AQA GCSE BIOLOGY (4401)

BIOLOGY



EXAM QUESTION PACK

UNIT B2 FOUNDATION TIER BL2FP PAPERS

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AQA

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Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
ADDITIONAL SCIENCE
BIOLOGY

F

Foundation Tier Unit Biology B2

Friday 10 June 2016 Morning Time allowed: 1 hour

Materials
For this paper you must have:
- a ruler

You may use a calculator.

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

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ANSWER IN THE SPACES PROVIDED

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

1 Living organisms are made of cells.

1 (a) Animal and plant cells have several parts. Each part has a different function.

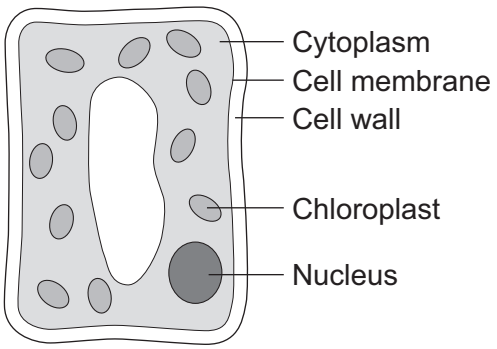
Draw **one** line from each cell part to the correct function of that part.

[3 marks]

Cell part	Function
Cell membrane	Where most energy is released in respiration
Mitochondria	Controls the movement of substances into and out of the cell
Nucleus	Controls the activities of the cell
	Where proteins are made

1 (b) **Figure 1** shows a cell from a plant leaf.

Figure 1



Which **two** parts in **Figure 1** are **not** found in an animal cell?

[2 marks]

1 _____

2 _____

5

Turn over ▶

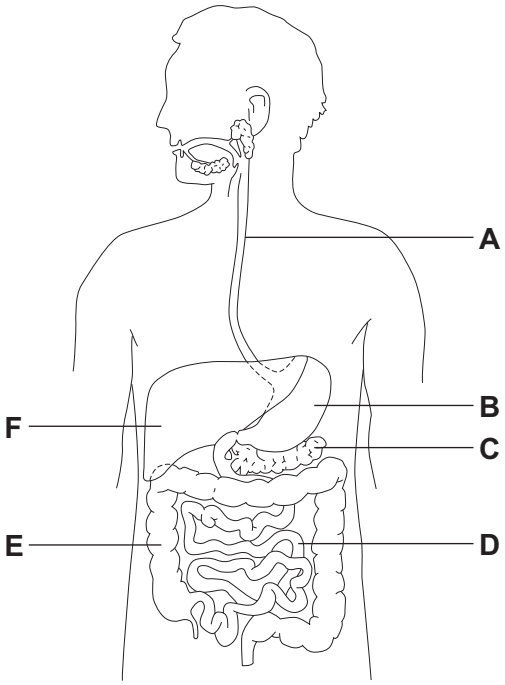
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2 The digestive system breaks down food into small molecules.

The small molecules can be absorbed into the blood.

Figure 2 shows the human digestive system.

Figure 2



2 (a) (i) Which letter, **A**, **B**, **C**, **D**, **E** or **F**, shows each of the following organs?

[3 marks]

Write **one** letter in each box.

large intestine ☐

small intestine ☐

stomach ☐

Do not write outside the box

2 (a) (ii) Different organs in the digestive system have different functions.

Draw **one** line from each function to the organ with that function.

[3 marks]

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

2 (b) Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

[1 mark]

Tick (✓) **one** box.

The concentration in the blood is higher. ☐

The concentration in the blood is lower. ☐

The concentration in the blood is the same. ☐

7

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3 Ragwort is a plant that often grows as a weed in grassland.

Figure 3 shows a ragwort plant.

Figure 3



Some students estimated the number of ragwort plants growing in a field on a farm.

The students:

- placed a quadrat at 10 random positions in the field
- counted the number of ragwort plants in each quadrat.

The quadrat measured 1 metre × 1 metre. The area of the field was 80 000 m^2.

Table 1 shows the students' results.

Table 1

Quadrat number	Number of ragwort plants
1	1
2	0
3	3
4	0
5	0
6	0
7	5
8	0
9	0
10	2

Do not write outside the box

3 (a) Complete the following calculation to estimate the number of ragwort plants in the field.

Use information from **Table 1**.

[2 marks]

Total number of ragwort plants in 10 quadrats = _____

Mean number of ragwort plants in 1 m^2 = _____

Therefore estimated number of ragwort plants in field = _____

3 (b) What could the students do to get a more accurate estimate?

[1 mark]

Tick (✓) **one** box.

Place the quadrat in 100 random positions. ☐

Place the quadrat only in areas where they could see ragwort plants. ☐

Place the quadrat in positions at the edge of the field. ☐

Question 3 continues on the next page

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3 (c) The farmer who owned the field kept horses.

If horses eat ragwort, the ragwort can poison them.

The farmer considered two methods of controlling ragwort in his field.

Method 1: Spraying with a selective weed killer

Method 2: Pulling out the ragwort plants by hand

In **Method 1**:

- the cost of the weed killer was £420
- the weed killer would not harm the grass but would kill all other plants
- the farmer could apply the weed killer from a sprayer towed by a tractor.

Method 2 could be done by local volunteers.

What are the advantages and disadvantages of using **Method 2** instead of **Method 1** for controlling ragwort?

[3 marks]

Advantages of **Method 2** _____

_____

_____

_____

Disadvantages of **Method 2** _____

_____

_____

_____

6

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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4 In humans, hair colour is an inherited characteristic.

Red hair is caused by a recessive allele.

4 (a) When does a recessive allele control the development of a characteristic?

[1 mark]

Tick (✓) **one** box.

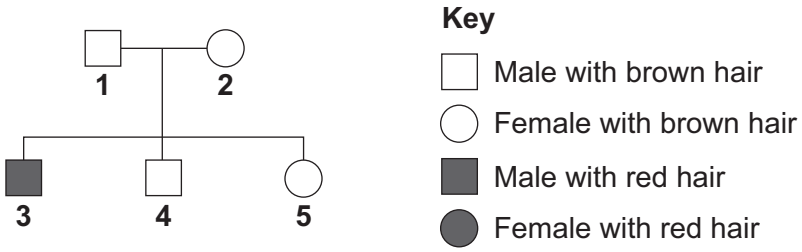
When the allele is present on only one of the chromosomes. ☐

When the dominant allele is not present. ☐

When the allele is inherited from the female parent. ☐

4 (b) **Figure 4** shows the inheritance of hair colour in one family.

Figure 4



4 (b) (i) Brown hair is caused by a dominant allele, **B**.

Red hair is caused by the recessive allele, **b**.

What combination of alleles does person **1** have?

[1 mark]

Tick (✓) **one** box.

BB ☐

Bb ☐

bb ☐

Do not write outside the box

4 (b) (ii) Person **3** married a woman with brown hair.

Figure 5 shows how hair colour could be inherited by their children.

Figure 5

		Woman Brown hair	
		B	b
Person 3 Red hair	b	Bb	
	b		

Complete **Figure 5** to show the combination of alleles that the children would inherit. One has been done for you.

[2 marks]

4 (b) (iii) What is the probability that one of the children would have red hair?

[1 mark]

Tick (✓) **one** box.

1 in 2 ☐

1 in 3 ☐

1 in 4 ☐

5

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ANSWER IN THE SPACES PROVIDED

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5 Over millions of years:

- new groups of organisms have evolved
- other groups of organisms have become extinct.

5 (a) If an asteroid collided with the Earth, large amounts of dust and water vapour would be thrown up into the air. This would mean less light and heat would reach the Earth's surface from the Sun.

5 (a) (i) A reduced amount of light and heat could have caused the extinction of plants.

Suggest how.

[1 mark]

5 (a) (ii) How could the extinction of plants have caused the extinction of some animals?

[1 mark]

5 (a) (iii) Give **two** reasons, other than collision with an asteroid, why groups of animals may become extinct.

[2 marks]

1

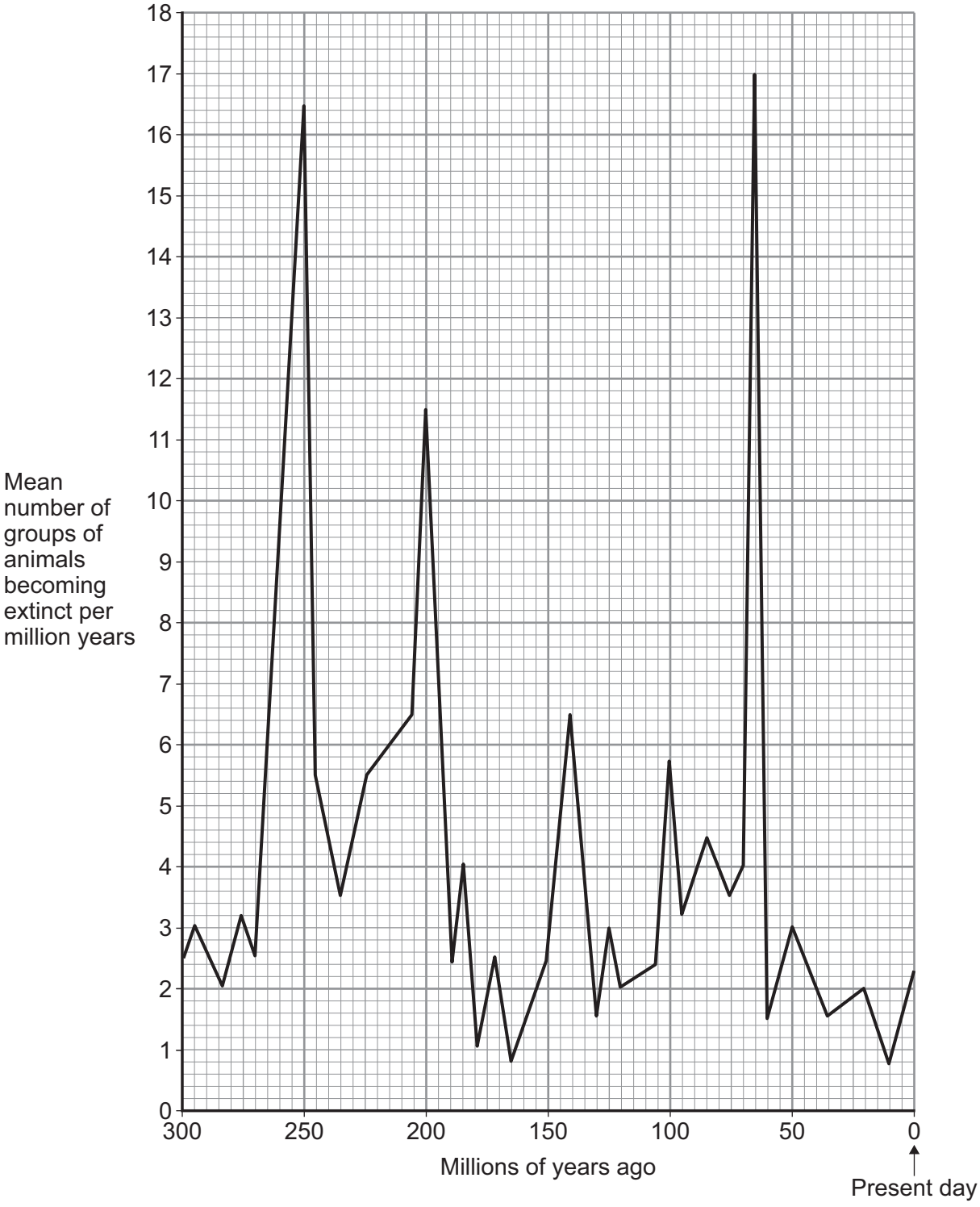
2

Question 5 continues on the next page

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5 (b) **Figure 6** shows how the rate of extinction of groups of animals has varied over the past 300 million years.

Figure 6



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5 (b) (i) If more than 10 groups of animals become extinct in a 1 million year period, scientists call this a 'mass extinction'.

How many mass extinctions occurred over the past 300 million years?

[1 mark]

_____

5 (b) (ii) How do we know what types of animals lived hundreds of millions of years ago?

[1 mark]

_____

_____

5 (c) Use information from **Figure 6** to answer questions **(c)(i)** and **(c)(ii)**.

5 (c) (i) How many years ago did the most recent mass extinction of animals occur?

[1 mark]

Tick (✓) **one** box.

50 million years ago ☐

65 million years ago ☐

250 million years ago ☐

5 (c) (ii) What was the mean number of groups of animals becoming extinct per million years in the most recent mass extinction?

[1 mark]

_____ groups per million years

5 (c) (iii) Why are scientists not sure how many groups of animals became extinct in the most recent mass extinction?

[1 mark]

_____

_____

9

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6 (a) Which organ of the human body produces egg cells?

[1 mark]

Draw a ring around the correct answer.

liver **ovary** **testis**

6 (b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

[1 mark]

Draw a ring around the correct answer.

23 **46** **48**

6 (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 2 shows how successful IVF was for women of different ages at one clinic.

Table 2

Age of women in years	Percentage of women who had a baby
<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

6 (c) (i) A student thought that the result for women aged 40–42 was anomalous.

Suggest why the student thought this result was anomalous.

[1 mark]

_____

_____

6 (c) (ii) Describe the general trend in the results in **Table 2**.

You should ignore the anomalous result.

[1 mark]

_____

_____

Do not write outside the box

6 (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 3 shows the scientists' results.

Table 3

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

6 (d) (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

[2 marks]

Answer = _____ times

6 (d) (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 2** and **Table 3** in your answer.

[2 marks]

1 _____

2 _____

8

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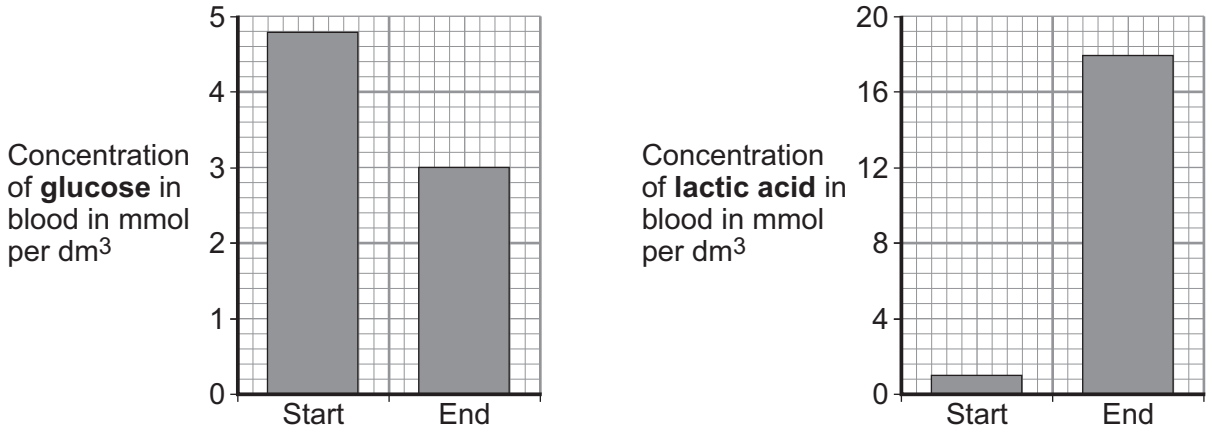
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ANSWER IN THE SPACES PROVIDED

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7 An athlete ran as fast as he could until he was exhausted.

7 (a) **Figure 7** shows the concentrations of glucose and of lactic acid in the athlete's blood at the start and at the end of the run.

Figure 7



7 (a) (i) Lactic acid is made during anaerobic respiration.

What does anaerobic mean?

[1 mark]

7 (a) (ii) Give evidence from **Figure 7** that the athlete respired anaerobically during the run.

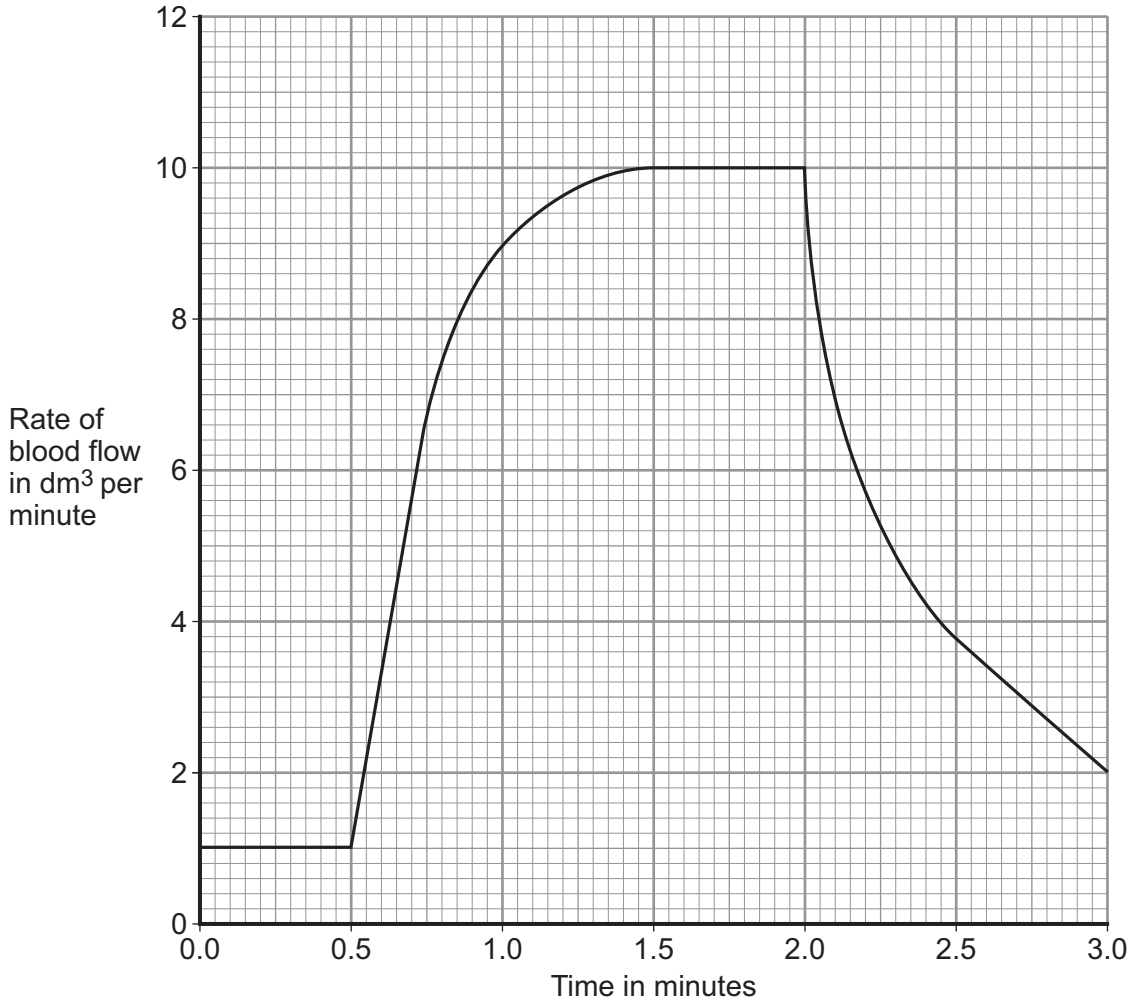
[1 mark]

Question 7 continues on the next page

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7 (b) **Figure 8** shows the effect of running on the rate of blood flow through the athlete's muscles.

Figure 8



7 (b) (i) For how many minutes did the athlete run?

[1 mark]

Time = _____ minutes

7 (b) (ii) Describe what happens to the rate of blood flow through the athlete's muscles during the run.

Use data from **Figure 8** in your answer.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

7 (b) (iii) Explain how the change in blood flow to the athlete's muscles helps him to run.

[4 marks]

9

Turn over for the next question

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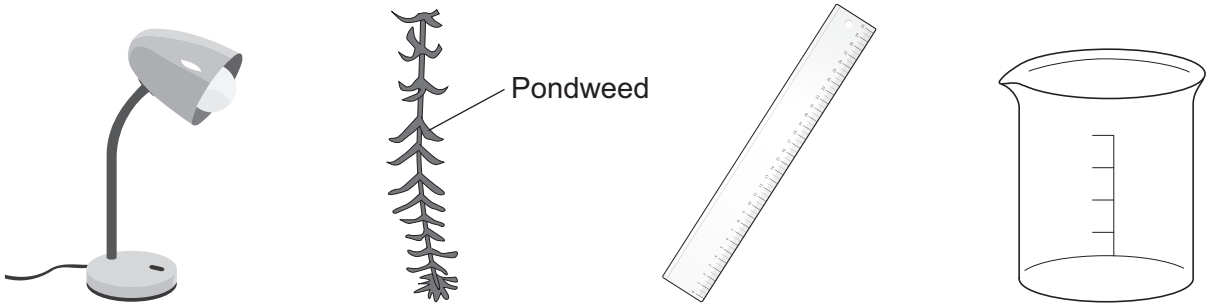
8 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Light intensity, carbon dioxide concentration and temperature are three factors that affect the rate of photosynthesis.

How would you investigate the effect of **light intensity** on the rate of photosynthesis?

Figure 9 shows some of the apparatus you might use.

Figure 9



Not to scale

You should include details of:

- how you would set up the apparatus and the materials you would use
- the measurements you would make
- how you could make this a fair test.

[6 marks]

Do not write outside the box

Extra space _____

6

Turn over for the next question

Do not write outside the box

9 Enzymes are made and used in all living organisms.

9 (a) What is an enzyme?

[2 marks]

9 (b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

[1 mark]

Draw a ring around the correct answer.

cell membrane **cytoplasm** **nucleus**

Do not write outside the box

9 (c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.

The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.

A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.

Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.

[2 marks]

Advantage of hydrogen peroxide and catalase _____

_____

_____

Disadvantage of hydrogen peroxide and catalase _____

_____

_____

5

END OF QUESTIONS

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GCSE

Additional Science / Biology

BL2FP

Mark scheme

4408 / 4401

June 2016

Version/Stage: 1.0 Final Mark Scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**.
Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

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Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation 'ecf' in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

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4. Quality of Written Communication and levels marking

In Question 8 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

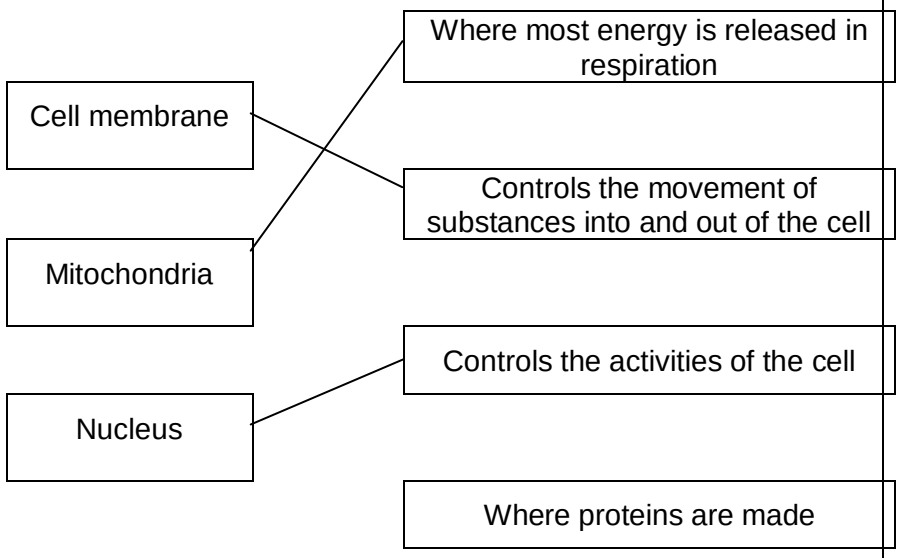
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	**Cell part** / **Function**  extra lines cancel		3	AO1 2.1.1a
1(b)	Cell wall Chloroplast	in either order allow (permanent) vacuole	1 1	AO1 2.1.1b
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	large intestine = **E** small intestine = **D** stomach = **B**		1 1 1	AO1 2.2.1d
2(a)(ii)	**Function** / **Organ** Digestion of fat Absorption of water into the blood Production of hydrochloric acid Large intestine Liver Small intestine Stomach extra lines cancel		3	AO1 2.2.1d 2.5.2f/g
2(b)	The concentration in the blood is lower.		1	AO2 2.1.2b
Total			**7**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	88 000	correct answer = 2 marks allow 1 mark for 1.1 (in 1 m^2) **or** allow 1 mark for answer = [candidate's value in 1m^2] x 80 000	2	AO2 2.4.1b
3(b)	Place the quadrat in 100 random positions.		1	AO3 2.4, 2.4.1b
3(c)	any **three** from: Advantages: • less cost / free • less likely to kill other (harmless species of) plants • weedkiller may be toxic **or** may cause water pollution • weedkiller may accumulate up food chains Disadvantages: • volunteers may mistake other species for ragwort • volunteers may miss plants • some ragwort left to poison horses • time consuming • difficulties getting enough volunteers	must include at least one advantage and one disadvantage for full marks allow uneven distribution of ragwort so much wastage of weedkiller allow weeds will grow back if no other disadvantages; allow ref. to issues with volunteers – eg don't turn up / not careful / don't finish the job	3	AO3 2.4, 2.4.1b
Total			**6**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	When the dominant allele is not present.		1	AO1 2.7.2c/d/e
4(b)(i)	Bb		1	AO2 2.7
4(b)(ii)	**Woman** Brown hair **Person 3** Red hair B: b b: **bb** b: **Bb**, **bb**	3 correct = 2 marks 2 correct = 1 mark 1 or 0 correct = 0 marks allow bB for Bb	2	AO2 2.7
4(b)(iii)	1 in 2	allow ecf from 4bii	1	AO2 2.7
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	reduced photosynthesis	ignore growth do **not** allow need light for respiration	1	AO2 2.3.1a/b 2.8.1e
5(a)(ii)	less food (for animals) **or** less oxygen (for animals)	allow loss of habitat	1	AO2 2.3.1a/b 2.8.1e
5(a)(iii)	any **two** from: examples of physical factors, eg • flooding • drought • ice age / temperature change • volcanic activity examples of biological factors, eg • (new) predators (allow hunters / poachers) • (new) disease / named pathogen • competition for food • competition for mates • cyclical nature of speciation • isolation • lack of habitat or habitat change	accept 2 physical factors or 2 biological factors or one of each for full marks ignore pollution If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark	2	AO1 2.8.1e
5(b)(i)	3		1	AO2 2.8.1e
5(b)(ii)	fossils	ignore bones, remains, fossil fuels	1	AO1 2.8.1a/e

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)(i)	65 million years ago		1	AO2 2.8.1e
5(c)(ii)	17	allow ecf	1	AO2 2.8.1e
5(c)(iii)	fossil record incomplete **or** some fossils destroyed	accept not enough evidence **or** cannot perform experiment to test	1	AO3 2.8 2.8.1a/e
Total			**9**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	ovary		1	AO1 2.7.1f
6(b)	46		1	AO1 2.7.1e/i 2.7.2b
6(c)(i)	does not fit the pattern **or** it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values	do **not** allow use of incorrect figures	1	AO3 2.7
6(c)(ii)	As age increases % of women (having a baby) decreases		1	AO2 2.7
6(d)(i)	33	allow 1 mark for $\frac{66}{2}$ if no answer / wrong answer	2	AO2 2.7, 2.7.3d
6(d)(ii)	low success rate more likely to have a baby with health problems / abnormalities / a faulty chromosome		1 1	AO3 2.7, 2.7.3d
Total			**8**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	without <u>oxygen</u>	allow not enough oxygen ignore air ignore production of CO_2 ignore energy	1	AO1 2.6, 2.6.2a
7(a)(ii)	more/high/increased lactic acid (at end)	allow approximate figures (to show increase) ignore reference to glucose	1	AO3 2.6, 2.6.2b
7(b)(i)	1.5	allow only 1.5 / 1½ / one and a half	1	AO3 2.6, 2.6.1g/h
7(b)(ii)	increases at first **and** levels off suitable use of numbers eg rises to 10 / by 9 (dm^3 per min) **or** increases up to 1.5 (min) / levels off after 1.5 (min) (of x axis timescale) **or** after the first minute (of the run)	ignore subsequent decrease allow answer in range 1.4 to 1.5	1 1	AO2 2.6, 2.6.1g/h
7(b)(iii)	supplies (more) oxygen supplies (more) glucose for (more) respiration releases (more) energy (for muscle contraction)	need 'more/faster' once only for full marks allow removes (more) CO_2 /lactic acid / heat as an alternative for either marking point one **or** two, **once** only do **not** allow energy production or **for** respiration	1 1 1 1	AO1 2.6.1b/e/f/g/h 2.6.2d
Total			**9**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
8			6	AO1/2/3 2.3.1a/b/c/d +prac

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	A partial description of how the apparatus is set up **or** a description of how light is supplied **or** a simple description of how photosynthesis can be measured. **or** a control variable	A description of how the apparatus is set up **and** a description of how photosynthesis can be measured. **or** a description of how light intensity is varied **or** a control variable **or** any other relevant point	A description of how the apparatus is used to measure the **rate** of photosynthesis at different light **intensities** is given. For full marks reference must be made to a control variable **or** repeats

examples of the points made in the response

- apparatus set up:
  - weed in water in beaker
  - light shining on beaker
- method of varying the light intensity – eg changing distance of lamp from plant
- method of controlling other variables
  - use same pond weed **or** same length of pond weed
  - temperature: water bath or heat screen
  - CO_2
- leave sufficient time at each new light intensity before measurements taken
- method of measuring photosynthesis – eg counting bubbles of gas released or collecting gas and measuring volume in a syringe
- measuring **rate of photosynthesis** by counting bubbles for set period of time
- repetitions

extra information

allow information in the form of a diagram

Total		6

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)	a catalyst / speeds up a reaction it is a protein **or** it is specific / described **or** it has an active site	ignore it is not used up allow it only acts on one molecule	1 1	AO1 2.5.1a/b
9(b)	cytoplasm		1	AO1 2.1.1a 2.6.1a
9(c)	**Advantage:** any **one** from: • heat would denature proteins in milk • heat alters texture or flavour of milk • catalase / enzyme is specific **or** only affects hydrogen peroxide • less energy / fuel / lower temperature used so less expensive **or** less pollution **Disadvantage:** any **one** from: • (some pathogens may survive) causing illness • catalase / enzyme left in milk **or** may cause allergies **or** may alter taste		1 1	AO3 2.5, 2.5.2j
Total			**5**	

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Foundation Tier
June 2015

Additional Science
Unit Biology B2

BL2FP

F

Biology
Unit Biology B2

Tuesday 12 May 2015 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler.

You may use a calculator.

A

Time allowed
- 1 hour

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

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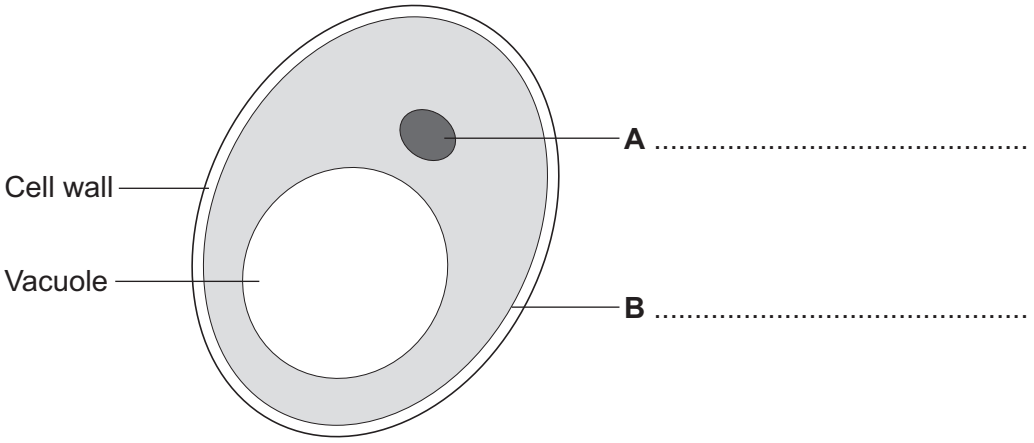
Do not write outside the box

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

1 Human cells and yeast cells have some parts that are the same.

1 (a) **Figure 1** shows a yeast cell.

Figure 1



Parts **A** and **B** in **Figure 1** are found in human cells and in yeast cells.
On **Figure 1**, label parts **A** and **B**.

[2 marks]

1 (b) Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

[1 mark]

.....

.....

Do not write outside the box

1 (c) Human stem cells can develop into many different types of human cell.

1 (c) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

embryos	**hair**	**nerve cells**

Human stem cells may come from ..... .

1 (c) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

cystic fibrosis	**paralysis**	**polydactyly**

Human stem cells can be used to treat ..... .

5

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

2 (a) Enzymes are used in body cells.

2 (a) (i) What is an enzyme?

Draw a ring around the correct answer.

[1 mark]

an antibody **a catalyst** **a hormone**

2 (a) (ii) All enzymes are made of the same type of substance.

What is this substance?

Draw a ring around the correct answer.

[1 mark]

carbohydrate **fat** **protein**

2 (a) (iii) Where is the enzyme amylase produced in the human body?

Draw a ring around the correct answer.

[1 mark]

liver **salivary glands** **stomach**

2 (b) Enzymes are sometimes used in industry.

Draw **one** line from each enzyme to the correct industrial use of that enzyme.

[3 marks]

Enzyme	Industrial use
Carbohydrase	Changes starch into sugars
Isomerase	Removes grease stains from clothes
Protease	Pre-digests proteins in some baby foods
	Changes glucose syrup into fructose syrup

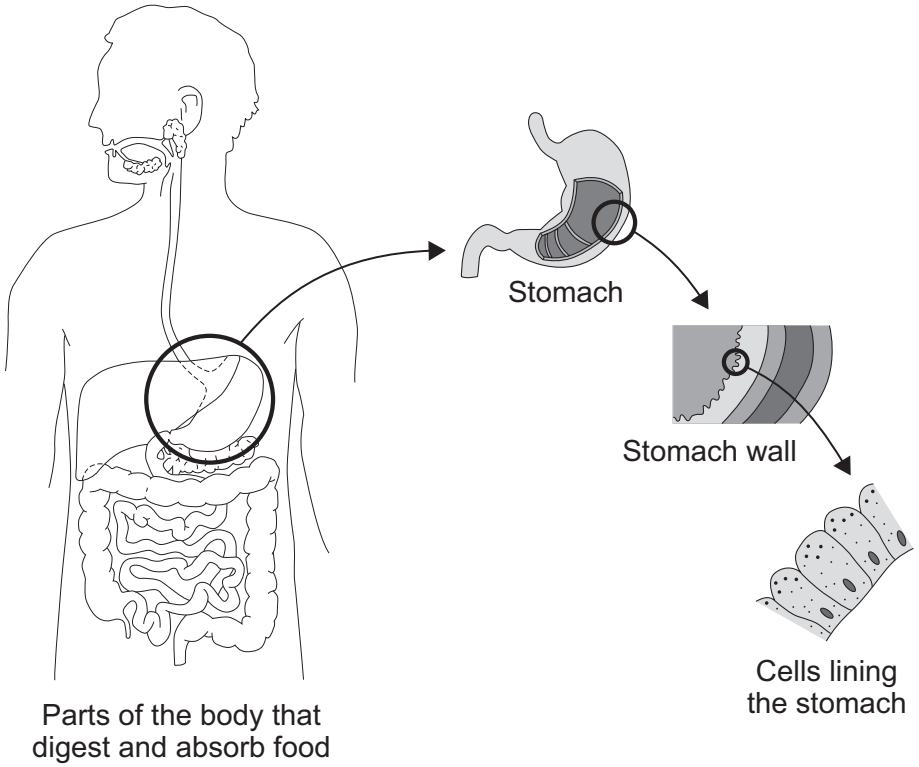
6

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3 **Figure 2** shows the parts of the body that digest and absorb food.

Figure 2 also shows some details about the structure of the stomach.

Figure 2



3 (a) Complete **Table 1** to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (✓) **one** box.

[2 marks]

Table 1

Structure	Organ	Organ system	Tissue
Stomach			
Cells lining the stomach			
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine			

Do not write outside the box

3 (b) (i) The blood going to the stomach has a high concentration of oxygen.
The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

[1 mark]

Oxygen moves from the blood to the cells lining the stomach by

the process of ..... .

3 (b) (ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

[1 mark]

glucose **protein** **starch**

3 (b) (iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

[1 mark]

cell membrane **mitochondria** **nucleus**

5

Turn over for the next question

Do not write outside the box

4 Photosynthesis uses carbon dioxide to make glucose.

4 (a) (i) Complete the equation for photosynthesis.

[2 marks]

carbon dioxide + ... $\xrightarrow{\text{energy}}$ glucose + ...

4 (a) (ii) What type of energy does a plant use in photosynthesis?

[1 mark]

.....

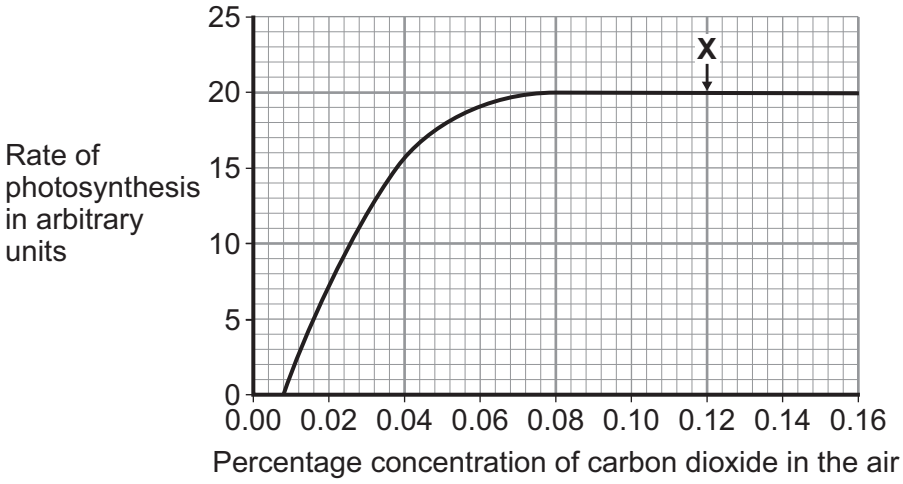
4 (a) (iii) Which part of a plant cell absorbs the energy needed for photosynthesis?

[1 mark]

.....

4 (b) **Figure 3** shows the effect of the concentration of carbon dioxide on the rate of photosynthesis in tomato plants at 20 °C.

Figure 3



4 (b) (i) What is the maximum rate of photosynthesis of the tomato plants shown in **Figure 3**?

[1 mark]

..... arbitrary units

4 (b) (ii) At point **X** on **Figure 3**, carbon dioxide is **not** a limiting factor of photosynthesis.

Suggest **one** factor that is limiting the rate of photosynthesis at point **X**.

[1 mark]

.....

Do not write outside the box

4 (c) A farmer plans to grow tomatoes in a large greenhouse.

The concentration of carbon dioxide in the atmosphere is 0.04%.
The farmer adds carbon dioxide to the greenhouse so that its concentration is 0.08%.

4 (c) (i) Why does the farmer use 0.08% carbon dioxide?

[1 mark]

Tick (✓) **one** box.

To increase the rate of growth of the tomato plants ☐

To increase the rate of respiration of the tomato plants ☐

To increase water uptake by the tomato plants ☐

4 (c) (ii) Why does the farmer **not** use a concentration of carbon dioxide higher than 0.08%?

[2 marks]

Tick (✓) **two** boxes.

Because it would cost more money than using 0.08% ☐

Because it would decrease the temperature of the greenhouse ☐

Because it would not increase the rate of photosynthesis of the tomato plants any further ☐

Because it would increase water loss from the tomato plants ☐

9

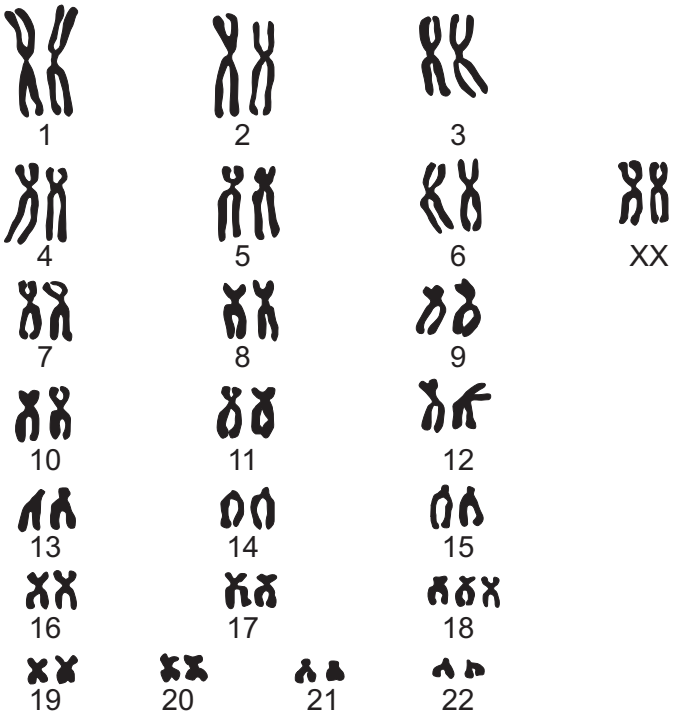
Turn over for the next question

Do not write outside the box

5 Genetic disorder **E** is a condition caused by a change in the chromosomes.

5 (a) **Figure 4** shows the chromosomes from one cell of a person with genetic disorder **E**.

Figure 4



5 (a) (i) How do you know this person is female?

Use information from **Figure 4**.

[1 mark]

.....

.....

5 (a) (ii) Describe how the chromosomes shown in **Figure 4** are different from the chromosomes from a person who does not have genetic disorder **E**.

[2 marks]

.....

.....

.....

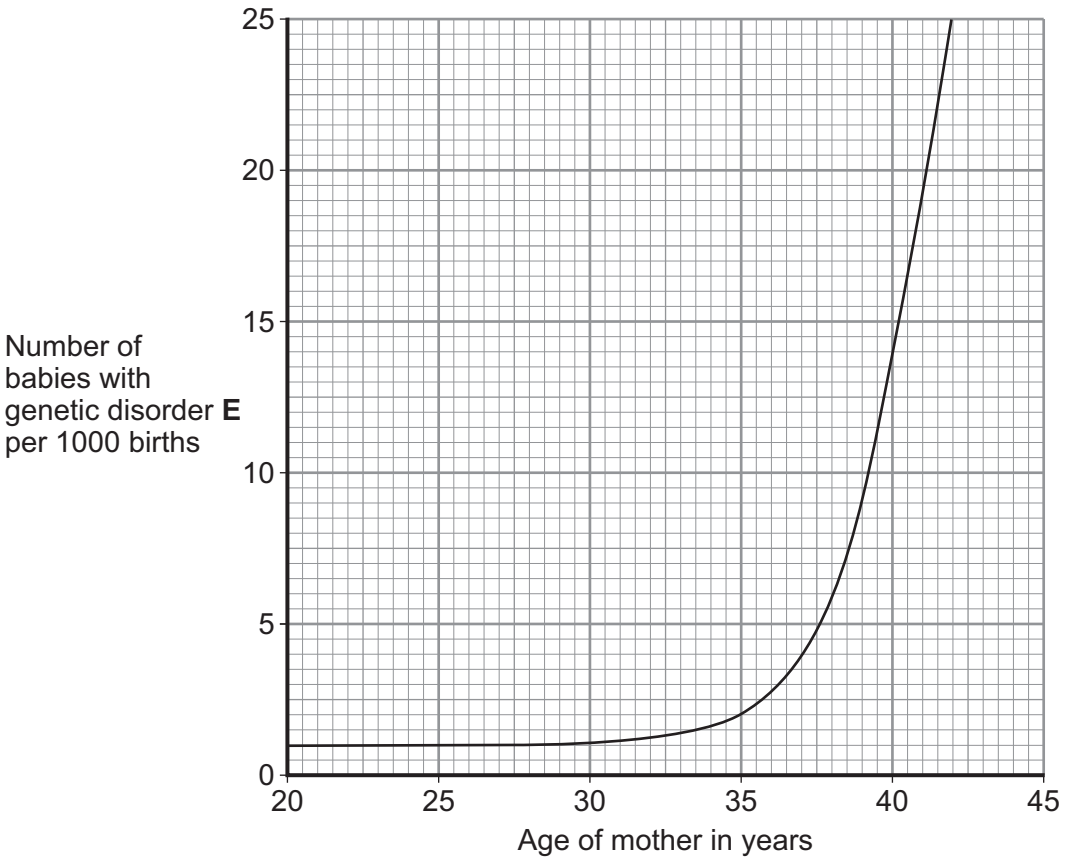
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5 (b) As a woman gets older, the chance of her having a baby with genetic disorder **E** increases.

Figure 5 shows this.

Figure 5



5 (b) (i) The chance of a 35-year-old woman having a baby with genetic disorder **E** is 2 per 1000 births.

What is the chance of a 40-year-old woman having a baby with genetic disorder **E**?

[1 mark]

..... per 1000 births

5 (b) (ii) A 40-year-old woman is more likely than a 35-year-old woman to have a baby with genetic disorder **E**.

How many times more likely?

[1 mark]

..... times

Question 5 continues on the next page

Do not write outside the box

5 (c) A 41-year-old woman wants to have a baby. A 41-year-old woman has an increased chance of having a baby with genetic disorder **E**.

Doctors can screen embryos for genetic disorder **E**.

Table 2 gives some information about two methods of embryo screening.

Table 2

Method 1	Method 2
1 The woman is given hormones to cause the release of a few eggs. The eggs are taken from her body in a minor operation. The eggs are fertilised in a glass dish.	1 The woman gets pregnant in the normal way.
2 One cell is taken from each embryo when the embryo is 3 days old.	2 Cells are taken when the embryo is 10 weeks old.
3 Cells are screened for genetic disorder **E**.	3 Cells are screened for genetic disorder **E**.
4 An unaffected embryo is placed in the woman's uterus. Embryos that are not used are destroyed or used in medical research.	4 An unaffected fetus is allowed to develop. If the fetus has genetic disorder **E**, the woman can choose to have an abortion.
5 This method costs about £6000.	5 This method costs about £600.

Use information from **Table 2** to give **two** advantages and **one** disadvantage of **Method 1** compared with **Method 2** for detecting genetic disorder **E**.

[3 marks]

Advantages of **Method 1**:

1 .....

.....

2 .....

.....

Disadvantage of **Method 1**:

.....

.....

8

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

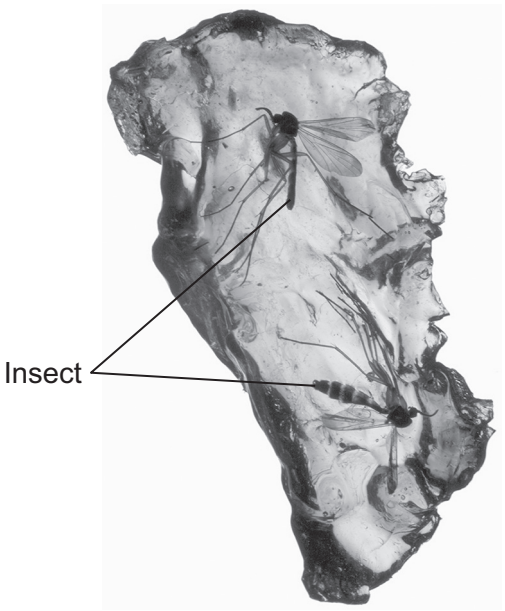
Do not write outside the box

6 Fossils give us information about organisms from a long time ago.

6 (a) Amber is a solid, glass-like material. Amber is formed from a thick, sticky liquid which oozes out of pine trees.

Figure 6 shows two fossil insects in amber.

Figure 6



6 (a) (i) Suggest how the insects came to be preserved in the amber.

[2 marks]

.....

.....

.....

.....

6 (a) (ii) Give **two** other ways fossils are formed.

[2 marks]

1 .....

.....

2 .....

.....

Do not write outside the box

6 (b) The fossil record shows that many organisms, including the dinosaurs, became extinct 65 million years ago.

One theory was that volcanic activity might have caused this mass extinction. Many scientists believe that this extinction was caused when an asteroid collided with the Earth.

6 (b) (i) A new scientific theory may replace an old theory.

Why might this happen?

[1 mark]

Tick (✓) **one** box.

Evidence from amber is unreliable. ☐

Internet evidence is more reliable than fossil evidence. ☐

New technology provides more valid evidence. ☐

6 (b) (ii) Give **three** reasons, other than volcanic activity and collision with an asteroid, why a species may become extinct.

[3 marks]

1 .....

.....

2 .....

.....

3 .....

.....

8

Turn over for the next question

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7 Lipase is an enzyme that digests fat.

7 (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

[1 mark]

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

7 (a) (ii) Name **one** organ that makes lipase.

[1 mark]

.....

7 (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:
1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

[2 marks]

1 .....

.....

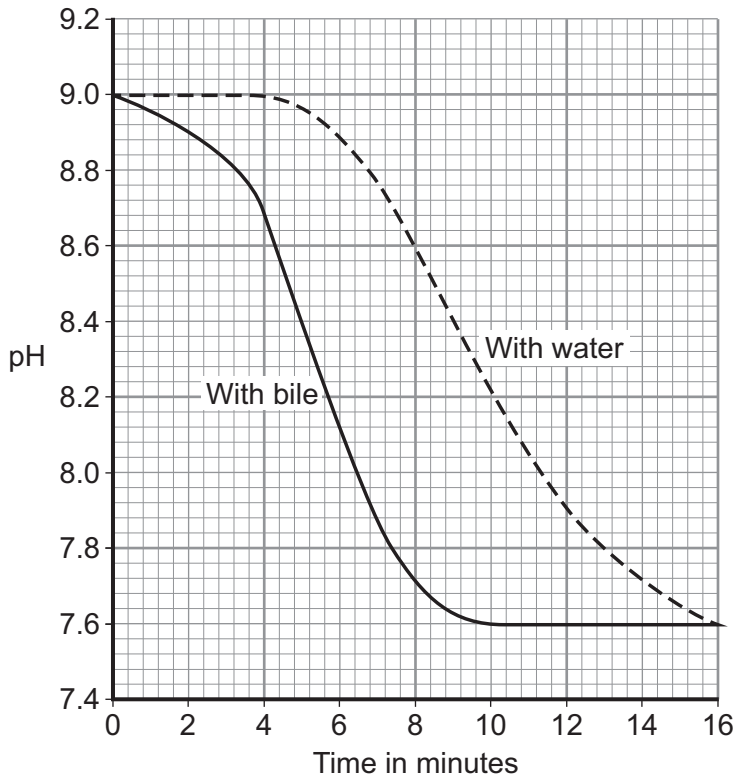
2 .....

.....

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7 (c) **Figure 7** shows the students' results.

Figure 7



7 (c) (i) Why did the pH decrease in both investigations?

[1 mark]

.....

.....

7 (c) (ii) Bile helps lipase to digest fat.

What evidence is there in **Figure 7** to support this conclusion?

[1 mark]

.....

.....

7 (c) (iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

[1 mark]

.....

.....

7

Turn over ▶

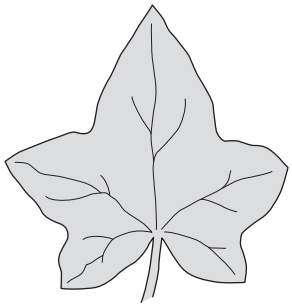
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8 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

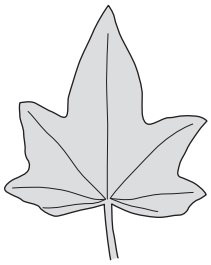
Ivy plants can grow up trees and walls.

Figure 8 shows two ivy leaves. One leaf is from an ivy plant growing up a tree in the centre of a shady woodland area. The other leaf is from an ivy plant growing up a tree in a sunny area at the edge of the woodland.

Figure 8



Ivy leaf from shady woodland area (centre of woodland)



Ivy leaf from sunny area (edge of woodland)

A student makes the following hypothesis.

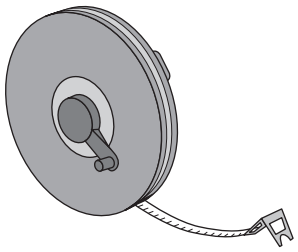
"The size of ivy leaves decreases as light intensity increases."

How would you use the apparatus shown in **Figure 9** to test this hypothesis?

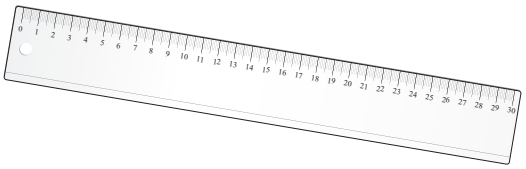
You should include details of how you would make sure the results are valid.

[6 marks]

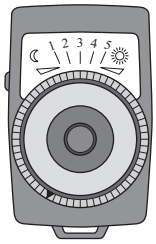
Figure 9



100 m tape measure



Ruler



Light meter

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Extra space .....

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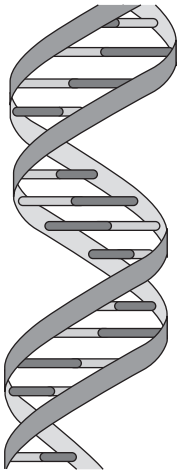
Turn over for the next question

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9 DNA is the genetic material of human cells.

Figure 10 shows the structure of part of a DNA molecule.

Figure 10



9 (a) (i) Describe where DNA is found in a human cell.

[2 marks]

.....

.....

.....

9 (a) (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

[1 mark]

.....

.....

9 (b) Many genes have different forms called alleles.

9 (b) (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.
What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

[1 mark]

.....

9 (b) (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.
How many copies of the recessive CF allele are there in a body cell of this person?

[1 mark]

.....

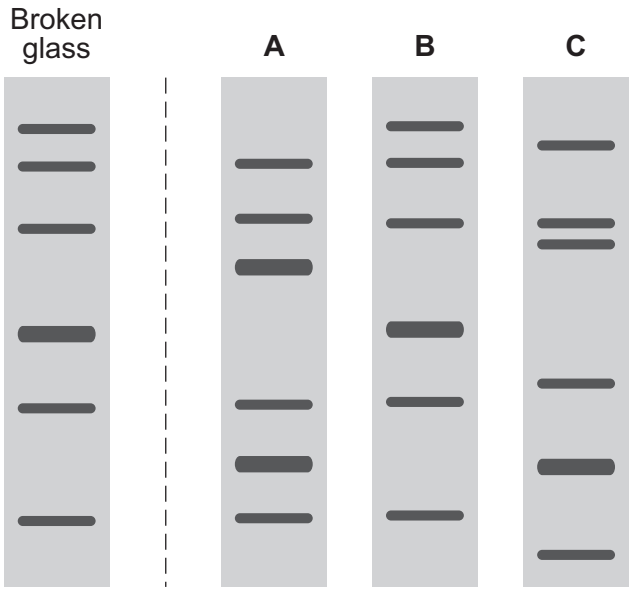
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9 (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 11 shows the scientists' results.

Figure 11



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

6

END OF QUESTIONS

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GCSE

Additional Science / Biology

BL2FP

Mark scheme

4408 / 4401

June 2015

Version: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

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Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Quality of Written Communication and levels marking

In Question 8 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

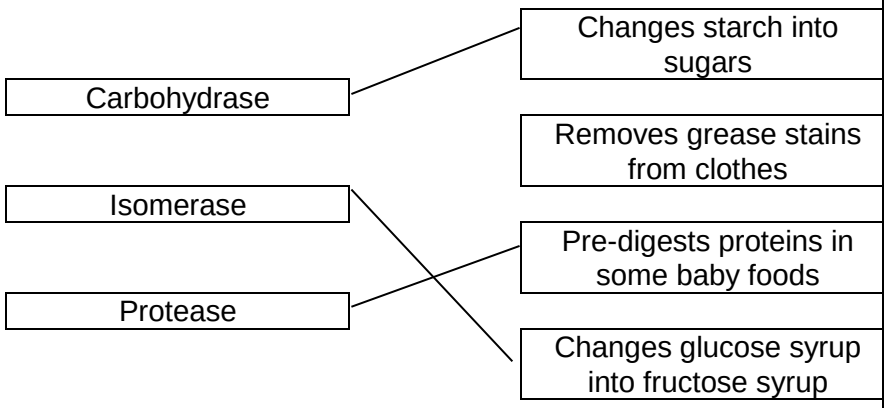
Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	**A** = nucleus **B** = (cell) membrane	allow phonetic spelling	1 1	AO1 2.1.1a, d
1(b)	for repair / growth **or** to replace cells	ignore new cells / skin	1	AO1 2.7.1j
1(c)(i)	embryos		1	AO1 2.7.1k
1(c)(ii)	paralysis		1	AO1 2.7.1l,m
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	a catalyst		1	AO1 2.5.1a,b, 2.6.1a
2(a)(ii)	protein		1	AO1 2.5.1b, 2.6.1a
2(a)(iii)	salivary glands		1	AO1 2.5.2d
2(b)	 extra lines from any enzyme cancels that mark		3	AO1 2.5, 2.5.2i
Total			**6**	

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<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><th>Structure</th><th>Organ</th><th>Organ system</th><th>Tissue</th></tr>
<tr><td>Stomach</td><td>✓</td><td></td><td></td></tr>
<tr><td>Cells lining the stomach</td><td></td><td></td><td>✓</td></tr>
<tr><td>Mouth, oesophagus, stomach, liver, pancreas, small and large intestine</td><td></td><td>✓</td><td></td></tr>
</table>
all 3 correct = 2 marks
2 correct = 1 mark
1 or 0 correct = 0 marks
</td><td></td><td>2</td><td>AO1
2.2, 2.2.1a,b,c, d</td></tr>
<tr><td>3(b)(i)</td><td>diffusion</td><td>allow phonetic spelling</td><td>1</td><td>AO1
2.1.2a,b,c</td></tr>
<tr><td>3(b)(ii)</td><td>glucose</td><td></td><td>1</td><td>AO1
2.6.1b</td></tr>
<tr><td>3(b)(iii)</td><td>mitochondria</td><td></td><td>1</td><td>AO1
2.6.1b,d</td></tr>
<tr><td>Total</td><td></td><td></td><td>5</td><td></td></tr>
</table>

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	LHS = water RHS = oxygen	accept H_2O do **not** accept H^2O / H2O accept O_2 do **not** accept O / O^2 / O2	1 1	AO1 2.3.1a,b
4(a)(ii)	light / sunlight	ignore solar / sun / sunshine do **not** allow thermal / heat	1	AO1 2.3.1a,b
4(a)(iii)	chloroplasts	allow chlorophyll	1	AO1 2.3.1b
4(b)(i)	20		1	AO2 2.3
4(b)(ii)	any **one** from: • light (intensity) • temperature		1	AO2 2.3, 2.3.1c,d
4(c)(i)	To increase the rate of growth of the tomato plants		1	AO2 2.3, 2.3.1c,d
4(c)(ii)	Because it would cost more money than using 0.08% Because it would not increase the rate of photosynthesis of the tomato plants any further		1 1	AO2 2.3, 2.3.1c,d
Total			**9**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	(female) has XX / only X's / no Y	allow has X chromosomes ignore ref to genes / cells	1	AO2 2.7.2b, 2.7.3a
5(a)(ii)	extra chromosome / has 47 chromosomes / one set has 3 copies no. 18	ignore reference to chromosome numbers other than 47 or no. 18	1 1	AO2 2.7.1a,e, 2.7.3a
5(b)(i)	14	allow in range of 13.5 to 14.5	1	AO2 2.7.1a,e, 2.7.3a
5(b)(ii)	7	allow in range of 6.75 to 7.25 accept ecf from 5bi	1	AO2 2.7.1a,e, 2.7.3a
5(c)	Advantages: any **two** from: • more than 1 embryo (so more chance of success) • tested at 3 days cf 10 weeks **or** tested earlier • tested before pregnancy • no termination / abortion • spare embryos have a potential use Disadvantages: any **one** from: • needs an operation • (spare) embryos / human life destroyed / harmed • higher cost • embryos might not implant / might not develop	allow method 2 may cause a miscarriage tested when only 3 days old accept described hazard of operation must be comparative	2 1	AO3 2.7, 2.7.3d
Total			**8**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	any **two** from: • trapped / held (since sticky) • engulfed / covered by resin • prevented decay	allow engulfed / covered by amber	2	AO2 / AO3 2.8.1b
6(a)(ii)	any **two** from: • animal / plant (dies and) body covered in sediment / mud • bones / shells / hard parts do not decay • minerals enter bones / parts are replaced by other materials / mineralisation • preserved traces / footprints / burrows / rootlet traces / impressions / casts	ignore ref to rock allow covered in tar / ice	2	AO1 2.8.1b
6(b)(i)	New technology provides more valid evidence.		1	AO3 2.8

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(b)(ii)	any **three** from: examples of physical factors, eg • flooding • drought • ice age / temperature change examples of biological factors, eg • (new) predators (allow hunters) • (new) disease / named pathogen • competition for food • competition for mates • cyclical nature of speciation • isolation • lack of habitat or habitat change	accept 3 physical factors or 3 biological factors or some of each for full marks ignore pollution competition must be qualified **if no other answers given allow** natural disaster / weather change / catastrophic event / environmental change / climate change for **1** mark	3	AO1 2.8.1e
Total			**8**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	glycerol		1	AO1 2.5.2f
7(a)(ii)	pancreas / small intestine	accept duodenum / ileum ignore intestine unqualified	1	AO1 2.5.2f
7(b)	any **two** from: • type of milk • volume / amount of milk • vol. bile equals vol. water • volume of lipase • concentration of lipase • temperature	ignore time interval ignore solution unqualified do **not** allow pH ignore starting pH ignore volume / amount of bile / water ignore concentration of bile accept amount of lipase if neither volume nor concentration given	2	AO3 2.5.2f,h
7(c)(i)	fatty acid (production)		1	AO2 2.5.2f,h
7(c)(ii)	faster reaction / digestion (with bile) **or** pH decreases faster (with bile) **or** takes less time (with bile) **or** steeper fall / line (with bile)	allow use of data ignore easier	1	AO3 2.5.2f,h

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(c)(iii)	all fat / milk digested **or** same amount of fatty acids present **or** (lower pH) denatures the enzyme / lipase	allow all reactants used up ignore reference to neutralisation allow enzyme won't work at low pH do **not** allow enzyme killed	1	AO2 2.5.2f,h
Total			**7**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref
8			6	AO1 / AO2 / AO3 2.4, 2.4.1a,b,prac

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	The apparatus needed to measure the leaf is identified **or** the apparatus needed to measure light intensity is identified **or** an appropriate use of the tape measure is identified.	There is a description of a leaf being measured at different locations **or** light being measured at different locations.	There is a description of a leaf **and** light being measured at different locations **and** repetitions are included **or** a control variable is described **or** appropriate mathematical treatment of the data is described

examples of points made in the response:

- use of tape measure to produce transect
- transect placed coming out of shady area (eg woodland) into lighter area
- repeat transects
- samples at same height above ground
- samples at same aspect (N / E / S / W) on trees
- measurement of length, or width, of leaves using ruler
- measure several leaves at each location
- use of light meter to measure light intensity
- repeat measurements of light intensity on several days
- measure light intensities at same time of day
- calculate mean for each location
- plot graph of mean leaf length, or width, vs. light intensity

extra information

allow attempt to overcome other variables – eg soil water / soil pH / temperature

Total		6

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)(i)	in the chromosome(s) in the nucleus	ignore genes / alleles allow nuclei allow mitochondria	1 1	AO1 2.7.2f, 2.7.1b
9(a)(ii)	the DNA / chromosomes / genes are replicated / copied / multiplied / doubled / duplicated	allow DNA is cloned ignore same DNA / chromosomes / genes if unqualified	1	AO1 2.7.1a,c,n
9(b)(i)	1 / one		1	AO2 2.7.2c,e, 2.7.3a,c
9(b)(ii)	2 / two		1	AO2 2.7.2c,d, 2.7.3a,b
9(c)	**B**		1	AO3 2.7.2i
Total			**6**	

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Foundation Tier
June 2014

Additional Science
Unit Biology B2

BL2FP

F

Biology
Unit Biology B2

Tuesday 13 May 2014 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

A

Time allowed
- 1 hour

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

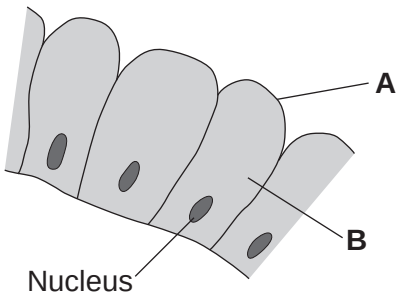
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Do not write outside the box

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

1 **Figure 1** shows some cells in the lining of the stomach.

Figure 1



1 (a) (i) Use words from the box to name structures **A** and **B**.

[2 marks]

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A .....

B .....

1 (a) (ii) What is the function of the nucleus?

Tick (✓) **one** box.

[1 mark]

To control the activities of the cell ☐

To control movement of substances into and out of the cell ☐

To release energy in respiration ☐

Do not write outside the box

1 (b) Draw **one** line from each part of the human body to its correct scientific name.

[3 marks]

Part of human body	Scientific name
Layer of cells lining the stomach	An organ
Stomach	An organism
Mouth, stomach, intestines, liver and pancreas	An organ system
	A tissue

6

Turn over for the next question

Do not write outside the box

2 Some students investigated the distribution of dandelion plants in a grassy field. The grassy field was between two areas of woodland.

Figure 2 shows two students recording how many dandelion plants there are in a 1 metre x 1 metre quadrat.

Figure 2

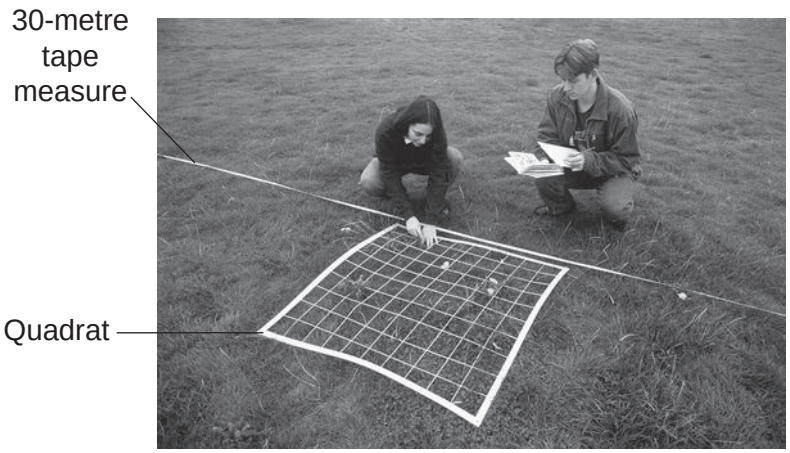


Figure 3 shows a section across the area studied and **Figure 4** shows a bar chart of the students' results.

Figure 3

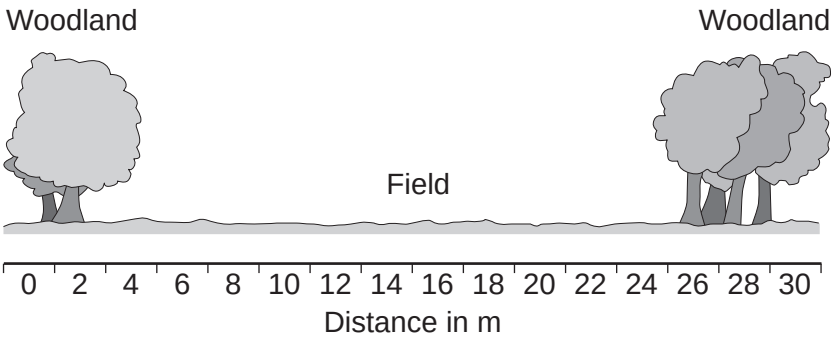
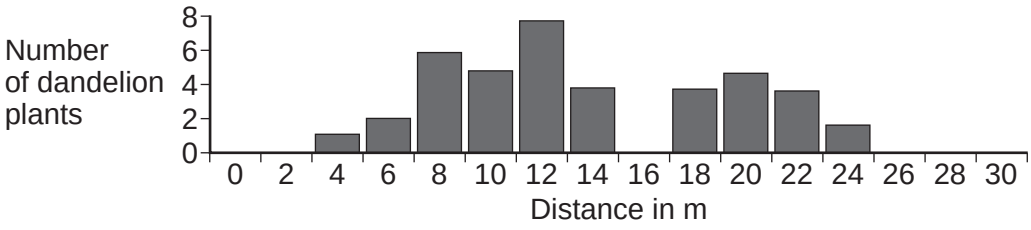


Figure 4



Do not write outside the box

2 (a) How did the students use the quadrat and the 30-metre tape measure to get the results in **Figure 4**?

Use information from **Figure 2**.

[3 marks]

.....

.....

.....

.....

.....

.....

2 (b) (i) Suggest **one** reason why the students found no dandelion plants under the trees.

[1 mark]

.....

.....

2 (b) (ii) Suggest **one** reason why the students found no dandelion plants at 16 metres.

[1 mark]

.....

.....

2 (c) The teacher suggested that it was **not** possible to make a valid conclusion from these results.

Describe how the students could improve the investigation so that they could make a valid conclusion.

[2 marks]

.....

.....

.....

.....

7

Do not write outside the box

3 Enzymes are used in many industrial processes.

3 (a) Draw a ring around the correct answer to complete each sentence.

3 (a) (i) An enzyme is

an antibody.

a catalyst.

a mineral.

[1 mark]

3 (a) (ii) In industry, enzymes are used so that reactions work well at

all pH values.

higher pressures.

lower temperatures.

[1 mark]

3 (a) (iii) In industry, the enzyme carbohydrase is used to change starch into

amino acids.

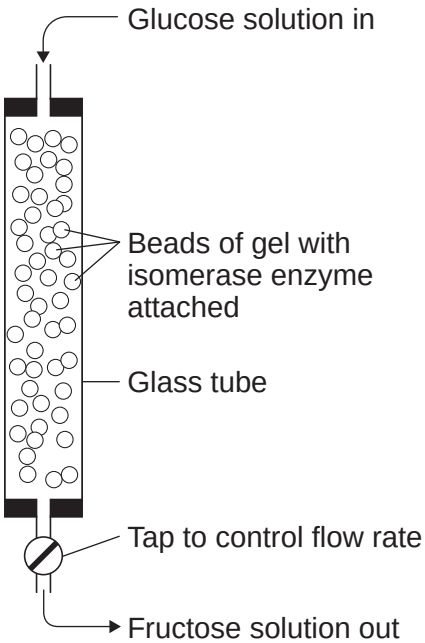
fatty acids.

sugar.

[1 mark]

3 (b) The enzyme isomerase changes glucose into fructose. In industry, the enzyme isomerase is attached to beads of gel in a glass tube, as shown in **Figure 5**.

Figure 5



Do not write outside the box

Give **two** advantages of using an enzyme attached to beads of gel.

Tick (✓) **two** boxes.

[2 marks]

The enzyme would be denatured. ☐

The enzyme can easily be used again. ☐

The fructose does not have any enzyme in it. ☐

The enzyme can also be used to pre-digest baby foods. ☐

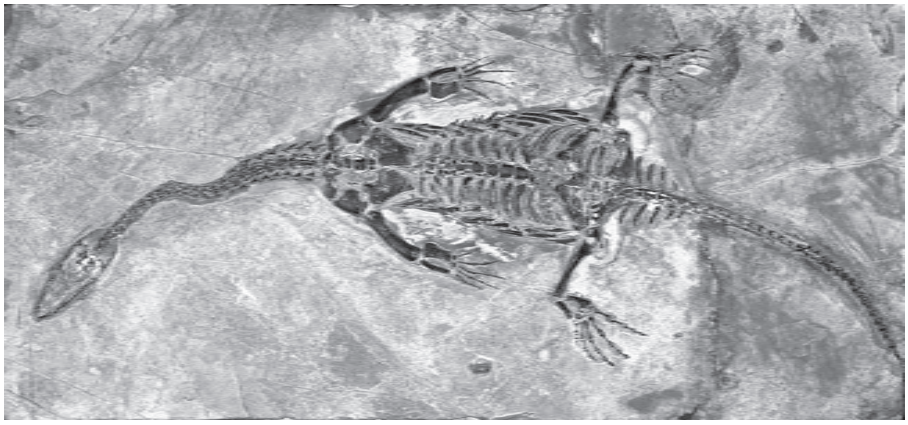
5

Turn over for the next question

Do not write outside the box

4 **Figure 6** shows a fossil of a sea animal called a Plesiosaur.
The Plesiosaur was alive about 135 million years ago.

Figure 6



4 (a) How can fossils give evidence for evolution?

Tick (✓) **one** box.

[1 mark]

Newer fossils are simpler than older fossils. ☐

Fossils show change over time. ☐

All fossils show the bones of animals. ☐

4 (b) Plesiosaurs lived in the sea. There was mud at the bottom of the sea.

Suggest how the fossil shown in **Figure 6** may have been formed after the animal died.

[3 marks]

.....

.....

.....

.....

.....

.....

Do not write outside the box

4 (c) **Figure 7** shows what scientists think a living Plesiosaur may have looked like.

Figure 7



Scientists think that the Plesiosaur had smooth skin, with no scales.

The scientists **cannot** be certain what the skin of a Plesiosaur was like.
Suggest why.

[1 mark]

.....

.....

4 (d) Plesiosaurs are now extinct.

Give **two** possible reasons why.

[2 marks]

1 .....

.....

2 .....

.....

7

Turn over ▶

Do not write outside the box

5 In sexual reproduction, an egg fuses with a sperm.

5 (a) (i) Draw a ring around the correct answer to complete the sentence.

[1 mark]

An egg and a sperm fuse together in the process of

cloning.
fertilisation.
mitosis.

5 (a) (ii) Egg cells and sperm cells each contain the structures given in the box.

chromosome	**gene**	**nucleus**

List these three structures in size order, starting with the smallest.

[2 marks]

1 ..... (smallest)

2 .....

3 ..... (largest)

5 (a) (iii) The egg and the sperm contain genetic material.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

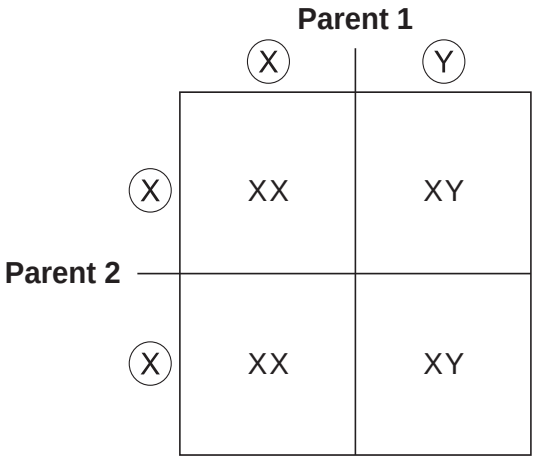
The genetic material is made of

carbohydrate.
DNA.
protein.

Do not write outside the box

5 (b) **Figure 8** shows the inheritance of **X** and **Y** chromosomes.

Figure 8



5 (b) (i) **On Figure 8**, draw a tick (✓) on the part of the diagram that shows a sperm cell.

[1 mark]

5 (b) (ii) What is the chance of having a female child?

Give the reason for your answer.

[2 marks]

.....

.....

.....

.....

7

Turn over for the next question

Do not write outside the box

6 (a) A student carried out the following investigation using a plant with variegated leaves.
A variegated leaf has green and white stripes.

The student:

- left the plant in the dark for 3 days to remove the starch
- fixed two pieces of card to a leaf on the plant
- left the plant in the light for 2 days
- removed the leaf from the plant
- tested the leaf for starch.

Figure 9 shows how the two pieces of card were attached to the leaf.

Figure 9

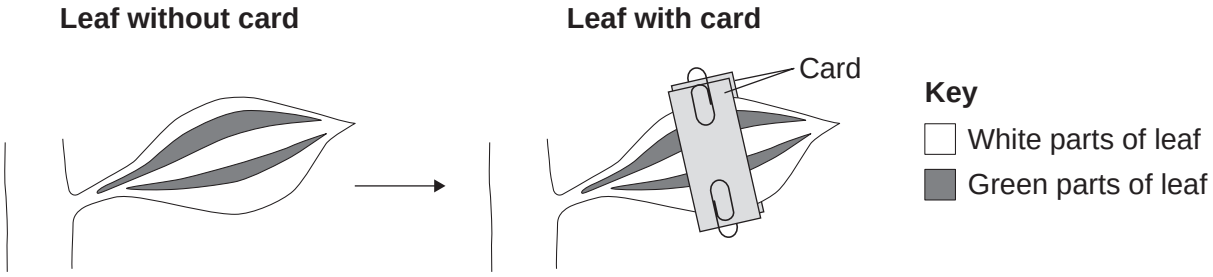
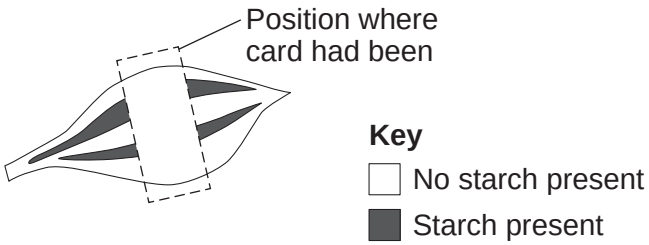


Figure 10 shows the same leaf after 2 days in the light.
The leaf has been tested for starch.

Figure 10



Give **two** conclusions from this investigation.

Tick (✓) **two** boxes.

[2 marks]

Carbon dioxide is needed for photosynthesis. ☐

Chlorophyll is needed for photosynthesis. ☐

Light is needed for photosynthesis. ☐

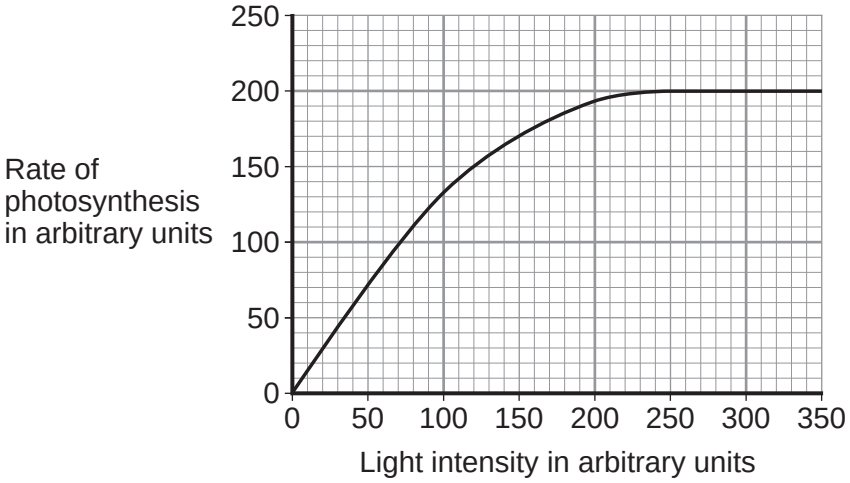
Water is needed for photosynthesis. ☐

Do not write outside the box

6 (b) Scientists investigated the effect of light intensity on the rate of photosynthesis.

Figure 11 shows the scientists' results.

Figure 11



Describe the effect of increasing light intensity on the rate of photosynthesis.
You should include numbers from **Figure 11** in your description.

[3 marks]

.....

.....

.....

.....

.....

.....

6 (c) At a light intensity of 250 arbitrary units, light is **not** a limiting factor of photosynthesis.

6 (c) (i) What is the evidence for this in **Figure 11**?

[1 mark]

.....

.....

6 (c) (ii) Give **two** factors that could be limiting the rate of photosynthesis at a light intensity of 250 arbitrary units.

[2 marks]

1 .....

2 .....

8

Turn over ▶

Do not write outside the box

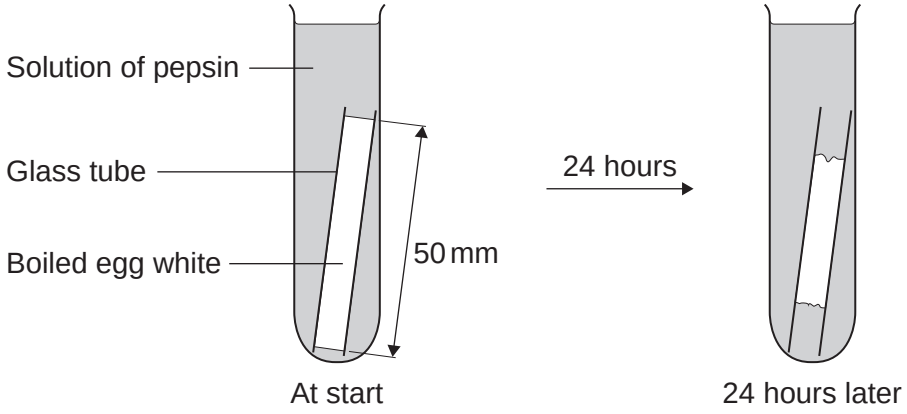
7 Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

Figure 12 shows one of the test tubes, at the start and at the end of the 24 hours.

Figure 12



7 (a) (i) Name the product of protein digestion.

[1 mark]

.....

7 (a) (ii) What type of enzyme digests protein?

Tick (✓) **one** box.

[1 mark]

amylase ☐

lipase ☐

protease ☐

Do not write outside the box

7 (b) The egg white in each tube was 50 mm long at the start of the investigation. **Table 1** shows the students' results.

Table 1

pH	Length in mm of boiled egg white after 24 hours
1	38
2	20
3	34
4	45
5	50
6	50
7	50

7 (b) (i) At which pH did the pepsin work best?

[1 mark]

pH .....

7 (b) (ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

[2 marks]

.....

.....

.....

.....

7 (b) (iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

[2 marks]

.....

.....

.....

.....

Question 7 continues on the next page

Turn over ▶

Do not write outside the box

7 (c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

[1 mark]

.....

8

Do not write outside the box

8 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

[6 marks]

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Extra space .....

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Do not write outside the box

9 **Figure 13** shows an athlete running on a treadmill.

Figure 13



After running for several minutes, the athlete's leg muscles began to ache.
This ache was caused by a high concentration of lactic acid in the muscles.

9 (a) The equation shows how lactic acid is made.

glucose ⟶ lactic acid (+ energy)

Name the process that makes lactic acid in the athlete's muscles.

[1 mark]

.....

9 (b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

In the investigation:

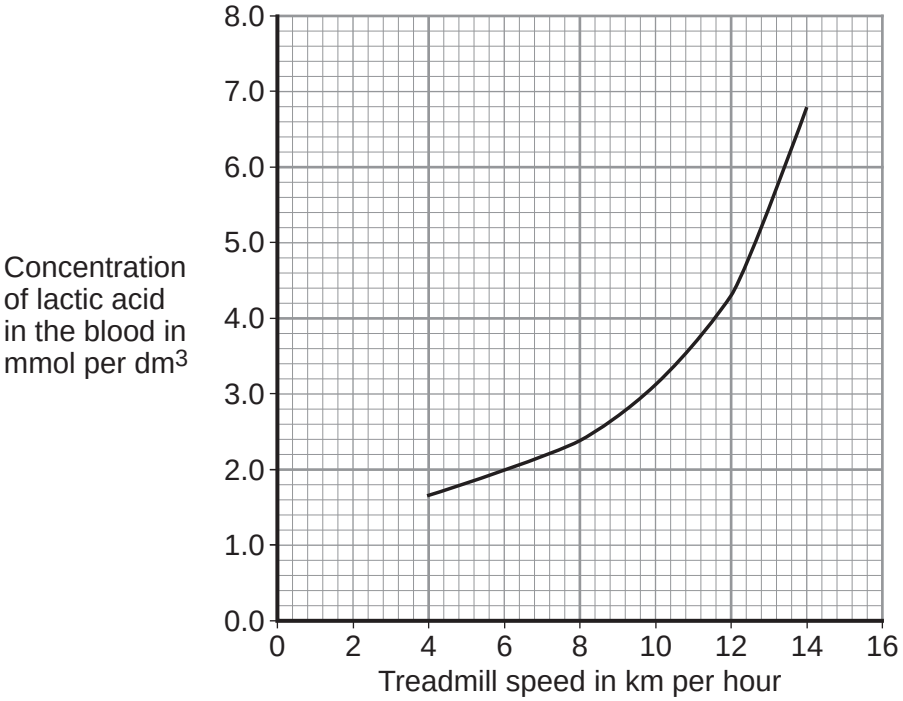
- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

The investigation was repeated for different running speeds.

Figure 14 shows the scientists' results.

Do not write outside the box

Figure 14



9 (b) (i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

[2 marks]

.....

.....

.....

Answer = ... mmol per dm^3

9 (b) (ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

[3 marks]

.....

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6

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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AQA Qualifications

GCSE
ADDITIONAL SCIENCE / BIOLOGY

BL2FP
Mark scheme

4405 / 4401
June 2014

Version: 1.0 Final

STEMUP.CO.UK

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

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Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Quality of Written Communication and levels marking

In Question 8 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

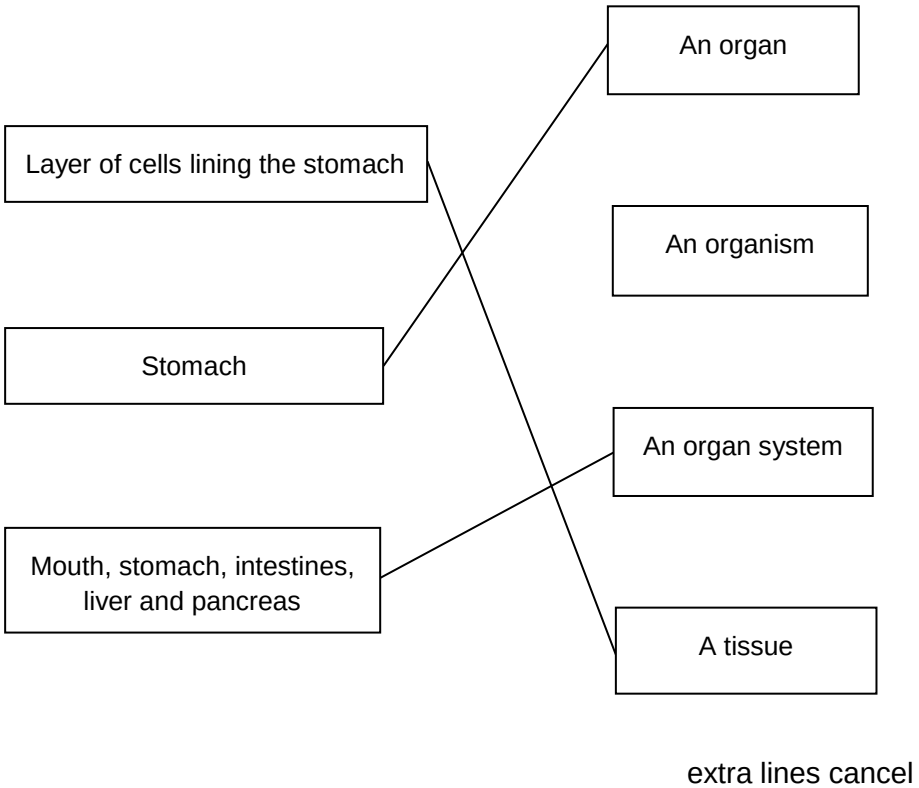
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

Question	Answers	Extra information	Mark	AO / spec ref.
1(a)(i)	A = (cell) membrane B = cytoplasm	 do **not** accept cytoplast	1 1	AO1 2.1.1a
1(a)(ii)	To control the activities of the cell		1	AO1 2.1.1a
1(b)	 extra lines cancel		3	AO1 2.2.1b, c,d
Total			**6**	

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Question	Answers	Extra information	Mark	AO / spec ref.
2(a)	any **three** from: • place 30-m tape measure across field / from one wood to the other • place quadrat(s) next to the tape • count / record the number / amount of dandelions / plants in the quadrat • repeat every 2 metres	ignore 'record the results' ignore measures / estimates dandelions allow every metre / at regular intervals	3	AO2 2.4.1b
2(b)(i)	low light / it is shady **or** not enough water / ions / nutrients **or** wrong pH of soil	allow no light ignore sun / rays accept correct named ion ignore no water / ions / nutrients accept competition with trees for light / water / ions ignore competition for space and competition unqualified accept soil too acidic / too alkaline ignore temperature	1	AO2 2.4.1a
2(b)(ii)	sensible suggestion for a small area, eg chance variation / anomaly / poisoned by animal waste / wrong pH of soil / eaten (by animals) / cut down / footpath		1	AO3 2.4.1a
2(c)	repeat (transect) / compare with the results of other groups at different / random location(s) / elsewhere (across the field)	allow 'do it in two different locations' for 2 marks do **not** allow 'in other fields'	1 1	AO3 2.4, 2.4.1b
Total			**7**	

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Question	Answers	Extra information	Mark	AO / spec ref.
3(a)(i)	a catalyst		1	AO1 2.5.1b
3(a)(ii)	lower temperatures		1	AO1 2.5.2j
3(a)(iii)	sugar		1	AO1 2.5.2i
3(b)	The enzyme can easily be used again The fructose does not have any enzyme in it		1 1	AO2 2.5.2i
Total			**5**	

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Question	Answers	Extra information	Mark	AO / spec ref.
4(a)	fossils show change over time.		1	AO1 2.8
4(b)	covered in sediment / mud or sinks into the mud soft parts decay / are eaten **or** bones / hard parts / shell do not decay minerals enter bones / parts are replaced by minerals / mineralisation	 accept turns to rock allow 'is an impression' / 'imprint' / 'cast'	1 1 1	AO1 / AO2 2.8.1a, b
4(c)	skin is soft / skin not preserved / not fossilised / skin decays	accept not enough / no evidence / no-one has seen one allow 'this fossil is only bones'	1	AO3 2.8, 2.8.1c
4(d)	any **two** examples of: physical factors such as volcanic activity (allow volcanoes) / earthquakes / asteroid (collision) / ice age / temperature change **and / or** biological factors such as predators / disease / named pathogen / competition/ lack of food / mates / cyclical nature of speciation / isolation / lack of habitat or habitat change	accept 2 physical factors or 2 biological factors or one of each for full marks ignore pollution if no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for 1 mark	2	AO1 2.8.1e
Total			**7**	

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Question	Answers	Extra information	Mark	AO / spec ref.
5(a)(i)	fertilisation		1	AO1 2.7.1i
5(a)(ii)	in sequence: 1 gene 2 chromosome 3 nucleus	accept 1 next to gene, 2 next to chromosome and 3 next to nucleus in box allow 1 mark for smallest **or** largest in correct position	2	AO2 2.1.1a, 2.7.1b,e, 2.7.2f,g
5(a)(iii)	DNA		1	AO1 2.7.2f
5(b)(i)	On diagram: tick drawn next to **X** and / or **Y** from Parent 1	tick(s) must be totally outside grid squares allow ticks around "parent 1" extra ticks elsewhere cancel	1	AO1 2.7, 2.7.2a,b
5(b)(ii)	0.5 / ½ / 50% / 1:1 / 50:50 / 1 in 2 2 (out of 4) boxes are **XX** **or** half of the sperm contain an **X**-chromosome	allow 2/4 / 2 in 4 / 2 out of 4 / 'even(s)' / 'fifty – fifty' do **not** allow 1:2 or '50 / 50' or '50 – 50' allow **XY** is male and 2 (out of 4) boxes are **XY**	1 1	AO2 2.7, 2.7.2a,b
Total			**7**	

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Question	Answers	Extra information	Mark	AO / spec ref.
6(a)	chlorophyll is needed for photosynthesis light is needed for photosynthesis		1 1	AO3 2.3.1b, e
6(b)	increases levels off / reaches a maximum / remains constant / stays the same / plateaus goes up to / reaches a maximum / levels off at (a rate of) 200 (arbitrary units) **or** levels off at 225 – 240 (light units)	 do **not** allow stops / stationary / peaks allow stops increasing ignore references to other numerical values	1 1 1	AO2 2.3.1c, d
6(c)(i)	higher light intensity does not increase rate of photosynthesis	accept the graph stays level (above this value) allow stops increasing allow the rate of photosynthesis stay the same (above this value)	1	AO3 2.3.1c, d
6(c)(ii)	any **two** from: • carbon dioxide (concentration) • temperature / heat • (amount of) chlorophyll / chloroplasts	 allow water allow ions / nutrients ignore ref to surface area of the leaf	2	AO1 2.3.1c, d
Total			**8**	

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Question	Answers	Extra information	Mark	AO / spec ref.
7(a)(i)	amino acid(s)	accept peptide(s) do **not** allow polypeptide(s)	1	AO1 2.5.2e
7(a)(ii)	protease		1	AO1 2.5.2e
7(b)(i)	2		1	AO3 2.5.2b, g
7(b)(ii)	repeat using smaller pH intervals between pH1 and pH3	do not allow other enzyme / substrate allow smaller intervals on both sides of / around pH2 allow smaller intervals on both sides of / around answer to (b)(i)	1 1	AO3 2.5.2b
7(b)(iii)	<u>enzyme / pepsin</u> denatured / shape changed <u>enzyme / pepsin</u> no longer fits (substrate)	do **not** allow enzyme killed allow enzyme 'destroyed' allow enzyme / pepsin does not work	1 1	AO1 / AO2 2.5.2a, b
7(c)	hydrochloric (acid)	allow phonetic spelling accept HCl allow HCL ignore hcl do **not** allow incorrect formula – e.g. H_2Cl / HCl_2	1	AO1 2.5.2g
Total			**8**	

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<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / spec ref.</th></tr>
<tr><td>8</td><td></td><td></td><td>6</td><td rowspan="5">AO1 2.1.2a,b, c, 2.2.1d, 2.3.1a,b, c,g, 2.6.1</td></tr>
<tr><td colspan="4">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a ‘best-fit’ approach to the marking.</td></tr>
<tr><td colspan="4"><table>
<tr><th>0 marks</th><th>Level 1 (1–2 marks)</th><th>Level 2 (3–4 marks)</th><th>Level 3 (5–6 marks)</th></tr>
<tr><td>No relevant content.</td><td>An example is given of a named substance
or
a process
or
there is an idea of why diffusion is important eg definition.</td><td>At least one example of a substance is given
and
correctly linked to a process in either animals or plants.</td><td>There is a description of a process occurring in either animals or plants that is correctly linked to a substance
and
a process occurring in the other type of organism that is correctly linked to a substance.</td></tr>
</table></td></tr>
<tr><td colspan="4">examples of points made in the response
Importance of diffusion:
• to take in substances for use in cell processes
• products from cell processes removed

Examples of processes and substances:
• for gas exchange / respiration: O_2 in / CO_2 out
• for gas exchange / photosynthesis: CO_2 in / O_2 out
• food molecules absorbed: glucose, amino acids, etc
• water absorption in the large intestine
• water lost from leaves / transpiration
• water absorption by roots
• mineral ions absorbed by roots</td><td>extra information

Description of processes might include:
• movement of particles / molecules / ions
• through a partially permeable membrane
• (movement of substance) down a concentration gradient

osmosis: turgor / support / stomatal movements</td></tr>
<tr><td>Total</td><td></td><td></td><td>6</td><td></td></tr>
</table>

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Question	Answers	Extra information	Mark	AO / spec ref.
9(a)	anaerobic respiration	allow phonetic spelling	1	AO1 2.6.2a, b,d
9(b)(i)	4.4	4.2, 4.3, 4.5 or 4.6 with figures in tolerance (6.7 to 6.9 and 2.3 to 2.5) and correct working gains 2 marks 4.2, 4.3, 4.5 or 4.6 with no working shown or correct working with one reading out of tolerance gains 1 mark correct readings from graph in the ranges of 6.7 to 6.9 **and** 2.3 to 2.5 but no answer / wrong answer gains 1 mark	2	AO2 2.6.2a, b,d
9(b)(ii)	more energy is needed / used / released (at 14 km per hour) not enough oxygen (can be taken in / can be supplied to muscles) so more anaerobic respiration (to supply the extra energy) **or** more glucose changed to lactic acid	do **not** allow energy production ignore work allow reference to oxygen debt do **not** allow less / no oxygen allow not enough aerobic respiration	1 1 1	AO1 / AO2 2.6.2a, b,d
Total			**6**	

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Foundation Tier
June 2013

Additional Science BL2FP
Unit Biology B2

F

Biology
Unit Biology B2

Tuesday 14 May 2013 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 1 hour

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9(b) should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

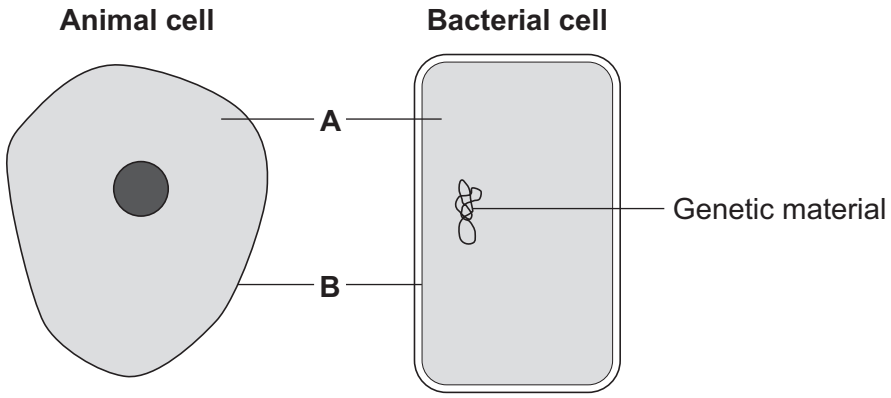
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

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

1 The diagrams show an animal cell and a bacterial cell.



1 (a) (i) Structures **A** and **B** are found in both the animal cell and the bacterial cell.

Use words from the box to name structures **A** and **B**.

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A .....

B .....

(2 marks)

1 (a) (ii) Both cells contain genetic material.

Name the structure in the animal cell that contains genetic material.

.....

(1 mark)

Do not write outside the box

1 (b) **List A** gives three structures found in animal cells.

List B gives four functions of cell structures.

Draw **one** line from each structure in **List A** to its correct function in **List B**.

List A – Structure	List B – Function
	Controls what substances enter the cell
Cell membrane	
	Photosynthesis
Mitochondrion	
	Protein synthesis
Ribosome	
	Respiration

(3 marks)

6

Turn over for the next question

Do not write outside the box

2 Evolution is the development of new species over time.
Evidence for evolution comes from *fossils*.

2 (a) (i) What is a *fossil*?

.....

.....

.....

.....

(2 marks)

2 (a) (ii) How can fossils give evidence for evolution?

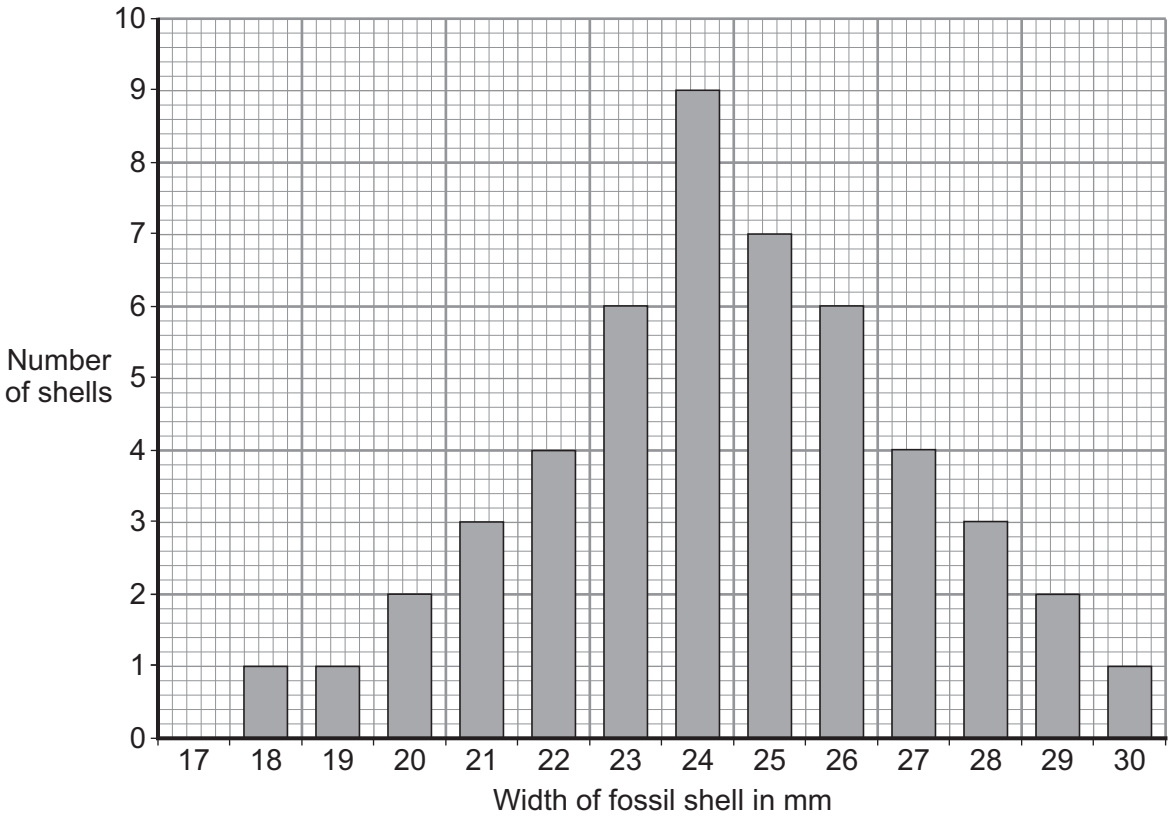
.....

.....

(1 mark)

2 (b) A species of snail lived 400 million years ago.
Scientists measured the width of 49 fossil shells of this snail.

The bar chart shows the scientists' results.



Do not write outside the box

2 (b) (i) What is the range of the values for the width of the fossil shells for this species?

From ..... to .....

(1 mark)

2 (b) (ii) The scientists **cannot** be sure that this is the full range of fossil shell widths for this species.

Why?

.....

.....

(1 mark)

2 (c) This species of snail became extinct 380 million years ago.

Give **one** possible reason why species become extinct.

.....

.....

(1 mark)

6

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

3 (a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	Only in mitosis (✓)	Only in meiosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2 marks)

3 (a) (ii) Name the organ that produces gametes (sex cells) in:

a man .....

a woman. .....

(2 marks)

3 (b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

3 (b) (i) a man .....

(1 mark)

3 (b) (ii) a woman? .....

(1 mark)

3 (c) A man and a woman decide to have a child.

What is the chance that the child will be a boy? .....

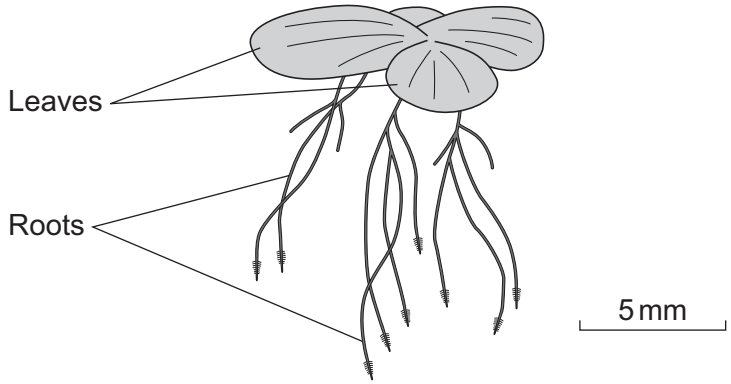
(1 mark)

7

Do not write outside the box

4 Duckweed is a plant. Duckweed grows in ponds. The leaves of duckweed float on the surface of the water and its roots hang down in the water.

The drawing shows a duckweed plant.



4 (a) Duckweed roots absorb nitrate ions from the water.
The nitrate ions help the duckweed to grow.

Draw a ring around the correct answer to complete the sentence.

Duckweed needs nitrate ions to make

carbohydrate.

fat.

protein.

(1 mark)

4 (b) Some students grew duckweed plants in three different solutions of mineral ions, **A**, **B** and **C**, and in distilled water (**D**).

Table 1 shows the concentrations of mineral ions in each of **A**, **B**, **C** and **D** at the start of the investigation.

Table 1

Mineral ion	**Concentration of mineral ions in mg per dm^3 at the start of the investigation**			
	A	**B**	**C**	**D**
Nitrate	1000	4	4	0
Phosphate	300	0	0	0
Magnesium	200	84	24	0

Do not write outside the box

The students counted the number of duckweed leaves in **A**, **B**, **C** and **D** at the start of the investigation and after 28 days.

Table 2 shows their results.

Table 2

	A	**B**	**C**	**D**
Number of leaves at start	4	4	4	4
Number of leaves after 28 days	50	27	14	6

4 (b) (i) Using **Table 1** and **Table 2**, describe the effect of magnesium ions on the growth of duckweed.

.....

.....

(1 mark)

4 (b) (ii) Solution **A** contained the highest concentration of nitrate ions.

One student said, 'The results show that nitrate ions are needed for the growth of duckweed.'

What evidence in **Table 2** supports what the student said?

.....

.....

(1 mark)

4 (c) The students measured the growth of the duckweed by counting the number of leaves.

4 (c) (i) Suggest a better method of measuring the growth of the duckweed.

.....

.....

(1 mark)

4 (c) (ii) Suggest why your method is better than the students' method.

.....

.....

(1 mark)

5

Turn over ▶

Do not write outside the box

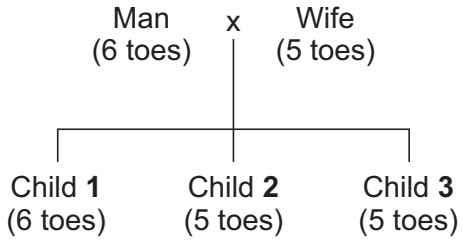
5 Polydactyly is an inherited condition. Polydactyly is controlled by a dominant allele.

The photograph shows the foot of a baby with polydactyly.



A man and his wife have three children. The man has polydactyly.

The diagram shows the inheritance of polydactyly in this family.
The diagram also shows the number of toes each person has on each foot.



In the rest of this question, the following symbols are used to represent alleles.

D = allele for polydactyly (6 toes on each foot)
d = allele for 5 toes on each foot

5 (a) (i) How many alleles for the number of toes will there be in **one** sperm cell? ☐

(1 mark)

5 (a) (ii) Complete the sentence.

A sperm cell joins with an egg cell in a process called ..... .

(1 mark)

Do not write outside the box

5 (b) (i) What combination of alleles does the man have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (b) (ii) What combination of alleles does the man's wife have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (c) Draw a ring around the correct answer to complete each sentence.

5 (c) (i) The man and his wife plan to have a fourth child.

The probability that this child will have 6 toes on each foot is

1 in 2.

1 in 3.

1 in 4.

(1 mark)

5 (c) (ii) When Child **2** grows up, he marries a woman with 5 toes on each foot.

The probability that their first child will have 6 toes on each foot is

0.

1 in 2.

1 in 4.

(1 mark)

6

Turn over ▶

Do not write outside the box

6 (a) Use words from the box to complete the equation for aerobic respiration.

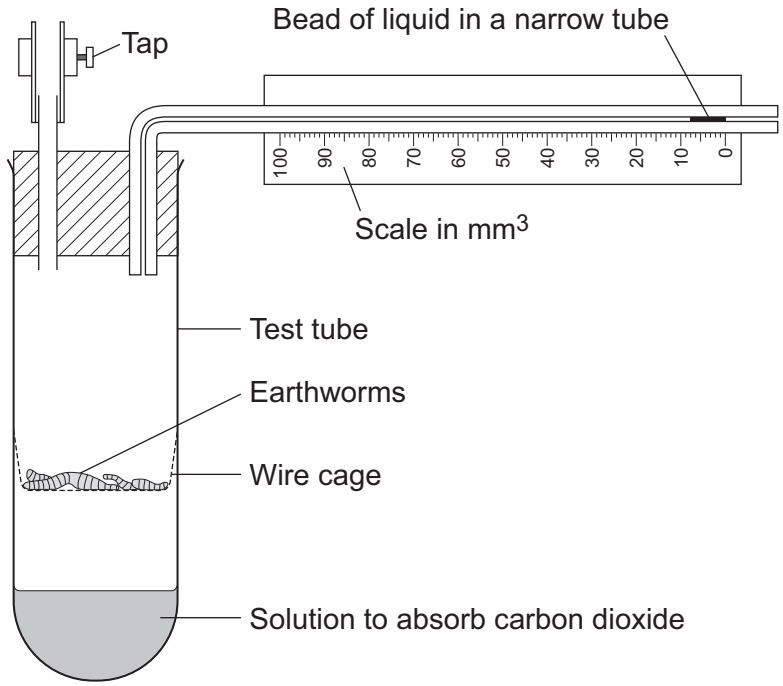
alcohol	glucose	lactic acid	water

..... + oxygen ⟶ carbon dioxide + ... (+ energy)

(2 marks)

6 (b) Some students investigated the effect of temperature on the rate of aerobic respiration in earthworms.

The diagram shows the apparatus the students used.
When the tap is closed, the bead of liquid moves to the left as the earthworms take in oxygen.



The students put the test tube into a water bath at 20 °C for 10 minutes.
They left the tap open during this time.

Do not write outside the box

Why did the students put the test tube in the water bath at 20 °C for 10 minutes?

Tick (✓) **one** box.

Because the air contains more oxygen at 20 °C. ☐

Because the air contains less carbon dioxide at 20 °C. ☐

So the earthworms' body temperature would change to 20 °C. ☐

(1 mark)

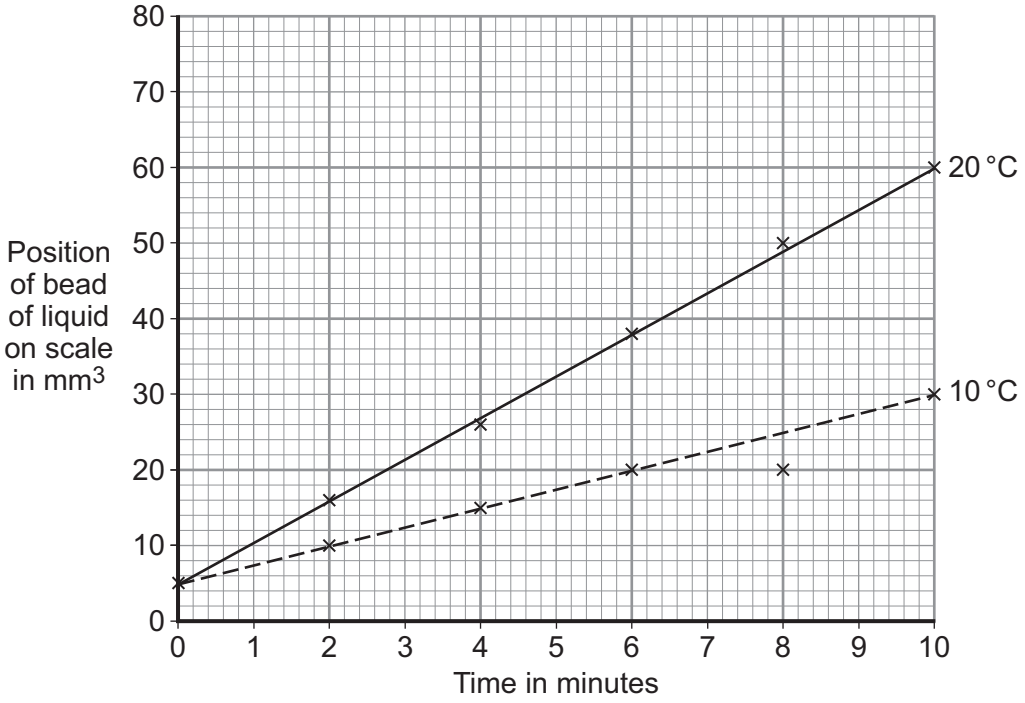
Question 6 continues on the next page

Do not write outside the box

6 (c) The students then:

- closed the tap
- started a stopwatch
- recorded the position of the bead of liquid every 2 minutes for 10 minutes
- repeated the experiment at 10 °C.

The graph shows the students' results.



6 (c) (i) How much oxygen did the earthworms take in during the 10 minutes at 20 °C?

Use information from the graph to work out your answer.

.....

.....

.....

Volume of oxygen taken in = ... mm^3

(2 marks)

Do not write outside the box

6 (c) (ii) The earthworms took in this volume of oxygen in 10 minutes.

Use your answer from part **(c)(i)** to calculate how much oxygen the earthworms took in each minute.

.....

.....

Volume of oxygen taken in = ... mm^3 per minute

(1 mark)

6 (c) (iii) The earthworms took in less oxygen each minute at 10 °C than they took in at 20 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

6 (d) When drawing the line on the graph for the experiment at 10 °C, the students ignored the reading at 8 minutes.

6 (d) (i) Suggest why they ignored the reading at 8 minutes.

.....

.....

(1 mark)

6 (d) (ii) One student suggested they should repeat the experiment twice more at each temperature.

How would repeating the experiment improve the investigation?

.....

.....

(1 mark)

10

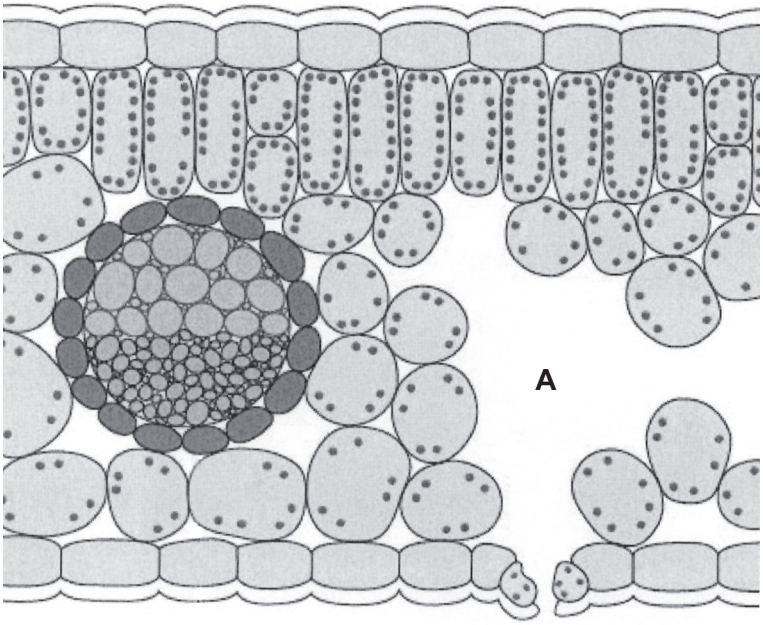
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ANSWER IN THE SPACES PROVIDED

Do not write outside the box

7 The diagram shows a section through a plant leaf.



7 (a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	**mesophyll**	**phloem**	**xylem**

..... and .....

(1 mark)

7 (b) Gases *diffuse* between the leaf and the surrounding air.

7 (b) (i) What is *diffusion*?

.....

.....

.....

.....

(2 marks)

7 (b) (ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

.....

(1 mark)

4

Turn over ▶

Do not write outside the box

8 Some students were asked to investigate the distribution of clover in a field of grass. They noticed that the clover grew in patches amongst the grass.

8 (a) The students decided to use quadrats.

Describe how the students should decide where to place the quadrats to investigate the distribution of the clover.

.....

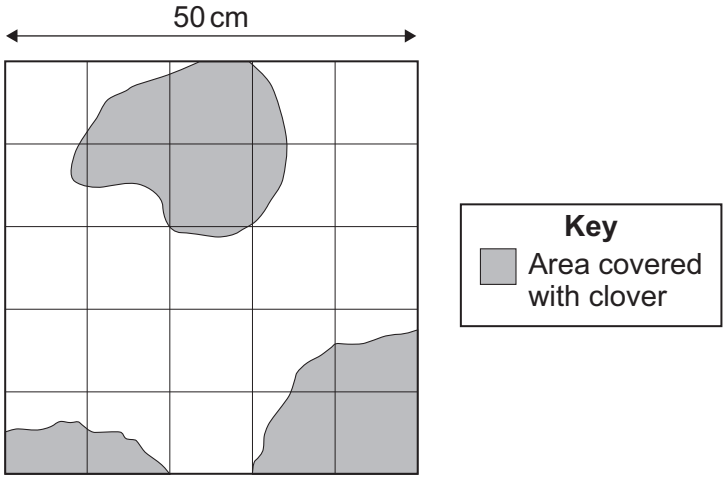
.....

.....

.....

(2 marks)

8 (b) The diagram shows one of the quadrats the students used.



8 (b) (i) Estimate the number of squares of the quadrat covered with clover.

.....

.....

Number of squares = ...

(1 mark)

Do not write outside the box

8 (b) (ii) Describe how you worked out your answer to part **(b)(i)**.

.....

.....

.....

(1 mark)

8 (b) (iii) Use your answer from part **(b)(i)** to calculate the percentage of the quadrat covered by the clover.

.....

.....

.....

Answer = ... %

(2 marks)

8 (c) Suggest **one** factor that could account for the distribution of the clover plants.

.....

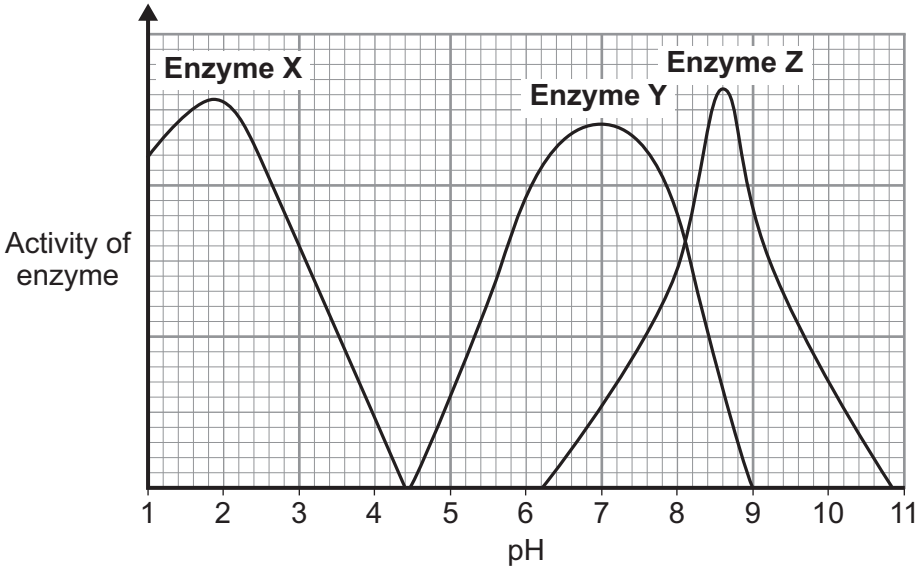
(1 mark)

7

Turn over for the next question

Do not write outside the box

9 (a) The graph shows the effect of pH on the activities of three enzymes, **X**, **Y** and **Z**.
These enzymes help to digest food in the human digestive system.
Each enzyme is produced by a different part of the digestive system.



9 (a) (i) What is the optimum (best) pH for the action of enzyme **Z**?

.....

(1 mark)

9 (a) (ii) The stomach makes a substance that gives the correct pH for enzyme action in the human stomach.

Name this substance. .....

(1 mark)

9 (a) (iii) Which enzyme, **X**, **Y** or **Z**, will work best in the human stomach?

.....

(1 mark)

Do not write outside the box

9 (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.

Describe how.

To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

.....

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(6 marks)

9

END OF QUESTIONS

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Version 1.0



General Certificate of Secondary Education
June 2013

Additional Science / Biology BL2FP

(Specification 4408 / 4401)

Unit 2: Biology 2

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

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Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

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Quality of Written Communication and levels marking

In Question 9(b) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

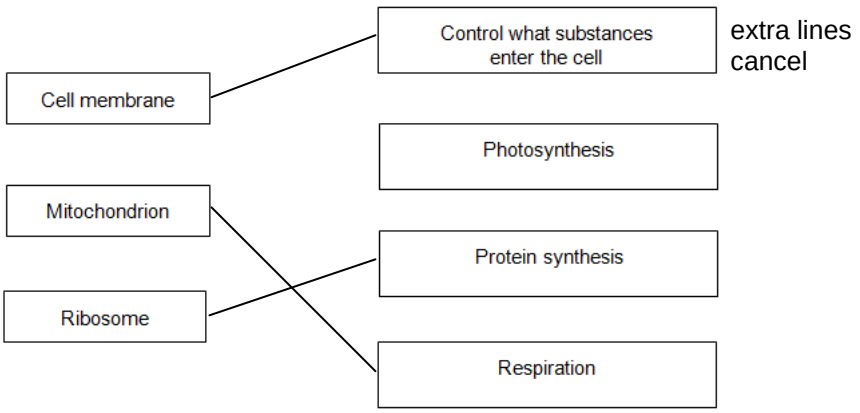
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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Question 1

question	answers	extra information	mark
1(a)(i)	A = cytoplasm B = (cell) membrane		1 1
1(a)(ii)	nucleus	accept chromosome / DNA / genes accept phonetic.	1
1(b)		extra lines cancel	3
Total			**6**

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Question 2

question	answers	extra information	mark
2(a)(i)	(remains of) an organism / a bone / a shell / hard part of an organism / part of organism that does not decay / impression of an organism / footprint / burrow / rootlet trace		1
	further detail – eg in rock / ice/ amber / mineralisation **or** from a long time ago / many years ago	if number, > 1000 years ignore hundreds	1
2(a)(ii)	older fossils are simple(r) **or** fossils show change / adaptation with time	must make ref to change and time allow deeper fossils are simple(r)	1
2(b)(i)	18 to 30	allow 30 to 18 allow 12 ignore units	1
2(b)(ii)	small sample	allow <u>only</u> 49 shells / not representative / not enough evidence allow not all fossils found	1
2(c)	example of a physical factor such as flooding, volcanic activity (allow volcanoes) asteroid collisions, drought, ice age / temperature change **or** example of a biological factor such as predators / disease / competition / lack of food or mates / cyclical nature of speciation / isolation / lack of habitat or habitat change	allow natural disaster / climate change / weather change / catastrophic event / environmental change ignore human factors eg hunting / pollution	1
Total			**6**

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Question 3

<table>
<tr><th>question</th><th>answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>3(a)(i)</td><td>
<table>
<tr><th>Feature</th><th>Mitosis only</th><th>Meiosis only</th></tr>
<tr><td>Produces new cells during growth and repair</td><td>✓</td><td></td></tr>
<tr><td>Produces gametes (sex cells)</td><td></td><td>✓</td></tr>
<tr><td>Produces genetically identical cells</td><td>✓</td><td></td></tr>
</table>
All 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 marks
</td><td></td><td>2</td></tr>
<tr><td>3(a)(ii)</td><td>(a man) testis / testes
(a woman) ovary / ovaries</td><td>accept testicle(s)
do not accept ‘ova’ / ovule</td><td>1
1</td></tr>
<tr><td>3(b)(i)</td><td>XY / YX
or
X and Y</td><td></td><td>1</td></tr>
<tr><td>3(b)(ii)</td><td>XX
or
X and X or 2 X’s</td><td>accept X</td><td>1</td></tr>
<tr><td>3(c)</td><td>½ / 0.5 / 50% / 1:1 / 1 in 2</td><td>do not accept 1:2 / 50/50
allow 50:50
allow 2 in 4</td><td>1</td></tr>
<tr><td>Total</td><td></td><td></td><td>7</td></tr>
</table>

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Question 4

question	answers	extra information	mark
4(a)	protein		1
4(b)(i)	(more) magnesium gives more growth / more leaves / more duckweed	if converse must be clear that less magnesium gives less growth	1
4(b)(ii)	**A** gave highest number of leaves / plants **or** more than others **or** **A** gave most growth / most duckweed **or** more than others	it equals '**A**' use of numbers must compare **A** with at least one other allow faster / fastest / better / best growth allow more growth with nitrate / less growth without nitrate do not allow 'no' growth without nitrate	1
4(c)(i)	mark (c) as a whole sensible method: e.g. mass / weighing	 ignore dry or fresh allow other sensible method involving measuring eg length of roots – ignore 'size' of roots or measure roots unqualified	1
4(c)(ii)	corresponding explanation: e.g. includes roots / includes whole plant **or** leaves vary in size **or** (length / mass / surface area given in c(i)) is a continuous variable	ignore accuracy	1
Total			**5**

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Question 5

question	answers	extra information	mark
5(a)(i)	1		1
5(a)(ii)	fertilisation / fusion	allow sexual reproduction allow fertilise / fuse ignore joining	1
5(b)(i)	**Dd**		1
5(b)(ii)	**dd**		1
5(c)(i)	1 in 2		1
5(c)(ii)	0		1
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)	LHS – glucose RHS – water	 allow H_2O / H20	1 1
6(b)	so the earthworms' body temperature would change to 20 °C		1
6(c)(i)	56 or 55 or 54	if incorrect answer given accept 60 - 5 for **1** mark or 60 – 6 for **1** mark or 60 – 4 for **1** mark	2
6(c)(ii)	one-tenth of answer to (c)(i) eg 5.5		1
6(c)(iii)	(at 10 °C / lower temperature): lower rate of respiration worms less active / worms release less energy / worms use less energy	 allow chemical reactions slower or enzymes less active ignore breathing do not allow anaerobic 	 1 1
6(d)(i)	anomalous result / not in line with other data / does not fit the pattern		1
6(d)(ii)	more representative / more reliable / can check 'repeatability' / see if get similar values / identify anomalies	ignore valid / more fair ignore reproducible ignore 'to remove' anomalies do not accept more accurate or more precise	1
Total			**10**

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Question 7

question	answers	extra information	mark
7(a)	xylem **and** phloem	either order allow words ringed in box allow mis-spelling if unambiguous	1
7(b)(i)	movement / spreading out of particles / molecules / ions / atoms	ignore names of substances / 'gases'	1
	from high to low concentration	accept down concentration gradient ignore 'along' / 'across' gradient ignore 'with' gradient	1
7(b)(ii)	oxygen / water (vapour)	allow O_2/O2 ignore O^2/O allow H_2O/H2O ignore H^2O	1
Total			**4**

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Question 8

question	answers	extra information	mark
8(a)	chose places randomly method of obtaining randomness, e.g. (grid and) random numbers	 allow thrown qualified e.g. over shoulder, eyes shut allow max 1 for mention of a transect with sampling at regular or random intervals	1 1
8(b)(i)	7 **or** 8	allow fractions / decimals between 7 and 8	1
8(b)(ii)	count number of whole squares and add estimate of area covered by part squares	allow reference to counting squares with ½ cover or more allow clear working on diagram and / or (b)(i)	1
8(b)(iii)	28 – 32 (in range)	allow ecf if answer incorrect allow **1** mark for reasonable reference to divided by 25 or multiplied by 4	2
8(c)	nutrients / minerals / ions / fertiliser / water	allow light / pH / trampling / soil texture / grazing / mowing / weed killer / where seeds originally fell ignore pollution / soil / competition if unqualified ignore temperature / wind	1
Total			**7**

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Question 9

question	answers	extra information	mark
9(a)(i)	8.6	accept value in range 8.5 to 8.7	1
9(a)(ii)	hydrochloric acid / HCl	accept HCL accept hydrogen chloride ignore hcl / etc.	1
9(a)(iii)	X		1

Question 9 continues on the next page . . .

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Question 9 continued . . .

9(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5.			6
0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**	
No relevant content.	There is a simple description of part of a process or a reference to at least one of: mechanical digestion, lipase, product of enzyme action, bile, site of production or site of digestion	There is a description of at least one process linking ideas.	There is a clear description of the process including reference to the majority of: mechanical digestion, lipase, bile, where they are produced, products, function of bile and site of digestion / absorption	

examples of biological points made in the response:

- mechanical breakdown in mouth / stomach
- fats →fatty acids and / or glycerol
- by lipase
- (produced by) pancreas
- and small intestine
- fat digestion occurs in small intestine
- bile
- produced by liver
- neutralises acid from stomach
- produces alkaline conditions in intestine
- refs. to increased surface area related to emulsification or chewing
- products are small molecules / water-soluble
- products absorbed by small intestine

Total			**9**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Foundation Tier
January 2013

Additional Science BL2FP
Unit Biology B2

F

Biology
Unit Biology B2

Tuesday 22 January 2013 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 1 hour

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 7(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

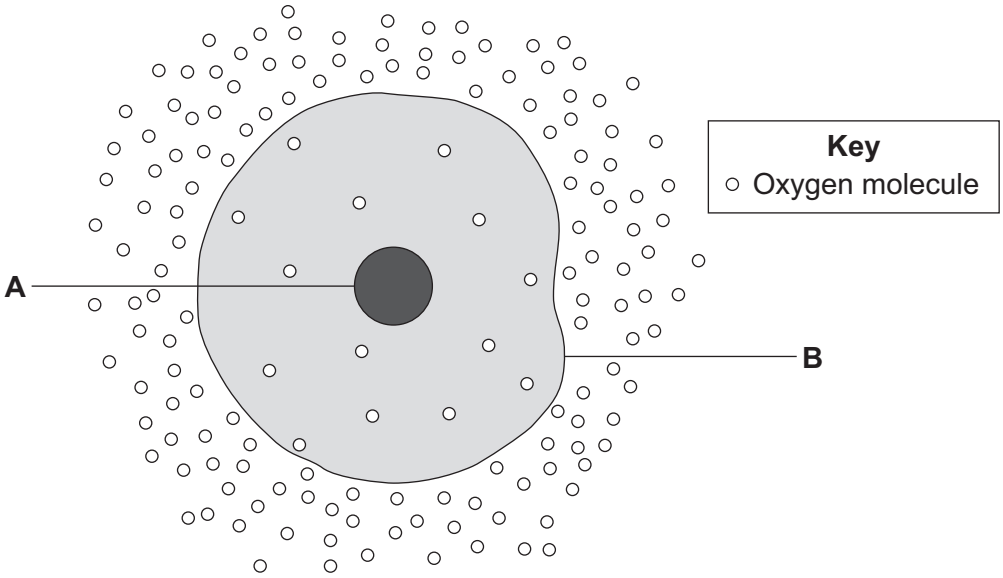
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

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

1 The diagram shows a cell.



1 (a) (i) Use words from the box to name the structures labelled **A** and **B**.

cell membrane	chloroplast	cytoplasm	nucleus

A .....

B .....

(2 marks)

1 (a) (ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and **not** a plant cell?

Give **two** reasons.

1 .....

.....

2 .....

.....

(2 marks)

Do not write outside the box

1 (b) Oxygen will diffuse into the cell in the diagram.

Why?

Use information from the diagram.

.....

.....

(1 mark)

1 (c) The cell shown in the diagram is usually found with similar cells.

Draw a ring around the correct answer to complete the sentence.

Scientists call a group of similar cells

- an organ.
- a system.
- a tissue.

(1 mark)

6

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

2 When humans reproduce, chromosomes and genes are passed on to the next generation.

In each of the following questions, draw a ring around the correct answer to complete the sentence.

2 (a) A gene is a small section of

cellulose.

DNA.

protein.

(1 mark)

2 (b) The sex chromosomes in the human male are

X and X.

X and Y.

Y and Y.

(1 mark)

2 (c) (i) Most human body cells contain

23 chromosomes.

46 chromosomes.

92 chromosomes.

(1 mark)

2 (c) (ii) The number of chromosomes in a human gamete (sex cell)

is

the same number as

half the number

twice the number

in body cells.

(1 mark)

2 (d) Gametes are produced by

fertilisation.

meiosis.

mitosis.

(1 mark)

5

Do not write outside the box

3 The photograph shows a fossil footprint. The fossil was found in a rock at the bottom of a shallow river.

Scientists believe this is the footprint of a dinosaur. The dinosaur was alive 110 million years ago.



3 (a) (i) Suggest how the fossil shown in the photograph was formed.

.....

.....

(1 mark)

3 (a) (ii) Fossils may also be formed by other methods.

Describe **one** other method of forming a fossil.

.....

.....

(1 mark)

3 (b) Dinosaurs are now extinct.

Give **two** factors that can cause extinction.

1 .....

.....

2 .....

.....

(2 marks)

Do not write outside the box

3 (c) How can fossils give evidence for evolution?

.....

.....

(1 mark)

3 (d) Scientists are uncertain about how life began on Earth.

Why?

.....

.....

(1 mark)

6

Turn over for the next question

Do not write outside the box

4 Some students wanted to find the number of thistle plants growing on a lawn.
The students placed 10 quadrats at different positions on the lawn.
Each quadrat measured 1 metre × 1 metre.
The students counted the number of thistle plants in each quadrat.

4 (a) Which method should the students use to decide where to place the 10 quadrats?

Tick (✓) **one** box.

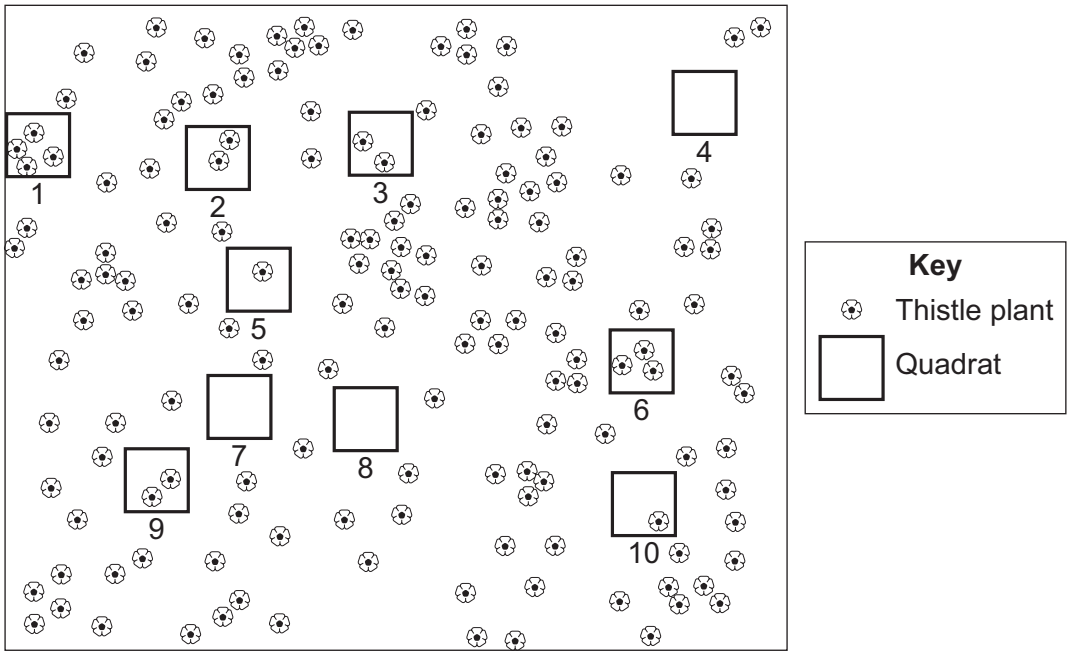
Place the quadrats as evenly as possible around the lawn. ☐

Place 5 quadrats in areas with many thistle plants and 5 quadrats in areas with only a few thistle plants. ☐

Place all the quadrats randomly on the lawn. ☐

(1 mark)

4 (b) The diagram shows the lawn with the positions of the thistle plants and the students' 10 quadrats.



Do not write outside the box

4 (b) (i) Complete the table to show:

- how many thistle plants the students found in each of the first four quadrats
- the total number of thistle plants found in all 10 quadrats.

Quadrat number	Number of thistle plants in each quadrat
1	
2	
3	
4	
5	1
6	3
7	0
8	0
9	2
10	1
Total	

(2 marks)

4 (b) (ii) Calculate the mean number of thistle plants in one quadrat.

.....

Mean = ...

(1 mark)

4 (b) (iii) The lawn measured 12 metres long and 10 metres wide.

Use your answer from part **(b)(ii)** to estimate the number of thistle plants on the lawn.

.....

.....

Estimated number of thistle plants = ...

(2 marks)

4 (c) How could the students make their estimate more accurate?

.....

.....

(1 mark)

7

Turn over ▶

Do not write outside the box

5 In each question, draw a ring around the correct answer to complete the sentence.

5 (a) Our understanding of how genes are inherited is mostly because of

the work of

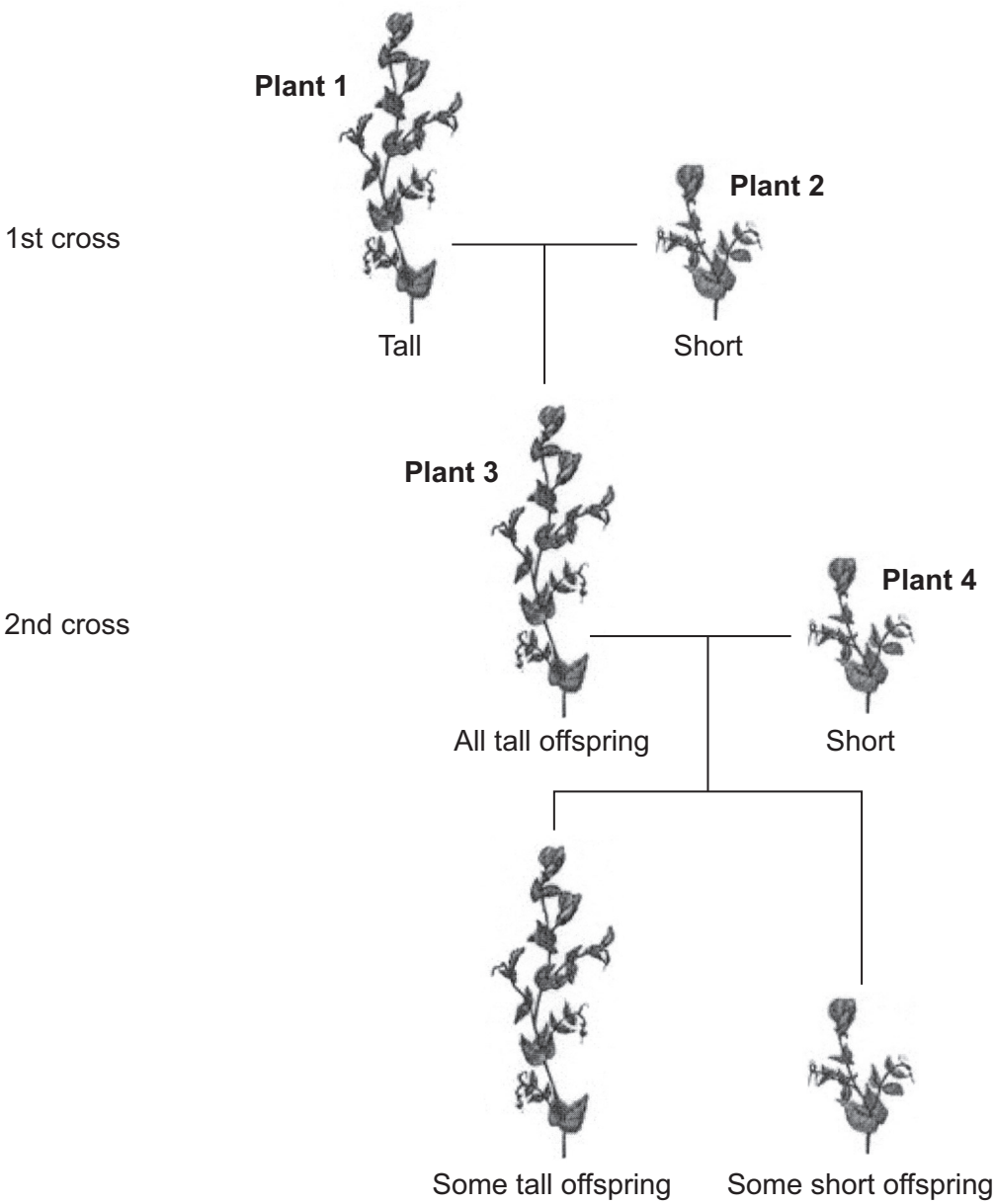
Darwin.
Lamarck.
Mendel.

(1 mark)

5 (b) A scientist investigated inheritance in pea plants.

The scientist crossed tall pea plants with short pea plants. **Diagram 1** shows the results.

Diagram 1



Do not write outside the box

In the rest of this question, the following symbols are used to represent alleles.

T = allele for tall
t = allele for short

5 (b) (i) The 1st cross in **Diagram 1** produced 120 offspring. All of these offspring were tall.

This shows that **plant 1** contained the alleles

- **TT**.
- **Tt**.
- **tt**.

(1 mark)

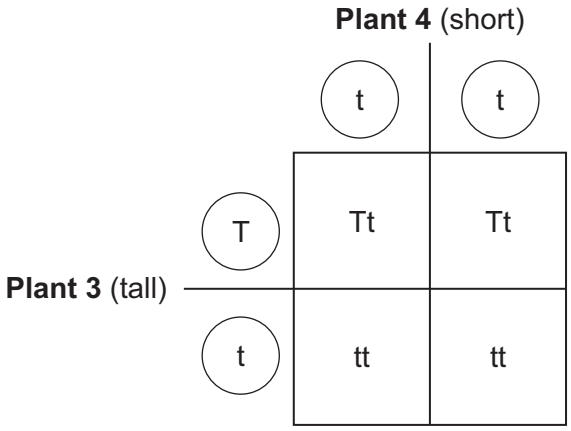
5 (b) (ii) **Plant 3** is tall because of

- a dominant allele.
- the environment.
- a recessive allele.

(1 mark)

5 (c) **Diagram 2** gives more information about the cross between **plant 3** and **plant 4**.

Diagram 2



This cross produced some tall offspring and some short offspring.

The ratio of tall to short offspring in **Diagram 2** is

- 1:1.
- 2:1.
- 3:1.

(1 mark)

Question 5 continues on the next page

Turn over ▶

Do not write outside the box

5 (d) Two short plants were crossed. This cross produced 100 offspring.

The expected offspring would be

- 100 short plants.
- 50 tall plants and 50 short plants.
- 75 tall plants and 25 short plants.

(1 mark)

5

Do not write outside the box

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

6 Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20 °C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm^3 per minute whilst …	
	resting	doing vigorous exercise
Brain	750	750
Heart	250	1000
Muscles	1200	22 000
Skin	500	600
Other	3100	650

6 (a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.

Suggest **two** reasons why.

Do **not** include safety reasons.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

6 (b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? .....

(1 mark)

Do not write outside the box

6 (c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

.....

.....

Answer = ... cm^3 per minute

(2 marks)

6 (c) (ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1 .....

2 .....

(2 marks)

6 (c) (iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part **(c)(ii)** helped the muscles to

make more lactic acid. ☐

respire aerobically. ☐

make more glycogen. ☐

(1 mark)

Question 6 continues on the next page

Do not write outside the box

6 (c) (iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.

Which **two** substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) **two** boxes.

Amino acids ☐

Carbon dioxide ☐

Glycogen ☐

Lactic acid ☐

(2 marks)

6 (d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give **one** other way to increase the blood flow.

.....

.....

(1 mark)

11

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Turn over for the next question

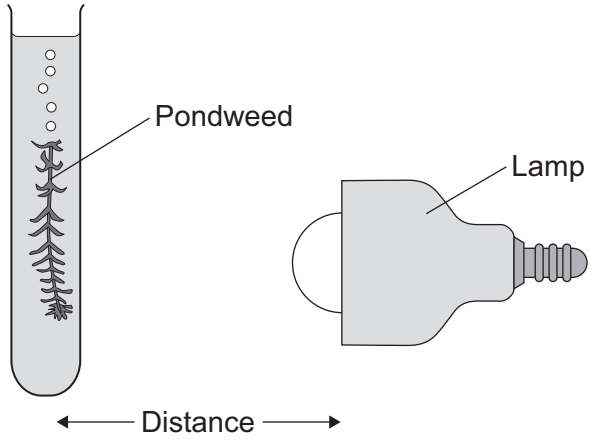
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ANSWER IN THE SPACES PROVIDED

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7 Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

7 (a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

.....

.....

(1 mark)

Do not write outside the box

7 (b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

7 (b) (i) At distances between 15cm and 50cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

.....

.....

(1 mark)

7 (b) (ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10cm and 15cm.

.....

(1 mark)

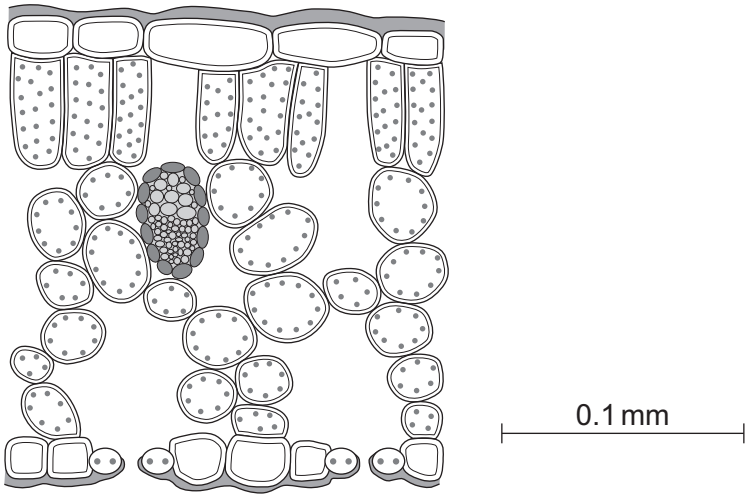
Question 7 continues on the next page

Do not write outside the box

7 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

.....

.....

.....

.....

.....

.....

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Do not write outside the box

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(6 marks)

9

Turn over for the next question

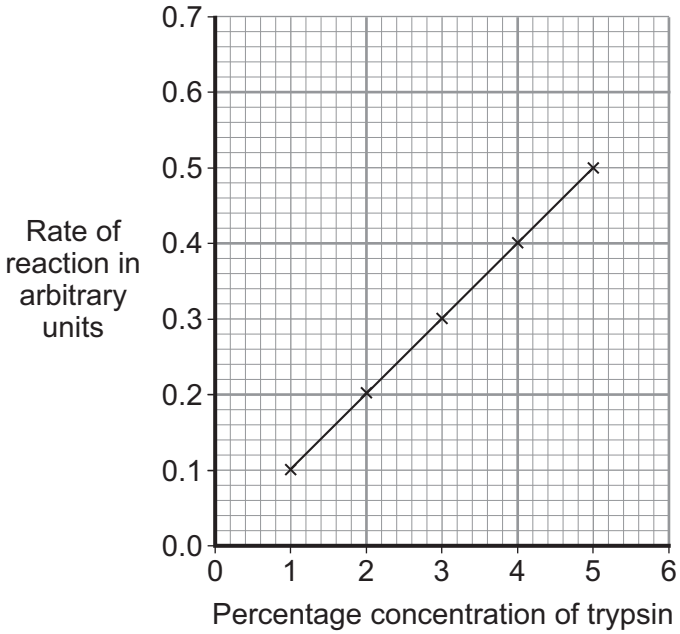
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8 Trypsin is a protease enzyme. Trypsin will digest a protein called gelatine which covers the surface of photographic film.

Some students investigated the time taken to digest the gelatine with trypsin.
The students used five different concentrations of trypsin.

The rate of reaction was calculated from the time taken for the gelatine to be digested.

The graph shows the students' results.



8 (a) (i) Describe the relationship between the concentration of trypsin and the rate of reaction.

.....

.....

.....

.....

(2 marks)

8 (a) (ii) Use the graph to predict the rate of reaction with 6% trypsin.

..... arbitrary units

(1 mark)

Do not write outside the box

8 (b) In industry, trypsin is used to pre-treat some baby foods.
In their experiment, the students used 1–5% trypsin at 20°C.
The baby food manufacturers make most profit if they use 0.5% trypsin at 35°C.

Suggest why the manufacturers make most profit with these conditions.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

8 (c) (i) Describe the effect trypsin would have on the baby food.

.....

.....

.....

.....

(2 marks)

8 (c) (ii) Apart from protease enzymes, give **one** other use of a **named** enzyme in industry.

.....

.....

.....

.....

(2 marks)

11

END OF QUESTIONS

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There are no questions printed on this page

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Version 1.0



General Certificate of Secondary Education
January 2013

Additional Science / Biology BL2FP

(Specification 4408 / 4401)

Unit: Biology 2

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from: www.aqa.org.uk

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Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

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Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

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Quality of Written Communication and levels marking

In Question 7(c) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

BL2FP

Question 1

question	answers	extra information	mark
1(a)(i)	A = nucleus B = (cell) membrane		1 1
1(a)(ii)	any **two** from: • no (cell) wall • no (large / permanent) vacuole • no chloroplasts / chlorophyll	ignore shape	2
1(b)	because high to low oxygen / concentration **or** down gradient	allow 'more / a lot of oxygen molecules outside' ignore along / across gradient	1
1(c)	a tissue		1
Total			**6**

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BL2FP

Question 2

question	answers	extra information	mark
2(a)	DNA		1
2(b)	X and Y		1
2(c)(i)	46 chromosomes		1
2(c)(ii)	half the number		1
2(d)	meiosis		1
Total			**5**

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BL2FP

Question 3

question	answers	extra information	mark
3(a)(i)	animal walking on soft material **or** suitably named material **or** further detail – eg dries out / buried / hardens / turns to rock	 do **not** allow general descriptions of how fossils are formed **or** reference to bones not decaying	1
3(a)(ii)	any **one** from: • (from) bones / shells / hard parts **or** from parts that do not decay / rot or are preserved • animal trapped in resin / amber / ice / peat • infiltration with minerals / named	 ignore imprint / impression allow frozen	1
3(b)	any **two** from: examples of physical factors such as flooding, volcanic activity (allow volcanoes) asteroid collision, drought, ice age / temperature change examples of biological factors such as predators (allow hunters), disease / named pathogen, competition lack of food / mates, cyclical nature of speciation / isolation / lack of habitat or habitat change	 accept 2 physical factors or 2 biological factors or one of each for full marks ignore pollution If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark	2

Question 3 continues on the next page . . .

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Question 3 continued . . .

question	answers	extra information	mark
3(c)	older fossils simpler **or** change (with time)	to gain the mark there must be implication of change ignore evolve ignore extinction	1
3(d)	insufficient / no evidence / no remains **or** fossils survive	ignore no people were there allow no proof	1
Total			**6**

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BL2FP

Question 4

question	answers	extra information	mark
4(a)	place all the quadrats randomly on the lawn		1
4(b)(i)	1 4 2 2 3 2 4 0 Total = 15	all 4 counts correct total correct for their figures	1 1
4(b)(ii)	1.5	allow ecf from **(b)(i)**	1
4(b)(iii)	180	correct answer with or without working if answer incorrect, allow **1** mark for $\frac{15}{10} \times 120$ **or** 15 x 20 **or** $\frac{15}{10} \times 12 \times 10$ **or** 1.5 x 12 x 10 **or** 1.5 x 120 allow ecf from **(b)(ii)** allow **1** mark if only 1 error	2
4(c)	use a larger sample size / more quadrats **or** use bigger quadrats	ignore repeats but allow repeat in different places ignore 'count them all'	1
Total			**7**

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Question 5

question	answers	extra information	mark
5(a)	Mendel		1
5(b)(i)	**TT**		1
5(b)(ii)	a dominant allele		1
5(c)	1 : 1		1
5(d)	100 short plants		1
Total			**5**

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BL2FP

Question 6

question	answers	extra information	mark
6(a)	any **two** from: • constant speed • constant effort • constant temperature	**or** allow converse for outdoors • variable speed • variable terrain • traffic conditions • variable temperature • wind (resistance) • rain / snow } allow weather allow pollution only if qualified by effect on body function but ignore pollution unqualified if no other marks obtained allow variable conditions outdoors	2
6(b)	Brain		1
6(c)(i)	20 800	correct answer with or without working gains **2** marks if answer incorrect, allow **1** mark for use of 1200 and 22 000 only	2
6(c)(ii)	oxygen glucose / sugar	apply list principle do **not** accept other named substances eg CO_2 water allow glycogen ignore food / carbohydrate	1 1
6(c)(iii)	respire aerobically		1
6(c)(iv)	carbon dioxide lactic acid		1 1
6(d)	increased heart rate	ignore adrenaline / drugs accept heart beats more but not heart pumps more	1
Total			**11**

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BL2FP

Question 7

question	Answers	extra information	mark
7(a)	any **one** from: • add a water bath • heat screen • use LED • low energy bulb / described	ignore 'check temperature'	1
7(b)(i)	rate / number of bubbles decreases **or** less oxygen / gas released	accept converse with reference to increasing light **or** shorter distance ignore reference to rate of photosynthesis	1
7(b)(ii)	temperature / CO_2 (concentration)	accept 'it was too cool' **or** not enough CO_2 accept number of chloroplasts / amount of chlorophyll allow heat allow CO2 do **not** allow CO^2	1

Question 7 continues on the next page . . .

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BL2FP

Question 7 continued . . .

<table>
<tr><th>question</th><th>Answers</th><th>extra information</th><th>mark</th></tr>
<tr><td>7(c)</td><td colspan="2">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a ‘best-fit’ approach to the marking.</td><td>6</td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><th>0 marks</th><th>Level 1 (1-2 marks)</th><th>Level 2 (3-4 marks)</th><th>Level 3 (5-6 marks)</th></tr>
<tr><td>No relevant content.</td><td>There is a brief description of at least 1 tissue or at least 1 function of an indicated part of the leaf.
The account lacks clarity or detail.</td><td>There is a clear description which includes at least 1 named tissue and at least 1 correct function described for an indicated part of the leaf.</td><td>There is a detailed description of most of the structures and their functions.</td></tr>
</table>
</td></tr>
<tr><td></td><td colspan="3">examples of responses:
• epidermis
• cover the plant
• mesophyll / palisade
• photosynthesises
• phloem
• xylem
• transport.
The following points are all acceptable but beyond the scope of the specification:
• (waxy) cuticle – reduce water loss
• epidermis – no chloroplasts so allows light to penetrate
• stomata / guard cells – allow CO_2 in (and O_2 out) or controls water loss
• palisade (mesophyll) – <u>many</u> chloroplasts to trap light
– near top of leaf for receiving more light
• spongy (mesophyll) – air spaces for rapid movement of gases</td></tr>
<tr><td>Total</td><td colspan="2"></td><td>9</td></tr>
</table>

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Question 8

question	Answers	extra information	mark
8(a)(i)	directly proportional **or** 0.1 rise in rate for 1% rise in concentration	gains full marks accept increased concentration: increased rate **or** positive correlation **or** proportional for **1** mark	2
8(a)(ii)	0.6	allow ± 0.01	1
8(b)	(0.5 % trypsin) cheaper (35 °C) faster reaction so takes less time to make product extra heating cost outweighed by savings on enzyme cost	ignore more profit allow (35 °C) optimum / best temperature	1 1 1 1
8(c)(i)	any **two** from: • breaks down / digests food • from protein into amino acids / peptides • makes soft(er) / runni(er)	 allow pre-digests protein / food allow easier for baby to digest allow description of texture change allow make (more) soluble	2

Question 8 continues on the next page . . .

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Question 8 continued . . .

question	answers	extra information	mark
8(c)(ii)	correct named enzyme		1
	correct function	to gain **2** marks function must relate to correctly named enzyme	1
	Eg		
	carbohydrase	accept amylase / maltase / lactase	
	starch → sugar **or** lactose → glucose **or** making sugar syrup		
	or		
	isomerase		
	glucose → fructose **or** making slimming foods		
	or		
	lipase		
	fats / oils → fatty acids **or** removal of grease stains	accept other correct example	
Total			**11**

UMS Conversion Calculator: www.aqa.org.uk/umsconversion

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Foundation Tier
June 2012

Additional Science BL2FP
Unit Biology B2

F

Biology
Unit Biology B2

Monday 21 May 2012 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 1 hour

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

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(b) should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

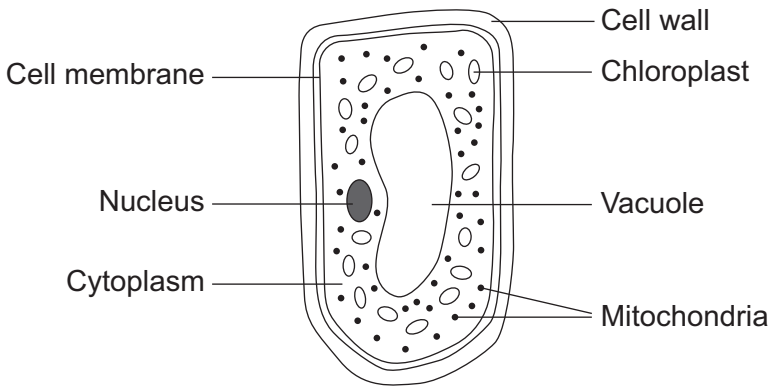
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

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

1 The diagram shows a cell from a plant leaf.



1 (a) Name the part of this cell that:

1 (a) (i) controls the passage of substances in and out of the cell

.....

(1 mark)

1 (a) (ii) is filled with cell sap.

.....

(1 mark)

1 (b) Give the names of **two** parts of the leaf cell that would **not** be found in a human liver cell.

..... and .....

(2 marks)

1 (c) The chloroplasts produce oxygen.

Draw a ring around the correct answer to complete the sentence.

The oxygen produced by the chloroplasts passes out of the cell by

diffusion.

digestion.

respiration.

(1 mark)

5

Do not write outside the box

2 In a living organism, the cells are organised into organs, systems and tissues.

2 (a) Use words from the box to complete the list of these structures in order of size.

organs	**systems**	**tissues**

The smallest structure is at the top of the list and the largest is at the bottom.

1 **cells** (smallest)

2 .....

3 .....

4 .....

5 **organism** (largest)

(1 mark)

2 (b) **List A** gives three tissues found in the human body.
List B gives four functions of tissues.

Draw a straight line from each tissue in **List A** to its correct function in **List B**.

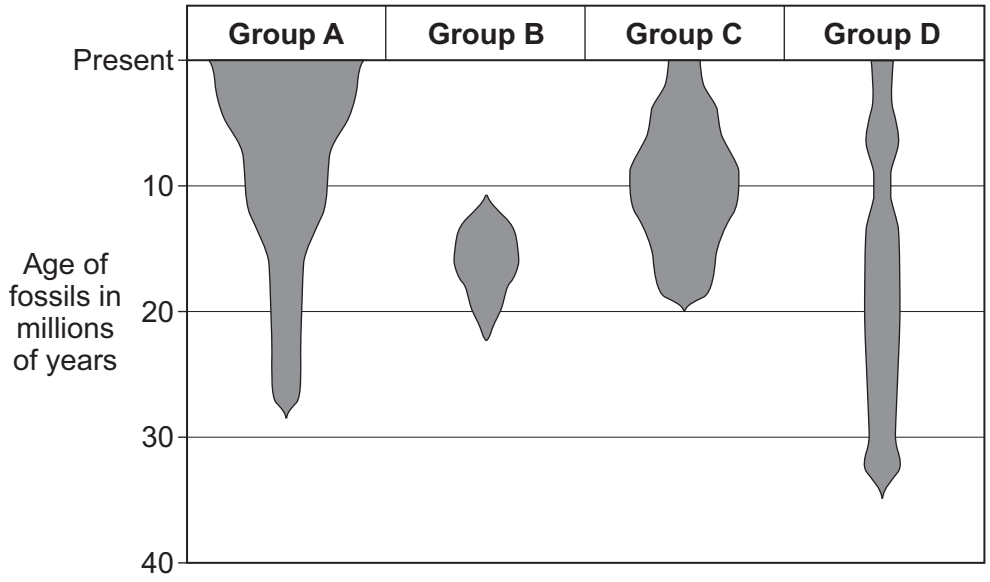
List A – Tissue	**List B – Function**
	Covers many parts of the body
Muscular tissue	
	Contracts to cause movement
Glandular tissue	
	Divides by meiosis
Epithelial tissue	
	Releases hormones or enzymes

(3 marks)

4

Do not write outside the box

3 In the Grand Canyon, scientists have found fossils of several different groups of organisms.
The diagram shows the number and age of the fossils that the scientists found.
The width of each shaded area shows the number of fossils found.



3 (a) What is a fossil?

.....

.....

.....

.....

(2 marks)

3 (b) (i) Which group of organisms, **A**, **B**, **C** or **D**, was the first to evolve? ☐

(1 mark)

3 (b) (ii) Which group of organisms, **A**, **B**, **C** or **D**, is now extinct? ☐

(1 mark)

Do not write outside the box

3 (b) (iii) Give **one** environmental factor that might have caused this group of organisms to become extinct.

.....

.....

(1 mark)

3 (c) Scientists suggested that, 10 million years ago, organisms of **Group C** were more common than organisms from any of the other groups.

What is the evidence for this in the diagram?

.....

.....

(1 mark)

3 (d) The scientists suggested that the four groups of fossilised organisms evolved from a common ancestor.

Which of the following would provide the best evidence that their suggestion is correct?

Tick (✓) **one** box.

Statement	Tick (✓)
All the groups lived in the same area.	
Fossils from each group were found in the same rock layer.	
Members of the groups have similar physical structures.	

(1 mark)

7

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

4 (a) Human body cells contain 46 chromosomes.

4 (a) (i) How many chromosomes are there in a human sperm cell? ☐

(1 mark)

4 (a) (ii) Name the part of the sperm cell that contains the chromosomes.

.....

(1 mark)

4 (b) Draw a ring around the correct answer to complete each sentence.

4 (b) (i) In human females, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (b) (ii) In human males, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (c) A man might release 300 million sperm cells at a time.

How many of these sperm cells would contain an **X** chromosome?

.....

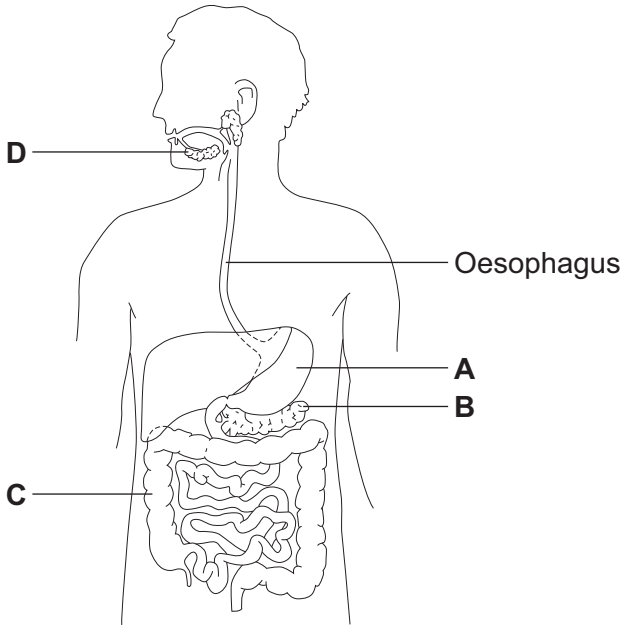
(1 mark)

5

Turn over for the next question

Do not write outside the box

5 The diagram shows the human digestive system.



5 (a) *Heartburn* is a burning feeling caused when acid enters the oesophagus. The acid comes from the stomach.

5 (a) (i) Which letter on the diagram shows the stomach? ☐

(1 mark)

5 (a) (ii) Name the acid the stomach produces.

.....

(1 mark)

5 (a) (iii) Medicines taken to treat *heartburn* contain chemicals that neutralise excess stomach acid.

What type of chemical will neutralise stomach acid?

.....

(1 mark)

Do not write outside the box

5 (b) Use words from the box and your own knowledge to describe how carbohydrates are digested.

amylase	starch	sugars

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(5 marks)

5 (c) Where in the body are the products of digestion absorbed?

.....

(1 mark)

9

Turn over for the next question

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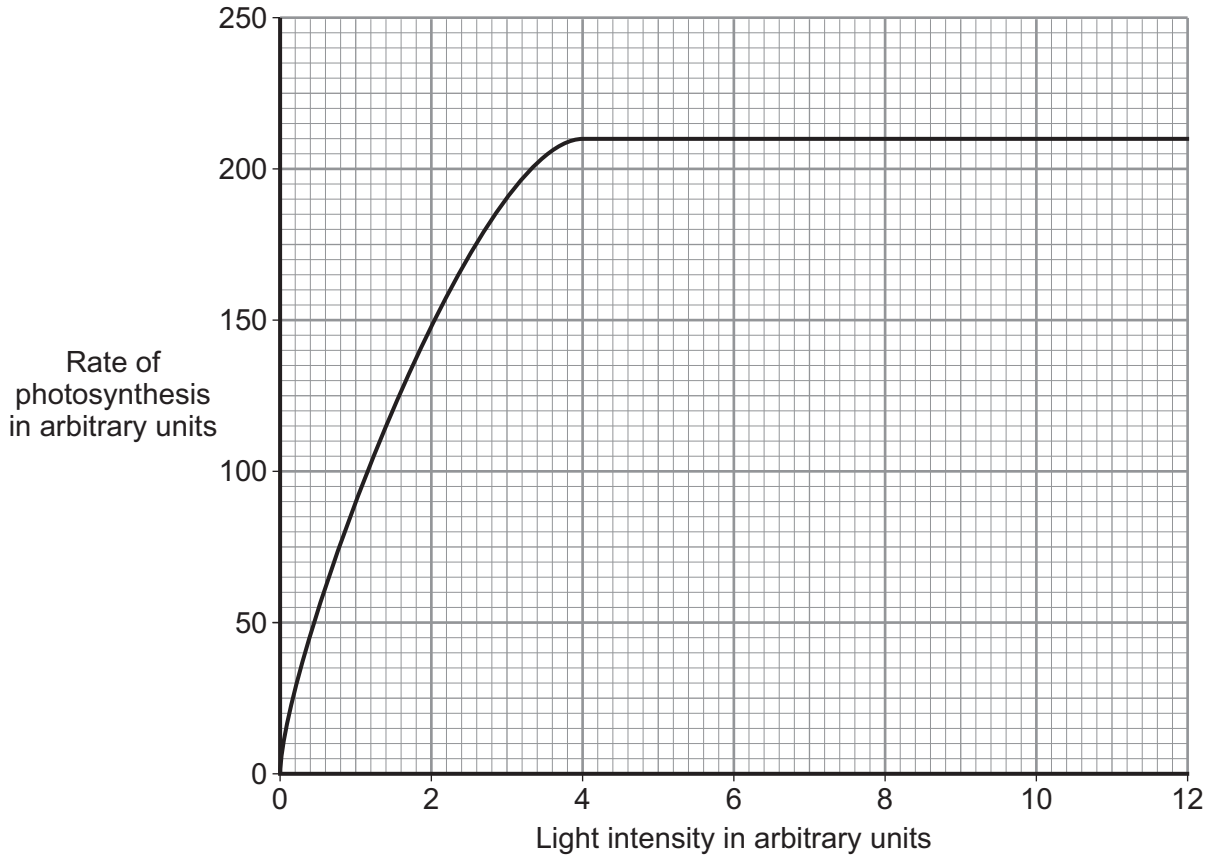
6 (a) Complete the equation for photosynthesis.

Carbon dioxide + ... $\xrightarrow{\text{light energy}}$ ..... + oxygen

(2 marks)

6 (b) A farmer grew tomato plants in a greenhouse.

The graph shows the effect of light intensity on the rate of photosynthesis in the tomato plants growing in the greenhouse.



6 (b) (i) At which light intensity was light a limiting factor for photosynthesis?

Tick (✓) **one** box.

1 arbitrary unit ☐

4 arbitrary units ☐

10 arbitrary units ☐

(1 mark)

Do not write outside the box

6 (b) (ii) What was the highest rate of photosynthesis?

..... arbitrary units

(1 mark)

6 (b) (iii) The farmer wants to increase the rate of photosynthesis in his tomato plants.

Apart from light intensity, name **one** factor that the farmer could change to increase the rate of photosynthesis in his tomato plants.

.....

(1 mark)

5

Turn over for the next question

Do not write outside the box

7 Cystic fibrosis is an inherited disorder.

Mr and Mrs Brown do **not** have cystic fibrosis but they have a child with cystic fibrosis.

7 (a) Draw a ring around the correct answer to complete each sentence.

7 (a) (i) The allele for cystic fibrosis is a

carrier allele.

dominant allele.

recessive allele.

(1 mark)

7 (a) (ii) Mr and Mrs Brown are both

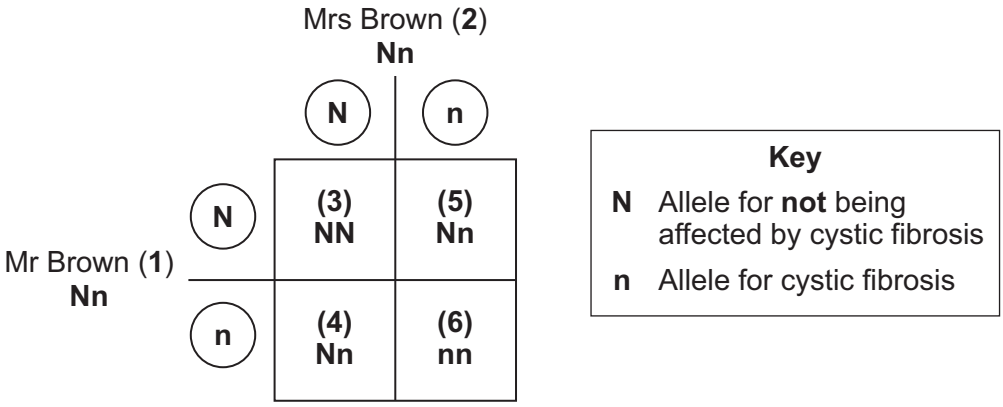
carriers.

immune.

infected.

(1 mark)

7 (b) The diagram shows how the allele for cystic fibrosis can be inherited by Mr and Mrs Brown's children.



7 (b) (i) Give the number of **one** person in the diagram who has cystic fibrosis. ☐

(1 mark)

7 (b) (ii) The chance that Mr and Mrs Brown's next child will have cystic fibrosis is

..... .

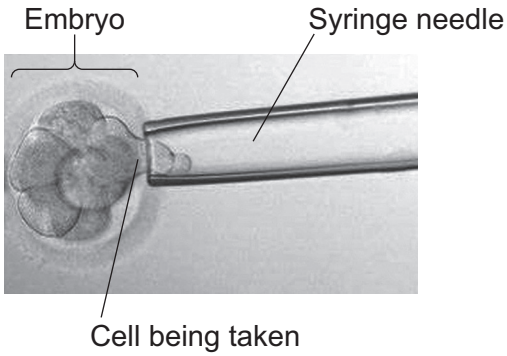
(1 mark)

Do not write outside the box

7 (c) A genetic counsellor describes to Mr and Mrs Brown one way of screening embryos for cystic fibrosis.

- Some eggs are collected from Mrs Brown.
- The eggs are then fertilised in a dish.
- Several embryos may start to develop.

The photograph shows how doctors take one cell from each embryo when it is only 3 days old.



Source: © Pascal Goetgheluck/Science Photo Library

- The DNA in the cell from each embryo is tested for cystic fibrosis.
- Doctors select one embryo that is unaffected and place it in Mrs Brown's uterus.
- The embryo then develops into a baby.

Use the information to suggest **one** advantage and **one** disadvantage of screening embryos in this way.

Advantage .....

.....

Disadvantage .....

.....

(2 marks)

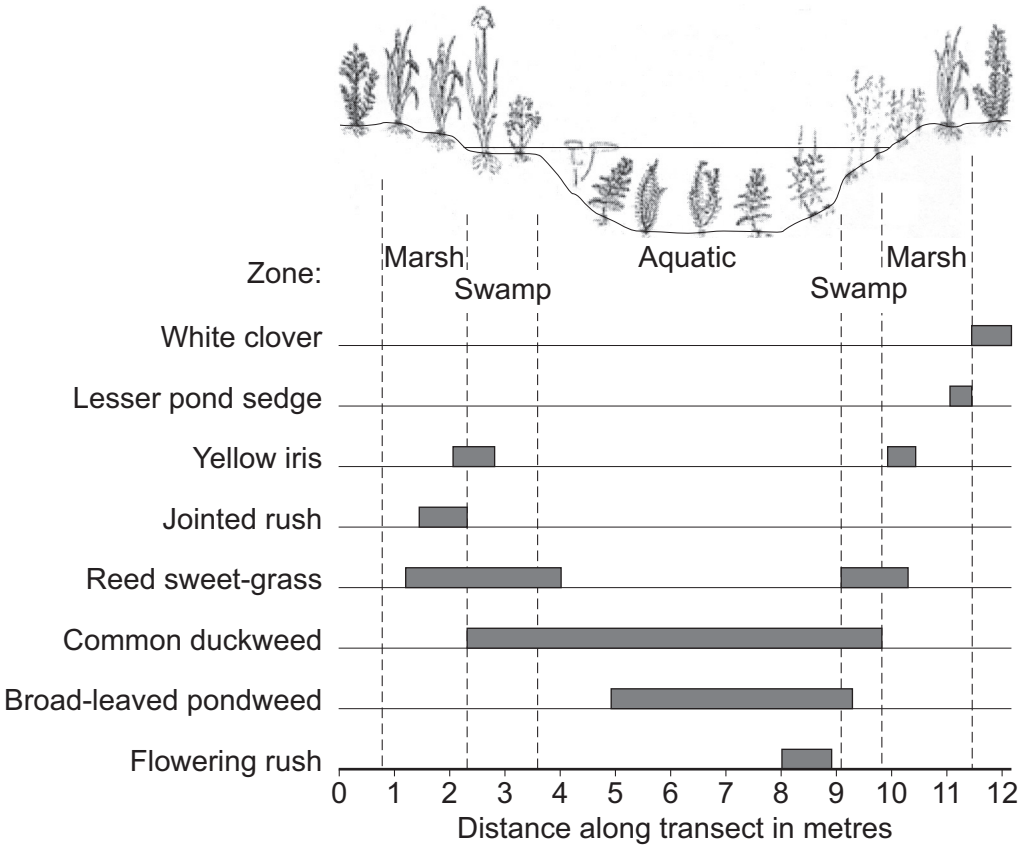
6

Turn over ▶

Do not write outside the box

8 Some students investigated the distribution of some of the plants growing in and around a shallow stream. They sampled along a transect line.

The diagram shows their results.



8 (a) (i) Name the **one** species that grew only in the driest conditions.

.....

(1 mark)

8 (a) (ii) Only **one** species grew in the marsh, the swamp and in the aquatic zones.

Which species?

.....

(1 mark)

8 (a) (iii) Duckweed grows floating in water. What evidence is there for this in the students' results?

.....

.....

(1 mark)

Do not write outside the box

8 (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe how you would use a $\frac{1}{2}$-metre $\times$ $\frac{1}{2}$-metre quadrat frame and a 30-metre tape measure to obtain data similar to the data shown in the diagram.

You should include details of how you would make sure that you would obtain valid results.

.....

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.....

.....

(6 marks)

9

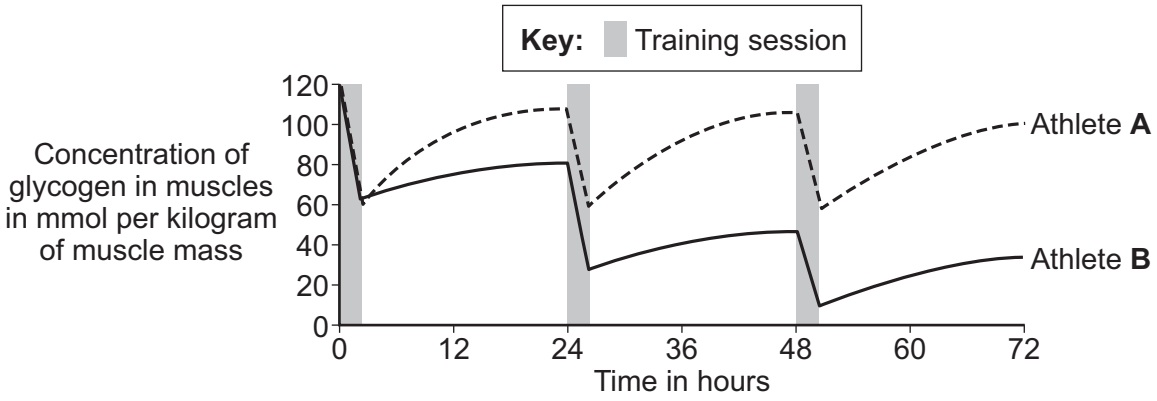
Do not write outside the box

9 Glycogen is stored in the muscles.

Scientists investigated changes in the amount of glycogen stored in the muscles of two 20 year-old male athletes, **A** and **B**.
Athlete **A** ate a high-carbohydrate diet. Athlete **B** ate a low-carbohydrate diet.

Each athlete did one 2-hour training session each day.

The graph shows the results for the first 3 days.



9 (a) (i) Give **three** variables that the scientists controlled in this investigation.

.....

.....

.....

.....

.....

.....

(3 marks)

9 (a) (ii) Suggest **two** variables that would be difficult to control in this investigation.

.....

.....

.....

.....

(2 marks)

Do not write outside the box

9 (a) (iii) Describe **one** way in which the results of Athlete **B** were different from the results of Athlete **A**.

.....

.....

(1 mark)

9 (b) Both athletes were training to run a marathon.

Which athlete, **A** or **B**, would be more likely to complete the marathon?

Use information from the graph to explain your answer.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

10

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Version : 10/08/2012



General Certificate of Secondary Education

Additional Science 4408 / Biology 4401

BL2FP Unit Biology 2

Mark Scheme

2012 examination – June series

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

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Example 1: What is the pH of an acidic solution? (1 mark)

Student	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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Quality of Written Communication and levels marking

In Question 8(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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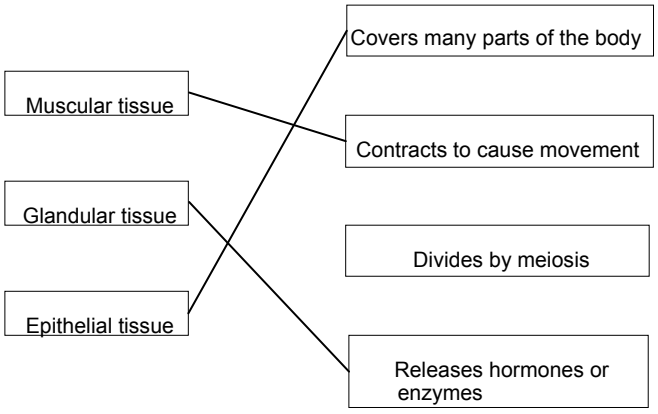
Question 1

question	answers	extra information	mark
1(a)(i)	(cell) membrane		1
1(a)(ii)	vacuole		1
1(b)	any **two** from: • (cell) wall • chloroplast(s) • vacuole	 ignore chlorophyll ignore cell sap	2
1(c)	diffusion		1
Total			**5**

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Question 2

question	answers	extra information	mark
2(a)	in sequence: 2 = tissue(s) 3 = organ(s) 4 = system(s)		1
2(b)		**1** mark for each correct line extra line(s) from one tissue cancel	3
Total			**4**

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Question 3

question	answers	extra information	mark
3(a)	remains of an organism **or** bone / shell / hard part of an organism / impression		1
	further detail – eg in rock / from a long time ago	if numbers, greater or equal to hundreds of years allow made of minerals ignore over time ignore fossil are rocks	1
3(b)(i)	D		1
3(b)(ii)	B		1
3(b)(iii)	predation / disease / lack of food / competition / loss of habitat / climate change / catastrophic event – or volcanic eruption / flood / drought / temperature change / weather change / ice age / change in atmosphere	ignore human effects ignore pollution effects / acid rain ignore human effects allow natural disaster	1
3(c)	C = 'widest' thickest / wider thicker column **or** more fossils (of type C found)	allow biggest / er	1
3(d)	members of the groups have similar physical structures	extra box ticked – cancel	1
Total			**7**

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Question 4

question	answers	extra information	mark
4(a)(i)	23		1
4(a)(ii)	nucleus / 'the head'	allow phonetic spelling	1
4(b)(i)	**X** and **X**		1
4(b)(ii)	**X** and **Y**		1
4(c)	150 million / 150,000,000 / half (of them) / 50% / 1in 2		1
Total			**5**

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Question 5

question	answers	extra information	mark
5(a)(i)	A		1
5(a)(ii)	hydrochloric (acid) / HCl		1
5(a)(iii)	alkali / suitable named example	accept sodium hydrogen carbonate / sodium bicarbonate / milk of magnesia / other brand names allow bile (salts) ignore antacid	1
5(b)	• amylase breaks down starch • (broken down) into sugars / glucose • digestion of starch in the mouth • (also) starch broken down in small intestine • amylase produced in salivary glands / small intestine / pancreas		1 1 1 1 1
5(c)	<u>small</u> intestine	allow ileum / duodenum do **not** accept large intestine	1
Total			**9**

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Question 6

question	answers	extra information	mark
6(a)	(LHS) water / H_2O	allow H2O do **not** accept H^2O	1
	(RHS) glucose / sugar / $C_6H_{12}O_6$	allow starch / carbohydrate allow C6H12O6 do **not** accept $C^6H^{12}O^6$	1
6(b)(i)	1 arbitrary unit	extra box ticked – cancel	1
6(b)(ii)	210		1
6(b)(iii)	carbon dioxide / CO_2 / CO2 **or** temperature / heat / warmth	do **not** accept CO^2 ignore mineral ions ignore water	1
Total			**5**

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Question 7

question	answers	extra information	mark
7(a)(i)	recessive allele		1
7(a)(ii)	carriers		1
7(b)(i)	6	allow nn	1
7(b)(ii)	1 in 4 / 0.25 / ¼ / 25 % / 1:3	do **not** accept '3:1' / 1:4 / 1 in 3 / 25	1
7(c)	**advantage:** detect CF qualified – eg at early stage / before becoming pregnant **or** (only) healthy children produced **disadvantage:** some embryos are destroyed / may damage embryo	 allow 'after only 3 days' allow reduces health care costs allow increased risk of miscarriage ignore not natural ignore cost	 1 1
Total			**6**

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Question 8

question	answers	extra information	mark
8(a)(i)	(white) clover		1
8(a)(ii)	reed sweet-grass	allow reed allow grass	1
8(a)(iii)	(only) found in swamp and aquatic zones **or** only found in water **or** doesn't grow in marsh	ignore wet conditions	1

8(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.			6
	0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
	No relevant content.	There is a basic description which describes how a quadrat **or** a metre tape could be used to collect data	There is a clear description of how a quadrat **and** a metre tape could be used to collect data along a line	There is a clear, logical and detailed description of a method that will produce valid, repeatable results across / at intervals along the stream.
	examples of procedural points made in the response: • use of tape measure to produce transect • placing of quadrats • transect placed across stream • score presence of each plant species • use quadrat at regular intervals along tape • repeat transect several times (≥ 3) • along stream • at random **or** regular intervals			

Total			**9**

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Question 9

question	answers	extra information	mark
9(a)(i)	any **three** from: • age (of athlete) • gender (of athlete) • starting concentration of glycogen • type / intensity of exercise • length of exercise period • number of training sessions • time interval between exercise sessions • exercise at same time of day	if diet given as answer = max **2** if none of these points gained amount of exercise = **1** mark if last four points not awarded allow time (for exercise) for **1** mark ignore references to amount of energy ignore they are both athletes	3
9(a)(ii)	any **two** from: • intensity of exercise • amount of exercise between sessions • starting concentration of glycogen • fitness / health • metabolic rate / respiration rate • amount / mass of muscle / physique • aspects of diet qualified, eg amount of food eaten	do **not** accept amount of carbohydrate if no other marks awarded allow height / mass / weight for **1** mark	2

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9(a)(iii)	(B has) less glycogen **or** (B's glycogen) fell more **or** (B's glycogen) built up less	he = B accept use of approximate figures allow other correct observations from graph eg A is lower at end of first session ignore rate of fall	1

9(b)	athlete **A** (no mark)	to gain full marks 'more' must be given at least once	
	athlete **A** had more glycogen / **B** has less (only if A chosen to complete marathon)	accept converse argument for **B**	1
	(glycogen / glucose) used in respiration	ignore anaerobic	1
	(more) energy released / available in athlete **A**	allow 'energy made'	1
	and either energy used for movement / muscle action / to run **or** (extra) glycogen → (more) glucose		1

Total			**10**

UMS Conversion Calculator www.aqa.org.uk/umsconversion

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