OCR
Oxford Cambridge and RSA

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GCSE (9–1) Biology B (Twenty First Century Science)

F

J257/02 Depth in biology (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2.1

Time allowed: 1 hour 45 minutes

You may use:
- a scientific or graphical calculator

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **28** pages.

Answer **all** the questions.

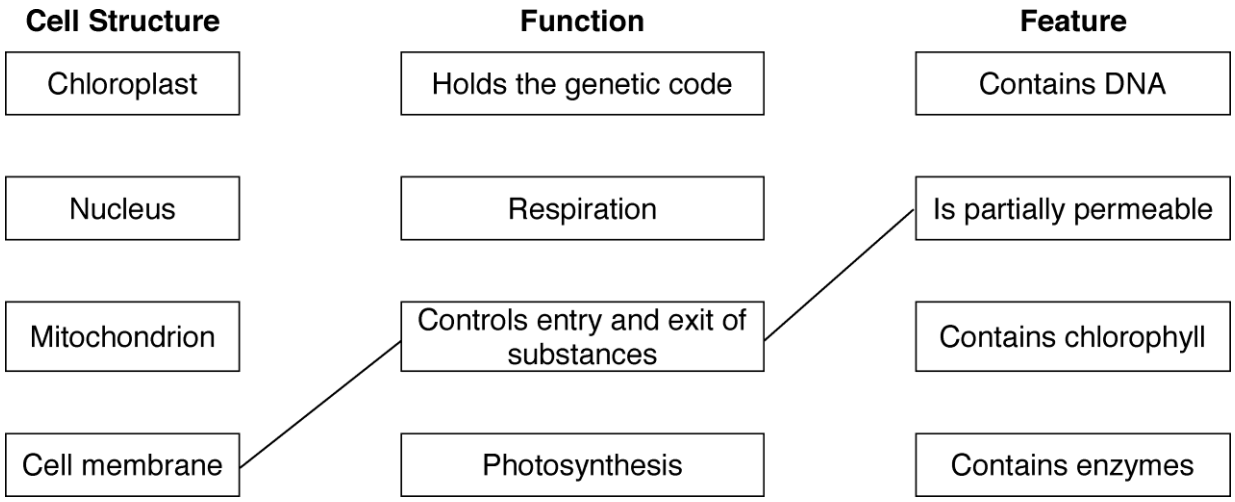
1 Cells are the basic building blocks of life. They need to do many things to stay alive.

(a) Structures within cells perform a variety of functions and have features that allow them to do these jobs.

The diagram below shows different cell structures, functions and features.

Draw **lines** to link the **cell structure** to its **function** and the **feature** that allows the structure to do its job.

Two lines have been drawn for you.



[3]

(b) Amaya and Jane are identical twins.

Their parents can easily tell the difference between them.

Explain why Amaya and Jane are described as genetically identical and suggest why their parents can tell the difference between them.

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..... **[4]**

2 It is important to keep fit and healthy.

(a) Read these descriptions about three different people.

- Jamal runs twice a week to keep fit. He has normal blood pressure and is not overweight.
- Mia has the flu. She feels unwell and goes to bed with a high temperature.
- Ben has inherited a condition called Huntington's disease from his father.

(i) Using the three people described above as examples, explain the difference between health and disease.

.....

.....

.....

..... **[2]**

(ii) Explain the difference between a communicable disease and non-communicable disease.

Use the three people above as examples to help you.

.....

.....

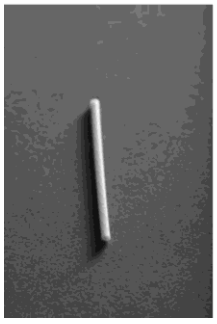
..... **[2]**

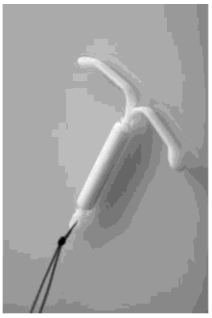
(iii) Sexually transmitted infections are a type of communicable disease.

Contraception prevents pregnancy and the pictures below shows four forms of contraception.

Which one also prevents the spread of sexually transmitted infections?

Explain why.





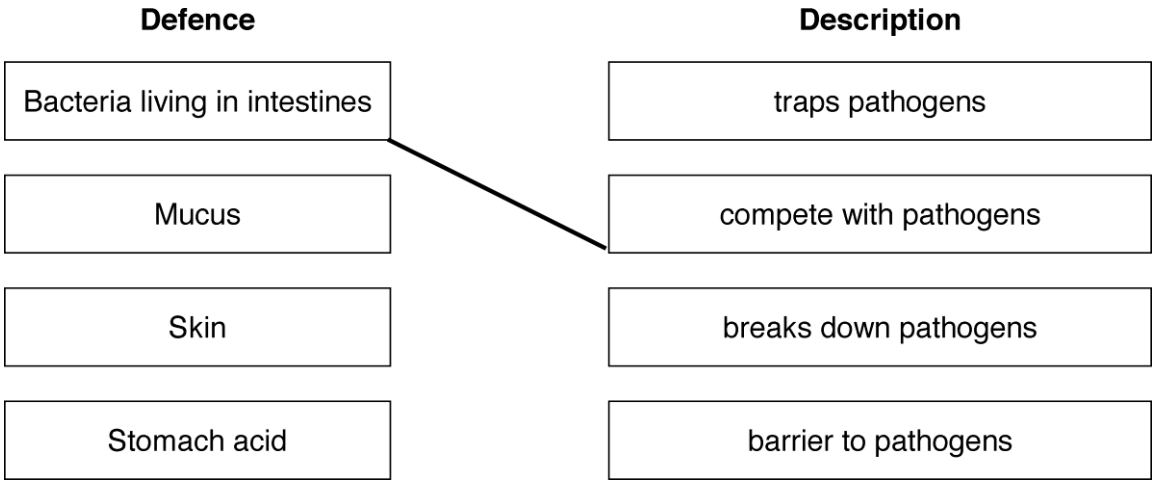
.....

..... **[2]**

(b) Humans have defences that make it difficult for pathogens to enter.

Draw **lines** to link each **defence** to its correct **description**.

One line has been drawn for you.



[2]

(c) Plants also need to protect themselves from disease.

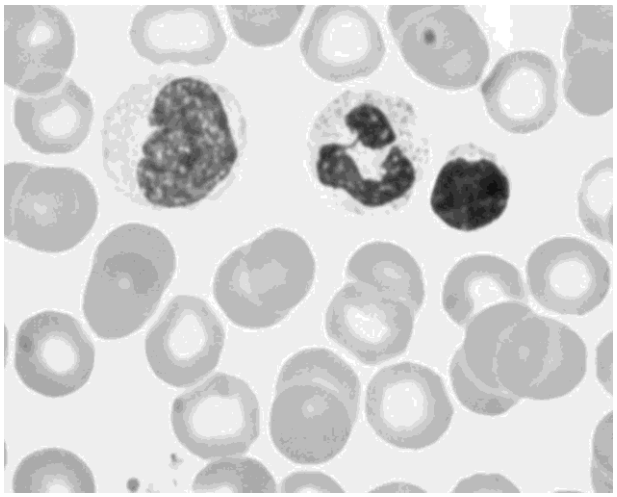
Give two **physical** defences used by plants against disease.

1 .....

2 ..... **[2]**

3 **(a)** Blood is made up of cells, plasma and platelets.

The picture below shows blood cells as seen down a microscope.



Draw a labelled scientific drawing of a white blood cell in the space below.

Label the nucleus and the cell membrane.

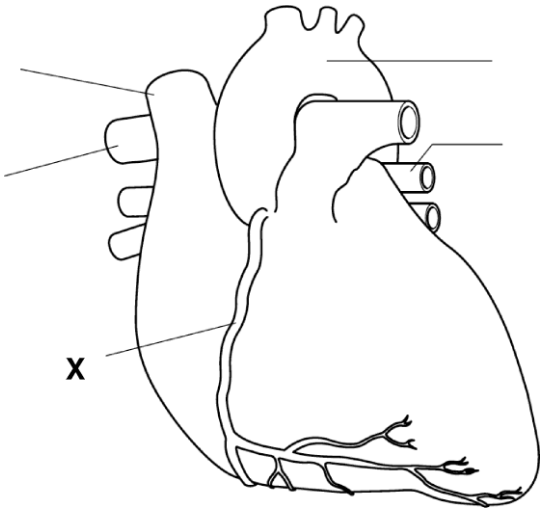
[4]

(b) There are more red blood cells than white blood cells in the blood sample above.

Estimate the ratio of red blood cells to white blood cells.

Ratio = ...**[1]**

(c) The diagram below shows a mammalian heart.



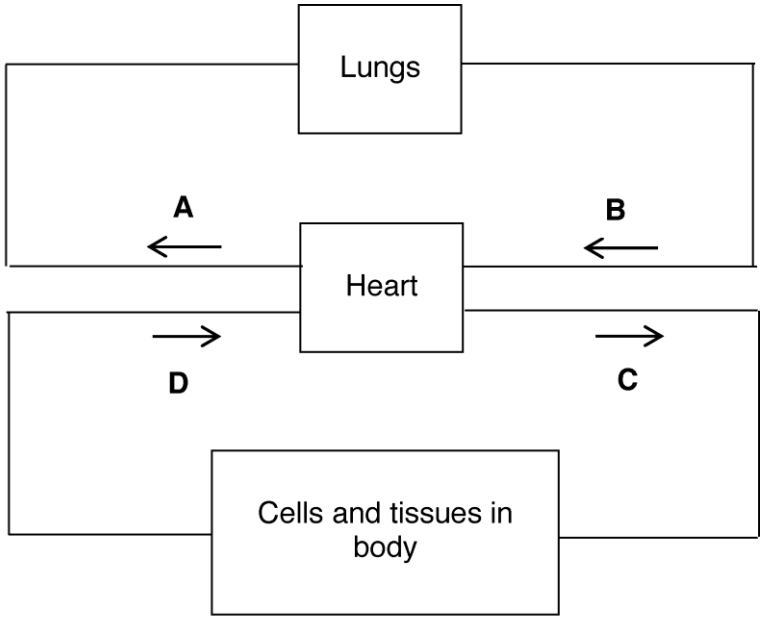
(i) Label **one** vessel that carries deoxygenated blood on the heart diagram. **[1]**

(ii) A heart attack is caused by a blockage in the blood vessel labelled **X**.

Name blood vessel **X**.

..... **[1]**

(d) The diagram shows some of the blood vessels, **A**, **B**, **C** and **D**, going into and out of the heart and to other parts of the body.



⟶ direction of blood flow

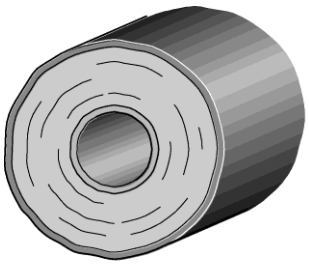
(i) Write the letter of a blood vessel that is an artery .....**[1]**

(ii) Write the letter of a blood vessel that is a vein. ..... **[1]**

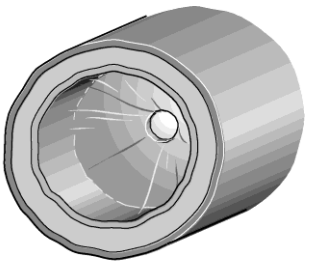
(e)* The table below shows information about the elasticity of arteries and veins when masses are attached to rings of the tissue.

The diagram below the table shows an artery, a vein and a capillary.

Mass (g)	Length of artery (mm)		Length of vein (mm)	
	With mass attached	After mass removed	With mass attached	After mass removed
0	20	20	21	21
10	45	25	36	36
20	53	27	38	37
30	58	28	40	39
40	63	33	41	39
50	65	33	41	41



Artery



Vein

Capillary

Explain how arteries, veins and capillaries are adapted to their functions.

Use the diagrams, draw conclusions from the data and use your own knowledge in your explanation.

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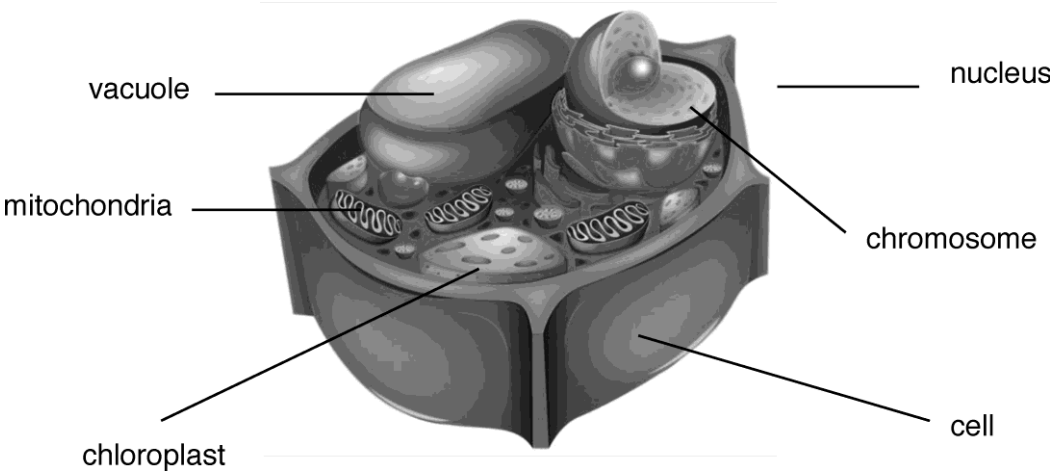
..... **[6]**

4 The use of microscopes has greatly increased our understanding of the structure and function of cells.

(a) The diagram shows a typical plant cell and some of the structures found inside it.



On the dotted lines below, name each structure in order, starting with the largest and ending with the smallest.

The first one has been done for you.

Cell ....

.... **[3]**

(b) A cell is observed to divide once every hour, doubling the total number of cells.

A student estimates the number of cells after ten hours to be 1024.

Explain why this number is an estimate and is not an exact number of cells after ten hours.

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.....

..... **[2]**

(c) Cells divide by mitosis or meiosis.

Fig 4.1 shows a parent cell containing chromosomes.

Cells **A**, **B**, **C**, **D** and **E** are possible daughter cells that **could** result from either mitosis or meiosis.

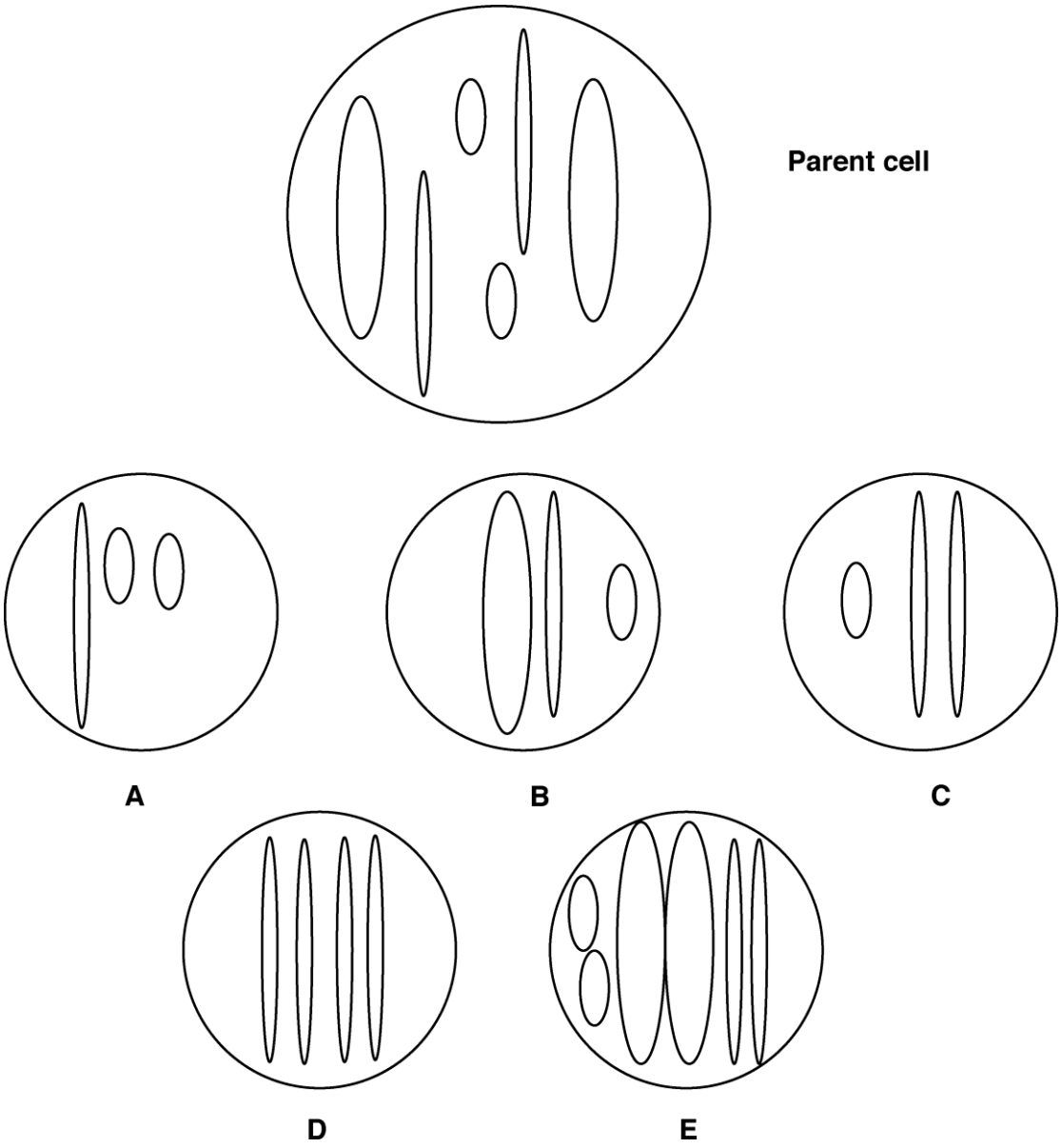


Fig 4.1

In Fig 4.1, identify the daughter cells, **A**, **B**, **C**, **D** or **E**, that correctly show the result of mitosis and meiosis.

In the table below:

- Write the letter of the correct daughter cell.
- Give reasons for your choice.

Type of cell division	Correct daughter cell	Reasons for choice
Mitosis	.....	**1**.
Meiosis	.....	**1**.
		2.

[5]

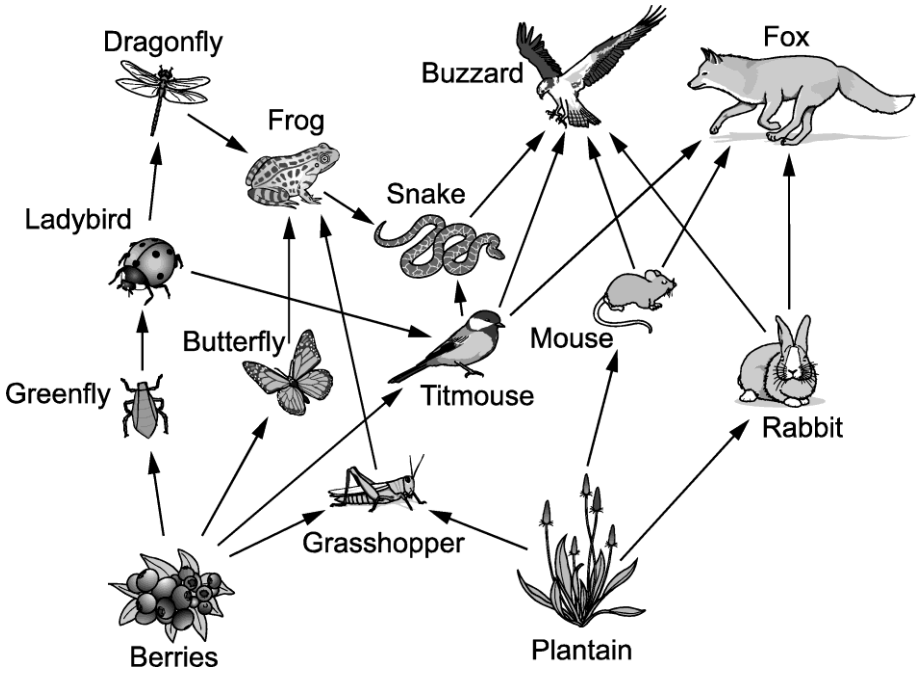
(d) A newt is a type of amphibian.

A newt can grow a new leg if one is damaged or bitten off by a predator.

What type of cell division does the newt use to grow a new leg?

..... **[1]**

5 This is a food web from woodland with a pond nearby.



(a) **(i)** Name a producer in this food web.

..... **[1]**

(ii) How many trophic levels are in the longest food chain in this food web?

..... **[1]**

(iii) What do the arrows in the food web mean?

.....

..... **[1]**

(b) One food chain from this food web is:

Berries → Titmouse → Fox

Draw a pyramid of biomass for this food chain in the space below.

Label your pyramid.

[2]

(c) A group of students decide to investigate the populations of animals and plants in this food web.

Suggest the piece of apparatus they would use for sampling the following.

(i) Small plants in the woodland.

..... **[1]**

(ii) Invertebrates, such as woodlice, on the ground in the woodland.

..... **[1]**

(d) A species of toad is introduced into this community.

- The toad eats butterflies and dragonflies.
- The toad has skin that tasted bitter and so nothing wanted to eat it.

Explain the effect on the food web of introducing this toad.

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..... **[4]**

6 Albinism is an inherited condition. The people affected are unable to make a pigment called melanin. Skin, hair and eyes may all be affected and the person will be very pale skinned with white-blonde hair and possibly red eyes.

Ling and Ben have a daughter called Mia who has albinism.

Ling and Ben are both heterozygous (carriers).

(a) Complete the Punnett square below to show how Ling and Ben passed the alleles for albinism to Mia.

Use **A** to represent the allele for normal melanin production and **a** to represent the allele for albinism.

Mia's genotype is aa.

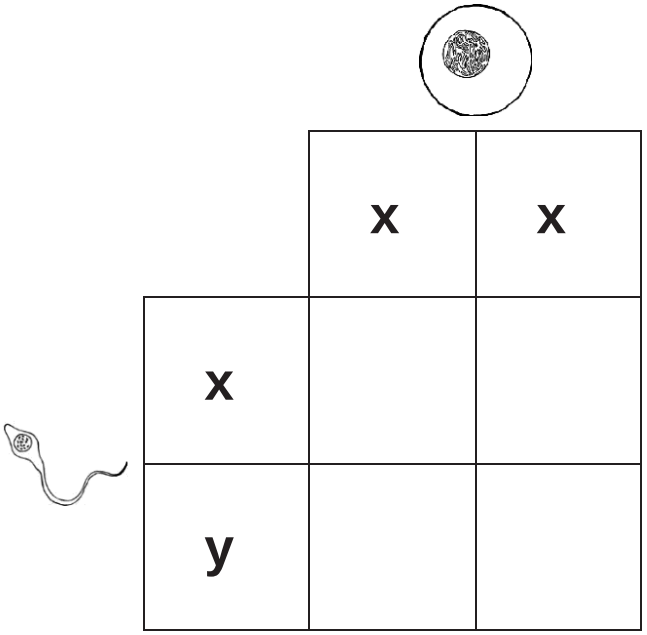
	A	**a**

[2]

(b) In humans, sex chromosomes determine gender.

Ling and Ben are having another child.

Use the diagram below to show the probability of Ling and Ben's second child being a boy.



Probability = ...**[2]**

(c) Use the example of the inheritance of albinism to describe the difference between **homozygous** and **heterozygous**.

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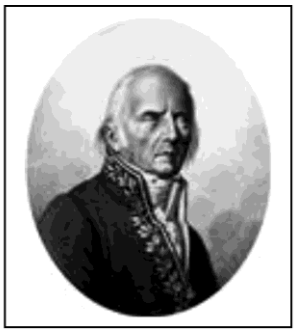
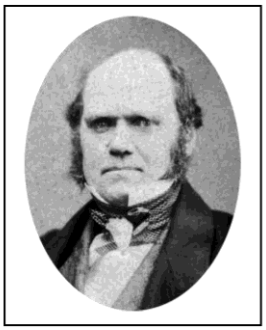
..... **[2]**

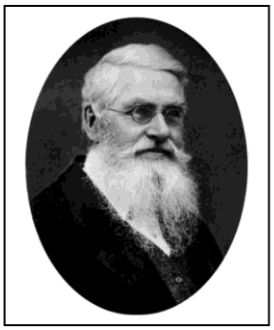
7 Lamarck, Darwin and Wallace were three scientists responsible for our understanding of evolution.



Jean Baptiste Lamarck



Charles Darwin



Alfred Russel Wallace

In the early 1800s, most scientists such as Lamarck thought that, when organisms acquired a characteristic during their lifetime, they could pass this characteristic on to their offspring. He thought that a giraffe had a long neck because it stretched to reach leaves from the branches of trees. He thought that the giraffes that stretched their necks the most would then pass on this characteristic to their offspring.

Darwin and Wallace did not believe this theory. They spent many years collecting different species of animals and plants from all over the world and they both came to the same conclusion.

Darwin and Wallace thought that life evolved due to a process of natural selection. Both Darwin and Wallace realised that, if natural selection was repeated over many generations, it could lead to the wide variety of different species that we see around us today.

(a) Today most scientists around the world believe Darwin's and Wallace's theory to be correct.

(i) Evaluate Lamarck's theory and suggest why most scientists now believe Darwin and Wallace's theory of evolution.

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..... **[4]**

(ii) Wallace sent Darwin his ideas to check that he had not made any mistakes.

Put a tick (✓) in the box next to the statement that best describes this process.

Controlling variables ☐

Extrapolation ☐

Peer review ☐

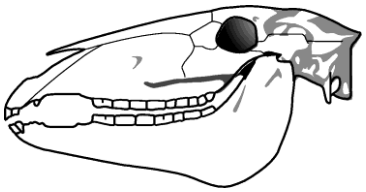
Repeatability ☐ **[1]**

(b) Scientists use fossils to provide evidence for evolution.

The five drawings below are of fossil skulls of horses.

The drawings, **A, B, C, D** and **E** can be used to show how horses have evolved.

The drawings are in the wrong order.

A	B	C	D	E
				

Complete the boxes to show how the horses have evolved.

The first and last have been done for you.

C	.....	.....	.....	B
First				**Last**

[2]

(c) Describe how the fossils can be used to provide evidence for the evolution of horses.

Use ideas of similarities and differences between the drawings and your own knowledge in your answer.

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..... **[4]**

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TURN OVER FOR THE NEXT QUESTION

8 A student did an experiment to find out more about the process of osmosis.

(a) The student was provided with ten pieces of potato, each about 5 cm long.

She was also given five dishes each containing a different **unknown** concentration of sugar solution.

The student put two pieces of potato in each dish and left them for 30 minutes. She then removed the potato pieces and re-measured their length.

The student recorded the results in Table 8.1.

Dish of sugar solution	Length of potato (cm)				Change in mean length (cm)	Percentage change (%)
	Original	After 30 minutes in sugar solution				
		Piece 1	Piece 2	Mean		
1	4.9	5.0	5.4	5.2	+0.3	.....
2	5.1	4.3	4.1	4.2	–0.9	–18.4
3	5.0	4.8	4.4	4.6	–0.4	–8.0
4	5.2	5.7	5.9	5.8	+0.6	+11.5
5	4.9	4.8	4.8	4.8	–0.1	–2.0

Table 8.1

(i) The student has not finished working out the results.

Calculate the missing value and write it in the table. **[2]**

(ii) The table below shows the concentration of sugar solution in each of the five dishes.

Use the results from the student's experiment to show which solution was in each dish.

Write down the correct dish numbers from Table 8.1 in the column headed **'Dish'**.

Sugar solution concentration (mol/dm^3)	Dish
0.2	
0.4	
0.6	
0.8	
1.0	

[1]

(iii) The student measured the length of the pieces of potato as a quick way to obtain results.

Why does this method not measure the total change to the pieces of potato?

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..... **[1]**

(iv) How could the student modify the experiment to show the rate of water movement by osmosis in pieces of potato?

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..... **[2]**

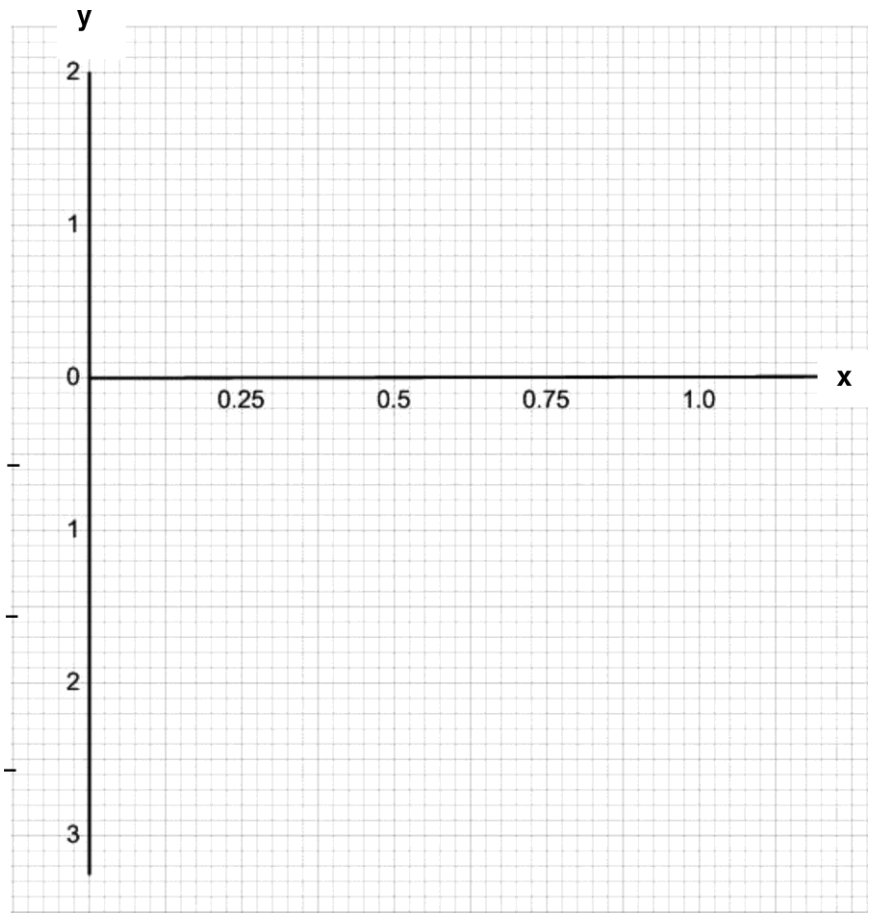
(b) Another student did a similar experiment.

These are his results in Table 8.2.

Sugar solution concentration (mol/dm^3)	Change in mean length (mm)
1.00	–1.9
0.75	–1.2
0.50	–0.5
0.25	+0.3
0.00	+1.0

Table 8.2

(i) Using the information in Table 8.2, label the x and y axis on the grid below. **[1]**



(ii) Plot the student's results on the grid. **[2]**

(iii) Draw a line of best fit on the grid. **[1]**

(iv) Use your graph to find the concentration of sugar solution where the potato pieces do not change in length.

sugar solution concentration ..... mol / dm^3 **[1]**

(v) What can you conclude, in terms of osmosis, at this concentration?

.....

.....

..... **[1]**

9 A group of students carry out an enzyme investigation.

The word equation below shows the reaction.

Hydrogen peroxide $\xrightarrow{\text{catalase}}$ oxygen and water

(a) Name the substrate and the enzyme in this reaction.

Substrate: .....

Enzyme: ..... **[1]**

(b)* The students investigated the effect of temperature on the rate of this enzyme-controlled reaction.

Fig 9.1 shows a graph of their results.

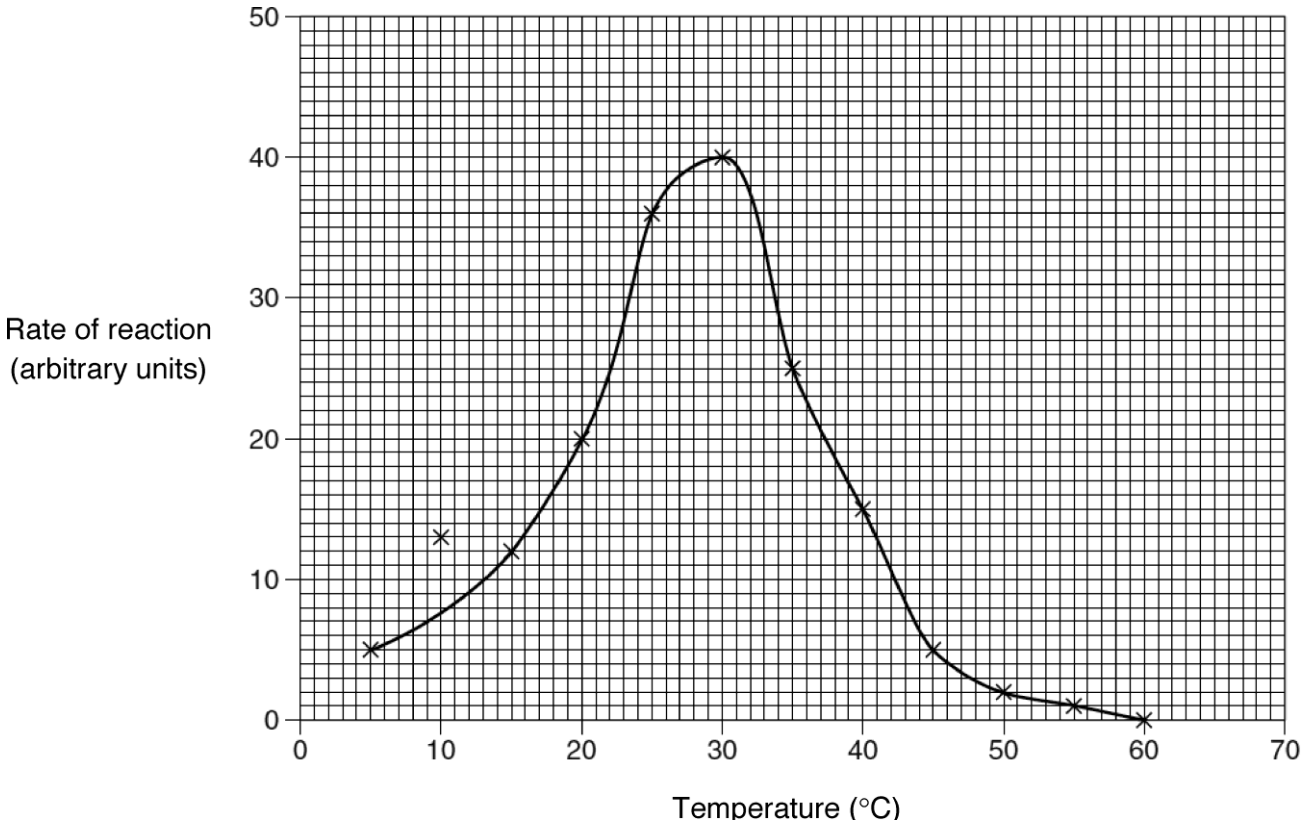


Fig 9.1

Using the graph in Fig 9.1, describe and explain the effect of temperature on this enzyme.

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..... **[6]**

END OF QUESTION PAPER

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Summary of updates

Date	Version	Details
October 2021	2.1	Updated copyright acknowledgements.

OCR
Oxford Cambridge and RSA

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…day June 20XX – Morning/Afternoon

GCSE (9–1) Biology B (Twenty First Century Science)

J257/02 Depth in biology (Foundation Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

This document consists of 24 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer. Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.
The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.
The communication statement determines the mark within a level.

Level of response questions on this paper are **3(e)** and **9(b).**

11. **Annotations**

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

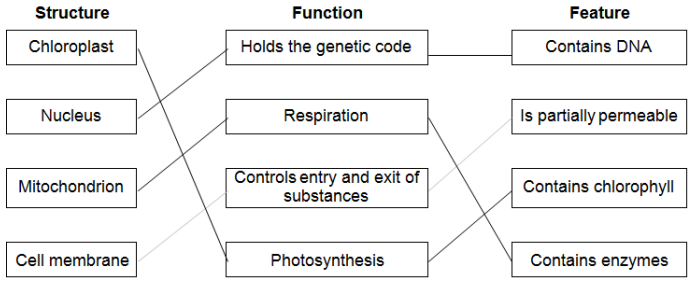
You should ensure that you have copies of these materials.

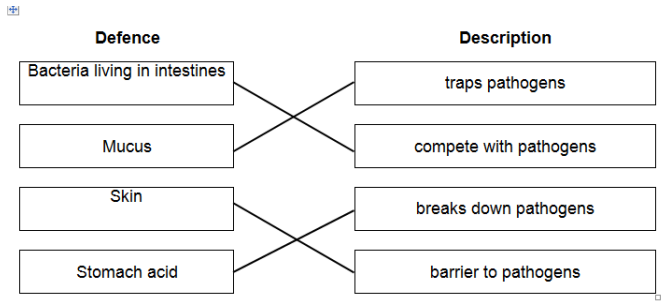
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

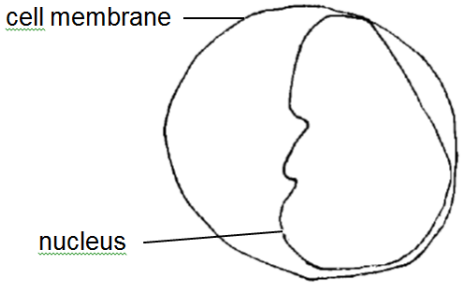
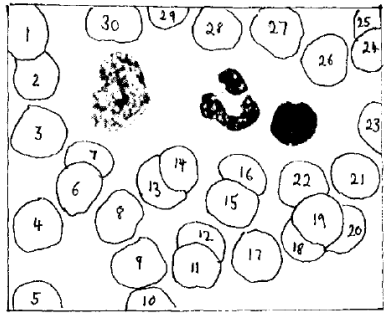
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

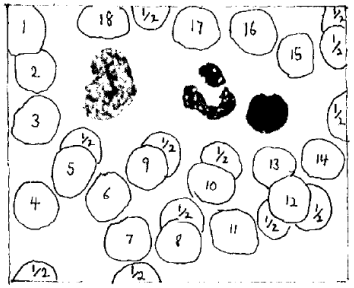
The breakdown of Assessment Objectives for GCSE (9-1) in Biology B:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Question			Answer	Marks	AO element	Guidance
1	(a)			3	1.1	Mark each structure separately Both lines need to be correct for 1 mark
	(b)		**1.** Same DNA / genes ✓ **2.** Resulting from a single fertilised egg / zygote that splits into two ✓ **3.** Idea of environmental differences ✓ **4.** One example of an environmental difference ✓	4	2.1	MP4 e.g. scar, piercings, dyed hair, different clothes

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	**Idea** that Jamal is an example of health which is a state of well-being ✓ **Idea** that Mia and Ben are examples of disease which is a disorder of structure or function on the body ✓	**2**	**2.1**	
		(ii)	Flu (Mia) is communicable **AND** can be passed from person to person ✓ Huntingdon's disease (Ben) is not communicable **AND** cannot be passed from person to person ✓	**2**	**2.1**	**IGNORE** reference to infections
		(iii)	Condom ✓ It is a physical barrier ✓	**2**	**1.1**	**ALLOW** idea that body fluids can't come into contact
	(b)			**2**	**1.1**	Three lines correct = 2 marks One or two lines correct = 1 mark
	(c)		Leaf cuticle ✓ Cell wall ✓	**2**	**1.1**	

Question			Answer	Marks	AO element	Guidance
3	(a)		Correct cell drawn **AND** taking up 50% or more of space ✓ Continuous, unfeathery lines, no shading ✓ Label lines drawn with a ruler ✓ Nucleus **AND** cell membrane correctly labelled ✓	**4**	**1.2 ×3** **1.1**	Drawing should take up approximately 50% of space e.g. 
	(b)		10 : 1 / 8 : 1 ✓	**1**	**2.2**	 If all red blood cells are estimated as whole cells as shown above, then ratio is 10 : 1

Question			Answer	Marks	AO element	Guidance
						 If partial or overlapping red blood cells are estimated as half cells as shown above, then ratio is 8 : 1
	(c)	**(i)**	Correctly labelled vena cava / pulmonary artery ✓	**1**	**2.1**	
		(ii)	Coronary artery ✓	**1**	**2.1**	
	(d)	**(i)**	A / C ✓	**1**	**2.1**	Mark first answer on the line A second letter given which is incorrect = 0 marks
		(ii)	B / D ✓	**1**	**2.1**	Mark first answer on the line A second letter given which is incorrect = 0 marks

Question	Answer	Marks	AO element	Guidance
(e)*	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** *Explains the function of three vessels and relates this to their structure using evidence from the diagrams* ***AND*** *Draws a conclusion from the data in support of the functions.* *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated* **Level 2 (3–4 marks)** *Explains the function of two vessels and relates this to their structure using evidence from the diagrams* ***AND*** *Makes reference to the data.* *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**1.1 x4** **3.2b x2**	**AO1.1 Description of structure related to function** For example: **Arteries:** • Blood carried away from the heart • Under high pressure • Thick outer walls • Thick layer of muscle • Thick layer of elastic fibres **Veins:** • Carry blood back to the heart • Under lower pressure than arteries • Thin walls • Thin layer of muscle • Thin layer of elastic fibres • Valves to ensure one way flow of blood **Capillaries:** • Exchange materials / oxygen / carbon dioxide • Thin walls • One cell thick • Thin lumen brings red blood cells close to body cells **AO3.2b Analyse the data in the table and draw a conclusion** For example: **Data:** • Arteries stretch more than veins • Arteries have more recoil than veins • Quote of data

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) *Explains the function of one vessel and relates this to its structure using evidence from the diagram.* *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*			

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>All correct award 3 marks
Any 3 or 4 correct award 2 marks
Any 2 correct award 1 mark</td><td>3</td><td>2.1</td><td>Vacuole, nucleus, chloroplast, mitochondria, chromosome</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Any two from
Run out of space / food ✓
Conditions may not stay the same ✓
Some will die ✓
Not all cells divide at the same rate ✓</td><td>2</td><td>2.2</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>
<table>
<tr><th>Type of cell division</th><th>Correct daughter cell</th><th>Reasons for your choice</th></tr>
<tr><td>Mitosis</td><td>E ✓</td><td>1. Identical to parent ✓</td></tr>
<tr><td rowspan="2">Meiosis</td><td rowspan="2">B ✓</td><td>1. Half the number of chromosomes ✓</td></tr>
<tr><td>2. One of each pair ✓</td></tr>
</table>
</td><td>5</td><td>2.1 x 2 (2nd column)
1.1 x 3 (3rd column)</td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td>Mitosis ✓</td><td>1</td><td>1.1</td><td></td></tr>
</table>

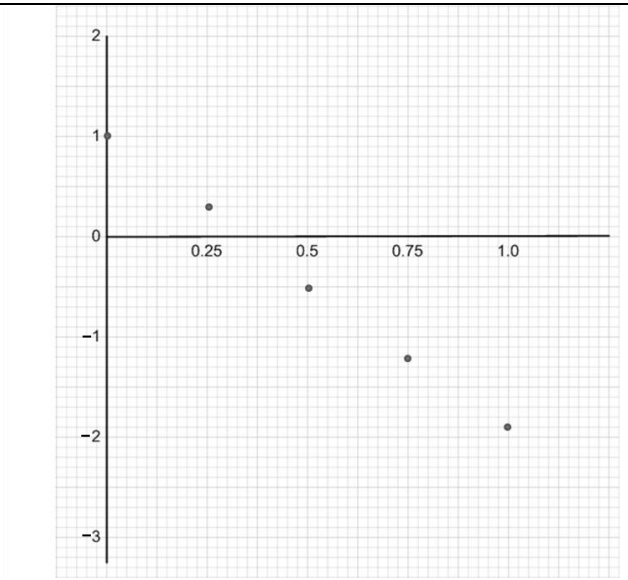
Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	Berries / plantain ✓	1	2.1	
		(ii)	6 ✓	1	3.1a	
		(iii)	Movement / flow of biomass (from one trophic level to another) ✓	1	2.1	**IGNORE** reference to flow of energy
	(b)		Pyramid with large bottom level, smaller middle and smallest top level ✓ Correctly labelled with berries at bottom, titmouse in middle and fox at the top ✓	2	2.2	
	(c)	(i)	Quadrat ✓	1	1.2	**DO NOT ALLOW** 'quadrant'
		(ii)	Pitfall trap ✓	1	1.2	
	(d)		**Any four from** Butterfly population would decrease as another species eating them ✓ Dragonfly population would decrease as another species eating them ✓ Frogs would decrease as would have less to eat ✓ Ladybird population might increase as fewer being eaten as there are fewer dragonflies ✓ Berries might increase as fewer butterflies to eat them ✓ Greenflies and grasshoppers might increase as more berries to eat as fewer butterflies eating them ✓ Snake population might decrease as fewer frogs to eat ✓ This would mean fewer buzzards ✓ Titmouse increases as more berries ✓ Buzzards increase as more titmouse ✓ Snakes increase as more titmouse ✓	4	3.2b	**ALLOW** any other correct description linked to a correct explanation

Question			Answer	Marks	AO element	Guidance
			Plantain could increase as grasshoppers eats more berries ✓ Plantain might decrease as more grasshoppers ✓ Rabbits might increase if plantain increases ✓ Buzzards might increase if there are more rabbits ✓ Mouse could increase as the plantain increases ✓ Buzzards could increase if there are more mice ✓			

Question			Answer	Marks	AO element	Guidance
6	(a)		<table><tr><td></td><td>A</td><td>a</td></tr><tr><td>A</td><td>AA</td><td>Aa</td></tr><tr><td>a</td><td>Aa</td><td>aa</td></tr></table>	2	2.2	One mark for correct gametes for second parent One mark for correct completion of Punnett square **ALLOW** aA for Aa
	(b)		Punnett square correct ✓ <table><tr><td></td><td>X</td><td>X</td></tr><tr><td>X</td><td>XX</td><td>XX</td></tr><tr><td>Y</td><td>XY</td><td>XY</td></tr></table> Probability is 50% / 0.5 / ½ ✓	2	2.1 2.2	**ALLOW** YX for XY
	(c)		Homozygous – having the same allele on both chromosomes of a pair e.g. AA or aa Heterozygous – when the alleles on a pair of chromosomes are different e.g. Aa	2	1.1	**DO NOT ALLOW** 'have same gene on both chromosomes' **DO NOT ALLOW** 'have different genes on both chromosomes'

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	**Any two from** *Evaluating Lamarck's theory* **1.** Idea that stretched neck is environmental ✓ **2.** Environmental effects not inherited ✓ **3.** Genes needed for inheritance ✓ **Any two from** *Reasons why evolution is now believed* **4.** Mutation in genes now understood ✓ **5.** Variation in offspring shown to be linked to DNA differences ✓ **6.** Idea of mole evidence to support theory ✓	**4**	**3.1b ×2** **1.1 ×2**	MP4 **ALLOW** idea of DNA better understood MP5 **ALLOW** an example MP6 **ALLOW** examples such as MRSA
		(ii)	Peer review ✓	**1**	**1.2**	
	(b)		E before A ✓ A before D ✓	**2**	**2.2**	
	(c)		**Any four from** **1.** Fossils show how organisms have changed over time ✓ **2.** Idea that size gets bigger over time ✓ **3.** Idea that basic shape is the same ✓ **4.** Similarity in shape indicates a common ancestor / specific example of similarity e.g. position / shape of jaw ✓	**4**	**2.1** **3.1a ×3**	**ALLOW** a statement the older the fossil, the smaller it is – mark points 1 and 4

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	**FIRST CHECK THE ANSWER IN TABLE. If answer = +6.1 award 2 marks** (0.3 ÷ 4.9) × 100 ✓ +6.1 ✓	**2**	**2.2**	**DO NOT ALLOW** answer if not given to 1d.p.
		(ii)	4, 1, 5, 3, 2 ✓	**1**	**3.2a**	
		(iii)	Does not take into account width ✓	**1**	**3.3a**	**ALLOW** reference to diameter / volume
		(iv)	Set up experiment as above and re-measure every 10 minutes / other suitable time period ✓ Find out how long it takes until there is now further change in length ✓	**2**	**3.3b**	
	(b)	**(i)**	X = sugar concentration (mol / dm^{-3}) **AND** Y = change in mean length (mm) ✓	**1**	**2.2**	**DO NOT ALLOW** axis labels without units
		(ii)		**2**	**2.2**	5 plots correct = 2 3 or 4 plots correct = 1

Question			Answer	Marks	AO element	Guidance
						
		(iii)	Straight line through points ✓	**1**	**2.2**	
		(iv)	0.35 to 0.4 ✓	**1**	**3.1a**	
		(v)	**Any one from** Idea that it is the same concentration as the potato cell content ✓ Water movement is the same in both directions / no net Flow in or out of the potato ✓	**1**	**3.2b**	

Question			Answer	Marks	AO element	Guidance
9	(a)		Substrate – hydrogen peroxide **AND** enzyme – catalase ✓	1	2.1	
	(b)*		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** *Describes in detail the pattern of the graph* ***AND*** *Links this to an explanation of the effect of all temperatures on enzyme function* ***AND*** *Identifies the optimum temperature for the enzyme* *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** *Describes the pattern of the graph* ***AND*** *Links this to an explanation of the effect of temperature on enzyme function* ***OR*** *Identifies the optimum temperature for the enzyme* *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** *Describes the pattern of the graph* ***AND***	6	**3.1a x2** **2.1 x3** **3.2a x1**	**AO3.1a Identification of patterns in graph** For example: • Rate of reaction increases between 0°C and 30°C • Rate of reaction decreases between 30°C and 60°C **AO2.1 Details of effect of temperature on enzyme function** For example: • Increase between 0 and 30°C is because there is more kinetic energy • So more collisions • So more ESC form • Decrease between 30°C and 60°C is because enzyme is denatured • Loss of 3D structure • ESC can no longer form as substrate does not fit into the enzyme **AO3.2a Identification of the optimum temperature of the enzyme** For example: • Optimum temperature is 30°C

Question			Answer	Marks	AO element	Guidance
			Makes reference to the effect of temperature on enzyme function between 0 and 30 ℃ ***OR*** *Makes reference to the effect of temperature on enzyme function between 30 ℃ and 60 ℃* *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** *No response or no response worthy of credit.*			

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website

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