Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology/Additional Science

Unit B2: The Components of Life

Higher Tier

Friday 6 June 2014 – Afternoon
Time: 1 hour

Paper Reference
5BI2H/01

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.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 3 4 1 5 A 0 1 2 0

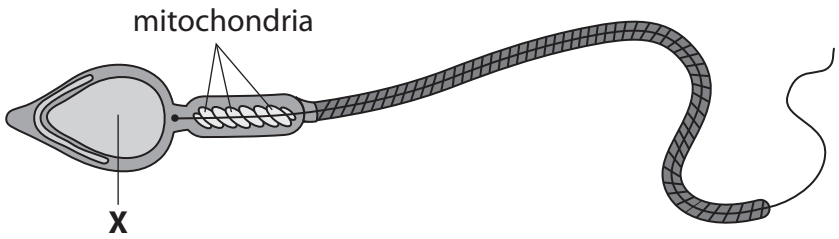
PEARSON

Answer ALL questions

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 ☒.

Cells

1 The diagram shows a human sperm cell.



(a) (i) Structure **X** on the diagram contains DNA.

Name structure **X**.

(1)

.....

(ii) Which statement is true for DNA?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** DNA is made up of amino acids and bases.

☒ **B** DNA is made up of amino acids which give instructions to make proteins.

☒ **C** In DNA, the bases A and T are complementary.

☒ **D** Every gene in a DNA molecule contains only three bases.

(b) Sperm cells are involved in fertilisation.

Define fertilisation.

(2)

(c) (i) Describe the function of mitochondria.

(2)

(ii) Gene mutations in DNA can produce abnormal mitochondria.

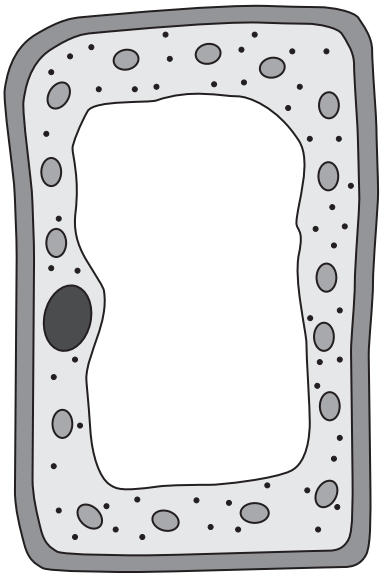
Explain how a gene mutation can produce a different protein.

(2)

(Total for Question 1 = 8 marks)

Photosynthesis

2 The diagram shows a plant cell.



(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

This plant cell is a

(1)

☒ **A** xylem vessel

☒ **B** phloem vessel

☒ **C** root hair cell

☒ **D** leaf palisade cell

(b) Explain how water moves from cell to cell in a leaf.

(2)

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(c) Some small plants can grow on the bark of trees.

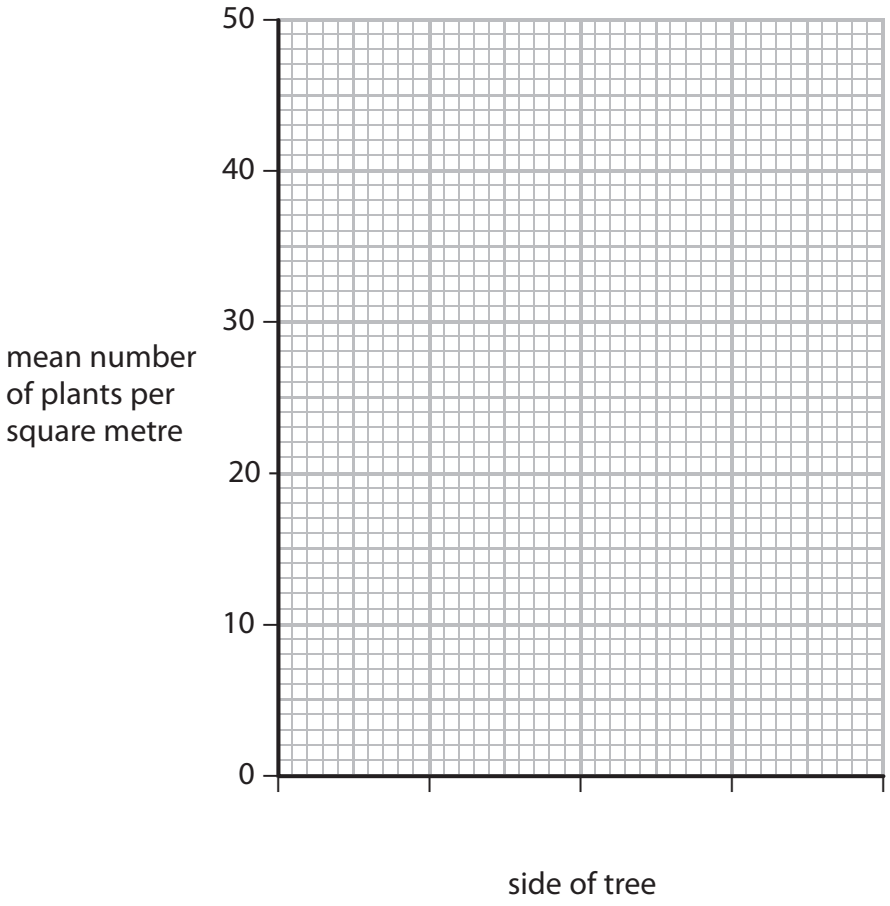
The distribution of two plant species, species A and species B, growing on the north and south side of a tree was investigated.

The results are shown in the table.

	mean number of plants per square metre	
side of tree	**species A**	**species B**
North	48	12
South	0	36

(i) Draw a bar chart to illustrate the data in this table.

(2)



(ii) Which piece of equipment would be used to measure the distribution of plants on the bark of the tree?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** a pooter

☒ **B** a sweep net

☒ **C** a pitfall trap

☒ **D** a quadrat

(iii) Suggest reasons for the distribution of species B on the north and south sides of the tree.

(2)

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(Total for Question 2 = 8 marks)

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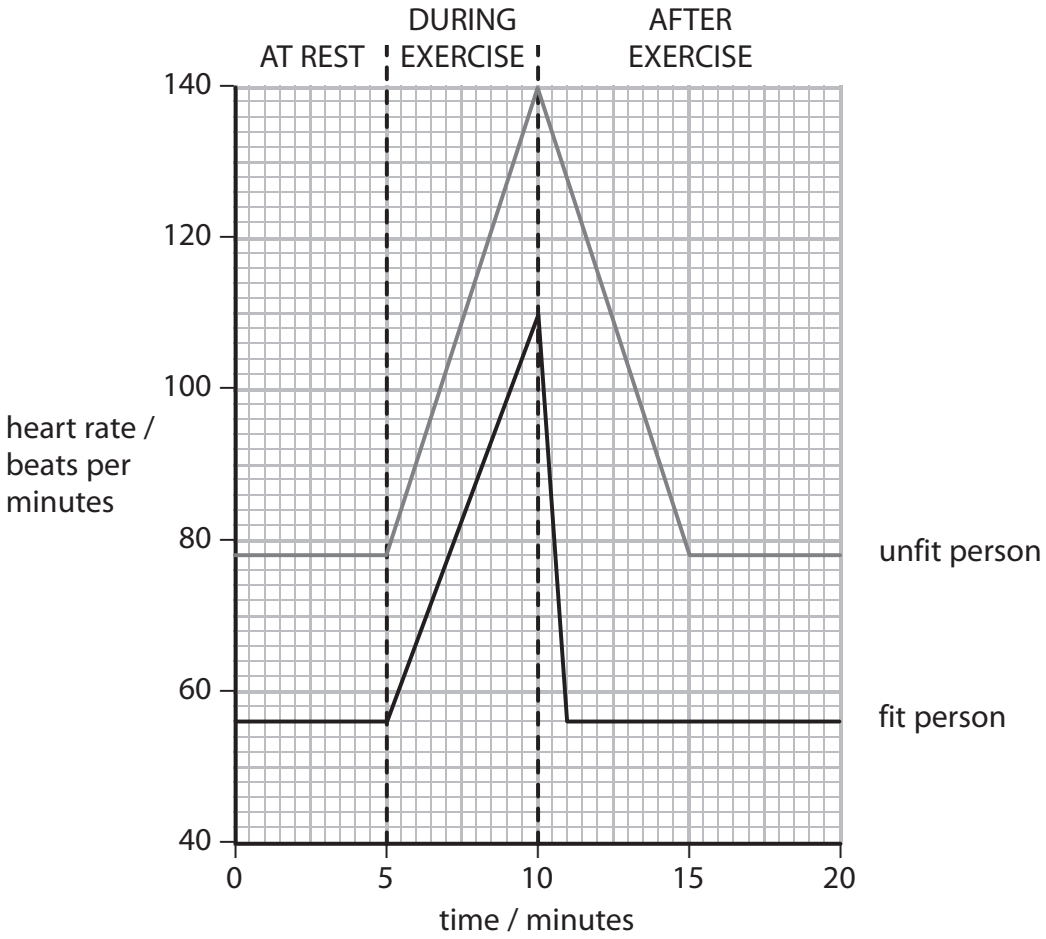
Question 3 is on the next page

Exercise

3 The graph shows the heart rate of a fit person and of an unfit person at rest, during exercise and after exercise.



(a) (i) Compare the heart rate of the fit person with the heart rate of the unfit person from 5 to 15 minutes.

(3)

(ii) Cardiac output = stroke volume × heart rate.

The stroke volume of the fit person at 10 minutes is 0.20 dm^3 per beat.

Calculate the cardiac output of the fit person at 10 minutes.

Use the graph to help you.

(2)

..... dm^3 per minute

(iii) The recovery period is the time it takes for the heart rate to return to its rate at rest after exercise.

Explain why the recovery period for the fit person was different from the recovery period for the unfit person.

(3)

(b) Which of the following shows the direction that blood flows towards, through and from the heart?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** vena cava → ventricle → atrium → pulmonary vein

☒ **B** pulmonary artery → atrium → ventricle → aorta

☒ **C** aorta → ventricle → atrium → pulmonary vein

☒ **D** pulmonary vein → atrium → ventricle → aorta

(c) More carbon dioxide is produced by cells during exercise.

Name the part of the blood that transports most of the carbon dioxide to the lungs.

(1)

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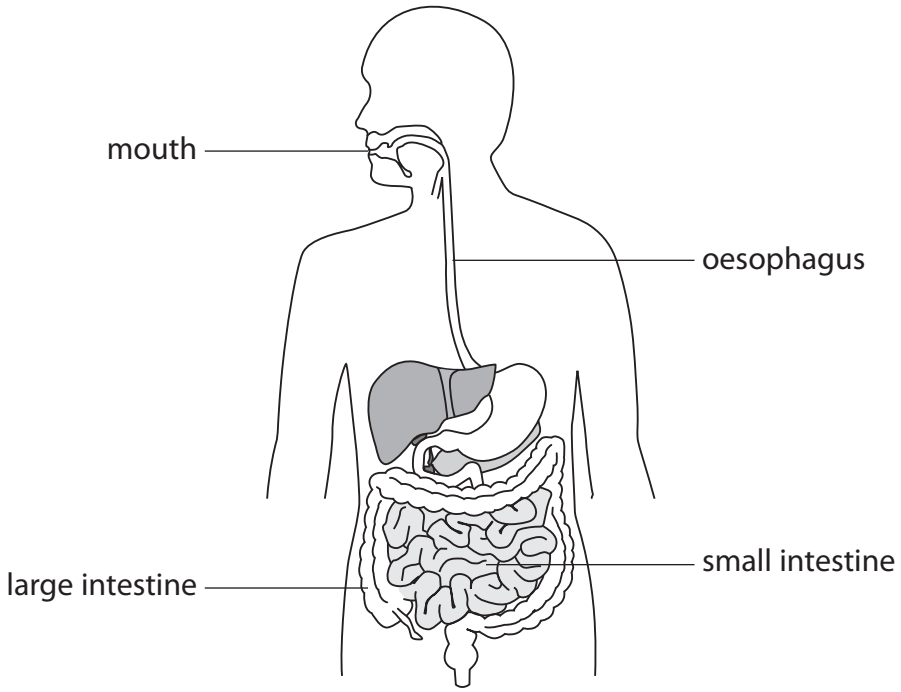
(Total for Question 3 = 10 marks)

A healthy digestive system

4 The diagram shows the digestive system of a human.



(a) Describe the role of the mouth in digestion.

(2)

(b) Villi are structures in the small intestine.

(i) Which **one** of the statements about villi is true?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** Glucose is the only substance absorbed by villi

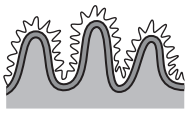
☒ **B** Three types of enzyme are absorbed by villi

☒ **C** The capillary network in the villi have a large surface area

☒ **D** The walls of the villi are thicker to absorb more food

(ii) Coeliac disease can cause a loss of microvilli.

The table shows how the structure of villi affects the surface area of the small intestine.

structure	diagram	surface area compared to small intestine as a tube
small intestine as a tube with no villi or microvilli		1
small intestine with villi but no microvilli		30
small intestine with villi and microvilli		600

A person with coeliac disease has no microvilli in their small intestine.

Explain why this person would find it hard to exercise.

Use information from the table to help you.

(3)

(c) Fibre in food is not digested.

Fibre makes up most of the solid material in the contents of the small intestine.

The recommended daily allowance (RDA) for fibre is between 18g and 30g.

Suggest why the muscles in the intestines of someone who eats much less fibre per day than the RDA may have trouble moving food through the small intestine.

(2)

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(d) Describe how probiotics containing *Bifidobacteria* are thought to improve the health of the digestive system.

(2)

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(Total for Question 4 = 10 marks)

Transport and exchange of materials

5 Some students investigated water movement in plant cells.

They measured the mass of five pieces of potato.

Each piece of potato was put into a different concentration of salt solution.

After one hour the pieces of potato were dried and the mass of each was recorded.

The results are shown in the table.

concentration of salt solution / %	mass / g			percentage change / %
	start	after 1 hour	change	
0	10.2	13.1	+2.9	+28.4
10	9.8	11.4	+1.6	+16.3
20	10.3	9.8	–0.5	
30	10.1	8.9	–1.2	–11.9
40	9.7	7.7	–2.0	–20.6

(a) (i) Calculate the percentage change in the mass of the potato in the 20% salt solution.

(2)

..... %

(ii) Suggest why calculating a percentage change is more useful than calculating the change in mass in this investigation.

(1)

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.....

(b) Mitosis occurs in plant cells during growth.

Describe the division of a cell by mitosis.

(3)

*(c) Explain how active transport and diffusion provide a plant with named substances it needs for growth.

(6)

(Total for Question 5 = 12 marks)

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Question 6 is on the next page

Enzymes

6 DNA and RNA are involved in the synthesis of proteins such as enzymes.

(a) Protein synthesis involves transcription and translation.

Which row shows the molecules involved in both transcription and translation?

Place a cross (☒) in the box next to your answer.

(1)

	transcription	translation
☒ **A**	tRNA	tRNA
☒ **B**	mRNA	DNA
☒ **C**	tRNA	DNA
☒ **D**	mRNA	mRNA

(b) Describe what happens to the molecule produced by transcription before it is translated.

(2)

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(c) Explain how the lock and key hypothesis models how enzymes work.

You may use labelled diagrams in your answer.

(3)

*(d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS