**Pearson Edexcel
International GCSE**

Centre Number | Candidate Number

# Human Biology

**Unit: 4HB0
Paper: 01**

Wednesday 11 May 2016 – Morning
**Time: 2 hours**

Paper Reference
**4HB0/01**

**You must have:**
Ruler
Calculator

Total Marks

## Instructions

## Information

## Advice

*Turn over* ▶

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**PEARSON**

**Answer ALL questions.**

1 For each of the questions (a) to (j), choose an answer **A**, **B**, **C** or **D** and put a cross in the box ☒. Mark only one answer for each question. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

(a) A cell containing 16 chromosomes divides by mitosis producing two cells, which each contain

**(1)**

☒ **A** 4 chromosomes

☒ **B** 8 chromosomes

☒ **C** 16 chromosomes

☒ **D** 32 chromosomes

(b) Semicircular canals in the ear are responsible for

**(1)**

☒ **A** balance

☒ **B** equalising air pressure

☒ **C** hearing

☒ **D** transmitting vibrations

(c) The diagram shows a human tooth.
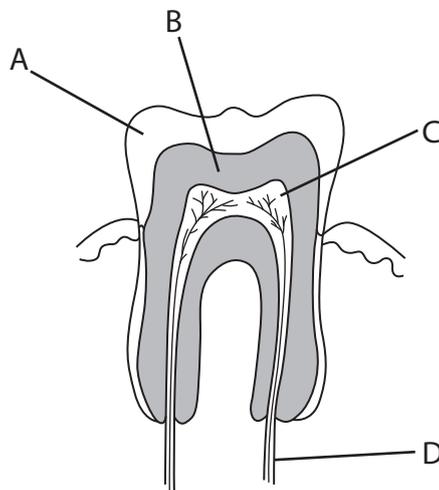


The hardest part of the tooth is labelled

**(1)**

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(d) Which component of a diet contains the elements carbon, hydrogen, oxygen and nitrogen?

**(1)**

☒ **A** carbohydrate

☒ **B** fat

☒ **C** glycerol

☒ **D** protein

(e) Which disease is caused by a bacterium?

**(1)**

☒ **A** athlete's foot

☒ **B** gonorrhoea

☒ **C** influenza

☒ **D** malaria

(f) The bacteria shown in the photograph are different from animal cells because they contain

**(1)**



☒ **A** cytoplasm

☒ **B** a cell wall

☒ **C** chromosomes

☒ **D** a cell membrane

(g) Which of the following is not an excretory organ?

**(1)**

☒ **A** kidney

☒ **B** lungs

☒ **C** pancreas

☒ **D** skin

(h) The position of the heart in the human body is

**(1)**

- ☒ **A** below the diaphragm
- ☒ **B** between the two lungs
- ☒ **C** in the middle of the abdomen
- ☒ **D** under the stomach

(i) Which of the following is **not** a greenhouse gas?

**(1)**

- ☒ **A** carbon dioxide
- ☒ **B** methane
- ☒ **C** sulfur dioxide
- ☒ **D** water vapour

(j) The diagram shows a section through the human brain.
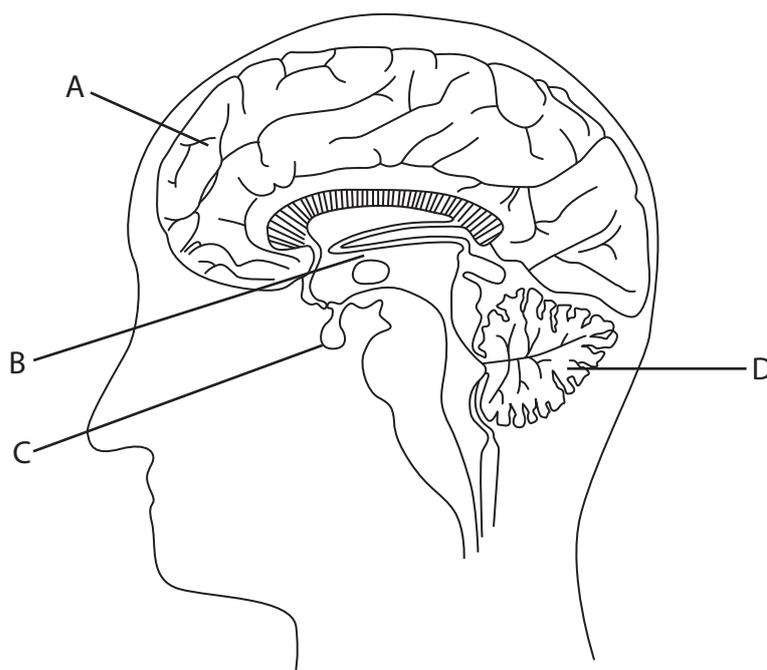


Which part is responsible for intelligence?

**(1)**

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

**(Total for Question 1 = 10 marks)**

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**2** (a) Complete the passage using the correct word or words from the list.

(8)

| | | | | |
|---|---|---|---|---|
| atria | pumps | right atrium | body | elastic tissue |
| right ventricle | seventy | cardiac muscle | left ventricle | |
| thirty | ventricles | receive | one hundred | lungs |

The human heart consists of four chambers.   The upper two chambers are called the

........................................................... and they ............................................................. blood from the

veins.

The lower chambers are the ................................................................. .   The right lower chamber pumps

blood to the ................................................................., whilst the left lower chamber pumps blood to the

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

The wall of the heart is made of ................................................................. and the chamber with the

thickest wall is the ................................................................. .

At rest, the average adult heart beats about ................................................................. times a minute.

(b) The diagram shows a heart without any valves being drawn.



right side | left side
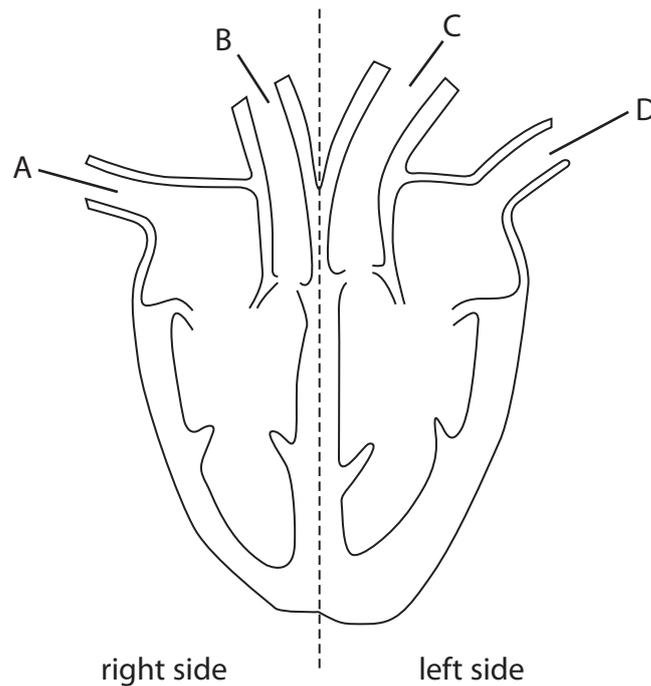
(i) Name the blood vessels A, B, C and D.

**(4)**

A ................................................................................................................................................................................................................................

B ................................................................................................................................................................................................................................

C ................................................................................................................................................................................................................................

D ................................................................................................................................................................................................................................

(ii) The ventricles of the heart are relaxed and filling with blood.

Complete the diagram by drawing the two sets of valves on the left side of the heart as they would appear at this stage.

**(2)**

(iii) Using label lines on the diagram, name the valves you have drawn.

**(2)**

**(Total for Question 2 = 16 marks)**

**3** (a) A student carries out an investigation into the effect of different concentrations of sugar solution on the mass of potato cylinders.

This is the method the student uses.

- wrap each potato cylinder in filter paper
- remove each potato cylinder from the filter paper and weigh
- place each potato cylinder into a sugar solution of known concentration
- remove the potato cylinders after two hours
- wrap the potato cylinders in filter paper, then remove from the filter paper and reweigh

The results are given as a percentage change in mass of the potato cylinders. The concentration of sugar is given in arbitrary units (au).

The student's results
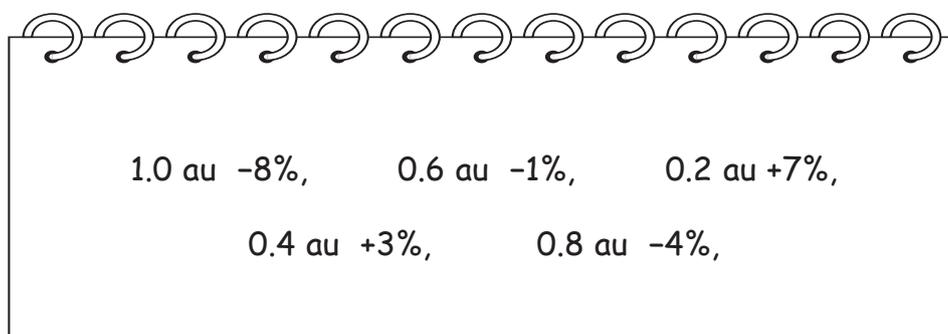
1.0 au  −8%,        0.6 au  −1%,        0.2 au  +7%,

0.4 au  +3%,        0.8 au  −4%,

(i) Draw a table with column headings to display the student's results.

**(4)**

(ii) Plot a graph of the results. Draw a line of best fit.

**(4)**
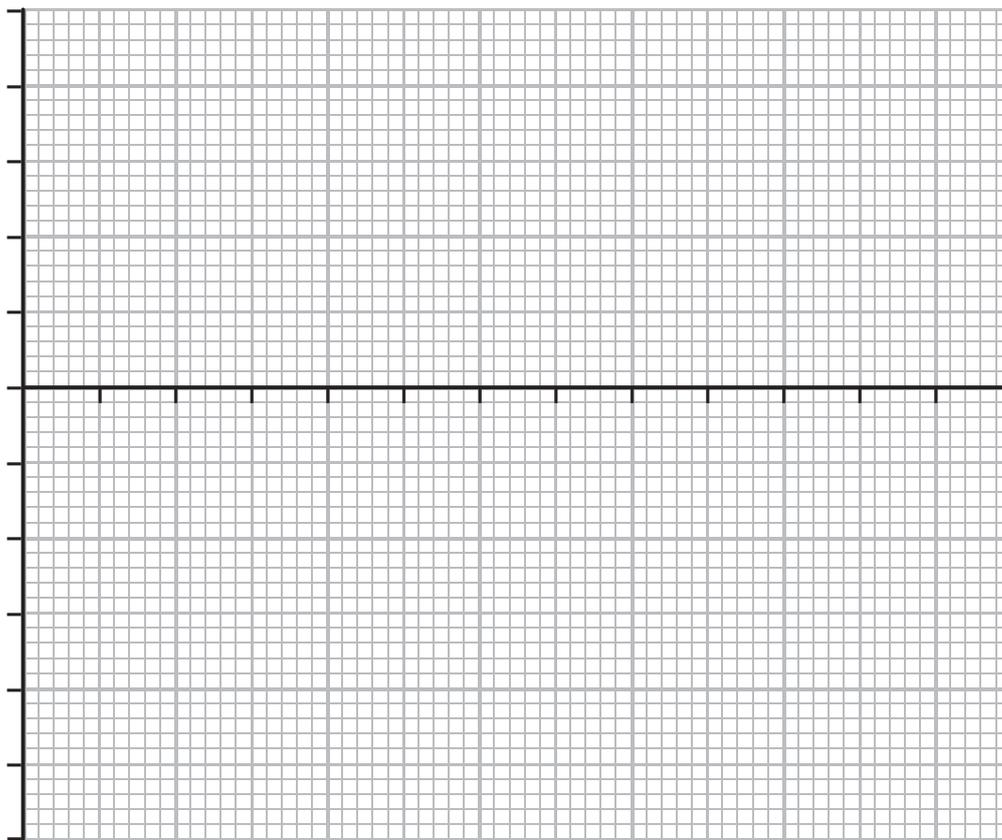


(iii) Use your graph to find the concentration of sugar that would produce no change in the mass of the potato cylinders.

**(1)**

concentration of sugar = ................................................................. au

(b) (i) State the process that causes the change in mass of the potato cylinders.

(1)

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(ii) Explain how this process causes the change in mass of the potato cylinders.

(2)

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(iii) Suggest why the potato cylinders are wrapped in filter paper at the start and at the end of the investigation.

(2)

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(iv) Each cylinder was left in its solution for two hours.

State two other factors that should be kept constant during this investigation.

(2)

1 ...........................................................................................................................................................................

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2 ...........................................................................................................................................................................

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**(Total for Question 3 = 16 marks)**

**4** The skeleton contains a number of joints.

(a) State what is meant by the term **joint**.

(1)

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(b) The diagram shows a hinge joint.
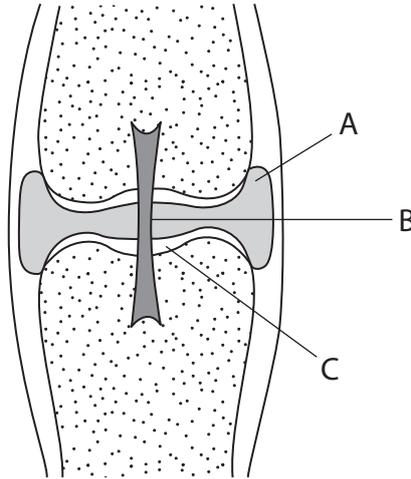


(i) Name parts A, B and C.

(3)

A.....................................................................................................................................................................................................

B.....................................................................................................................................................................................................

C.....................................................................................................................................................................................................

(ii) Describe the function of each of the parts A, B and C.

(6)

A .....................................................................................................................................................................................................

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B .....................................................................................................................................................................................................

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C .....................................................................................................................................................................................................

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**(Total for Question 4 = 10 marks)**

**5**   During eating, food often becomes stuck between teeth.
In an investigation, a student removes food particles from between his teeth.
He places them into each of three test tubes, A, B and C.
He adds an indicator to each test tube that changes to red in acid conditions, as shown in the table below.
The colour of the indicator is recorded after one hour.

The student's results are shown in the table.

| Test tube | Contents of test tube | Indicator colour after 1 hour |
|-----------|----------------------|-------------------------------|
| A | food particles + indicator | green |
| B | glucose + food particles + indicator | red |
| C | glucose + boiled food particles + indicator | green |

(a) (i)   Explain which is the best temperature to carry out this investigation.

**(3)**

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(ii)  Explain the purpose of tube C.

**(3)**

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(b) The tubes are left for a further 24 hours.   After this time the indicator in tube A becomes red.

Explain why this change occurs.

(2)

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**(Total for Question 5 = 8 marks)**

**6** (a) Organisms have different energy contents and may also contain insecticide.

The table shows the energy content and mass of insecticide in each organism in a food chain.

| Organism | Energy content in arbitrary units | Mass of insecticide in mg per kg of body mass |
|---|---|---|
| humans | 88 | 1.000 |
| fish | 1600 | 0.100 |
| microscopic animals | 14100 | 0.010 |
| microscopic plants | 87100 | 0.001 |

(i) Calculate the mass of insecticide in a woman of mass 65 kg.

Give a unit.

**(2)**

mass of insecticide = ......................................... unit ...............

(ii) Calculate the percentage of energy transferred from fish to humans.

**(2)**

percentage = ...............................................................

(iii) Draw a food chain to include all the organisms in the table.

(2)

(b) Using the information in the table and your own knowledge, explain why food chains involving humans should remain short.

(4)

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**(Total for Question 6 = 10 marks)**

**7** (a) The passage describes the control of blood glucose.

Complete the passage by using the correct word or words.

**(6)**

Blood glucose concentration is regulated by ........................................................................ feedback involving

hormones secreted by the ........................................................................ found in the pancreas. These contain

alpha cells that detect a reduced blood glucose concentration, which as a result will secrete

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

This hormone returns the blood glucose concentration to normal by stimulating the conversion of

........................................................................ into ........................................................................ .

The beta cells detect a raised blood glucose concentration and secrete the hormone

........................................................................ which returns blood glucose levels to normal.

(b) Homeostasis is achieved by nervous and hormonal control.

Complete the table by giving four differences between nervous and hormonal
control of the human body.

**(4)**

| Nervous control | Hormonal control |
|---|---|
|  |  |
|  |  |
|  |  |
|  |  |

**(Total for Question 7 = 10 marks)**

**8** Sickle cell anaemia is a genetically inherited condition.   People with this condition have red blood cells that are shaped differently from normal red blood cells.

The diagram shows blood cells passing through a capillary of a person with normal red blood cells and a person with sickled red blood cells.

normal red blood cells
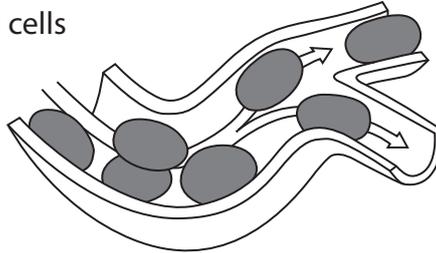
sickled red blood cells
(sickle cells)
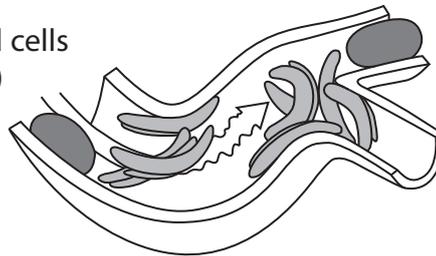
(a) (i) Using information from the diagram, explain the disadvantage of having the sickle cell condition.

**(3)**

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(ii) State an advantage for people living in tropical areas of having the sickle cell allele.

**(1)**

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(b) The diagram shows a family tree, some of whose members carry the allele for sickle cell anaemia.
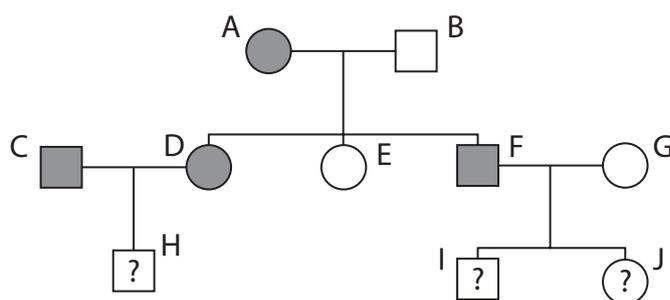


Key

◯ Female not affected    ◻ Male not affected

⬤ Female carrier    ◼ Male carrier

⊘ Female condition unknown    ⯒ Male condition unknown

The allele for normal haemoglobin is N and the allele for sickle haemoglobin is n.

(i) Explain how the family tree shows that sickle cell anaemia is not a sex linked condition.

(2)

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(ii) Explain what is meant by the term **carrier**.

(2)

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(iii) What is the genotype of person A in the family tree?

(1)

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(iv) Explain who is the only person in the family tree who might have sickle cell anaemia.

(3)

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**(Total for Question 8 = 12 marks)**

**9** (a)  The diagram shows a section through human skin.

The temperature of the air surrounding the skin is 4°C.
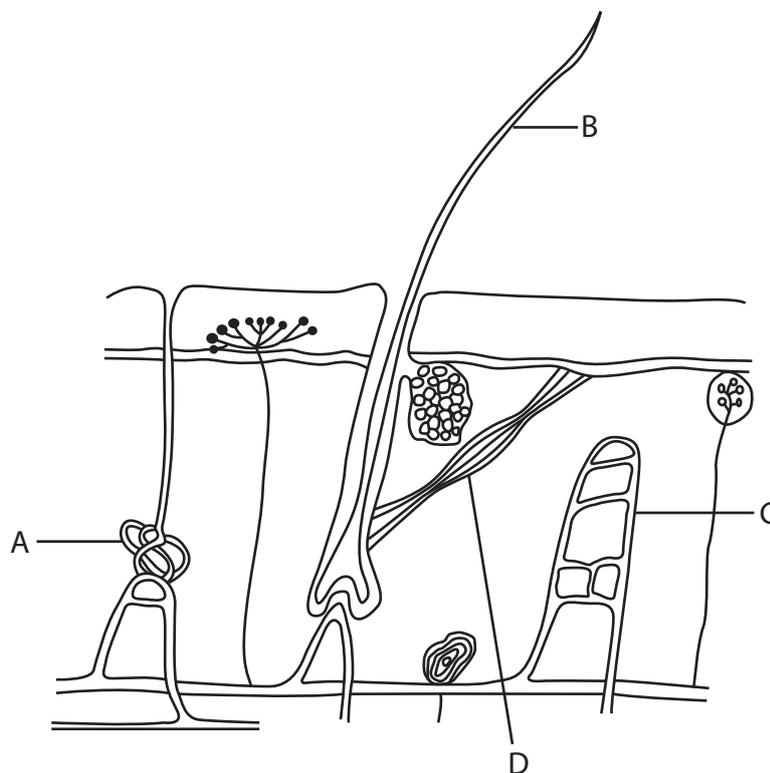


(i)  Name the structures A, B and C.

**(3)**

A ..................................................................................................

B ..................................................................................................

C ..................................................................................................

(ii)  Explain the function of structure D.

**(1)**

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(iii) The air temperature increases to 25 °C.

Describe how the appearance of structures B and C would change.

(2)

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(iv) Explain why these changes occur.

(4)

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(b) If the body temperature of a person drops, an uncontrolled contraction of the skeletal muscles occurs.

(i) Name this process of uncontrolled contraction of the skeletal muscles.

(1)

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(ii) Describe how this process raises body temperature.

(3)

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**(Total for Question 9 = 14 marks)**

**10** The diagrams show a sperm and an ovum.

Sperm



A .................................................................

B .................................................................
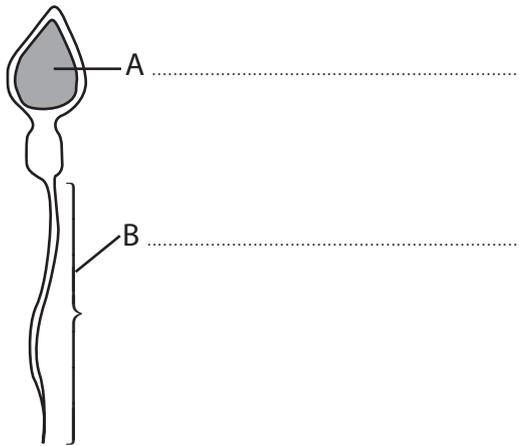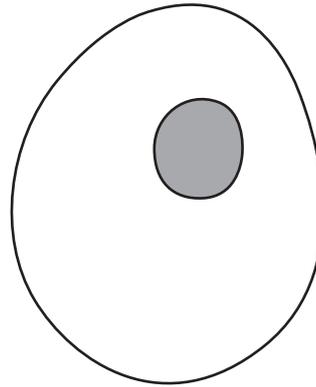
Ovum



(a) On the diagram, name the parts of the sperm labelled A and B.

**(2)**

(b) Describe how structures A and B help the sperm to carry out its functions.

**(2)**

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(c) Suggest two advantages of an ovum being much larger than a sperm.

**(2)**

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**(Total for Question 10 = 6 marks)**

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**11** The diagram shows the human breathing system.
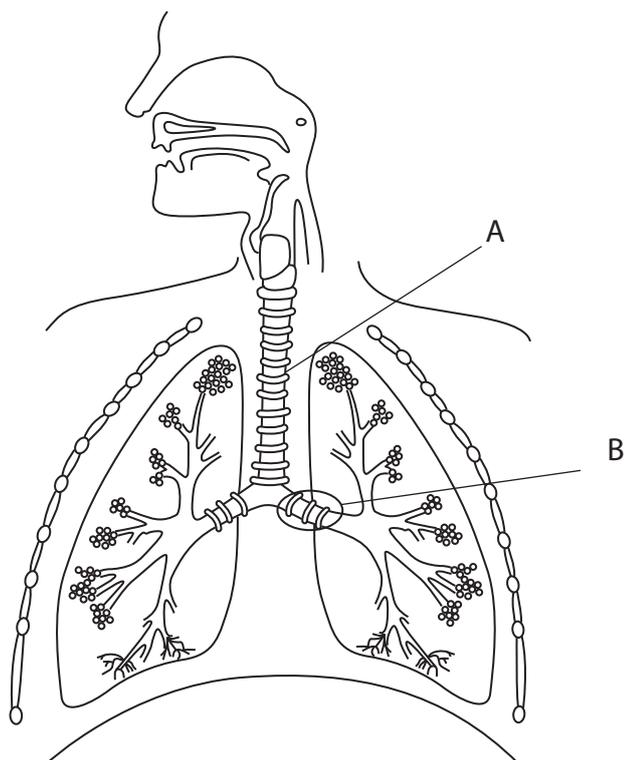


(a) Name the structures A and B.

**(2)**

A ...................................................................................................................................................................................................

B ...................................................................................................................................................................................................

(b) The table gives data for athletes running races of different distances.

| Distance of race in metres | Oxygen needed in $dm^3$ | Oxygen taken into the blood in $dm^3$ |
|---|---|---|
| 100 | 10 | 0.5 |
| 10 000 | 150 | 133 |

(i) The oxygen debt is the difference between the amount of oxygen needed and the amount of oxygen taken into the blood.

Calculate the oxygen debt for an athlete running a 10 000 m race.
Show your working.

**(2)**

oxygen debt ............................................. dm$^3$

(ii) Name a waste product only produced during the period of the oxygen debt.

**(1)**

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(iii) Explain why the time taken to repay the oxygen debt will be greater for an athlete running a 10 000 m race than for an athlete running a 100 m race.

**(3)**

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**(Total for Question 11 = 8 marks)**

**TOTAL FOR PAPER = 120 MARKS**

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