EDEXCEL GCSE BIOLOGY

BIOLOGY



EXAM QUESTION PACK

UNIT B2 FOUNDATION TIER 5BI2F PAPERS

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Write your name here

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Pearson Edexcel GCSE

Centre Number | Candidate Number

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Wednesday 17 January 2018 – Morning
Time: 1 hour

Paper Reference
5BI2F/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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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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 ☒.

Plants

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

(i) The plant cells that absorb mineral ions from the soil are

(1)

☒ **A** guard cells

☒ **B** palisade cells

☒ **C** root hair cells

☒ **D** xylem cells

(ii) Plants absorb mineral ions by

(1)

☒ **A** active transport

☒ **B** osmosis

☒ **C** photosynthesis

☒ **D** transpiration

(b) Plants absorb carbon dioxide from the air.

Use words from the box to complete the sentences.

(2)

oxygen	nitrate ions	xylem
water	phloem	roots

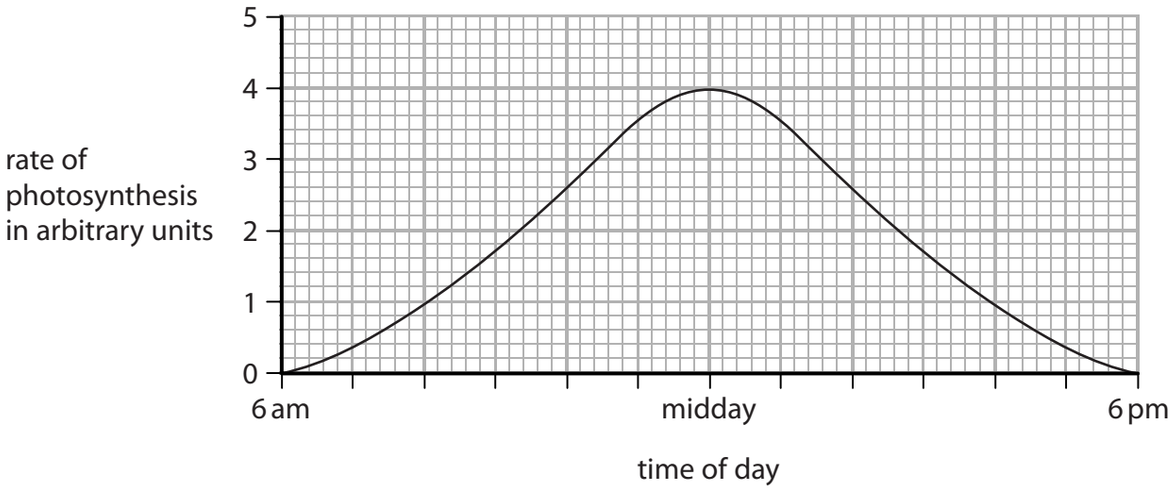
During photosynthesis, carbon dioxide reacts with ..... to make the sugar glucose.

Sugars are transported through the ..... in the stem to other parts of the plant.

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(c) The graph shows the rate of photosynthesis for a plant during one day.



(i) Describe how the rate of photosynthesis changes from 6 am to 6 pm.

(2)

.....

.....

.....

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(ii) Photosynthesis occurs in a leaf.

Describe how a leaf is adapted for photosynthesis.

(2)

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(Total for Question 1 = 8 marks)

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Digestion

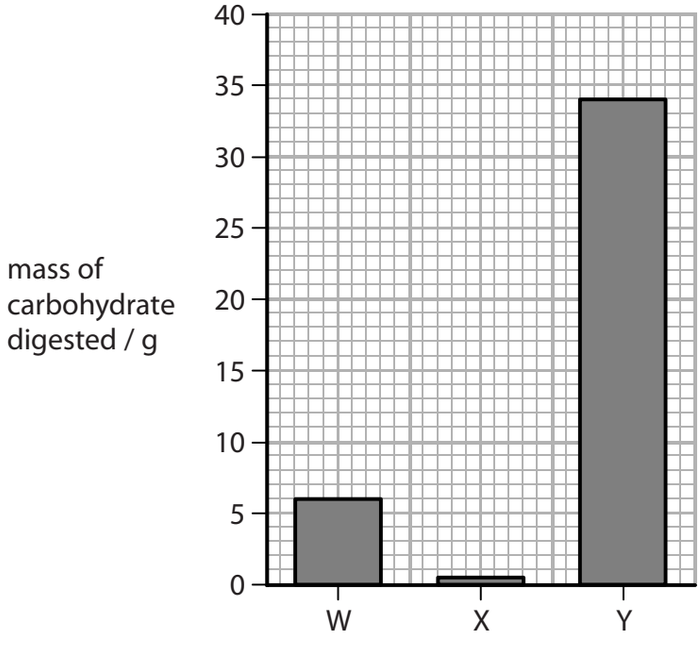
2 (a) The digestive system produces enzymes.

Draw one straight line from each enzyme to the nutrient that it breaks down.

(2)

enzyme	nutrient
lipase	carbohydrate
amylase	protein
protease	fat
	fibre

(b) The graph shows the mass of carbohydrate digested in three organs of the digestive system.



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(i) Describe the difference in the mass of carbohydrate digested in organ W and organ Y.

(2)

(ii) The table shows the amount of time food remains in each organ.

organ	amount of time food remains in each organ / minutes
W	1
X	150
Y	180

Use the information in the graph and in the table to explain which organ is most likely to be the small intestine.

(2)

(iii) Suggest why the least amount of carbohydrate is digested in organ X.

(2)

(Total for Question 2 = 8 marks)

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DNA and genetic engineering

3 (a) Use numbers from the box to complete the sentences.

(2)

2	3	4
23	46	92

The nucleus of a human muscle cell contains ..... chromosomes that are made of DNA.

In DNA, there are ..... different bases.

(b) Which of the following best describes the shape of a DNA molecule?

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

(1)

☒ **A** one strand coiled to form a single helix

☒ **B** one strand coiled to form a double helix

☒ **C** two strands coiled to form a single helix

☒ **D** two strands coiled to form a double helix

(c) Describe the contribution that Rosalind Franklin made to the understanding of DNA structure.

(2)

.....

.....

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(d) Genetic engineering involves inserting a gene from one organism into the DNA of another organism.

(i) Describe how the gene from the first organism is obtained.

(2)

(ii) Herbicide resistant crop plants have been produced by genetic engineering.

Explain how a farmer can use herbicide resistant plants to increase the yield of a crop.

(2)

(iii) State **one** concern about using genetically engineered crop plants.

(1)

(Total for Question 3 = 10 marks)

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4 The diagram shows three types of insect collected from trees in a small area of woodland.





(a) (i) Calculate the ratio of beetles to wingless moths.

(2)

ratio .....

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(ii) Describe how to estimate the total number of wingless moths in the woodland.

(3)

(b) Female moths release a chemical that can be detected by male moths.

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

(1)

The chemical released by female moths travels through the air to the male moths by

☒ **A** active transport

☒ **B** diffusion

☒ **C** osmosis

☒ **D** transpiration

(ii) This chemical helps male moths to find female moths so that the eggs can be fertilised.

Describe what happens at fertilisation.

(2)

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(iii) The cell produced at fertilisation eventually forms a moth made of many different types of cell.

Describe how a single cell can produce many different types of cell.

(2)

.....

.....

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.....

(Total for Question 4 = 10 marks)

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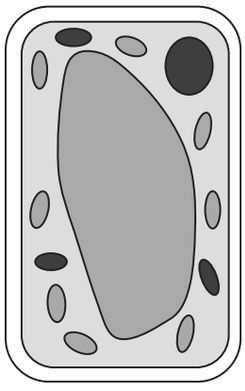
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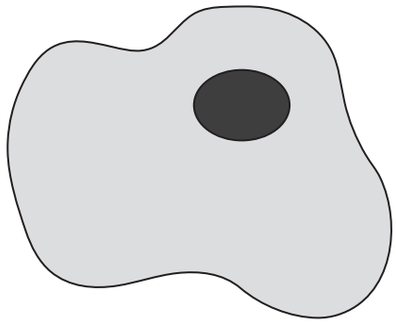
Cells

5 The diagram shows two types of cell.

cell X



cell Y



(a) (i) Explain which cell is from a plant.

(2)

.....

.....

.....

.....

(ii) Aerobic respiration takes place in cell X and in cell Y.

Which is the correct equation for aerobic respiration?

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

(1)

☒ **A** carbon dioxide + water ⟶ glucose + oxygen

☒ **B** oxygen + water ⟶ glucose + carbon dioxide

☒ **C** glucose + oxygen ⟶ water + carbon dioxide

☒ **D** carbon dioxide + glucose ⟶ water + oxygen

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(iii) Name the part of the cell where aerobic respiration takes place.

(1)

.....

(b) (i) A light microscope is used to magnify a cell.

The actual width of the cell before it is magnified is 0.02 mm.

After magnification the width of the image seen is 3 mm.

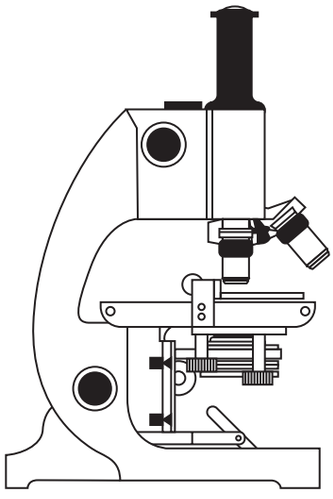
Calculate the magnification of this cell.

(2)

magnification .....

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*(ii) The diagram shows a light microscope.



Describe how the light microscope is used to obtain clear, detailed images of cells.

(6)

(Total for Question 5 = 12 marks)

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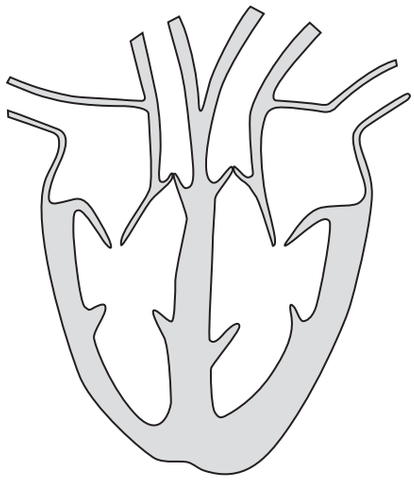
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The heart and blood

6 The diagram shows a human heart.



(a) (i) Use a straight line and the letter X to label the left atrium on the diagram.

(1)

(ii) Describe how blood is moved from the right ventricle to the lungs.

(2)

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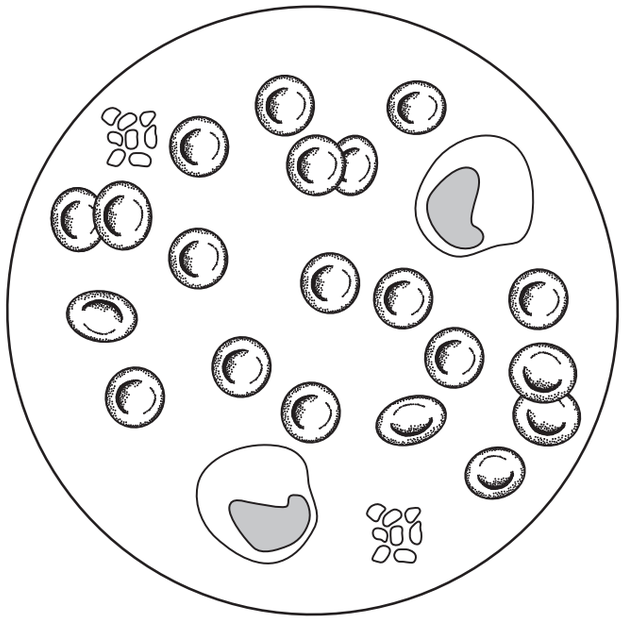
(iii) Which blood vessel transports blood from the lungs to the heart?

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

(1)

- ☒ **A** aorta
- ☒ **B** pulmonary artery
- ☒ **C** vena cava
- ☒ **D** pulmonary vein

(b) The diagram shows some components in a sample of blood.



This sample of blood shows a total of 38 components: red blood cells, white blood cells and platelets.

Calculate the percentage of red blood cells in this blood sample.

(2)

..... %

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*(c) Describe the functions of red blood cells, white blood cells and platelets.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

January 2018

Pearson Edexcel GCSE
In Biology (5BI2F)
Paper 01

edexcel

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January 2018
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Acceptable answers	Marks
1 (a) (i)	C root hair cells		(1)

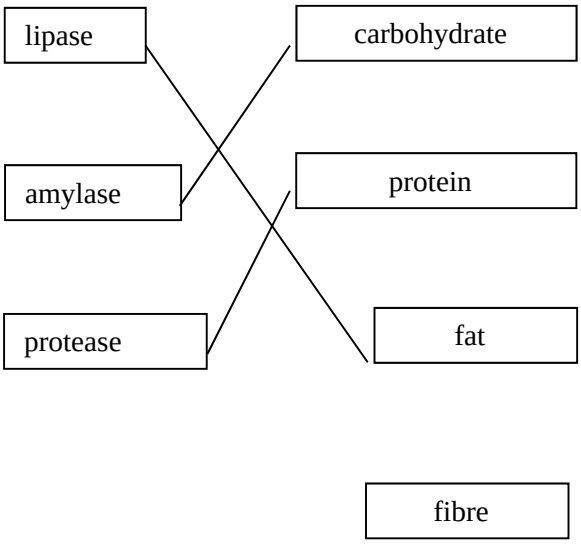
Question number	Answer	Acceptable answers	Marks
1 (a) (ii)	A active transport		(1)

Question number	Answer	Acceptable answers	Marks
1 (b)	• water • phloem	answers must be in correct order accept phonetic spellings	(2)

Question number	Answer	Acceptable answers	Marks
1 (c) (i)	A description including two of the following • increases then decreases (1) • reference to correct data from the graph(1)		(2)

Question number	Answer	Acceptable answers	Marks
1 (c) (ii)	A description including two of the following • flat leaf / large surface area • contains chlorophyll / chloroplasts • has stomata		(2)

Question 1 total= 8 marks

Question number	Answer	Acceptable answers	Marks
2 (a)		Two marks for 3 lines correct. One mark for 1 or 2 lines correct. Reject more than one line from an enzyme	(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (i)	A description including the following: • organ Y digests more carbohydrate (than organ W) (1) • 34g compared to 6g/28g more (1)		(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (ii)	A explanation including: • organ Y (1) and any one from the following: • food spends more time in small intestine (as it is longer) (1) • more carbohydrate digested than in any other organ / intestine contains carbohydrase (1)		(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (iii)	A suggestion including two of the following: • organ X is the stomach (1) • contains acid/low pH (1) • carbohydrase/amylase not present/ denatured (1)		(2)

Question 2 total = 8 marks

Question number	Answer	Acceptable answers	Marks
3 (a)	• 46 (1) • 4 (1)	answers must be in the correct order	(2)

Question number	Answer	Acceptable answers	Marks
3 (b)	D two strands coiled to form a double helix		(1)

Question number	Answer	Acceptable answers	Marks
3 (c)	A description including two of the following • (Rosalind Franklin) shone X-rays through (crystallised) DNA (1) • {examined / used / took} pictures of {diffraction pattern / X image} (1) • showed DNA was a double helix (1)		(2)

Question number	Answer	Acceptable answers	Marks
3 (d) (i)	A description including two of the following • (the gene is) removed / cut out from DNA / chromosome (1) • using an enzyme (1)	accept restriction (endonuclease) enzyme / named enzyme	(2)

Question number	Answer	Acceptable answers	Marks
3 (d) (ii)	A explanation linking the following • spray crop with herbicide (so weeds die) (1) • (so) less competition /more resources / named resource for the crop (1)		(2)

Question number	Answer	Acceptable answers	Marks
3 (d) (iii)	{cross fertilisation with other species / idea of super-weeds being produced}/ pests becoming resistant to {pesticide / herbicide} / GM {seeds / plants} cost more	accept other valid concerns	(1)

Question 3 total = 10 marks

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	6:3(1) 2:1	full marks for correct final ratio	(2)

Question number	Answer	Acceptable answers	Marks
4 (a) (ii)	A description including three of the following: • named appropriate equipment (1) • use within a set area (1) • repeat over several areas of woodland (1) • count wingless moths /calculate average number of wingless moths (1) • scale up (to area of woodland) (1)		(3)

Question number	Answer	Acceptable answers	Marks
4 (b) (i)	**B** diffusion		(1)

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	A description including two of the following • {male and female gametes/sex cells/sperm and egg/ haploid cells} join (1) • DNA/nuclei combine (1) • zygote/diploid cell produced (1)		(2)

Question number	MT	Answer	Acceptable answers	Marks
4 (b) (iii)	exp	A description including two of the following • (stem) cell divides(1) • by mitosis (1) • cells differentiate/become specialised (1)		(2)

Question 4 total =10 marks

Question number	Answer	Acceptable answers	Marks
5 (a) (i)	An explanation linking the following: • cell X (1) • because it contains a cell wall/chloroplasts/vacuole (1)		(2)

Question number	Answer	Acceptable answers	Marks
5 (a) (ii)	**C** glucose + oxygen ⟶ water + carbon dioxide		(1)

Question number	Answer	Acceptable answers	Marks
5 (a) (iii)	mitochondria/mitochondrion	accept phonetic spelling	(1)

Question number	Answer	Acceptable answers	Marks
5 (b) (i)	3 ÷ 0.02 (1) (X)150	award full marks for correct bald answer	(2)

Question Number		Indicative Content	Mark
QWC	***5b(ii)**	A description which includes some of the following points Prepare microscope slide Place the slide on the stage Select the smallest objective lens Look through the eyepiece Adjust the light source Use focusing wheel to obtain a clear image Move slide to view cells Change objective lens to increase magnification Refocus to obtain clear image	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description that names at least two parts of the microscope or at least one step involved in using a microscope • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description that links at least three steps involved, in a logical order, in using a microscope • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description that links most steps involved in using the microscope, in a logical order, to give a clear, detailed image • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question 5 total = 12 marks

Question number	Answer	Acceptable answers	Marks
6 (a) (i)	A line drawn to anywhere to the edge of or the inside the left atrium		(1)

Question number	Answer	Acceptable answers	Marks
6 (a) (ii)	A description including any two of the following • the heart /ventricle / muscle contracts (1) • increasing the pressure of the blood (1) • pushing blood out of the ventricle (1) • into pulmonary artery (1)	accept reference to (semilunar) valve (1)	(2)

Question number	Answer	Acceptable answers	Marks
6 (a) (iii)	D the pulmonary vein		(1)

Question number	Answer	Acceptable answers	Marks
6 (b)	20 (1) ÷ 38 (x100) = 52.6% / 53%	award full marks for bald correct final answer	(2)

Question Number		Indicative Content	Mark
QWC	***6c**	A description which includes some of the following points Red blood cells • contain haemoglobin • carry oxygen • as oxyhaemoglobin • from lungs to tissues White blood cells • produce antibodies • produce antitoxins • phagocytes • engulf / ingest pathogens • and destroy them Platelets • make fibrin / fibres • forms a mesh / clot • reduces / stops blood loss	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description about at least one blood component • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description about at least two blood components OR detailed information about one blood component • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description including the details about at least two blood components • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question 6 total = 11 marks

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Centre Number | | | | | |

Candidate Number | | | | |

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Friday 9 June 2017 – Morning
Time: 1 hour

Paper Reference
5BI2F/01

You must have:
Calculator, ruler

Total Marks

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Answer ALL questions

Some questions must be answered with a cross in a box ☒.
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Leaves and photosynthesis

1 The photograph shows a leaf.



© Krzysztof P. Jasiutowicz

(a) (i) Describe how the leaf produces glucose.

(2)

.....

.....

.....

.....

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

(1)

Glucose diffuses into other cells

☒ **A** from an area of low concentration to an area of high concentration

☒ **B** from an area of high concentration to an area of low concentration

☒ **C** across a membrane using energy from respiration

☒ **D** across a membrane using energy from transpiration

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

Xylem vessels transport

(1)

- ☒ **A** water from the roots to the leaves
- ☒ **B** water from the leaves to the roots
- ☒ **C** sugars from the roots to the leaves
- ☒ **D** sugars from the leaves to the roots

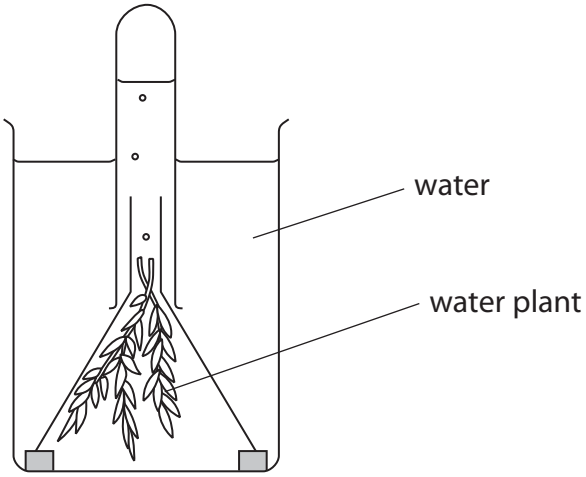
(b) Draw one straight line from each plant cell structure to its function.

(2)

plant cell structure	**function**
cell wall	contains cell sap which stores nutrients
vacuole	controls how much oxygen leaves the plant
	contains cellulose to give the cell strength
	releases energy for the cell
	increases the amount of light absorbed by the cell

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(c) A student investigated the amount of oxygen released from a water plant.



The student counted the number of gas bubbles produced by the water plant every minute at different temperatures.

The results are shown in the table.

temperature / °C	number of gas bubbles produced every minute
5	2
15	14
25	26
35	16
45	7

Describe the effect of temperature on the number of gas bubbles produced every minute.

(2)

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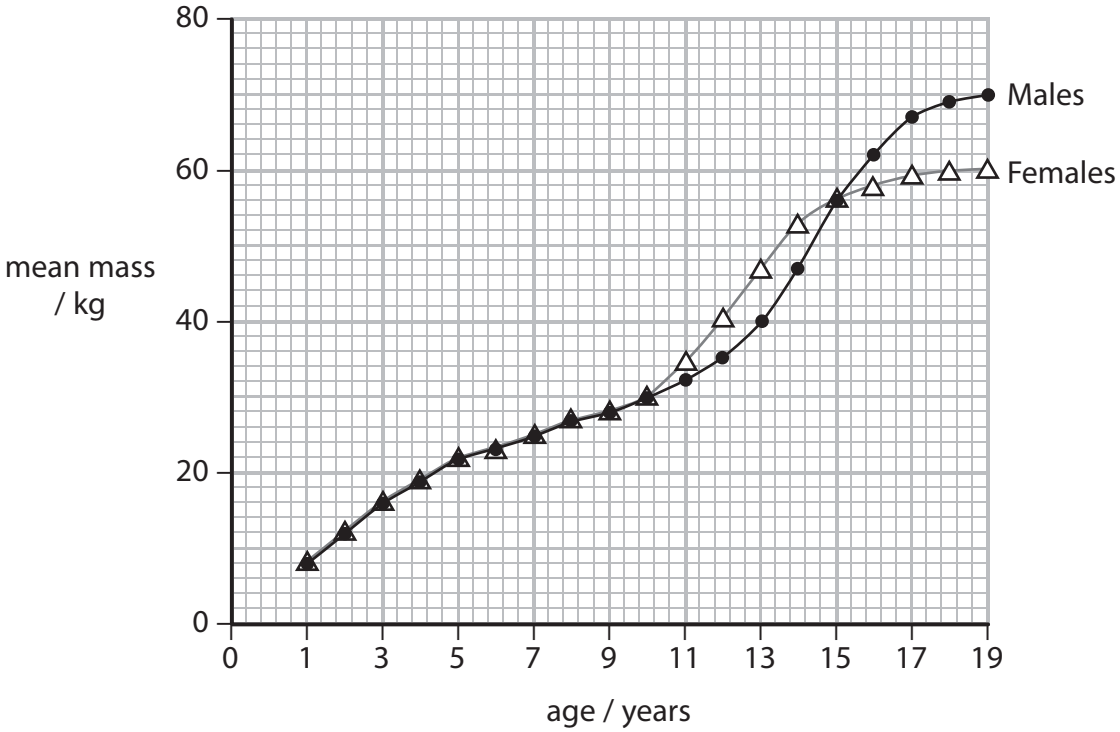
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Growth

2 (a) The graph shows the mean mass of males and females from the age of 1 year to 19 years.



(i) Calculate the difference in the mean mass of males and females at the age of 19 years.

(2)

difference in mean mass = ... kg

(ii) Describe how the mean mass of the males would have been obtained at the age of 19 years.

(2)

.....

.....

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(b) Some nutrients in food provide the body with energy needed for growth.

Use words from the box to complete the passage about the chemical reaction that releases energy from food.

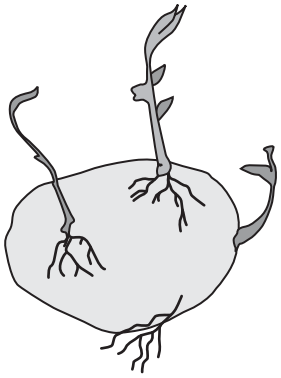
(2)

hydrogen	sunlight	lactic acid	glucose
	carbon dioxide	nitrogen	

Body cells use ..... for respiration.

Aerobic respiration produces ..... which is removed by the lungs.

(c) The diagram shows several shoots growing from one potato.
Each shoot can grow into a new potato plant.



Explain why the new potato plants are clones of the original potato.

(2)

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(Total for Question 2 = 8 marks)

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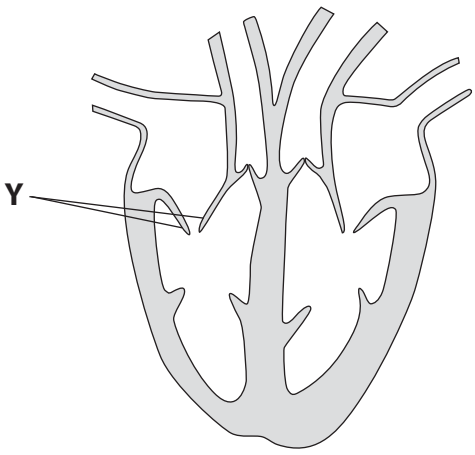
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The heart and blood

3 The diagram shows the main blood vessels and structures of the heart.



(a) (i) Draw a line to show the aorta on the diagram.
Label this line X.

(1)

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

(1)

The wall of the left ventricle is thicker than the wall of the right ventricle.

This is because the left ventricle pumps

☒ **A** blood containing more carbon dioxide

☒ **B** blood faster when you are exercising

☒ **C** blood to all parts of the body

☒ **D** blood to the lungs

(iii) Explain the function of the structure labelled **Y**.

(2)

.....

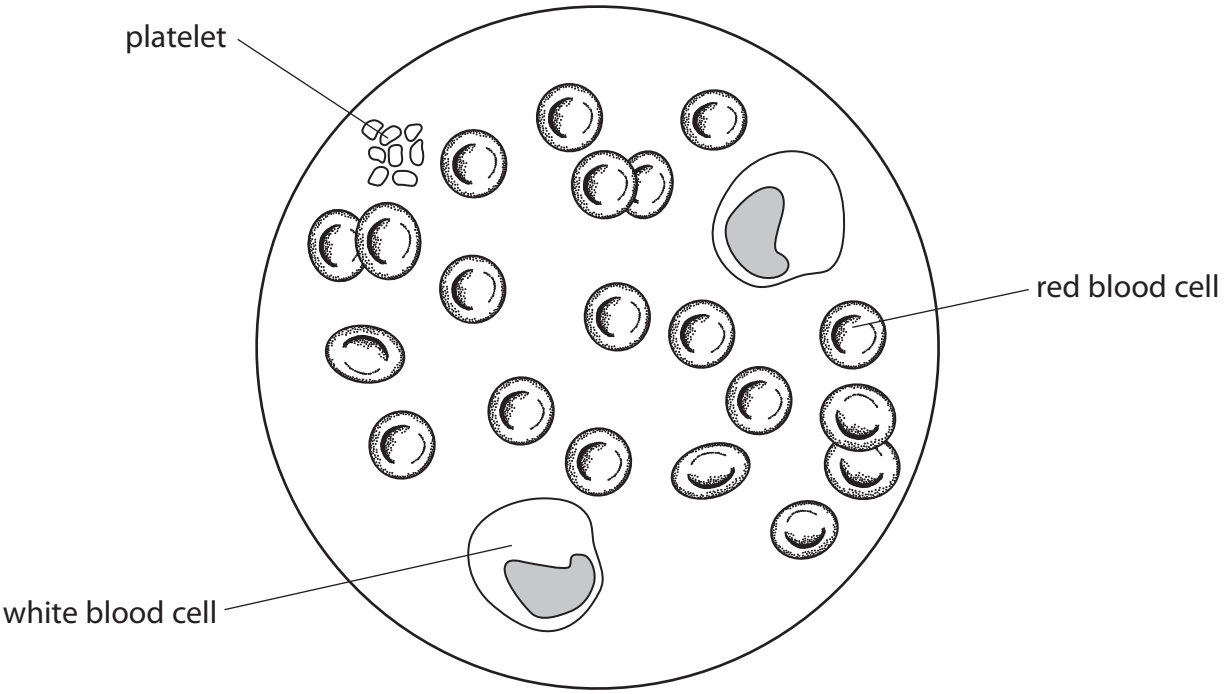
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(b) The diagram shows a blood sample from a patient.



(i) State the ratio of red blood cells to white blood cells in this blood sample.

(1)

.....

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

(1)

Platelets in the blood

☒ **A** transport glucose

☒ **B** transport carbon dioxide

☒ **C** have a nucleus

☒ **D** are involved in blood clotting

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(iii) The blood sample shows that the patient has a higher number of white blood cells than normal.

Suggest why this patient has a higher number of white blood cells.

(2)

(iv) Red blood cells are adapted to carry oxygen.

Explain how one feature of a red blood cell increases the amount of oxygen carried.

(2)

(Total for Question 3 = 10 marks)

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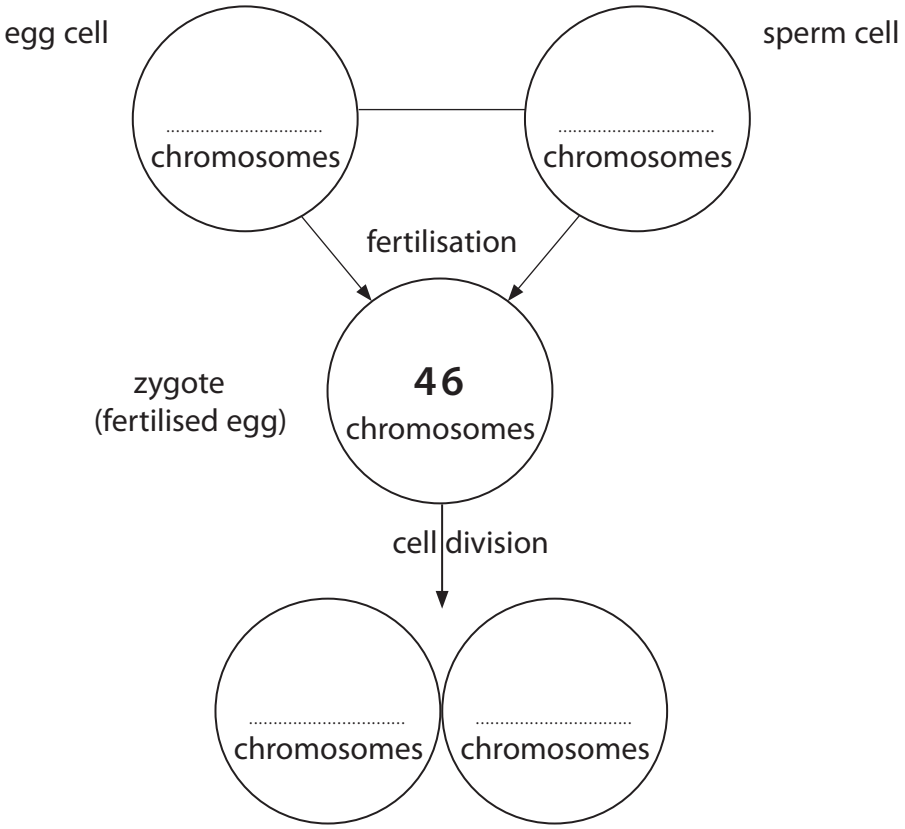
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Cells and reproduction

4 (a) The diagram shows the stages involved in the production of a human embryo.



(i) Complete the diagram by stating the number of chromosomes found in the egg cell, the sperm cell and each cell of the embryo.

(2)

(ii) Use the words in the box to complete the sentences.

(2)

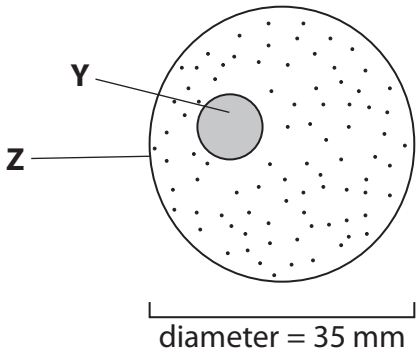
haploid	respiration	diploid
meiosis	identical	mitosis

The sperm cells are produced by a process called .....

This process produces ..... cells.

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(b) The diagram shows a zygote.



(i) Complete the table to give the name of part **Y** and the function of part **Z**.

(2)

part	name of part	function of part
Y	.....	contains DNA that controls the activities of the cell
Z	cell membrane	....

(ii) The diameter of the diagram is 35 mm.
The diagram is 5000 times larger than the actual zygote.

Calculate the diameter of the zygote.

(2)

diameter = ... mm

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(iii) The DNA in the zygote contains bases.

Describe how bases are paired in DNA.

(2)

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

(1)

Stem cells from embryos are

☒ **A** differentiated cells

☒ **B** undifferentiated cells

☒ **C** specialised cells

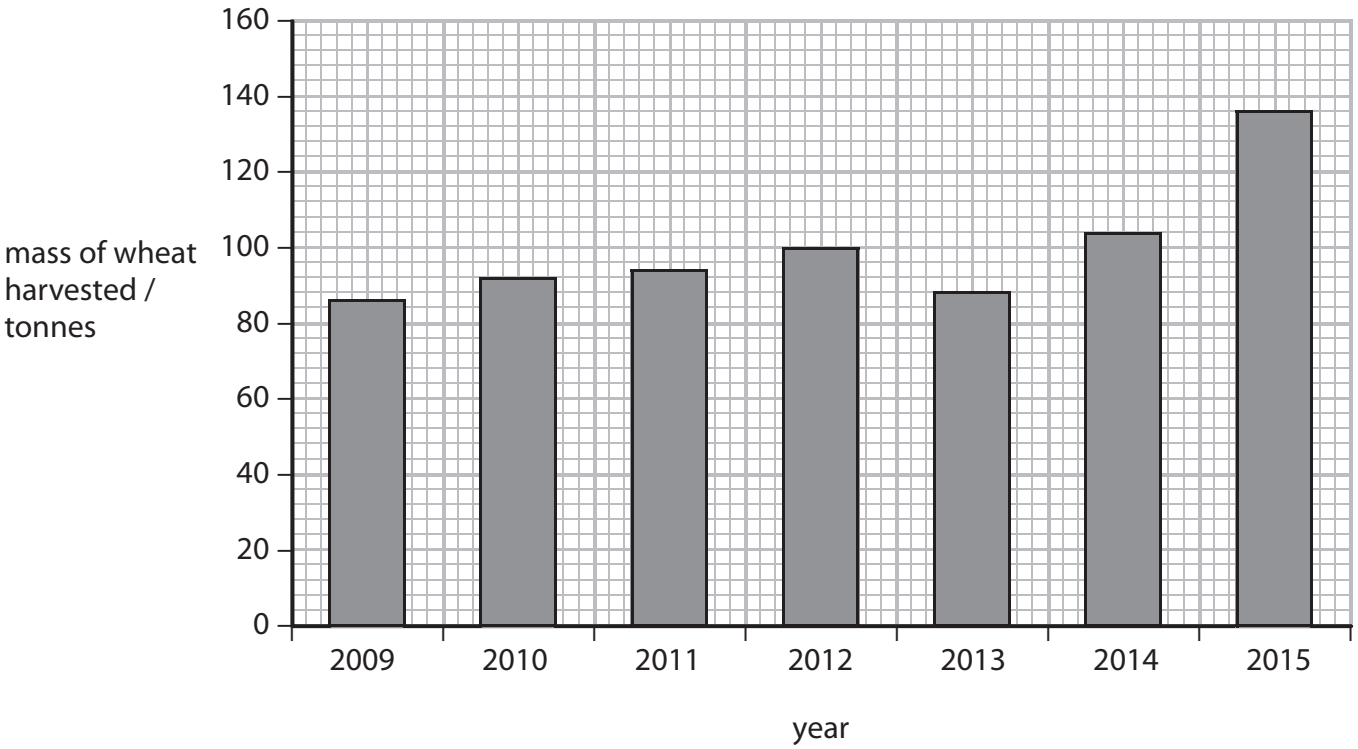
☒ **D** sex cells

(Total for Question 4 = 11 marks)

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Wheat yields

5 The bar chart shows the mass of wheat harvested on a farm each year from 2009 to 2015.



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

Which of the statements about the mass of wheat harvested are true?

1. The mass of wheat harvested increased every year.
2. In 2012, 100 tonnes of wheat was harvested.

(1)

☒ **A** statement 1 only

☒ **B** statement 2 only

☒ **C** both statement 1 and 2

☒ **D** neither statement 1 nor 2

(b) Describe how wheat plants absorb water from the soil.

(2)

.....

.....

.....

.....

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(c) Crop plants can be genetically modified.

State **two** genetic modifications that can improve crop plants.

(2)

1 .....

.....

2 .....

.....

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*(d) A farmer estimated the total number of wheat plants in a field.

Describe a method to estimate the total number of wheat plants in a 100 m^2 area of a field.

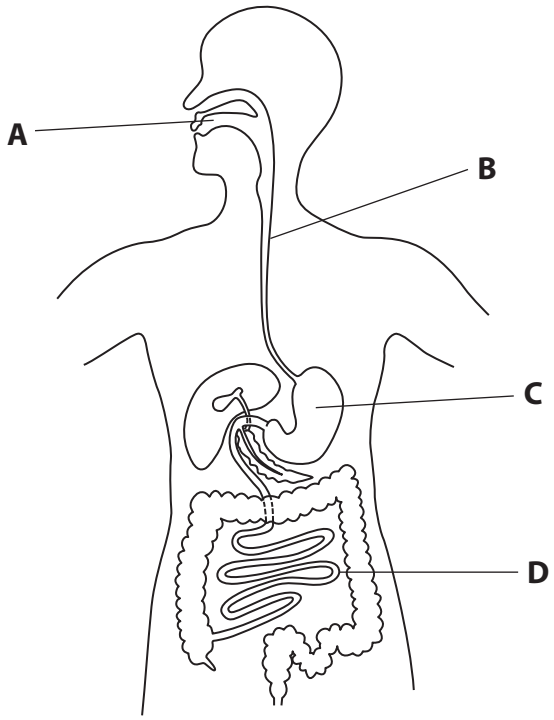
(6)

(Total for Question 5 = 11 marks)

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Enzymes and digestion

6 The diagram shows the human digestive system.



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

(1)

Amylase begins the breakdown of starch in the part of the digestive system labelled

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

(ii) State the product of carbohydrate digestion.

(1)

.....

(b) Describe the functions of the small intestine in the digestive system.

(2)

.....

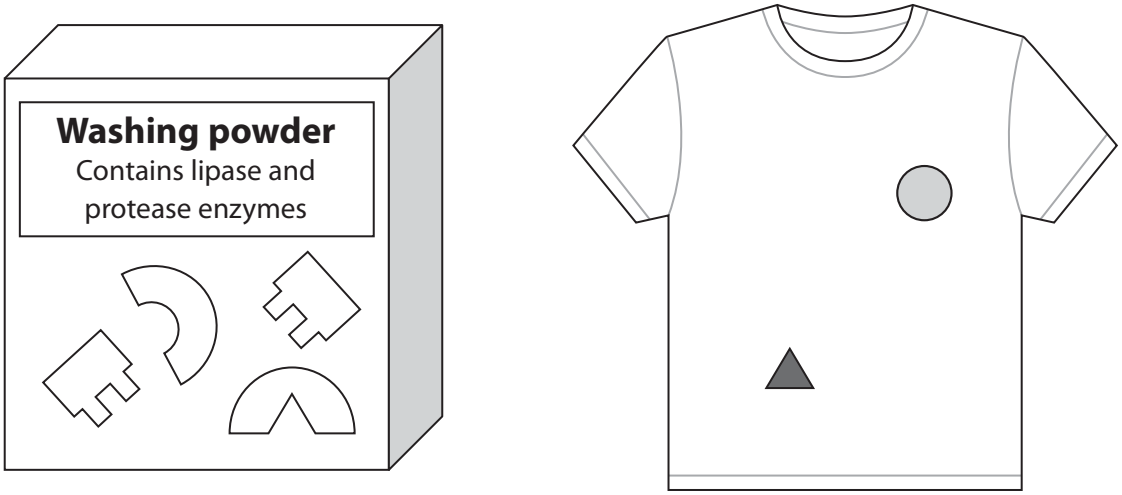
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*(c) (i) The diagram shows a box of washing powder that contains lipase and protease enzymes and a shirt stained with food molecules.



Explain why lipase and protease enzymes are used in some washing powders.

(6)

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(ii) Suggest why washing powders containing enzymes should **not** be used at a temperature of 80 °C.

(2)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE

In Biology (5BI2F) Paper 01

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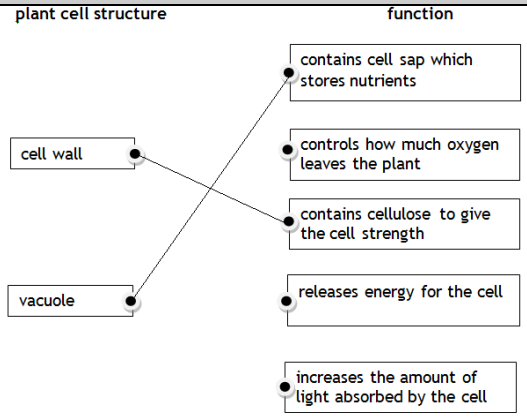
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Acceptable answers	Marks
1 (a) (i)	A description linking two of the following: • photosynthesis (1) • carbon dioxide (absorbed) (1) • (using) water (1) • (sun)light (absorbed) (1) • by chlorophyll/chloroplasts (1)	Ignore energy/Sun Accept equation for 2 marks	(2)

Question number	Answer	Marks
1 (a) (ii)	**B** from an area of high concentration to an area of low concentration **The only correct answer is B** ***A** is not correct because glucose does not diffuse from a low to a high concentration. This is active transport.* ***C** is not correct because glucose does not diffuse using energy. Only active transport uses energy.* ***D** is not correct because energy is not needed and transpiration is the evaporation of water.*	(1)

Question number	Answer	Marks
1 (a) (iii)	**A** water from the roots to the leaves **The only correct answer is A** ***B** is not correct because this is the wrong direction. Water is transported from roots to leaves.* ***C** is not correct because do not transport sugars.* ***D** is not correct because do not transport sugars. This is the role of phloem.*	(1)

Question number	Answer		Marks
1 (b)		**Reject more than one line from each plant cell structure**	(2)

Question number	Answer	Marks
1 (c)	Two from: • (bubbles) increase (to 25°C) (1) • peaks at 25°C/until 26 bubbles (1) • then decrease (after 25 °C) (1)	(2)

Total for question 1 = 8 marks

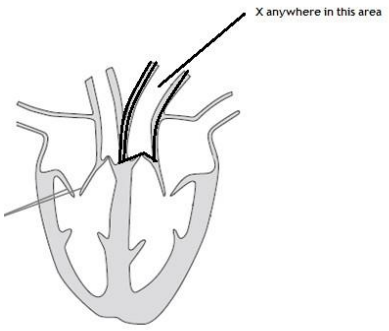
Question number	Answer	Acceptable answers	Marks
2 (a) (i)	• 70 **and** 60 (1) • 10 (kg)	Correct final answer for 2 marks	(2)

Question number	Answer	Marks
2 (a) (ii)	• add masses (of each male) together (1) • divide by the number of (19-year-old) males (1)	(2)

Question number	Answer	Acceptable answers	Marks
2 (b)	• glucose (1) • carbon dioxide (1)	**In this order only**	(2)

Question number	Answer	Acceptable answers	Marks
2 (c)	An explanation including two of the following: • asexual reproduction(1); • to produce (genetically) identical cells (1); • by mitosis (1);	Allow same genes/DNA / chromosomes	(2)

Total for question 2 = 8 marks

Question number	Answer	Acceptable answers	Marks
3 (a) (i)	A line to anywhere on the aorta.  	Allow line labelled 'aorta'	(1)

Question number	Answer	Marks
3 (a) (ii)	**C** blood to all parts of the body **The only correct answer is C** ***A** is not correct because the blood in the left ventricle contains less carbon dioxide.* ***B** is not correct because the speed at which the heart pumps blood bears no relation to thickness.* ***D** is not correct because the left side of the heart pumps blood a further distance i.e. to the body.*	(1)

Question number	Answer	Acceptable answers	Marks
3 (a) (iii)	An explanation including two of the following: • valve (1) • opens/closes (1) • stops backflow of blood /so blood flows in one direction only(1);	accept so blood can only go into the (pulmonary) artery/to lungs	(2)

Question number	Answer	Acceptable answers	Marks
3 (b) (i)	10:1/10 to 1	accept 20:2/20 to 2 Allow 1 white to 10 red / 10 red to 1 white Reject 1:10 or 2:20	(1)

Question number	Answer	Marks
3 (b) (ii)	**D** are involved in blood clotting **The only correct answer is D** ***A** is not correct because the plasma transports glucose, not platelets.* ***B** is not correct because platelets do not transport carbon dioxide. This is the role of the plasma.* ***C** is not correct because do not have a nucleus – they are fragments of cells.*	(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (iii)	• the patient has an infection • white blood cells defend the body against disease/pathogens (1)	Allow the patient is ill/sick Allow named infectious disease Allow immune response	(2)

Question number	Answer	Acceptable answers	Marks
3 (b) (iv)	An explanation linking two points from the following • contain haemoglobin(1) • which combines with oxygen(1) OR • no nucleus (1) • so (more) haemoglobin can be carried(1) OR • biconcave (shape)(1) • large surface area(1)	Accept forms oxyhaemoglobin for 2 marks Allow more room to carry oxygen	(2)

Total for question 3 = 10 marks

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	23 and 23 (in egg and sperm cell) (1); 46 and 46 (in cells of embryo)(1);	In this order only	(2)

Question number	Answer	Acceptable answers	Marks
4 (a) (ii)	• meiosis (1); • haploid (1);	In this order only	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (i)	• nucleus (1); • allows substances to enter and exit the cell (1);	Reject nucleolus	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	35 ÷ 5000 (1) 0.007/7 x 10^{-3} (mm)	Allow 7 1000 full marks for correct final answer	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (iii)	A description including any two from • adenine pairs with thymine/A pairs with T(1) • guanine pairs with cytosine / C pairs with G (1) • hydrogen bonds between base pairs (1)	Allow A-T Allow C-G	(2)

Question number	Answer	Marks
4 (c)	**B** undifferentiated cells **The only correct answer is B** ***A** is not correct because stem cells from embryos are not differentiated.* ***C** is not correct because stem cells are not specialised cells.* ***D** is not correct because stem cells are non-specialised and therefore not sex cells.*	(1)

Total for question 4 = 11 marks

Question number	Answer	Marks
5 (a)	**B** statement 2 only **The only correct answer is B** ***A** is not correct because the amount of wheat harvest does not increase every year. There are clearly years where the harvest decreases.* ***C** is not correct because statement 1 is incorrect for reasons given above.* ***D** is not correct because statement 2 is correct (100 tonnes of wheat was harvested) and statement 1 is incorrect for reasons given above.*	(1)

Question number	Answer	Acceptable answers	Marks
5 (b)	A description linking two of the following: • (water absorbed by) root hair cells (1) • by osmosis (1) • from low solute concentration to high solute concentration (1)	accept roots Accept from high (water) concentration to low (water) concentration.	(2)

Question number	Answer	Acceptable answers	Marks
5 (c)	Any two from: • produce toxins/pesticide (1) • herbicide resistance (1) • increase vitamin A/beta carotene content (1)	Allow other valid reasons for genetically modifying plants e.g. drought resistance	(2)

Question Number		Indicative Content	Mark
QWC	***5d**	A description to include some of the following points **method** • count number of plants • in a small area/1m^2 • reference to quadrat • (place quadrat) randomly • (place quadrat) several times **calculation** • add total number of plants in all quadrats • reference to a mean/calculate an average • multiply mean by 100/area of field	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description which includes at least one piece of indicative content • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description which includes at least one piece of indicative content from the method and the calculation OR a detailed description of a method OR calculation • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description that includes both the method including details of repeats and the calculation including reference to a mean/average. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 5 = 11 marks

Question number	Answer	Marks
6 (a) (i)	**A** **The only correct answer is A** ***B** is not correct because no digestion takes place in the oesophagus.* ***C** is not correct because amylase would denature in the low pH found in the stomach.* ***D** is not correct because this is the last place where carbohydrates are digested, not the first place as the question suggests.*	(1)

Question number	Answer	Marks
6 (a) (ii)	maltose/glucose/sugar	(1)

Question number	Answer	Acceptable answers	Marks
6 (b)	A description including two of the following: • food/named food molecule broken down/ digested (1); • by enzymes/named enzyme (1); • (nutrients) absorbed/diffuse (1); • through villi/into blood (1);	Allow nutrients for food Accept moves / pushes food along / peristalsis	(2)

Question Number		Indicative Content	Mark
QWC	***6c(i)**	An explanation linking some of the following points • food stains can be fats or proteins • (enzymes are) biological catalysts • enzymes break down fats and proteins • references to complementary shapes • reference to lock and key hypothesis /active site of enzyme • clothes washed at lower temperatures/energy saving **Lipase** • lipase breaks down fats • into fatty acids/glycerol **Protease** • protease breaks down proteins • into amino acids	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation that includes at least one piece of indicative content • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation of the action of lipase **or** protease enzymes OR a detailed explanation of enzyme action. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation of the action of enzymes AND includes the products of lipase OR protease digestion. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question number	Answer	Acceptable answers	Marks
6 (c) (ii)	A suggestion including two of the following: • enzymes have an optimum temperature(1) • denature at high temperatures (1) • less stains broken down / removed/clothes not cleaned (1);	Accept stated temperatures between 35-40 °C / body temperature Accept change in shape of enzyme/active site	(2)

Total for question 6 = 12 marks

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Write your name here

Surname	Other names

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Candidate Number | | | | |

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Friday 10 June 2016 – Morning
Time: 1 hour

Paper Reference
5BI2F/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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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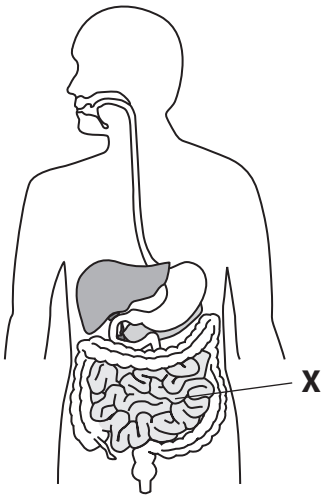
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Answer ALL questions

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 ☒.

The digestive system

1 The diagram shows the digestive system of a human.



(a) (i) Use words from the box to complete the sentences.

(2)

amino acids	amylase	lipase
fat	protease	simple sugars

Starch is chemically digested by the enzyme ..... .

This enzyme breaks starch down into ..... .

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

The part labelled **X** in the diagram is the

(1)

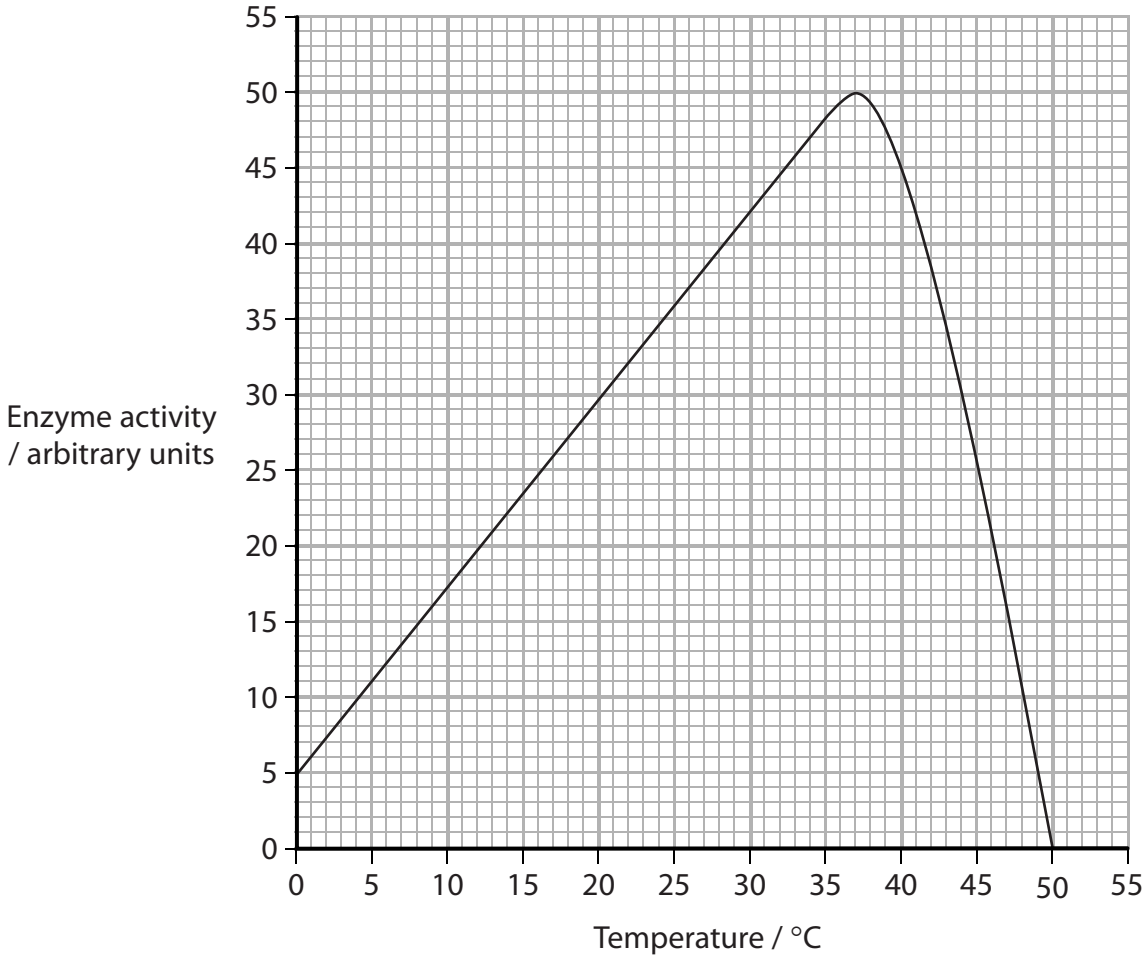
- ☒ **A** oesophagus
- ☒ **B** small intestine
- ☒ **C** large intestine
- ☒ **D** anus

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(b) The effect of temperature on the activity of the enzyme pepsin was investigated.

The graph shows the results of the investigation.



(i) Describe the enzyme activity from 0 °C to 40 °C.

(2)

(ii) Explain why the enzyme activity stopped at a temperature of 50 °C.

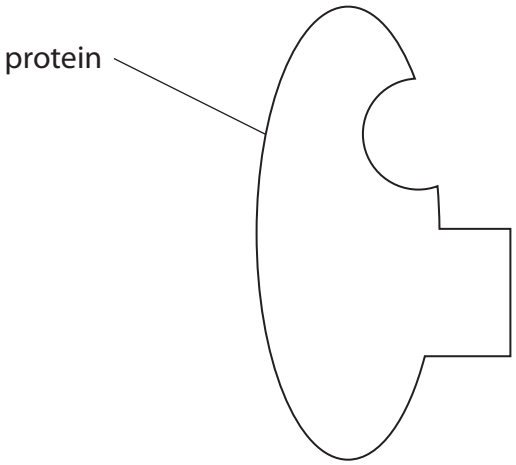
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(c) The lock and key hypothesis explains the complementary shape of enzymes and substrates.

Protein is digested by the enzyme pepsin.

The diagram shows a model of a protein.



Draw the complementary shape of pepsin on the diagram.

(1)

(Total for Question 1 = 8 marks)

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Fossils and DNA

2 The diagram shows fossils in different layers of rock.



(a) (i) Which layer of rock is most likely to contain the oldest fossils?

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

(1)

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

(ii) Use one word from the box to complete the sentence.

(1)

replication	probiotics
evolution	osmosis

The fossil record provides evidence for .....

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(iii) Explain why there are gaps in the fossil record for some organisms.

(2)

(b) Scientists are trying to extract DNA from fossils.

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

The correct pairing of bases in DNA is

(1)

☒ **A** C with T

☒ **B** T with G

☒ **C** G with A

☒ **D** A with T

(c) During cloning, DNA is replicated and a single cell divides to form genetically identical cells.

(i) Name the type of cell division that produces genetically identical cells.

(1)

(ii) Describe the advantages of cloning a mammal.

(2)

(Total for Question 2 = 8 marks)

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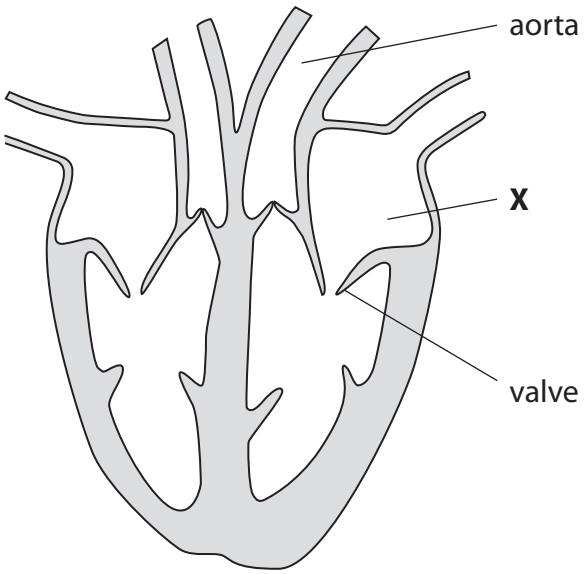
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The heart and circulation

3 The diagram shows a human heart.



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

The part labelled **X** in the diagram is the

(1)

- ☒ **A** left atrium
- ☒ **B** left ventricle
- ☒ **C** right atrium
- ☒ **D** right ventricle

(ii) Describe the role of the valve labelled in the diagram.

(2)

(b) Blood from the left side of the heart travels to different organs of the body.

The table shows the percentage of blood travelling to different organs at rest and during exercise.

	percentage of blood (%)	
organ	**at rest**	**during exercise**
brain	19	3
muscles	15	60
skin	9	18
liver	28	7
rest of body	29	12

(i) During exercise the percentage of blood travelling to the skin doubles.

Calculate how many times the percentage of blood travelling to the muscles increases during exercise.

(2)

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(ii) Explain why the percentage of blood travelling to the muscles increases during exercise.

(3)

(c) The word equation shows a process that takes place in muscles during vigorous exercise.

glucose ⟶ lactic acid

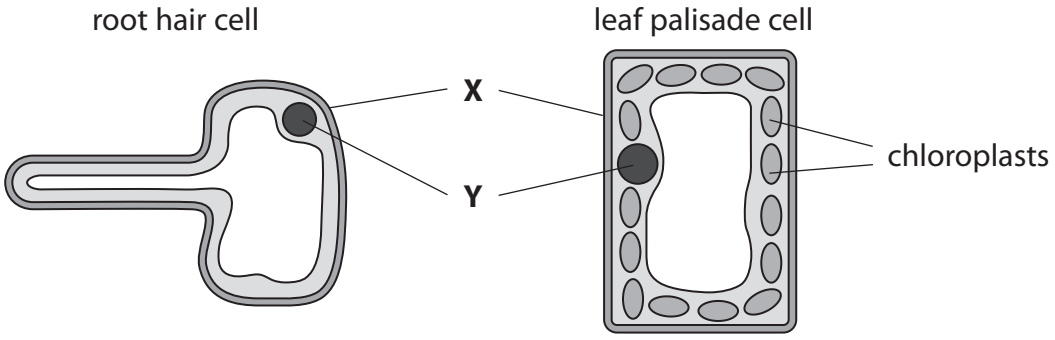
Explain why this process takes place during vigorous exercise.

(2)

(Total for Question 3 = 10 marks)

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4 The diagrams show a root hair cell and a leaf palisade cell.



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

The part labelled **X** is the

(1)

- ☒ **A** nucleus
- ☒ **B** cell wall
- ☒ **C** cytoplasm
- ☒ **D** vacuole

(ii) Describe the role of part **Y**.

(2)

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(iii) Draw one straight line from each type of cell to the function of that cell.

(2)

Type of cell	Function
root hair cell	photosynthesis
leaf palisade cell	transports mineral ions to the leaves
	absorbs water from the soil
	transports sugar to the roots
	prevents transpiration

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(b) The diagram shows one broad bean pod containing five seeds.



The length of each seed in a broad bean pod, from a plant grown in one area of a garden, is shown in the table.

seed number	length / mm
1	14.5
2	20.7
3	17.3
4	12.5
5	10.0

(i) Calculate the mean length of the seeds.

(2)

Mean length = ... mm

(ii) A pod was taken from a plant grown in a different area of this garden. The mean length of the seeds in this pod is greater.

Suggest reasons why the mean length of these seeds is greater.

(2)

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

Flowering plants produce gametes that combine to form a zygote.

Gametes combine during a process known as

(1)

☒ **A** cloning

☒ **B** fertilisation

☒ **C** meiosis

☒ **D** elongation

(Total for Question 4 = 10 marks)

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DNA

5 The diagram shows a section of a DNA molecule.



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

The two scientists who first made an accurate model of DNA were

(1)

- ☒ **A** Crick and Franklin
- ☒ **B** Franklin and Wilkins
- ☒ **C** Wilkins and Watson
- ☒ **D** Watson and Crick

(ii) State the term used to describe the shape of a DNA molecule.

(1)

.....

(b) Some chemicals can cause DNA mutations.

Describe two ways that a DNA molecule is changed by mutation.

(2)

.....

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(c) Explain why an electron microscope is more useful than a light microscope to study the structures inside a cell.

(2)

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*(d) Describe the advantages and disadvantages of using genetically modified plants.

(6)

(Total for Question 5 = 12 marks)

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Transport in living things

6 Living cells need a constant supply of oxygen and nutrients.

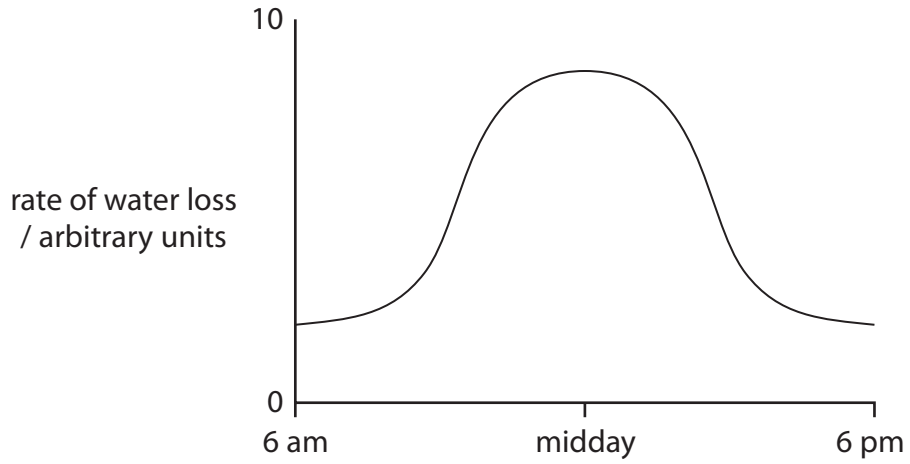
(a) Describe how oxygen is transported around the body by the blood.

(2)

(b) (i) Describe how water is transported up the stem and into the leaves of a plant.

(2)

(ii) The graph shows the rate of water loss from the leaves of a flowering plant during a 12-hour period on one summer's day.



Explain why the rate of water loss changes in the flowering plant from 6 am to midday.

(2)

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*(c) Describe how sampling techniques can be used to investigate the distribution of plants and insects in a field.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE
in Biology (5BI2F) Paper 01
Unit 2: The Components of Life

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

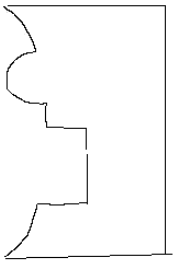
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	amylase		**(1)**
	(simple) sugars	Accept glucose	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	B small intestine		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	A description linking two of the following • increases (1) • (peaks) between 36°C-38°C / at 50 (au) (1) • decreases (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	An explanation linking two of the following • above optimum temperature/above value between 36-38 °C (1) • enzyme/active site changed shape (1) • enzyme is denatured (1) • so it will not fit with the substrate / form an enzyme substrate complex / no longer complementary to the substrate (1)	Accept destroyed / breaks down	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)	Any drawing that shows that the enzyme has a complementary shape to any part of the substrate e.g. 		**(1)**

Total for question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	**D**		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	evolution		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	An explanation including two of the following: • fossils do not always form (1) • soft tissue decays (1) • some fossils not found (1) • some fossils destroyed (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	**D** A with T		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	mitosis		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	a description including two of the following • useful substances produced (1) • will have known / desired characteristics/same characteristics as parent (1) • conservation of endangered species / increase population size(1)	Accept example of useful substance	**(2)**

Total for question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	**A** left atrium		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	A description to include the following • open / close (1) • to keep blood flowing in one direction / to prevent backflow (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• 60 **and** 15 (1) • (X) 4	Allow 2 marks for correct bald answer	**(2)**

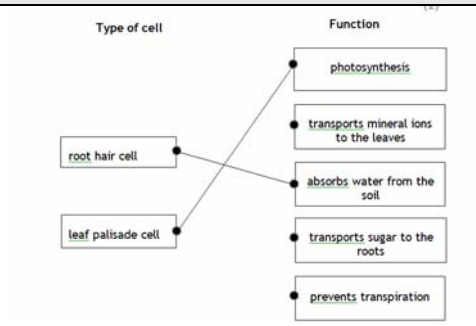
Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation linking three from the following • more oxygen/glucose (needed) (1) • (more aerobic) respiration (1) • greater energy demand / muscles working harder/faster (1) • to remove (excess) carbon dioxide (1) • reduce lactic acid build-up/remove lactic acid (1)	Ignore reference to anaerobic respiration accept blood is diverted from other organs (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)	An explanation linking two of the following • not enough oxygen • (so) anaerobic respiration • supplies (more) energy	accept cannot respire aerobically any faster	**(2)**

Total for question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**B** cell wall		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	• contains DNA/chromosomes / genes / genetic information (1) • controls the cell (activities / reactions) / gives cell its characteristics (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)		Reject more than one line from each type of cell	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	75 (mm) / ÷ 5 (1) 15 (mm)	Allow full marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	A suggestion including **two** of the following: • any two named environmental factors (2) • (increased) photosynthesis (1) • different genes / different variety (of bean plant) (1) • grown for longer time / grew faster (1)	eg. light, water, carbon dioxide, minerals, temperature	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	**B** fertilisation		**(1)**

Total for question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**D** Watson and Crick		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	double helix		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	A description including two of the following • changed base / order of bases (1) • change in number of bases (1)	accept substitution eg A becomes T accept insertion or deletion eg A*C*TTGA becomes ATTGA	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(c)	An explanation including two of the following: • higher magnification (1) • greater resolution / clearer image (1) • greater detail / can see more structures (1)	Allow reverse argument	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(d)**	A description to include some of the following points Advantages • herbicide resistant • pest resistant • disease resistant • weather resistant • higher yield • better quality product • golden rice reducing problems of vitamin A deficiencies in humans Disadvantages • idea of monocultures • reduce biodiversity • idea of cross pollination may occur with weeds / other species • super weeds • ideas of farmers / countries becoming dependent on GM seed companies • only rich countries will be able to afford the seeds / poor countries will not be able to compete • cost of development	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of either one advantage or one disadvantage • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of two or more advantages OR two or more disadvantages OR one advantage and one disadvantage • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of two or more advantages AND two or more disadvantages • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)	A description including two of the following: • (attaches to) red blood cells (1) • transported through (named) blood vessels (1) • (blood) pumped / moved by heart (1)	accept dissolved in plasma Ignore other named blood components attaches to haemoglobin (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	A description including two of the following: • through xylem (vessels) (1) • transpiration (stream) (1) • into leaf cells by osmosis (1)	ignore phloem accept diffusion	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	An explanation including two of the following: • (at midday) more light / higher temperature (1) • more stomata open (1) • (more) evaporation / transpiration (1)	allow more sun ignore references to water drying up	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A description to include some of the following points Equipment • use a pooter • use of pitfall traps • use of sweep nets • use of quadrats Description of method • pooter to suck up insects without damaging them • pitfall trap buried to trap walking insects • sweep nets to collect flying insects / in long grass • quadrat used to sample plants/insects • count plants / quantify numbers of insects Process • sampling occurs randomly • sampling occurs several times • sampling occurs in different locations • calculate an average • multiply average by area of a field / scale up	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description that includes at least two pieces of indicative content from any section • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that links at least two pieces of equipment with their method of use OR a detailed description of one piece of equipment with its method of use AND its linked process • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description that links at least two pieces of equipment with their method of use AND at least one linked process • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 = 12 marks

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Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Friday 5 June 2015 – Afternoon
Time: 1 hour

Paper Reference
5BI2F/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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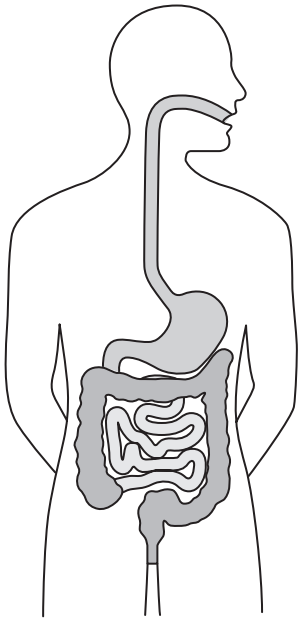
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Answer ALL questions

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 ☒.

Digesting food

1 The diagram shows the human digestive system.



(a) Use words from the box to complete the sentences.

(2)

active	amino	DNA	lactic	soluble

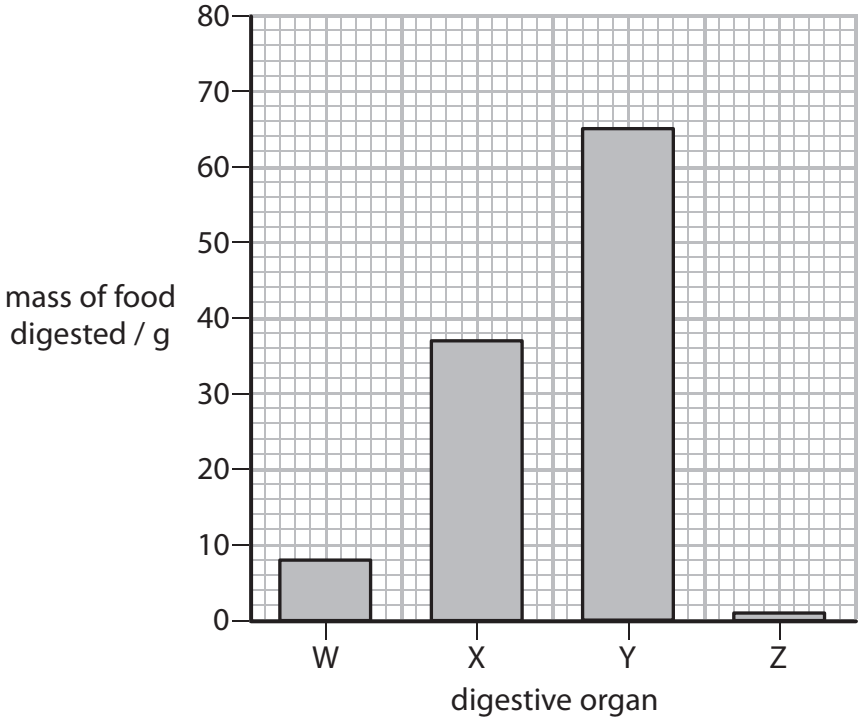
During digestion, large molecules are broken down into

small ..... molecules.

Proteins are large molecules that are broken down into ..... acids.

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(b) The graph shows the mass of food digested by four different digestive organs.



(i) Calculate the difference in the mass of food digested by organ **W** and organ **X**.

(2)

..... g

(ii) The food digested in organ **Y** was mainly carbohydrate.

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

Organ **Y** is most likely to be the

(1)

☒ **A** oesophagus

☒ **B** stomach

☒ **C** small intestine

☒ **D** large intestine

(c) State the role of peristalsis in the alimentary canal.

(1)

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.....

(d) Describe how digested food molecules move from the alimentary canal to the heart.

(2)

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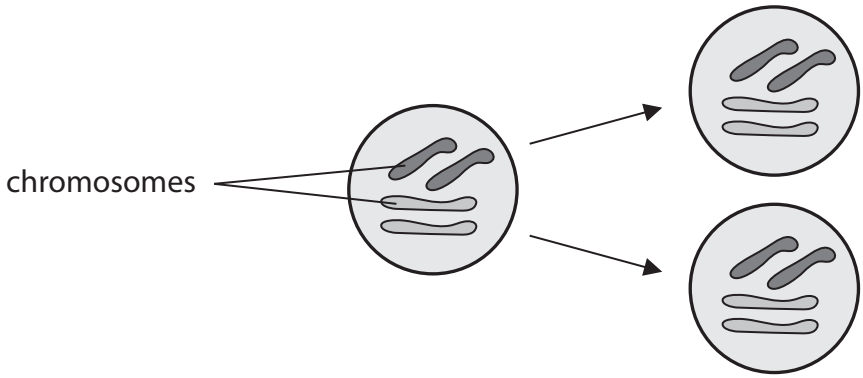
(Total for Question 1 = 8 marks)

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Cell division

2 The diagram shows cell division by mitosis.



(a) Describe how the diagram shows that this cell division is mitosis.

(2)

.....

.....

.....

.....

(b) A skin cell divides by mitosis once every day to produce new skin cells.

Calculate how many days it would take to produce 16 skin cells from one skin cell.

(2)

..... days

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(c) Cloning mammals involves mitosis.

Describe **one** advantage and **one** disadvantage of cloning mammals.

(2)

Advantage .....

.....

.....

.....

Disadvantage .....

.....

.....

.....

(d) Some cells divide by meiosis.

Use words from the box to complete the sentences.

(2)

double	two	stem cells	four	gametes

Meiosis is used in sexual reproduction to produce ..... .

Meiosis produces ..... haploid cells.

(Total for Question 2 = 8 marks)

Olympic training

3 The photograph shows an athlete training on a running machine.

The mask she is wearing measures the volume of oxygen she uses per minute.



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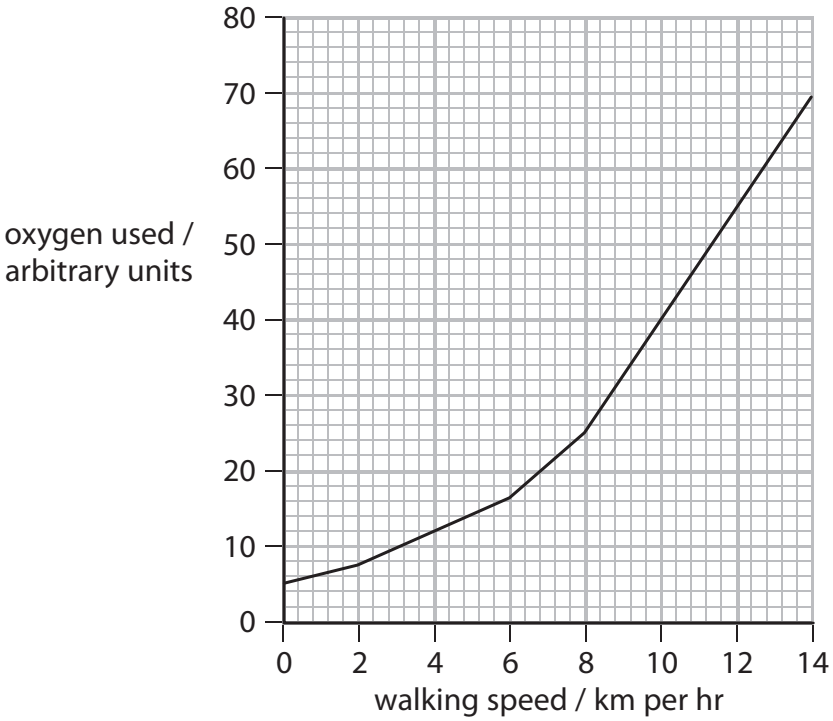
(a) The athlete runs faster in a race than when she is training.

Explain why running faster changes the volume of oxygen used per minute.

(2)

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(b) The graph shows the oxygen used by an Olympic walker during a training session.



(i) Describe how walking speed affects the amount of oxygen used by this Olympic walker.

(2)

(ii) Explain why this Olympic walker did not get cramp in their muscles when walking at a speed of 4 km / hour.

(3)

(c) Complete the word equation for aerobic respiration.

(1)

glucose + oxygen ⟶ ..... + water

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

Oxygen moves from the blood into cells by

(1)

☒ **A** breathing

☒ **B** diffusion

☒ **C** osmosis

☒ **D** transpiration

(e) Cardiac output increases during exercise.

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

When cardiac output is calculated, the stroke volume is multiplied by the

(1)

☒ **A** time

☒ **B** heart rate per minute

☒ **C** volume of the right ventricle

☒ **D** breathing rate

(Total for Question 3 = 10 marks)

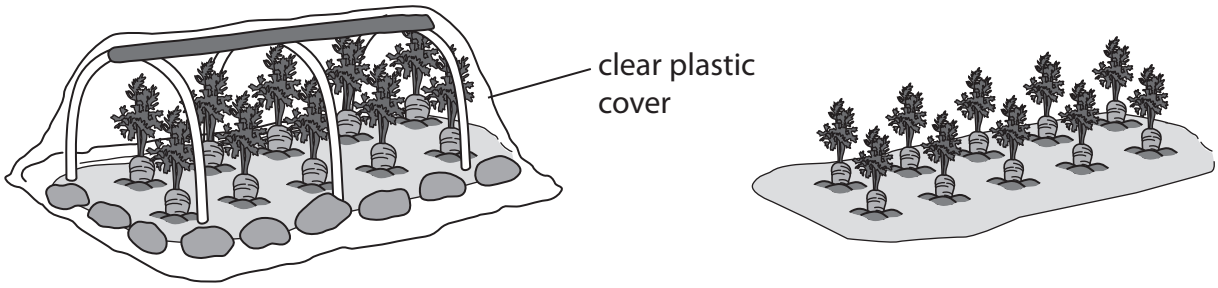
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Growing vegetables

4 A gardener grew 20 carrot plants in his garden.

Ten plants were grown under a clear plastic cover.

Ten plants were grown without a clear plastic cover.



(a) Explain why it is important that the clear plastic cover is transparent.

(2)

(b) (i) After 30 days, the gardener measured the height of each plant.

Describe how to calculate the mean height of the plants grown under the clear plastic cover.

(2)

.....

.....

.....

.....

(ii) The table shows the mean height of each group of plants.

group of plants	mean height of plants after 30 days / cm
plants grown under the clear plastic cover	15.3
plants grown without the clear plastic cover	13.4

Calculate the difference in the mean height of the two groups of plants.

(1)

..... cm

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

The most likely reason for the difference in the mean heights is because the plants under the clear plastic cover

(1)

☒ **A** were in a warmer environment

☒ **B** received more light

☒ **C** absorbed more oxygen

☒ **D** were in a drier environment

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(c) (i) Some gardeners add fertiliser, containing mineral ions, to the soil around their plants.

Name the plant cell that is adapted to take in mineral ions and water from the soil.

(1)

.....

(ii) Describe how active transport moves mineral ions from the soil into plants.

(3)

.....

.....

.....

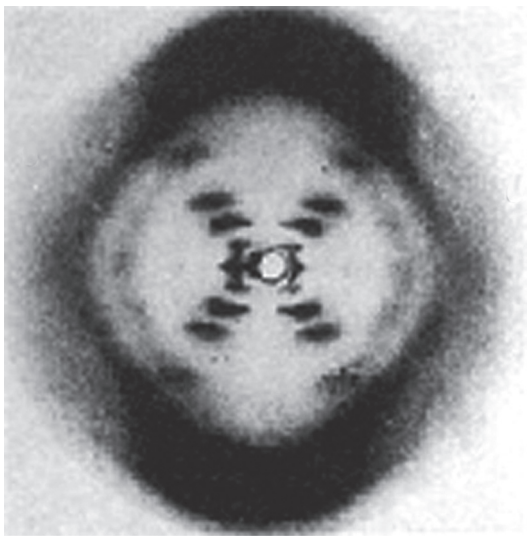
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(Total for Question 4 = 10 marks)

5 (a) Rosalind Franklin used this image in her study of the structure of DNA.



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

Rosalind Franklin obtained this image using

(1)

☒ **A** a light microscope

☒ **B** X-ray crystallography

☒ **C** an electron microscope

☒ **D** a digital camera

(b) Scientists discovered that a DNA molecule is a double helix.

Describe the meaning of the term **double helix**.

(2)

.....

.....

.....

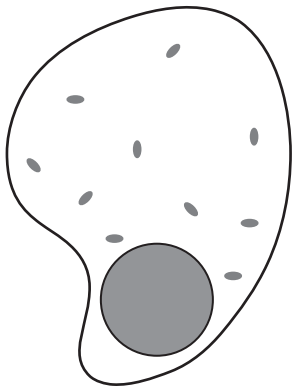
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(c) The diagram shows an animal cell.

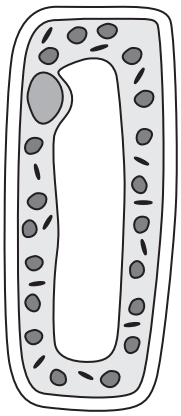
Draw a line to the part of the cell that contains most of the DNA.

Label this line **X**.

(1)



*(d) The diagram shows a cell from the leaf of a plant.



Describe the role of the structures in this plant cell.

(6)

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(e) Golden rice has been produced by genetic engineering.

Explain the health benefits of eating golden rice.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question 5 = 12 marks)

Using enzymes

6 Pectinase is an enzyme that is used to extract juice from apples.

In an investigation, 1 cm^3 of pectinase was added to 1 kg of chopped apples.

After 20 minutes, the volume of juice produced was measured.

This was repeated using different volumes of pectinase.

The table shows the results of this investigation.

volume of pectinase added / cm^3	volume of apple juice produced / cm^3
1	180
2	212
3	
4	269
5	300

(a) (i) Estimate the volume of apple juice that should be produced when 3cm^3 of pectinase was added.

(1)

..... cm^3

(ii) The maximum volume of apple juice that can be produced from 1 kg of apples is 500 cm^3.

Calculate the percentage of apple juice produced when 5 cm^3 of pectinase was added.

(2)

..... %

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(iii) Suggest **two** ways of increasing the volume of apple juice produced when 5 cm^3 of pectinase is added to 1 kg of chopped apples.

(2)

.....

.....

.....

.....

*(b) Explain the action of enzymes in terms of the lock and key hypothesis.

You may use labelled diagrams to illustrate your answer.

(6)

(c) The leaves of apple trees produce sugar.

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

Which vessel transports sugar from the leaves to the apples?

(1)

☒ **A** artery

☒ **B** capillary

☒ **C** phloem

☒ **D** xylem

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE in Biology (5BI2F/01) Unit 2: The Components of Life

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
-

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
1(a)	soluble (1) amino (1)	Must be in the correct order	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	37 (-) 8 (1) 29	 Award 2 marks for correct answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	C small intestine		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)	moves food (along the digestive tract)	pushes /squeezes/transports Ignore 'digests food' or 'breaks down food'	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(d)	A description linking two of the following: • absorbed/diffuse (1) • into blood/plasma (1) • into capillaries (1) • in veins (to the heart)(1)	 accept through villi	**(2)**

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)	A description including two of the following: • (produces) genetically identical cells (1) • (produces) diploid cells (1) • one (cell) division (1) • two cells produced (1)	 full/same number of chromosomes (as parent cell)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	Indication of doubling e.g. 1, 2, 4, 8, 16 (1) 4 (days)	 Award 2 marks for correct answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)	A description including one advantage and one disadvantage: Advantages: • conservation of endangered species (1) • to provide food/named desirable feature (1) • providing organs for transplant/medical research (1) Disadvantages: • shorter life-span • health issues e.g. breathing difficulties/arthritis • reduction in gene pool	 prevent extinction <

Question Number	Answer	Acceptable answers	Mark
2(d)	gametes (1) four (1)	accept '4' Must be in the correct order	**(2)**

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	An explanation linking two of the following • more oxygen needed/idea of greater oxygen demand (1) • for aerobic respiration (1) • by muscles (1) • more energy needed/idea of greater energy demand (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• (overall) increases as walking speed increases (1) • correct reference to data from graph (1)	you need more oxygen when walking faster	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation linking two of the following points • sufficient blood flow (1) • enough oxygen (is reaching muscles) (1) • (so) no / little anaerobic respiration occurs (1) • no / little lactic acid (1)	energy demand met they are respiring aerobically	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(c)	carbon dioxide	Accept CO_2 Reject CO^2	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(d)	**B** diffusion		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(e)	**B** – the heart rate per minute		**(1)**

Total for question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	An explanation linking the following points • plants need light (1) • for photosynthesis (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	A description including the following: • add the height of each plant together (1) • divide by the number of plants/10 (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	1.9		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(iii)	**A** were in a warmer environment		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	root hair (cell)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	A description including three of the following: • (mineral ions) pumped (1) • using energy (1) • move up/against their concentration gradient (1) • across a (partially permeable) membrane (1)	low concentration to a high concentration	**(3)**

Total for question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)	**B** X-ray crystallography		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)	• two strands(1) • twisted/coiled/spiral/wound around (each other) (1) • held together by (weak) hydrogen bonds (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (c)	A line drawn to the edge or inside the nucleus.		**(1)**

<table>
<tr><th colspan="2">Question Number</th><th>Indicative Content</th><th>Mark</th></tr>
<tr><td>QWC</td><td>*5(d)</td><td>A description to include some of the following points

<u>Structure</u> — <u>Role</u>

cell wall
• provides strength
• gives the cell shape/structure
• support for plant
• acts as a barrier (to pathogens)

cell membrane
• is partially permeable
• allows substances/named substances to pass in and out of the cell

cytoplasm
• where chemical reactions take place

chloroplasts
• site for photosynthesis
• absorb light
• produce sugar/glucose

vacuole
• stores mineral ions/nutrients
• contains/absorbs water for cell support

nucleus
• contains genetic information / chromosomes / DNA
• gives instructions to cell/controls cell activities

mitochondria
• (cellular/aerobic) respiration
• releases energy</td><td>(6)</td></tr>
<tr><td>Level</td><td>0</td><td colspan="2">No rewardable content</td></tr>
<tr><td>1</td><td>1 - 2</td><td colspan="2">• a limited description that includes at least one structure or role
• the answer communicates ideas using simple language and uses limited scientific terminology
• spelling, punctuation and grammar are used with limited accuracy</td></tr>
<tr><td>2</td><td>3 - 4</td><td colspan="2">• a simple description that includes details of at least two structures linked to their role
• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately
• spelling, punctuation and grammar are used with some accuracy</td></tr>
<tr><td>3</td><td>5 - 6</td><td colspan="2">• a detailed description that includes details of at least four structures linked to their role
• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately
• spelling, punctuation and grammar are used with few errors</td></tr>
</table>

Question Number	Answer	Acceptable answers	Mark
5(e)	An explanation linking two of the following • it contains beta carotene (1) • (increased) vitamin A (1) • reduces (night) blindness (1)	 reduces sight problems	**(2)**

Total for question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	any number from 230 to 250 (cm^3)		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	300 (÷) 500 (x100) (1) 60 (%)	two marks for correct answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(iii)	A suggestion including two of the following: • change temperature (to optimum) (1) • change pH (to optimum) (1) • increase the surface area (1) • allow more time (for the reaction) (1)	crush/press/squeeze /blend stir (the mixture) (1)	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(b)**	An explanation to include some of the following: Enzymes: • are involved in the digestion of food and other reactions • are biological catalysts • catalyse a specific reaction • are proteins • have specific shape* • have an active site* • active site has a complementary shape to substrate* • reference to denaturing Action of enzymes: • enzymes bind to their substrate* • enzyme substrate complex formed* • enzyme and product released* • enzyme reused* Hypothesis • enzyme acts as the lock* • substrate acts as the key* *annotated diagrams may show indicative content	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation that includes at least one piece of information from at least one area • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation that gives at least one piece of information from two areas or a detailed explanation from one area • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation that gives at least two pieces of information from each of the three areas or detailed explanations from two areas • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(c)	**C** phloem		**(1)**

Total for question 6 = 12 marks

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Surname	Other names

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Centre Number | | | | | |

Candidate Number | | | | |

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Friday 6 June 2014 – Afternoon
Time: 1 hour

Paper Reference
5BI2F/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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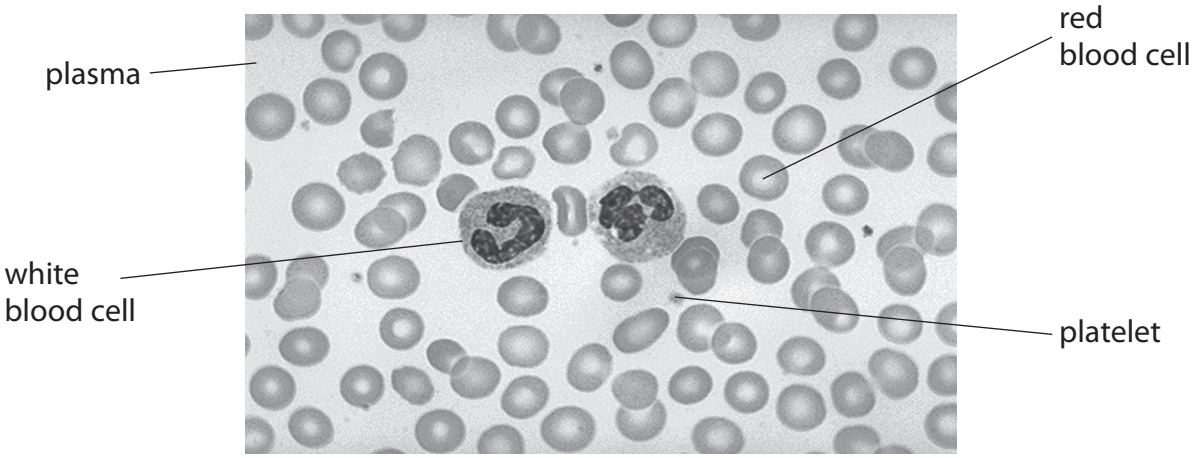
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Answer ALL questions

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 ☒.

The blood system

1 (a) The photograph shows parts of the blood.



(i) Use words from the box to complete the sentences.

(2)

clot	flow	glucose
carbon dioxide		oxygen

Red blood cells carry ..... to body cells for respiration.

Platelets help to make blood ..... .

(ii) Describe the function of white blood cells.

(2)

.....

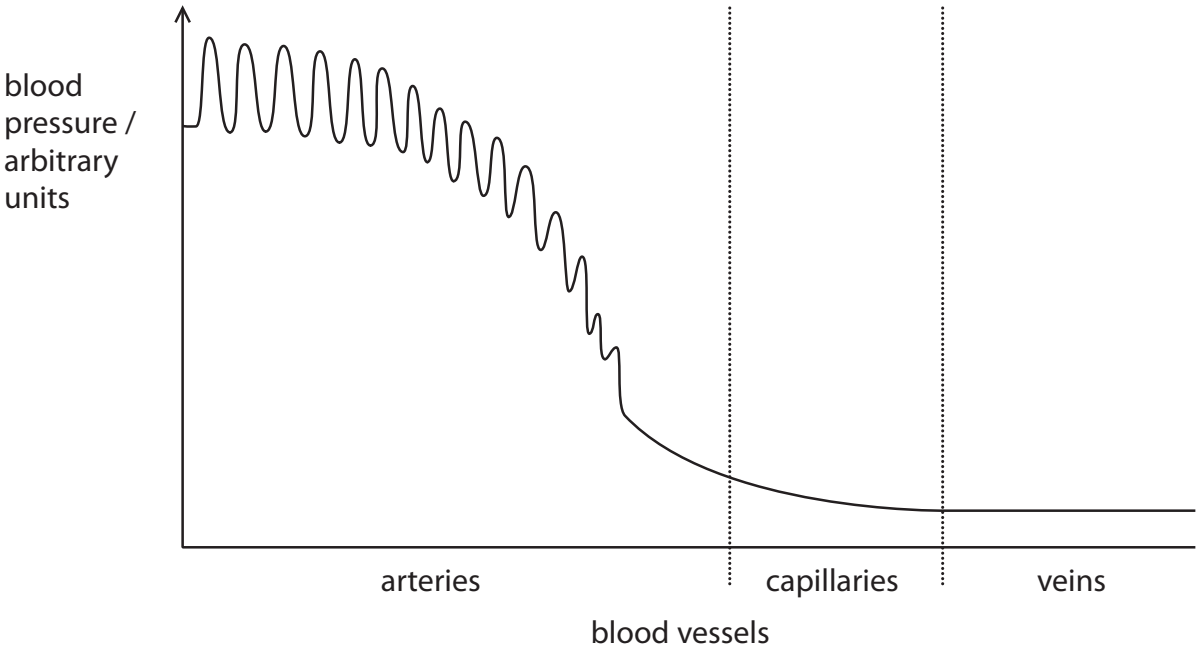
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(b) The graph shows the pressure of blood as it flows through arteries, capillaries and veins.



Describe the changes in the pressure of the blood as it flows through the arteries.

(2)

(c) Explain why the walls of the left and right ventricles of the heart have different thicknesses.

(2)

(Total for Question 1 = 8 marks)

Breathing and exercise

2 Two students, X and Y, investigated how exercise affected breathing rate.

They recorded their breathing rate at rest.

Their breathing rate was then measured each minute during 5 minutes of exercise.

The results of the investigation are shown in the table.

exercise time / minutes	breathing rate / breaths per minute	
	student X	student Y
0 (at rest)	11	12
1	14	17
2	17	24
3	23	27
4	26	32
5	28	35

(a) The breathing rate of student X increased by 17 breaths per minute during the investigation.

Calculate the increase in the breathing rate of student Y from rest to 5 minutes of exercise.

(1)

..... breaths per minute

(b) Suggest a reason for the difference in the overall increase in the breathing rate between students X and Y.

(1)

.....

.....

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(c) Explain why the breathing rate of the students changed during the exercise.

(2)

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

During the exercise gases pass into and out of the blood by

(1)

- ☒ **A** active transport
- ☒ **B** diffusion
- ☒ **C** osmosis
- ☒ **D** transpiration

(e) The students extended their investigation by exercising for 20 minutes.

During this exercise the students' muscles produced lactic acid, which caused cramp.

Suggest why their muscles produced lactic acid.

(2)

(f) Which substance supplies the energy used by muscles during exercise?

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

(1)

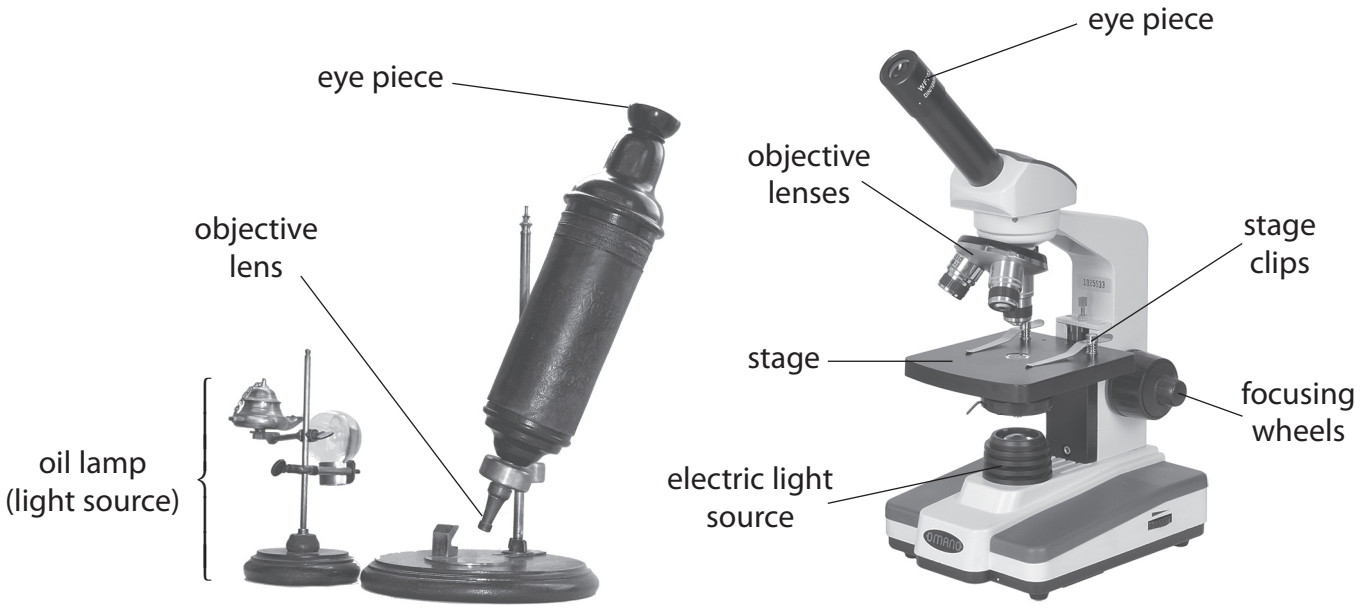
- ☒ **A** water
- ☒ **B** oxygen
- ☒ **C** glucose
- ☒ **D** lactic acid

(Total for Question 2 = 8 marks)

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Cells

3 The photographs show a 350 year-old light microscope and a modern light microscope.



(a) (i) Suggest how the modern light microscope helps us to see cells in greater detail than the 350 year-old microscope.

Use the photographs to help you.

(2)

.....

.....

.....

.....

.....

.....

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

Structures in bacterial cells are so small they can only be seen using

(1)

☒ **A** a hand lens

☒ **B** an electron microscope

☒ **C** a light microscope

☒ **D** a camera

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

Bacterial cells are similar to animal cells because they contain a

(1)

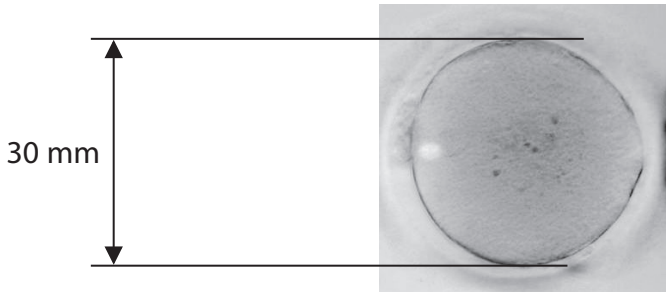
☒ **A** cell membrane

☒ **B** cell wall

☒ **C** plasmid

☒ **D** nucleus

(b) The photograph shows an animal cell magnified using a modern light microscope.



(i) The magnified animal cell has a diameter of 30 mm.

The actual diameter of the animal cell is 0.1 mm.

Calculate how many times the animal cell has been magnified.

(2)

..... times

(ii) State the function of the nucleus in the animal cell.

(1)

.....

.....

(c) Plant cells have large vacuoles.

Describe the functions of the large vacuole in a plant cell.

(2)

.....

.....

.....

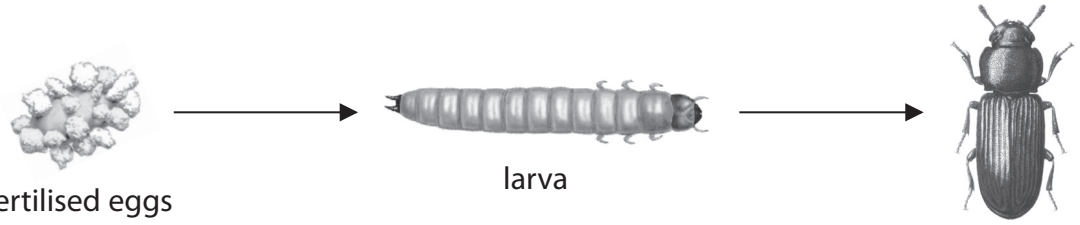
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(Total for Question 3 = 9 marks)

Flour beetles

4 Flour beetles are pests. They destroy food produced from crops.

The diagram shows the development of a flour beetle.



(a) (i) Flour beetles produce sex cells.

Describe the role of sex cells in the production of fertilised eggs.

(2)

.....

.....

.....

.....

(ii) It takes 120 days for the larva to develop into an adult beetle.

During this time the cells of the larva become specialised.

Name the process by which cells become specialised.

(1)

.....

(iii) A flour beetle has 16 000 genes.

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

The 16 000 genes of the flour beetle can produce 16 000 different

(1)

☒ **A** amino acids

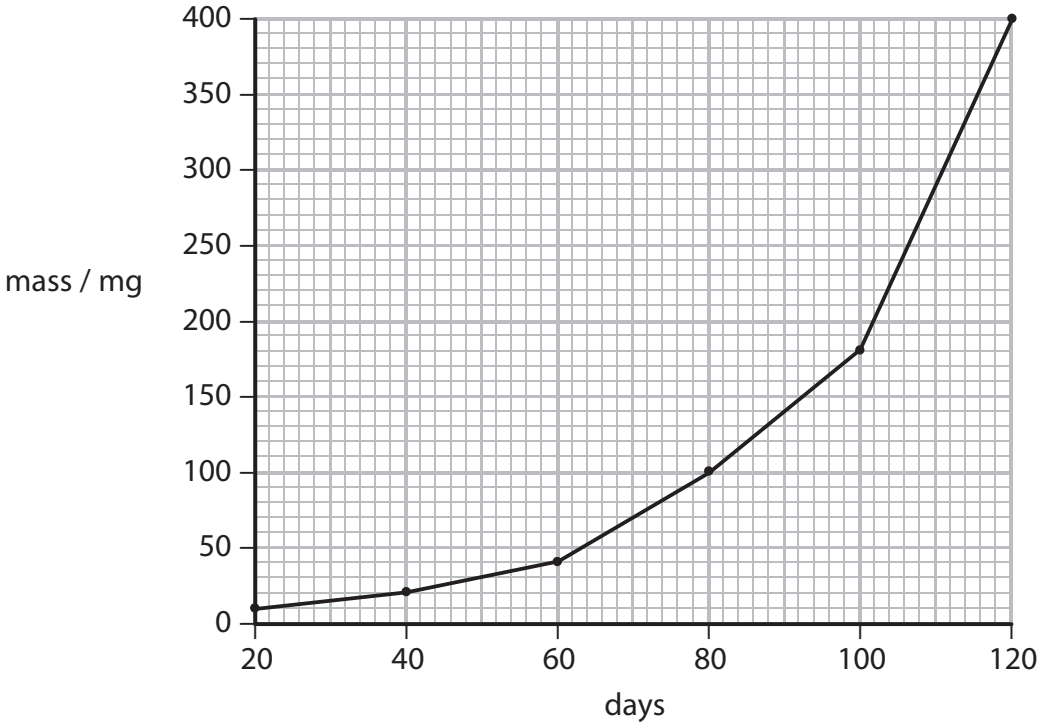
☒ **B** bases

☒ **C** chromosomes

☒ **D** proteins

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(b) The graph shows the mass of a flour beetle larva as it grows.



(i) State the mass of the larva on day 100.

(1)

..... mg

(ii) Describe the change in mass of the flour beetle as it grows from day 20 to day 120. Use the information in the graph to help you.

(2)

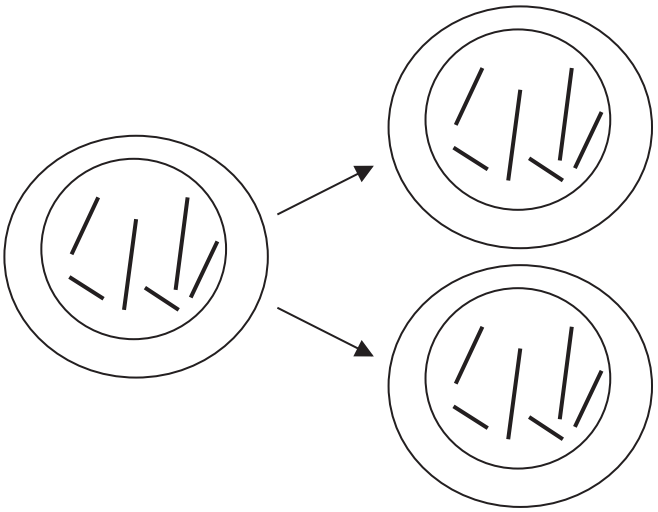
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(c) The diagram shows cell division during growth.



Describe this type of cell division.

(2)

(d) Flour beetles eat flour.

Flour can be produced from genetically modified wheat.

Suggest why wheat is genetically modified.

(2)

(Total for Question 4 = 11 marks)

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Question 5 is on the next page

Plants

5 (a) (i) A plant is growing in soil with a very low concentration of mineral ions.

Explain how these mineral ions are taken into the plant from the soil.

(2)

.....

.....

.....

.....

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

Mineral ions are transported from the roots to the leaves of the plant in the

(1)

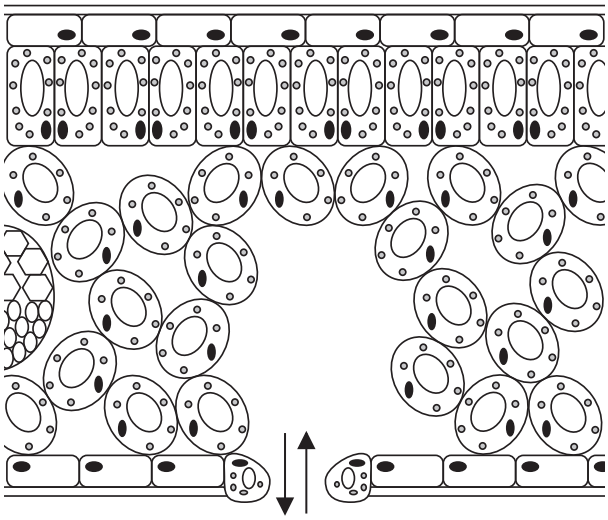
☒ **A** phloem vessels

☒ **B** root hair cells

☒ **C** stomata

☒ **D** xylem vessels

*(b) The diagram shows a section through a leaf.

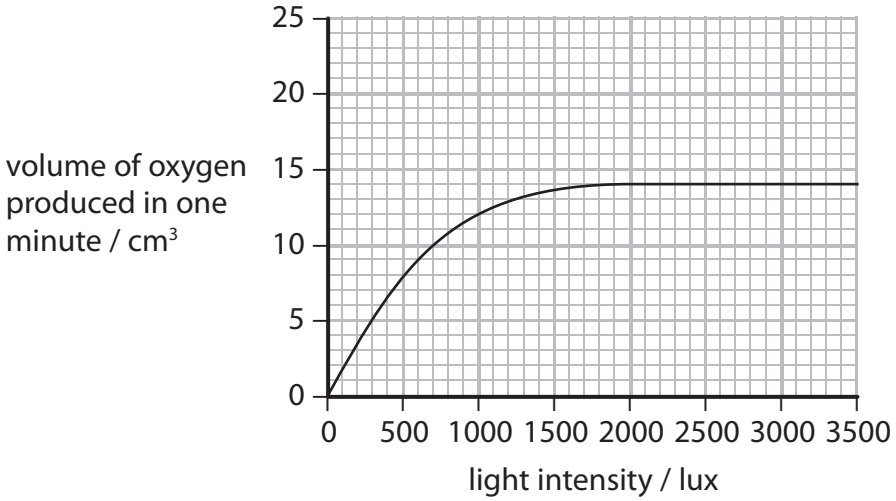


gas exchange

Explain how leaves are adapted for gas exchange.

(6)

(c) The graph shows the volume of oxygen produced by a plant in one minute at different light intensities.



(i) State the maximum volume of oxygen produced in one minute by this plant.

(1)

..... cm^3

(ii) Factors other than light intensity are limiting the rate of oxygen production above 2000 lux.

Describe how a different factor can increase the volume of oxygen produced by this plant.

(2)

.....

.....

.....

.....

(Total for Question 5 = 12 marks)

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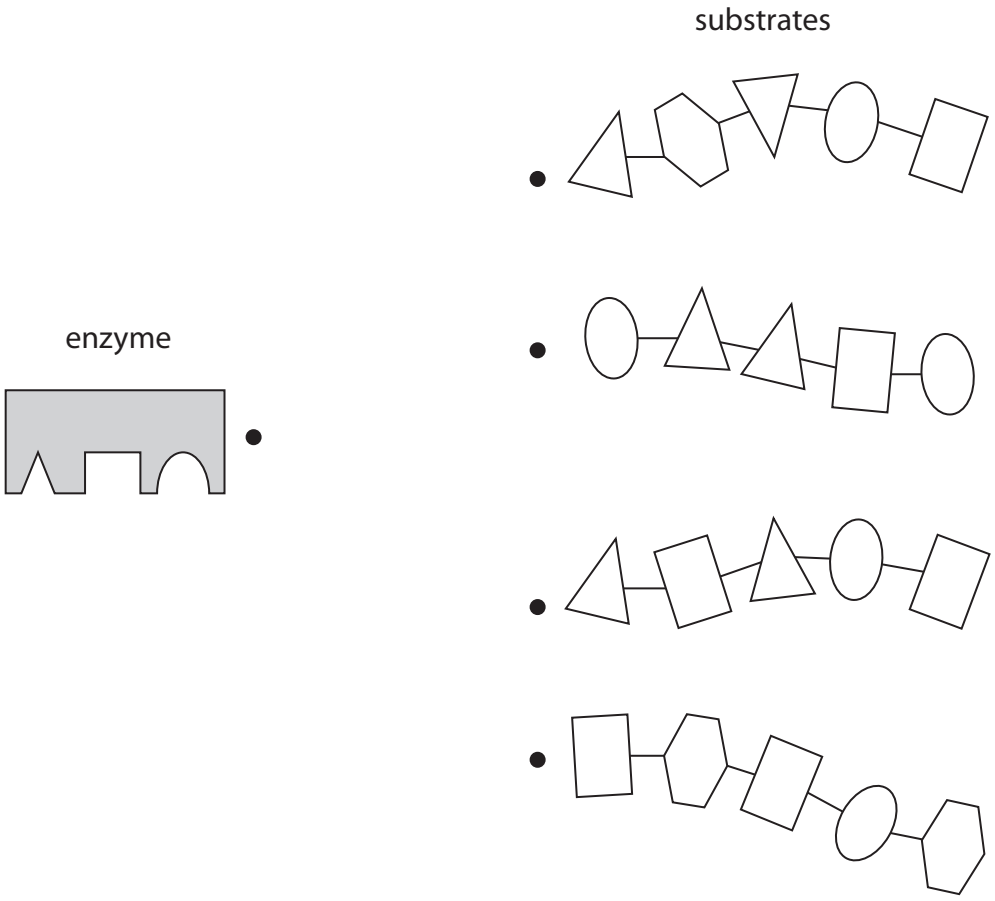
Question 6 is on the next page

Enzymes and digestion

6 (a) (i) The diagram shows an enzyme and four substrates.

Draw **one** straight line from the enzyme to its correct substrate.

(1)



(ii) The diagram models one way enzymes are thought to work with their substrates.

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

This model represents the hypothesis known as

(1)

- ☒ **A** base pairing
- ☒ **B** DNA replication
- ☒ **C** lock and key
- ☒ **D** protein synthesis

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(b) Some babies have difficulty absorbing nutrients from their food.

Protease enzymes can be added to baby food during its manufacture.

(i) Explain why protease enzymes are added to baby food.

(2)

(ii) A baby food is manufactured at 35 °C.

Higher temperatures affect the protease enzymes in baby food.

Explain how enzymes are affected by temperatures above 40 °C.

(2)

*(c) Describe the action of carbohydrase and lipase enzymes in different parts of the digestive system.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE in Biology (5BI2F) Paper 01

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Question Number	Answer	Acceptable answers	Mark
1(a)(i)1	oxygen		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(i)2	clot		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	A description including any **two** from the following: • defend against disease/infection(1) • {by engulfing /destroying/digesting} {pathogens/bacteria/ microorganisms/viruses/ foreign particles}(1) • produce antibodies(1) • produce antitoxins(1)	Allow fight infection Ignore germs	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	A description including any **two** of the following: • (overall) decrease (1) • (blood pressure) in arteries goes up and down / fluctuates/ shows pulse(1) • pulse/fluctuation becomes less (as it flows towards capillaries)(1)	Allow increases and decreases Ignore references to pressure in veins and capillaries	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)	An explanation including two of the following: • left ventricle has a thicker wall (1) • left ventricle pumps blood to the body/further distance (1) • right ventricle pumps blood to the lungs/shorter distance (1) • idea of different blood pressures (1)	MAX 1 if there is no reference to left or right side ORA/right side contains less muscle/ left side contains more muscle	**(2)**

(Total for question 1 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)	23 (breaths per minute)		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)	One mark for any of the following: (Student Y) exercising harder /faster/carried out a different exercise (Student Y) has a smaller lung capacity/ greater mass/is less fit (Student Y's) breathing rate started higher	Accept: Any reasonable suggestion ORA ORA ORA	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)	An explanation linking : • (more) oxygen needed (1) • (aerobic) respiration (1) • (greater) energy demand (1) • to remove (excess) carbon dioxide(1)	Ignore references to anaerobic respiration	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(d)	**B** diffusion		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(e)	• not enough oxygen (reaching muscles) (1) • anaerobic respiration(1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
2(f)	**C** glucose		**(1)**

(Total for question 2 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	Any two linked statements from the following: • focusing wheel (1) • for sharper/more clear image (1) OR • more/better/stronger (objective) lenses (1) • greater magnification(1) OR • electric light (1) • brighter/clearer image (1) OR • stage/stage clips(1) • holds the slide steady(1) OR • light underneath (1) • brighter/clearer image/ light goes through the slide (1)	Ignore 'more detail' as this is in the question	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	**B** – an electron microscope		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	**A** cell membrane		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• 30 ÷ 0.1 (1) • 300	Award 2 marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	contains genetic information/genes/DNA/ chromosomes /controls the activities of the cell/cell reactions		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)	A description including **two** of the following points • provides support (to plant/cell)/gives cell its shape(1) • stores cell sap (1) • (containing) minerals / sugar / named sugar/amino acids (1)	Accept reference to turgidity Accept: stores water/nutrients	**(2)**

(Total for question 3 = 9 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A description including **two** of the following: • (sex cells) are haploid (1) • sex cells/gametes fuse(1) • genetic information/DNA/ chromosomes combine/mix (1) • to form a diploid cell (1)	Accept reference to cells containing half the number of chromosomes Accept: male sex/sperm cell joins with female sex cell/egg cell Accept reference to a cell containing the full number of chromosomes	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	(cell) differentiation	Allow: specialisation	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	**D** proteins		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	180 (mg)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	A description including: • (mass) increases (1) • manipulation of data/correct reference to specific point(s) from the graph e.g. mass increases most rapidly between 80 and 120 days(1)	Ignore growth	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	A description including **two** of the following: • mitosis (1) • DNA/chromosomes are copied (1) • 2 cells (produced)(1) • (daughter) cells are genetically identical (1) • cells are diploid(1)	Credit reference to other stages of mitosis Accept clones	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	A suggestion including **two** of the following: • to produce poisons/chemicals/ pesticides (1) • to resist herbicides (1) • to contain more nutrients (1) • faster growing (1) • more tolerant to harsh conditions e.g. drought (1) • increased yield (1)	Accept to reduce deficiency disease Accept other reasonable suggestion e.g. increased shelf-life	**(2)**

(Total for question 4 = 11 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	An explanation including **two** of the following: • (into) root hair cells(1) • by active transport(1) • using energy(1) • against a concentration gradient/(from a low concentration in the soil) to a high concentration (in the plant cell)(1)	Ignore diffusion Allow pumped in	**(2)**

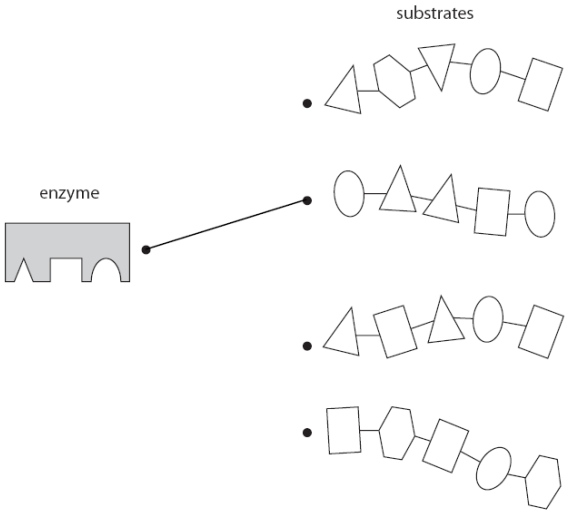
Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	**D** xylem vessels		**(1)**

Question Number		Indicative Content	Mark
QWC	***5(b)**	A explanation to include some of the following points Structure/feature: • large surface area • contains stomata/pores • controlled by guard cells • contains air spaces • chloroplasts Processes: • carbon dioxide in/out • oxygen in/out • water (vapour) in/out • diffusion (of gases) • from a high to low concentration (of gas) • reference to photosynthesis/respiration/ environmental factors /transpiration • concentration gradient of carbon dioxide maintained (by chloroplasts)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation that mentions one structure OR one named gas OR one process e.g. carbon dioxide moves into the leaf or the leaf has stomata • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation that links a structure to a named gas e.g. carbon dioxide enters through the stomata OR a structure to a named process e.g. gases diffuse through air spaces • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation that links BOTH CO_2 and O_2 to stomata. At least one other structure and/or process linked to gas exchange will be included. • the answer communicates ideas clearly and coherently using a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
5(c)(i)	14 (cm^3)		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(c)(ii)	A description that linking either: • temperature / CO_2 concentration/water (1) • correct reference to named factor being increased (1)	Ignore light/sunlight Accept a method describing how named factor could be increased	**(2)**

(Total for question 5 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
6(a)(i)		Reject if more than one line drawn from enzyme	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	**C** lock and key		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	A explanation including **two** of the following: • (baby food) contains proteins (1); • (protease) breaks down/digests proteins(1); • into amino acids (1); • amino acids can then be absorbed(1); • reference to growth(1);	Accept large/ insoluble molecules Accept small/ soluble molecules	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	An explanation including **two** of the following: • less/no activity/not at optimum(1); • enzyme/active site changes shape(1); • cannot bind to substrate(1); • denatures(1);	Accept destroyed	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A description that links some of the following points • carbohydrase breaks down carbohydrates • to maltose/glucose/sugar • carbohydrase in small intestine/ mouth • reference to amylase • lipase breaks down fats • to fatty acids/glycerol • in the (small) intestine	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description that gives one correct link between an enzyme and its substrate OR product OR location e.g. carbohydrases in the mouth • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that gives one correct link between one enzyme, its substrate, product and its location e.g. carbohydrases break down carbohydrates to glucose in the small intestine OR two enzymes with their substrates and either the products OR location • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description that links BOTH enzymes with their substrates AND their products AND their location. • the answer communicates ideas clearly and coherently using a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for question 6 = 12 marks)

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Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Monday 10 June 2013 – Afternoon **Time: 1 hour**	Paper Reference **5BI2F/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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Answer ALL questions

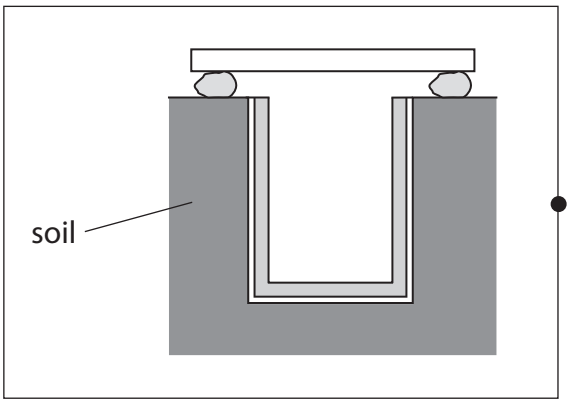
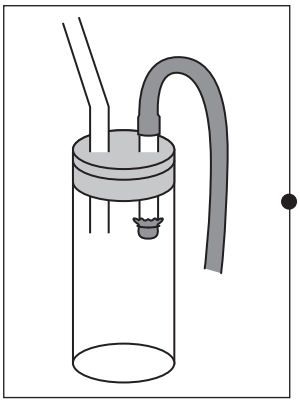
Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Sampling

1 Sampling can be used to find out the type and number of living organisms in a habitat.

(a) (i) Draw **one** straight line from each piece of sampling equipment to its name.

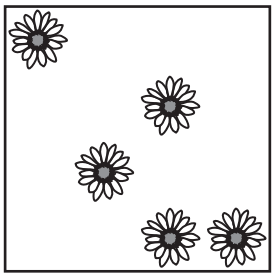
(2)

sampling equipment	name
	pooter
	sweep net
	filter funnel
	pond net
	pitfall trap

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(ii) A quadrat was used to estimate the number of daisies in a garden.

The diagram shows the number of daisies found in a 1 m^2 quadrat.

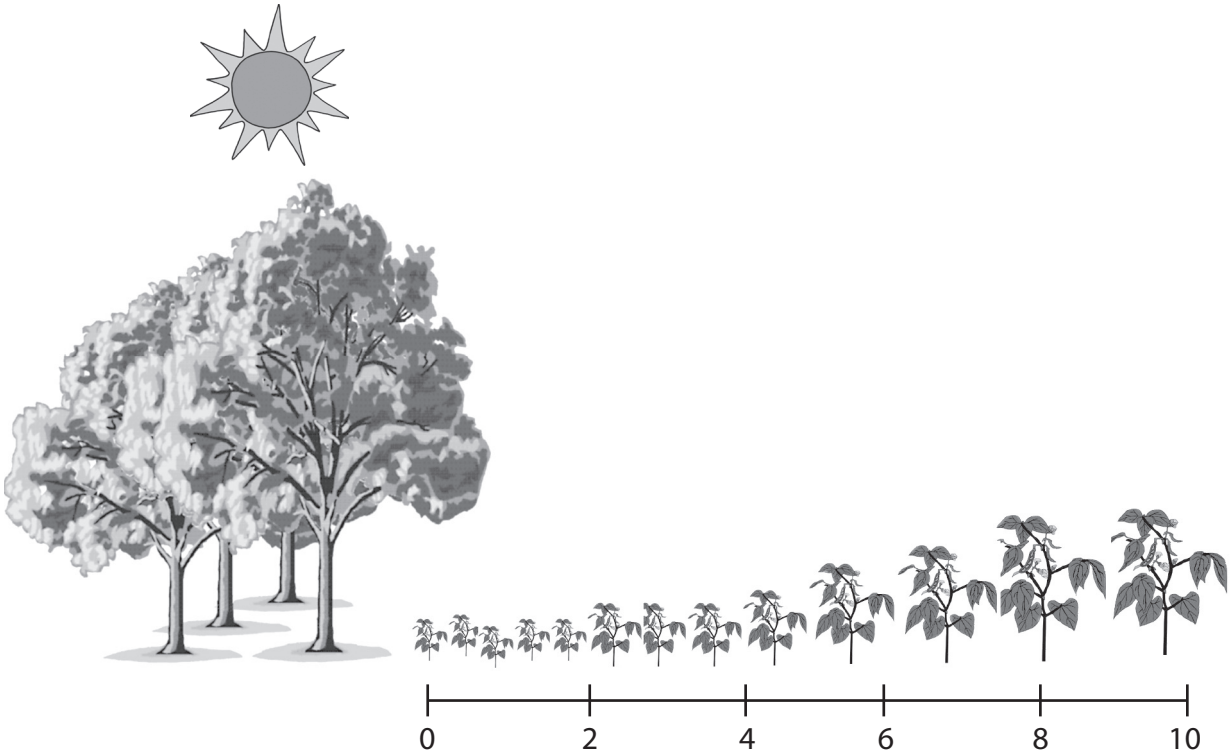


Estimate the number of daisies in a garden with an area of 20 m^2.

(2)

number of daisies = ...

(b) Some students measured the heights of one type of plant growing at the edge of a wood and into a field.



Suggest why the plants get taller as the distance between the plants and the wood increases.

(2)

.....

.....

.....

.....

(c) Name **two** substances that plants need to produce glucose, using light energy from the Sun.

(2)

1 .....

2 .....

(Total for Question 1 = 8 marks)

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Digesting fat

2 (a) Food high in saturated fat can raise blood cholesterol levels.

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

(1)

The enzymes for fat digestion are released into the

☒ **A** mouth

☒ **B** oesophagus

☒ **C** small intestine

☒ **D** stomach

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

An enzyme that breaks down fat is

(1)

☒ **A** amylase

☒ **B** lipase

☒ **C** pepsin

☒ **D** protease

(iii) Explain the role of the muscular wall of the oesophagus in digestion.

(2)

.....

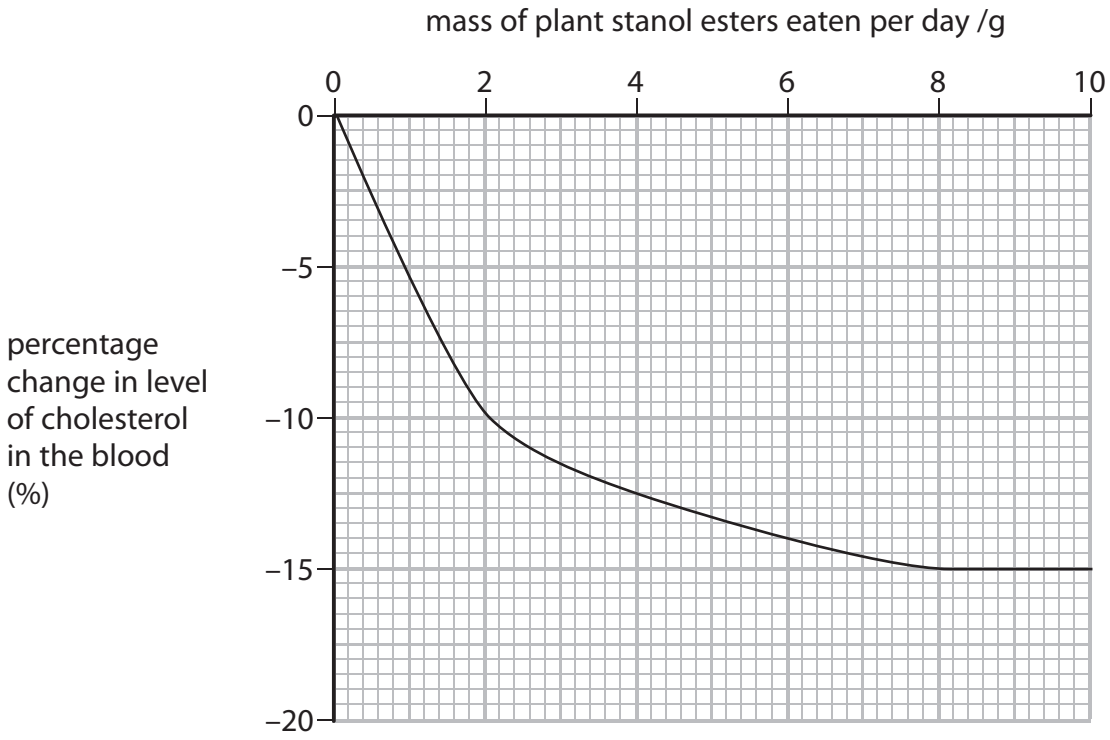
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(b) Plant stanol esters in food can affect the level of cholesterol in the blood.

The graph shows the percentage change in the level of cholesterol in the blood when different quantities of plant stanol esters are eaten.



(i) Calculate the percentage change in the levels of cholesterol in the blood between eating 2 g of plant stanol esters per day and 8 g of plant stanol esters per day.

(2)

answer = ...

(ii) Describe how the level of cholesterol in the blood changes as the mass of plant stanol esters eaten increases.

(2)

.....

.....

.....

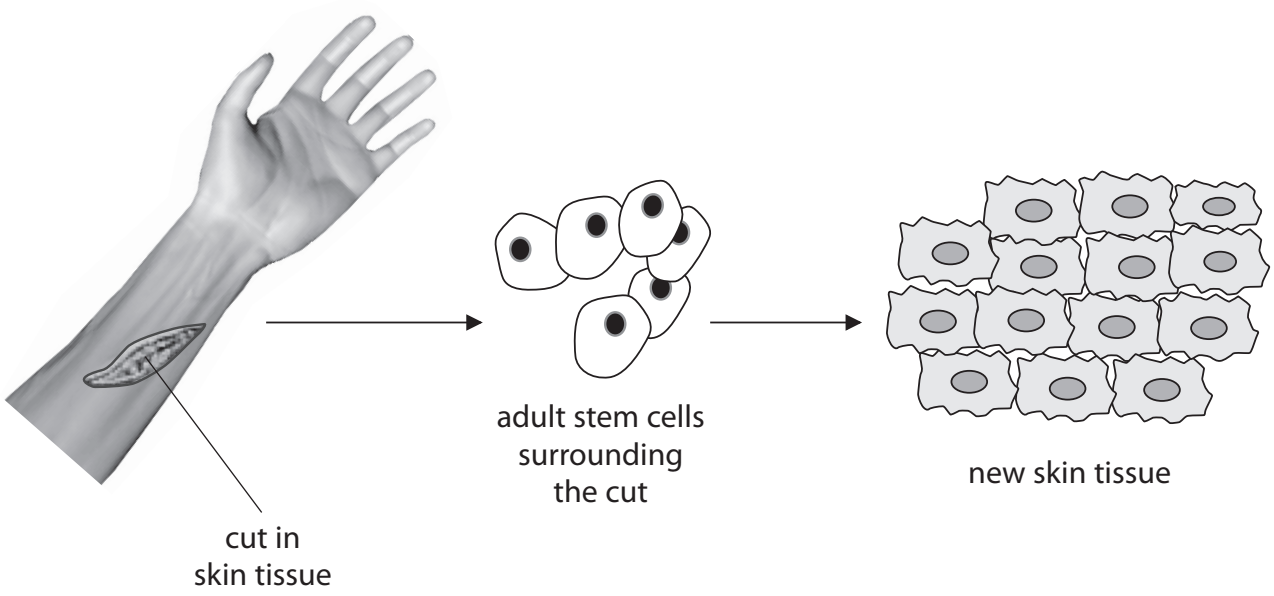
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(Total for Question 2 = 8 marks)

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Growth of living organisms

3 (a) The diagram shows the cells involved in the repair of skin tissue.



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

A tissue is a group of

(1)

- ☒ **A** stem cells dividing
- ☒ **B** sex cells dividing
- ☒ **C** organs working together
- ☒ **D** similar cells working together

(ii) Suggest how stem cells produce new tissue.

(2)

.....

.....

.....

.....

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

The process that releases energy for the growth and repair of damaged body tissue is

(1)

☒ **A** digestion

☒ **B** photosynthesis

☒ **C** respiration

☒ **D** transpiration

(b) Mass can be used to measure the growth of babies.

The table shows the mass of baby X and baby Y from birth to 24 months.

	mass / kg	
age / months	**baby X**	**baby Y**
0	2.5	3.4
6	6.4	8.0
12	7.8	9.6
18	9.0	11.0
24	10.8	12.2
mass gained		8.8

(i) Calculate the mass gained by baby X from birth to 24 months.

(2)

mass gained = ... kg

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(ii) Suggest **one** way, other than mass gained, that can be used to measure the growth of babies.

(1)

.....

(c) Carbohydrates provide energy for growth.

Use words from the box to complete the sentences.

(3)

amino acids	amylase	large intestine	protease
proteins	small intestine	stomach	sugars

Carbohydrates are broken down by ..... into

simple ..... .

Glucose is absorbed into the blood through villi found in the

..... .

(Total for Question 3 = 10 marks)

Structure of DNA

4 (a) Use words from the box to complete the sentences.

(3)

carbon	chromosome	double
gene	triple	hydrogen

A DNA molecule consists of two coiled strands that form a ..... helix.

The strands are held together by ..... bonds between the bases.

A ..... is a section of a DNA molecule that codes for a specific protein.

(b) Which **two** scientists were the first to build a 3D model of a DNA molecule?

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

(1)

☒ **A** Franklin and Crick

☒ **B** Franklin and Wilkins

☒ **C** Watson and Crick

☒ **D** Watson and Wilkins

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(c) (i) DNA gives instructions to make proteins.

Describe how two proteins can be different shaped molecules.

(2)

(ii) Some proteins are not the correct shape.

Suggest what may have happened to the DNA to cause a protein to form the wrong shape.

(2)

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

Some proteins are enzymes.

Enzymes are

(1)

- ☒ **A** biological catalysts
- ☒ **B** functional foods
- ☒ **C** haploid gametes
- ☒ **D** respiring cells

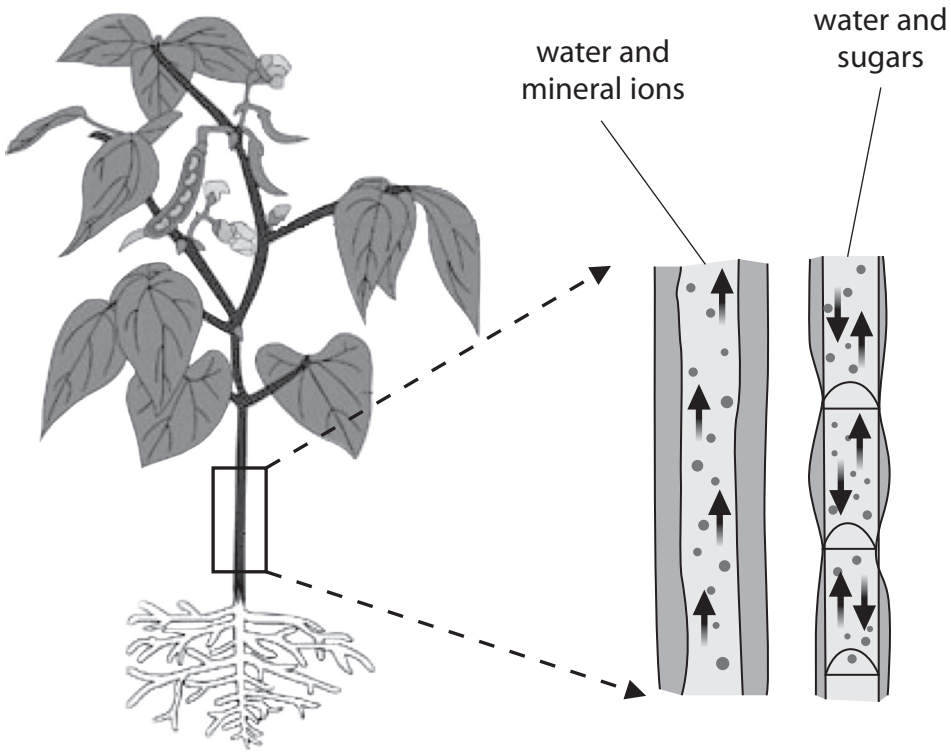
(d) State the term used to describe organisms that have identical DNA.

(1)

(Total for Question 4 = 10 marks)

Transport of materials

5 (a) The diagram shows two vessels found in the stems of plants.



(i) Name the vessel that transports water and mineral ions through the plant.

(1)

.....

(ii) Energy is needed to transport sugars through the plant.

Which cell component supplies energy that can be used for the transport of sugars through the plant?

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

(1)

- ☒ **A** cell wall
- ☒ **B** mitochondria
- ☒ **C** nucleus
- ☒ **D** vacuole

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(b) The table shows how the percentage of a person's blood that goes to each body part changes when they exercise.

	percentage of blood delivered to each part (%)	
body part	**at rest**	**during exercise**
brain	17	5
liver	27	7
muscles	15	66

(i) Suggest why the percentage of blood going to each of the body parts changes when a person exercises.

(3)

(ii) Muscle cells can carry out anaerobic respiration during exercise.

State a disadvantage of anaerobic respiration.

(1)

*(c) Describe how the circulatory system transports substances around the body.

(6)

(Total for Question 5 = 12 marks)

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Question 6 is on the next page

Genetic modification (GM)

6 Maize is a crop plant that has been genetically modified.

(a) Suggest how maize is genetically modified.

(2)

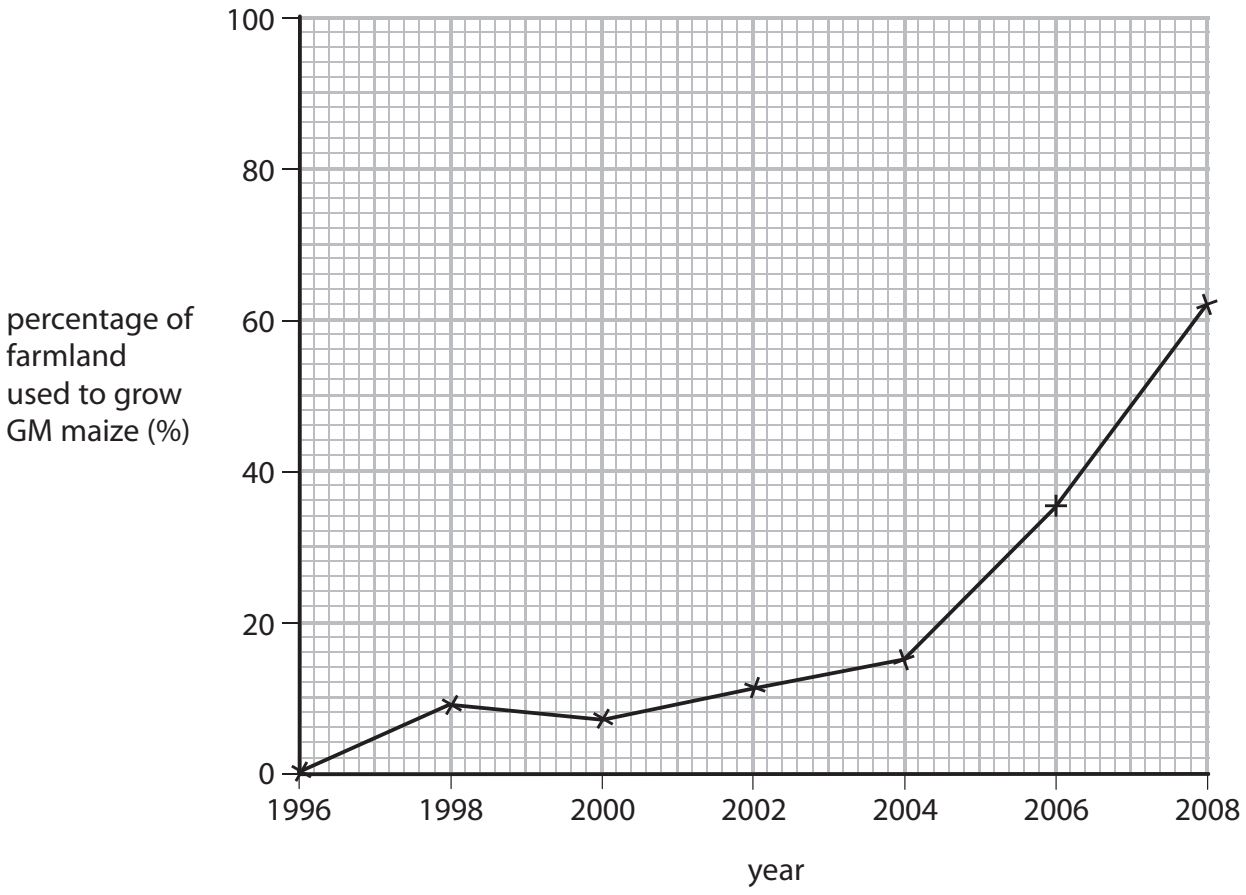
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.....

(b) The graph shows how the percentage of farmland used to grow genetically modified (GM) maize has changed from 1996 to 2008.



(i) Calculate the change in the percentage of farmland used to grow GM maize from 2004 to 2008.

(2)

answer = ...

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(ii) Describe the changes in the percentage of farmland used to grow GM maize between 1996 to 2008.

(2)

*(c) Discuss the advantages and disadvantages of the use of GM organisms.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Paper 01

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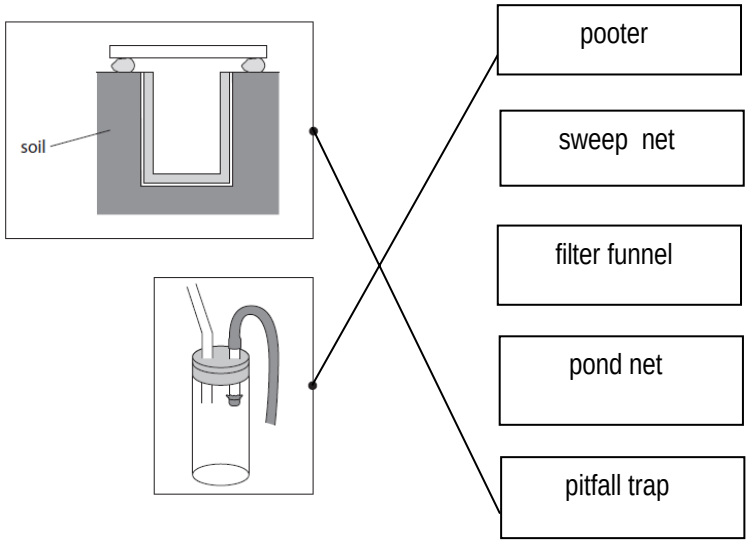
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Question Number	Answer	Acceptable answers	Mark
1(a)(i)		Do not allow more than one line from each box	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	5 (x 20) (1) = 100 (daisies)	award two marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	A suggestion including two of the following points: • (more) light (1) • (more) photosynthesis (1) • (more) water (1) • (more) mineral ions / nutrients (1) • faster growth (1) • less competition (1)	Allow reverse argument (plants closer to the wood) for all marking points warmer / (more)Sun Ignore grow taller / more growth Ignore more space	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)	Any two of the following: • chlorophyll / chloroplasts (1) • carbon dioxide (1) • water (1)	if formula used it must be correct Ignore heat and light	**(2)**

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	**C** small intestine		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	**B** lipase		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	An explanation including two of the following points • peristalsis (1) • <u>contraction</u> (of muscles) (1) • move/push (digested) food along (1) • (from mouth) to stomach (1)	ignore squeeze ignore breakdown of food	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	10 and 15 (1) = 5 (%)	two marks for bald correct answer Ignore negative sign	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	A description including two of the following points • decreases (1) • (then) remains constant (1) • correct reference to data from the graph (1)		**(2)**

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	**D** similar cells working together		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	A suggestion including the following: • divide / mitosis (1) • (stem cells) differentiate / specialise (1)	multiply /replicate / copy / clone allow description of differentiation e.g. can change into any type of cell/named cell/named tissue	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	**C** respiration		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	10.8 and 2.5 (1) = 8.3 (kg)	award two marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	(increase in) length (1)	height other valid measurements e.g. head circumference (1) allow named equipment that could be used to measure growth e.g. ultrasound (1)	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(c)	amylase (1) sugars (1) small intestine (1)	answers must be in this order accept phonetic spellings	**(3)**

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	double(1) hydrogen(1) gene(1)	answers must be in this order accept phonetic spellings	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(b)	**C** Watson and Crick		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	A description including **two** of the following points: • (coded for by a) different base sequence (1) • (made up of) different types of amino acid (1) • (made up of) a different number of amino acid (1) • (made up of) a different order of amino acid (1)	 accept (coded for by) different genes / DNA code accept different amino acids	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	A suggestion including **two** of the following points: • (DNA) mutated (1) • change in base/base order (1) • correct reference to cause of mutation e.g. radiation / tar (1)	 accept named change e.g. insertion ignore references to base-pairing	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c) (iii)	**A** biological catalysts		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(d)	• clone (s)	identical twins Accept phonetic spelling	**(1)**

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	• Xylem (vessel)	Accept phonetic spelling	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	**B** mitochondria		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	An suggestion including three of the following points: • (greater blood flow) muscles work harder / need more energy(1) • to provide oxygen /glucose (1) • for (aerobic) respiration (1) • to remove CO_2 (1) • less blood flow to brain / liver (1)	accept reference to reducing build up of lactic acid / reduce rate of anaerobic respiration / reduce oxygen debt / EPOC (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	Any one from • provides less energy • build up of lactic acid • causes cramp / muscle fatigue	accept muscles ache / tire quickly	**(1)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	A description including some of the following points in a logical sequence • heart / ventricle pumps blood • through blood vessels/arteries/veins/capillaries • to lungs and to the rest of the body • arteries/named arteries transport blood away from heart • veins / named veins transport blood to the heart • valves prevent backflow • capillaries exchange materials/named material with tissues/cells • red blood cells carry oxygen • plasma transports nutrients/waste/hormones	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description of **one** structure OR **one** function of the circulatory system e.g. the heart pumps blood or the blood carries oxygen • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of **two** structures **and** their functions of the circulatory system e.g. arteries carry blood away from the heart and red blood cells transport oxygen. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed description of at least **three** structures **and** their functions of the circulatory system which MUST include relevant information on red blood cells OR plasma OR the exchange of material at capillaries. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)	A suggestion including any two from: • new gene / DNA located(1) • inserted (into plant DNA) (1) • (by) genetic engineering (1)	any named GM characteristic e.g. pest resistant accept reference to correct GM procedure e.g. restriction enzymes / use of plasmid (1) accept <u>DNA</u> has been changed / modified (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	• 62 and 15 (1) • 47 (%)	award two marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	A description including two of the following points • overall increase(1) • by 62 (%) (+/-2)(1) • relevant point mentioned from graph between 1996 and 2000(1) • increases between 2000 and 2008(1)	Accept relevant point mentioned from graph between 2000 and 2008	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A discussion including some of the following points in a logical sequence **<u>Advantages</u>** <u>reference to GM crops</u> • named GM characteristic e.g. herbicide resistance/longer shelf life/faster growth • increased yield • less use of chemical pesticides • less harm to living things • ref to beta carotene/golden rice • reduction in vitamin A deficiency/improvement in health <u>reference to GM bacteria</u> • rapid population growth • increased yield (of product) • named GM characteristic e.g. insulin production • no animals harmed/used in production • less side effects (than bovine insulin) • suitable for use by vegans (no animal products) <u>reference to GM animals</u> • production of hormones / named GM product **<u>Disadvantages</u>** • reference to cross-pollination/gene transfer • production of superweeds/plants with GM characteristics • greater competition between plant species • reduction in biodiversity/non-target organisms harmed/ negative impact on food chains • long term effects on human health unknown/side effects/allergies • expensive to produce/buy • reliance on GM companies (for GM seeds) • farmers cannot afford to buy them • risks in culturing microorganisms	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited discussion including one advantage OR one disadvantage e.g bacteria can produce insulin or genes can transfer to other plants • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple discussion including at least one advantage **and** one disadvantage OR two advantages OR two disadvantages • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed discussion including at least two advantages **and** two disadvantages • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for Question 6 = 12 marks

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Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Friday 1 March 2013 – Morning
Time: 1 hour

Paper Reference
5BI2F/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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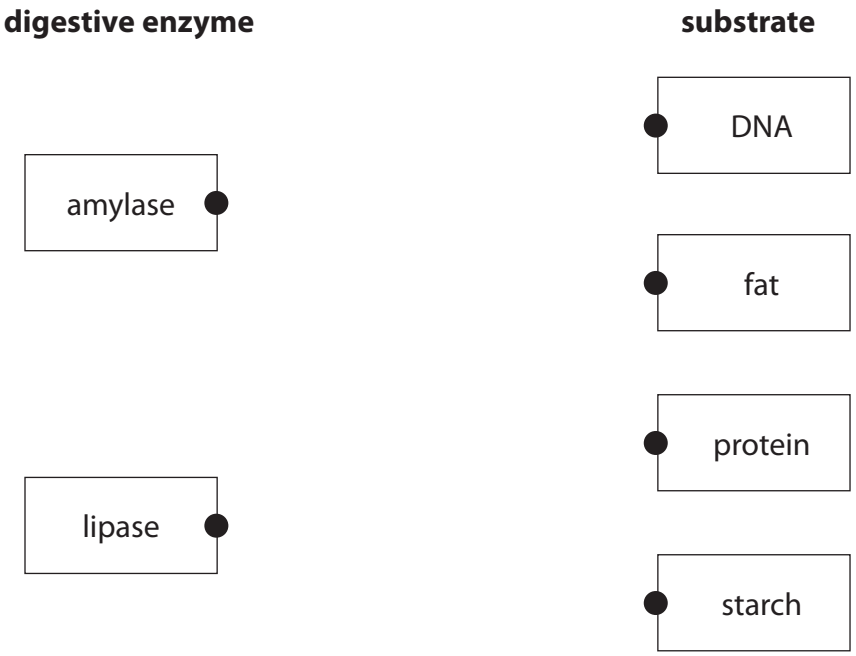
Answer ALL questions

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 ☒.

Digestive enzymes

1 (a) Draw **one** straight line from each digestive enzyme to its substrate.

(2)



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

Pepsin is an enzyme that digests protein into

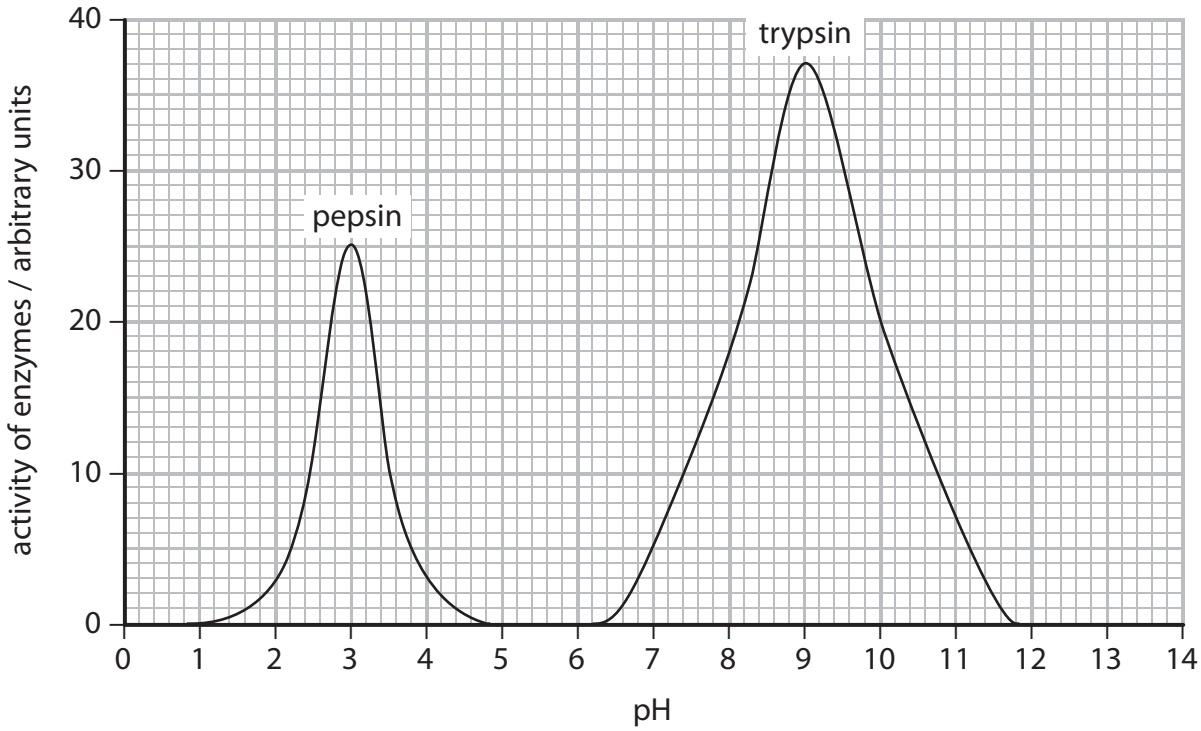
(1)

- ☒ **A** amino acids
- ☒ **B** fatty acids
- ☒ **C** glucose
- ☒ **D** glycerol

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(ii) An experiment was carried out to investigate the effect of pH on the activity of pepsin and another enzyme called trypsin.

The graph shows the results of the experiment.



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

The graph shows that

(1)

☒ **A** pepsin only works at a pH of 3

☒ **B** pepsin has an optimum pH of 3

☒ **C** trypsin only works at a pH of 3

☒ **D** trypsin has an optimum pH of 3

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 .....

.....

2 .....

.....

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

.....

.....

.....

.....

(Total for Question 1 = 8 marks)

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Useful bacteria

2 (a) Some foods contain prebiotics.

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

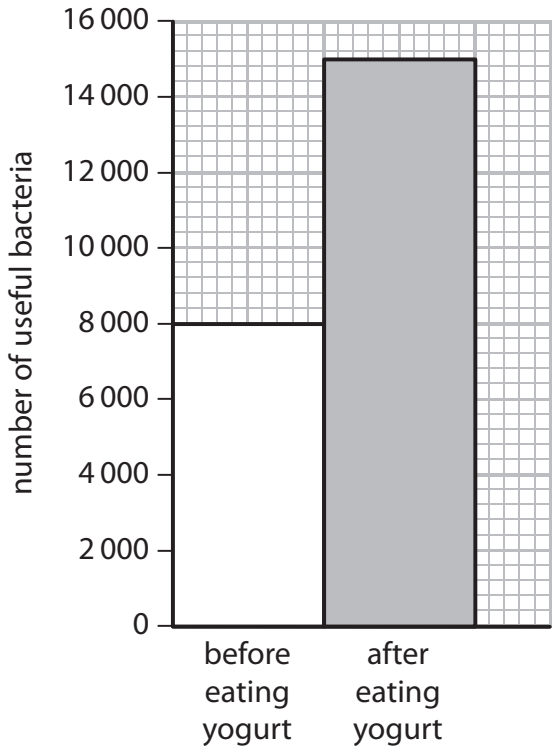
The active ingredients in prebiotics are

(1)

- ☒ **A** lactic acids
- ☒ **B** oligosaccharides
- ☒ **C** stanol esters
- ☒ **D** starch

(b) The graph shows the number of useful bacteria in part of the digestive system of a person before and after eating yogurt.

The yogurt contained prebiotics.



(i) Calculate the difference between the number of bacteria present in the digestive system before and after the yogurt was eaten.

(2)

..... useful bacteria

(ii) Describe the effect on the number of useful bacteria after eating yogurt containing prebiotics.

(1)

.....

.....

(c) Bacteria are microscopic organisms.

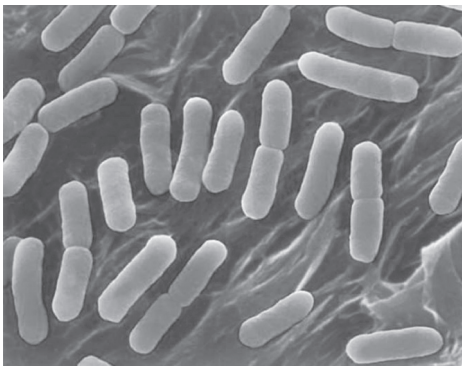
(i) State a part of the light microscope that magnifies the bacteria.

(1)

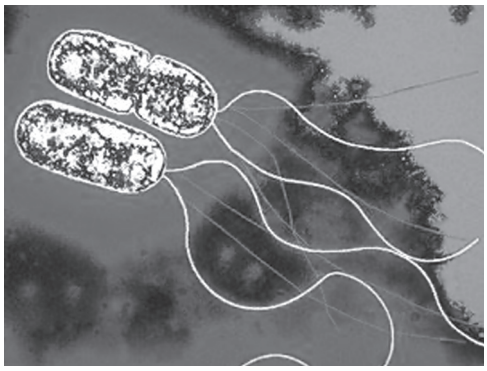
.....

Photograph A was taken using a light microscope and photograph B was taken using an electron microscope.

Photograph A



Photograph B



(ii) Describe **two** advantages of using an electron microscope to view bacteria.

(2)

.....

.....

.....

.....

(iii) Name **one** structure of the bacterial cell that can be seen in the image from the electron microscope.

(1)

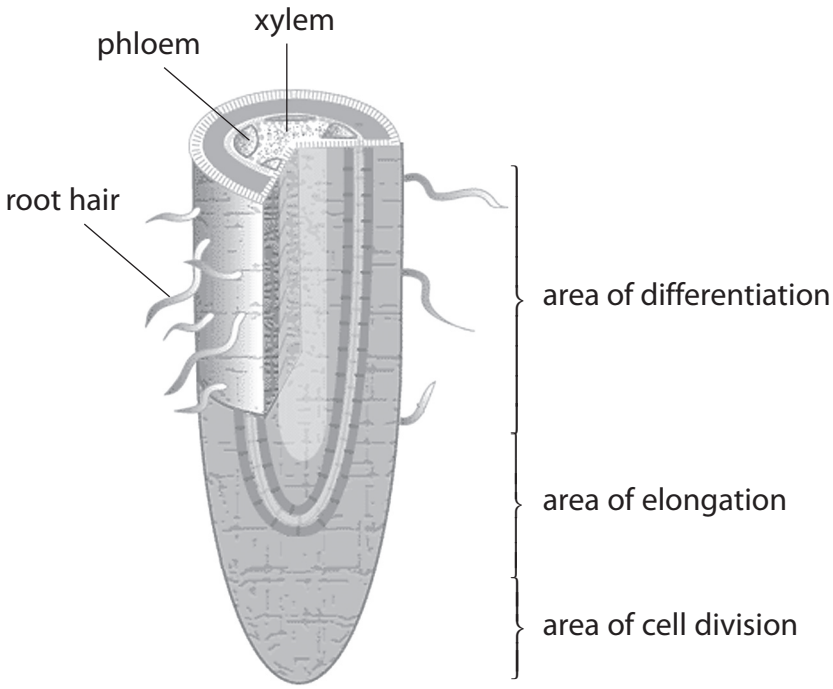
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(Total for Question 2 = 8 marks)

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Plant growth

3 (a) The diagram shows a section through a plant root.



(i) State the type of cell division taking place in the root.

(1)

.....

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

During cell elongation the root cells are

(1)

- ☒ **A** branching
- ☒ **B** getting longer
- ☒ **C** getting smaller
- ☒ **D** photosynthesising

(iii) Describe what happens to the root cells during cell differentiation.

(2)

.....

.....

.....

.....

(b) A student investigated the growth of tomato plants over a two-month period.

(i) In one investigation, three tomato plants were grown without fertiliser.

The increase in the height of each plant, after two months, is shown in the table.

Increase in height of tomato plants / cm		
plant 1	plant 2	plant 3
9.8	10.5	10.0

Calculate the mean increase in the height of these plants.

(2)

answer = ... cm

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(ii) In a second investigation, another three tomato plants each had a different fertiliser, **A**, **B** or **C**, added to their soil.

The mean increase in the height of each plant, after two months, is shown in the table.

	Fertiliser		
	A	**B**	**C**
increase in height of tomato plant / cm	20.4	14.6	10.6

Describe the effect of these fertilisers on the height of the tomato plants.

(2)

.....

.....

.....

.....

(iii) The student thought that fertilisers might also affect the growth of tomato plants in other ways.

Suggest **two** other measurements of the plant the student could make to test this idea.

(2)

1 .....

.....

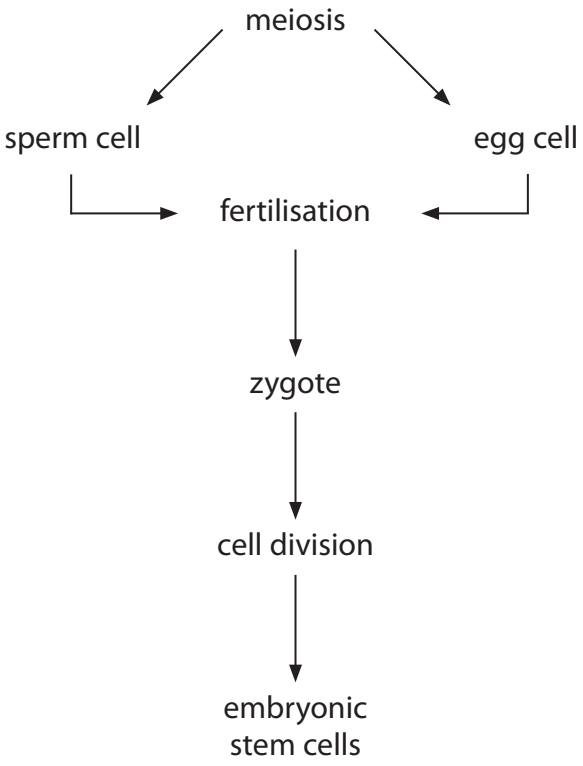
2 .....

.....

(Total for Question 3 = 10 marks)

Stem cells

4 The diagram shows how embryonic stem cells are produced.



(a) (i) Describe how the cells produced by meiosis are different from body cells.

(2)

.....

.....

.....

.....

(ii) Describe what happens to the sex cells during fertilisation.

(2)

.....

.....

.....

.....

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(b) Suggest **one** advantage and **one** disadvantage of using embryonic stem cells in scientific research.

(2)

(c) The diagram shows a section of a DNA molecule.



(i) Describe the structure of a DNA molecule.

(3)

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

A gene is a section of DNA that codes for a

(1)

☒ **A** chromosome

☒ **B** plasmid

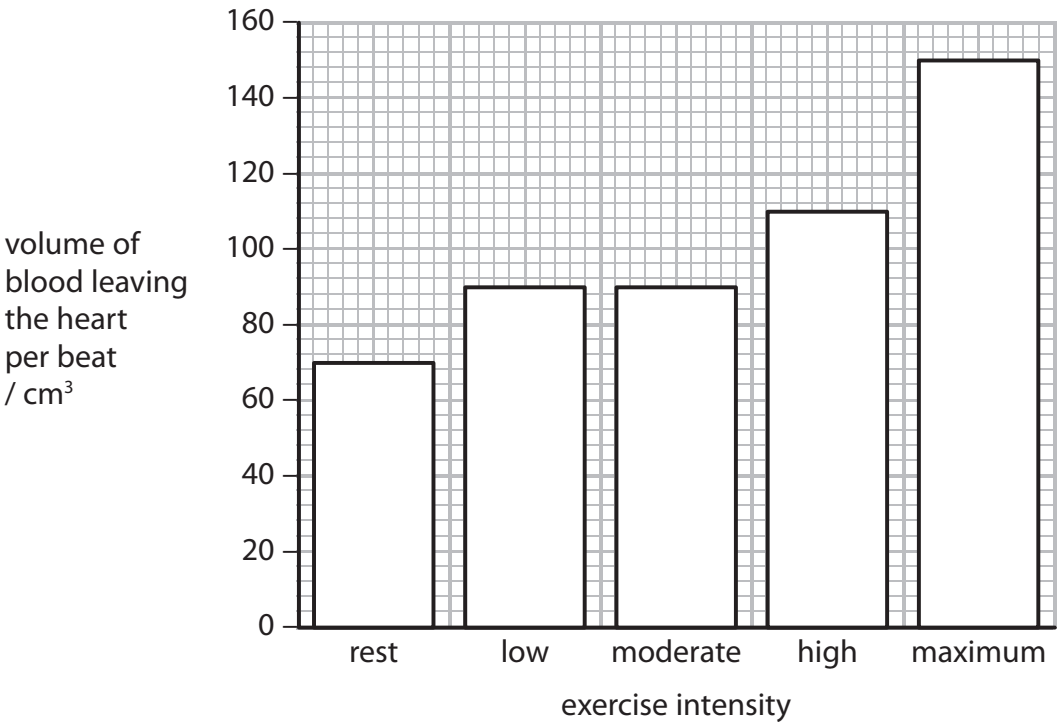
☒ **C** protein

☒ **D** sugar

(Total for Question 4 = 10 marks)

Exercise and blood flow

5 The graph shows the effect of exercise intensity on the volume of blood leaving the heart per beat.



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

The difference between the volume of blood leaving the heart at rest and the volume of blood leaving the heart at maximum exercise intensity is

(1)

☒ **A** 70 cm^3

☒ **B** 80 cm^3

☒ **C** 90 cm^3

☒ **D** 150 cm^3

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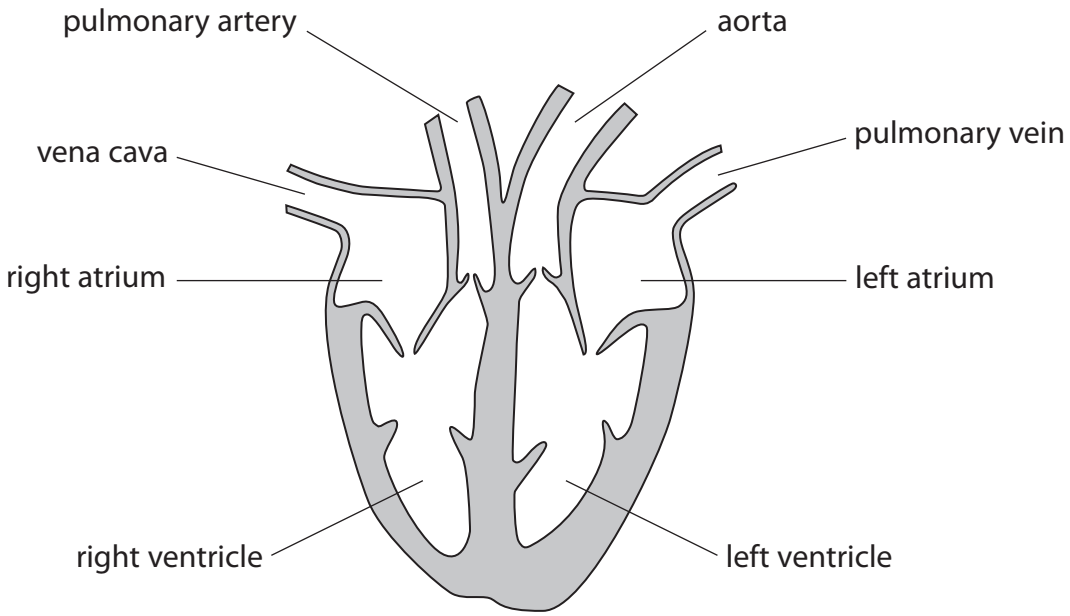
(ii) Using information in the graph, describe the effect of different levels of exercise intensity on the volume of blood leaving the heart.

(2)

(iii) Explain why it is important to have a change in blood flow to muscles during exercise.

(3)

*(b) The diagram shows a heart.



Explain how the structures of the heart are related to their function.

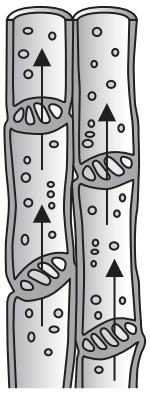
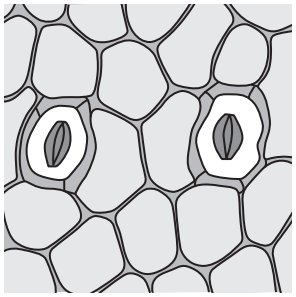
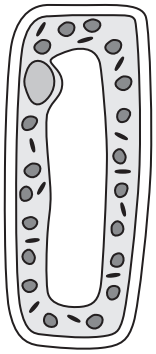
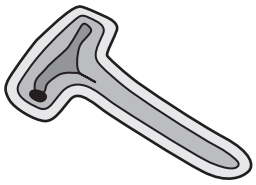
(6)

(Total for Question 5 = 12 marks)

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Transport in plants

6 (a) The diagrams show different structures found in a plant.

			
A	**B**	**C**	**D**

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

Stomata are shown in structure

(1)

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

(ii) Explain how structure **C** is adapted for photosynthesis.

(2)

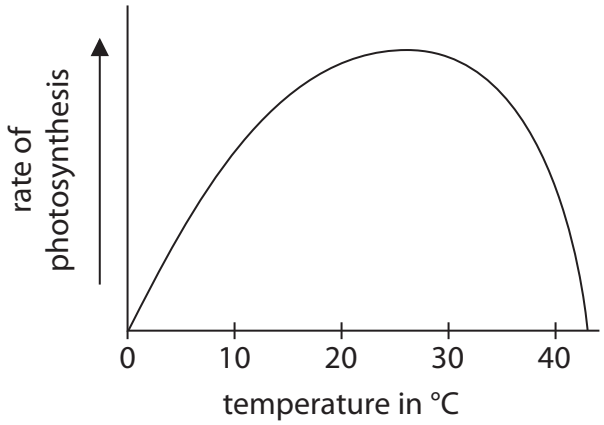
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(b) The graph shows the effect of temperature on the rate of photosynthesis.



(i) State the optimum temperature for photosynthesis.

(1)

.....

(ii) Temperature can be a limiting factor.

Describe how another limiting factor could affect the rate of photosynthesis.

(2)

.....

.....

.....

.....

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*(c) Describe how water enters plants from the soil and is transported to the leaves.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

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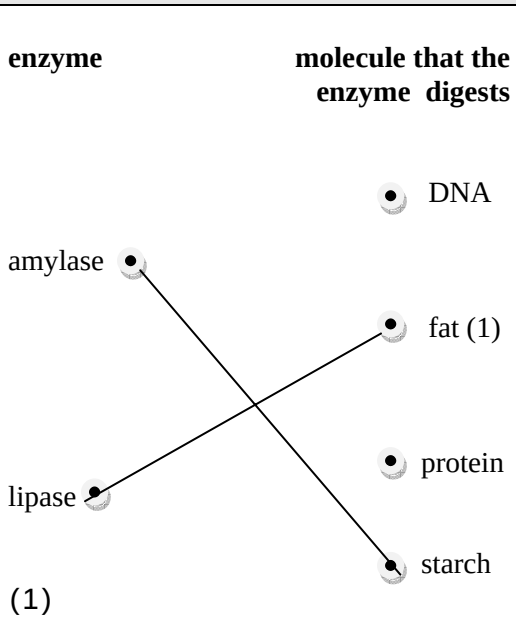
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Question Number	Answer	Acceptable answers	Mark
1(a)	 (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	**A** amino acids		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	**B** pepsin has an optimum pH of 3		**(1)**

Question Number	Answer	Acceptable answers	Mark
1 (b)(iii)	A description including two from the following points • pepsin has a lower activity • pepsin works at a lower pH • pepsin works within a narrower pH range • the optimum pH of pepsin is lower	ORA Accept: pepsin works in acidic conditions	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(iv)	A explanation linking the following points • it is less active/activity only 6 arbitrary units (1) • (starting to) denature (1) • active site is changing shape (1) • cannot bind to its substrate as well at this pH (1)	Accept: reference to pH9 being the optimum/pH11 is not the optimum	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	**B** - oligosaccharides		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	• 15000 - 8000 (1) • 7000 (1)	Accept: ecf - a sum that includes any value from 14200 to 15000 as alternative to 15000 minus 8000 and its correct answer e.g. 14200 – 8000 = 6200 (1 maximum) 2 marks for correct bald answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	A description that includes: increases number of useful bacteria	Ignore numbers	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	objective lens / eye piece lens	lens	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	A description including two of the following: • Image has more clarity/is more clear(1) • More detail can be seen(1) • Larger image can be seen(1)	Accept: more focussed Accept: named bacterial cell components Accept: idea of greater magnification	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(c)(iii)	Any one of the following: • cell wall • flagellum	Accept: cell membrane Ignore: tail	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	mitosis (1)	Do not accept meiosis or any word that sounds similar	**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	**B** - getting longer		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	An description linking the following points • idea that cells are becoming specialised (1) • to perform a specific function / eq (1) • eg phloem, xylem, root hair cell (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• total = 30.3 (1) • mean = 10.1 (1)	2 marks for correct bald answer Accept: incorrect values in sum ÷ 3 = correct answer e.g. (20.4 + 14.6 + 10.6) ÷ 3 = 15.2 (1 mark max)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A suggestion including two from the following points • fertilisers increase plant height/growth (1) • A has a greater effect than B/ A has a greater effect than C/ B has a greater effect than C (1) • A has the greatest effect/C has the least effect (1)	Accept: Fertiliser A/B/C increases height/growth (1) ORA Accept: reference to compared figures/correct manipulation of figures (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	Any two from the following points • shoot/stem diameter (1) • number of branches (1) • number of leaves/flowers (1) • length/surface area of leaves (1) • length of roots (1) • size of fruit (1) • number/yield of fruit (1)	Accept: size of leaves Accept: mass/dry mass/weight of plant/fruit (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A description that includes two of the following points • gametes produced (1) • haploid cells / half the number of chromosomes (1) • genetically different (1)	Accept: sex cells are produced Accept: 23 chromosomes	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	A description that includes two of the following points • idea that sperm and egg cell/gametes join (1) • genetic information combines (1) • zygote produced (1)	Accept sex cells join Accept: chromosomes/DNA combines Accept: diploid cell	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	Suggestions that include **one** advantage from • differentiate into any (body) cell • grow/repair tissues/ body organ / limb • for transplants and one disadvantage from • embryos are destroyed • can become cancerous • justified ethical issue e.g some people feel that embryo has a right to life	Accept: research cures/treatments for disease/named genetic disease/Parkinsons/cancer/diabetes	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	A description that includes three of the following points • two strands (1) • double helix (1) • reference to bases (1) • A with T / G with C (1) • hydrogen bonds (1)	 Accept: description e.g twisted ladder Accept: complimentary pairs	 **(3)**

Question Number	Answer	Acceptable answers	Mark
(4)(c)(ii)	**C** protein		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**B** 80 cm^3		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	A description that includes **two** of the following: • it increases from rest to low intensity (1) • low to moderate intensity stays the same (1) • increases from moderate (1) • reference to compared figures/correct manipulation of figures (1)	Accept: increases as exercise intensity increases (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	A explanation that includes **three** of the following • (more) oxygen needed (1) • (more) glucose needed (1) • for (aerobic) respiration (1) • which releases (more) energy (1) • so that muscles can work for longer/harder (1)	Accept: reduce muscle fatigue/cramp Accept: to reduce build up of lactic acid (1) remove carbon dioxide/waste from cells (1) maintain body temperature (1)	**(3)**

Question Number		Indicative Content	Mark
QWC	***5(b)**	An explanation including some of the following points in a logical sequence • two sides to prevent mixing of blood • left side deals with oxygenated blood • thicker wall of left ventricles • pump blood to body • right side deals with deoxygenated blood • pumps blood to lungs • muscular wall of ventricles which contract • atria receive blood • valves to prevent backflow • correct reference to (named) arteries/veins	**(6) exp**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation that links one structure to its function e.g. the right side pumps blood (to the lungs) OR the pulmonary vein takes blood into the heart. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation that links two different structures in the heart to their function e.g. right ventricle pumps blood to the lungs AND atria receive blood • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation that covers most of the indicative content and that includes at least three different structures linked to their function • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	**B**		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	A explanation that includes any two of the following points • contains chloroplasts (1) • containing chlorophyll (1) • which absorb light energy (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)(i)	• Any value between 24 ^{o}C to 28^{o}C	units (^{o}C) must be given	**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)(ii)	A description that includes two of the following: • named limiting factor e.g water, carbon dioxide, light (1) • described effect on rate of photosynthesis e.g (lower light intensity) lower rate of photosynthesis (1)	ORA	**(2)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A description including some of the following points in a logical sequence • (water moves into) root hair cells • by osmosis • from a high concentration (of water) • to a low concentration (of water) • down a concentration gradient • through a partially permeable membrane • through xylem vessels • by capillary action • (into leaves) and out through the stomata • reference to transpiration/transpiration stream	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of how water enters the plant **OR** how water moves through the plant e.g. waters goes into the roots from the soil **OR** water goes up the stem • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that includes a reference to root hair cells **OR** xylem vessels OR osmosis in the correct context. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description that includes a reference to root hair cells **AND** xylem vessels **AND** osmosis in the correct context. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Edexcel GCSE

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Monday 5 November 2012 – Morning
Time: 1 hour

Paper Reference
5BI2F/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 1 7 5 2 A 0 1 1 6

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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 ☒.

Mitosis

1 (a) Use words from the box to complete the sentences.

(3)

chromosomes		cytoplasm	diploid
haploid	nucleus	carbohydrate	gametes

When a human body cell divides by mitosis, two ..... body cells are produced.

Each of the cells produced contain identical sets of ..... in their ..... .

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

Mitosis occurs during

(1)

☒ **A** digestion

☒ **B** fertilisation

☒ **C** growth

☒ **D** respiration

(c) Embryonic stem cells divide by mitosis.

(i) Explain why embryonic stem cells are useful in medical research.

(2)

.....

.....

.....

.....

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(ii) Each stem cell divides once every 30 minutes.

Calculate how many minutes it would take one stem cell to form sixteen cells.

(2)

answer = ... minutes

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

Organisms that are genetically identical to each other are called

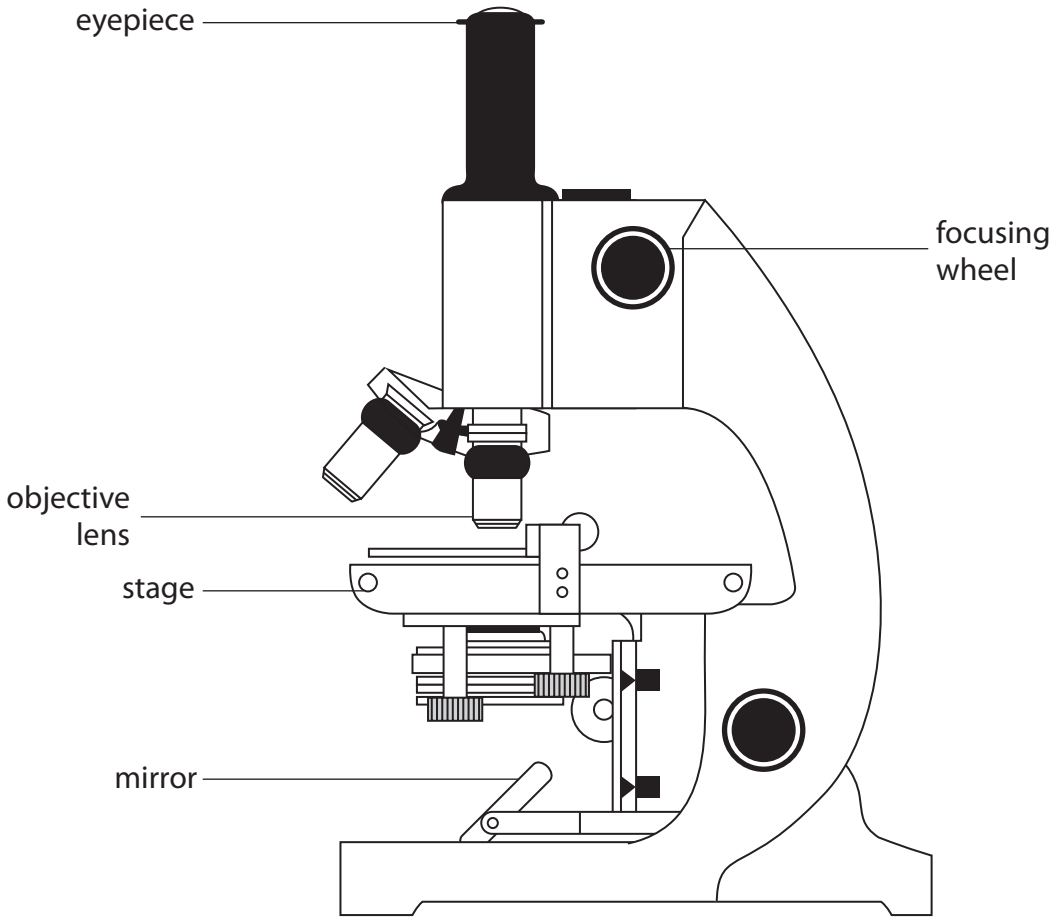
(1)

- ☒ **A** cells
- ☒ **B** clones
- ☒ **C** gametes
- ☒ **D** zygotes

(Total for Question 1 = 9 marks)

Magnifying cells

2 (a) The diagram shows a light microscope.



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

The focusing wheel is used to

(1)

☒ **A** decrease the magnification

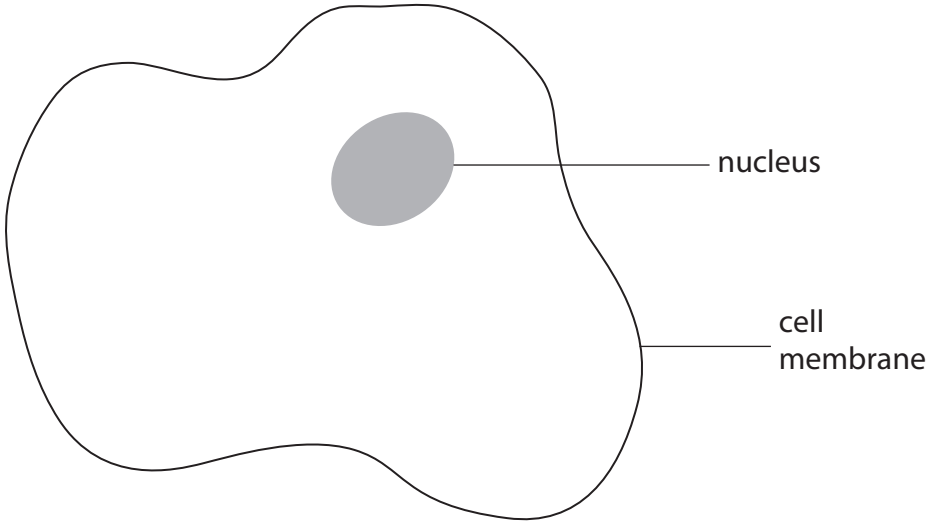
☒ **B** increase the amount of light

☒ **C** move the slide on the stage

☒ **D** produce a clear, detailed image

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(ii) The diagram shows an animal cell as seen using a light microscope.



not to scale

The length of this cell before it is magnified is 0.005 mm.

Calculate the length of the image after it has been magnified x400.

(2)

answer = ... mm

(b) An electron microscope can be used to see mitochondria inside cells.

State the function of mitochondria in a cell.

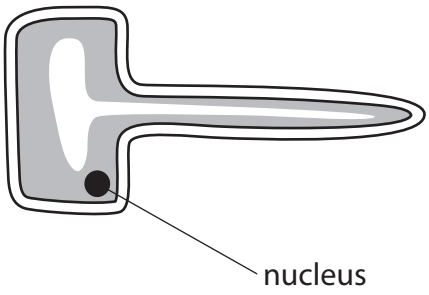
(1)

.....

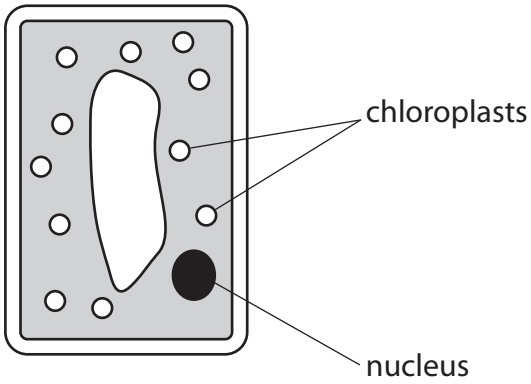
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(c) The diagrams show two cells taken from a plant.

a root hair cell



a leaf cell



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

Root hair cells take in water by

(1)

☒ **A** active transport

☒ **B** osmosis

☒ **C** respiration

☒ **D** transpiration

(ii) Describe the function of the chloroplasts in a leaf cell.

(2)

.....

.....

.....

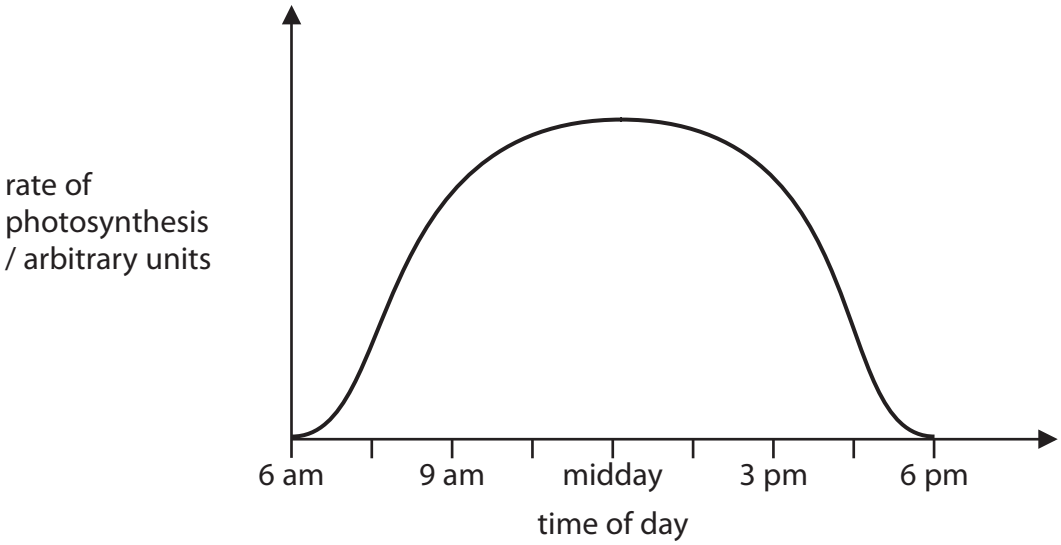
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(Total for Question 2 = 7 marks)

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Grass plants

3 (a) The graph shows the rate of photosynthesis in a field containing grass plants, during a 12 hour period.



(i) Describe the trend shown by the graph from 6 am to 6 pm.

(2)

.....

.....

.....

.....

.....

(ii) Suggest **two** factors that may affect the rate of photosynthesis during this 12 hour period.

(2)

1 .....

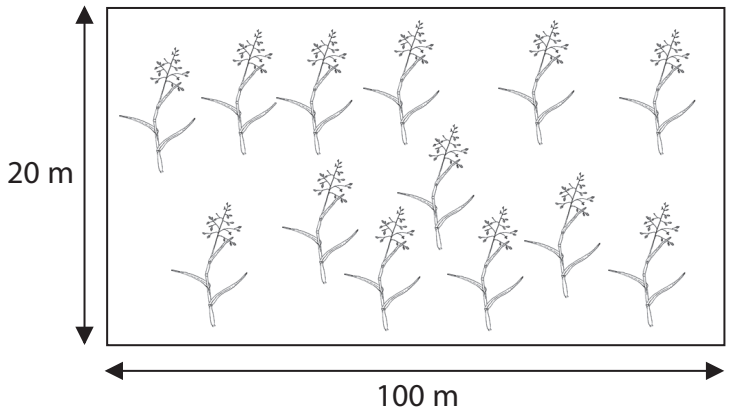
2 .....

(iii) Complete the word equation for photosynthesis.

(2)

..... + water ⟶ glucose + ...

(b) The diagram shows a field containing grass plants.



(i) Calculate the area of the field.

(2)

area of field = ... m^2

(ii) Describe a method that could be used to estimate the total number of grass plants in this field.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 3 = 11 marks)

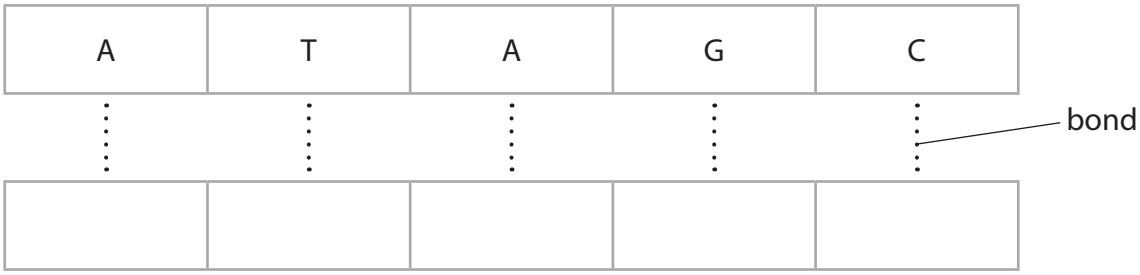
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DNA

4 (a) The diagram shows part of a DNA molecule.

(i) Complete the diagram by writing the letters of the missing bases in the empty boxes.

(2)

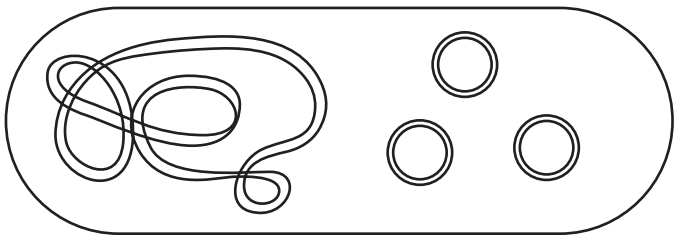


(ii) Name the type of bond that joins the base pairs together.

(1)

.....

(b) The diagram shows DNA in a bacterial cell.



(i) Name the **two** types of DNA found in a bacterial cell.

(2)

1 .....

2 .....

(ii) State the function of DNA in cells.

(1)

.....

.....

(c) Explain how a gene mutation can affect the structure of a protein.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question 4 = 9 marks)

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The circulatory system

5 (a) (i) State the type of blood vessel that carries blood to the heart.

(1)

(ii) Explain how blood is prevented from flowing backwards in the heart.

(2)

(b) Suggest why the heart can be referred to as a 'double-pump'.

(2)

*(c) Explain why heart rate and breathing rate increase during exercise.

(6)

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

The substance produced during anaerobic respiration is

(1)

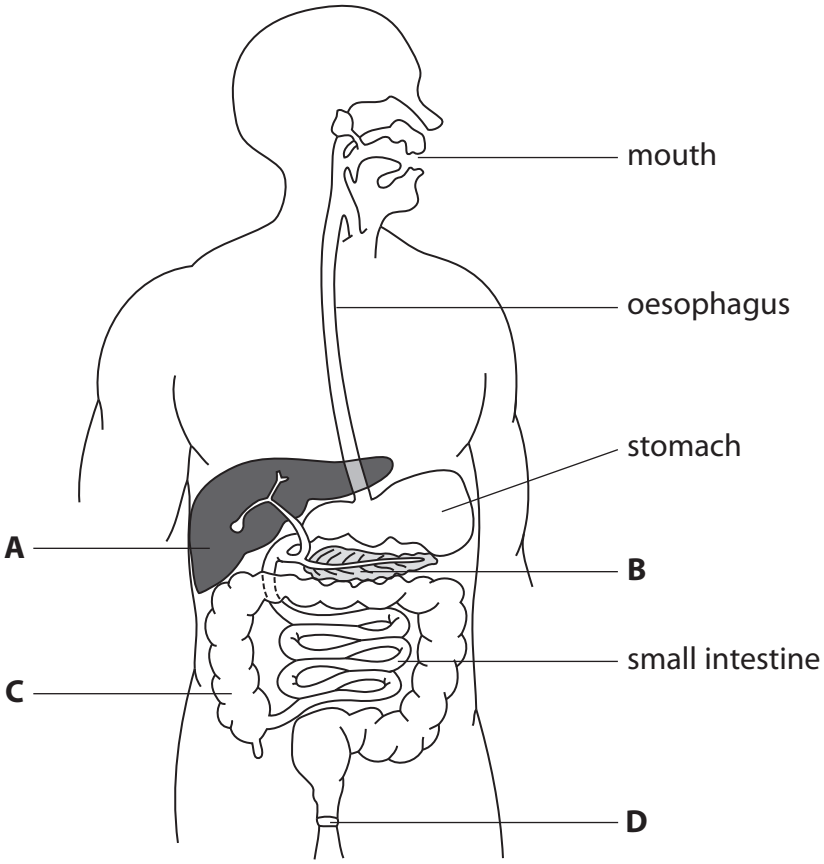
- ☒ **A** glucose
- ☒ **B** lactic acid
- ☒ **C** oxygen
- ☒ **D** water

(Total for Question 5 = 12 marks)

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Digestion

6 (a) The diagram shows part of the human digestive system.



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

The pancreas in the diagram is labelled

(1)

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

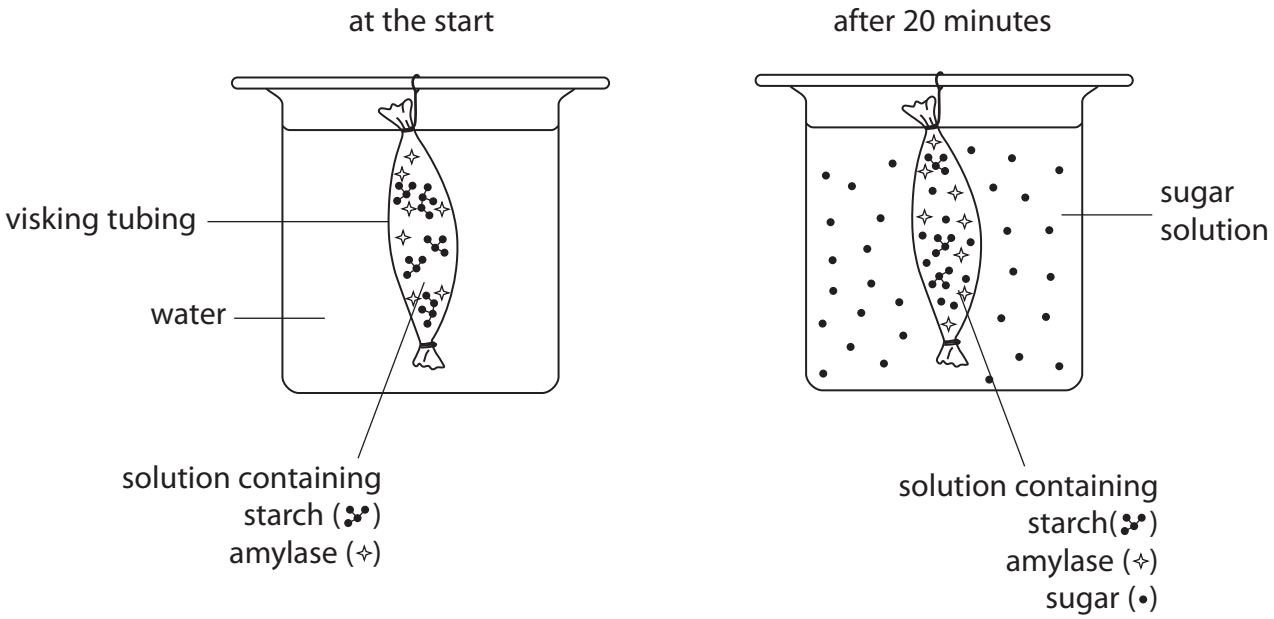
(ii) Describe the function of the small intestine.

(2)

(b) An experiment was set up to find out what happens to food molecules in the small intestine.

Visking tubing was used as a model for the small intestine.

The diagrams show the experiment at the start and the results after 20 minutes.



Explain the results of this experiment.

(3)

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*(c) Describe how the action of the mouth, oesophagus and stomach contribute to the digestion of food.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

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GCSE Biology
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GCSE Biology 5BI2F/01 Mark Scheme – November 2012

Question Number	Answer	Acceptable answers	Mark
1(a)	• diploid (1) • chromosomes (1) • nucleus (1) correct order		**(3)**

Question Number	Answer	Acceptable answers	Mark
1(b)	C – growth		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	An explanation including two of the following points • undifferentiated / unspecialised (cells) (1) • can change into any type of (body) cell (1) • can be used (in research) to grow new tissues/ repair damaged tissue / organs (for transplant)/for treatment/cure for genetic disease (1)	Equivalent wording Named example of body cell Named genetic disease/valid disease e.g. Parkinson's/diabetes	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	• 4 x 30 (1) • 120 (minutes) (1)	Allow one mark for a given calculation that includes any number x30 = their correct answer e.g. 16 x 30 = 480 Bald answer 120 (minutes) (2) Allow 2 hours **only** if units given	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(d)	B - clones		**(1)**

Question Number	Answer	Acceptable answers	Mark
2ai	D – produce a clear detailed image		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	• 0.005 x 400 (1) • 2 (mm) (1)	Bald answer 2 (mm) (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	(releases) energy	Reject: stores energy Accept: (aerobic) respiration Reject: anaerobic respiration	**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	B - osmosis		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	A description including two of the following points • chloroplasts contain chlorophyll (1) • which absorb (sun)light (1) • for photosynthesis (1) • to produce glucose/sugar (1)	takes in/traps (sun) light Accept: starch Ignore: food	**(2)**

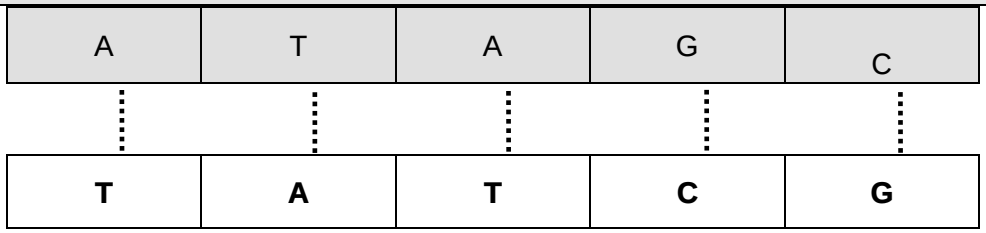
Question Number	Answer	Acceptable answers	Mark
3(a)(i)	A description including the following points • increases to midday/in the morning (1) • decreases from midday/ in the afternoon/to 6pm (1)	increases and then decreases (1) reference to highest rate around midday (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	two of the following points • light (levels) (1) • temperature (1) • water (levels) (1) • carbon dioxide (concentration)(1)	mineral ion concentration cloudy too hot/cold Ignore: rain/weather Reject: (change of) seasons as 12 hour period in question	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	1 carbon dioxide/CO_2; 2 oxygen/O_2;	Ignore: sunlight/light energy Reject: CO^2 or O^2 or any other variation in formulae from that given	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	• 100 x 20 (1) • 2000 m^2 (1)	Bald answer 2000 (m^2) (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A description including any three of the following points • use a quadrat/select smaller area of the field (1) • place quadrat randomly/select areas randomly (1) • count the number of plants in each quadrat/location (1) • reference to use of several locations (1) • calculate average number of plants from quadrats/ samples (1) • multiply sample size up to the total area of the field (1)	Accept: multiplied by 2000 m^2 (from 3bi)	**(3)**

Question Number	Answer		Mark
4(a)(i)	 TAT (1) CG (1) Must be in correct order		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	(weak) hydrogen / H (bonds)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	In any order: • chromosomal (DNA) (1) • plasmid(s) (DNA) (1)	circular (DNA) Ignore: circle/ring/chromosome(s) named plasmid	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	give instructions to make proteins	Accept controls activities /characteristics of the cell	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	An explanation including any three of the following points Protein may have: • different amino acids (1) • different order of amino acids (1) • a different shape/structure (1) • a different function/not function correctly(1)	References to change in active site (of enzymes) Ignore: references to mutations (as in the question) Ignore: denaturing	**3)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	vein / vena cava	pulmonary vein Reject: pulmonary artery	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	An explanation including any two of the following points • valves (1) • between the atria and ventricles/in arteries leading away from heart (1) • (valves) only open one way • (valves) close (when blood flows backwards) (1)	Accept: named valves Ignore: prevents from flowing backwards (as in the question)	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)	A suggestion including any two of the following points • the heart has two sides/left and right side (1) • destination of blood from one side e.g. left side pumps to body (1) • type of blood from one side e.g. right side pumps deoxygenated blood(1)	Accept: one side pumps blood to the body/lungs Accept: one side pumps oxygenated/deoxygenated blood	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	An explanation including some of the following points in a logical sequence • increased muscle contraction • blood is pumped faster around the body/to muscles • more oxygen/glucose delivered to cells/muscles • for aerobic respiration • which releases energy • rate of gas exchange increases • more carbon dioxide in the blood • more oxygen inhaled/into body • more carbon dioxide exhaled/from body • reduce build up of lactic acid	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the reasons why heart or breathing rate increase with exercise e.g. blood flows faster or more oxygen is needed • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that links an increase in heart rate with increased blood flow and an increase in breathing rate with increased oxygen uptake • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description linking an increase in heart rate AND breathing rate to an increase in blood flow and oxygen uptake. A link to aerobic respiration and/or energy demand is made. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
5(d)	B – lactic acid		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	(Label) B		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	A description including any two from the following points • movement of food/ peristalsis(1) • release of enzymes (1) • breakdown/digestion of food (1) • absorption/diffusion of small/soluble molecules (1) • into the blood (1)	 named digestive enzymes named nutrients absorption/diffusion of food/nutrients	 **(2)**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation including three of the following points • amylase is an enzyme (1) • (amylase) breaks down/digests starch (1) • to maltose/sugar (1) • maltose/sugar is a small/ soluble molecule (1) • (and can) diffuse through the wall of the visking tubing (1)	 glucose for maltose/ sugar allow ‘pass through’ for diffusion	 **(3)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	A description including some of the following points in a logical sequence **mouth** • teeth chew food/break food down into smaller pieces • increasing its surface area • (and) mixes food with saliva so it can be swallowed more easily • enzyme action in mouth / references to named enzymes? • tongue helps to roll food into a ball/bolus (so it can be swallowed more easily) **oesophagus** • swallowing • muscular contractions/peristalsis in oesophagus • pushes/moves food towards the stomach **stomach** • contraction of muscle tissue in the stomach mixes food with acid and digestive juices • enzyme action in stomach / references to named enzymes? • hydrochloric acid contributes to the breakdown of food	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description which is likely to be restricted to one or two processes in one area only e.g. teeth chew food or saliva helps food to be swallowed. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description that describes one process in at least two areas e.g. food is chewed in the mouth and pushed down the oesophagus to the stomach. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description that describes most of the processes in at least two areas and includes the action of enzymes in the mouth or stomach • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Biology/Additional Science

Unit B2: The Components of Life

Foundation Tier

Tuesday 15 May 2012 – Morning
Time: 1 hour

Paper Reference
5BI2F/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 0 2 4 3 A 0 1 1 6

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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 ☒.

Water and mineral uptake by plants

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

(i) Plants absorb water from the soil.

The plant cells that absorb water from the soil are called

(1)

- ☒ **A** root hair cells
- ☒ **B** palisade cells
- ☒ **C** stomata cells
- ☒ **D** xylem cells

(ii) These cells absorb water by a process known as

(1)

- ☒ **A** active transport
- ☒ **B** osmosis
- ☒ **C** photosynthesis
- ☒ **D** transpiration

(b) Plants also absorb mineral ions from the soil.

Use words from the box to complete the sentences.

(3)

active transport	leaves	xylem
photosynthesis	phloem	roots

Plants absorb mineral ions from the soil through their ..... by a process called ..... . The mineral ions are then transported up the stem through ..... vessels.

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(c) Magnesium and nitrates are two mineral ions that are absorbed by plants.

The table shows the amount of magnesium ions and nitrate ions in the tips of sunflower and wheat plants.

type of plant	mineral ion content / arbitrary units	
	magnesium ions	nitrate ions
sunflower	0.730	0.147
wheat	0.225	0.226

(i) Compare the mineral ion content in the tips of these two plants.

(2)

.....

.....

.....

.....

(ii) Magnesium is used by plant cells to make chlorophyll.

Describe the function of chlorophyll in plant cells.

(2)

.....

.....

.....

.....

(Total for Question 1 = 9 marks)

Race horses

2 Casper is a horse training for the Grand National.
Casper's diet contains an increased amount of carbohydrate.
Casper runs several miles each day.

(a) (i) Use words from the box to complete the sentences.

(2)

fat	oxygen	protein	carbon dioxide	nitrogen

During training, Casper's heart rate increases to supply his muscles with

more ..... .

Casper's breathing rate increases to remove excess .....

from his blood.

(ii) Explain why Casper needs a diet containing an increased amount of carbohydrate.

(3)

.....

.....

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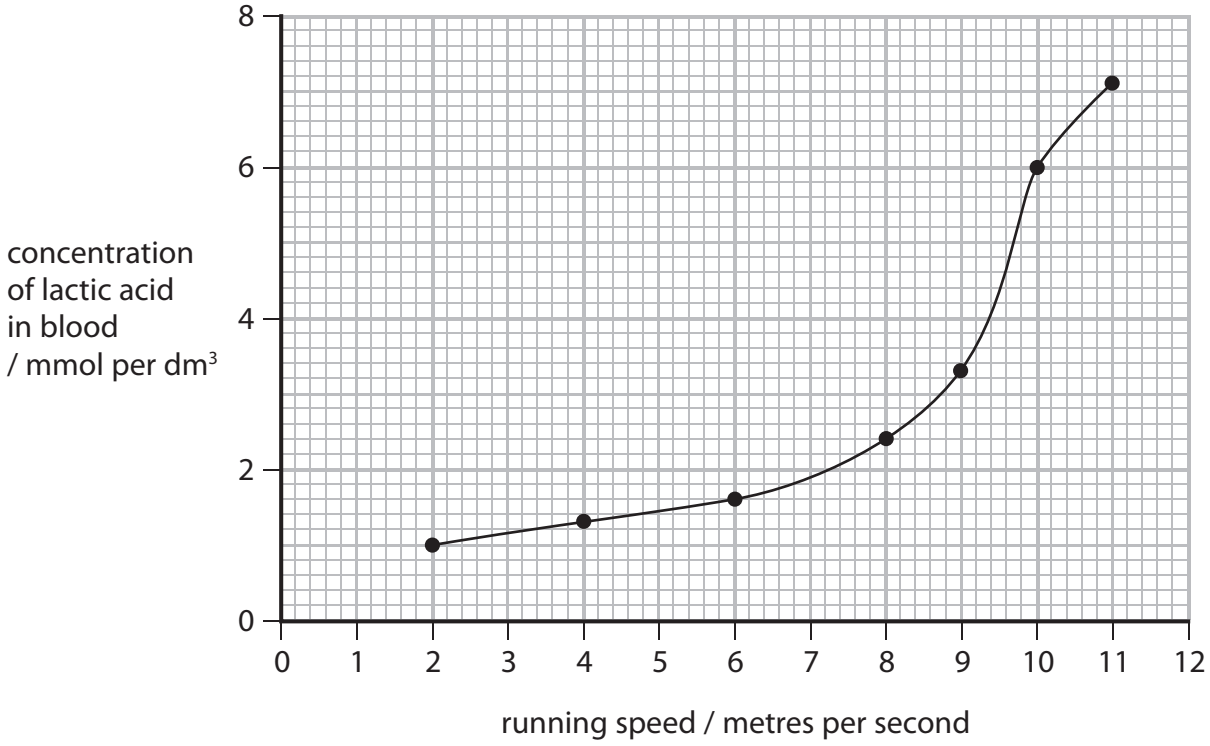
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(b) The graph shows the concentration of lactic acid in Casper's blood as his running speed increases.



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

The difference in the concentration of lactic acid in Casper's blood between 2 and 10 metres per second is

(1)

☒ **A** 1 mmol per dm^3

☒ **B** 2 mmol per dm^3

☒ **C** 5 mmol per dm^3

☒ **D** 8 mmol per dm^3

(ii) Explain why the concentration of lactic acid in Casper's blood changes as his speed increases.

(2)

.....

.....

.....

.....

(Total for Question 2 = 8 marks)

Using glucose

3 Leaf cells produce glucose.
Plants can use glucose to make oils, cellulose and DNA.

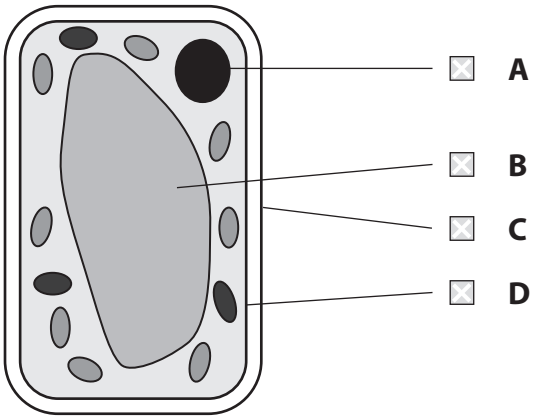
(a) (i) Oils are needed to make cell membranes.

The diagram shows a plant cell.

Which label on the diagram shows the cell membrane?

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

(1)



(ii) Cellulose is found in plant cell walls.

Describe the function of cell walls in plant cells.

(2)

(iii) The nucleus contains chromosomes.
Chromosomes are made up of DNA.

Describe the structure of DNA.

(2)

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(b) The table shows the concentration of glucose found in plant cells at different times of the day.

time of day	6am	9am	midday	3pm	6pm	midnight
concentration of glucose / mg per g	2	6	18	12	2	2

(i) Calculate the change in the concentration of glucose from 6am to midday.

(1)

answer = ... mg per g

(ii) Describe the pattern shown in the concentration of glucose from 6am to midnight.

(2)

.....

.....

.....

.....

(iii) Suggest **two** reasons why the concentration of glucose in the plant cells changes between 3pm and 6pm.

(2)

1 .....

.....

2 .....

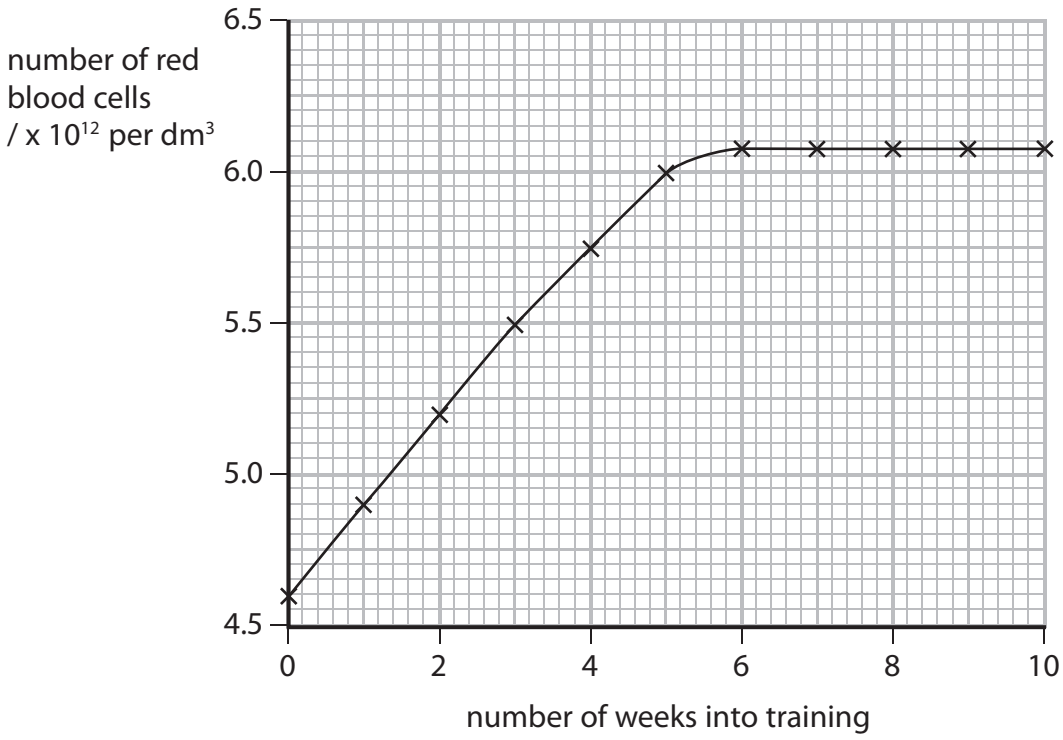
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(Total for Question 3 = 10 marks)

Altitude training

4 Some athletes train at high altitudes (over 2000 m above sea level).
There is less oxygen in the air at high altitudes.

(a) The graph shows the number of red blood cells in the blood of an athlete training at high altitudes, over a ten-week period.



(i) Describe the change in the number of red blood cells during this ten-week training period.

(2)

.....

.....

.....

.....

(ii) Suggest the minimum training period this athlete needs to produce the highest number of red blood cells.

(1)

.....

(iii) State the function of red blood cells.

(1)

.....

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(b) When athletes train, the size of their hearts can increase.

Suggest how an increase in the size of the heart is an advantage to an athlete.

(2)

.....

.....

.....

.....

(c) (i) Draw **two** straight lines from the function to the blood vessels that carry out that function.

(2)

function	**blood vessel**
transport blood away from the heart	pulmonary artery
	pulmonary vein
	aorta
	vena cava
	capillary

(ii) Name the structures in the heart that prevent the backflow of blood.

(1)

.....

(Total for Question 4 = 9 marks)

Enzymes

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

(i) Enzymes are

(1)

☒ **A** cells

☒ **B** hormones

☒ **C** proteins

☒ **D** sugars

(ii) An enzyme is a biological catalyst that

(1)

☒ **A** slows down all chemical reactions

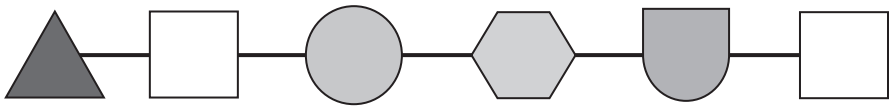
☒ **B** speeds up a chemical reaction

☒ **C** prevents all chemical reactions taking place

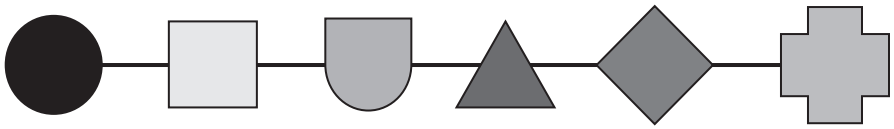
☒ **D** has no effect on a chemical reaction

(b) The diagrams show two sequences of six amino acids.

Sequence 1 is found in an enzyme called catalase.



Sequence 2 is found in an enzyme called amylase.



(i) Suggest how the structures of the enzymes, catalase and amylase, are different from each other.

(2)

.....

.....

.....

.....

(ii) Suggest why the action of these two enzymes will be different.

(2)

.....

.....

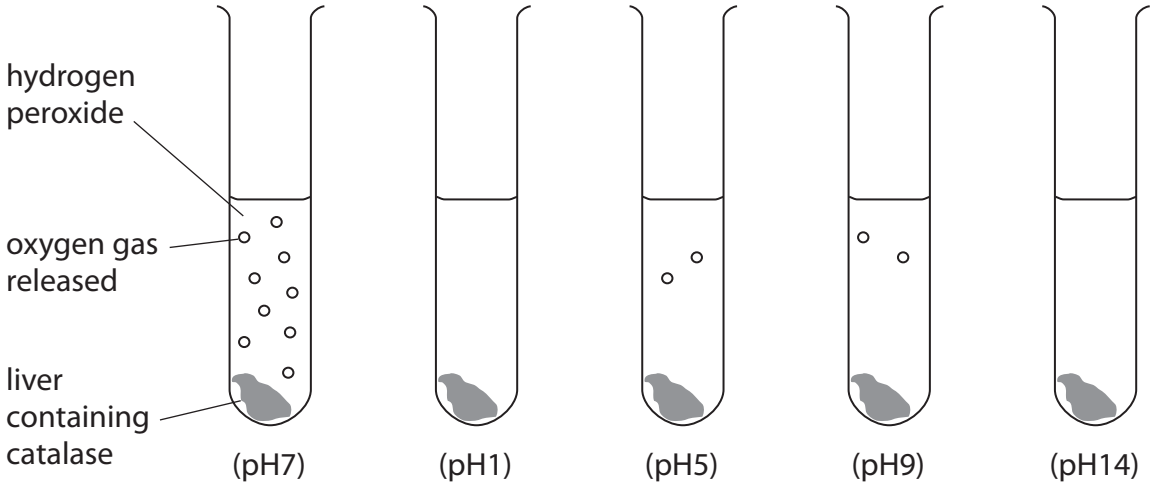
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*(c) A student carried out an investigation to study the effect of pH on the activity of catalase.

In the presence of catalase, hydrogen peroxide breaks down to release oxygen gas.

The student set up five test tubes, as shown in the diagram, and observed the amount of oxygen gas released.



Explain the effect of pH on the enzyme catalase in this investigation.

(6)

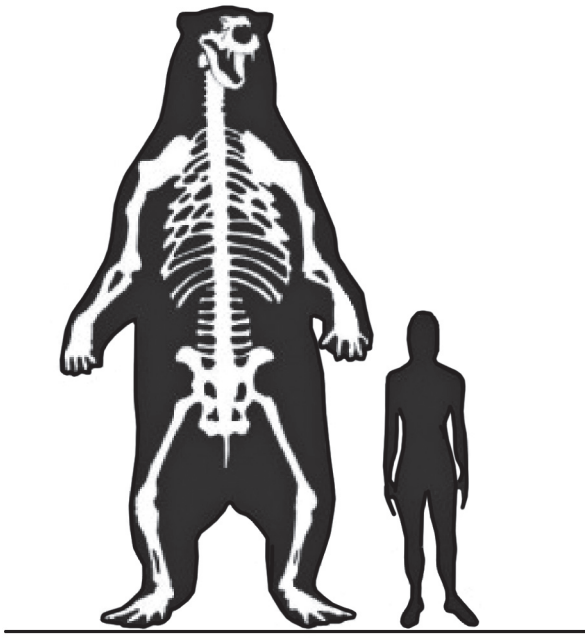
(Total for Question 5 = 12 marks)

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Bears

6 A small number of fossil bones from a very large bear was found in South America in 1935.
The bones were estimated to be about one million years old.
Scientists used these bones to predict the shape and size of the bear.

The diagram shows the bear and a person who is 165 cm tall.



(a) (i) Estimate the height of the bear.

(2)

answer = ... cm

(ii) Which process occurs in animal cells that results in growth?

(1)

.....

(b) Explain why scientists can only make predictions about the size and shape of animals when working from fossil evidence.

(3)

*(c) Some species of bears eat leaves.

Describe how the structure of a leaf is adapted for photosynthesis.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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Mark Scheme (Results)

Summer 2012

GCSE Biology
5BI2F/01

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GCSE Biology 5BI2F/01 Mark Scheme – Summer 2012

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	**A** root hair cells		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	**B** osmosis		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)	• roots (1) • active transport (1) • xylem (1)		**(3)**

Question Number	Answer	Acceptable answers	Mark
1(c)(i)	A comparison including **two** of the following points • sunflower contains more magnesium than nitrate (1) • sunflower contains more magnesium than wheat (1) • wheat contains more nitrate than sunflower (1) • magnesium and nitrate in wheat are similar (1)	**ORA** **ORA** **ORA** the total number of ions in sunflower is greater than the total number in wheat (1) credit correct manipulation of data (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(c)(ii)	A description including two of the following points • to absorb {sunlight / energy} (1) • to make glucose (1) • for photosynthesis (1)	absorb light to make sugar/starch ignore food	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a) (i)	• oxygen (1) • carbon dioxide (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	An explanation linking **three** of the following points • needs more energy for training/race • carbohydrates contain/release energy • (carbohydrates) broken down to glucose (1) • by enzymes/amylase (1) • (during) respiration (1)	sugar for glucose	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	**C** 5 mmol per dm^3		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	An explanation linking **two** of the following points • more energy needed/energy needed quickly (1) • not enough oxygen (1) • to muscles (1) • anaerobic respiration (produces lactic acid) (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	**D** cell membrane		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	A description including **two** of the following points • gives cell its shape (1) • provides strength/support to cell/plant (1) • provides a barrier (against microorganisms) (1)	keeps cell together/keeps contents inside Ignore protection if not qualified free passage of water and minerals/ions (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A description including **two** of the following points • double helix (1) • containing (pairs) of bases (1) • linked by hydrogen bonds (1)	description of shape e.g. twisted ladder/two strands Reference to A / T / G / C Reference to sugar/phosphate 'backbone' (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	16		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A description including **two** of the following points • increases up to midday (1) • decreases from midday to 6pm / midnight / 2 mg per g (1) • remains constant from 6pm to midnight (1)	increases then decreases (1) Correct manipulation of data e.g. trebles from 9am to midday (1)	**(2)**

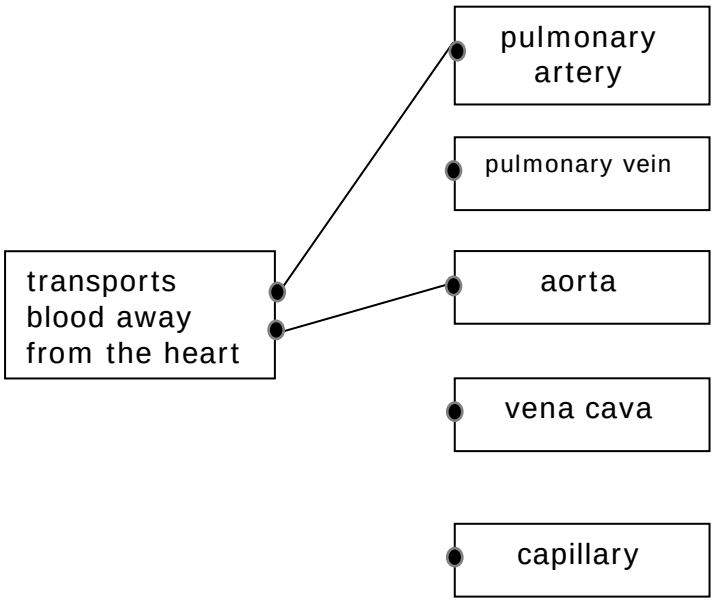
Question Number	Answer	Acceptable answers	Mark
3(b)(iii)	A suggestion including **two** of the following points • less photosynthesis(1) • less sunlight(1) • temperature decreases (1) • lack of water(1) • reference to named use of glucose e.g. respiration (1)	no light (at night) reference to enzyme activity	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	A description including **two** of the following points • increase in number up to {5-6} weeks/6.075 (x 10^{12} per dm^3) (1) • number stays constant from 6 weeks (1)	increases and levels off (1) credit manipulated figures (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	6 weeks **Units must be stated**		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(iii)	carry oxygen		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)	An explanation linking the following points • more blood pumped out (in one heart beat) (1) • (so) more {oxygen / glucose} (reaches the working muscles) (1)	more blood pumped around body/to muscles/blood travels faster (1) carbon dioxide / heat removed faster (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	**function** **blood vessel**  **Accept lines crossing over** **If only one line drawn and correct then 1 mark** **No marks if more than 2 lines are drawn.**		**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	valve	named heart valve(s)	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	**C** proteins		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	**B** speeds up a chemical reaction		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	Any **two** from the following points • contain different amino acids (1) • different sequence/order (of amino acids) (1)	State a difference in an amino acid e.g. black circle in amylase	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	Any **two** from the following points • different shape (enzyme/protein) • work with different substrates • ref to active sites/lock and key (1)	named substrates enzymes are specific	**(2)**

Question Number		Indicative Content	Mark
QWC	***5(c)**	An explanation including some of the following points • more oxygen given off at pH 7 • pH 7 is the optimum pH for this enzyme • reaction is faster/enzyme more active in neutral solution • very little oxygen given off at pH 5 and pH 9 • enzyme / catalase less active • no oxygen given off at pH 1 and pH 14 • no enzyme activity • enzyme denatured • shape of active site is changed • due to strong acid / low pH/strong alkali / high pH • no longer binds to hydrogen peroxide / substrate	**(6)**
Level	**0**	No rewardable content	
1	**1 -2**	• a limited description is given on the results of the investigation that covers one aspect of the results e.g. identifies best pH or recognises when a reaction has or has not taken place. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 -4**	• a simple explanation is given on at least one aspects of the results of the investigation **and** links this to enzyme activity e.g. enzymes work better at pH7 as more bubbles are released or inactive at pH1 as no bubbles are released. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 -6**	• a detailed explanation of how pH affects enzyme activity (linking this to number of bubbles/oxygen production) including reference to denaturation and/or shape change of enzyme/active site • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	• (165) x 2 (1) • 330 (cm) (1)	a range from 1.8 to 2.2 Accept a height value between 297 – 363 (cm) with no working shown (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
6(a)(ii)	• mitosis/cell division/cell differentiation		**(1)**

Question Number	Answer	Acceptable answers	Mark
6(b)	An explanation linking any **three** of the following points • many fossils found are only part of an animal or plant (1) • soft tissue has decayed(1) • fossils are often broken (into pieces)(1) • many fossils are yet to be found / fossil record incomplete (1) • fossils do not always form (1)		**(3)**

Question Number		Indicative Content	Mark
QWC	***6(c)**	An description including some of the following points • leaves have a large surface area • contain (many) chloroplasts/chlorophyll • for maximum absorption of light • waxy cuticle to reduce water loss • stomata/pores • gas exchange/to take in carbon dioxide and release oxygen • guard cells that control size of stoma • xylem vessels throughout the leaf deliver water and mineral ions	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the structure of a leaf that gives either one adaptation or one function not linked e.g. large surface area or takes in carbon dioxide • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of how leaf is adapted for photosynthesis that gives one structure linked to its function in photosynthesis/or two or more adaptations/structures not linked • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of how leaf is adapted for photosynthesis with two or more structures related to functions of photosynthesis e.g. the role of stomata in gas exchange and the presence of xylem/vessels that deliver water • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

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