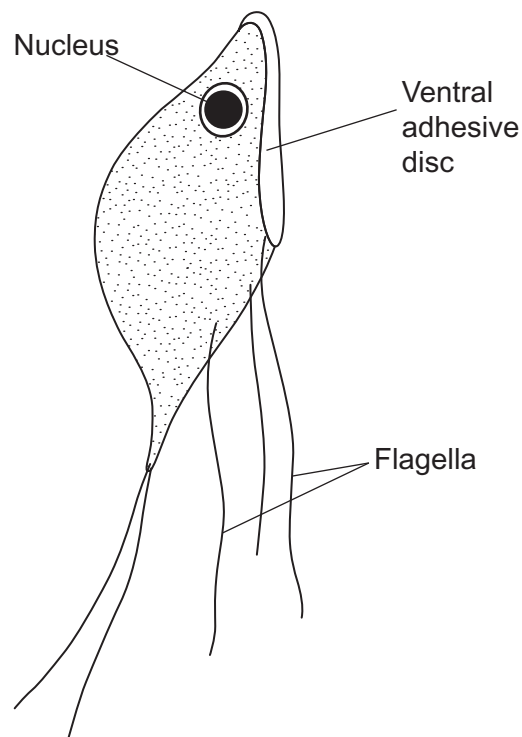


Figure 2



4 (a) Describe **two** features of *Giardia*'s life cycle that show that it is a parasite.

1

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2

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(2 marks)

4 (b) Describe and explain **two** adaptations of *Giardia* that allow it to complete its life cycle. Use information from both **Figure 1** and **Figure 2** in your answer.

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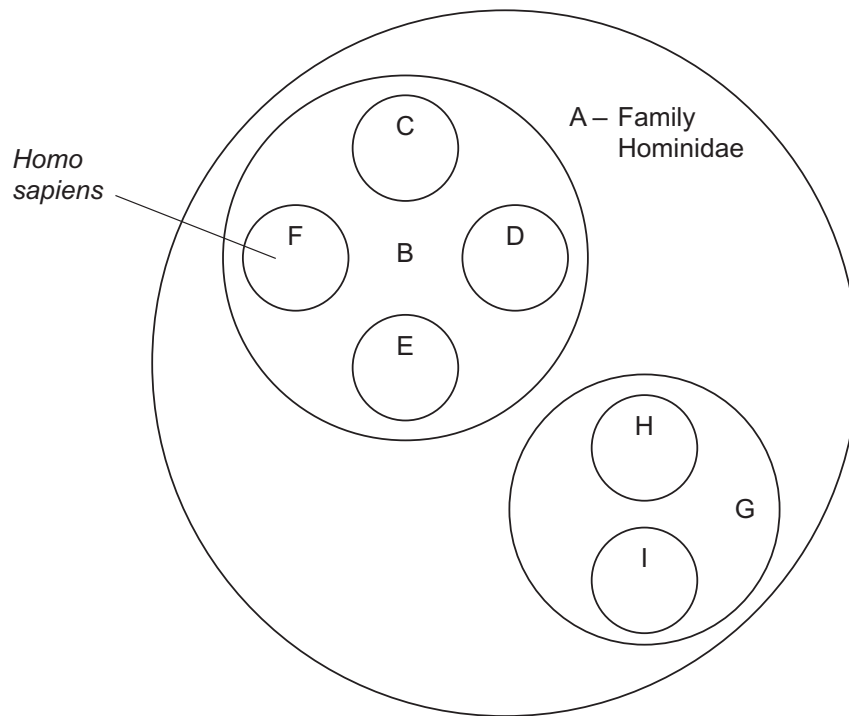
(4 marks)

6

Turn over ►



- 5 (a) The diagram represents some of the levels of classification of some hominids.



Which circle represents the genus *Australopithecus*? Explain your answer.

Circle

Explanation

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(3 marks)

(Extra space)

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- 5 (b)** Biologists can classify organisms by comparing their DNA. How does this allow the organisms to be classified?

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(2 marks)

Turn over for the next question

5

Turn over ►



6 (a) Give **two** ways in which a malignant tumour differs from a benign tumour.

1

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2

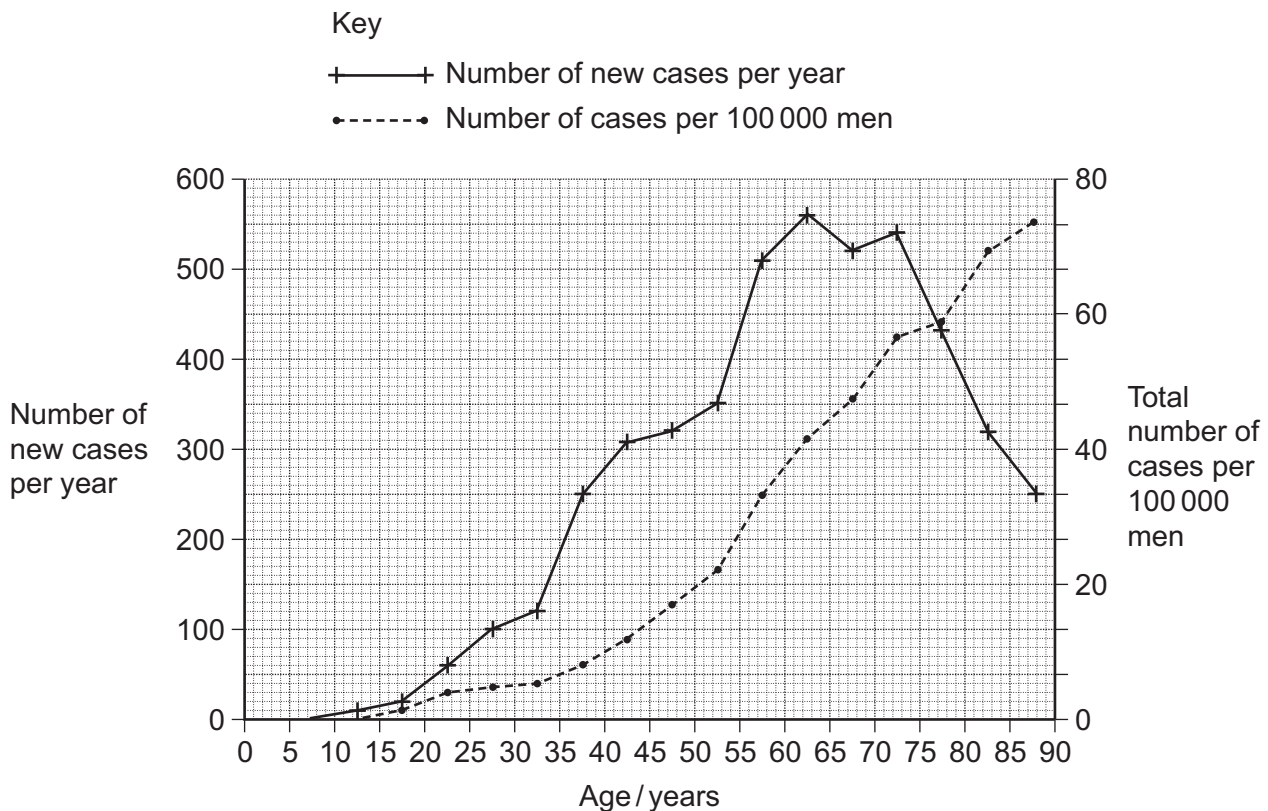
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(2 marks)

6 (b) Melanoma is a skin tumour that is malignant. Doctors investigated cases of melanoma in men belonging to different age groups. For each age group, they recorded:

- the number of new cases per year
- the total number of cases per 100 000 men.

The graph shows their results.



- 6 (b) (i)** Suggest a reason for the increase in the total number of cases of melanoma per 100 000 men between age 20 and age 65.

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(2 marks)

- 6 (b) (ii)** The doctors concluded that the risk of developing melanoma increases with age. Do you think that this conclusion is valid? Use both sets of data in the graph to support your answer.

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(3 marks)

(Extra space)

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7

Turn over for the next question

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- 7** Much of the woodland that used to cover the UK has been cut down. At the start of the 20th century, only 700 000 hectares of woodland remained. One hundred years later, this area had risen to 2 800 000 hectares because of replanting.

- 7 (a)** Calculate the average area of trees replanted each year in the one hundred years since the start of the 20th century. Show your working.

Average area of trees replanted each year =hectares
(2 marks)

- 7 (b)** Both coniferous and deciduous woodland were planted in the 20th century. The table shows some features of each type of woodland.

Feature	Coniferous woodland	Deciduous woodland
Number of tree species	Low	High
Number of plant species other than trees	Low	High
Number of insect species	Low	High
Growth rate of trees	High	Low
Density of planting	High	Low
Approximate financial yield per hectare per year	£185	£87
Government grant available to help with planting each type of woodland	£700 per hectare	£1 200 per hectare



Use information in the table to answer the following questions.

- 7 (b) (i) Give **two** factors that would explain the difference in the financial yield of the two types of woodland.

1

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2

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(2 marks)

- 7 (b) (ii) Explain **one** environmental reason why the government pays larger grants for planting deciduous woodland.

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(2 marks)

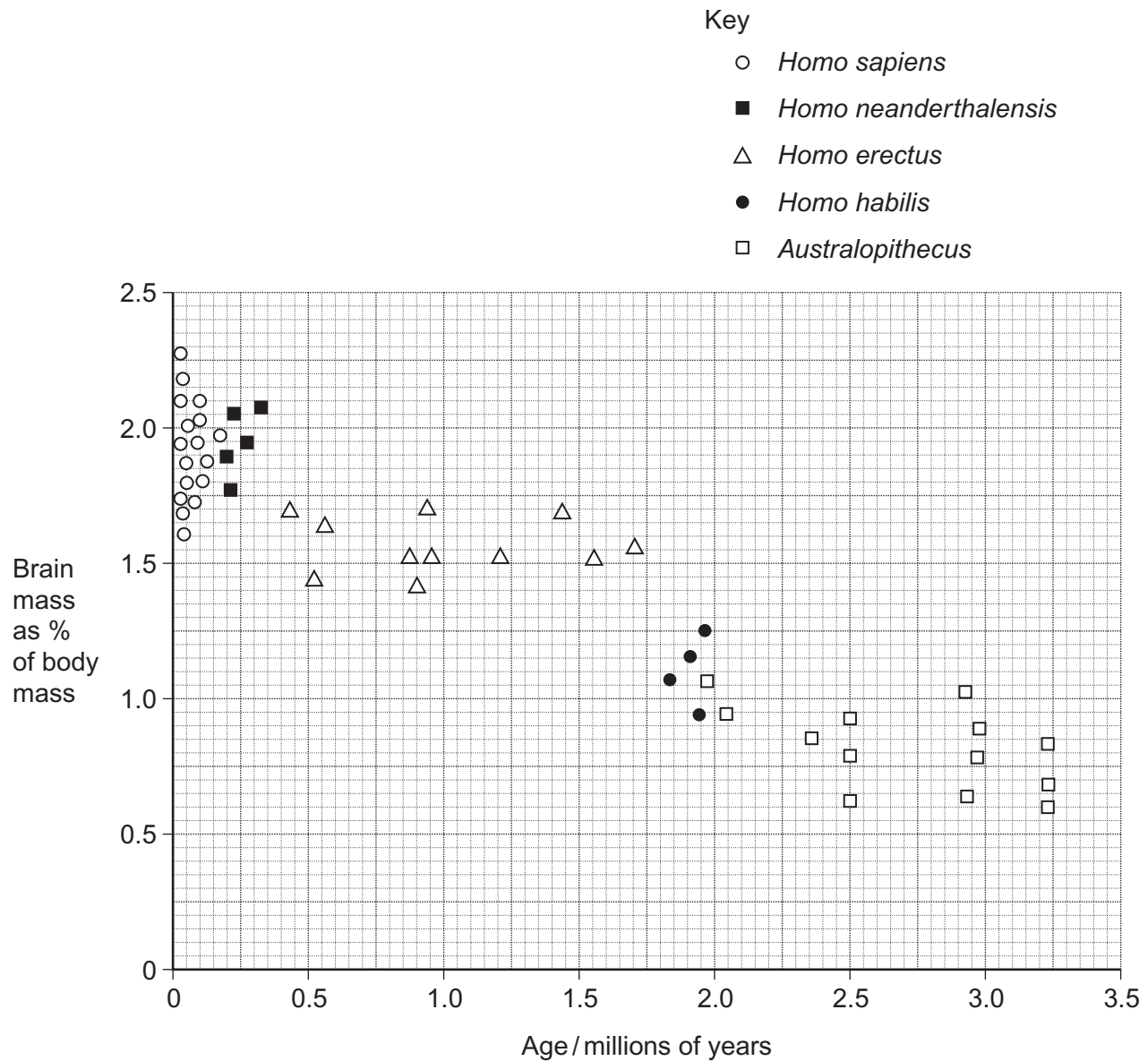
Turn over for the next question



- 8 (a) Biologists investigated the brain mass of different hominids (*Australopithecus* and different species of the genus *Homo*). They estimated their brain mass from the volume of the skull.

Figure 3 shows their results.

Figure 3



- 8 (a) (i)** The biologists gave brain mass as a percentage of body mass in their results.
Explain why.

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(2 marks)

- 8 (a) (ii)** One biologist concluded that 'brain size within hominids had increased steadily over the past 3.5 million years'. Does the evidence in **Figure 3** support this conclusion?
Give reasons for your answer.

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(3 marks)

(Extra space)

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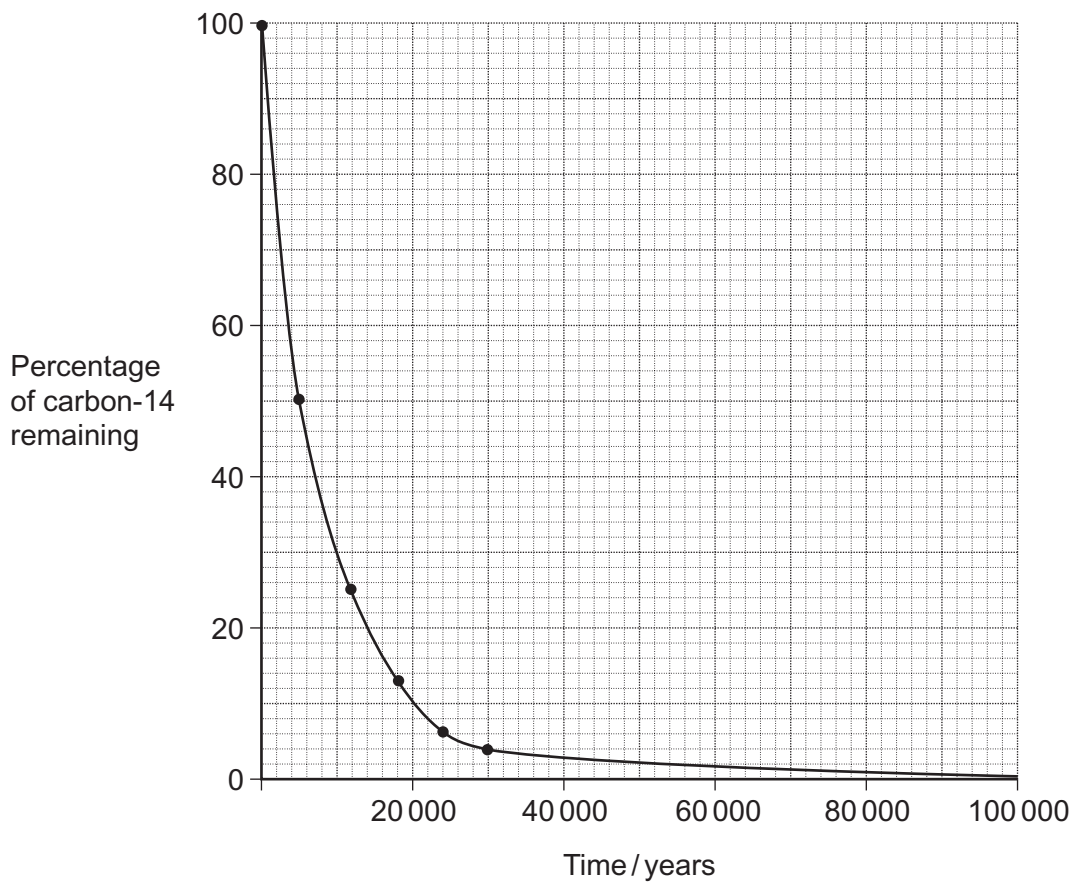
Question 8 continues on the next page

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- 8 (b) The biologists used carbon dating to estimate the age of some of the fossils.
Figure 4 shows how the percentage of carbon-14 in a fossil changes over time.

Figure 4



- 8 (b) (i) Name **two** other techniques that can be used to date fossils.

1

2

(2 marks)

8 (b) (ii) Use information from **Figure 3** and **Figure 4** to explain why carbon dating cannot be used to date fossils of *Homo habilis*.

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(3 marks)

(Extra space)

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10

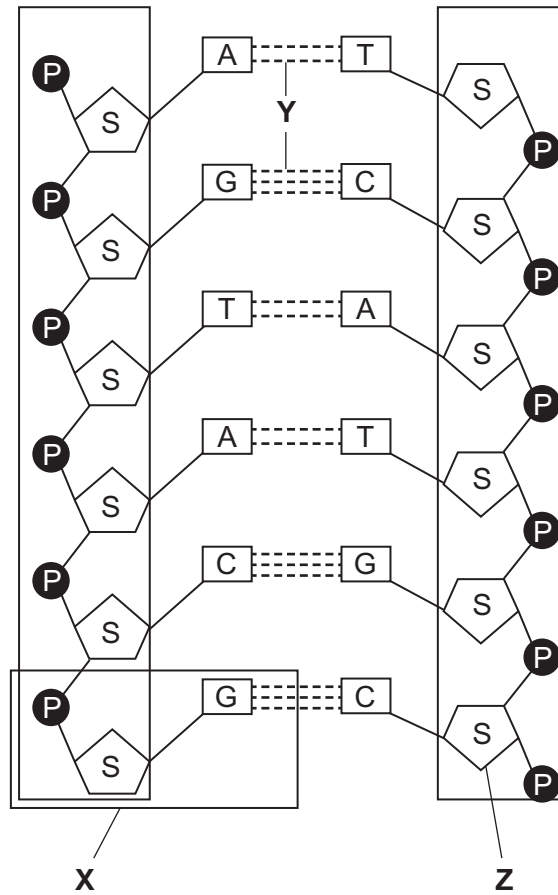
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9 **Figure 5** shows part of a molecule of DNA.

Figure 5



9 (a) Name the parts of the molecule labelled

X

Y

Z

(3 marks)



- 9 (b)** A molecule of RNA is much smaller than a molecule of DNA. This difference in size is related to their function. Complete the following sentences to explain how.

The larger size of a DNA molecule allows it to:

.....

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The smaller size of an RNA molecule allows it to:

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(2 marks)

Question 9 continues on the next page

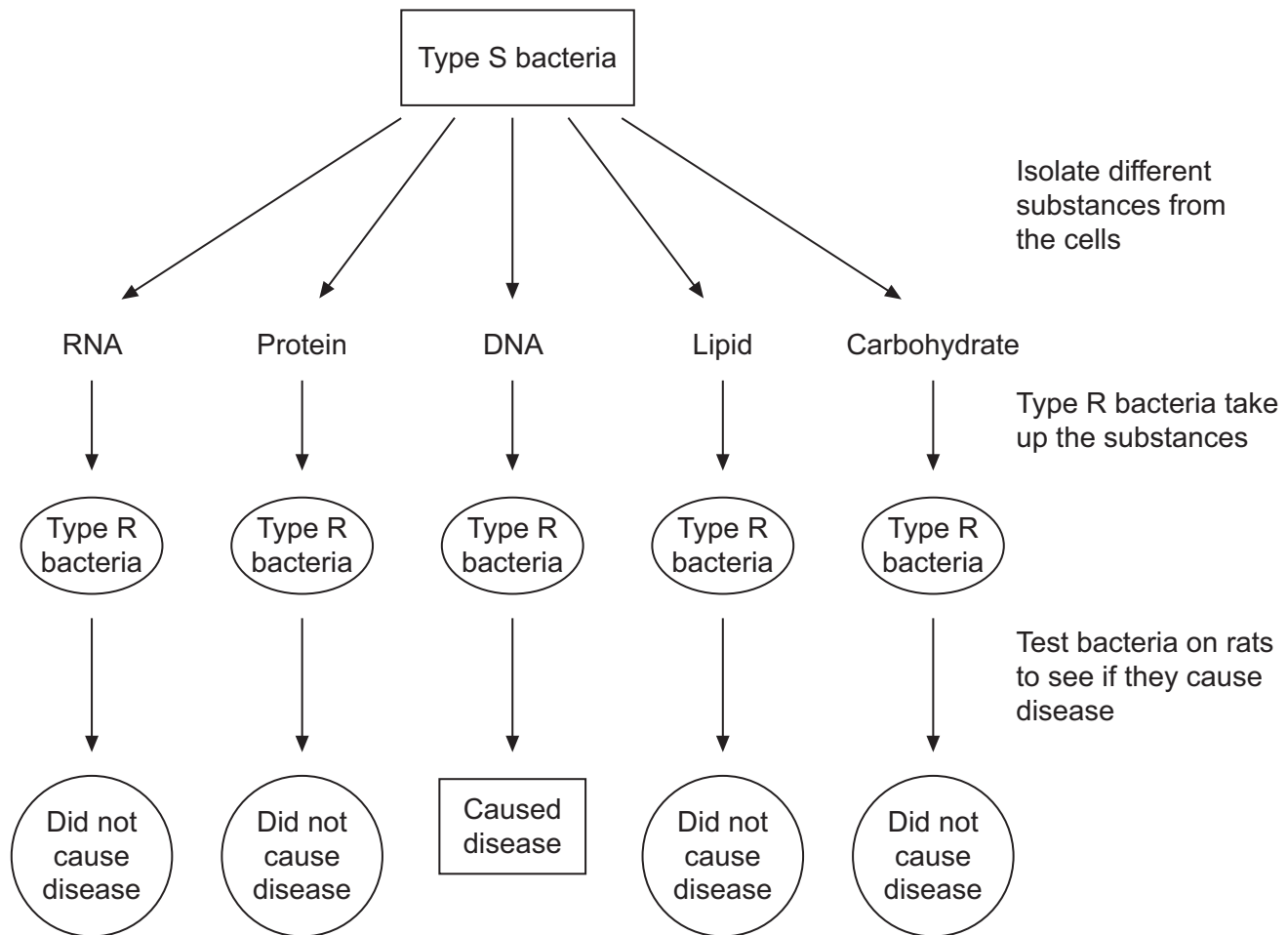
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- 9 (c)** Before the structure of DNA had been discovered, geneticists carried out an investigation to see if DNA was the genetic material. They used two types of the same species of bacterium:
- type S, which caused disease in rats
 - type R, which did not cause disease in rats.

Figure 6 shows some of the stages of this investigation.

Figure 6



- 9 (c) (i)** The results from the investigation show that DNA must be the hereditary material. Explain how they show this.

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(2 marks)

- 9 (c) (ii)** Explain why each substance was added to a different batch of type R bacteria.

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(2 marks)

- 9 (c) (iii)** Evaluate the ethics of this investigation.

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(2 marks)

Turn over for the next question



10 Read the following passage.

Between 20 000 and 10 000 years ago, significant changes were taking place to the environment. The temperature of the Earth increased by 8°C to around its present level. The carbon dioxide concentration of the atmosphere doubled to just below its present level. These changes would increase the rate of photosynthesis in most plants. During this period, humans were hunter-gatherers. They had domesticated wild dogs to help them to hunt and had developed a complex language which their children learnt during their extended childhood. 5

Many biologists believe that humans first began to form settled agricultural communities in the fertile crescent of the Middle East about 10 000 years ago. In these communities, humans domesticated and cultivated crop plants, including wheat. 10 The seeds of wheat were used to make bread. Chance mutations allowed the seeds of some wheat plants to survive the harvesting process better than others. Within 500 years, most wheat plants cultivated by humans carried these mutations.

10 (a) Explain how humans may have used selective breeding to domesticate dogs to help them to hunt (lines 5 and 6).

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(4 marks)

(Extra space)

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10 (b) (i) Explain the importance of a complex language to the hunter-gatherer way of life (line 6).

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(2 marks)

10 (b) (ii) Explain the importance of an extended childhood to the hunter-gatherer way of life (line 7).

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(2 marks)

Question 10 continues on the next page

Turn over ►



10 (c) (i) What is a mutation (line 11)?

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(2 marks)

10 (c) (ii) Explain how natural selection could have led to the mutation that allowed seeds of wheat to survive the harvesting process better becoming widespread in wheat plants (lines 11 to 13).

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(4 marks)

(Extra space)

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END OF QUESTIONS



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