AQA GCSE BIOLOGY (4401)

BIOLOGY



EXAM QUESTION PACK

UNIT B1 HIGHER TIER BL1HP PAPERS

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AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
SCIENCE A
BIOLOGY

H

Higher Tier Unit Biology B1

Tuesday 17 May 2016 Afternoon 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 2 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 **all** questions in the spaces provided.

1 Nicotine and alcohol are drugs that affect the brain.

1 (a) (i) What is the correct description of both nicotine and alcohol?

[1 mark]

Tick (✓) **one** box.

illegal, medical drugs ☐

illegal, recreational drugs ☐

legal, medical drugs ☐

legal, recreational drugs ☐

1 (a) (ii) Why do people find it difficult to stop smoking?

[1 mark]

_____

_____

1 (b) A drug company has developed a new drug which helps people to stop smoking.
The new drug prevents the feeling of pleasure caused by nicotine in the smoke.

The new drug is now being tested on rats which have been given a lot of alcohol to drink.
The company wants to find out if the drug can help people to stop drinking alcohol.

1 (b) (i) It is important that the tests on rats are done by an independent company.

What is meant by an independent company?

[1 mark]

_____

_____

Do not write outside the box

1 (b) (ii) Why is it important that the tests are done by an independent company?

[1 mark]

1 (b) (iii) Some scientists believe that the part of the brain sensitive to alcohol is the same as the part of the brain sensitive to nicotine.

Explain why the new drug might be useful for treating people who find it difficult to stop drinking alcohol.

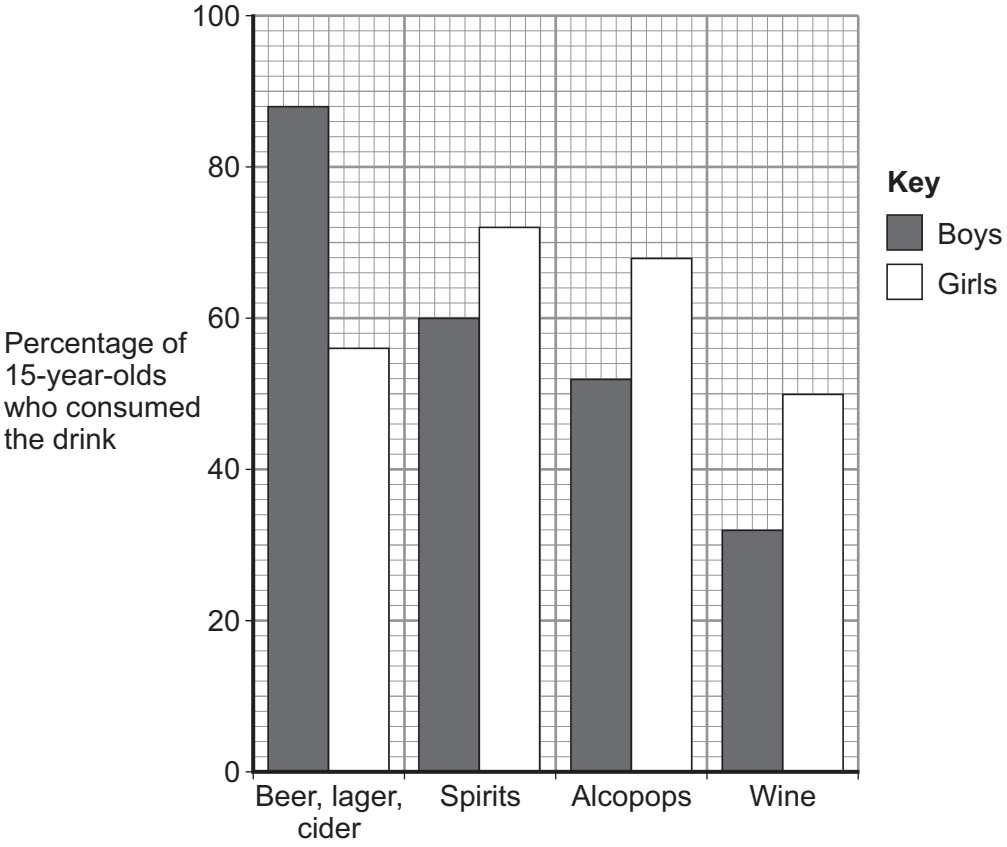
[2 marks]

Question 1 continues on the next page

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1 (c) **Figure 1** shows the results of a survey into the different types of alcoholic drinks consumed by one hundred 15-year-old boys and one hundred 15-year-old girls in the UK.

Figure 1



1 (c) (i) Describe the differences between the **types** of alcoholic drink consumed by boys and by girls.

Use **only** information from **Figure 1**.

[2 marks]

1 (c) (ii) A newspaper headline stated:

"All boys drink alcohol"

Use information from part **(c)** and **Figure 1** to give **one** reason why the newspaper headline may **not** be correct.

[1 mark]

9

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

Mineral ions are an important component of a healthy diet.

Describe how the other components of the diet are important in keeping us healthy.

In your answer you should refer to:

- the different components
- why we need each component.

[6 marks]

Extra space

6

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3 Students investigated decomposition.

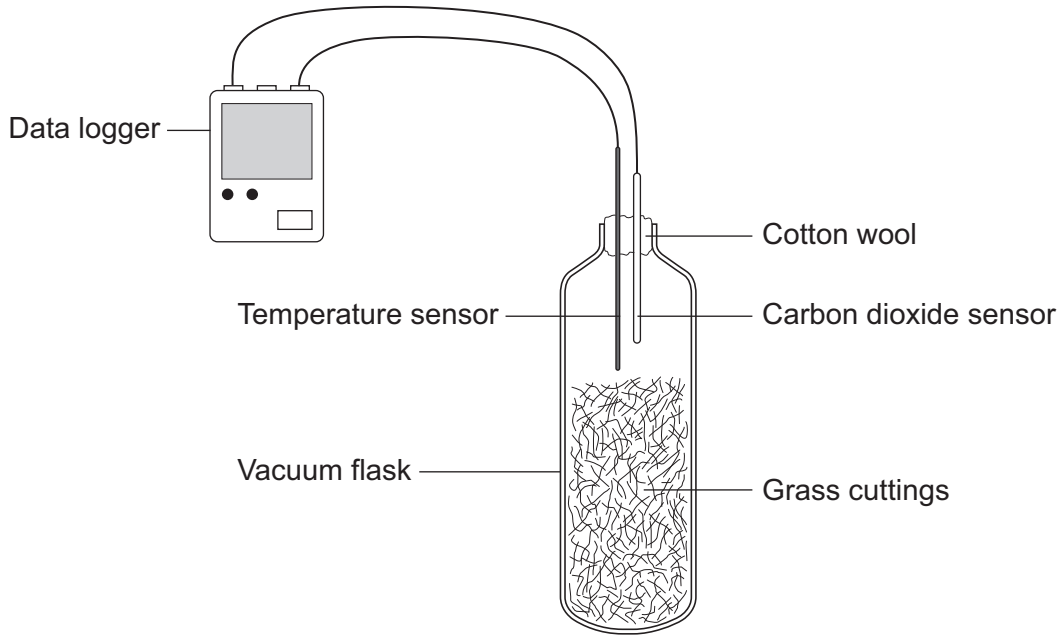
The students:

- put some decaying grass cuttings into a vacuum flask
- put a carbon dioxide sensor and a temperature sensor in the flask
- attached the sensors to a data logger
- closed the flask with cotton wool.

A vacuum flask was used to reduce the loss of thermal energy.

Figure 2 shows the investigation.

Figure 2



3 (a) Give **one** advantage of using a temperature sensor attached to a data logger instead of a thermometer.

[1 mark]

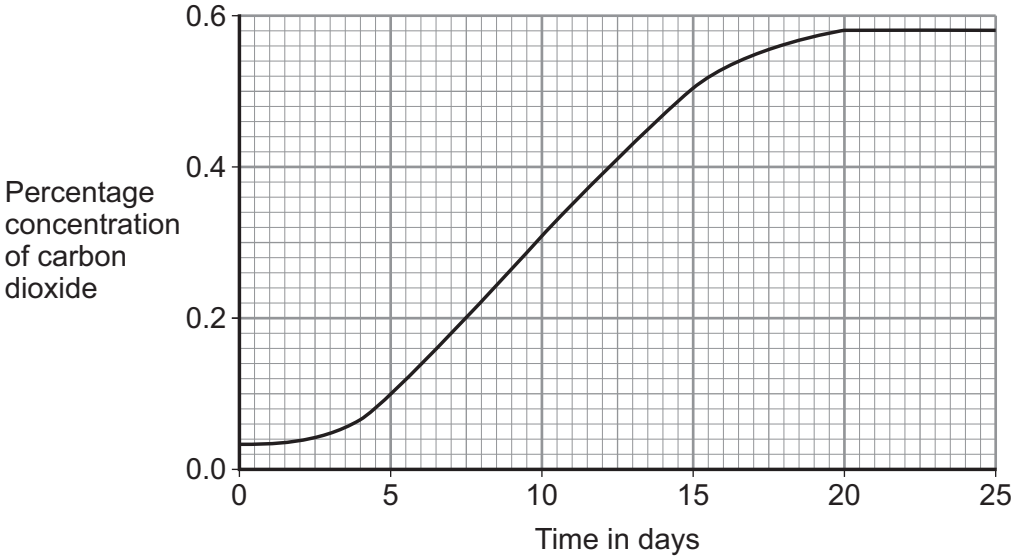
_____

_____

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3 (b) **Figure 3** shows the results from the data logger for carbon dioxide concentration in the flask for the next 25 days.

Figure 3



3 (b) (i) Why did the concentration of carbon dioxide in the flask increase?

[3 marks]

3 (b) (ii) Suggest what has happened in the flask to cause the carbon dioxide concentration to level off after 20 days.

[1 mark]

5

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4 This question is about the nervous system.

4 (a) Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

[4 marks]

4 (b) Synapses are important in the nervous system.

4 (b) (i) What is a synapse?

[2 marks]

4 (b) (ii) Describe how information passes across a synapse.

[2 marks]

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4 (c) Reflexes may be co-ordinated by the brain or by the spinal cord.

4 (c) (i) The reflexes from sense organs in the head are co-ordinated by the brain.

Name a sense organ involved in a reflex co-ordinated by the spinal cord.

[1 mark]

_____

4 (c) (ii) **Table 1** shows information about reflexes co-ordinated by the brain and reflexes co-ordinated by the spinal cord.

Table 1

Organ co-ordinating the reflex	Mean length of neurones involved in cm	Mean time taken for reflex in milliseconds	Mean speed of impulse in cm per millisecond
Brain	12	4	3
Spinal cord	80	50	

Calculate the mean speed of the impulse for the reflex co-ordinated by the spinal cord.

[1 mark]

_____

_____

Mean speed = _____ cm per millisecond

4 (c) (iii) In reflexes co-ordinated by the brain there are **no** relay neurones.

Suggest why there is a difference in the mean speed of the impulse for the two reflexes.

[2 marks]

_____

_____

_____

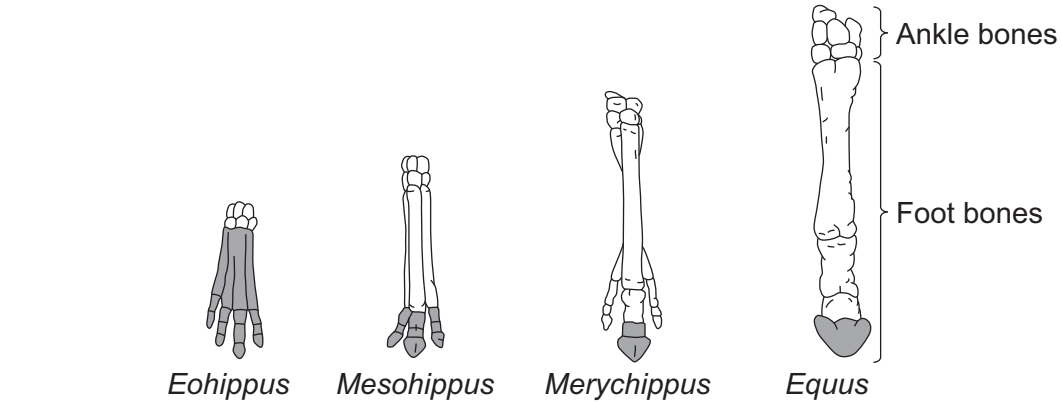
_____

12

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5 **Figure 4** shows changes in the foot bones of four ancestors of modern horses over the past 50 million years.

Figure 4



Key: The shaded bones are the bones which touched the ground.

5 (a) Describe **two** changes to the bones in the feet of horses that have taken place over the past 50 million years.

[2 marks]

5 (b) *Eohippus* lived in swampy areas with soft mud.

Since this time the ground in the habitat has become drier and harder.

All of the horse ancestors were preyed upon by other animals.

5 (b) (i) Explain **one** advantage to *Eohippus* of the arrangement of bones in its feet.

[2 marks]

Do not write outside the box

5 (b) (ii) The changes in the arrangement of the foot bones of horses support Darwin's theory of evolution by natural selection.

Explain how the arrangement of the foot bones of *Eohippus* could have evolved into the arrangement of the foot bones of *Equus*.

[4 marks]

8

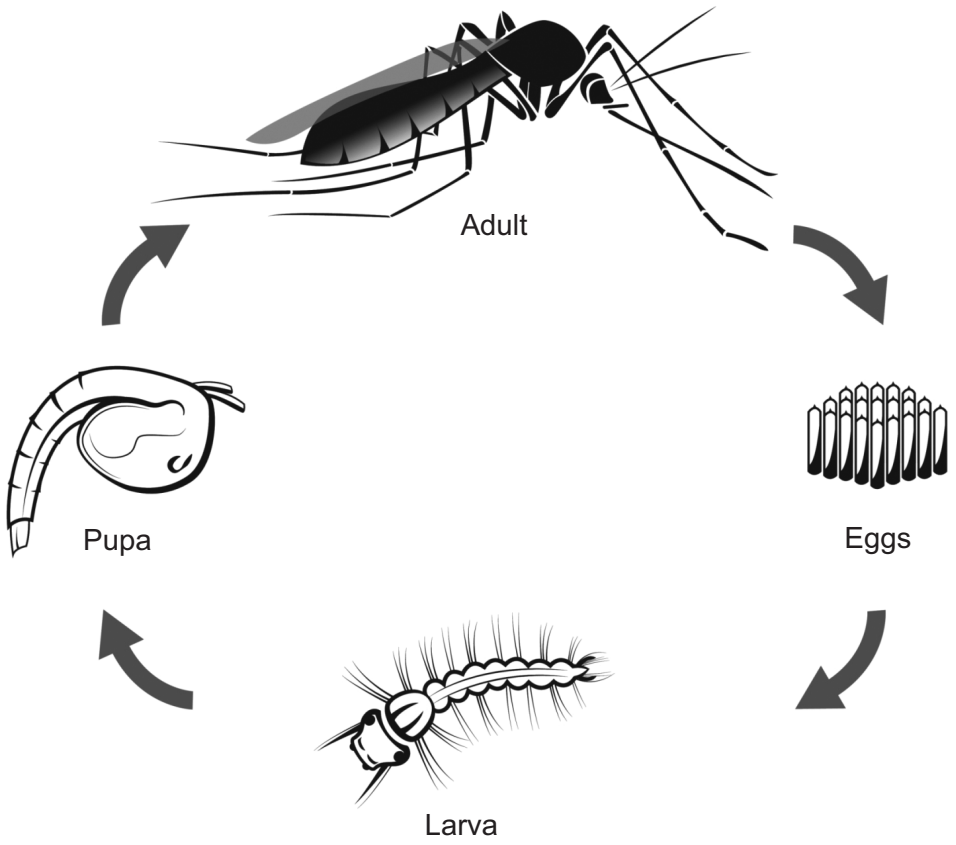
Turn over for the next question

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6 Malaria is a disease caused by a microorganism carried by mosquitoes.
The microorganism is transferred to humans when adult female mosquitoes feed on human blood.

Figure 5 shows the life cycle of a mosquito.

Figure 5



The World Health Organisation estimates that 3×10^8 people are infected with malaria every year.

Scientists estimate that malaria kills 2×10^6 people every year.

The people who are infected with malaria but do not die, may be seriously ill and need health care for the rest of their lives.

6 (a) Based on the estimated figures, what percentage of people infected with malaria die from the disease?

[2 marks]

Do not write outside the box

6 (b) An internet article states:

1 Mosquito larvae are at the start of the food chain for some fish.
2 Adult mosquitoes provide food for bats and birds.
3 Mosquitoes are also important in plant reproduction because they feed from flowers of crop plants.

6 (b) (i) The first sentence in the article is **not** correct.

Explain why.

[2 marks]

6 (b) (ii) A company plans to produce genetically modified (GM) adult male mosquitoes.
The GM mosquitoes will carry a gene from bacteria. The gene causes the death of offspring before they become adults.

Male mosquitoes do **not** feed on blood.
Scientists are considering releasing millions of adult male GM mosquitoes into the wild.

Do you think scientists should release millions of male GM mosquitoes into the wild?

In your answer you should give advantages and disadvantages of releasing GM mosquitoes into the wild.

[4 marks]

Question 6 continues on the next page

Do not write outside the box

6 (b) (iii) Describe the process for creating a GM mosquito.

[3 marks]

11

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7 Students investigated a food chain in a garden.

lettuce ⟶ **snail** ⟶ **thrush (bird)**

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

Table 2 shows the students' results and calculations.

Table 2

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

7 (a) (i) Give **two** ways that biomass is lost along a food chain.

[2 marks]

7 (a) (ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

[1 mark]

Question 7 continues on the next page

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7 (b) European banded snails have shells with different colours (light or dark) and with stripes or with no stripes.

Figure 6 shows two examples of European banded snails.

Figure 6



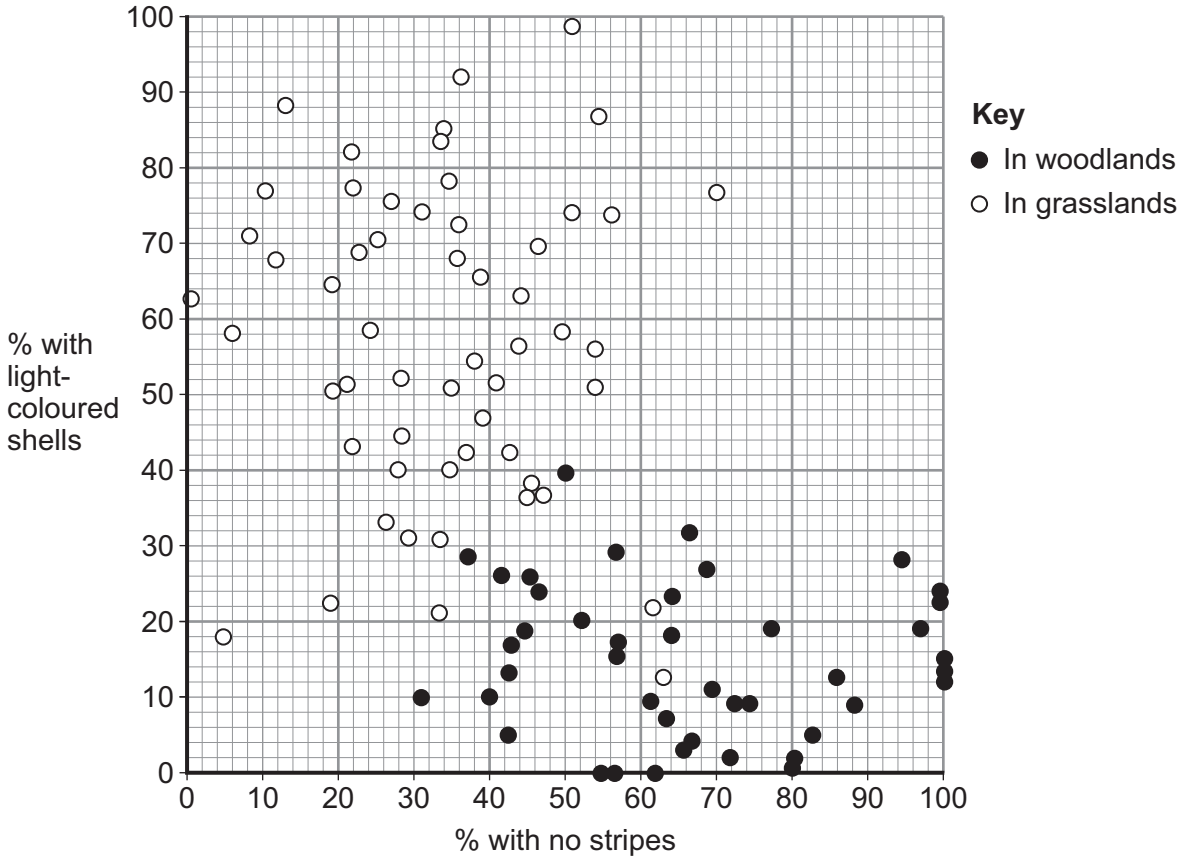
Dark-coloured shell, with stripes

Light-coloured shell, with no stripes

Figure 7 shows results from surveys in woodlands and in grasslands of the percentage of snails with light-coloured shells and the percentage of snails with no stripes.

Each point on **Figure 7** represents the results of one survey in one habitat.

Figure 7



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7 (b) (i) **Figure 7** is a scatter graph.

Why is a scatter graph used for this data?

[1 mark]

7 (b) (ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

[2 marks]

7 (b) (iii) Suggest a reason for the general appearance of snails that live in woodlands.

[1 mark]

7 (c) Snails are **not** used as indicator species as they cannot give us information about pollution levels.

7 (c) (i) Name **one** type of animal that can be used as an indicator species.
State the environmental factor that the animal indicates.

[1 mark]

Indicator species _____

Environmental factor _____

7 (c) (ii) Give **one** different method of measuring the environmental factor you gave in part **(c)(i)**.

[1 mark]

9

END OF QUESTIONS

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GCSE

Science A / Biology

BL1HP

Mark scheme

4405 / 4401

June 2016

Version 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.

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	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 2 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)(i)	legal, recreational drugs		1	AO1 1.3.1e
1(a)(ii)	any **one** from: • dependence / addiction • withdrawal (symptoms) or described	 allow reliance eg headache / sickness / nausea ignore side effects alone	1	AO1 1.3.1h
1(b)(i)	idea of not part of the drug company **or** it is another company	not biased can be accepted for either part bi or bii, but not both	1	AO2 1.3.1a
1(b)(ii)	idea of so they will not be biased	allow results will be trustworthy	1	AO3 1.3.1a
1(b)(iii)	no / reduced feeling of pleasure (from alcohol) (so) less likely to drink alcohol	allow brain less sensitive to alcohol allow so easier to stop (drinking alcohol)	1 1	AO3 1.3.1
1(c)(i)	higher % **or** more boys (than girls) drink beer / lager / cider higher % **or** more girls (than boys) drink spirits / alcopops / wine	allow boys drink more beer / lager / cider allow girls drink more spirits / alcopops / wine allow valid descriptions using % figures	1 1	AO2 1.3.1
1(c)(ii)	any **one** from: • only 100 boys were surveyed • only done on 15-year-olds • no data on the table about boys that don't drink alcohol • data only about UK • boys may have lied about alcohol consumption	 allow small sample may not be representative allow not done on all ages allow none of the bars are 100% or highest bar is 88%	1	AO3 1.3.1
Total			**9**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
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.		6	AO1 1.1.1a/b/c

0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	At least one component of the diet is given *(C)* **or** at least one reason why a component is required *(R)* **or** why a healthy diet is needed. *(N)*	Components of the diet are given *(C)* **and** for at least one of these components a reason why the component is required *(R)* **or** why a healthy diet is needed. *(N)*	Most components of the diet are given *(C)* **and** different reasons why components are required are given. *(R)*

examples of biology points made in the response:	**extra information:**
• *(C)* carbohydrate	allow other components and needs, eg *(C)* fibre / roughage; *(R)* prevent constipation / bowel cancer
• *(C)* protein	
• *(C)* fat	*(C)* water; *(R)* transport / as solvent / part of cytoplasm / produce sweat
• *(R)* (carbohydrate / protein / fat) for energy (release)	
• *(R)* (carbohydrate / protein / fat) to build cells / growth / repair	
• *(C)* vitamins	
• *(R)* (vitamins) for healthy functioning of the body	allow correctly named vitamin *(C)* with correct reason *(R)*
• *(N)* (balanced diet) contains right balance of different foods to meet needs **or** avoid malnourishment **or** avoid under / over weight	
• *(N)* (balanced diet) contains right amount of energy to meet needs	ignore ref to minerals / ions as a component of the diet and their use in the body

Total		**6**

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	any **one** from: • continuous readings • do not need to be there • (more likely to be) accurate • reduces human error	 allow automatic readings allow greater resolution do **not** allow valid allow easier to read	1	AO3 1.6.2
3(b)(i)	microorganisms (microorganisms) respire (respiration / decay / microorganisms) releases carbon dioxide	allow microbes / bacteria / fungi / decomposers for microorganisms, throughout ignore carbon released	1 1 1	AO1 1.6.1a/b / 1.6.2a /1.5.1c
3(b)(ii)	all grass decomposed / decayed / rotted	allow idea that all microorganisms dead (due to accumulation of waste **or** lack of oxygen) allow lack of / no oxygen (for respiration of microorganisms)	1	AO3 1.6.1b
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	receptors detect / sense stimuli / change in surroundings **or** convert stimulus into an impulse	ignore send impulses to brain / spinal cord	1	AO1 1.2.1b/d/e
	example of a receptor	allow any appropriate organ or part of an organ, eg eye / retina or named type of receptor eg light receptor	1	
	effectors allow / make response **or** convert an impulse to an action	ignore receive impulses from brain / spinal cord	1	
	(effector) muscle / gland	allow an example ignore eg arm / leg	1	
4(b)(i)	junction	allow idea of a (small) gap / space do **not** allow if implication is that the neurones move	1	AO1 1.2.1e
	between neuron(e)s	allow named types of neurones	1	
4(b)(ii)		allow answers in terms of specific types of neurone		AO1 1.2.1e
	chemical	allow neurotransmitter / named neurotransmitter released	1	
	any **one** from: • (chemical released) from one neurone • (chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse	ignore produced allow diffuses for passes (across)	1	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(c)(i)	skin	ignore hand / leg	1	AO2 1.2.1b
4(c)(ii)	1.6 (cm per millisecond)	allow 2 if evidence of rounding up of 1.6	1	AO2 1.2.1d/e
4(c)(iii)	any **two** from: • synapses slow down transmission / impulse • fewer synapses (via brain) • (therefore) fewer delays	ignore length of neurones allow idea of movement of chemical being slower than electrical impulse allow one synapse compared to two **or** only one synapse allow impulse travels more slowly in relay neurones	2	AO3 1.2.1d/e
Total			**12**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	any **two** from: • larger / longer / thicker • fewer (bones in total) • fewer bones touching the ground	 allow examples eg fewer toes **or** bones fused allow smaller surface area touching the ground	2	AO2 1.8.1d
5(b)(i)	large(r) surface / area in contact with the ground **or** low / less pressure on ground (so) less likely to sink into mud / ground **or** (so) could run fast(er)	 allow easy / easier to escape predators	1 1	AO2 1.4.1c/d
5(b)(ii)	variation (in size / number / arrangement of bones) (and) those with large(r) / few(er) bones more suited to running **or** run faster (on harder / drier ground) these survive **and** breed (so) genes / DNA (for larger / fewer bones) passed on	allow mutation(s) (in size / number / arrangement of bones) allow ref to offspring for breed allow alleles passed on	1 1 1 1	AO1 / AO2 1.8.1e/f
Total			**8**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	0.67(%)	allow $0.\dot{6}$ or 0.7 allow **1** mark for evidence of $(2 \times 10^6) \div (3 \times 10^8)$ **or** allow **1** mark for 0.0067 or 0.6	2	AO2 1.1.2
6(b)(i)	idea that food chains start with plants / producers idea that these make food (for other organisms in the chain)	allow food chains do not start with animals **or** larvae are consumers allow idea that plants / producers photosynthesise **or** plants / producers get energy from the sun allow mosquito larvae do not make food / photosynthesise **or** mosquito larvae do not get energy from the sun	1 1	AO1 1.5.1a

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(b)(ii)	any **four** from: • reasoned argument for **or** against release *advantages:* • fewer mosquitos biting **or** spreading malaria • fewer people get / die from malaria • lower medical costs (for those infected **or** for treatment) **or** less healthcare needed • better economically for developing / tropical countries. *disadvantages:* • fewer crops reproduce • poorer crop yield • possible starvation (of people) • high cost of GM production / mosquito release • less food for bats / birds **or** bats / birds die • gene could 'escape' into other wildlife / species	 must refer to at least one advantage and one disadvantage. max **3** marks for either only advantages **or** only disadvantages allow people won't get / die from malaria allow fewer crops pollinated allow disruption to food chain / ecosystem **or** reduction of biodiversity ignore into plants	4	AO3 1.7.2f
6(b)(iii)	any **three** from: • gene from bacteria cut out • ref to enzymes (anywhere in process) • (gene) transferred to chromosome of mosquito • at an early stage of development	 allow allele for gene allow at any point in process, ie in cutting or in splicing allow DNA for chromosome allow egg / embryo	3	AO1 1.7.2d/e
Total			**11**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	any **two** from: • not all eaten • used for respiration • lost as CO_2 / water / urea • lost as faeces **or** not all digested	 allow eaten by other animals ignore used / lost in heat / movement if neither mark awarded allow 1 mark for lost as waste ignore references to energy losses do **not** allow for growth / repair / reproduction	2	AO1 1.5.1b/c
7(a)(ii)	any **one** from: • thrushes eat other things • thrush numbers likely to vary (considerably) • thrushes were not present all the time • thrushes feed on a much bigger area	 allow it is only an estimate (of population size) **or** only counted thrushes for 5 hours	1	AO3 1.5.1
7(b)(i)	any **one** from: • there are two dependent variables • there is no independent variable • to show the association / correlation / pattern (between the two variables)		1	AO2 1.5.1

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(b)(ii)	(snails in woodlands) more have dark(er) colour (ed shells) **or** fewer have light-coloured shells (shells have) no / fewer stripes or have no stripes	allow converse for grassland, if clear allow converse for grassland, if clear	1 1	AO2 1.4.1d/f/g
7(b)(iii)	less likely to be seen (by predators / birds / thrushes)	allow camouflaged (from predators / birds / thrushes) allow light coloured shells with stripes would be more visible (to predators / birds / thrushes in woodland (than grassland)).	1	AO3 1.4.1d/f/g
7(c)(i)	*Indicator species* invertebrate (animals) **or** correctly named invertebrate *Environmental factor* (concentration of dissolved) oxygen	both required for **1** mark allow water pollution allow other correct examples	1	AO1 1.4.2c
7(c)(ii)	oxygen meter	must match factor given in **(c)(i)** allow oxygen probe / sensor (and data logger) ignore pollution meter	1	AO1 1.4.2d
Total			**9**	

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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
Higher Tier
June 2015

Science A
Unit Biology B1

BL1HP

H

Biology
Unit Biology B1

Friday 5 June 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 3(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 Many people in the UK take sleeping pills.

1 (a) The drug thalidomide was developed as a sleeping pill in the 1950s.
In the 1960s thalidomide was banned.
Recently thalidomide has been used to treat other diseases.

Name **one** disease thalidomide is used to treat now.

[1 mark]

.....

1 (b) **Table 1** shows information about the development of a new sleeping pill.

Table 1

Type of test or trial	Preclinical	Clinical phase 1	Clinical phase 2	Clinical phase 3
Tested or trialled on	Cells, tissues or animals	20–100 healthy volunteers	100–500 volunteer patients	1000–5000 volunteer patients
Number of compounds tested	>10 000	5–10	2–3	1 (new sleeping pill)
Time taken for test or trial in years	1–4	2–4	1–3	2–4

1 (b) (i) What is the shortest time taken to develop a new sleeping pill?

[1 mark]

..... years

1 (b) (ii) What is the **range** for the number of volunteers needed to complete all the clinical trials for the new sleeping pill?

[1 mark]

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Do not write outside the box

1 (c) Drugs are trialled to check for side effects on people.

Give **one** other reason why drugs are trialled.

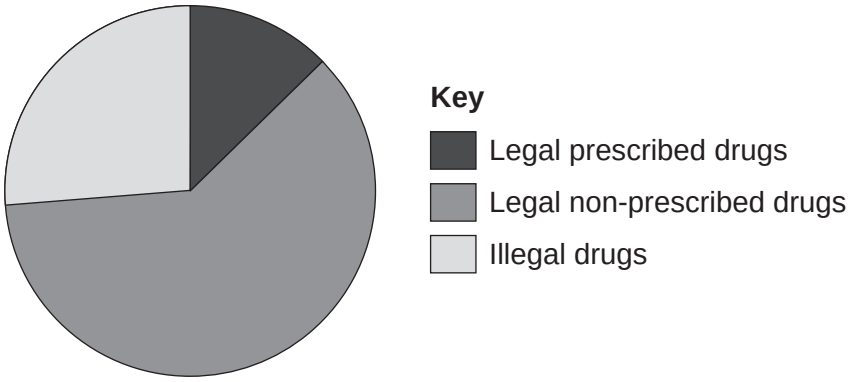
[1 mark]

.....

.....

1 (d) **Figure 1** shows the impact on the health of the population caused by drugs from different sources.

Figure 1



1 (d) (i) Legal non-prescribed drugs have a greater impact on the health of the population than illegal drugs.

Suggest **two** reasons why.

[2 marks]

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1 (d) (ii) Drugs change chemical processes in a person's body.

Why is it difficult for a person to stop taking certain drugs?

[1 mark]

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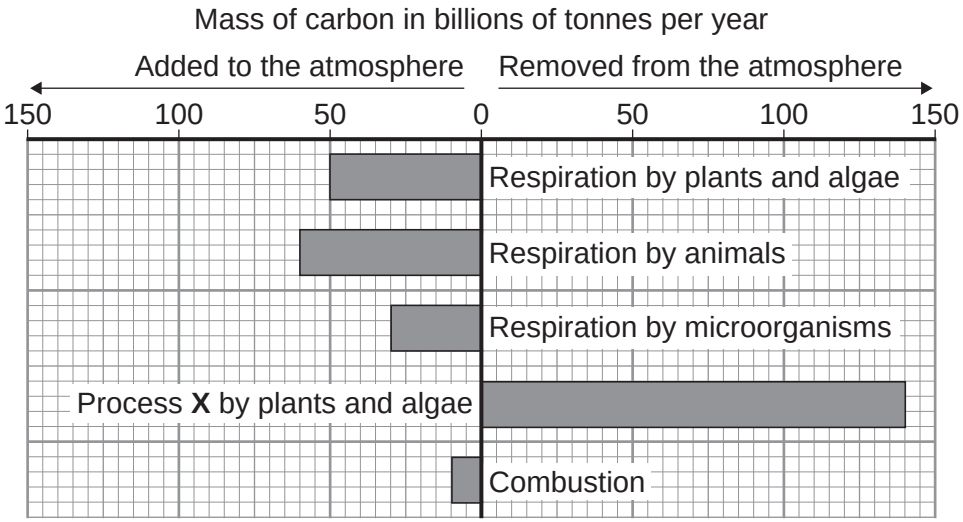
7

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2 This question is about carbon.

Figure 2 shows the mass of carbon added to and removed from the atmosphere each year.

Figure 2



2 (a) Name process **X**.

[1 mark]

.....

2 (b) (i) Calculate the mass of carbon added to the atmosphere by respiration per year.

[1 mark]

Answer = ... billion tonnes

2 (b) (ii) Some scientists are concerned that the mass of carbon in the atmosphere is changing.

How does the data in **Figure 2** support this idea?

[1 mark]

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3

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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3 Gardeners sometimes use weed killers to control the growth of plants.

3 (a) A gardener wanted to get rid of daisy plants growing in a lawn.

The gardener investigated the use of a weed killer.

The gardener:

- recorded the number of daisy plants growing in different 10 m^2 areas of the lawn
- made solutions of the weed killer (each solution had a different concentration)
- put 5 dm^3 of each solution on different 10 m^2 areas of the lawn
- recorded the number of daisy plants growing in each area after 2 weeks.

Table 2 shows the results.

Table 2

Concentration of weed killer in arbitrary units	Number of daisy plants per 10 m^2	
	Before using weed killer	2 weeks after using weed killer
0 (water)	8	8
20	6	8
40	9	6
60	5	2
80	4	0
100	8	0

3 (a) (i) To make the investigation fair, the gardener controlled some variables.

Give **one** variable the gardener controlled in the investigation.

[1 mark]

.....

.....

3 (a) (ii) The gardener decided that the result for a concentration of 20 arbitrary units of weed killer was anomalous.

Suggest why the gardener decided this result was anomalous.

[1 mark]

.....

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Do not write outside the box

3 (a) (iii) Why did the gardener put 0 arbitrary units of weed killer on one area of the lawn?

[1 mark]

.....

.....

3 (a) (iv) The gardener concluded that the best concentration of weed killer to use all over a lawn is 100 arbitrary units.

Suggest why the gardener cannot be sure about this conclusion.

[1 mark]

.....

.....

Question 3 continues on the next page

Do not write outside the box

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

Plants respond to different environmental factors.

Describe how different environmental factors affect:

- the direction of growth of roots
- the direction of growth of shoots.

In your answer you should refer to the role of plant hormones.

Do **not** refer to the artificial use of plant hormones by gardeners or scientists.

[6 marks]

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Extra space .....

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10

Do not write outside the box

4 Antibiotics can be used to protect our bodies from pathogens.

4 (a) What is a pathogen?

[1 mark]

.....

.....

4 (b) Bacteria may become resistant to antibiotics.

How can doctors reduce the number of bacteria that become resistant to antibiotics?

[2 marks]

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4 (c) Scientists grow microorganisms in industrial conditions at a higher temperature than is used in school laboratories.

4 (c) (i) Which temperature would be most suitable for growing bacteria in industrial conditions?

Draw a ring around the correct answer.

[1 mark]

25 °C **40 °C** **100 °C**

4 (c) (ii) What is the advantage of using the temperature you gave in part **(c)(i)**?

[1 mark]

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5

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5 Organisms compete with each other.

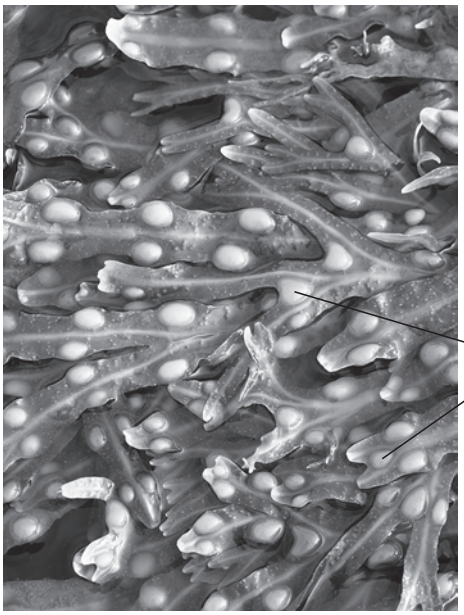
5 (a) **Figure 3** shows two types of seaweed which live in similar seashore habitats.

Figure 3

Saw wrack



Bladder wrack



Most of the time the two seaweeds are covered with water.

Bladder wrack has bladders filled with air.

Bladder wrack grows more quickly than saw wrack.
Suggest an explanation why.

[3 marks]

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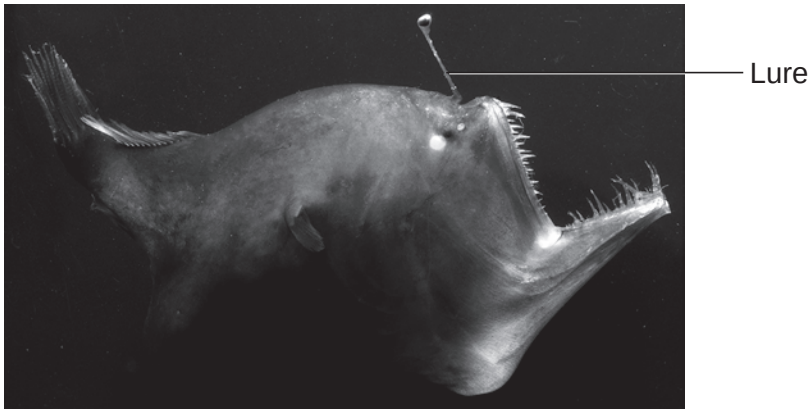
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5 (b) **Figure 4** shows an angler fish.

Figure 4



Angler fish live at depths of over 1000 m.

In clear water, sunlight does not usually reach more than 100 m deep.
Many angler fish have a transparent 'lure' containing a high concentration of bioluminescent bacteria.
Bioluminescent bacteria produce light.

Suggest an advantage to the angler fish of having a lure containing bioluminescent bacteria.

[2 marks]

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5

Turn over for the next question

Do not write outside the box

6 In January 2011 more than 600 000 people collected results for the UK national bird survey.

People recorded the number of each species of bird they saw in 1 hour on 1 day in their garden.

Some of the results are shown in **Table 3**.

Table 3

Species	Mean number of birds seen per garden	Percentage of gardens in which the bird was seen
House sparrow	4.1	64.5
Starling	3.9	51.3
Blackbird	3.2	95.2
Goldfinch	1.5	33.5

6 (a) A student looked at **Table 3** and said:

"In the UK, house sparrows are more common than blackbirds."

Suggest **three** reasons why the student's statement may **not** be true.

[3 marks]

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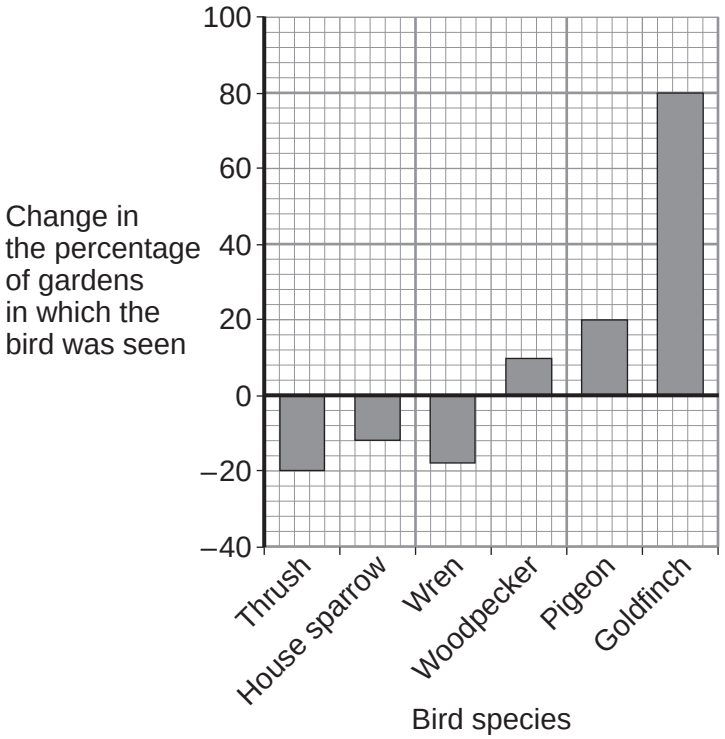
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6 (b) A survey in 2012 was done in the same way as the 2011 survey.

Figure 5 shows changes in the percentages of gardens in which some birds were seen from 2011 to 2012.

Figure 5



6 (b) (i) Calculate the percentage of gardens in which goldfinches were seen in 2012.

Use information from **Figure 5** and **Table 3**.

[2 marks]

.....

.....

Answer = ... %

6 (b) (ii) Suggest **two** reasons why goldfinches were seen in more gardens in 2012 than in 2011.

[2 marks]

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7

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7 This question is about the nervous system.

7 (a) Describe the function of receptors in the skin.

[2 marks]

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7 (b) A response is caused when information in the nervous system reaches an effector.

7 (b) (i) There are two different types of effector.

Complete **Table 4** to show:

- the two different types of effector
- the response each type of effector makes.

[4 marks]

Table 4

Type of effector	Response the effector makes
1	....
2	....

7 (b) (ii) Some effectors help to control body temperature.

Give **one** reason why it is important to control body temperature.

[1 mark]

.....

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7

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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8 As embryos develop, some genes in cells are turned off and some genes are turned on. This allows cells to become specialised for particular functions.

Usually, after cells have become specialised, they cannot change again into different types of cells.

8 (a) What is a gene?

[2 marks]

.....

.....

.....

.....

8 (b) Scientists have developed a way to change specialised cells back into embryo-like cells by a method called iPS.

Read the information in the box.

> Cells made using iPS can be changed into different types of cells.
>
> Scientists plan to take skin cells from an endangered species of monkey called a drill and change these cells into iPS cells. These iPS cells can then be changed into egg cells or sperm cells.
>
> After fertilisation, the embryo can be inserted into the womb of a female of a non-endangered species called a mandrill. The mandrill is closely related to the drill.

Describe similarities and differences between the iPS method and adult cell cloning.

[4 marks]

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8 (c) Suggest **one** advantage of trying to preserve endangered species such as the drill.

[1 mark]

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7

Turn over for the next question

Do not write outside the box

9 (a) A healthy diet should be balanced.

What is meant by a balanced diet?

[2 marks]

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.....

9 (b) Cholesterol has important functions in the body.
Some cholesterol is produced by the liver.

Cholesterol is needed in the body to make the hormone oestrogen.

9 (b) (i) Name the organ in the body which produces oestrogen.

[1 mark]

.....

9 (b) (ii) What effect does oestrogen have on the female reproductive cycle?

[1 mark]

.....

.....

9 (b) (iii) Oestrogen is a naturally occurring steroid hormone.

Give **one** artificial use of a steroid hormone in the body.

[1 mark]

.....

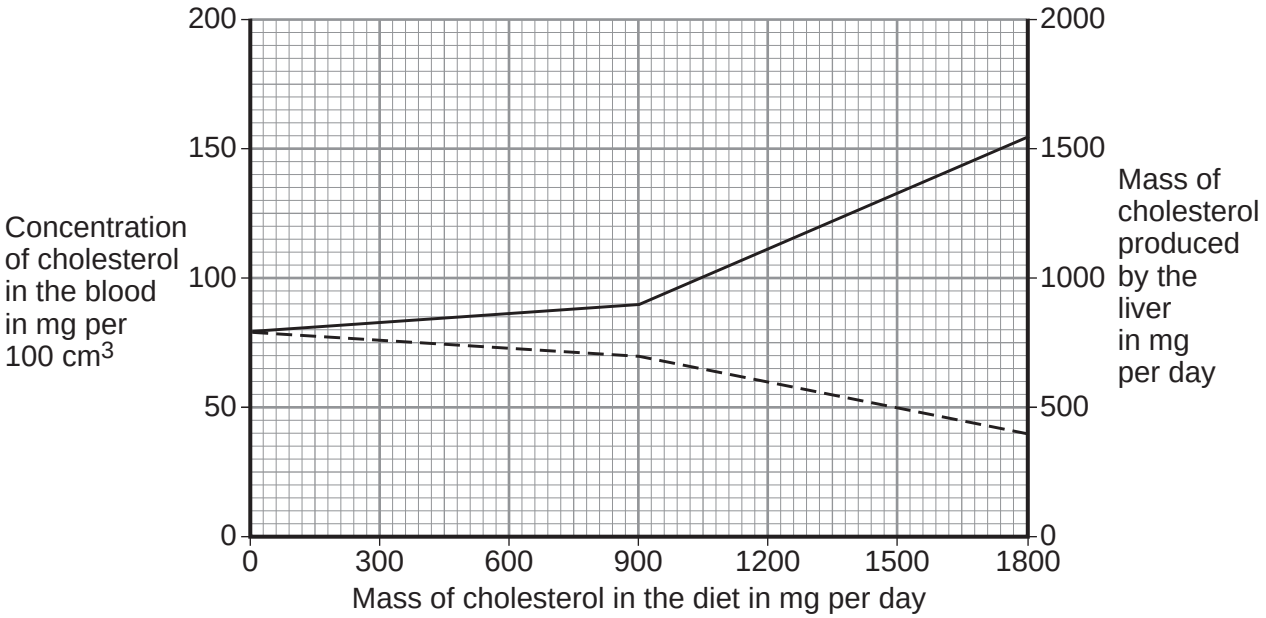
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Do not write outside the box

9 (c) **Figure 6** shows the effect of the mass of cholesterol in the diet on:

- the concentration of cholesterol in the blood
- the mass of cholesterol produced by the liver.

Figure 6



Describe the effect of increasing the mass of cholesterol in the diet on the mass of cholesterol produced by the liver.

To gain full marks you should include data from **Figure 6** in your answer.

[2 marks]

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Question 9 continues on the next page

Do not write outside the box

9 (d) Large amounts of cholesterol in the diet switch off the production of an enzyme called reductase, in the liver.

An increase of the enzyme reductase increases the production of cholesterol by the liver.

9 (d) (i) Which part of a liver cell is responsible for controlling the production of reductase?

[1 mark]

.....

.....

9 (d) (ii) High blood cholesterol concentrations increase the likelihood of heart and circulatory diseases.

Doctors can prescribe statins to control the concentration of cholesterol in the blood.

Suggest how statins work.

[1 mark]

.....

.....

9

END OF QUESTIONS

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Question 5, Figure 3: Bladder wrack © Corbis
Question 5, Figure 4: © Dante Fenolio/Science Photo Library

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GCSE

Science A / Biology

BL1HP

Mark scheme

4405 / 4401
June 2015

Version/Stage: 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 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.

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Quality of Written Communication and levels marking

In Question 3(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	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	leprosy	allow bone / blood cancer ignore cancer	1	AO1 1.3.1d
1(b)(i)	6 / six		1	AO2 1.3.1a
1(b)(ii)	from 1120 to 5600	allow from 5600 to 1120 allow 4480 (alone)	1	AO2 1.3.1a
1(c)	any **one** from: • (test for) toxicity • (test for) dosage • (test for) efficacy	ignore side effects, eg allergies ignore safety / harm unqualified allow poisonous allow idea of amount allow to see if it works allow to check for interaction with other drugs	1	AO1 1.3.1b
1(d)(i)	any **two** from: • more people take / use legal / non-prescribed drugs • legal / non-prescribed drugs are (more) readily available • alcohol causes liver/brain damage **or** tobacco causes cancer	ignore reference to cost / addiction allow harmful effects of other named legal non-prescribed drugs	2	AO1 / AO3 1.3.1g
1(d)(ii)	addiction / dependency	allow withdrawal or examples of symptoms of withdrawal (if attempting to stop)	1	AO1 1.3.1h
Total			**7**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	photosynthesis		1	AO2 1.6.1a/1.6.2a
2(b)(i)	140		1	AO2 1.6.1d/ 1.6.2a
2(b)(ii)	(10 billion tonnes) more added (to atmosphere) than removed	allow ecf from part (b)(i)	1	AO2 1.6.1d/ 1.6.2a
Total			**3**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	any **one** from: • (same) (type of) weed killer • (same) volume / 5dm^3 of solution used (on each area) • effect on daisies (not other weeds / plants) • (same) area / 10m^2 • (same) time **or** (effect after) two weeks	ignore references to same lawn / weather / soil, which are not given in the question. allow amount of solution used do **not** allow amount / volume / concentration of weed killer do **not** allow number of daisy plants	1	AO2 1.2.3d
3(a)(ii)	more (daisies) growing after use of weed killer **or** after two weeks	allow it does not fit pattern (of other results)	1	AO3 1.2.3d
3(a)(iii)	any **one** from: • as a control • to compare (to the other areas) • to check other factor(s) are not affecting the results / daisies	ignore to see if it / water has an effect do **not** allow as a control variable	1	AO2 1.2.3d
3(a)(iv)	80 (arbitrary units of weed killer) also killed all the daisies	allow ref to possible experimental design flaws such as 'only tested once' or 'not repeated' or 'different number of daisies in each area at first' allow idea that other weed species may not respond in the same way as daisies allow idea that 100 (units) may also kill wanted species / grass	1	AO3 1.2.3d

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Question	Answers	Extra information	Mark	AO / Spec. Ref
3(b)			6	AO1 1.2.3a/b/c

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.	Reference to at least one environmental factor plants respond to **or** at least one response **or** a named hormone	Reference to at least one environmental factor plants respond to **and** at least one associated response **or** reference to a named hormone **and** at least one associated response	Reference to at least one environmental factor plants respond to **and** at least one associated response **and** reference to a named hormone

examples of biology points made in the response:	**extra information**
environmental factors	
• light	allow phototropism
• (direction of the force of) gravity	allow gravi/geotropism
• moisture / water	allow hydrotropism
effects on direction of growth	
• shoots grow upwards	allow reference to 'positive' and 'negative' in terms of tropisms as indicating direction of growth
• shoots grow towards light	
• shoots grow against (the force of) gravity	
• roots grow downwards	
• roots grow towards moisture	
• roots grow towards (the force of) gravity	
hormone	
• reference to auxin	allow other named hormone(s)
• unequal distribution of hormone causes unequal growth (rates)	allow higher concentration of hormone causes faster growth in shoots allow higher concentration of hormone causes slower growth in roots

Total		10

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	microorganism / bacteria / virus / fungus that causes (infectious) disease		1	AO1 1.1.2a
4(b)	reduce / stop use of (current) antibiotics (reduce / stop use) for non-serious / mild / viral infections	allow ensure course is completed allow use of variety of antibiotics	1 1	AO1 1.1.2j/k/ 1.8.1f
4(c)(i)	40 °C		1	AO2 1.1.2o
4(c)(ii)	any **one** from: • microorganisms grow / reproduce / work / act faster • results / product acquired sooner		1	AO1 1.1.2o
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	gets more light (near surface) (so) photosynthesises more (because) bladders aid floating (when tide is in) **or** (so) more biomass / glucose / starch produced	allow warmer (near surface) allow bladders contain (more) carbon dioxide ref to 'more' needed only once, eg gets more light for photosynthesis gains **two** marks if 'more' not given do not award mark on the first occasion	1 1 1	AO2 / AO3 1.4.1a/b/d
5(b)	lets angler fish see /attract its prey / mates **or** see predators as it is dark (at 1000m) **or** lets angler fish see / attract prey to get food **or** lets angler fish see / attract mates to reproduce **or** lets angler fish see predators to avoid being eaten	must be in a correct pair to gain **two** marks	2	AO2 1.4.1a/c/d/ f/g
Total			**5**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	any **three** from: • blackbirds seen in higher % of / more gardens • multiplying mean number by percentage of gardens seen in shows blackbird is higher • only done on one day / month / hour • only done in gardens (one bird may prefer a different habitat) • problem of (correct) identification • may re-count same ones • people may quote false numbers / may make it up	allow **1** additional mark for correct figures showing this, ie 264 sparrows: 305 blackbirds eg only done in January if neither point 5 or 6 given allow **1** mark for idea of error / miscounted	3	AO3 1.4.2
6(b)(i)	60.3	award **2** marks for correct answer, irrespective of working award **1** mark for 33.5 + (33.5 x 80/100) or equivalent with no answer or incorrect answer **or** award **1** mark for 26.8	2	AO2 1.4.2
6(b)(ii)	any **two** from: • change in temperature • fewer predators • more food **or** less competition for food • more nesting space **or** less competition for nesting space • less disease (in 2012)	a comparison is required eg cooler / warmer / less frost (in 2012) allow idea that people may be better / worse at identifying birds / goldfinches allow idea of movement to gardens (due to poor food supply elsewhere)	2	AO2 1.4.2b
Total			**7**	

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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>7(a)</td><td>detect changes in surroundings or detect stimuli

convert information to impulse</td><td>allow any named stimulus for skin

allow send impulse to sensory neurones / brain</td><td>1

1</td><td>AO1
1.2.1a/b</td></tr>
<tr><td>7(b)(i)</td><td><table><tr><td>muscle</td><td>contract(ion)</td></tr><tr><td>gland</td><td>release / secrete / produce chemical / hormone / enzyme</td></tr></table></td><td>1 mark for each effector
1 mark for each response
response must match type of effector (if given)
ignore examples
ignore relax(ation) / movement for contraction
do not allow expansion for muscles</td><td>4</td><td>AO1
1.2.1e</td></tr>
<tr><td>7(b)(ii)</td><td>any one from:
• (maintain temperature at which) enzymes work best
• so chemical reactions are fast(est)
• prevent damage to cells / enzymes</td><td>allow prevent enzymes being denatured (by temperature being too high)</td><td>1</td><td>AO1
1.2.2a</td></tr>
<tr><td>Total</td><td></td><td></td><td>7</td><td></td></tr>
</table>

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	part of a chromosome controls a characteristic	allow piece of DNA allow parts of chromosomes allow controls characteristics allow codes for (**or** controls production of) protein / enzyme ignore examples of characteristics	1 1	AO1 1.7.1b/c
8(b)	(iPS method) *similarities* • (both) use of skin / body cell • (both) ref to (formation of) embryo • (both) transfer (embryo) into womb / uterus • (both) use surrogate mothers *differences* • (iPS) uses sexual reproduction • (iPS) surrogate mother is different species • (iPS) no nucleus transfer / removal • (iPS) offspring genetically different from parent • (iPS) no electric shock	max **3** similarities or differences allow converse if clearly referring to adult cell cloning allow ref to egg **and** sperm **or** gamete**s or** fertilisation allow not a clone	4	AO1 / AO3 1.7.2a/c
8(c)	any **one** from: • idea of retaining biodiversity • may be (economically) useful (in the future) • idea of maintaining food chain / ecosystem		1	AO3 1.7
Total			**7**	

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Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)	any **two** from: • right amount of nutrients **or** different / all foods • right amount of energy • for (individual) needs	'right amount' only needed once for both marks to be awarded	2	AO1 1.1.1a
9(b)(i)	ovaries / ovary	allow placenta	1	AO1 1.2.2d
9(b)(ii)	any **one** from: • inhibits follicle stimulating hormone / FSH production • inhibits maturation of eggs	ignore ref to site of production of FSH allow stimulates LH production **or** stimulates preparation of womb lining	1	AO1 1.2.2d
9(b)(iii)	any **one** from: • stimulate muscle growth • used in (oral) contraceptives		1	AO1 1.3.1i / 1.2.2e
9(c)	small (rate of) decrease then bigger (rate of) decrease idea that change of rate (of decrease) at 900 (mg per day)	If no other mark awarded allow **1** mark for decrease	1 1	AO2 1.3
9(d)(i)	gene(s) / nucleus / chromosome(s) / DNA	allow ribosome	1	AO2 1.7.1a/b/c/d
9(d)(ii)	reduces production of cholesterol (by liver)	allow idea of switching off gene for reductase (production) allow switch off / reduce / inhibit reductase (production) allow reduces absorption of cholesterol (by intestine) allow statins (might) breakdown / destroy cholesterol	1	AO2 1.1.1d
Total			**9**	

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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
Higher Tier
June 2014

Science A
Unit Biology B1

Biology
Unit Biology B1

BL1HP

H

Friday 6 June 2014 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 2 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 Food chains show the flow of energy through the organisms in a habitat.

1 (a) **Figure 1** shows a food chain.

Figure 1

grass ⟶ **sheep** ⟶ **human**

The biomass in each stage of the food chain changes as food passes along the food chain.

Draw a pyramid of biomass for this food chain.

Label the pyramid.

[2 marks]

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1 (b) **Table 1** shows three food chains, **A**, **B** and **C**.

Table 1

	Food chain
A	plants → sheep → human
B	plants → grasshoppers → frogs → trout → human
C	plants → human

1 (b) (i) In which food chain, **A**, **B** or **C**, will the greatest proportion of biomass and energy of the plants be passed to humans? ☐

[1 mark]

1 (b) (ii) Give reasons why the food chain that you chose in part **(b)(i)** passes on the greatest proportion of biomass and energy to humans.

[3 marks]

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6

Turn over for the next question

Do not write outside the box

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

Animals and plants have features (adaptations) that allow them to survive in the conditions in which they normally live.

Describe how animals and plants are adapted to survive in dry conditions such as deserts.

For each adaptation that you give, describe how the adaptation helps the animal or plant to survive in dry conditions.

To obtain full marks you should refer to **both** animals and plants.

[6 marks]

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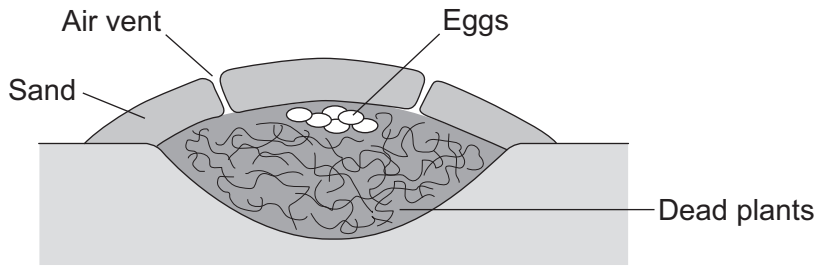
3 Most birds sit on their eggs to keep them warm until they hatch.

Megapode birds:

- dig a large hole in sand
- fill the hole with dead plants
- lay their eggs on top of the dead plants
- cover the surface with a thick layer of sand.

Figure 2 shows a megapode bird's nest.

Figure 2



3 (a) The dead plants in the nest decay. The decaying process helps to keep the eggs warm for many weeks.

Suggest how.

[3 marks]

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3 (b) (i) Megapode birds open and close the air vents of the nest at different times of the day.

Suggest reasons why it is necessary to open and close the air vents.

[3 marks]

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3 (b) (ii) The sex of a megapode bird that hatches from an egg depends on the temperature at which the egg was kept.

Use this information to suggest why it is important for megapode birds to control the temperature of their nests.

[1 mark]

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7

Turn over for the next question

Do not write outside the box

4 The MMR vaccine is used to protect against measles.

4 (a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

[1 mark]

..... and .....

4 (b) Read the information.

> Measles is a dangerous disease caused by a virus.
> Normally, MMR vaccinations are given at 1 year old and again at 4 years old.
> Each vaccination is 90% effective in protecting against the measles virus.
>
> In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

4 (b) (i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

[2 marks]

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Percentage = ...

4 (b) (ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

[1 mark]

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Do not write outside the box

4 (c) (i) What does a vaccine contain?

[1 mark]

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4 (c) (ii) Explain how a vaccination prevents infection.

[3 marks]

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4 (d) (i) Antibiotics can only be used to treat some infections.

Explain why antibiotics **cannot** be used to treat measles.

[2 marks]

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4 (d) (ii) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?

[1 mark]

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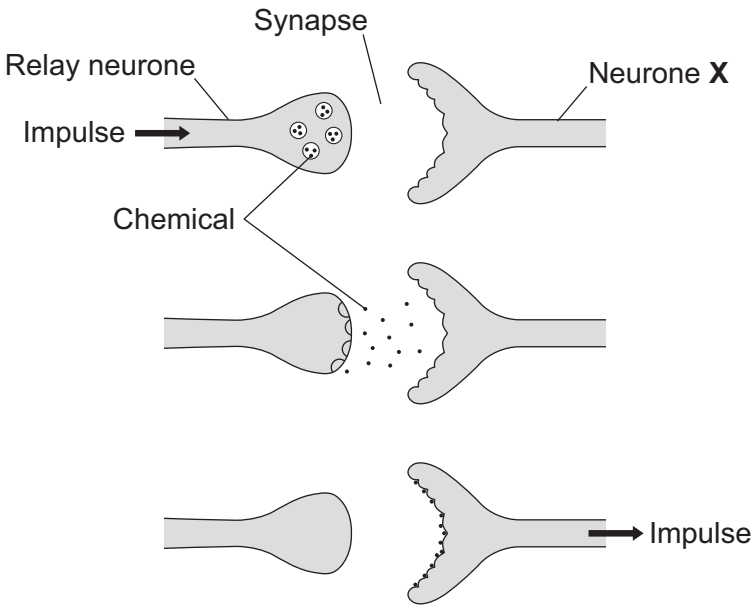
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5 **Figure 3** shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone **X**.

Figure 3



5 (a) What type of neurone is neurone **X**?

[1 mark]

.....

5 (b) Describe how information passes from the relay neurone to neurone **X**.
Use **Figure 3** to help you.

[3 marks]

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5 (c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. **Table 2** shows the results.

Table 2

Toxin	Effect at the synapse
Curare	Decreases the effect of the chemical on neurone **X**
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

[2 marks]

Curare .....

.....

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Strychnine .....

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6

Turn over for the next question

Do not write outside the box

6 Drugs may harm the human body.

6 (a) The drug thalidomide was originally developed in the 1950s.

6 (a) (i) What was the drug thalidomide originally developed to treat?

[1 mark]

.....

6 (a) (ii) Soon after it was developed, thalidomide was found to be useful in treating another condition.

What was this other condition?

[1 mark]

.....

6 (a) (iii) Describe **one** harmful effect of thalidomide.

[1 mark]

.....

6 (a) (iv) Suggest why this harmful effect had **not** been detected during clinical drug trials on thalidomide.

[1 mark]

.....

.....

6 (b) Using a recreational drug may cause a person to become dependent on the drug.

6 (b) (i) What happens in the body to make someone dependent on a drug?

[1 mark]

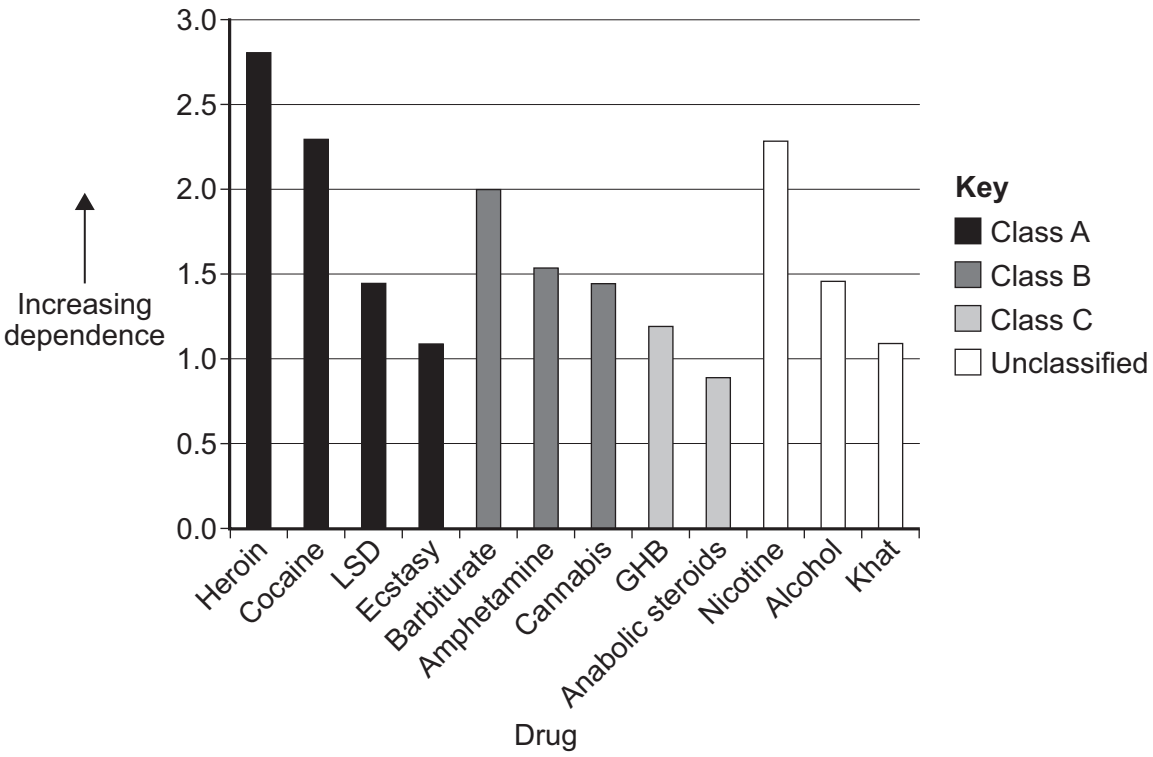
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6 (b) (ii) Doctors rated different recreational drugs according to how dependent users had become on them. **Figure 4** shows the results.

Figure 4



It is illegal (against the law) to take Class A, B or C drugs.
Unclassified drugs are legal.

Some people think that some legal drugs should be made illegal.
What evidence is there in **Figure 4** to support this view?

[2 marks]

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6 (b) (iii) Suggest **one** other piece of information about legal drugs that would need to be considered before the classification of these drugs was changed.

[1 mark]

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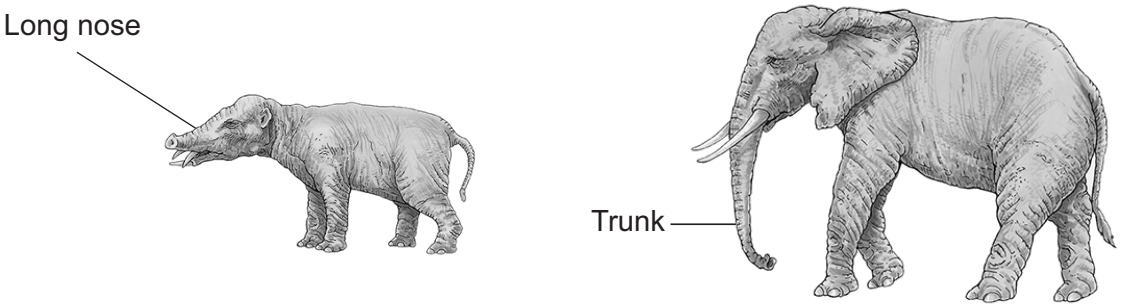
7 **Figure 5** shows:

- *Phiomia,* an ancestor of elephants
- a modern African elephant.

Phiomia lived about 35 million years ago.

Figure 5

Phiomia **African elephant**



Both *Phiomia* and the African elephant reach up into trees to get leaves.

In the 1800s, Darwin and Lamarck had different theories about how the long nose of *Phiomia* evolved into the trunk of the African elephant.

7 (a) (i) Use Darwin's theory of natural selection to explain how the elephant's trunk evolved.

[4 marks]

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7 (a) (ii) Lamarck's theory is different from Darwin's theory.

Use Lamarck's theory to explain how the elephant's trunk evolved.

[2 marks]

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7 (b) (i) In the 1800s, many scientists could **not** decide whether Lamarck's theory or Darwin's theory was the right one.

Give **two** reasons why.

[2 marks]

1 .....

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2 .....

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7 (b) (ii) Before the 1800s, many people had a different idea to explain where all the living things on Earth came from.

What idea was this?

[1 mark]

.....

.....

9

Turn over for the next question

Do not write outside the box

8 Read the information.

Insects can be both useful and harmful to crop plants.
Insects such as bees pollinate the flowers of some crop plants. Pollination is needed for successful sexual reproduction of crop plants.
Some insects eat crops and other insects eat the insects that eat crops.

Corn borers are insects that eat maize plants.
A toxin produced by the bacterium *Bacillus thuringiensis* kills insects.
Scientists grow *Bacillus thuringiensis* in large containers. The toxin is collected from the containers and is sprayed over maize crops to kill corn borers.

A company has developed genetically modified (GM) maize plants. GM maize plants contain a gene from *Bacillus thuringiensis*. This gene changes the GM maize plants so that they produce the toxin.

8 (a) Describe how scientists can transfer the gene from *Bacillus thuringiensis* to maize plants.

[3 marks]

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8 (b) Would you advise farmers to grow GM maize plants?

Justify your answer by giving advantages and disadvantages of growing GM maize plants.

Use the information from the box and your own knowledge to help you.

[4 marks]

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END OF QUESTIONS

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AQA Qualifications

GCSE

SCIENCE A / BIOLOGY

BL1HP

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 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 2 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)	3-layered triangular pyramid	as blocks or layered triangle, ignore (small) gaps between layers	1	AO2 1.5.1b
	(pyramid) labelled in food chain order	all three labels are required for **2** marks the pyramid must be fully correct	1	
1(b)(i)	C		1	AO3 1.5.1c
1(b)(ii)	shortest **or** fewest stages / transfers / (trophic) levels	allow only if (b)(i) is C or blank	1	AO1 / AO2 1.5.1c
	less losses in waste / faeces / urine / CO_2 / excretion	allow smaller amount uneaten	1	
	less loss in respiration / heat / movement	allow less lost keeping warm do **not** allow energy for respiration do **not** allow respiration makes energy	1	
		allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for **1** mark		
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>2</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><td>AO1
1.4.1d,f</td></tr>
<tr><td>0 marks</td><td>Level 1 (1-2 marks)</td><td>Level 2 (3-4 marks)</td><td>Level 3 (5-6 marks)</td><td></td></tr>
<tr><td>No relevant content.</td><td>At least one way in which animals and / or plants are adapted to survive.</td><td>A description of ways in which animals and / or plants are adapted and an attempt to link at least one adaptation to how it increases the chance of survival.</td><td>A description of ways in which animals and plants are adapted and a description of how at least one adaptation increases the chance of survival.</td><td></td></tr>
<tr><td colspan="2">examples of biology points made in the response:
(animals)
• (A) change / decrease in surface area / example
○ (decrease in surface area which) reduces area from which sweat / water may be lost
• (A) hump with fat / fat stores
○ (fat in hump) to convert to water (via respiration)
• (A) long eyelashes
○ (long eyelashes) to keep (wind-blown) dust out of eyes
• (A) nocturnal / ‘keep out of the sun’
○ reduce sweat loss (in heat of the day)

(plants)
• (A) decrease in surface area
• (A) leaves are spikes
○ (reduced area / leaves are spikes) reduces water loss / transpiration / evaporation
• (A) long / wide spread / extensive roots
○ (long / wide spread /extensive roots) to absorb (more) water
• (A) fleshy / thick stem
○ (fleshy / thick stem) to store water</td><td colspan="2">extra information
allow adaptations of specific animals to living in specified dry conditions, eg a desert
• (A) change / increase in surface area / example
○ (increase in surface area which) increases area heat may be lost from (by radiation)
• (A) changes to thickness of insulating coat
○ (thicker coat on upper surface) increases insulation from sun’s heat
• (A) thin (layer) / reduced amount of body fat
○ (reduced amount of body fat which) reduces insulating layer
• (A) wide feet
○ (wide feet) to reduce pressure / spread weight / prevent sinking

allow adaptations of specific plants to living in specified dry conditions, eg a desert
• (A) thick wax
○ (thick wax) to reduce evaporation / water loss / transpiration
• (A) few(er) stomata
○ (few stomata) to reduce evaporation / water loss / transpiration</td><td></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.
3(a)	microorganisms	allow microbes / bacteria / fungi / decomposers	1	AO1 / AO2 1.6.1b
	(microorganisms) respire	do **not** allow dead plants respire	1	
	(respiration / decay / microorganisms) releases (thermal) energy / 'heat'	ignore produce 'heat' do **not** allow produce energy do **not** allow dead plants release 'heat'	1	
3(b)(i)	any **three** from: • (opening) allows oxygen in • microorganisms / eggs need oxygen • oxygen needed for respiration • (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs) • (opening) allows energy / 'heat' to escape • (closing) retains energy / 'heat' if too cool / at night • (closing) retains moisture	allow air for oxygen allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating **and** close at night to prevent it getting too cold allow (opening) releases moisture	3	AO1 / AO2 / AO3 1.6.1b, c, 1.6.2
3(b)(ii)	any **one** from: • maintains sex balance • (survival of species depends on there being) males and females in population	e.g. equal / best / correct numbers of male and female allow so the offspring are not all the same sex	1	AO3 1.6.1
Total			**7**	

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Question	Answers	Extra information	Mark	AO / spec ref.
4(a)	mumps rubella / German measles	in either order both needed for the mark ignore measles unqualified	1	AO1 1.1.2l
4(b)(i)	80(.0)	allow **1** mark for $\frac{504}{630}$ **or** 0.8	2	AO2 1.1.2
4(b)(ii)	less chance of epidemic / pandemic **or** less chance of spread of disease / measles / mumps / rubella	allow idea of herd immunity (increased protection for those who are not vaccinated) ignore less chance of getting the disease **or** to eradicate the disease	1	AO2 1.1.2e,l
4(c)(i)	dead / inactive pathogens / viruses / bacteria	allow antigens / proteins from pathogens / viruses / bacteria ignore microorganisms	1	AO1 1.1.2l
4(c)(ii)	white blood cells produce <u>antibodies</u> antibodies produced rapidly (on re-infection) **or** response rapid (on re-infection) these antibodies kill pathogens / viruses / bacteria	 allow ecf if antibodies incorrectly identified in first marking point do **not** accept idea that original antibodies remain in blood and kill pathogens	1 1 1	AO1 1.1.2c, d,e,l
4(d)(i)	antibiotics don't kill viruses (because measles) virus / pathogen lives inside cells	allow antibiotics only kill bacteria allow antibiotics do not work inside cells **or** killing virus / pathogen would kill / damage cell	1 1	AO1 / AO2 1.1.2h
4(d)(ii)	(bacteria / pathogens) develop resistance (to antibiotic)	ignore reference to immunity ignore viruses develop resistance	1	AO1 1.1.2i,j
Total			**11**	

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Question	Answers	Extra information	Mark	AO / spec ref.
5(a)	motor	allow efferent / postsynaptic allow **another** relay (neurone)	1	AO1 1.2.1d, e
5(b)	release of chemical (from relay neurone)	allow ecf for 'motor' neurone from (a) allow release of neurotransmitter / named example	1	AO1 / AO2 1.2.1e
	chemical crosses gap / junction / synapse	allow diffuses across allow chemical moves to X	1	
	chemical attaches to X / motor / next neurone (causing impulse)		1	
5(c)	(curare) decrease / no contraction	accept (muscle) relaxes	1	AO2 / AO3 1.2.1e
	(strychnine) increase / more contraction	if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response	1	
Total			**6**	

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Question	Answers	Extra information	Mark	AO / spec ref.
6(a)(i)	idea of poor sleeping	allow as a sleeping pill	1	AO1 1.3.1d
6(a)(ii)	(for) morning sickness (in pregnant women)	ignore sickness unqualified ignore leprosy	1	AO1 1.3.1d
6(a)(iii)	limb abnormalities / defects	accept description e.g. short / no arms / legs ignore disabled / deformed	1	AO1 1.3.1d
6(a)(iv)	drug not tested / trialled on pregnant animals / women	allow not tested for treatment of morning sickness	1	AO3 1.3.1b,d
6(b)(i)	changes to chemical processes	ignore addiction	1	AO1 1.3.1h
6(b)(ii)	dependency on (some) legal drugs is more than / equal to on (some) illegal drugs example of a named legal drug for which dependency is equal to **or** greater than a named illegal drug	allow idea of no / little consistency between dependency and classification allow two pairs of named examples for 2 marks	1 1	AO3 1.3.1e
6(b)(iii)	any **one** from: • the harm it does / harmfulness • effect on health • side effects	ignore cost / addiction / dependency accept (severity of) withdrawal symptoms accept named health effects e.g. mental illness **or** effect on heart / circulatory system	1	AO3 1.3.1f,g
Total			**8**	

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Question	Answers	Extra information	Mark	AO / spec ref.
7(a)(i)	variation (in population) / mutation		1	AO1 / AO2
	longer nosed individuals get more food / leaves	allow longer nosed individuals more likely to survive	1	1.8.1a,d, e,f
	(these) survivors breed (more)		1	
	pass on genes / alleles / DNA (for long nose)	allow pass on mutation	1	
7(a)(ii)	Phiomia / ancestor stretched its nose (during its lifetime) to reach food / leaves		1	AO1 / AO2
	passed on (stretched nose) to offspring	allow offspring inherit (stretched nose) do **not** allow ref to genes	1	1.8.1c
7(b)(i)		ignore other theories, eg religion		AO1
	insufficient evidence / no proof	do **not** allow no evidence	1	1.8.1b
	mechanism of inheritance not known	allow genes / DNA not discovered	1	
7(b)(ii)	God made all living things / them	allow creationism ignore religion	1	AO1 1.8.1b
Total			**9**	

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Question	Answers	Extra information	Mark	AO / spec ref.
8(a)	any **three** from: • (gene) cut out • (gene / cut out) from (bacterial) chromosome / DNA • ref to enzymes (at any point) • (gene spliced) into maize chromosome / DNA • (gene added) at an early stage of development	accept (gene / cut out) from (bacterial) plasmid	3	AO1 1.7.2d, e
8(b)	any **four** from: • justification based on comparison of the relative merits of at least one advantage and one disadvantage Advantages: • less effort for farmer **or** less likely to harm farmer • (pesticide) always there **or** doesn't wash away • less insects to eat crop / maize **or** carry disease • so greater crop production / yield Disadvantages: • (toxin) kills other insects • so (some) crops don't get pollinated / (sexually) reproduce • possible harm when eaten by humans / animals • damage to food chains • gene may spread to other species	max **3** marks if only advantages or disadvantages given ignore ref to cost allow examples eg no need to spray allow pesticide doesn't contaminate water courses ignore ref to cost allow maize not pollinated allow may have unpleasant taste allow reduced biodiversity	4	AO3 1.7.2e, f
Total			**7**	

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Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
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TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2013

Science A
Unit Biology B1

BL1HP

H

Biology
Unit Biology B1

Wednesday 5 June 2013 1.30 pm to 2.30 pm

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 3 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 In the 1800s, many women died from disease after giving birth.

Dr Semmelweis compared the death rates of women in two hospital wards, **Ward A** and **Ward B**.

Table 1 shows some of the results.

Table 1

Year	Percentage (%) of women who died	
	Ward A	**Ward B**
1834	7.7	7.4
1836	7.5	7.8
1844	8.4	2.1
1846	11.3	2.8

Before 1840
Doctors and nurses worked in **Ward A** and in **Ward B**.
The doctors often worked in other wards with patients who had diseases.
The doctors did **not** wash their hands.

After 1840
Doctors only worked in **Ward A** and **not** in **Ward B**.
Only nurses worked in **Ward B**.
The nurses did **not** work in other wards with patients who had diseases.

1 (a) (i) Look at the data for **Ward A** and **Ward B** after 1840.

Describe the effect on death rate of having **only** nurses working in **Ward B** and **not** doctors.

To gain full marks you must refer to the data in **Table 1**.

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(2 marks)

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1 (a) (ii) Suggest an explanation for the difference you described in part **(a)(i)**.

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(2 marks)

1 (b) In 1847, Dr Semmelweis told the doctors to wash their hands each time before they began to work in **Ward A**.

Table 2 shows the death rates in the two wards, after 1847.

Table 2

Year	Percentage (%) of women who died	
	Ward A	Ward B
1848	2.7	2.8
1849	2.0	1.9

Dr Semmelweis was right to tell the doctors to wash their hands.

What evidence is there to support Dr Semmelweis telling the doctors to wash their hands?

Use information from **Table 1** and **Table 2** in your answer.

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(3 marks)

Question 1 continues on the next page

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1 (c) In modern hospitals less than 0.1% of women die from disease after giving birth.

Medical understanding has improved since the 1850s to reduce the death rate.

Other than improvements in hygiene, give **two** reasons for the low death rate from infectious diseases in modern hospitals.

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(2 marks)

9

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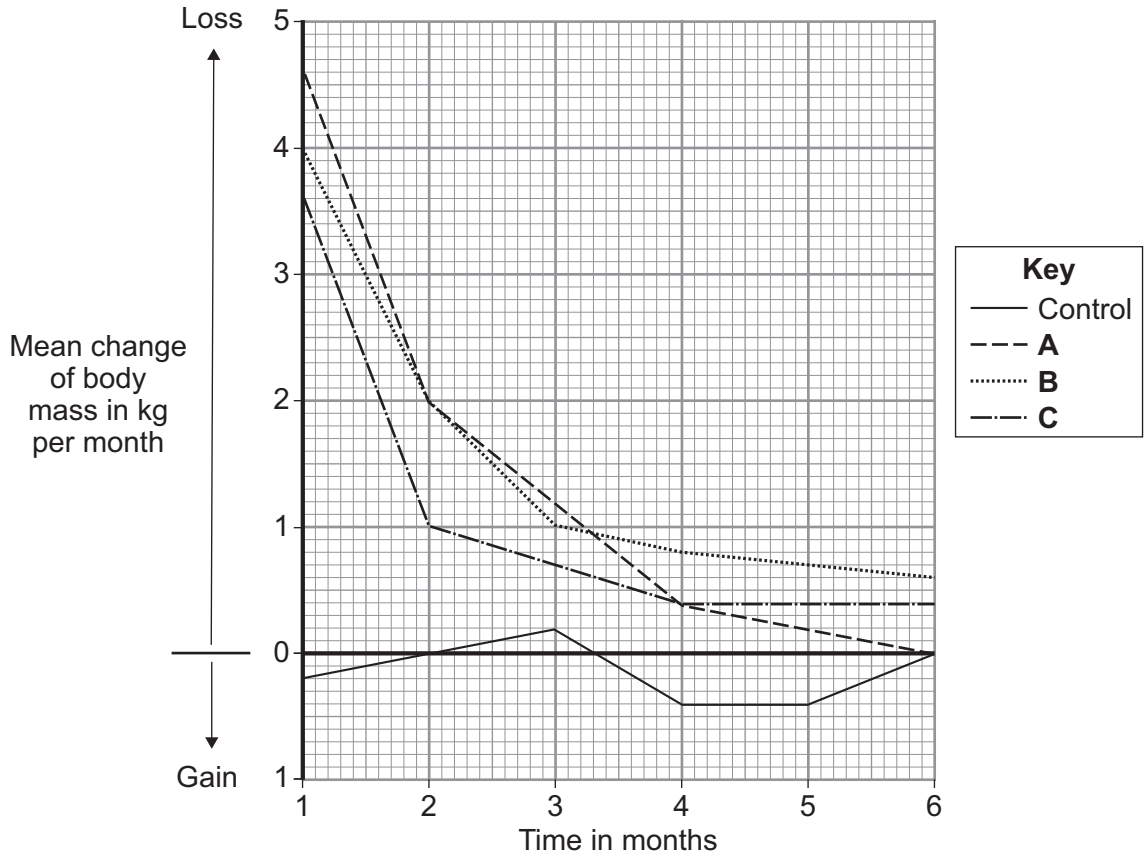
DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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2 Scientists investigated the effectiveness of three slimming programmes, **A**, **B** and **C**.

The scientists recorded the body mass of four groups of volunteers each month for 6 months. Three of the groups were each given a different slimming programme. The fourth group was a control group.

The graph shows the mean change of body mass each month for all four groups.



2 (a) (i) What should the control group eat?

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(1 mark)

2 (a) (ii) Why did the scientists include a control group in this study?

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(1 mark)

Do not write outside the box

2 (b) (i) The three groups of volunteers using the slimming programmes each showed a similar pattern of body mass loss over the 6 months.

Describe this pattern.

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(2 marks)

2 (b) (ii) All the slimming programmes seemed to be effective.

How does the information in the graph show this?

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(1 mark)

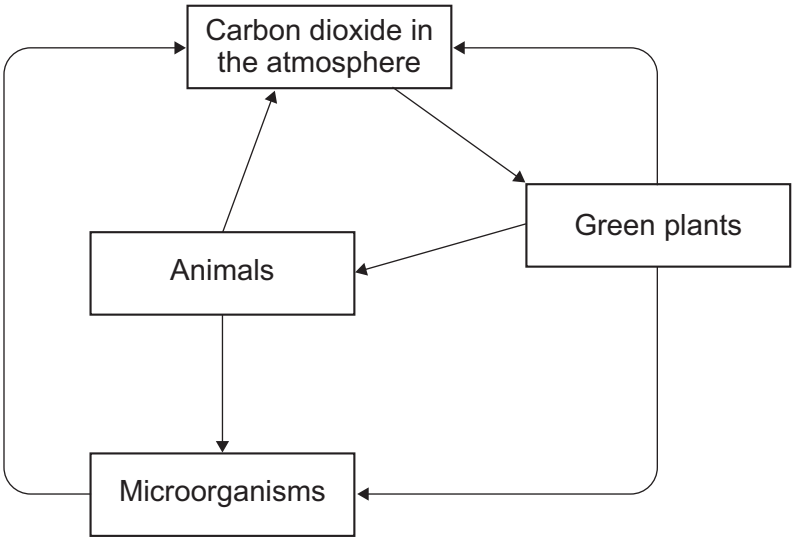
5

Turn over for the next question

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

The diagram shows part of the carbon cycle.



Describe how living things are involved in the constant cycling of carbon.

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(6 marks)

6

Turn over for the next question

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4 One factor that may affect body mass is *metabolic rate*.

4 (a) (i) What is meant by *metabolic rate*?

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(1 mark)

4 (a) (ii) Metabolic rate is affected by the amount of activity a person does.

Give **two** other factors that may affect a person's metabolic rate.

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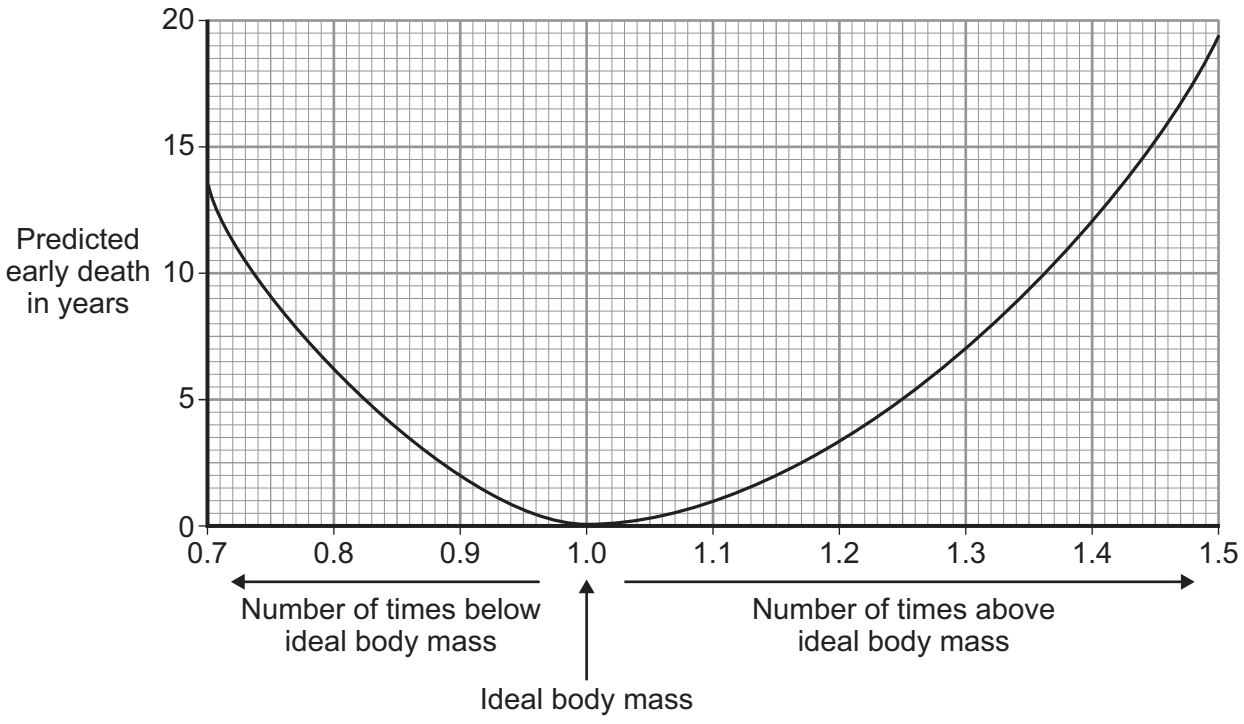
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(2 marks)

4 (b) Predicted early death is the number of years that a person will die before the mean age of death for the whole population. The predicted early death of a person is affected by their body mass.

Scientists have calculated the effect of body mass on predicted early death.

The graph shows the results of the scientists' calculations.



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Do not write outside the box

The number of times above or below ideal body mass is given by the equation:

$$\frac{\text{Actual body mass}}{\text{Ideal body mass}}$$

In the UK the mean age of death for women is 82.

A woman has a body mass of 70 kg. The woman's ideal body mass is 56 kg.

4 (b) (i) Use the information from the graph to predict the age of this woman when she dies.

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Age at death = ... years

(2 marks)

4 (b) (ii) The woman could live longer by changing her lifestyle.

Give **two** changes she should make.

1 .....

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2 .....

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(2 marks)

7

Turn over for the next question

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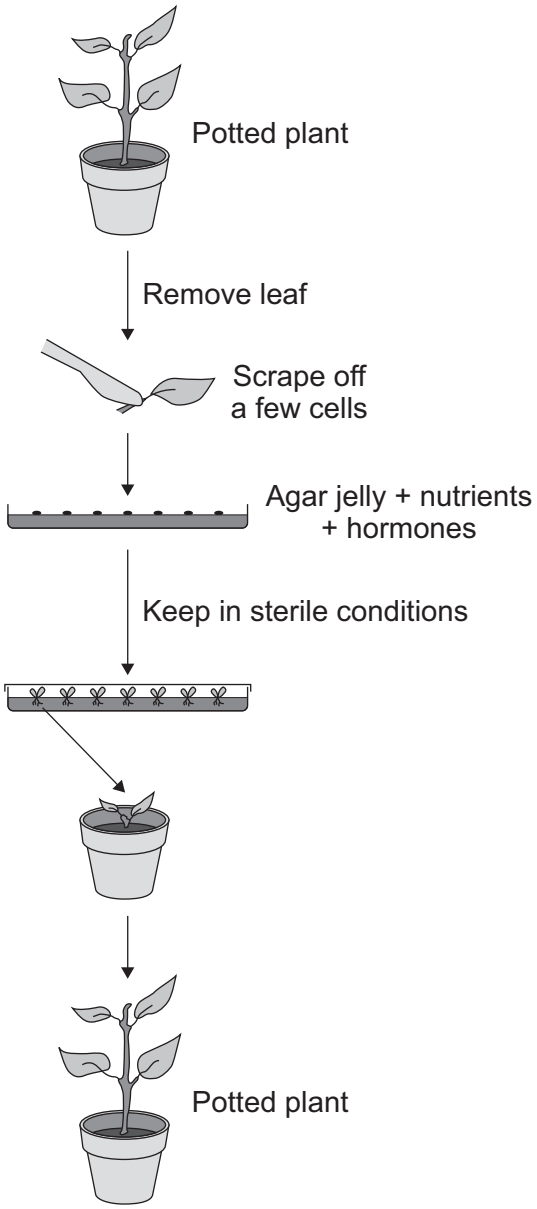
5 Plant hormones are used in horticulture.

5 (a) Name **one** plant hormone.

.....

(1 mark)

5 (b) The diagram shows how new plants are produced using tissue culture.



Do not write outside the box

5 (b) (i) Tissue culture is a type of *asexual reproduction*.

Give the main features of *asexual reproduction*.

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(3 marks)

5 (b) (ii) Another method of producing new plants is by taking cuttings.

Suggest **one** advantage of using tissue culture and **not** using cuttings to produce plants.

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(1 mark)

5

Turn over for the next question

Do not write outside the box

6 Drugs are used to treat cardiovascular diseases (diseases of the heart and blood vessels).

6 (a) What is a drug?

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(1 mark)

6 (b) People can be treated for cardiovascular diseases with statins or aspirin.

Information about these two drugs is given in the table.

STATINS	ASPIRIN
Statins are only available on prescription from doctors. In studies, 30 000 patients were monitored over several years. Statins were found to reduce the rate of non-fatal heart attacks by about 30%. Approximately 0.1% of the patients suffered serious muscle damage and 0.01% suffered kidney failure. Statins reduce blood cholesterol which builds up in the walls of blood vessels. The cost of treating patients with statins can vary between £150 and £500 per year, depending on the type of cardiovascular disease being treated.	Aspirin can be bought over the counter. Treatment with aspirin costs up to £15 per year. In a study of 1000 patients, aspirin was found to cause bleeding of the stomach in around 0.5% of patients and there was a slightly increased risk of poor blood clotting at cuts. There was a slightly increased risk of damage to the blood vessels in the brain in older patients. Aspirin was found to reduce the risk of non-fatal heart attacks by 31%.

Do not write outside the box

Would you recommend statins or aspirin for the treatment of cardiovascular diseases?

In your answer you should:

- give your recommendation
- use information from the table to support your recommendation by making comparisons of the two drugs.

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(5 marks)

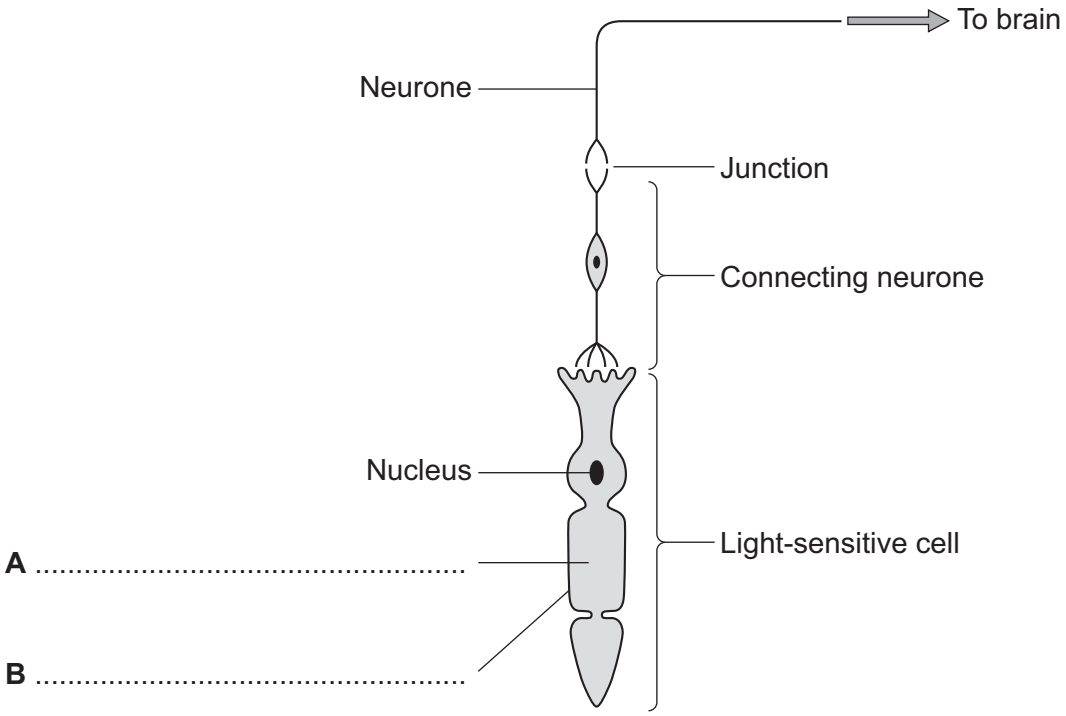
6

Turn over ▶

Do not write outside the box

7 **Diagram 1** shows cells from the light-sensitive layer in the eye.

Diagram 1



7 (a) On **Diagram 1**, add labels to name part **A** and part **B** of the light-sensitive cell.

(2 marks)

7 (b) There is a junction between the connecting neurone and the neurone carrying the impulse to the brain.

7 (b) (i) What name is given to the junction?

.....

(1 mark)

7 (b) (ii) In what form is information passed across the junction?

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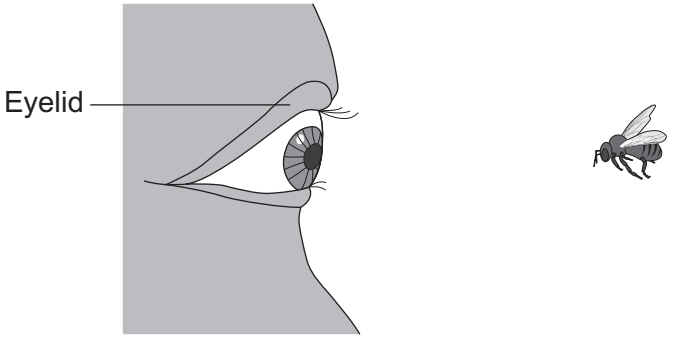
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(1 mark)

Do not write outside the box

7 (c) **Diagram 2** shows a bee flying towards a man's eye.

Diagram 2



In the *blink reflex*, light from the bee reaches the light-sensitive cell in the eye. The muscles in the eyelid shut the man's eye before the bee hits the eye.

Describe the pathway taken by the nerve impulse in the *blink reflex*.

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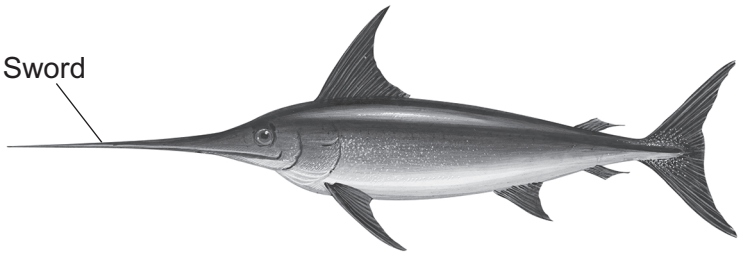
(4 marks)

8

Turn over for the next question

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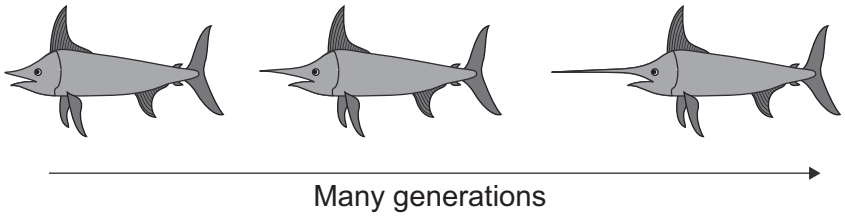
8 The picture shows a modern swordfish.



Ancestors of swordfish had short swords. Modern swordfish have long swords. Swordfish use their swords to injure prey. The injured prey are easier to catch.

The information in the box shows one theory of how the length of the sword of swordfish changed.

The sword grew longer as each swordfish used its sword more and more.
Each time a swordfish reproduced, the longer sword was passed on to its offspring.



8 (a) Which scientist suggested the theory shown in the box?

.....

(1 mark)

Do not write outside the box

8 (b) (i) Darwin suggested that evolution is a result of natural selection.

Describe how natural selection could result in modern swordfish with long swords developing from ancestors with short swords.

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(4 marks)

8 (b) (ii) Scientists in the 1800s accepted both the theory shown in the box, and Darwin's theory.

Now most scientists only accept Darwin's theory.

Give **one** reason why.

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(1 mark)

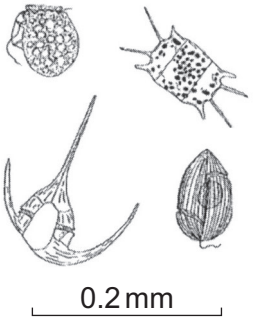
6

Turn over for the next question

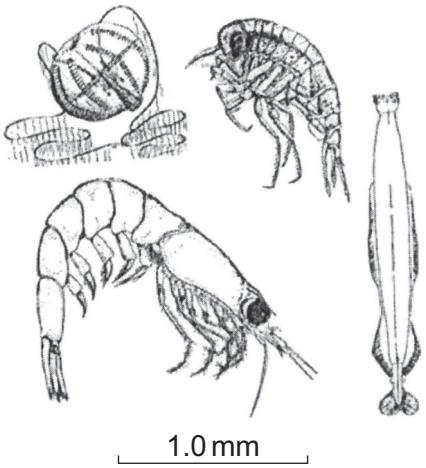
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9 Plankton live in the sea.
The diagram shows plant plankton and animal plankton drawn to the scales shown.

Plant plankton



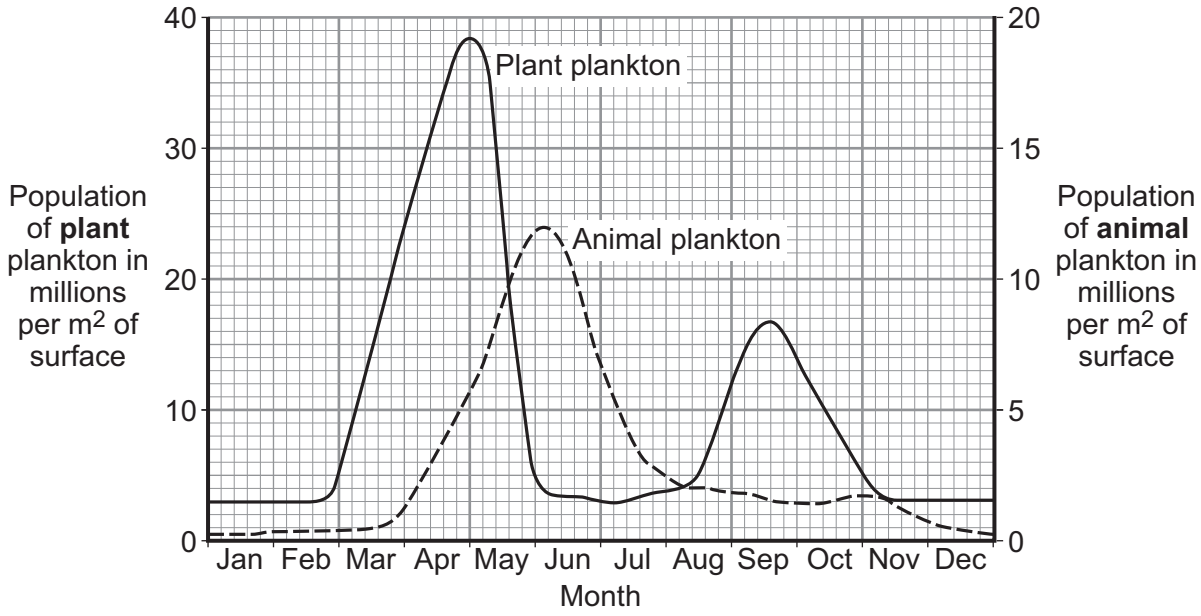
Animal plankton



Animal plankton eat plant plankton.

Graph 1 shows how the populations of the plankton change through the year in the seas around the UK.

Graph 1



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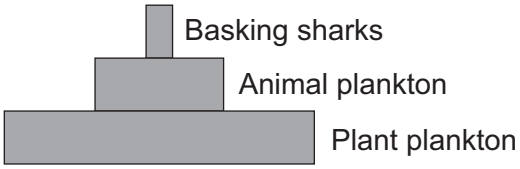
Do not write outside the box

9 (a) Basking sharks eat animal plankton. Basking sharks grow up to 8 metres long.

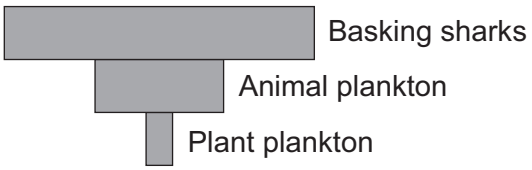
Look at the diagram and **Graph 1**.

Which is the correct shape for the pyramid of biomass to show the relationship between plant plankton, animal plankton and basking sharks, in June?

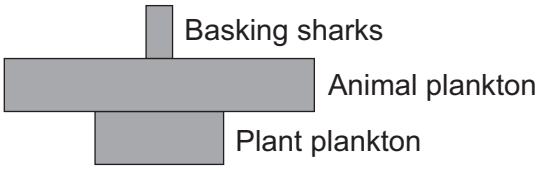
Tick (✓) **one** box.



☐



☐



☐

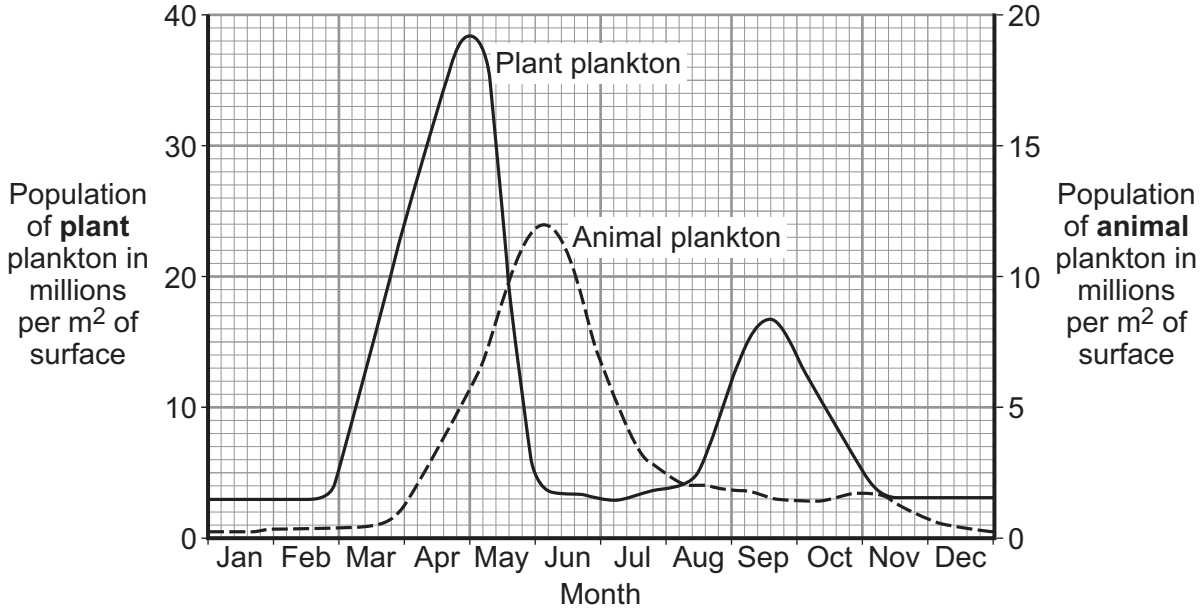
(1 mark)

Question 9 continues on the next page

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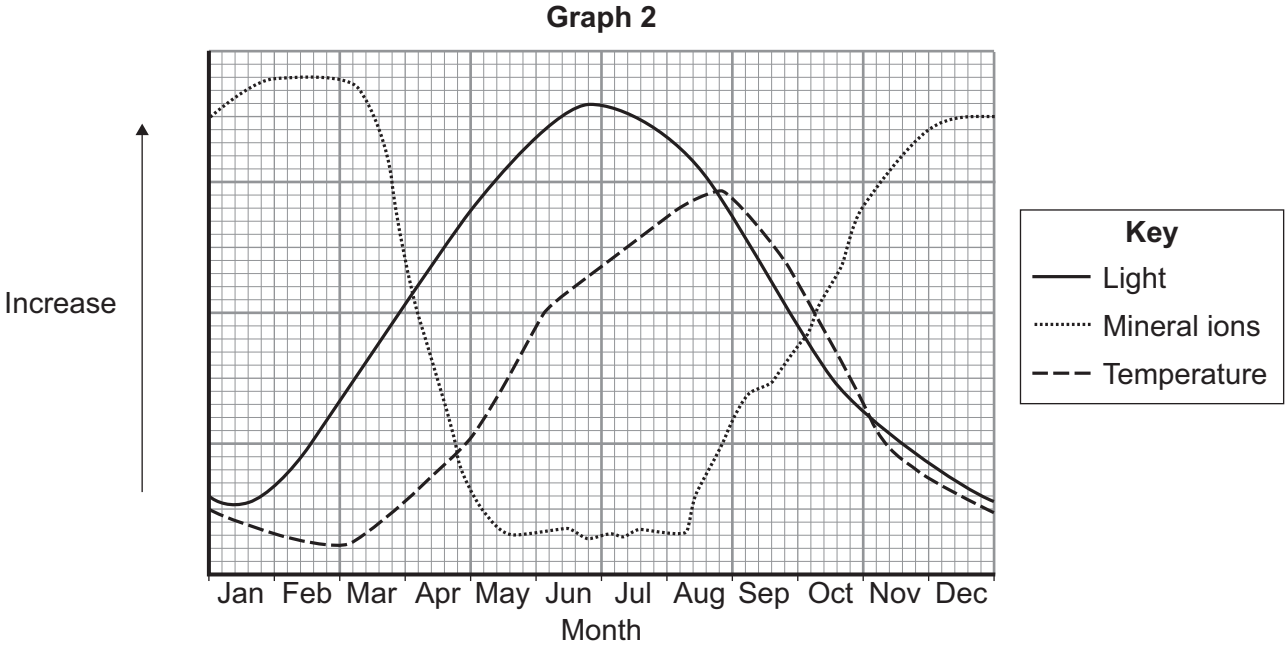
Graph 1 is repeated here to help you answer the following questions.

Graph 1



Graph 2 shows changes in some of the conditions in the upper layers of the sea around the UK.

Graph 2



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Do not write outside the box

9 (b) The population of plant plankton increases between February and April.

Suggest **one** reason for the increase.

Explain your answer.

.....

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(2 marks)

9 (c) The population of animal plankton changes between April and July.

Suggest explanations for the changes.

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(2 marks)

9 (d) The concentration of mineral ions changes between February and December.

Suggest explanations for the changes.

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(3 marks)

8

END OF QUESTIONS

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There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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Question 9: Diagram: John Vigor, The Practical Encyclopedia of Boating: An A–Z Compendium of Navigation, Seamanship, Boat Maintenance and Nautical Wisdom, 2007. © The McGraw-Hill Companies, Inc.

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Version 1.0



General Certificate of Secondary Education
June 2013

Science A / Biology BL1HP

(Specification 4405 / 4401)

Unit 1: Biology 1

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: 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 / ; e.g. 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 3 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)	lower percentage (of women) who died	allow fewer (women) died	1
	numerical reference to a pair of figures to show this	allow any difference in a pair of figures	1
1(a)(ii)	doctors were not transferring	ignore reference to nurses	1
	pathogens / bacteria / viruses / microorganisms / microbes	allow fungi ignore disease / germs / infection	1
1(b)	any **three** from: • lower percentage of patients died (when doctors washed hands or in ward A) • large decrease or reference to proportional decrease • little / no difference / similar to ward B • continued drop (in ward A)	allow fewer for lower percentage ignore raw data	3
1(c)	any **two** from: • better understanding / knowledge of immunity • better / new drugs • sterilisation of equipment **or** isolation of patients **or** some infectious diseases wiped out **or** earlier identification / treatment of infections	accept ref to immunisation / vaccination accept examples, e.g. antibiotics / penicillin (discovered) allow better / new medicines ignore references to general hygiene	2
Total			**9**

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Question 2

question	answers	extra information	mark
2(a)(i)	idea of 'normal' food / diet	e.g. 'the same as usual' or 'the same as before' allow balanced diet allow none of the slimming programmes ignore healthy diet	1
2(a)(ii)	for comparison	accept to show the test is valid allow to show the effect of the slimming programmes allow to see if the slimming programmes work ignore idea of fair test / reliable do **not** allow accurate / precise	1
2(b)(i)	(at first) large / rapid (loss / change of body mass) then small (loss / change) / levelling off	accept 'loss of mass decreased' for **2** marks	1 1
2(b)(ii)	all lost body mass (compared to the control group)		1
Total			**5**

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Question 3

question	Answers	extra information	Mark
3	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.	For at least one process **either** the organism that carries it out **or** the carbon compound used **or** the carbon compound produced is described **or** for at least one organism **either** the carbon compound it uses **or** the carbon compound it produces is described **or** at least one process is named	For some processes (at least one of which is named) **either** the organisms involved **or** the carbon compounds used **or** the carbon compounds produced are described	For at least one named process an organism **and** either the carbon compound used for the process **or** the carbon compound produced by the process are described **and** for other processes (at least one of which is named) **either** the organism **or** the carbon compounds used **or** the carbon compounds produced are described (as in Level 2)

examples of biology points made in the response:

- (green) plants photosynthesise
- photosynthesis takes in carbon dioxide
- (green) plants use carbon to make carbohydrate / protein / fat / organic compounds / named (e.g. enzymes / cellulose)
- animals eat (green) plants (and other animals)
- (green) plants respire
- animals respire
- respiration releases carbon dioxide
- (green) plants and animals die
- microorganisms decay / decompose / rot / break down / feed on dead organisms
- microorganisms respire

Total			**6**

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Question 4

question	answers	extra information	mark
4(a)(i)	rate of chemical reactions (in the body)		1
4(a)(ii)	any **two** from: • heredity / inheritance / genetics • proportion of muscle to fat **or** (body) mass • age / growth rate • gender	 allow (body) weight / BMI accept hormone balance **or** environmental temperature ignore exercise / activity	2
4(b)(i)	77	correct answer with or without working gains **2** marks allow **1** mark for 70/56 **or** 1.25 **or** 5	2
4(b)(ii)	increase exercise reduce food intake	accept a way of increasing exercise accept examples such as eat less fat / sugar allow go on a diet **or** take in fewer calories ignore lose weight ignore medical treatments such as gastric band / liposuction	1 1
Total			**7**

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Question 5

question	answers	extra information	mark
5(a)	auxin	accept other named plant hormones	1
5(b)(i)	any **three** from: • no (fusion of) gametes / fertilisation • only one parent • no mixing of genetic material • no genetic variation **or** genetically identical offspring	 allow no meiosis **or** new cells only produced by mitosis allow not two parents allow clones	3
5(b)(ii)	more / many offspring / plants (produced from one parent plant)	allow less damage to parent plant ignore speed / cost	1
Total			**5**

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Question 6

question	answers	extra information	mark
6(a)	(substance / chemical) that affects body chemistry / chemical reactions in the body		1
6(b)	statin / aspirin / neither recommended	no mark, may be implied. If no recommendation or implication, max 4 marks answers should be comparative	
	any **five** from: • argued evaluation in favour of aspirin or statin or neither		5
	answers could include reference to for statins:	accept converse for statins / aspirin but **not** as advantage of one **and** disadvantage of other	
	• more people in studies • so data / findings more repeatable	accept reliable for repeatable ignore accurate / precise	
	• reduces cholesterol but aspirin doesn't	allow reduces cholesterol but no evidence about aspirin	
	• aspirin (may) causes bleeding / poor clotting but statins do not	allow aspirin causes bleeding / poor clotting but no evidence about statins	
	• smaller (total) percentage suffer side-effects		
	• monitored by doctor, aspirins not		
	for aspirin:		
	• cheaper		
	• can be bought over the counter rather than prescribed		
	• statins cause serious damage / muscle damage / kidney failure but aspirins do not		
	similarities:		
	• both have similar effect on reducing (non-fatal) heart attacks	allow (for aspirin) higher reduction of risk of heart attack	
	• incidence of side-effects low in both		
Total			**6**

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Question 7

question	answers	extra information	mark
7(a)		in this order only	
	A cytoplasm		1
	B (cell) membrane	do **not** accept (cell) wall	1
7(b)(i)	synapse		1
7(b)(ii)	(as) chemical	accept neurotransmitter or named ignore references to how the chemical is passed do **not** accept electrical	1
7(c)		ignore references to synapses accept 'nerve cell' for neuron(e) throughout penalise 'nerve' for neurone once only	
	(from light-sensitive cell to connecting neurone) to sensory neurone		1
	(sensory neurone) to brain / CNS	allow (sensory neurone) to relay neurone / spinal cord	1
	(brain / CNS) to motor neurone	allow (relay neurone / spinal cord) to motor neurone	1
	(motor neurone) to (eyelid) muscle	ignore effector	1
Total			**8**

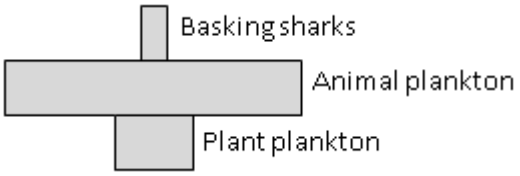
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Question 8

question	answers	extra information	mark
8(a)	Lamarck	ignore any first name(s)	1
8(b)(i)	variation / range of sword lengths (in ancestors)	accept mutation produced longer sword	1
	those with long swords get more food	accept those with short swords get less food	1
	swordfish (with long swords) survive **and** breed	allow have offspring for breed	1
	(survivors) pass on gene(s) / allele(s) (for long sword)	allow mutation for gene(s) / allele(s)	1
8(b)(ii)	any **one** from: • more evidence (now) • DNA / genes / mechanism of inheritance discovered	 accept examples of evidence, e.g. more fossils allow Lamarck's theory has been disproved ignore religious arguments ignore proof	1
Total			**6**

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Question 9

question	Answers	extra information	mark
9(a)		if more than one box is ticked award no mark	1
9(b)	increasing / higher light / temperature more / increased photosynthesis	ignore references to months other than February – April do **not** accept mineral / ions increase for both marks there must be a reference to 'more' at least once (e.g. 'more light for photosynthesis' gains **2** marks) allow **1** mark for reference to light **and** photosynthesis without an idea of 'more'	1 1
9(c)	increase due to increase in plant plankton / food decrease due to fall in plant plankton / food **or** decrease as eaten by (basking) sharks	ignore references to months other than April – July allow decrease as eaten by predators / animals / fish	1 1
9(d)	 fall due to use / intake by <u>plant</u> (plankton) increase due to decay / decomposition / breakdown of dead (plant / animal) plankton	ignore ref to no change section of graph for fall allow March / April ignore May / February for increase allow any month in range August to November ignore December allow of dead organisms / waste	 1 1 1
Total			**8**

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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
Higher Tier
January 2013

Science A
Unit Biology B1

Biology
Unit Biology B1

BL1HP

H

Wednesday 9 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 3(a) 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.

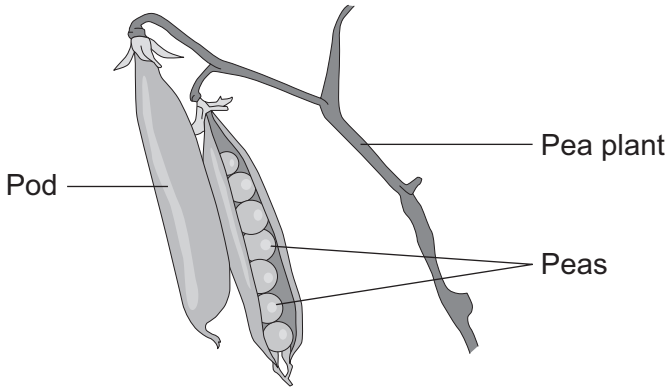
Advice
- In all calculations, show clearly how you work out your answer.

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Do not write outside the box

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

1 Peas grow in pods on pea plants.



A gardener grew four varieties of pea plants, **A**, **B**, **C** and **D**, in his garden.
The gardener counted the number of peas in each pod growing on each plant.

The table shows his results.

Variety	Range of number of peas in each pod	Mean number of peas in each pod
A	2–6	4
B	3–7	5
C	3–8	6
D	6–8	7

1 (a) Give **one** environmental factor and **one other** factor that might affect the number of peas in a pod.

Environmental factor .....

Other factor .....

(2 marks)

Do not write outside the box

1 (b) The gardener thinks that he will get the largest mass of peas from his garden if he grows variety **D**.

Why is the gardener **not** correct?

Suggest **one** reason.

.....

.....

(1 mark)

1 (c) It is important that carbon is cycled through living things.

After he has picked the peas, the gardener puts the dead pea plants onto a compost heap.

Over the next few months, the carbon in the carbon compounds from the pea plants is returned to the air.

Describe how.

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(4 marks)

7

Turn over for the next question

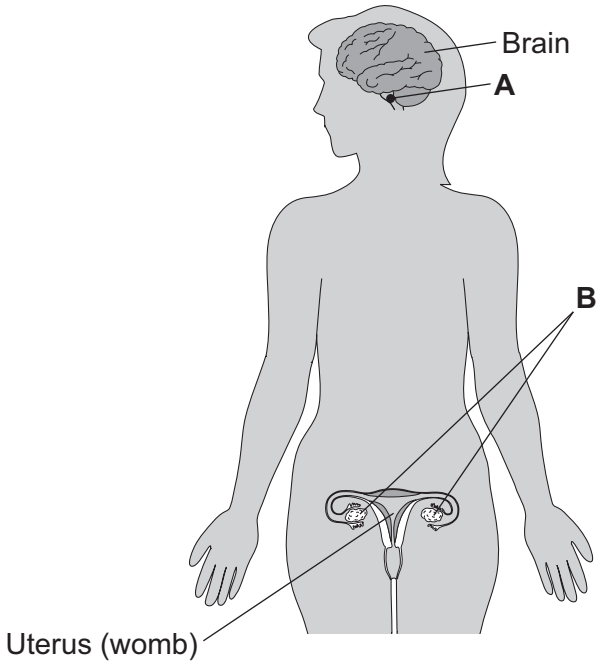
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ANSWER IN THE SPACES PROVIDED

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2 The diagram shows the position of two glands, **A** and **B**, in a woman.



2 (a) (i) Name glands **A** and **B**.

A .....

B .....

(2 marks)

2 (a) (ii) Gland **A** produces the hormone Follicle Stimulating Hormone (FSH).

FSH controls changes in gland **B**.

How does FSH move from gland **A** to gland **B**?

.....

(1 mark)

Question 2 continues on the next page

Do not write outside the box

2 (b) (i) A woman is not able to become pregnant. The woman does not produce mature eggs. The woman decides to have In Vitro Fertilisation (IVF) treatment.

Which **two** hormones will help the woman produce and release mature eggs?

Tick (✓) **one** box.

FSH and Luteinising Hormone (LH) ☐

FSH and oestrogen ☐

Luteinising Hormone (LH) and oestrogen ☐

(1 mark)

2 (b) (ii) Giving these hormones to the woman helps her to produce several mature eggs. Doctors collect the mature eggs from the woman in an operation.

Describe how the mature eggs are used in IVF treatment so that the woman may become pregnant.

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(3 marks)

2 (b) (iii) IVF clinics have been set a target to reduce multiple births.

> At least 76% of IVF treatments should result in single babies and a maximum of 24% of treatments should result in multiple births.

Suggest **one** reason why the clinics have been set this target to reduce multiple births.

.....

.....

(1 mark)

Do not write outside the box

2 (c) Two clinics, **R** and **S**, used IVF treatment on women in 2007. Doctors at each clinic used the results of the treatments to predict the success rate of treatments in 2008.

The table shows the information.

	Total number of IVF treatments in 2007	**Number of IVF treatments resulting in pregnancy in 2007**	**Predicted percentage success rate in 2008**
Clinic **R**	1004	200	18 – 23
Clinic **S**	98	20	3 – 56

2 (c) (i) Compare the success rates of the two clinics in 2007.

.....

.....

(1 mark)

2 (c) (ii) The range of the predicted success rate in 2008 for clinic **R** is much smaller than the range of the predicted success rate for clinic **S**.

Suggest why.

.....

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(2 marks)

11

Turn over for the next question

Do not write outside the box

3 A student is given a tube containing a liquid nutrient medium. The medium contains one type of bacterium.

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

The student is told to grow some of the bacteria on agar jelly in a Petri dish.

Describe how the student should prepare an uncontaminated culture of the bacterium in the Petri dish.

You should explain the reasons for each of the steps you describe.

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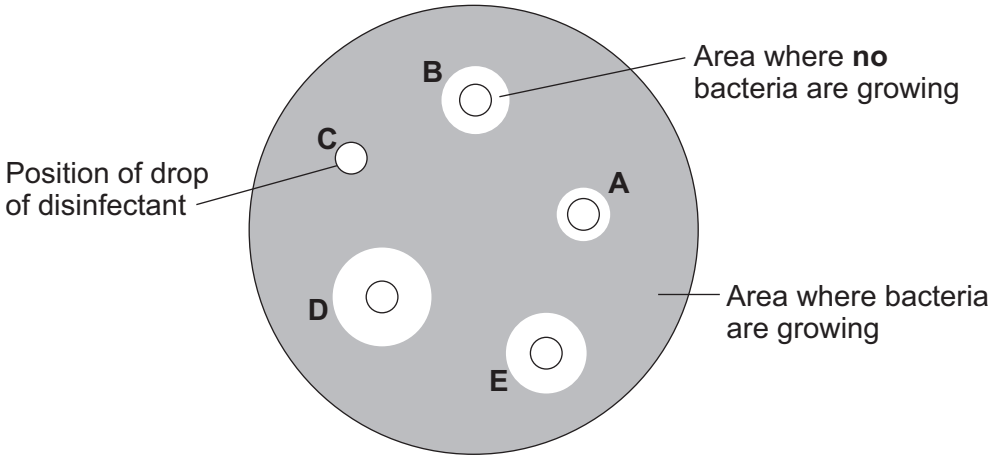
.....

(6 marks)

Do not write outside the box

3 (b) After the culture had been prepared, the student added one drop of each of five disinfectants, **A**, **B**, **C**, **D** and **E**, onto the culture.

The diagram shows the appearance of the Petri dish 3 days later.



3 (b) (i) There are areas on the agar jelly where **no** bacteria are growing.

Why?

.....

.....

(1 mark)

3 (b) (ii) The student concluded that disinfectant **D** would be the best for using around the home.

Give **one** reason why the student might be correct.

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Give **one** reason why the student might **not** be correct.

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(2 marks)

9

Turn over ▶

Do not write outside the box

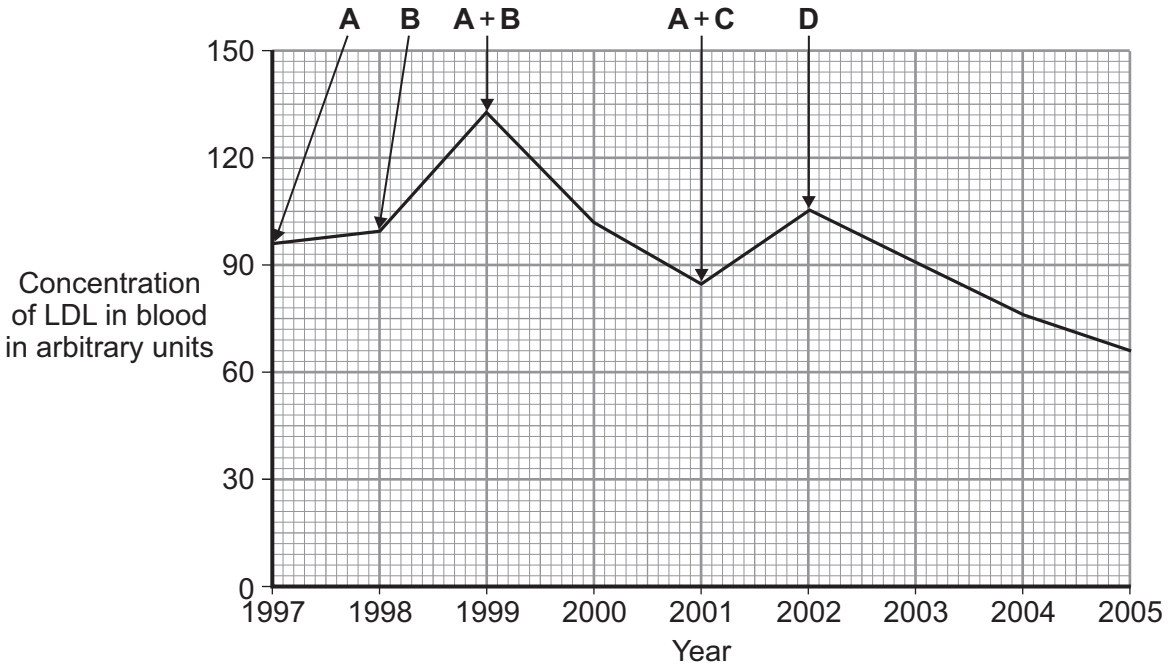
4 LDL is one form of cholesterol found in the blood.

People with a high concentration of LDL in their blood may be treated with drugs called statins.

A high concentration of LDL cholesterol in the blood may result in an increased risk of heart and circulatory diseases.

The graph shows the effects of the treatment of one person with four different statins, **A**, **B**, **C** and **D**, over a period of 8 years. The arrows show when each new treatment was started.

Each treatment was continued until the next treatment was started.



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Do not write outside the box

Compare the effectiveness of the five treatments in reducing the risk of heart and circulatory diseases for this person.

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(4 marks)

4

Turn over for the next question

Do not write outside the box

5 On a rocky shore, when the tide goes in and out, organisms are exposed to the air for different amounts of time.

5 (a) On hot, windy days when the tide is out the concentration of the salt solution in rock pools may become very high.

What term is used to describe organisms that can survive in severe conditions such as very high concentrations of salt solution?

.....

(1 mark)

5 (b) Periwinkles are types of snail.
Students surveyed the different types of periwinkle living on a rocky shore.

The diagram shows the results of the students' survey.
The highest position that the sea water reaches on the shore is called the high tide level.
Each bar represents the range of habitats for each type of periwinkle.

Position on shore	Small periwinkle	Rough periwinkle	Common periwinkle	Flat periwinkle
High tide level ↓ Low tide level				

5 (b) (i) Which **two** types of periwinkle are likely to compete with each other to the greatest extent?

.....

(1 mark)

5 (b) (ii) Explain your answer to part **(b)(i)**.

.....

.....

(1 mark)

Do not write outside the box

5 (b) (iii) The small periwinkle can survive much nearer to the high tide level than the flat periwinkle.

Suggest **two** reasons why the flat periwinkle cannot survive near to the high tide level.

1 .....

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2 .....

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(2 marks)

5

Turn over for the next question

Do not write outside the box

6 White blood cells protect the body against pathogens such as bacteria and viruses.

6 (a) (i) Pathogens make us feel ill.

Give **one** reason why.

.....

.....

(1 mark)

6 (a) (ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1 .....

.....

2 .....

.....

(2 marks)

6 (b) Vaccination can protect us from the diseases pathogens cause.

6 (b) (i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

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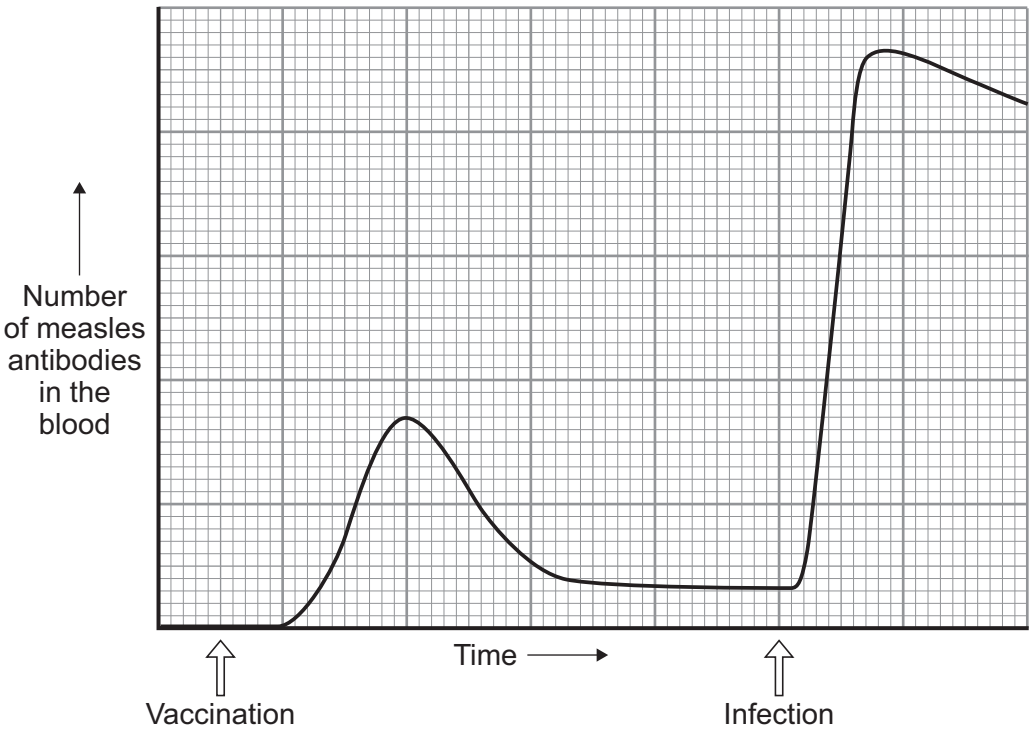
.....

(2 marks)

6 (b) (ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.

Do not write outside the box



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

.....

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(3 marks)

6 (b) (iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

.....

(1 mark)

6 (c) What is the advantage of vaccinating a large proportion of the population against measles?

.....

(1 mark)

10

Turn over ▶

Do not write outside the box

7 Darwin suggested the theory of natural selection.

7 (a) Explain how natural selection occurs.

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(3 marks)

7 (b) Latitude is a measure of distance from the Earth's equator.

Scientists investigated the effect of latitude on:

- the time taken for new species to evolve
- the number of living species.

The table shows the scientists' results.

Latitude in degrees North of equator	Time taken for new species to evolve in millions of years	Relative number of living species
0 (at the equator)	3–4	100
25	2	80
50	1	30
75 (in the Arctic)	0.5	20

As latitude increases environmental conditions become more severe.

Do not write outside the box

7 (b) (i) Describe the patterns shown by the data.

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(2 marks)

7 (b) (ii) Suggest explanations for the patterns you have described in part **(b)(i)**.

.....

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(2 marks)

7

Turn over for the next question

Do not write outside the box

8 The photographs show four different species of bird.

Great tit



Blue tit



Coal tit



Long-tailed tit



The table gives information about the four species of bird in winter.

Bird species	Mean body mass in grams	Mean energy needed in kJ per day	Mean percentage of day spent feeding
Great tit	21	84.2	75
Blue tit	12	62.4	81
Coal tit	9	49.5	88
Long-tailed tit	7	42.0	92

8 (a) (i) Calculate the energy needed per day per gram of body mass for the blue tit.

.....

.....

.....

Answer = ... kJ per day per gram of body mass
(2 marks)

Do not write outside the box

8 (a) (ii) Describe the trend for energy needed per day per gram of body mass for the four species of bird.

.....

.....

.....

(1 mark)

8 (a) (iii) Suggest an explanation for the trend you have described in part **(a)(ii)**.

.....

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(2 marks)

8 (b) Describe and explain the trend shown by the data for the time spent feeding in winter for the birds.

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(2 marks)

7

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Question 8 Great tit © Thinkstock
Blue tit © Thinkstock
Coal tit © Thinkstock
Long-tailed tit © Getty

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Version 1.0



General Certificate of Secondary Education
January 2013

Science A / Biology BL1HP

(Specification 4405 / 4401)

Unit: Biology 1

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

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

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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 3(a) 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)	any correct named physical environmental condition, e.g. light / water / rain / temperature / minerals / nutrients / space (between plants)	ignore carbon dioxide / climate / weather / sun / pollution	1
	genes / inheritance OR any correct named biotic factor e.g. predation / disease	ignore 'variety'	1
1(b)	mass of crop also depends on number of pods (per plant) / size / mass of each pea	ignore number of plants	1
1(c)	microorganisms / bacteria / fungi / decomposers / detritus feeders / named		1
	decompose / rot / break down / decay / digest	ignore feed / eat	1
	(these organisms) respire	do **not** allow respiration by pea (plants)	1
	(decay / respiration / microorganisms etc) releases carbon dioxide	do **not** allow combustion / fossilisation	1
Total			**7**

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Question 2

question	answers	extra information	mark
2(a)(i)	**A** – pituitary **B** – ovary / ovaries	allow hypothalamus	1 1
2(a)(ii)	in blood (stream)	accept in plasma ignore dissolved	1
2(b)(i)	FSH and Luteinising Hormone (LH)		1
2(b)(ii)	fertilised OR reference to sperm form embryos / ball of cells or cell division (embryo) inserted into mother's womb / uterus	 allow (fertilised egg) is inserted into mother's womb / uterus	1 1 1
2(b)(iii)	any **one** from: • multiple births lead to low birth weight • multiple births cause possible harm to mother / fetus / embryo / baby / miscarriages	 allow premature ignore reference to cost / ethics / population	1
2(c)(i)	any **one** from: • almost identical • both approximately 20%	 allow S (slightly) more successful	1
2(c)(ii)	larger numbers (in clinic R) (in 2007) results likely to be more repeatable (in 2008)	allow <u>only</u> 98 (in S) (compared to 1004 (in R)) allow more reliable do **not** accept more reproducible / accurate / precise	1 1
Total			**11**

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Question 3

question	answers	extra information	mark
3(a)	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.		6

0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is a brief description of at least one of the stages (pre-inoculation, inoculation, post-inoculation).	There is a simple description of at least two stages and an explanation of at least one of them.	There is a clear description of all three stages and an explanation of at least two of them.

examples of biology points made in the response:

Pre-inoculation

- Petri dish and agar sterilised before use
- to kill unwanted bacteria
- inoculating loop passed through flame / sterile swab
- to sterilise / kill (other) bacteria

Inoculation

- loop/swab used to spread/streak bacterium onto agar

allow other correct methods, eg bacterial lawns

- lid of Petri dish opened as little as possible
- to prevent microbes from air entering

Post-inoculation

- sealed with tape
- to prevent microbes from air entering
- incubate
- to allow growth of bacteria

Question 3 continues on the next page

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Question 3 continued

question	answers	extra information	mark
3(b)(i)	bacteria killed / destroyed	ignore fights / attacks / stops growth / got rid of	1
3(b)(ii)	*Might be correct* largest area / space where no bacteria are growing *Might not be correct* (need more evidence as) D may be harmful to people / animals / surfaces **or** may work differently with different bacteria **or** disinfectants may be different concentrations **or** may not last as long	allow most bacteria killed ignore ref to cost / dangerous or harmful unqualified ignore different amounts of disinfectant unless reference to different drop size ignore take longer to work allow reference to anomalous result or not repeated	1 1
Total			**9**

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Question 4

question	answers	extra information	mark
4		ignore descriptions of LDL levels	
	A + B most effective (treatment)		1
	D is (the most) effective (treatment)	D is the best single (treatment)	1
	neither A nor B (alone) are effective	allow increase risk of heart disease instead of not effective	1
	can't tell if C is effective		1
	OR		
	A + C is not effective		
Total			**4**

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Question 5

question	answers	extra information	mark
5(a)	extremophile(s)		1
5(b)(i)	common (periwinkle) and flat (periwinkle)	either order, **both** required	1
5(b)(ii)	(common and flat) both live in the same habitat / area / named area	allow habitats overlap the most	1
5(b)(iii)	any **two** from: • would have wrong food • would otherwise be exposed to (specific) predators • cannot tolerate extended exposure to air **or** reduced submersion in seawater • cannot tolerate high salt concentration (in rock pools) • cannot compete with small periwinkle	allow cannot tolerate temperature / dehydration allow low salt concentration (in rock pools)	2
Total			**5**

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Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • (produce) toxins / poisons • (cause) damage to cells	 kill / destroy cells allow kills white blood cells	1
6(a)(ii)	produce antitoxins engulf / ingest / digest pathogens / viruses / bacteria / microorganisms	 accept phagocytosis or description ignore eat / consume / absorb for engulf ignore references to memory cells	1 1
6(b)(i)	dead / inactive / weakened (measles) pathogen / virus	accept idea of antigen / protein ignore bacteria	1 1
6(b)(ii)	(after infection) rise begins sooner / less lag time steeper / faster rise (in number) longer lasting **or** doesn't drop so quickly	accept converse if clearly referring to before vaccination idea of staying high for longer ignore reference to higher starting point	 1 1 1
6(b)(iii)	antibodies are specific or needs different antibodies	accept antigens are different **or** white blood cells do not recognise virus	1
6(c)	reduces spread of infection / less likely to get an epidemic	 accept idea of eradicating measles	1
Total			**10**

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Question 7

question	answers	extra information	mark
7(a)		allow described example	
	variation (between organisms within species)	allow mutation – but **not** if caused by change in conditions	1
	those most suited / fittest survive		1
	genes / alleles passed on (to offspring / next generation)	allow mutation passed on	1
7(b)(i)	any **two** from: • increase in latitude reduces number of (living) species • increase in latitude reduces time for evolution (of new species) • the less the time to evolve the fewer the number of (living) species	allow converse ignore references to severity of conditions	2
7(b)(ii)	any **two** from: • (increase in latitude reduces number of (living) species because) less food / habitats / more competition at high latitude • increase in latitude reduces time for evolution (of new species) because) severe conditions act more quickly / to a greater extent on the weakest • (the less the time to evolve the fewer the number of (living) species because) species that evolve slowly don't survive	do **not** accept intention or need to evolve allow only extremophiles / well-adapted species can survive	2
Total			**7**

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Question 8

question	answers	extra information	mark
8(a)(i)	5.2	award **2** marks for correct answer, irrespective of working or lack of it award **1** mark for 62.4÷12 only with incorrect or no answer	2
8(a)(ii)	the smaller the (mass of the) bird the more energy is needed (per gram of body mass)	allow converse ignore figures	1
8(a)(iii)	smaller bird has larger surface area : volume / mass ratio so heat / energy lost more quickly	allow converse allow lose more heat / energy if (a)(ii) describes a trend of more energy with increasing body mass allow **one** mark for idea of more energy needed for flight	1 1
8(b)	larger birds spend less time feeding since they need less food per gram of body mass (to satisfy energy needs)	accept converse allow the less energy they need per day the longer they spend feeding	1 1
Total			**7**

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
Higher Tier
June 2012

Science A
Unit Biology B1

BL1HP

H

Biology
Unit Biology B1

Tuesday 12 June 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 3 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 Scientists at a drug company developed a new pain-killing drug, drug **X**.

1 (a) Painkillers do **not** cure infectious diseases.

Why?

.....

(1 mark)

1 (b) The scientists compared drug **X** with two other pain-killing drugs, drug **A** and drug **B**. In their investigation the scientists:

- chose 600 volunteers. The volunteers were all in pain
- gave 200 of the volunteers a standard dose of drug **A**
- gave 200 of the volunteers a standard dose of drug **B**
- gave 200 of the volunteers a standard dose of drug **X**.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

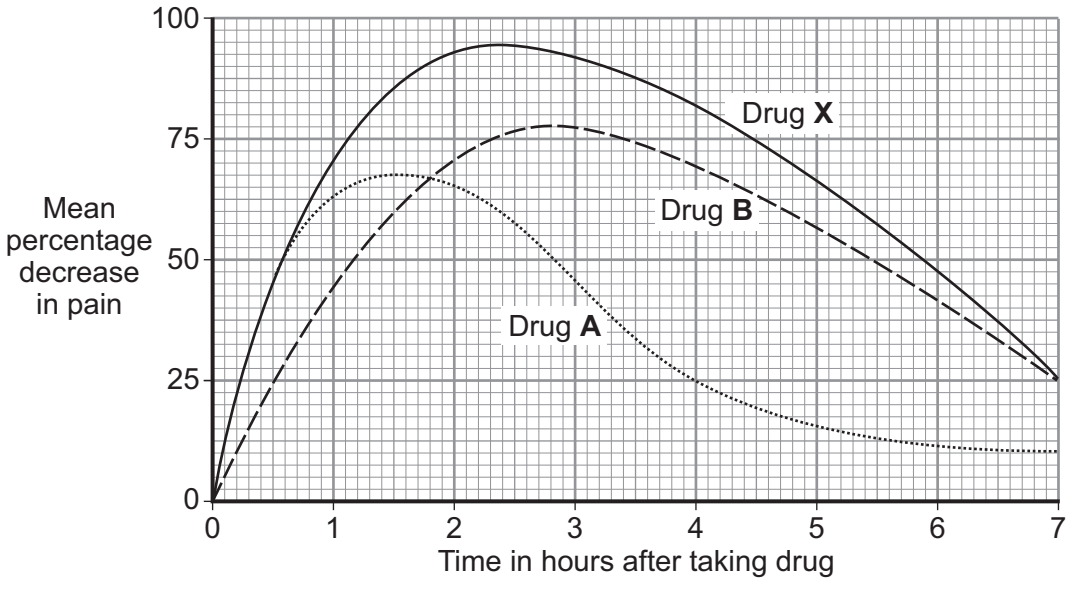
Suggest **two** of the factors that should be matched.

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(2 marks)

1 (c) The graph shows the results of the investigation.



Do not write outside the box

1 (c) (i) How much pain did the volunteers still feel, four hours after taking drug **A**?

..... percent
(1 mark)

1 (c) (ii) Give **one** advantage of taking drug **A** and **not** drug **B**.

.....

.....
(1 mark)

1 (c) (iii) Give **two** advantages of taking drug **B** and **not** drug **A**.

.....

.....

.....

.....
(2 marks)

1 (d) Drug **X** is much more expensive than both drug **A** and drug **B**.

A pharmacist advised a customer that it would be just as good to take drug **A** and drug **B** together instead of drug **X**.

Do you agree with the pharmacist's advice?

Give reasons for your answer.

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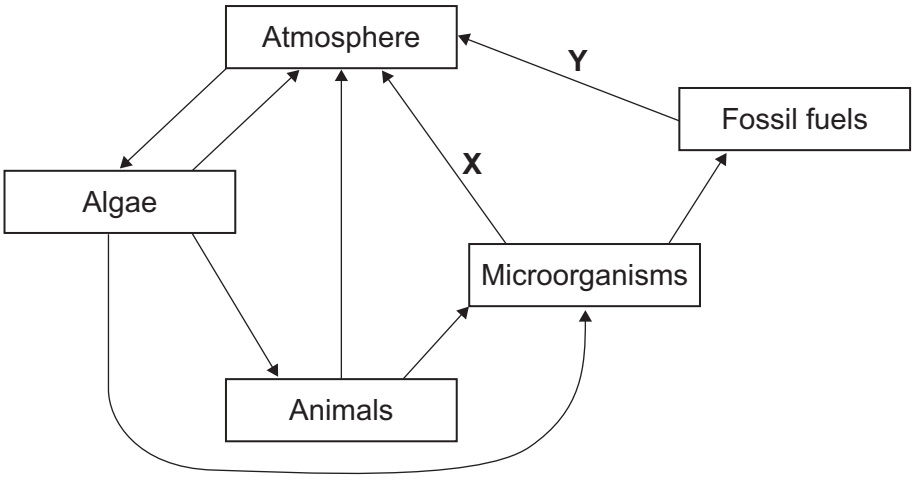
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(3 marks)

10

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2 The diagram shows part of a carbon cycle in a habitat.



2 (a) Name the processes shown by arrows **X** and **Y**.

X .....

Y .....

(2 marks)

2 (b) Describe the part played by algae in this carbon cycle.

.....

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.....

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(3 marks)

2 (c) In tropical rainforests process **X** is much faster than in most other habitats.

Suggest why.

.....

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.....

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(2 marks)

7

Do not write outside the box

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

Plants and animals have become adapted in many different ways to reduce the risk of being eaten by predators.

Describe these adaptations.

Give examples of animals and plants adapted in the ways you describe.

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(6 marks)

6

Turn over ▶

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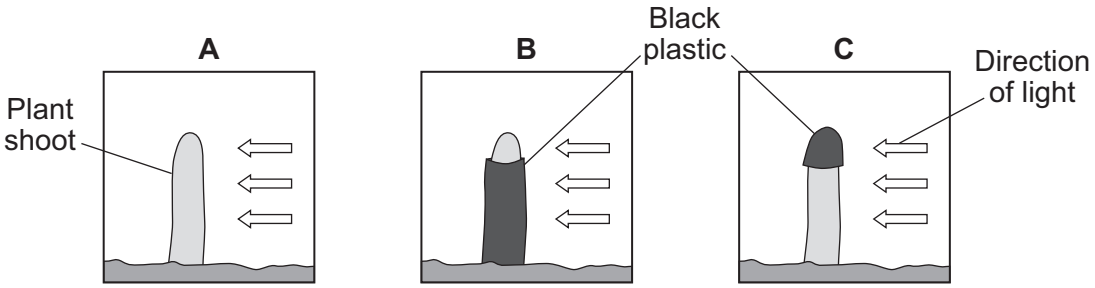
4 Charles Darwin investigated tropisms in plants.

Some students did an investigation similar to Darwin's investigation.

The students:

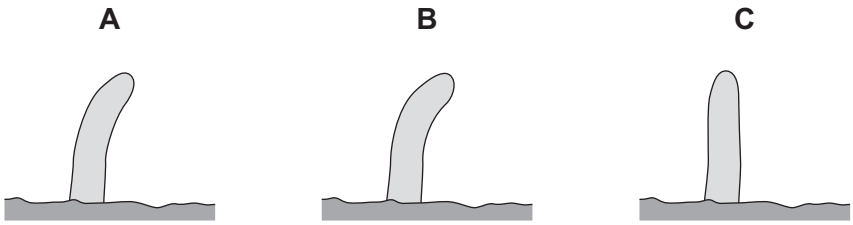
- grew seeds until short shoots had grown
- used black plastic to cover parts of some of the shoots
- put the shoots in light coming from one direction
- put boxes over the shoots to keep out other light.

The diagrams show how the investigation was set up.



Two days later the students took off the black plastic covers and looked at the shoots.

The diagrams show the results.



4 (a) Give **two** variables that the students should control in this investigation.

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(2 marks)

Do not write outside the box

4 (b) Shoot **A** bent towards the light as it grew.

Explain how.

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(4 marks)

4 (c) What conclusions can be drawn from the results about:

4 (c) (i) the detection of the light stimulus

.....

.....

(1 mark)

4 (c) (ii) where in the shoot the response to the light takes place.

.....

.....

(1 mark)

8

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

5 People may be immunised against diseases using vaccines.

5 (a) (i) Which part of the vaccine stimulates the body's defence system?

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.....

.....

.....

(2 marks)

5 (a) (ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

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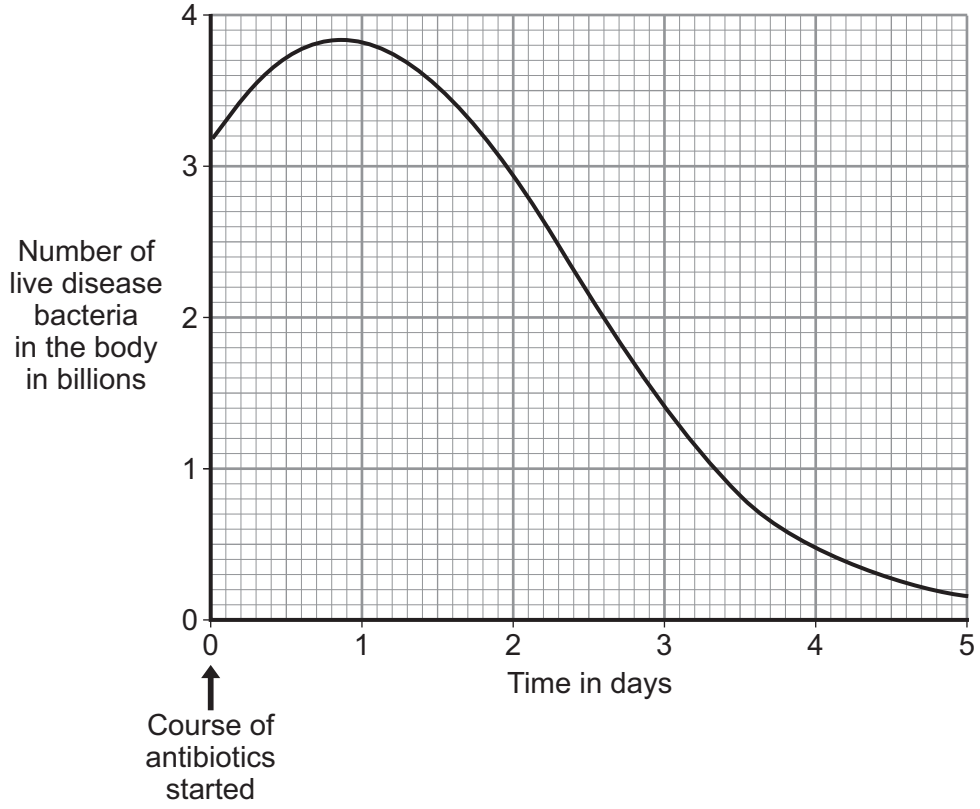
(3 marks)

Question 5 continues on the next page

Do not write outside the box

5 (b) A man catches a disease. The man has **not** been immunised against this disease. A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.



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Do not write outside the box

5 (b) (i) Four days after starting the course of antibiotics the man feels well again.
It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

.....

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(2 marks)

5 (b) (ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

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(3 marks)

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Turn over for the next question

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6 The picture shows a zebra fish.



Illustration © Emily S. Damstra

Zebra fish are small freshwater fish that usually have black and silver stripes.
Zebra fish can tolerate a wide range of environmental conditions.

6 (a) Scientists have genetically modified zebra fish to act as pollution indicators.
The genetically modified zebra fish have a gene transferred from a jellyfish.
The gene allows the stripes of the zebra fish to change colour.

Describe how the scientists produced the genetically modified zebra fish.

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(3 marks)

6 (b) Some scientists are worried about the production of genetically modified zebra fish.

Suggest reasons why.

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(2 marks)

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Turn over ▶

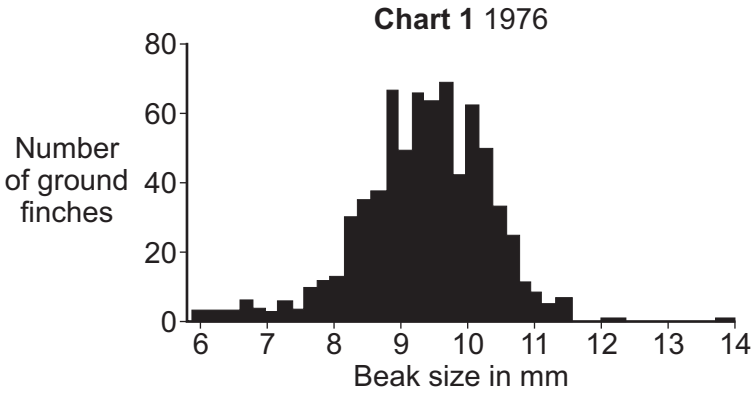
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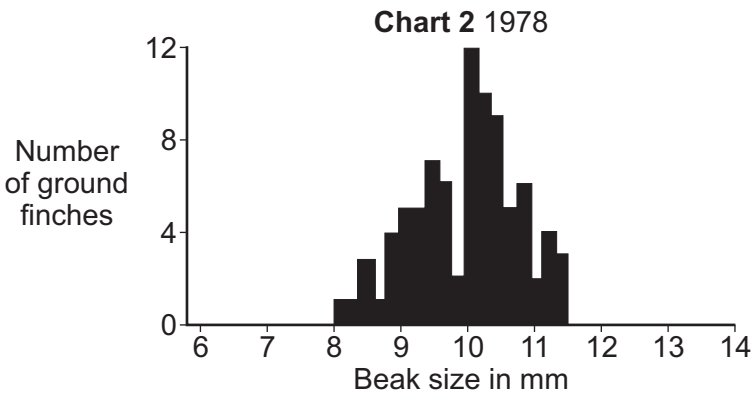
7 The Galapagos Islands are in the Pacific Ocean, 1400 km from South America.
A type of bird called a ground finch lives on the islands.
The picture shows a ground finch.



© Gerald & Buff Corsi, Visuals Unlimited/Science Photo Library

The size of the seeds the ground finch can eat depends upon the size of the beak.
To eat large seeds, a large beak is needed.
The bar charts show the sizes of the beaks of ground finches on **one** island, in 1976 and in 1978.





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7 (a) The population of the ground finches and their beak sizes changed between 1976 and 1978.

Describe these changes.

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(3 marks)

7 (b) In 1977 there was very little rain on the island. The lack of rain affected the seeds that the finches ate.
The table shows how the seeds were affected.

Year	Mean number of seeds per m^2	Mean mass of each seed in mg
1976	8.5	3.5
1978	2.8	4.2

Suggest an explanation for the changes in beak sizes between 1976 and 1978.

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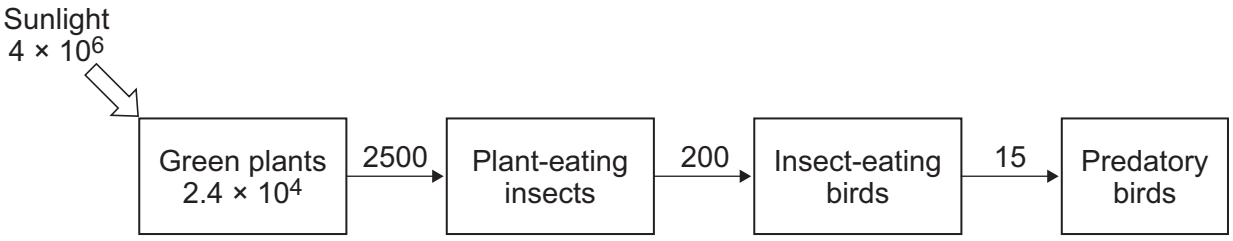
(4 marks)

7

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8 The diagram shows the annual flow of energy through a habitat.

The figures are in $kJ\,m^{-2}$.



8 (a) (i) Calculate the percentage of the energy in sunlight that was transferred into energy in the green plants.

Show clearly how you work out your answer.

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Answer = ... %

(2 marks)

8 (a) (ii) Suggest reasons why the percentage energy transfer you calculated in part **(a)(i)** was so low.

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(2 marks)

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8 (b) Compare the amount of energy transferred to the insect-eating birds with the amount transferred to the predatory birds.

Suggest explanations for the difference in the amount of energy transferred to the two types of bird.

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(3 marks)

7

END OF QUESTIONS

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Version : 10/08/2012



General Certificate of Secondary Education

Science A 4405 / Biology 4401

BL1HP Unit Biology 1

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 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, 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 3 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.

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)	don't kill pathogens / bacteria / viruses / microbes / microorganisms	allow don't contain antibiotics ignore antibodies / attack / fight allow only treat symptoms / pain ignore kill disease / germs	1
1 (b)	any **two** from: • age • gender • extent / severity of pain **or** how long had pain before trial • type of pain / illness / site of pain • (body) mass / weight / height • other medical issues / drugs taken / health / fitness • ethnicity	accept 'the pain' for **1** mark, if neither extent or type given ignore pain threshold allow body size / physique	2
1 (c)(i)	75	ignore calculations / %	1
1 (c)(ii)	faster pain relief / decrease	allow pain relief sooner **or** it works quicker **or** more pain relief at start / in first hour / $1\frac{3}{4}$ hours	1
1 (c)(iii)	decrease of pain higher / more decrease of pain is longer lasting	ignore more effective unless qualified by time $>1\frac{3}{4}$ hours allow effect lasts longer	1 1

Question 1 continues on the next page . . .

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BL1HP

Question 1 continued

question	answers	extra information	mark
1 (d)	any **three** from: **(Yes because)** • rapid pain relief (from A) • long lasting pain relief (from B) • and it costs less • the sum of the pain relief (from A + B) is greater (than X) **(No because)** • drug X gives more pain relief • (A + B / they) might interact with each other • could result in overdose • could be more / new side effects	ignore yes or no if neither points gained allow (more) dangerous	3
Total			**10**

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Question 2

question	answers	extra information	mark
2 (a)	**X** respiration	correct order only allow decay / decomposition / rotting ignore breakdown / disintegrate	1
	Y combustion / burning		1
2 (b)	any **three** from: • photosynthesise / absorb carbon dioxide	accept are producers **or** produce / make biomass / glucose / other named do **not** accept photosynthesis releases CO_2	3
	• release carbon dioxide / respire		
	• eaten by animals		
	• fed on / decayed by microorganisms	ignore eaten by microorganisms	
2 (c)	any **two** from: (in tropical rainforest conditions are) • warm(er) / hot		2
	• damp / moist / wet / humid	ignore rain	
	• a lot of microorganisms		
	• a lot of material to decay	allow warm(er) so enzymes work faster for **2** marks	
Total			**7**

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Question 3

question	information		mark
3	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 at least one example of an adaptation of either an animal **or** a plant. However it may not be clear how the adaptation helps the organism to avoid being eaten.	There is a description of an adaptation of at least one animal **and** at least one plant. It is clear how at least one of these adaptations helps the organism to avoid being eaten.	There are clear and detailed descriptions of a range of adaptations of named animals **and** named plants. It is clear how most of these adaptations help the organisms to avoid being eaten.

examples of clear and detailed biology points made in response:

- **camouflage** – the method of camouflage should be described plus a statement that the predator is less likely to see the prey
- **mimicry / warning colouration** – the method should be described plus a statement that the predator is likely to confuse the prey with e.g. a poisonous organism
- **thorns / prickles / spines / horns** – a statement that these are sharp and are likely to hurt a predator
- **long limbs / streamlining** – a statement that these increase speed and make it more likely that prey will outrun predator
- **bad taste** / **poison** – a statement that predator will find this unpleasant and 'spit out' prey / not attack same prey again
- **large ears / position of eyes** – a statement that predators will be detected earlier so the prey can escape sooner

Total		**6**

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Question 4

question	answers	extra information	mark
4 (a)	any **two** control variables for **1** mark each: • age / size of shoots • species **or** type of plant / seeds • light intensity • (other) named condition eg temperature / water	 accept amount of light / colour of light 	2
4 (b)	ref to auxin / hormone unequal (lateral) distribution more hormone on dark side causes growth on dark side	ignore reference to phototropism	 1 1 1 1
4 (c)(i)	(detection) in tip / top / end		1
4 (c)(ii)	(response) behind tip	allow at tip / end / top half	1
Total			**8**

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Question 5

question	answers	extra information	mark
5 (a)(i)	dead / inactive / weakened	allow antigen / protein ignore ref to other components ignore small amount	1
	pathogen / bacterium / virus / microorganism	ignore germs / disease	1
5 (a)(ii)		antigen / antibiotic instead of antibody = max 2	
	white blood cells produce / release antibodies	accept lymphocytes / leucocytes / memory cells produce antibodies do **not** accept phagocytes	1
	antibodies produced quickly		1
	(these) antibodies destroy the pathogen	allow kill do **not** accept antibodies engulf pathogens	1
5 (b)(i)	(live) bacteria still in body	ignore numbers	1
	would reproduce	ignore mutation / growth	1
5 (b)(ii)	antibiotics / treatment ineffective **or** resistant pathogens survive	accept resistant out compete non-resistant	1
	these reproduce		1
	population of resistant pathogens increases	allow (resistant pathogens reproduce) rapidly	1
Total			**10**

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Question 6

question	answers	extra information	mark
6 (a)	(jellyfish) gene(s) cut out		1
	ref to enzymes (at any stage)		1
	(gene) transferred to zebra fish at early stage of development / embryo / egg	ignore removal of zebra fish genes	1
6 (b)	any **two** from: • could transfer gene to other (fish) species • effects on food chains • effects on zebra fish themselves, eg may out compete non GM zebra fish	ignore unethical / religious / unnatural accept effects on other species / humans who eat them	2
Total			**5**

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Question 7

question	answers	extra information	mark
7 (a)	in 1978 fewer finches **or** population smaller		1
	any **two** from: • no beaks less than 8mm • no beaks greater than 11.5 / 12mm • mean / average beak size higher	if these points not given allow smaller range of beak sizes for **1** mark	2
7 (b)	variation or range or mutation of beak sizes	do **not** accept idea that drought / seed size caused mutation	1
	birds with larg(er) beaks are better adapted for feeding	accept idea of competition for food / seeds amongst finches	1
	birds with larg(er) beaks survive	accept (only / more) birds with large beaks were better competitors	1
	birds with larg(er) beaks breed **or** gene / allele for large beak passed on	do **not** accept large beak passed on	1
Total			**7**

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Question 8

question	answers	extra information	mark
8 (a)(i)	0.6 **or** 6 x 10^{-1}	for correct answer if no / incorrect answer $\frac{2.4 \times 10^{4}}{4 \times 10^{6}} \times 100$ **or** 0.006 **or** 6 x 10^{-3} gains **1** mark	2
8 (a)(ii)	any **two** from: • reflected • not absorbed **or** misses chloroplasts / chlorophyll • wrong wavelength • photosynthesis inefficient • allow some lost through respiration / as heat (from respiration)	 ignore some of light is green allow transmitted **or** passes through leaves allow hits other plant parts accept other limiting factors / named	2
8 (b)	energy lost via faeces / not digested / waste / excreted (of insect-eating birds) energy loss via respiration / movement / muscle contraction / heat (by insect-eating bird) some of (insect eating) bird not eaten <u>but</u> all / most / more of insect is eaten	 accept examples of muscle contraction do **not** accept energy used for respiration	1 1 1
Total			**7**

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	
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8	
TOTAL	

General Certificate of Secondary Education
Higher Tier
January 2012

Science A
Unit Biology B1

BL1HP

H

Biology
Unit Biology B1

Thursday 12 January 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 1(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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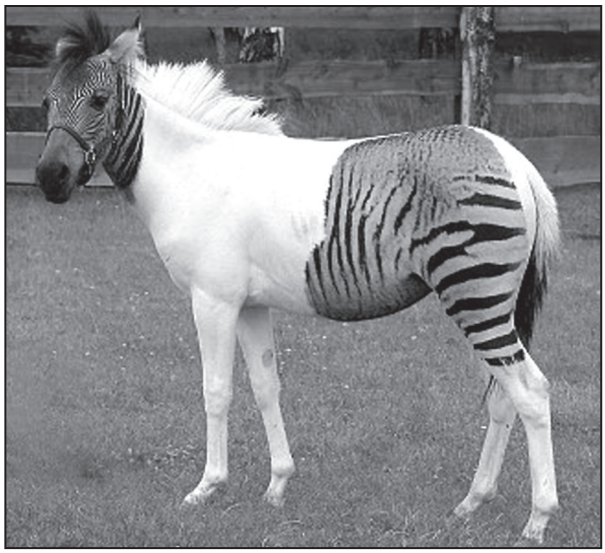
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Answer **all** questions in the spaces provided.

1 The photograph shows a zorse.



A zorse is a cross between a male zebra and a female horse.
The zorse has characteristics of both parents.

1 (a) The zorse was produced by *sexual reproduction*.

1 (a) (i) What is *sexual reproduction*?

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(1 mark)

1 (a) (ii) The zorse has characteristics of a zebra and a horse.

Why?

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(2 marks)

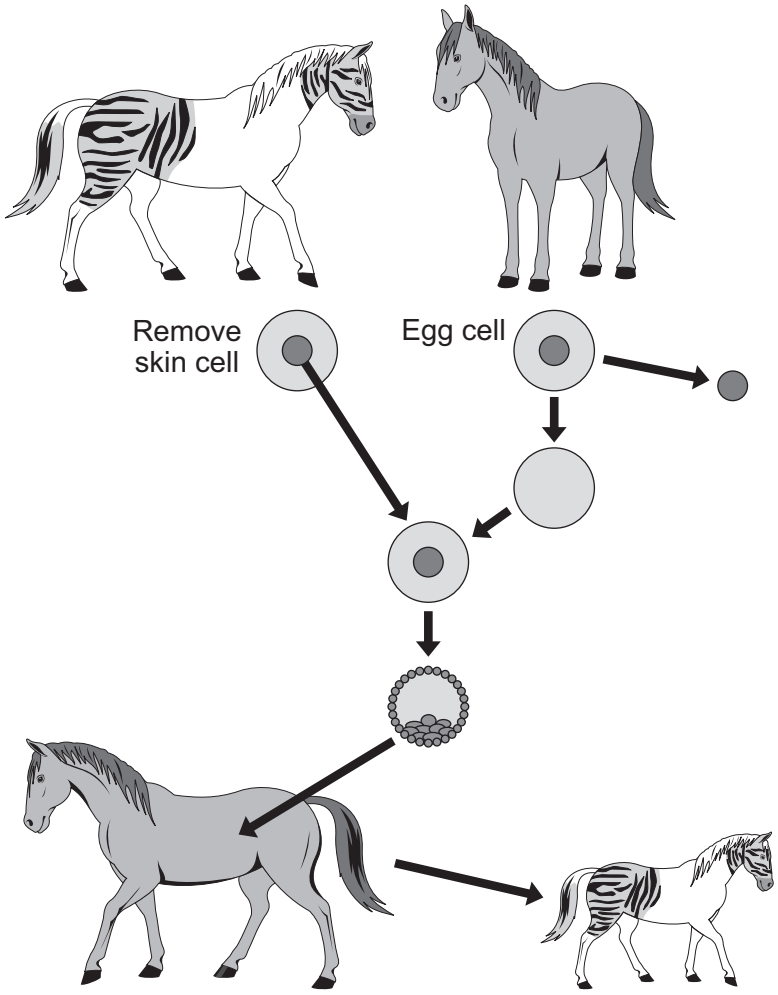
Question 1 continues on the next page

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1 (b) Zorses are **not** able to breed.
Scientists could produce more zorses from this zorse by adult cell cloning.

The diagram shows how the scientists might clone a zorse.



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

Use information from the diagram and your own knowledge to describe how adult cell cloning could be used to clone a zorse.

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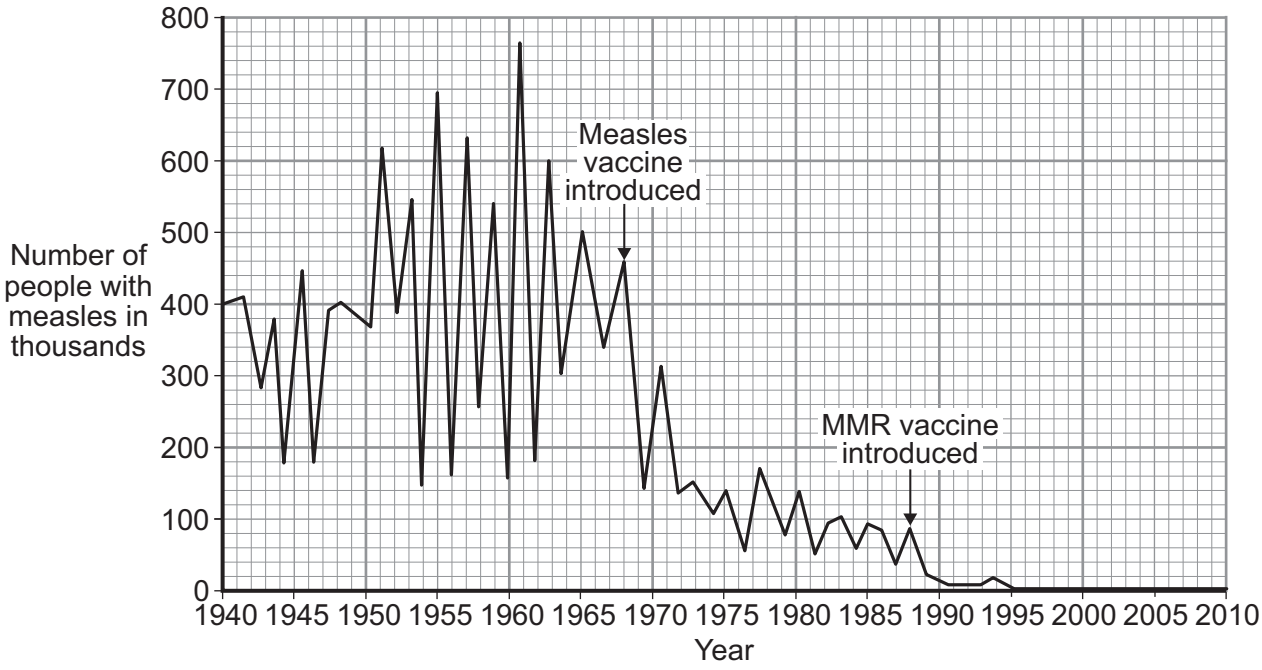
(6 marks)

9

Turn over for the next question

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2 The graph shows the number of people with measles in the UK between 1940 and 2010.



2 (a) Compare how effective introducing the measles vaccine was with introducing the MMR vaccine.

Use data from the graph.

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(3 marks)

Do not write outside the box

2 (b) The MMR vaccine was introduced in 1988.

Other than measles, which **two** diseases does the MMR vaccine protect against?

1 ..... 2 .....

(2 marks)

2 (c) To immunise someone against measles, a small quantity of the inactive measles pathogen is injected into the body.

Describe what happens in the body after immunisation to stop a person catching measles in the future.

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(3 marks)

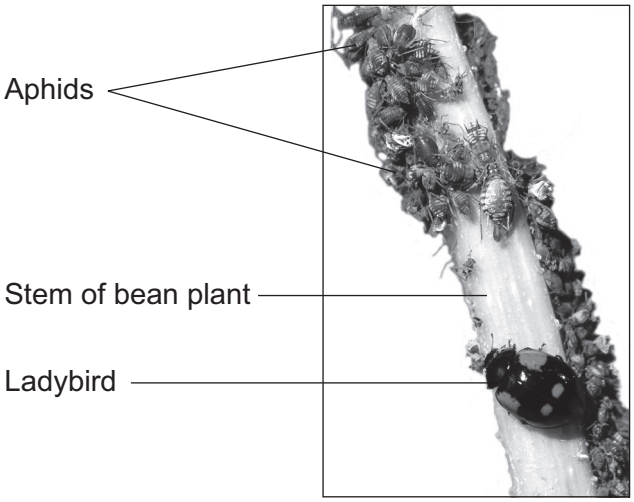
8

Turn over for the next question

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3 Students investigated a food chain in a garden.

The students found 650 aphids feeding on one bean plant.
Five ladybirds were feeding on the aphids.



3 (a) (i) Draw a pyramid of biomass for this food chain.
Label the pyramid.

(2 marks)

Do not write outside the box

3 (a) (ii) The biomass in the five ladybirds is less than the biomass in the bean plant.

Give **two** reasons why.

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(2 marks)

3 (b) The carbon in dead bean plants is returned to the atmosphere via the carbon cycle.

Describe this part of the carbon cycle.

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(4 marks)

8

Turn over for the next question

Do not write outside the box

4 The human body produces many hormones.

4 (a) (i) What is a *hormone*?

.....

.....

(1 mark)

4 (a) (ii) Name an organ that produces a hormone.

.....

(1 mark)

4 (a) (iii) How are hormones transported to their target organs?

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(1 mark)

4 (b) Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

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(3 marks)

6

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5 The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.



In 2006 Blue-moon butterflies almost became extinct.

Wolbachia bacteria killed males before they could hatch from eggs. Only females were resistant to the bacteria.

In 2006 the number of male Blue-moon butterflies had decreased to only 1 per cent of the population. Two years later, the number of males was equal to the number of females.

5 (a) Scientists believe that a change in a gene suddenly occurred to make some males resistant to the bacteria.

What scientific term describes a change in a gene?

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(1 mark)

5 (b) The numbers of male Blue-moon butterflies in the population increased quickly after the new form of the gene had appeared.

Suggest why.

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(4 marks)

5

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6 Drugs must be trialled before the drugs can be used on patients.

6 (a) (i) Before the clinical trials, drugs are tested in the laboratory.
The laboratory trials are **not** trials on people.

What is the drug tested on in these laboratory trials?

.....

(1 mark)

6 (a) (ii) Drugs must be trialled before the drugs can be used on patients.

Give **three** reasons why.

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(3 marks)

6 (b) Read the information about cholesterol and ways of treating high cholesterol levels.

Diet and inherited factors affect the level of cholesterol in a person's blood.
Too much cholesterol may cause deposits of fat to build up in blood vessels and reduce the flow of blood. This may cause the person to have a heart attack.
Some drugs can lower the amount of cholesterol in the blood.

The body needs cholesterol. Cells use cholesterol to make new cell membranes and some hormones. The liver makes cholesterol for the body.

Some drugs can help people with high cholesterol levels.

Statins block the enzyme in the liver that is used to produce cholesterol.
People will normally have to take statins for the rest of their lives. Statins can lead to muscle damage and kidney problems. Using some statins for a long time has caused high numbers of deaths.

Cholesterol blockers reduce the absorption of cholesterol from the intestine into the blood.
Cholesterol blockers can sometimes cause problems if the person is using other drugs.

Do not write outside the box

Evaluate the use of the two types of drug for a person with high cholesterol levels.

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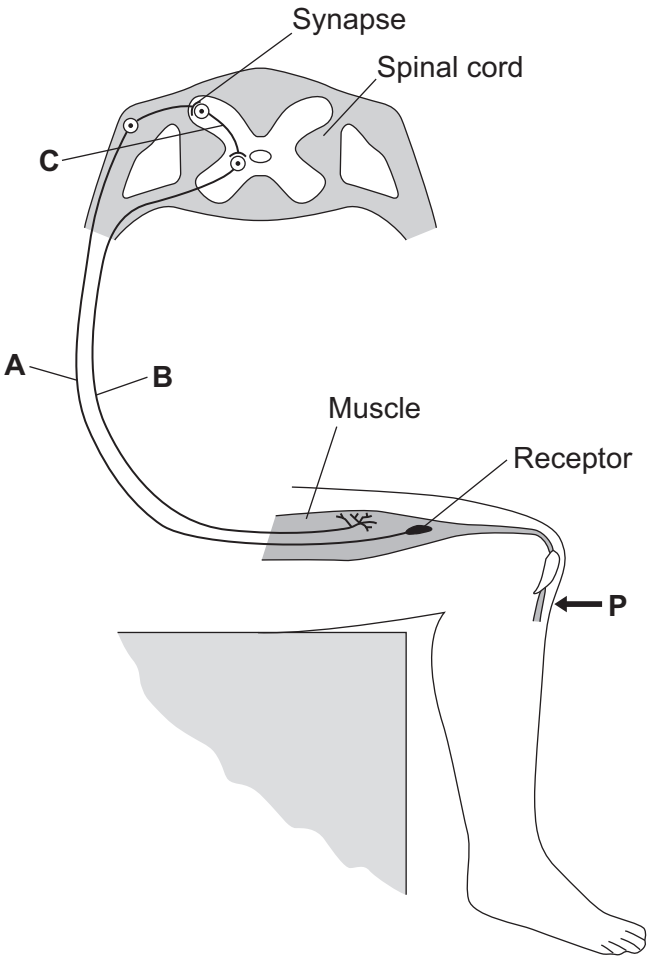
(6 marks)

10

Turn over for the next question

Do not write outside the box

7 The diagram shows the nervous pathway used to coordinate the knee-jerk reflex. When the person is hit at point **P**, the lower leg is suddenly raised.



7 (a) Name neurones **A**, **B** and **C**.

A .....

B .....

C .....

(3 marks)

7 (b) The receptor in the muscle in the leg is sensitive to a stimulus.

Suggest the stimulus.

.....

(1 mark)

Do not write outside the box

7 (c) Describe what happens at the synapse during this reflex.

.....

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.....

.....

(3 marks)

7

Turn over for the next question

Do not write outside the box

8 Squirrels live in woodland.

Table 1 shows:

- the total area of England, Scotland and Wales
- the area of different types of woodland in these countries.

Table 1

Country	Total area of country in thousands of km^2	Area of woodland in thousands of km^2		
		Coniferous woodland	Broadleaf woodland	Total
England	130	3.6	7.8	11.4
Scotland	79	10.4	3.0	13.4
Wales	21	1.9	0.9	2.8

8 (a) Look at the data for the three countries. Estimate which country has the greatest proportion of its area suitable as a habitat for squirrels.

Support your answer with relevant figures.

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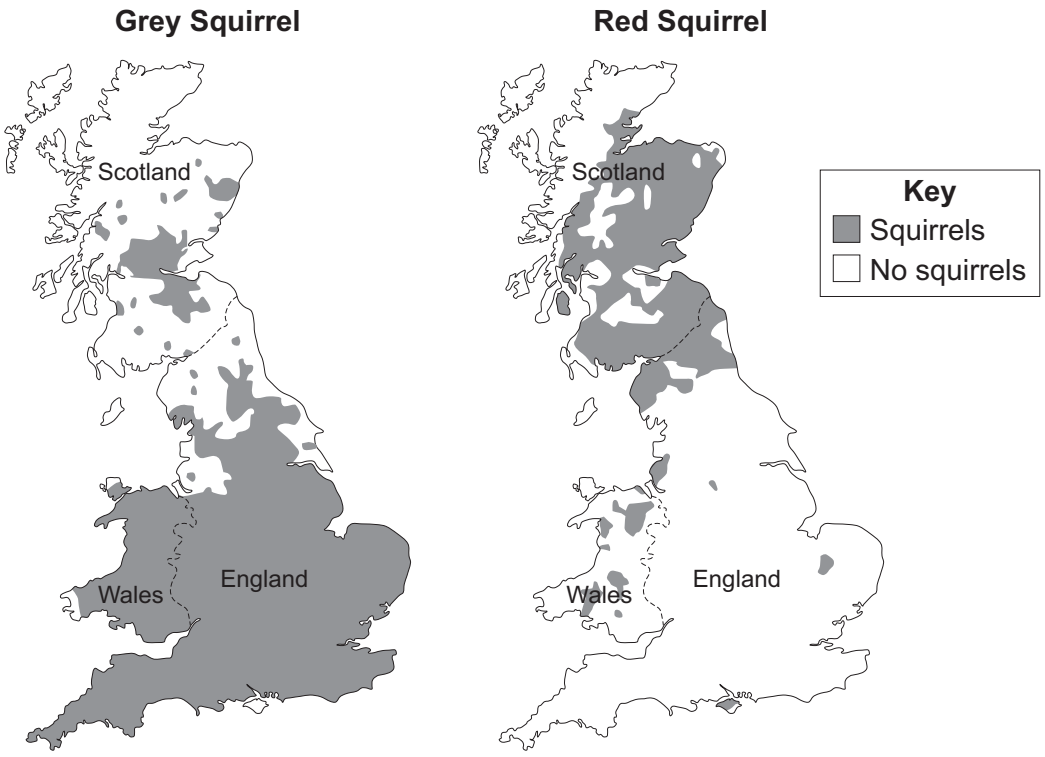
.....

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(2 marks)

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8 (b) The maps show the distribution of grey squirrels and red squirrels in England, Scotland and Wales.



Scientists suggested that the distribution of grey squirrels and red squirrels is linked to the type of trees in woodlands.

8 (b) (i) The information for England and Scotland supports this suggestion.

How?

.....

.....

(1 mark)

8 (b) (ii) Give **one** piece of evidence that contradicts this suggestion.

.....

.....

(1 mark)

Question 8 continues on the next page

Turn over ▶

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8 (c) Red squirrels are native to the UK.
Grey squirrels were introduced to the UK from the USA over 100 years ago.

Table 2 gives information about the two types of squirrel.

Table 2

	Grey squirrel	**Red squirrel**
Population in UK	2.5 million	140 000
Main food types	Seeds, nuts, tree bark, birds' eggs, young birds	Cones from coniferous trees, nuts, tree bark, berries
Health	Can become immune to parapox virus	Cannot become immune to parapox virus
Reproduction	Up to 9 young, twice a year	Up to 6 young, twice a year
Survival rate of young in mixed populations	41%	14%
Length of life	2 – 4 years	Up to 7 years

In most parts of the UK the population of grey squirrels is increasing, but the population of red squirrels is decreasing.

Suggest why.

Use information from **Table 2**.

.....

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(3 marks)

7

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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Version : 07/03/2012



General Certificate of Secondary Education

Science A 4405 / Biology 4401

BL1HP Unit Biology

Mark Scheme

2012 examination – January 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.

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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	Pluto, Mars, Moon	1
2	Pluto, 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, 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 1(b) student 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.

BL1HP

Question 1

question	answers	extra information	mark
1(a)(i)	fusion / joining / combining of gametes / egg **and** sperm / sex cells	accept fertilisation allow fusion / joining / combining DNA from two parents ignore meeting / coming together / mixing of gametes etc	1
1(a)(ii)	(mixture of) genes / DNA / genetic information / chromosomes from both parents / horse **and** zebra	ignore nucleus / inherited information but allow second mark if given dependent on sensible attempt at 1st mark	1 1

Question 1 continues on the next page . . .

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BL1HP

Question 1 continued

<table>
<tr><td>1(b)</td><td colspan="3">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.</td></tr>
<tr><td>0 marks</td><td>Level 1 (1–2 marks)</td><td>Level 2 (3–4 marks)</td><td>Level 3 (5–6 marks)</td></tr>
<tr><td>No relevant content</td><td>There is simple description of the early stages of adult cell cloning. However there is little other detail and the description may be confused or inaccurate.</td><td>There is an almost complete description of the early stages of the process and description of some aspects of the later stages. The description may show some confusion or inaccuracies.</td><td>There is a clear, detailed and accurate description of all the major points of how adult cell cloning is carried out.</td></tr>
<tr><td colspan="3">Examples of Biology points made in the response could include:
• skin cell from zorse
• (unfertilised) egg cell from horse
• remove nucleus from egg cell
• take nucleus from skin cell
• put into (empty) egg cell
• (then give) electric shock
• (causes) egg cell divides / embryo formed
• (then) place (embryo) in womb / uterus</td><td>6</td></tr>
<tr><td>Total</td><td colspan="2"></td><td>9</td></tr>
</table>

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BL1HP

Question 2

question	answers	extra information	mark
2(a)	both lead to reduction / fall (in measles cases)	can be implied	1
	measles vaccine caused a big drop **or** correct use of figures		1
	MMR wipes out measles **or** drops to (almost) zero **or** doesn't fall as much as measles vaccine **or** correct use of figures.		1
2(b)	mump(s)	either order	1
	rubella / german measles	allow phonetic spelling	1
2(c)	white blood cells	allow lymphocytes / leucocytes ignore memory cells	1
	(wbc) produce antibodies	ignore antitoxins / antigens / antibiotics / engulfing	1
	in future / if re-infected antibody production rapid / fast(er) / quick(er)	allow ecf from antitoxins / antigens / antibiotics ignore engulfing ignore reference to specificity	1
Total			**8**

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COMPONENT NUMBER: BL1HP

Question 3

question	answers	extra information	mark
3(a)(i)	triangular pyramid with 3 layers	may be as blocks or as triangle ignore food chains and arrows	1
	layers appropriately labelled: bean / plant aphid, ladybird	labelled in food chain order must **not** contradict correct pyramid allow correctly labelled inverted pyramid for **2** marks	1
3(a)(ii)	any **two** from: (for aphid / ladybird) • not all digested / faeces • loss in urine • loss of CO_2 • not all eaten	ignore energy ignore loss of CO_2 from bean plant if none of first 3 points given then allow waste (materials) / excretion for **1** mark	2
3(b)	microorganisms / microbes / bacteria / fungi / decomposers / detritivores / named	do **not** accept germs allow mould ignore aphids	1
	decay / breakdown / digest / decompose / rot (bean plant)	ignore eat	1
	respiration (of microorganisms etc / aphids)	allow burning / combustion	1
	carbon dioxide released (from respiration of microorganisms etc / aphids)	allow carbon dioxide released / produced (from burning / combustion) ignore other parts of the carbon cycle ignore formation of fossil fuels	1
Total			**8**

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Question 4

question	answers	extra information	mark
4(a)(i)	any **one** from: • chemical messenger / message • chemical / substance produced by a gland • chemical / substance transported to / acting on a target organ • chemical / substance that controls body functions	allow substance / material which is a messenger allow material produced by a gland	1
4(a)(ii)	gland / named endocrine gland	brain alone is insufficient allow phonetic spelling	1
4(a)(iii)	in blood / plasma **or** circulatory system **or** bloodstream	accept blood vessels / named do **not** accept blood cells / named	1
4(b)	FSH stimulates oestrogen (production) / egg maturation / egg ripening oestrogen inhibits FSH LH stimulates egg / ovum release / ovulation	each hormone must be linked to correct action apply list principle ignore the gland producing hormone ignore production / development of egg allow oestrogen stimulates LH / build up of uterine lining accept LH inhibits oestrogen accept LH controls / stimulates growth of corpus luteum ignore production of egg	1 1 1
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)	mutation	correct spelling only ignore other adjectives eg random / spontaneous	1
5(b)	idea of mutant gene / new form / this allows hatching (of males)	ignore references to X / Y chromosomes	1
	(individual with advantage) (more) survive / (more) live / (more) don't die	allow immunity rather than resistance throughout	1
	(so survivors) breed / reproduce		1
	mutation / gene passed (from survivors) to offspring / next generation	allow resistance / characteristic for gene 'gene passed on' is insufficient	1
Total			**5**

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Question 6

question	answers	extra information	mark
6(a)(i)	any **one** from: • cells • tissues • (live) animals / named	 allow mammals	1
6(a)(ii)	any **three** from: (to test for) • toxicity / check not poisonous / not harmful • interaction with other drugs • efficacy **or** to see if they work **or** check if they treat the disease • dosage **or** how much is needed	 allow side-effect allow converse allow converse	3

Question 6 continues on the next page . . .

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Question 6 continued

question	answers	extra information	mark
6(b)	**argued evaluation** any **six** from: • statin can damage / muscles / kidneys / organs but cholesterol blockers don't • statins can cause death but cholesterol blockers don't • cholesterol blockers can interfere with action of other drugs but statins don't • statins are for a life time but cholesterol blockers are not • statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it **or** statins reduce cholesterol more • statins better for people with inherited high cholesterol • cholesterol blockers better for people with dietary cholesterol problems • taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow	comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg **only** statins damage muscles / kidneys / organs ignore liver if neither of the first 2 points are given accept for **1** mark statins are more dangerous than cholesterol blockers **or** statins have more side effects allow statins (might) stop membrane / hormone production but cholesterol blockers don't	6
Total			**10**

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COMPONENT NUMBER: BL1HP

Question 7

question	answers	extra information	mark
7(a)		ignore nerve / neuron(e) throughout	
	A sensory	accept afferent	1
	B motor	accept efferent	1
	C relay	accept intermediate	1
7(b)	stretch	allow pressure / pull / tension (in muscle) allow a hit at (point) **P** ignore pain	1
7(c)	any **three** from: • chemical (release) • diffuses (across the gap / synapse) • transmits impulse / information (across synapse) • between neurones / nerve cells / named	 accept neurotransmitter / acetylcholine allow transmits signal / message if named, must be either sensory / A to relay / C **or** relay / C to motor / B allow 'to the next neurone'	3
Total			**7**

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COMPONENT NUMBER: BL1HP

Question 8

question	answers	extra information	mark
8(a)	Scotland any **one** from • Scotland 15 to 20% / about 1/5th to 1/7th but England and Wales / the others are less / lower / reasonable estimated figures • $\frac{13.4}{79}$ is greater than England / $\frac{11.4}{130}$ and Wales / $\frac{2.8}{21}$		1 1
8(b)(i)	broadleaf woodlands have more grey squirrels **or** broadleaf woodlands have less red squirrels	allow converse referring to conifers	1
8(b)(ii)	Wales has more conifers and / but more grey squirrels **or** Wales has less broadleaf and / but more grey squirrels	allow converse for red squirrels	1
8(c)	any **three** from: grey squirrels • have wider range/ more types of food • are resistant to parapox (virus) but reds are not • have more young each year / litter • young more likely to survive (in mixed populations)	answers must be comparative they = grey squirrels allow converse arguments for red squirrels ignore reference to other disease	3
Total			**7**

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

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