CCEA GCSE SCIENCE: SINGLE AWARD

# SCIENCE



## EXAM QUESTION PACK

UNIT 1 (BIOLOGY) HIGHER TIER GSS12 PAPERS

STEMUP

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Rewarding Learning

General Certificate of Secondary Education
2016–2017

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**WEDNESDAY 9 NOVEMBER 2016, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 1 | (a) | (i) | White chocolate will not affect colour of Benedict's reagent/ 'normal' (brown) chocolate will make it difficult to judge colour changes [1] | |
| | | (ii) | To see which changed first [1]<br>each will have the same (brick red) end point [1] [2] | |
| | | (iii) | To ensure both boiling tubes were at same temperature/to control this variable/make sure results were valid [1] | |
| | (b) | (i) | As age increases more people/men/women have heart disease [1] | |
| | | (ii) | Any **two** from:<br>• stress<br>• lack of exercise<br>• too much salt<br>• too much saturated fat<br>• high levels of cholesterol<br>• high blood pressure<br>• genetic<br>• diabetes<br>• too much alcohol<br>[2] | |
| | | (iii) | Stroke [1] | 8 |



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**2 Indicative Content:**

- contraception is prevention of pregnancy
- condom traps sperm
- easy to use/not a chemical so doesn't affect body/also prevents sexually transmitted diseases
- not as reliable as other methods
- vasectomy cuts sperm tubes/prevents sperm reaching penis
- virtually 100% reliable
- cannot easily be reversed

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain the different types of male contraceptive using **six or seven** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe and explain the different types of male contraceptive using **four or five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe and/or explain at least one type of male contraceptive using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

[6]

AVAILABLE MARKS

6

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 3 | (a) | (i) | Photosynthesis [1]<br>respiration [1] | [2] | |
| | | (ii) | Increase in carbon dioxide taken in (over time) [1]<br>more photosynthesis [1]<br>as plants increase in size [1] | [3] | |
| | | (iii) | Neutral as carbon dioxide given out in respiration and combustion is the same as that taken in in photosynthesis [1]<br>(51 + 66) = 117 given out and 117 taken in [1] | [2] | |
| | (b) | (i) | White fur/thick fur [1]<br>so not spotted by seals/stay warm [1] | [2] | |
| | | (ii) | Polar bears are too heavy for ice/loss of habitat | [1] | |
| | (c) | (i) | Ongoing monitoring/can reach inaccessible areas/very accurate | [1] | |
| | | (ii) | To persuade governments to act against global warming/to take appropriate conservation measures | [1] | 12 |
| 4 | (a) | | The spread of disease over a large area (town or region)/many people are affected in the one area | [1] | |
| | (b) | | The bacteria causing the disease are resistant to antibiotics [1]<br>there is no vaccination for the disease [1] | [2] | |
| | (c) | | Phagocytes/white blood cells engulf [1]<br>and digest/break down microorganisms [1] | [2] | 5 |
| 5 | (a) | (i) | Central Nervous System/CNS/brain | [1] | |
| | | (ii) | Nerve impulses | [1] | |
| | (b) | | Reflex actions are rapid/automatic/protective/do not involve thinking time [1]<br>as have short pathways/do not involve thinking (explanation must match the description/allow converse for voluntary actions) [1] | [2] | |
| | (c) | | The revolving platform means that all sides of the seedling receive equal light [1]<br>grows evenly/hormones were evenly spread across the seedling [1] | [2] | 6 |



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 6 | (a) | (i) | The average age of patients when diagnosed decreases with time | [1] | |
| | | (ii) | Any **two** from:<br>• more people obese at a younger age<br>• more fatty/high sugar foods in the diet<br>• less exercise taken than previously<br>• better screening/more education or awareness | [2] | |
| | (b) | (i) | Bronchitis/emphysema | [1] | |
| | | (ii) | Carbon monoxide reduces the blood's ability to carry oxygen [1]<br>less oxygen reaches the muscles/body cells/for respiration [1] | [2] | |
| | (c) | | Advantage – E-cigarettes are less harmful/they do not contain tar/carbon monoxide/less likely to lead to cancer [1]<br>Disadvantage – contain nicotine/could possibly lead to starting real cigarettes [1] | [2] | 8 |
| 7 | (a) | (i) | Slug | [1] | |
| | | (ii) | The garden plants will grow more/fewer will be eaten [1]<br>fewer thrushes and birds of prey [1] | [2] | |
| | (b) | | Ammonia converted to nitrates [1]<br>by nitrification/nitrifying bacteria [1] | [2] | 5 |
| 8 | (a) | | Continuous variation [1]<br>no discrete groups/no clear boundaries/gradual change in speed [1] | [2] | |
| | (b) | (i) | Average maximum speed increases/lowest maximum speed is higher | [1] | |
| | | (ii) | Foxes more able to catch slower hares/slower hares die out/all eaten [1]<br>faster hares more likely to survive and have (faster) offspring [1] | [2] | |
| | (c) | (i) | The process of change in a species/type of organism [1]<br>over time [1] | [2] | |
| | | (ii) | Large timescales involved/complex process | [1] | |
| | (d) | | The process in which scientific discoveries is checked/approved/validated [1] by other scientists [1] | [2] | 10 |



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**9 Indicative content**

- carbon dioxide/global warming
- acid rain/sulfur dioxide
- plant more trees/reduce deforestation/alternative fuels/use less fossil fuels
- filters/scrubbers in factory chimneys/low sulfur fuels/alternative fuels (allow once)
- abiotic monitoring – carbon dioxide levels/temperature/climate change
- biotic monitoring – lichens

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain human pollution of the atmosphere using **five or six** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe and explain human pollution of the atmosphere using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe/explain human pollution of the atmosphere using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

AVAILABLE MARKS

6

| | | | AVAILABLE MARKS |
|---|---|---|---|
| **10** | **(a)** Protein | [1] | |
| | **(b)** **(i)** Son-in-law/married to A's daughter | [1] | |
| | **(ii)** None | [1] | |
| | **(iii)** | [3] | |
| | **(iv)** 1 in 4/25% | [1] | |
| | **(c)** **(i)** Genetic screening | [1] | |
| | **(ii)** Ethical reasons over deciding whether to have an abortion/screening process may have a risk/religious reasons | [1] | 9 |
| | **Total** | | **75** |

| | | |
|---|---|---|
| | K | k |
| K | KK | Kk |
| k | Kk | kk |



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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

# Science: Single Award

Unit 1 (Biology)
Higher Tier

**[GSS12]**

*GSS12*

**TUESDAY 17 MAY 2016, AFTERNOON**

## TIME

1 hour 15 minutes.

## INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
**You must answer the questions in the spaces provided.**
**Do not write outside the boxed area on each page or on blank pages.**
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

## INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **3** and **10(a)**.



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**1** Rhododendron is an example of a competitive invasive species in Northern Ireland.

**(a)** Give **two** features that 'competitive invasive species' have in common.

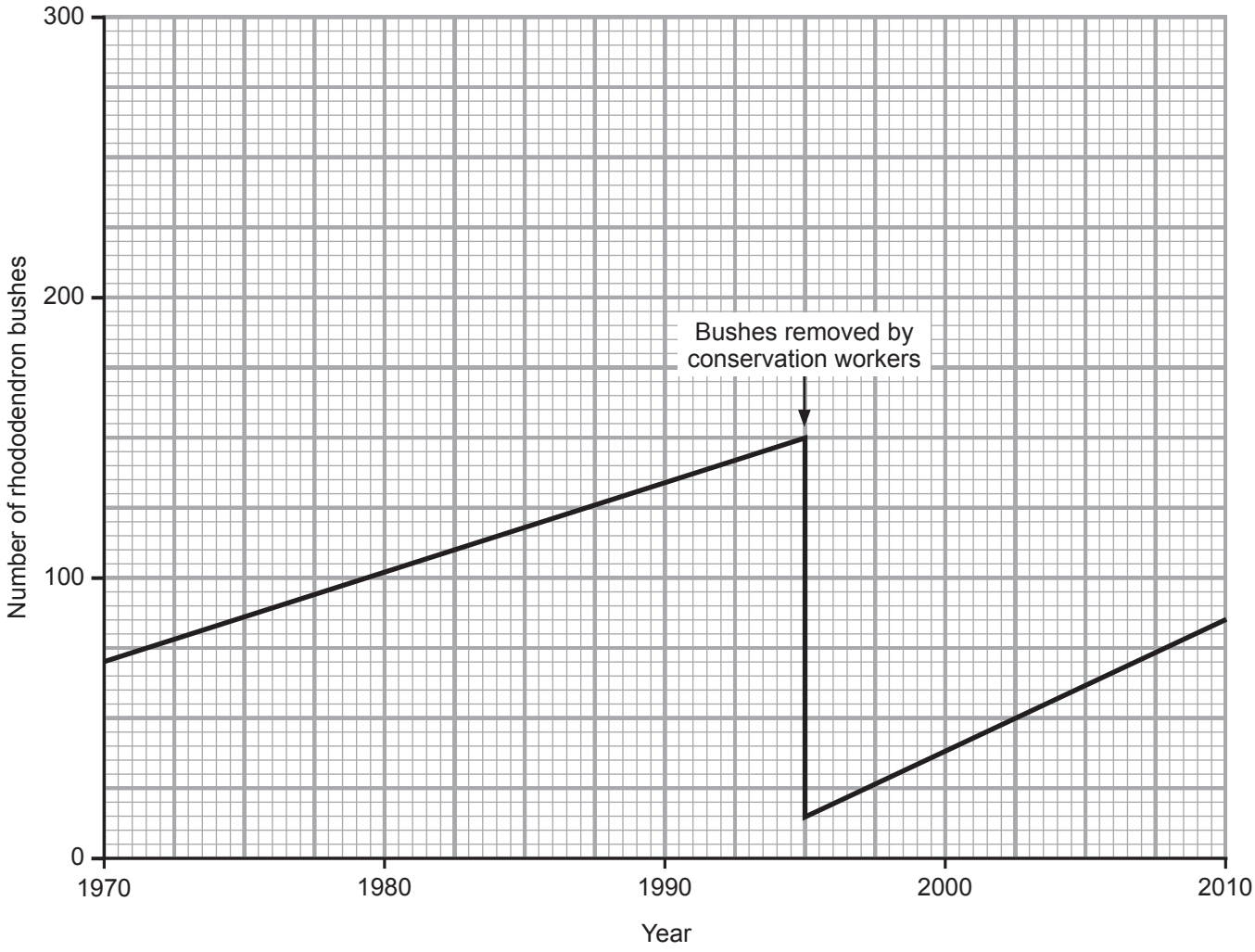
1. _____

_____

2. _____

_____ [2]

**(b)** The graph below shows how the number of rhododendron bushes has changed over a 40 year period in an area of heathland.




10742

**(i)** Calculate how many rhododendron bushes were removed in 1995.

(Show your working out.)

_____ [2]

**(ii)** Calculate the percentage of bushes that were not removed in 1995.

_____ % [1]

**(iii)** Predict how many rhododendron bushes there would have been in 2010 if no bushes had been removed.

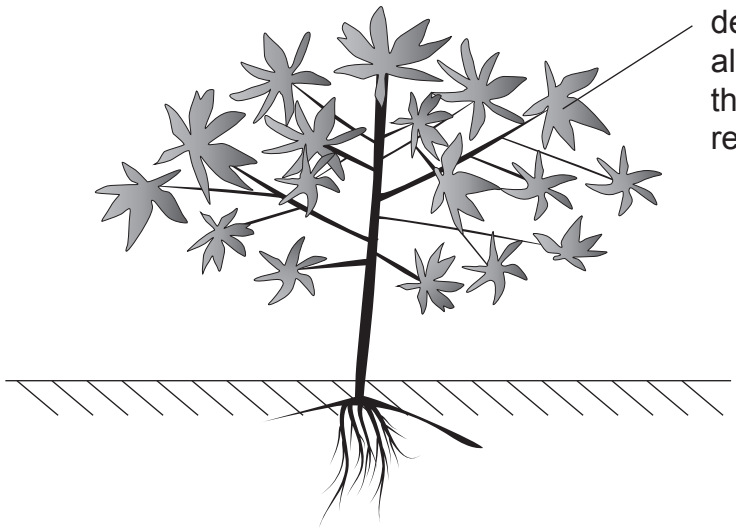
_____ [1]

**[Turn over**



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**(c)** The drawing below represents a rhododendron bush.



dense arrangement of all-year (evergreen) leaves that allows very little light to reach the ground

© Chief Examiner

Using the information provided and your knowledge, answer the following questions.

**(i)** Suggest the effect a rhododendron bush has on other species of plants growing close to it. Explain your answer.

_____

_____

_____

_____

_____ [3]

**(ii)** Suggest the effect on biodiversity, if any, the removal of rhododendron bushes will have in the heathland.

_____ [1]

**(d)** Name **one** other competitive invasive species.

_____ [1]



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**2** **(a)** There are many different strains (types) of virus that cause flu. Flu viruses mutate easily making many new virus strains that cause flu.

**(i)** Explain the term 'mutation'.

_____

_____

_____ [2]

Many people in the UK get a flu vaccination each year.

**(ii)** Describe fully what a flu vaccination contains.

_____

_____

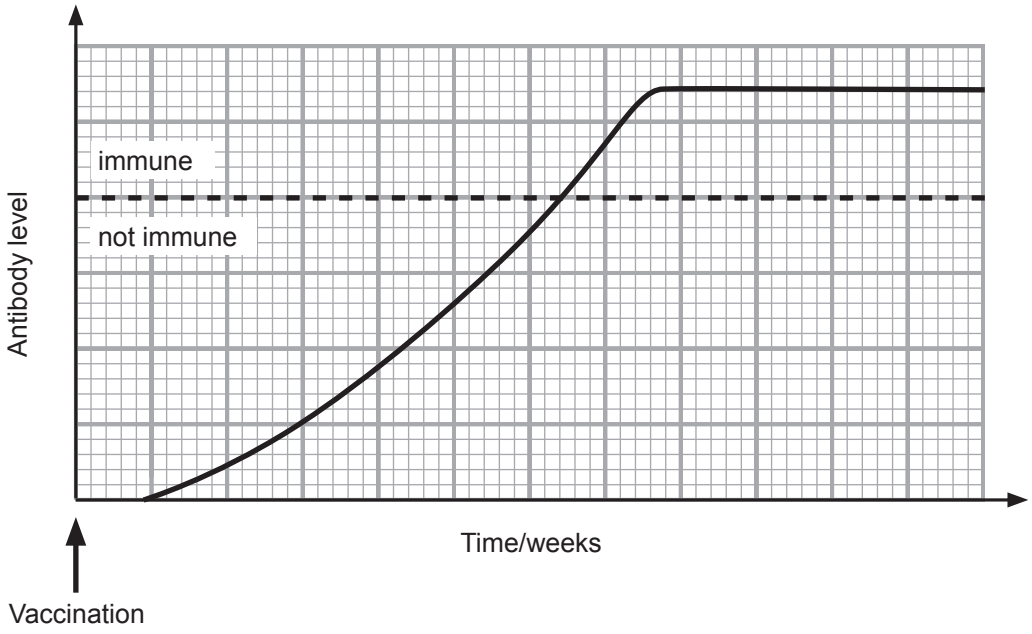
_____ [2]

**[Turn over**



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The graph below shows the effect of a flu vaccination on a person's antibody level.




When developing the flu vaccination in any particular year, scientists have to predict (guess) which strain of virus is likely to infect the most people. They then develop the flu vaccination against this particular strain.

Using the information provided, answer the questions below.

**(iii)** Use the graph to suggest why people get the flu vaccination well before they are expected to be infected by the flu virus.

_____

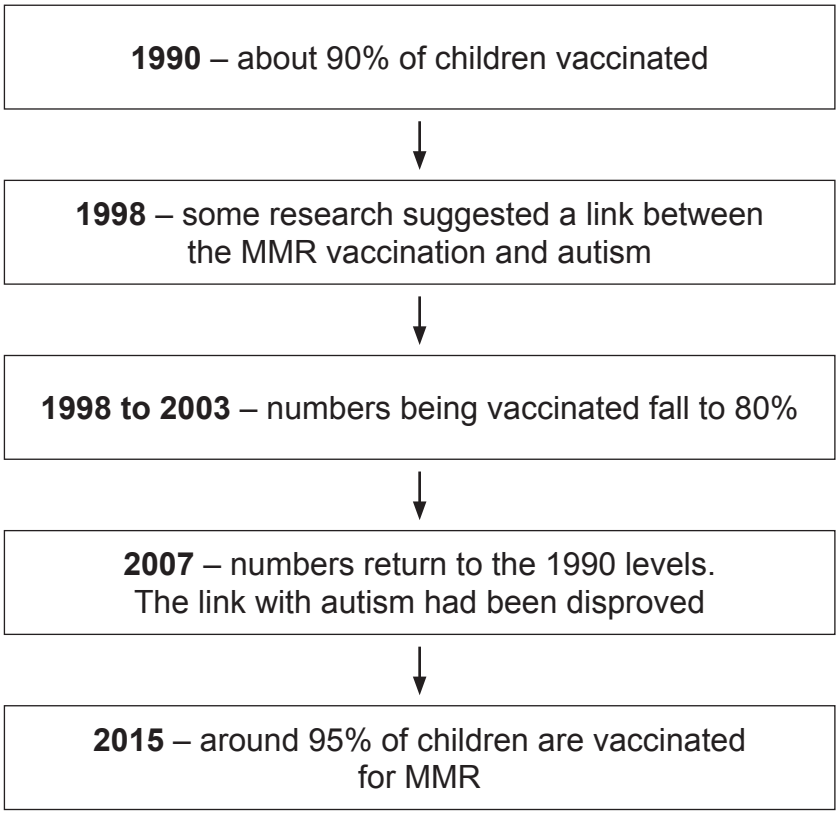
_____ [1]

**(iv)** Suggest why some people who get the flu vaccination still get flu many months later.

_____

_____ [1]

**(b)** The flow chart below summarises how the number of children being vaccinated for MMR has changed since 1990.




**(i)** Describe fully the trend in the number of children being vaccinated for MMR between **2003 and 2015**. Use data from the flow chart to support your answer.

[2]

**(ii)** Suggest why there are still some parents who do not have their children vaccinated for MMR.

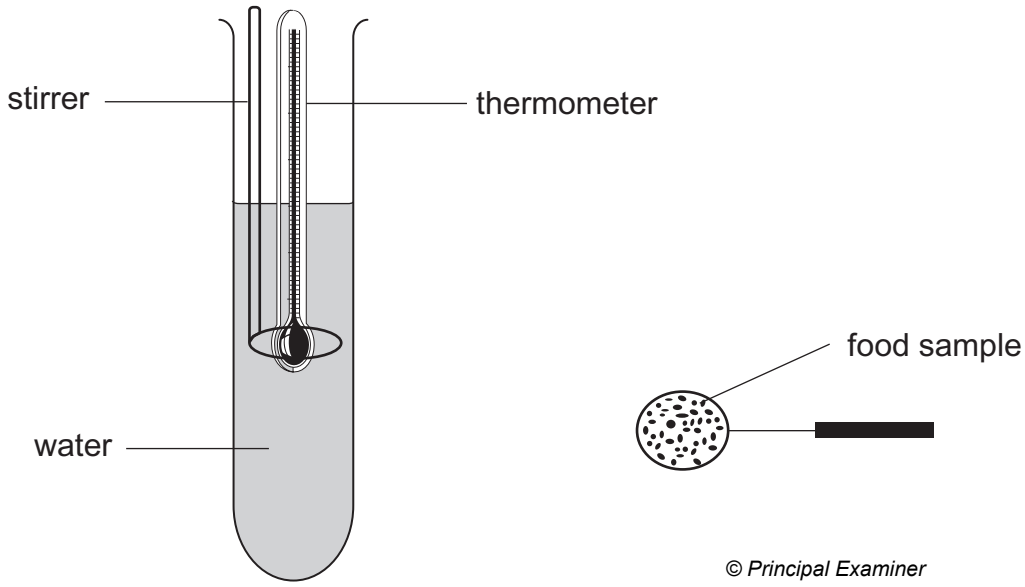
[1]

**[Turn over**



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**3** Energy released from different foods can be compared using the apparatus shown in the diagram.




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Describe how you would compare the amount of energy released from a biscuit to the amount of energy released from bread.

Your answer should include:

- **two** variables to be controlled to make the investigation fair
- **one** reason why the results obtained are likely to be less than the actual amount of energy in the foods

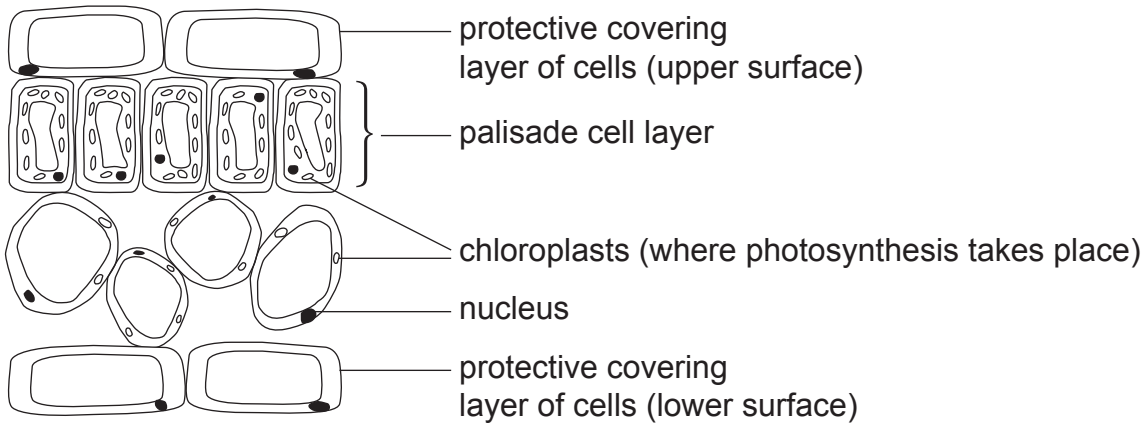
**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]



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**4** **(a)** The diagram below represents a section through a leaf.




© Chief Examiner

Using only the information in the diagram, give **two** reasons why most photosynthesis in a leaf takes place in the palisade cells.

1. _____

_____

2. _____

_____ [2]

**(b)** To show that photosynthesis has taken place, a leaf can be tested with iodine to see if starch is present.

**(i)** Describe how you would remove chlorophyll from a leaf when testing for starch.

_____

_____

_____ [2]

**(ii)** State the colour change in iodine if starch is present.

_____ to _____ [1]



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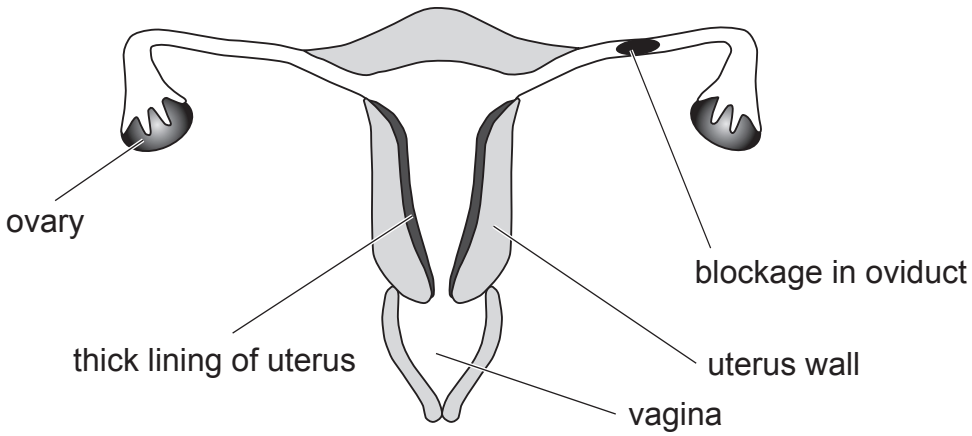
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**(Questions continue overleaf)**



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**5** **(a)** The diagram below represents the female reproductive system with one of the oviducts blocked due to an infection.




*Source: Chief Examiner*

**(i)** What is the evidence from the diagram that menstruation has **not** occurred in the last few days?

_____

_____ [1]

**(ii)** Suggest the effect a blocked oviduct will have on the chances of a female becoming pregnant. Explain your answer.

_____

_____

_____

_____ [2]



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**(b)** Oestrogen and progesterone are hormones involved in the menstrual cycle.

**(i)** Define the term 'hormone'.

_____

_____

_____ [2]

**(ii)** State **one** function of oestrogen in the menstrual cycle.

_____

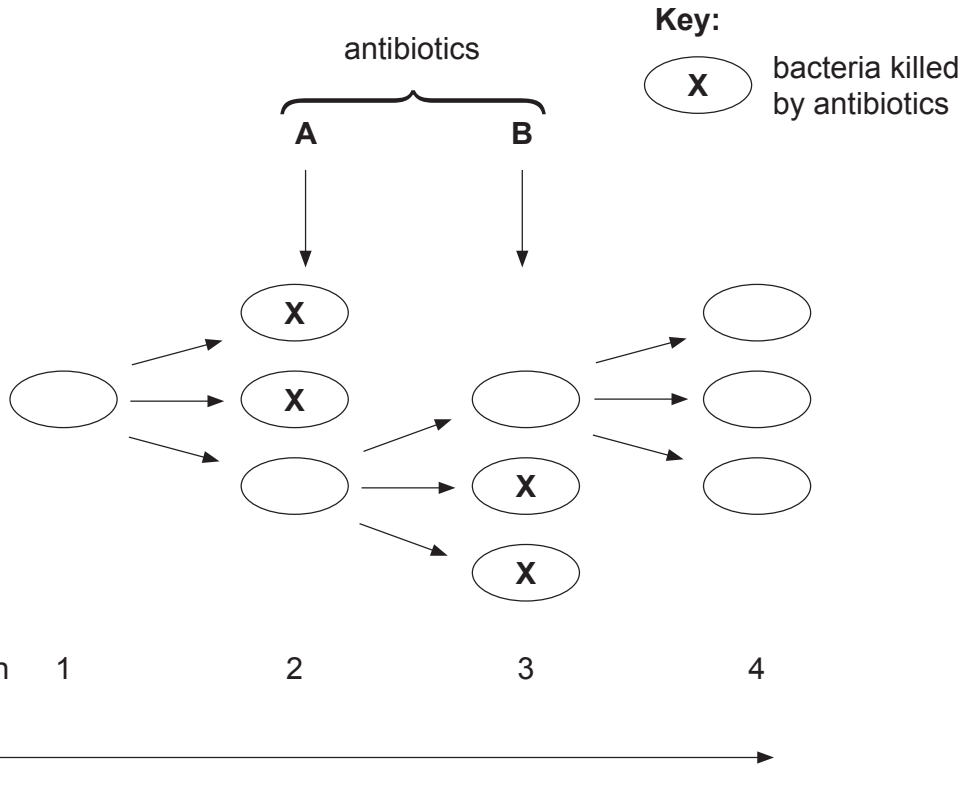
_____ [1]

**[Turn over**



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6 **(a)** The diagram below shows the effects of two different antibiotics on one type of bacteria over a period of time.




**(i)** On the diagram circle one of the bacteria that is resistant to antibiotic **B**. [1]

**(ii)** Explain how the diagram shows natural selection in action.

_____

_____

_____

_____ [2]



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**(b)** MRSA is also antibiotic resistant and it has made many hospital patients very ill.

**(i)** Suggest **two** reasons why MRSA is a particular problem in hospitals.

1. _____

2. _____ [2]

**(ii)** Suggest **one** reason why the number of patients with MRSA in hospitals has decreased in recent years.

_____

_____ [1]

**[Turn over**



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7 **(a)** The table below shows the average recovery times after exercise for three hockey players over a period of six weeks. Each player exercised for the same length of time. Recovery time was recorded as the time taken for heart rate to return to normal.

| Hockey player | Recovery time/s | | | | | |
|---|---|---|---|---|---|---|
| | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Week 5** | **Week 6** |
| **Jane** | 211 | 205 | 198 | 144 | 121 | 115 |
| **Sorca** | 278 | 268 | 271 | 271 | 242 | 221 |
| **Kellie** | 171 | 166 | 141 | 122 | 115 | 115 |

Use the information and your knowledge to answer the questions below.

**(i)** State **one** way in which the trend shown for each hockey player is similar.

_____

_____ [1]

**(ii)** Suggest which hockey player is the fittest. Explain your answer.

_____

_____

_____

_____ [2]

**(b)** Exercise helps strengthen the heart. This means that each time the heart beats it can pump more blood. Explain fully the advantage of the heart pumping more blood per beat.

_____

_____

_____ [2]



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**(c)** We can also help the heart and circulatory system by being careful about what we eat.

Apart from eating less food, state **another** dietary change people can make to help protect against heart disease.

_____ [1]

**[Turn over**

**8** **(a)** Each year many animals are used to test new medical drugs.

**(i)** State **one** advantage in using animals when testing drugs.

_____

_____ [1]

**(ii)** Give **one** reason why it is necessary to test new drugs on human volunteers before a drug is licensed.

_____

_____ [1]

**(iii)** Suggest why many countries allow medical drugs, but not beauty products, to be tested on animals.

_____

_____ [1]

**(b)** Carbon monoxide in cigarette smoke can cause people to be short of energy.

Explain fully why people who smoke may be short of energy.

_____

_____

_____

_____

_____ [3]



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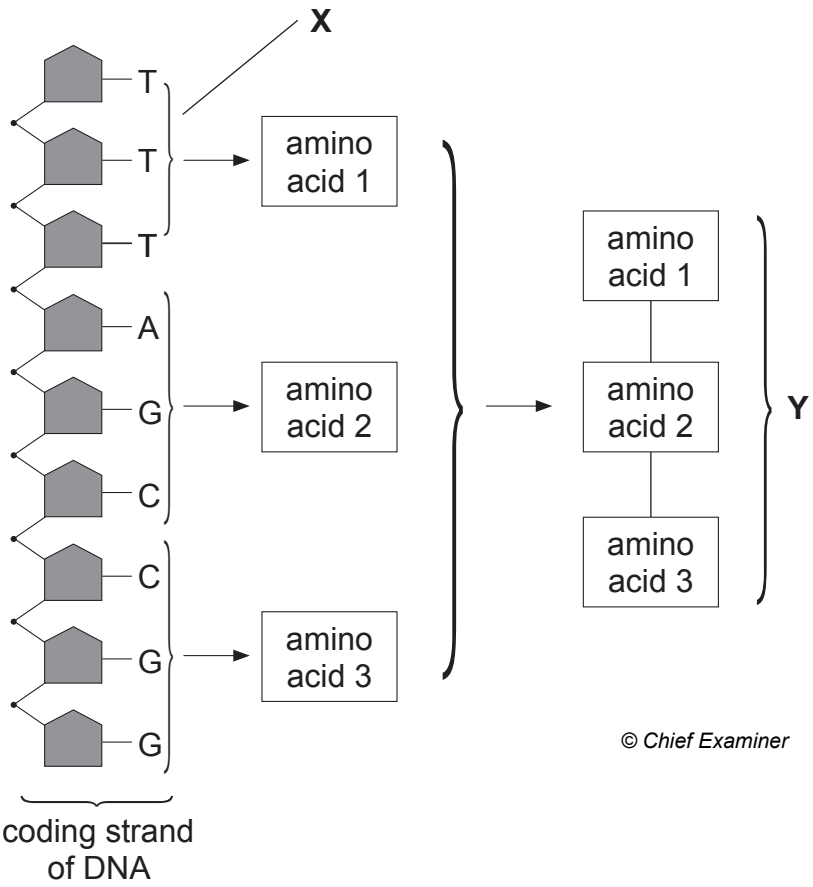
**9** The table below shows the percentage of guanine bases in a section of DNA.

**(a)** Complete the table to show the percentage of the other bases.

| base | adenine | cytosine | guanine | thymine |
|---|---|---|---|---|
| % | | | 20 | |

[2]

**(b)** The diagram below summarises the coding role of DNA in cells.




© Chief Examiner

**(i)** State the term that is used to describe the group of three bases labelled **X**.

_____

[1]

**(ii)** Name the structure labelled **Y**.

_____

[1]

**[Turn over**



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**(c)** Franklin and Wilkins, Watson and Crick, and Chargaff were all involved in working out the structure of DNA.

Which scientist(s) investigated the structure of DNA first?

_____ [1]

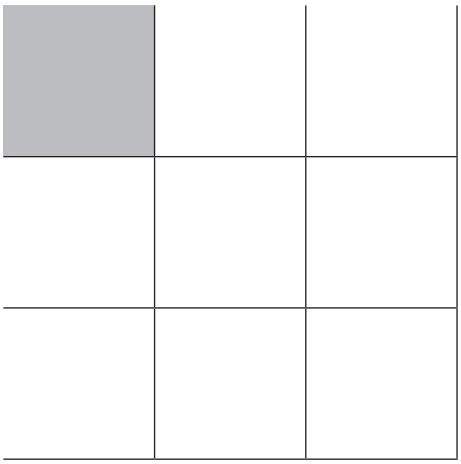
**(d)** Cystic fibrosis is an inherited genetic condition. The cystic fibrosis allele **(f)** is recessive to the normal allele **(F)**.

**(i)** Explain what is meant by the term 'recessive'.

_____

_____ [1]

**(ii)** Use the Punnett square to show how two parents who do **not** have the condition can have a child who has cystic fibrosis.



[2]

**(iii)** What is the probability of a child from these parents having cystic fibrosis?

_____ [1]



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**(e)** The digestive system, lungs and some other parts of the body are damaged in individuals who have cystic fibrosis. Gene therapy can be used to treat individuals with cystic fibrosis. This involves spraying normal alleles into the lungs using aerosols. Any lung cells that the spray reaches and enters will then function normally.

Using the information provided and your knowledge, give **two** reasons why gene therapy only has limited success in the treatment of cystic fibrosis.

1. _____

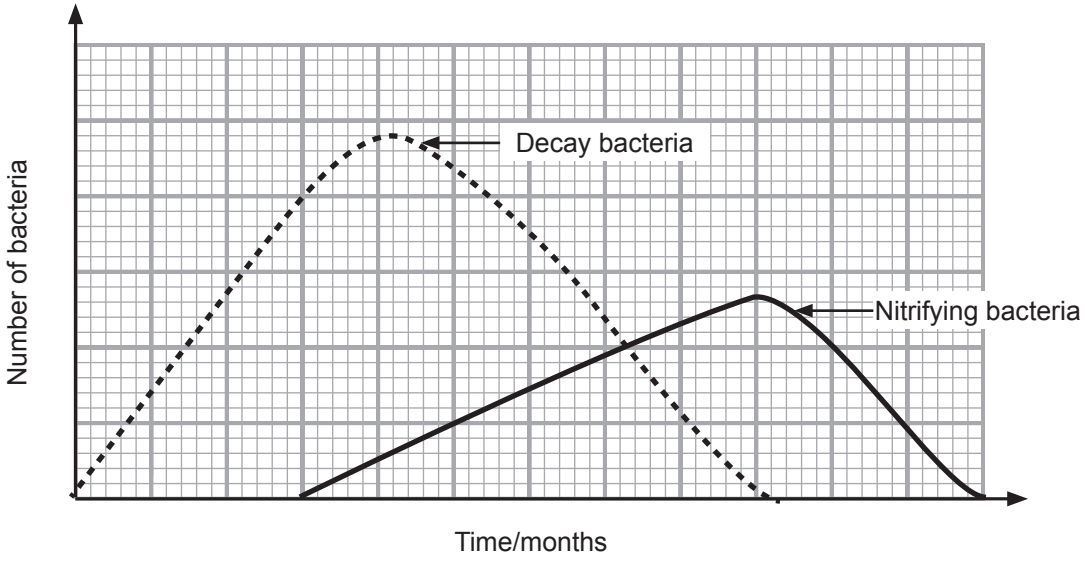
_____

2. _____

_____ [2]

**[Turn over**

**10 (a)** The nitrogen cycle is used to explain how nitrogen in organic material is made available to plant roots by bacteria. The graph below shows how the numbers of decay and nitrifying bacteria change over time during the recycling of nitrogen in grass cuttings in a compost heap.




Use this information and your knowledge to describe and explain the trends shown in the graph and describe in detail how the nitrogen in the cuttings is eventually recycled to become nitrogen in plant protein again.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**



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[6]

**(b)** Carbon is another element that is needed for life on Earth. However, unlike the nitrogen cycle, the carbon cycle can be described as being 'unbalanced'.

Why can the carbon cycle be described as being 'unbalanced'?
Explain ways in which humans have contributed to it being 'unbalanced'.

[3]

**THIS IS THE END OF THE QUESTION PAPER**

## DO NOT WRITE ON THIS PAGE

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |

Examiner Number

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General Certificate of Secondary Education
2015–2016

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**TUESDAY 17 MAY 2016, AFTERNOON**

# MARK SCHEME



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## General Marking Instructions

### Introduction

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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **1** | **(a)** | Any **two** from:<br>• a non-native species/introduced by man<br>• out-competes other (native) species<br>• spreads (rapidly) across countryside/reproduces rapidly | | [2] | |
| | **(b)** | **(i)** | 150 – 15 [1]<br>135 [1] | [2] | |
| | | **(ii)** | 10% | [1] | |
| | | **(iii)** | 195–205 | [1] | |
| | **(c)** | **(i)** | Prevents/reduces other plants' growth [1]<br>not enough light/or other resource described [1]<br>for photosynthesis/explanation of effect of reduced resource [1] | [3] | |
| | | **(ii)** | Increased | [1] | |
| | **(d)** | Grey squirrel (or other suitable example) | | [1] | 11 |
| **2** | **(a)** | **(i)** | Change [1]<br>in gene/chromosome/DNA [1] | [2] | |
| | | **(ii)** | Weakened/dead/modified [1]<br>flu virus [1] | [2] | |
| | | **(iii)** | It takes a long time/weeks before immunity is achieved/antibodies reach a high enough level | [1] | |
| | | **(iv)** | The vaccination was for a different strain/two strains (species) were different | [1] | |
| | **(b)** | **(i)** | Numbers increased from 2003–2015 [1]<br>increase supported by reference to any two percentages from flow chart [1] | [2] | |
| | | **(ii)** | Don't believe vaccination is safe | [1] | 9 |

AVAILABLE MARKS

**3 Indicative content**

- use the thermometer to record the temperature of the water
- at the start and end of the investigation
- burn the food sample, e.g. biscuit
- record difference in temperature/the higher the temperature rise, the more energy in the food
- repeat for the other food sample (bread)
- any **two** from – use same mass of food/ensure burning food is same distance away from boiling tube/ensure temperature of water is even throughout boiling tube (use of stirrer)/use the same volume of water
- some burnt food remains/used to heat glass/lost in air

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe how to compare the amount of energy in different foods using **six, seven or eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe how to compare the amount of energy in different foods using **four or five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe how to compare the amount of energy in food using **one, two or three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6] 6

**4 (a)** Any **two** from:

- palisade cells are close to the top of the leaf
- they have more chloroplasts
- they are tightly packed together [2]

**(b) (i)** Boil [1]
in ethanol/alcohol [1] [2]

**(ii)** Yellow/brown to blue/black [1] 5



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **5** | **(a)** | **(i)** | There is a thick uterine lining present | [1] | |
| | | **(ii)** | Reduced chance [1]<br>as eggs from (one ovary) cannot reach uterus/sperm/be fertilised [1] | [2] | |
| | **(b)** | **(i)** | Any **two** from:<br>• chemical messengers<br>• travel in blood<br>• to a target organ (where they act) | [2] | |
| | | **(ii)** | Causes ovulation/build-up of uterine lining | [1] | 6 |
| **6** | **(a)** | **(i)** | Correct bacterium circled | [1] | |
| | | **(ii)** | (Better adapted) antibiotic-resistant bacteria survive [1]<br>(less well adapted) non-resistant bacteria are killed by antibiotic [1] | [2] | |
| | **(b)** | **(i)** | Any **two** from:<br>• many patients in close proximity<br>• many with open wounds<br>• weak immune systems<br>• overuse of antibiotics | [2] | |
| | | **(ii)** | Better hygiene/isolation of infected patients/reduction in antibiotic use | [1] | 6 |
| **7** | **(a)** | **(i)** | Recovery times decrease over time | [1] | |
| | | **(ii)** | Kellie [1]<br>her recovery times were lowest to start/decreased the least/levelled off after week 5/lowest each week except week 6 [1] | [2] | |
| | **(b)** | | Fewer beats (per minute) [1]<br>therefore less wear on heart [1] | [2] | |
| | **(c)** | | Eat less salt/less saturated fat/lower cholesterol levels | [1] | 6 |
| **8** | **(a)** | **(i)** | Avoids testing on humans at this stage/to see the effect on living organism/whole body systems/similar immune systems | [1] | |
| | | **(ii)** | Humans are different to animals/side effects in humans/check dosage | [1] | |
| | | **(iii)** | Distinction between beauty products and medical intervention (or explained) | [1] | |
| | **(b)** | | Carbon monoxide (combines) with red blood cells [1]<br>therefore less oxygen transported [1]<br>for respiration [1] | [3] | 6 |



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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **9** | **(a)** | Cytosine 20 [1]<br>adenine and thymine 30 each [1] | [2] | |
| | **(b)** | **(i)** Base triplet | [1] | |
| | | **(ii)** Protein | [1] | |
| | **(c)** | Chargaff | [1] | |
| | **(d)** | **(i)** Phenotype only shown if two alleles recessive/characteristic masked by dominant allele | [1] | |
| | | **(ii)** Gametes correct [1]<br>offspring correct [1] | [2] | |
| | | **(iii)** One in four (or equivalent) | [1] | |
| | **(e)** | Any **two** from:<br>• digestive system (and other parts of the body) are not treated<br>• spray may not reach all lung cells<br>• CF condition still passed on to offspring<br>• lung cells are constantly replaced/new cells will have cystic fibrosis (regular treatment is required) | [2] | 11 |



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**10 (a) Indicative content**

- decay bacteria peak before nitrifying bacteria
- more decay bacteria than nitrifying bacteria
- both decay and nitrifying bacteria increase over time then decrease/ nitrifying bacteria take longer to increase/nitrifying bacteria decrease more rapidly
- decay bacteria break down plant cuttings into ammonia
- (nitrifying bacteria (then) convert) ammonia into nitrate
- in process called nitrification
- nitrate absorbed into plants from the soil

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe the nitrogen cycle using **six, seven or eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe the nitrogen cycle using **four or five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe the nitrogen cycle using **one, two or three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6]

**(b)** Carbon cycle is unbalanced as more carbon dioxide is entering atmosphere [1]
due to increased combustion of fossil fuels [1]
and deforestation [1]

[3]

AVAILABLE MARKS

9

**Total** **75**



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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

# Science: Single Award

## Unit 1 (Biology)
## Higher Tier

GSS12

## [GSS12]
## WEDNESDAY 24 FEBRUARY 2016, MORNING

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **10(c)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |



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| Examiner Only | |
|---|---|
| Marks | Remark |

**1** **(a)** The table below shows information about different sources used to produce electricity in the United Kingdom.

| | Electricity produced/% | Cost to customer per unit of electricity/pence | Carbon dioxide produced |
|---|---|---|---|
| coal | 22.2 | 2.5 | Yes |
| gas | 23.8 | 3.1 | Yes |
| wind | 5.2 | 5.5 | No |
| wave | 1.2 | 6.8 | No |

*Electricity produced - © Crown Copyright https://www.gov.uk/government/statistics/electricity-section-5-energy-trends.*
*Cost - Copyright © 2005 The Telegraph & The Royal Academy of Engineering, 26 March 2005.*

Carbon dioxide is a greenhouse gas. Increasing levels of carbon dioxide are being linked to global warming.

**(i)** Suggest why the UK government wants to produce more electricity from wind and wave sources. Explain why customers might disagree.

_____

_____

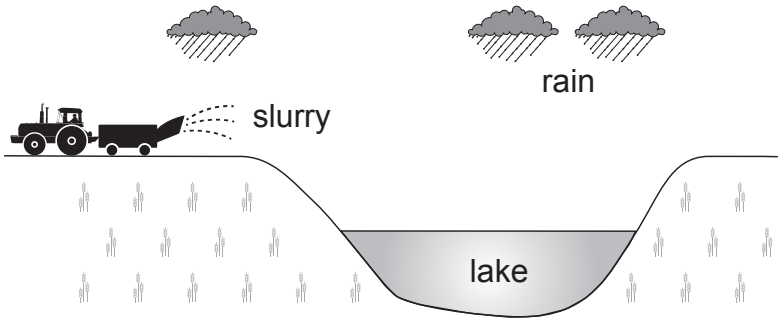
_____

_____ [2]

**(ii)** Apart from a rise in temperature, state **one** effect of global warming.

_____ [1]

**(b)** The diagram below shows slurry being spread onto farmland.




*Source: CCEA*

**(i)** Using the diagram and your knowledge give **two** reasons why the lake is at risk of pollution due to the slurry.

1. _____

_____

2. _____

_____ [2]

The table below gives some information about this lake from 2006 to 2010.

| | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **level of nitrates** | very high | high | moderate | low | very low |
| **oxygen in water/mg/l** | 3 | 5 | 8 | 10 | 12 |
| **number of species of fish in the lake** | 6 | 8 | 10 | 20 | 26 |
| **level of bacteria** | very high | high | moderate | low | very low |

Use the information in the table to answer the questions below.

**(ii)** Explain why the oxygen level has increased between 2006 and 2010.

_____

_____ [1]

**(iii)** Give **one** effect of this increase in oxygen.

_____ [1]

Examiner Only

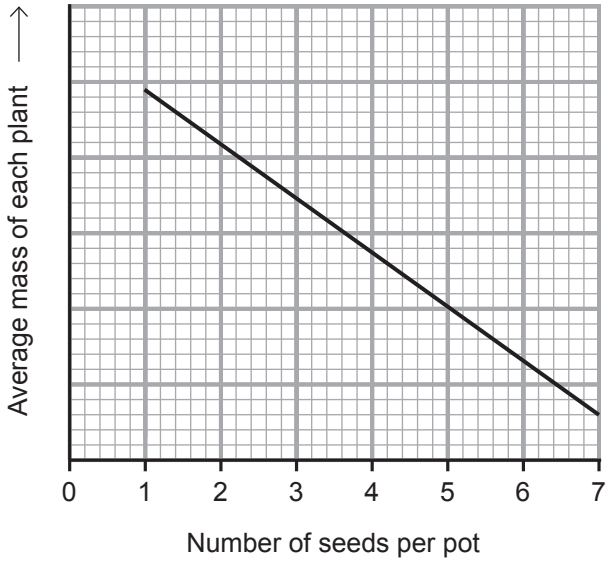
| Marks | Remark |
|---|---|
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**2** The graph below shows the results of an investigation into the effect of the number of seeds per pot on the average mass of each plant.




*© GCSE Science Single Award for CCEA Foundation and Higher Tier by James Napier, Alyn G McFarland and Roy White. Published by Hodder Education in 2013. ISBN: 9781444195729. Reproduced by permission of Hodder Education*

**(a)** Describe and explain these results.

_____

_____

_____

_____ [2]

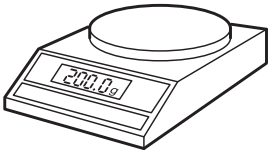
**(b)** The equipment used to obtain these results is shown below.

| Examiner Only | |
|---|---|
| Marks | Remark |



plant pot(s) with compost

© Chimpinski / iStock / Thinkstock



balance

© CCEA




flower seeds

© colematt / iStock / Thinkstock



watering can

© Creative_Outlet / iStock / Thinkstock

**(i)** Describe fully how this equipment could be used to carry out the investigation.

_____

_____

_____

_____

_____

_____

_____ [3]

**(ii)** Give **two** things that need to be done to give valid results (fair test) in this investigation.

1. _____

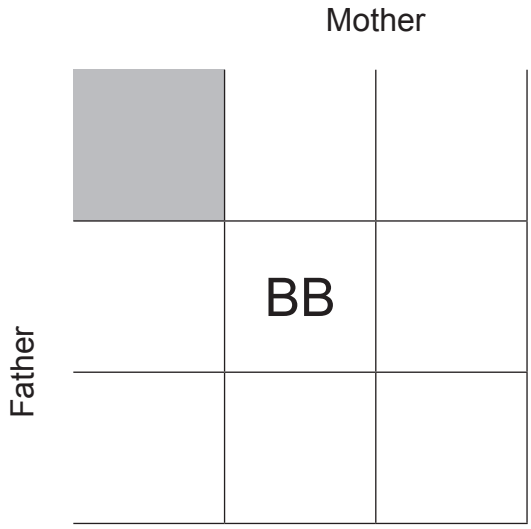
2. _____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**3** **(a)** Cystic fibrosis is an inherited disease.
It is possible for two heterozygous parents without cystic fibrosis to have a child with cystic fibrosis.

**(i)** Complete the Punnett square to show how two heterozygous parents could have a child with cystic fibrosis.

B = dominant allele
b = recessive allele




[2]

**(ii)** In the Punnett square above circle the genotype for cystic fibrosis. [1]

**(iii)** How many different genotypes are shown in the Punnett square?

_____ [1]

**(b)** Explain the term 'homozygous'.

_____

_____ [1]



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**(c)** Explain the genetic terms dominant and recessive.

dominant

_____

_____

recessive

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**4** Name and describe the two types of variation in living things and give **one** example of each.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

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**(Questions continue overleaf)**



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| Examiner Only | |
|---|---|
| Marks | Remark |

**5** **(a)** The Giant Panda is an animal that is nearly extinct.



*© XiFotos / iStock / Thinkstock*

In 2003 there were 1596 Giant Pandas living in the wild in China.
By 2013 that number had increased to 1864.

**(i)** Calculate the percentage increase in Giant Panda numbers from 2003 to 2013.

(Show your working out.)

_____ % [2]

**(ii)** Suggest **one** way in which the Chinese Government has helped Giant Panda numbers to increase.

_____ [1]

**(iii)** What word is used to describe animals that are close to extinction?

_____ [1]

**(b)** The Giant Panda feeds almost entirely on the leaves, stems and shoots of various bamboo plants. Sometimes they will hunt and eat pikas (small mammals). These pikas feed on a variety of green plants.

**(i)** Using the information provided suggest how the Giant Panda can be described as both a primary and secondary consumer.

_____

_____

_____

_____ [2]

**(ii)** In a food chain the plant is called a producer. Explain the term producer.

_____

_____ [1]

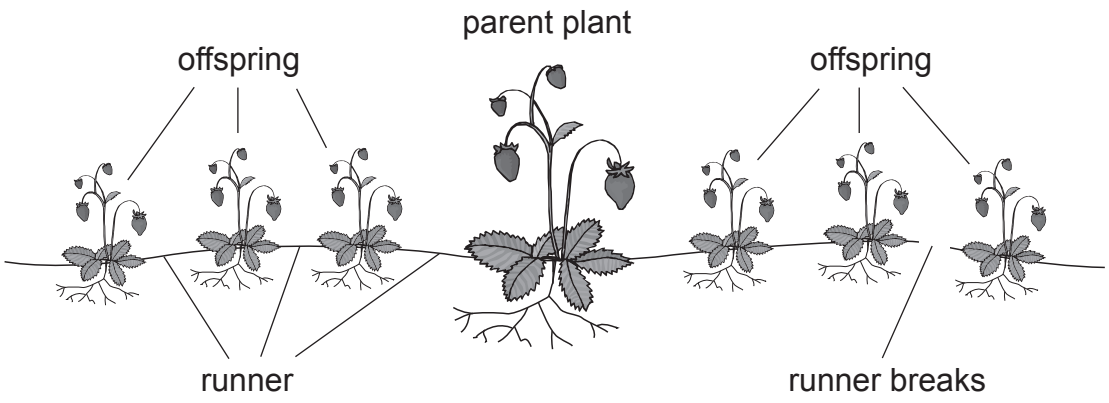
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**6** The diagram below shows how a strawberry plant reproduces.
The parent plant produces runners and from the runners offspring develop at intervals. Once the offspring are established the runners break.




*Source: CCEA*

Use the information provided and your knowledge to answer the following questions.

**(a)** Give **two** pieces of evidence that suggest the reproduction is asexual.

1. _____

2. _____ [2]

**(b)** **(i)** George grows and sells strawberry plants.
Give **one** advantage and **one** disadvantage of producing the plants asexually.

advantage _____

_____

disadvantage _____

_____ [2]

**(ii)** George also sells strawberries to a local shop.
Suggest **two** features these strawberries might have to help boost sales and make more money.

1. _____

2. _____ [2]



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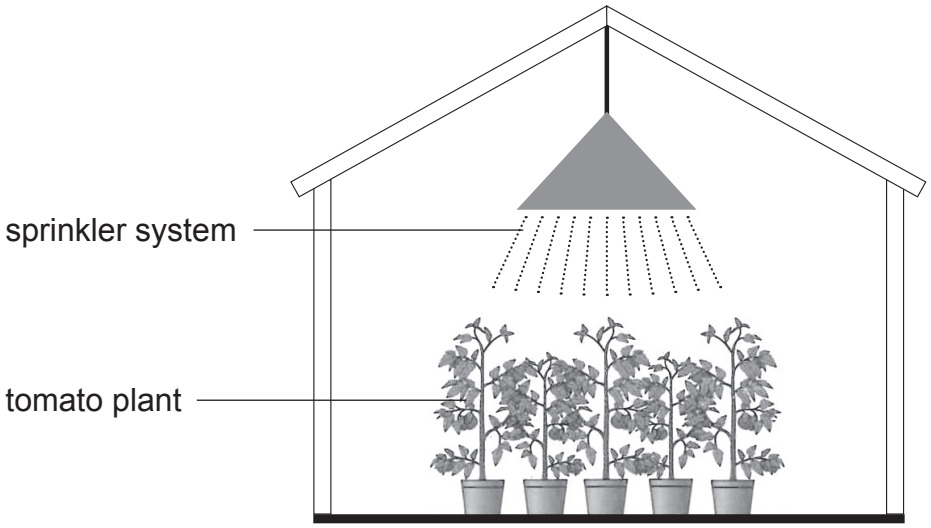
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**(Questions continue overleaf)**



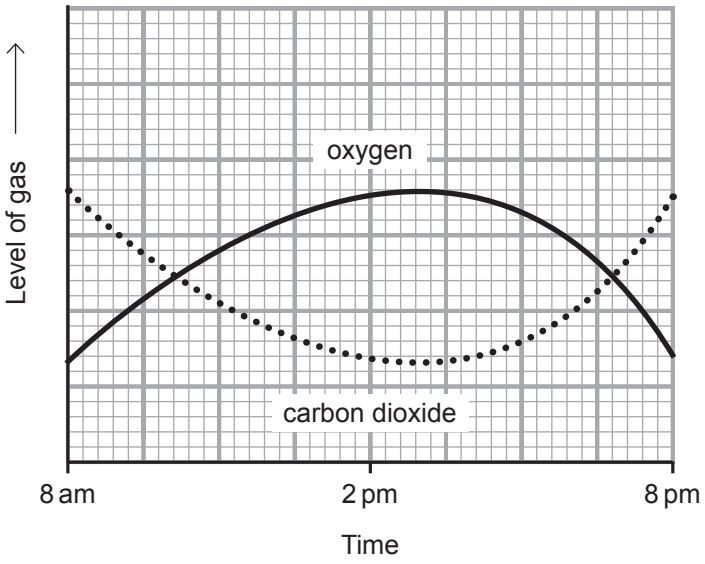
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**7** **(a)** A scientist investigated gas exchange in tomato plants in a glasshouse.

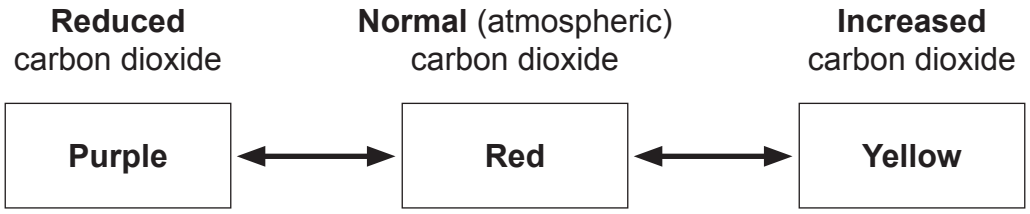



*Source: CCEA*

The graph below shows how the levels of oxygen and carbon dioxide change over a number of hours in the glasshouse.



The scientist placed test tubes of hydrogencarbonate indicator in the glasshouse.
The hydrogencarbonate indicator shows the level of carbon dioxide by changing colour as shown below:




He recorded the colour of the indicator at certain times.

**(i)** Complete the table below to give the colour of the indicator at 8 am and 2 pm.

| | **Colour of indicator at start** | **Colour of indicator at set time** |
|---|---|---|
| 8 am | Red | |
| 2 pm | Red | |

[2]

**(ii)** Suggest **one** reason why gardeners often choose to grow their tomato plants inside a glasshouse as opposed to outside on open ground.

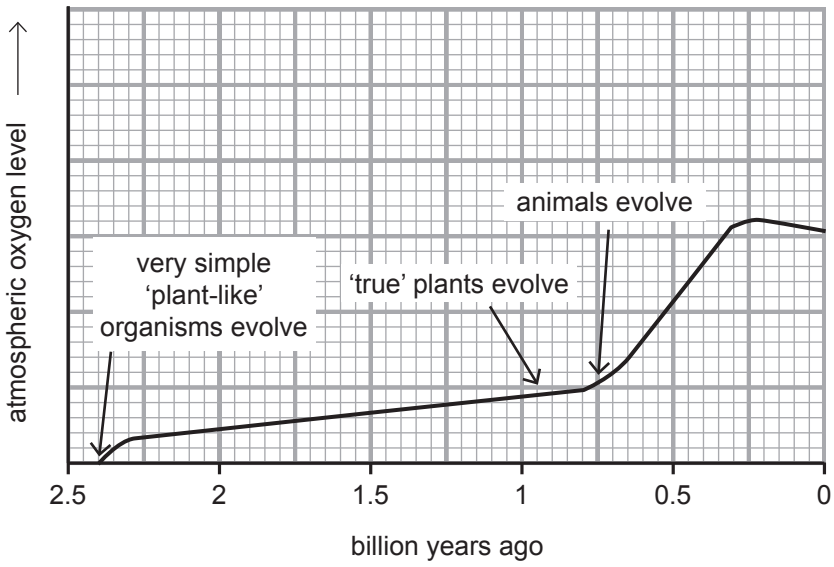
_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** The following diagram shows how the level of atmospheric oxygen has changed throughout the last 2.5 billion years.




**(i)** Using the information provided and your knowledge, explain why it was necessary that plants evolved before animals.

_____

_____

_____

_____ [2]

**(ii)** Name the process that caused the rise in oxygen level around 2.4 billion years ago.

_____ [1]

**(c)** Purple tomatoes have been produced by scientists in Norfolk that contain two genes from another plant species called snapdragon. These genes 'switch on' another set of genes in the tomato causing the tomato to be purple rather than red.

**(i)** Using this information explain why the purple tomato is described as a 'genetically modified' tomato.

_____

_____ [1]

**(ii)** Give **two** reasons why there is opposition to growing genetically modified crops.

1. _____

2. _____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**8** The table below shows the percentage of DNA bases in a human.

| **Bases** | Adenine | Guanine | Cytosine | Thymine |
|---|---|---|---|---|
| **%** | 31.2 | 18.8 | 18.8 | 31.2 |

**(a)** Using this information and your knowledge explain how the bases in DNA are arranged.

_____

_____ [1]

**(b)** Describe fully how DNA codes for protein.

_____

_____

_____

_____

_____

_____ [3]

**(c)** State what Franklin and Wilkins discovered about the structure of DNA and name the procedure they used.

_____

_____

_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

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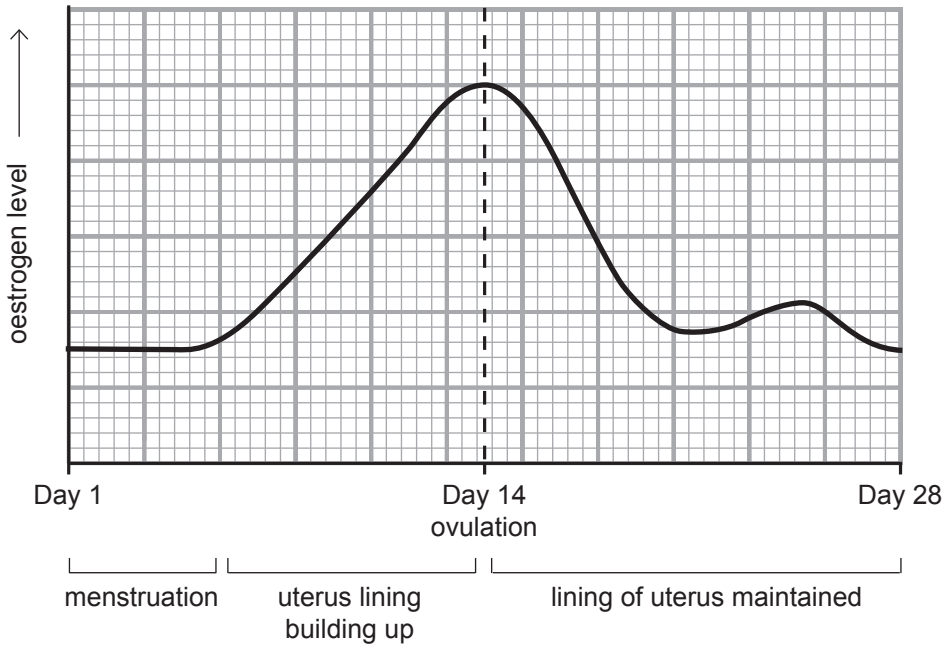
**(Questions continue overleaf)**



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** The graph below shows the changes in the oestrogen (female hormone) level during the menstrual cycle.




**(a)** Describe the changes in the oestrogen level over the first 14 days. Explain the effects of these changes.

_____

_____

_____

_____

_____ [3]

**(b)** Name another important female hormone in the menstrual cycle. Explain its function.

_____

_____

_____ [2]

**(c)** Name the method of contraception which changes a woman's hormone levels.

_____ [1]

**(d)** The table below shows how the level of female reproductive hormone controlling sexual development changes between the ages of ten and seventeen.

| Age | Level of reproductive hormone/arbitrary units |
|---|---|
| 10 | 4 |
| 11 | 6 |
| 12 | 10 |
| 13 | 9 |
| 14 | 8 |
| 15 | 7 |
| 16 | 5 |
| 17 | 5 |

Describe fully the trend shown by the information above.

_____

_____

_____ [2]

**(e)** Hormones are chemical messengers in the body.
Name **one** other way in which messages are sent around the body.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

**10** Louis Pasteur carried out an experiment to show that microorganisms caused food to go bad.

**(a)** Describe how Pasteur set up his experiment and the results he obtained.

[3]

**(b)** Microorganisms also cause the disease rubella. Explain fully why a doctor would not prescribe antibiotics for someone who has rubella.

[2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(c)** Describe and explain all the ways in which the body defends itself against microorganisms gaining entry and causing harm in the body.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**THIS IS THE END OF THE QUESTION PAPER**

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Rewarding Learning

General Certificate of Secondary Education
2015–2016

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**WEDNESDAY 24 FEBRUARY 2016, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 1 | (a) | (i) | Wind and wave do not produce carbon dioxide/do not contribute to global warming [1]<br>however, the cost of producing electricity is far greater from wind and wave than coal and gas/people not prepared to pay extra cost [1] [2] | |
| | | (ii) | Melting polar ice caps/increasing sea levels/climate change [1] | |
| | (b) | (i) | Slurry being spread on sloping land/too close to lake [1]<br>It is raining (so slurry is going to be washed off land) [1] [2] | |
| | | (ii) | Fewer bacteria so less oxygen being used up [1] | |
| | | (iii) | Number of species of fish increases [1] | 7 |
| 2 | (a) | | As number of seeds per pot increases average mass of each plant decreases [1]<br>competition/for light/space/water [1] [2] | |
| | (b) | (i) | Any **three** from:<br>• add different numbers of seeds in each pot [1]<br>• leave for a period of time that is specified [1]<br>• weigh plant in each pot [1]<br>• calculate average mass of each plant in the pot [1] [3] | |
| | | (ii) | Any **two** from:<br>• use the same size of pot<br>• use the same volume/type of compost<br>• give each pot equal amount of water<br>• same amount of light<br>• same temperature<br>• grow for same length of time<br>• same type of seeds [2] | 7 |
| 3 | (a) | (i) | Gametes correct [1]<br>offspring correct [1] [2] | |
| | | (ii) | bb circled [1] | |
| | | (iii) | 3 [1] | |
| | (b) | | Both alleles the same [1] | |
| | (c) | | Dominant allele is expressed/characteristic shows if heterozygous [1]<br>recessive allele is masked by dominant allele/characteristic only shows if homozygous [1] [2] | 7 |



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AVAILABLE MARKS

**4 Indicative content**

- continuous
- (continuous variation) is a gradual change in a characteristic across a population
- discontinuous
- (discontinuous variation) occurs when all individuals can be clearly divided into two or more groups
- height (continuous)
- tongue rolling (discontinuous)

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe variation using **all** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe variation using **four or five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe variation using **one, two or three** of the points above. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6] 6

**5 (a) (i)** 1864 – 1596 = 268
268/1596 [1]
× 100 = 16.8 [1] [2]

**(ii)** Legislation/special programmes/education/stop poaching/nature reserves [1]

**(iii)** Endangered [1]

**(b) (i)** Primary – as it eats plants/producers [1]
secondary – as it eats pikas which have already eaten plants [1] [2]

**(ii)** Makes its own food from sunlight energy [1] 7



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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **6** | **(a)** | Only one parent plant is involved [1]<br>all offspring are identical [1] | [2] | |
| | **(b)** | **(i)** Advantage – faster growth/good features will always be passed on [1]<br>Disadvantage – if one gets a disease they all get it [1] | [2] | |
| | | **(ii)** Any **two** from:<br>• large fruit<br>• high yield<br>• colour of fruit<br>• texture<br>• taste | [2] | 6 |
| **7** | **(a)** | **(i)** 8 am – Yellow [1]<br>2 pm – Purple [1] | [2] | |
| | | **(ii)** Temperature can be controlled/water can be controlled | [1] | |
| | **(b)** | **(i)** More plants for food/produce oxygen [1]<br>Oxygen needed for respiration of animals/active animals require a lot of oxygen [1] | [2] | |
| | | **(ii)** Photosynthesis | [1] | |
| | **(c)** | **(i)** Has genes transferred from snapdragon (one organism to another) | [1] | |
| | | **(ii)** Any **two** from:<br>• could cause 'superweeds'<br>• can be more expensive<br>• can cause allergies | [2] | 9 |
| **8** | **(a)** | Adenine pairs with thymine and Guanine with Cytosine (both parts needed) | [1] | |
| | **(b)** | Any **three** from:<br>• sequence of three bases codes for one amino acid<br>• one strand/side of DNA is used as the coding strand<br>• base triplet<br>• amino acids join together to form proteins | [3] | |
| | **(c)** | Worked out overall shape of DNA [1]<br>used X-ray diffraction (crystallography) [1] | [2] | 6 |

| | | | AVAILABLE MARKS |
|---|---|---|---|
| 9 | **(a)** | Any **three** from:<br>• level is low during menstruation<br>• oestrogen level rises to a peak at day 14<br>• to cause the release of an ovum<br>• causing uterus lining to build up [3] | |
| | **(b)** | Progesterone [1]<br>to build up and maintain the thick uterine lining/development of placenta and other structures associated with pregnancy [1] [2] | |
| | **(c)** | Contraceptive pill [1] | |
| | **(d)** | Increases from 10 years old to a peak at 12 years old [1]<br>decreases after this and levels off [1] [2] | |
| | **(e)** | Nervous [1] | 9 |



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| AVAILABLE MARKS |
|---|

**10** **(a)** Sterilised broth (was placed in two flasks) [1]
one with a swan neck and one with a broken neck [1]
broth in flask with broken neck became contaminated/broth in flask with swan neck stayed fresh [1] [3]

**(b)** Rubella is a virus [1]
antibiotics only treat bacterial infections [1] [2]

**(c)** **Indicative content**

- skin provides a covering to stop microorganisms getting in
- mucous membranes trap microorganisms
- blood clotting prevents microorganisms getting in through cuts
- antibodies are produced
- lock on to antigens
- as they are complementary in shape
- clump microorganisms together
- phagocytes
- engulf and digest microorganisms

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain how the body defends itself against microorganisms using **seven to nine** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe and explain how the body defends itself against microorganisms using **four to six** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe and explain how the body defends itself against microorganisms using **one to three** of the points above. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6] 11

**Total** **75**

Rewarding Learning

General Certificate of Secondary Education
2015–2016

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**WEDNESDAY 11 NOVEMBER 2015, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 1 | **(a)** | **(i)** Double helix | [1] | |
| | | **(ii)** Genes | [1] | |
| | **(b)** | **(i)** RR [1] Rr [1] | [2] | |
| | | **(ii)** | | |

red flowered plant

| white flowered plant | | | |
|---|---|---|---|
| | | | r |
| | r | | rr |
| | | Rr | rr |

1 mark for each set of parental gametes [2]
1 mark for offspring [1] [3]

**(c)** Continuous [1]
no discrete groups/difficulty in allocating to group [1] [2] 9



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| AVAILABLE MARKS |
|---|

**2 Indicative content**

- blood glucose levels increase
- as insulin no longer produced/insulin ceases to function
- glucose not converted to glycogen
- symptom – increased glucose in urine/thirst/need to visit toilet more often/ coma (if treatment delayed)/tiredness
- long term effect – eye damage/heart disease/strokes/kidney damage/limb damage
- increase mainly due to increase in Type 2
- due to obesity/increase in fat or carbohydrate intake/reduced exercise

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain the effect of diabetes on humans using **five to seven** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe and explain the effect of diabetes on humans using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe and/or explain the effect of diabetes on humans using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

6

**3 (a)** Shading in central T zone and bottom and top of leaf [1]

**(b) (i)** Moving the lamp position/dimmer switch [1]

**(ii)** To make sure the temperature can be kept constant [1]

**(iii)** Number of oxygen bubbles increases with increasing light intensity [1]
difference is greater between medium and high (compared to low and medium light intensities) [1]
with increasing light more photosynthesis [1] [3]

**(iv)** Number of bubbles increases as temperature increases [1]

**(c)** Cells tightly packed together / near top of leaf [1]
more cells/chloroplasts for photosynthesis/more light for photosynthesis [1] [2]

9



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **4** | **(a)** | **(i)** | 70 bpm [1] | | |
| | | **(ii)** | 100% [1] | | |
| | | **(iii)** | Kerry [1]<br>heart rises less during exercise/returns to normal quicker [1] | [2] | |
| | **(b)** | | Involves long periods in hospital/ill and so off work [1]<br>usually parents/fathers so no one to earn money/look after young children/ other appropriate answer [1] | [2] | 6 |
| **5** | **(a)** | | Percentage of adults who drink alcohol decreases with age [1]<br>more men than women drink alcohol (in all age groups) [1] | [2] | |
| | **(b)** | **(i)** | Drinking a large quantity of alcohol on a particular occasion | [1] | |
| | | **(ii)** | Peer pressure/inexperienced drinker (e.g. don't know warning signs) | [1] | |
| | | **(iii)** | Many people cannot afford to buy a lot of drink at one time so less likely to binge drink | [1] | 5 |
| **6** | **(a)** | **(i)** | Any **two** from:<br>• expensive equipment<br>• highly trained scientists needed<br>• trial and error nature of process | [2] | |
| | | **(ii)** | Avoids testing on humans at this stage [1]<br>testing on whole body systems/living organisms [1] | [2] | |
| | | **(iii)** | Testing on volunteers/patients [1]<br>testing effectiveness of drugs/side effects/dosage required [1] | [2] | |
| | **(b)** | **(i)** | The transfer of DNA/genes from one species to another | [1] | |
| | | **(ii)** | Any **two** from:<br>• more yield/high quality foods<br>• disease resistant<br>• pest (insect) resistant<br>• greater habitat range | [2] | |
| | | **(iii)** | Lack of understanding/allergies/'super-weeds' | [1] | 10 |

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **7** | **(a)** | **(i)** | Oestrogen | [1] | |
| | | **(ii)** | The lining is repaired/builds up | [1] | |
| | | **(iii)** | Vagina – cervix – uterus – oviduct (all correct = 2)<br>Any two in correct order [1] | [2] | |
| | **(b)** | | Both oestrogen and progesterone [1]<br>fall to a low level [1] | [2] | 6 |
| **8** | **(a)** | | Everyone's sequence of bases is different | [1] | |
| | **(b)** | | Three bases (in sequence on the coding strand) code for one amino acid | [1] | |
| | **(c)** | | | | |

| Scientist(s) | Discovery |
|---|---|
| Chargaff | |
| | Used X-ray diffraction to show overall shape of DNA |
| | Used modelling to work out double helix shape/ that bases link A-T and C-G |

[3] 5

| | | | | | |
|---|---|---|---|---|---|
| **9** | **(a)** | **(i)** | Native to Britain and Ireland | [1] | |
| | | **(ii)** | Can reproduce both sexually and asexually | [1] | |
| | | **(iii)** | Decreases biodiversity | [1] | |
| | **(b)** | | Any **three** from:<br>• plants die and decay<br>• decay caused by bacteria/fungi<br>• protein converted into ammonia<br>• nitrification/nitrifying bacteria converts the ammonia to nitrate | [3] | 6 |
| **10** | **(a)** | | Sample both the island and the mainland [1]<br>count the number of both winged and wingless insect species found [1]<br>convert to percentages [1] | [3] | |
| | **(b)** | **(i)** | Evolution | [1] | |
| | | **(ii)** | Charles Darwin | [1] | |
| | **(c)** | | High oxygen levels [1]<br>for the high rates of respiration required (when in flight) [1] | [2] | 7 |

**11 Indicative content**

- number of deaths increased between 2002–2008
- number of deaths fell between 2008–2012
- increase as MRSA antibiotic resistant
- due to mutations
- in bacterial DNA / chromosomes
- improvement in death rate due to increased hygiene in hospitals
- other improvement strategy (e.g. isolation wards, more controlled use of antibiotics)

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain the rise and fall of MRSA deaths using **six or seven** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe and explain the rise and fall of MRSA deaths using **four or five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe and/or explain the rise and fall of MRSA deaths using **one to three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6] 6

**Total** **75**

AVAILABLE MARKS



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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

# Science: Single Award

Unit 1 (Biology)
Higher Tier

## [GSS12]

*GSS12*

## TUESDAY 12 MAY 2015, AFTERNOON

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
**You must answer the questions in the spaces provided.**
**Do not write outside the boxed area on each page or on blank pages.**
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

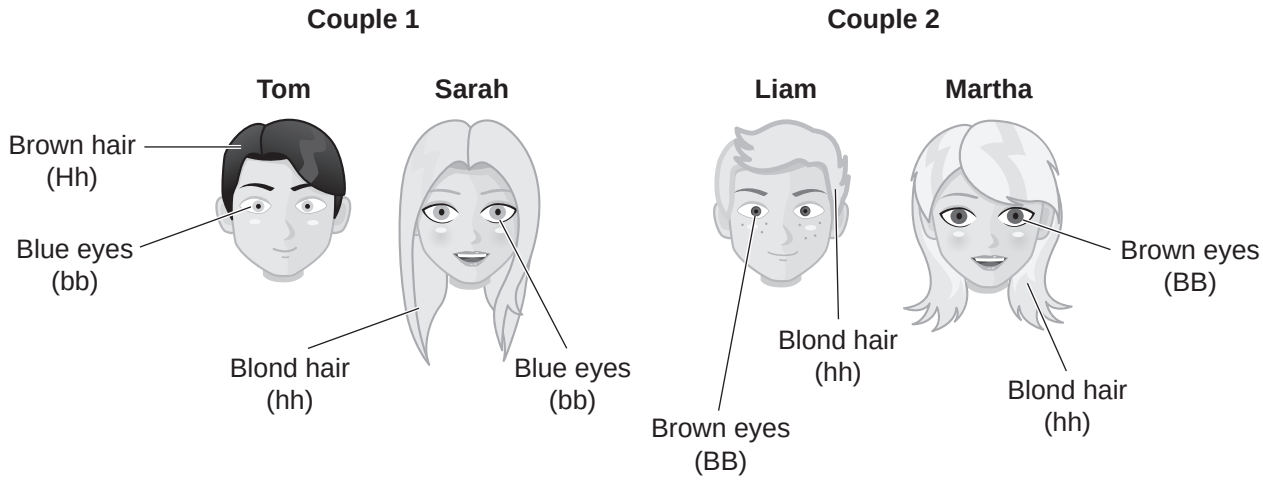
**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **10**.

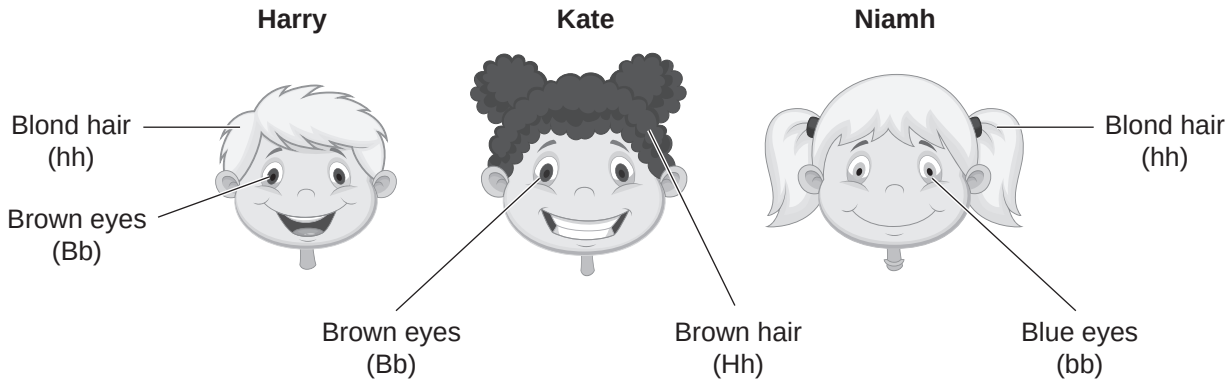
9831

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**1** **(a)** The diagram below shows some characteristics of two couples.
For **hair colour**, the brown allele (H) is dominant.
For **eye colour**, the brown allele (B) is dominant.




**(i)** Which child below could be a child of Couple 1 (Tom and Sarah)?
Explain your answer.




Name of child _____

Explanation _____

_____ [2]

**(ii)** Explain why Harry could not be a child of Couple 2 (Liam and Martha).

_____

_____ [1]



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**(b) (i)** The presence of a dominant allele, T, means a person can roll his or her tongue. Give the genotype of a person who is heterozygous for tongue rolling.

_____ [1]

**(ii)** Complete the Punnett square below to show how two parents, both of whom can roll their tongue, can have a child who cannot roll his or her tongue.

| | | t |
|---|---|---|
| T | T T | |
| | | |

[2]

**(iii)** How many of the offspring may be able to roll his or her tongue?

_____ [1]

**(iv)** Name the type of variation shown by tongue rolling.

_____ [1]

**[Turn over**



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**2** **(a)** The Ebola virus is spread through contact with body fluids such as blood and sweat. It spread rapidly through parts of Africa and killed over 8000 people.

No licensed vaccines are available at present to treat the virus. However, Canada agreed to send doses of an experimental vaccine to be used with patients who have the disease. This vaccine has been through two drug development stages but it has not been tested on humans.

**(i)** Using the information above, suggest why doctors and nurses are at risk of being infected while treating patients with the Ebola virus.

_____

_____ [1]

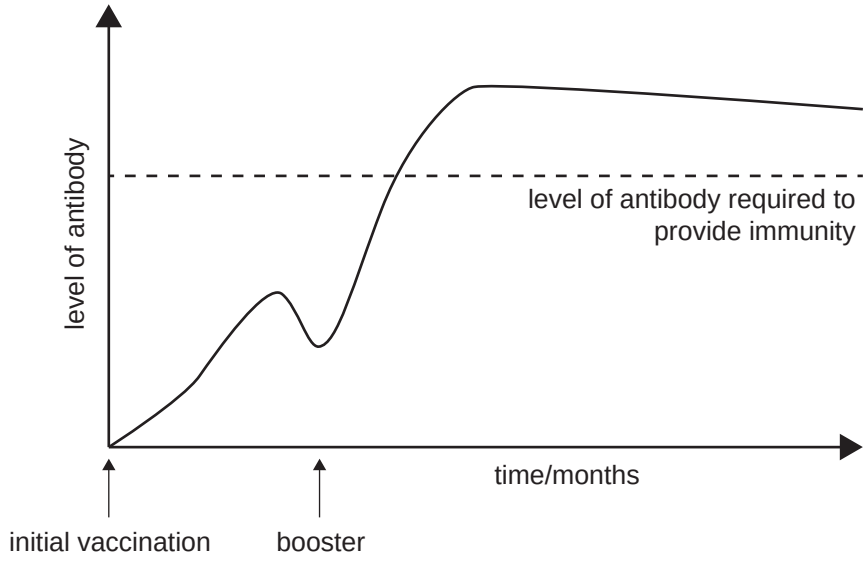
**(ii)** Name the **two** drug development stages, in the correct order, that the experimental vaccine has already been through.

_____ → _____ [2]



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**(b)** The graph below shows how immunity is provided by a vaccination.




**(i)** Using the graph and your knowledge, name the type of immunity provided by a vaccination. Explain your answer.

_____

_____

_____ [2]

**(ii)** Suggest why the microorganisms in vaccinations must be dead or weakened.

_____ [1]

**(iii)** Suggest why a booster is sometimes given a few months after the initial vaccination.

_____

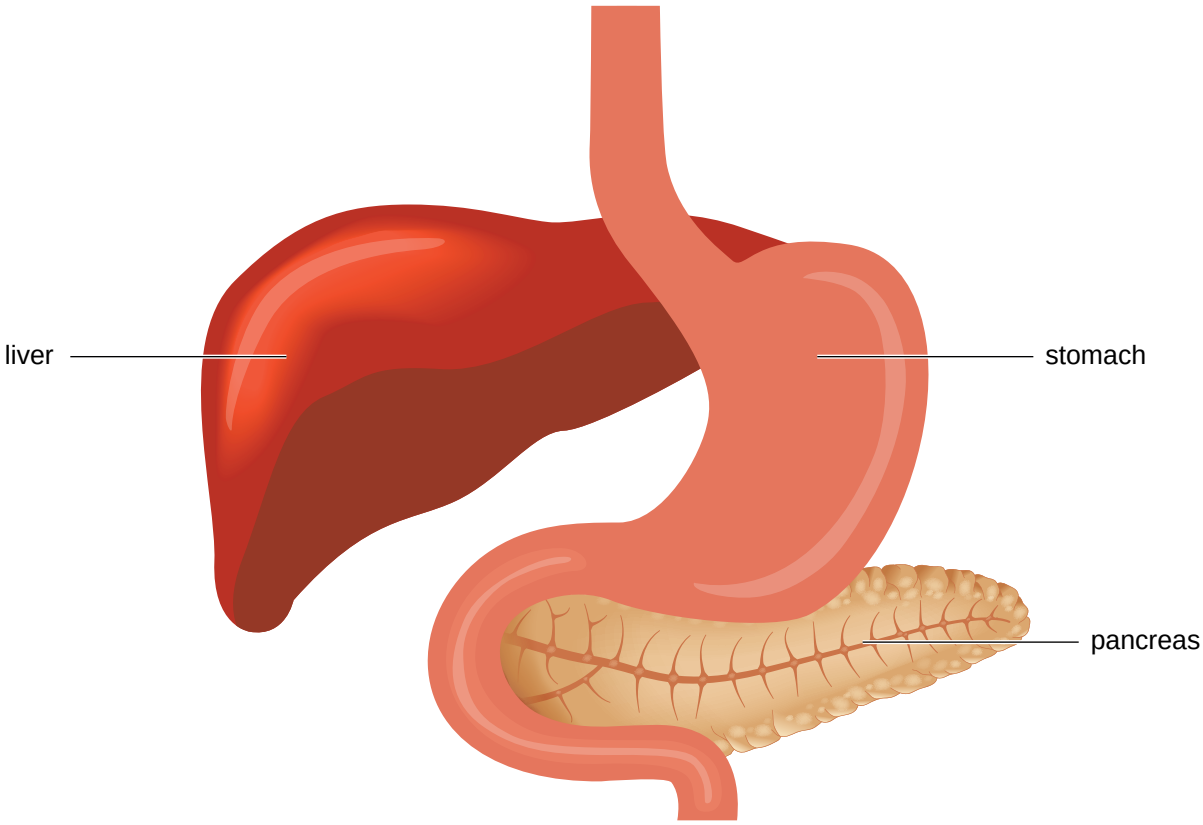
_____ [1]

**[Turn over**



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**3** **(a)** The diagram below shows some organs inside the human body.




**(i)** Place an **X** on the organ where the hormone insulin is produced. [1]

**(ii)** Describe and explain the effect insulin has on blood sugar levels.

_____

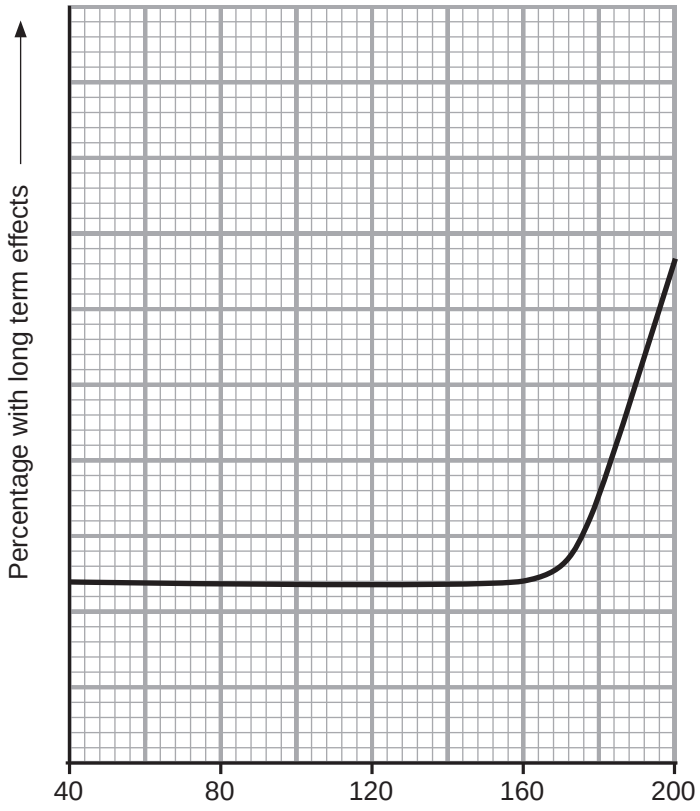
_____

_____ [2]



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**(b)** Diabetes is a condition which can effect the average blood sugar level of a person. The graph below shows the relationship between the percentage of people with diabetes who have long term effects and their average blood sugar levels.




**(i)** Describe fully the trend shown by the graph.

_____

_____

_____ [2]

**(ii)** Suggest why people with diabetes need to check their blood sugar levels more than once during the day.

_____

_____ [1]

**[Turn over**



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**4** Protein is one of the main food types needed for a balanced diet. Describe how you would carry out an investigation to show that a particular food contained protein.

Your answer should include:

- a named source of protein and its function within the body
- the reagent used and the colour change which would take place

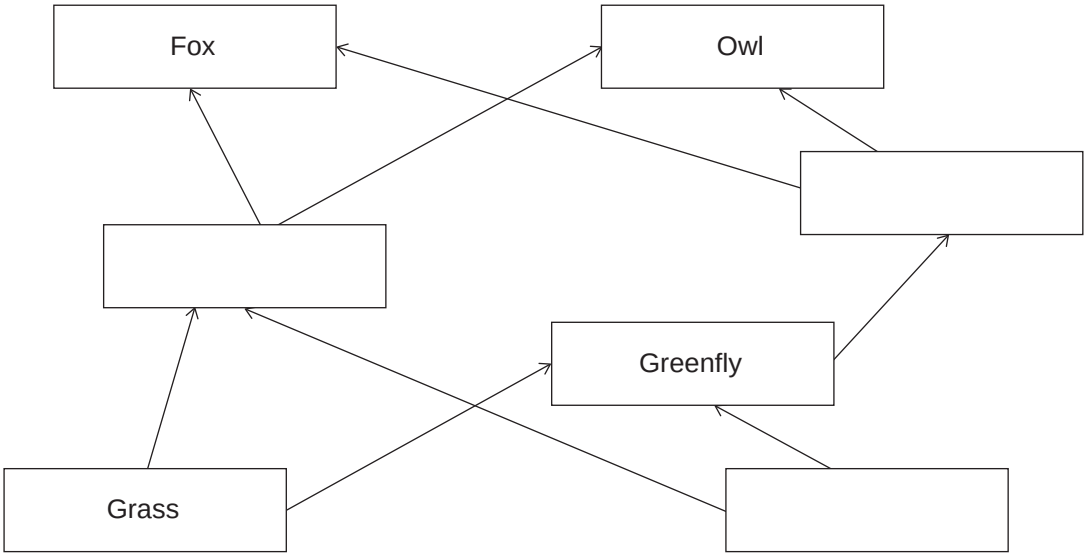
**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**5** **(a)** Food chains show the feeding relationships between organisms. When several food chains are interlinked they form a food web.

| Consumer | What it feeds on |
|---|---|
| Fox | Mouse and Bluetit |
| Owl | Mouse and Bluetit |
| Bluetit | Greenfly |
| Mouse | Grass and Tree Leaves |
| Greenfly | Grass and Tree Leaves |

**(i)** Using this information, complete the following food web.




[2]

**(ii)** How many primary consumers are in this food web?

_____

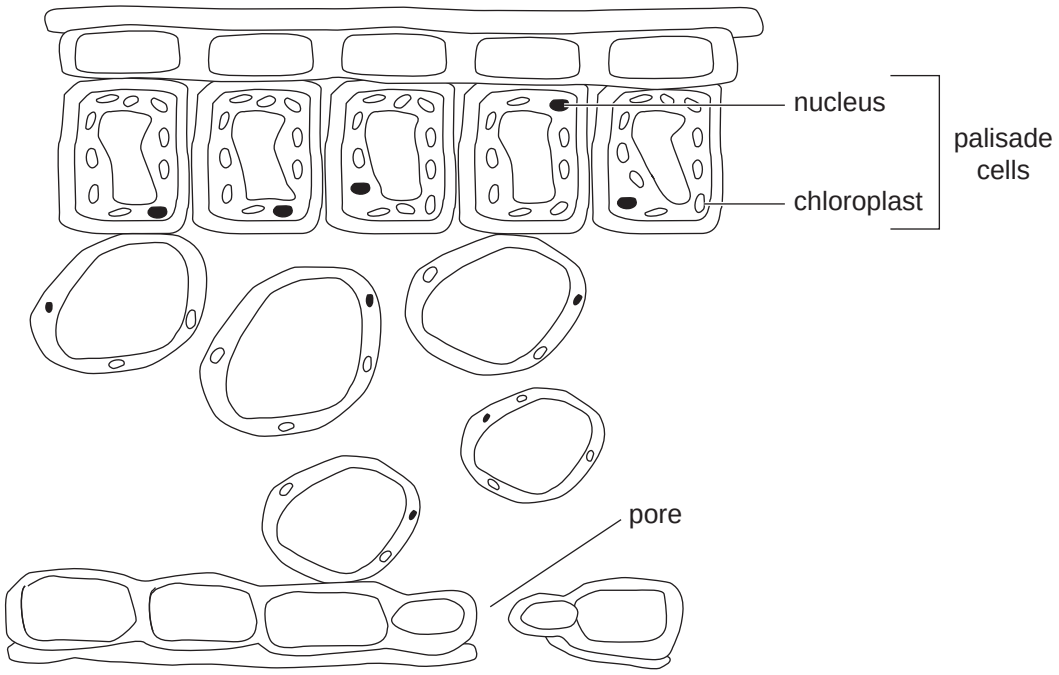
[1]

**[Turn over**



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**(b)** The diagram below shows a cross section of a leaf.




**(i)** Using the diagram, give **three** ways in which palisade cells are adapted to achieve maximum photosynthesis.

1. _____

2. _____

3. _____ [3]

**(ii)** Carbon dioxide is needed by palisade cells for photosynthesis.
Using the diagram, suggest how carbon dioxide reaches these cells.

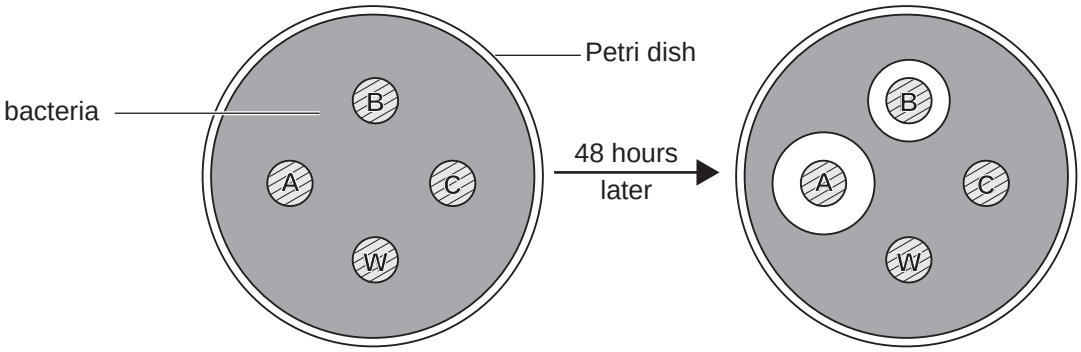
_____

_____ [1]



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**6** **(a)** An investigation was carried out to see the effect of different antibiotics on bacteria.
Three disks (**A**, **B** and **C**) soaked in different antibiotics were placed in a Petri dish that contained bacteria.
One other disk soaked with water (**W**) was also added.
The results are shown below.




**(i)** Suggest why a disk with water was used in this investigation.

_____

_____ [1]

**(ii)** Which antibiotic, **A, B** or **C**, was most effective? Explain your answer.

_____

_____ [2]

**(iii)** Suggest **one** thing that needed to be done to ensure valid results.

_____ [1]

**(b)** Explain fully, in terms of changes within bacteria, how antibiotic resistance has developed.

_____

_____

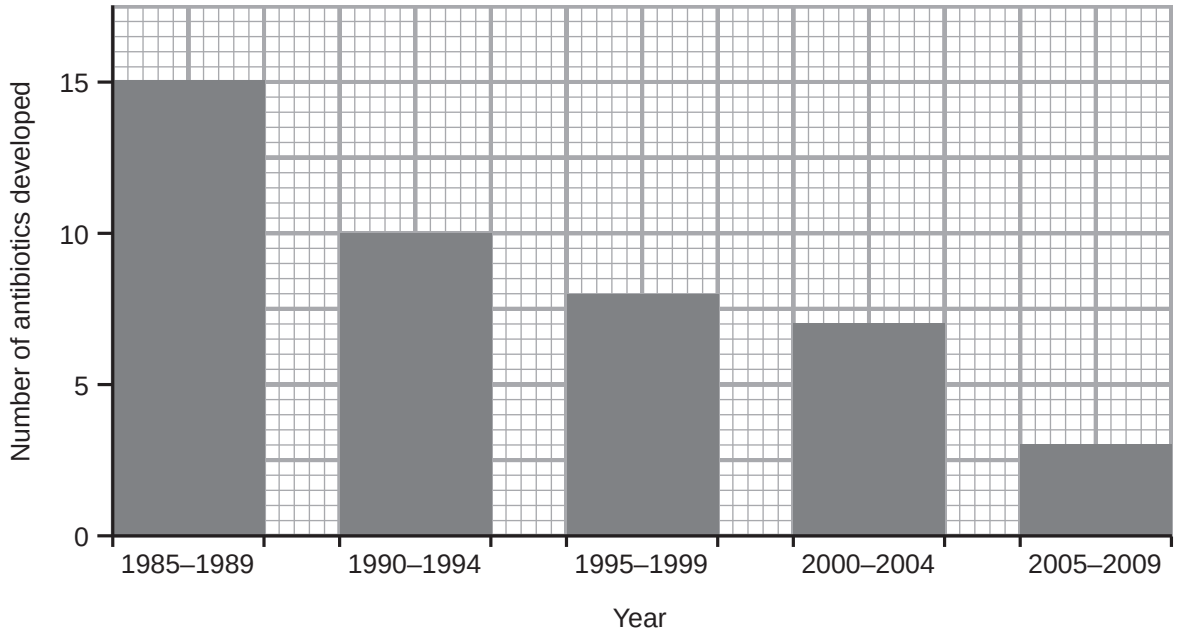
_____ [2]

**[Turn over**



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**(c)** The graph below shows the number of antibiotics developed from 1985 to 2009.




**(i)** Calculate the percentage decrease in the number of antibiotics developed from 1985–1989 to 2005–2009.

(Show your working out.)

_____ % [2]

**(ii)** State the trend shown by the graph above.

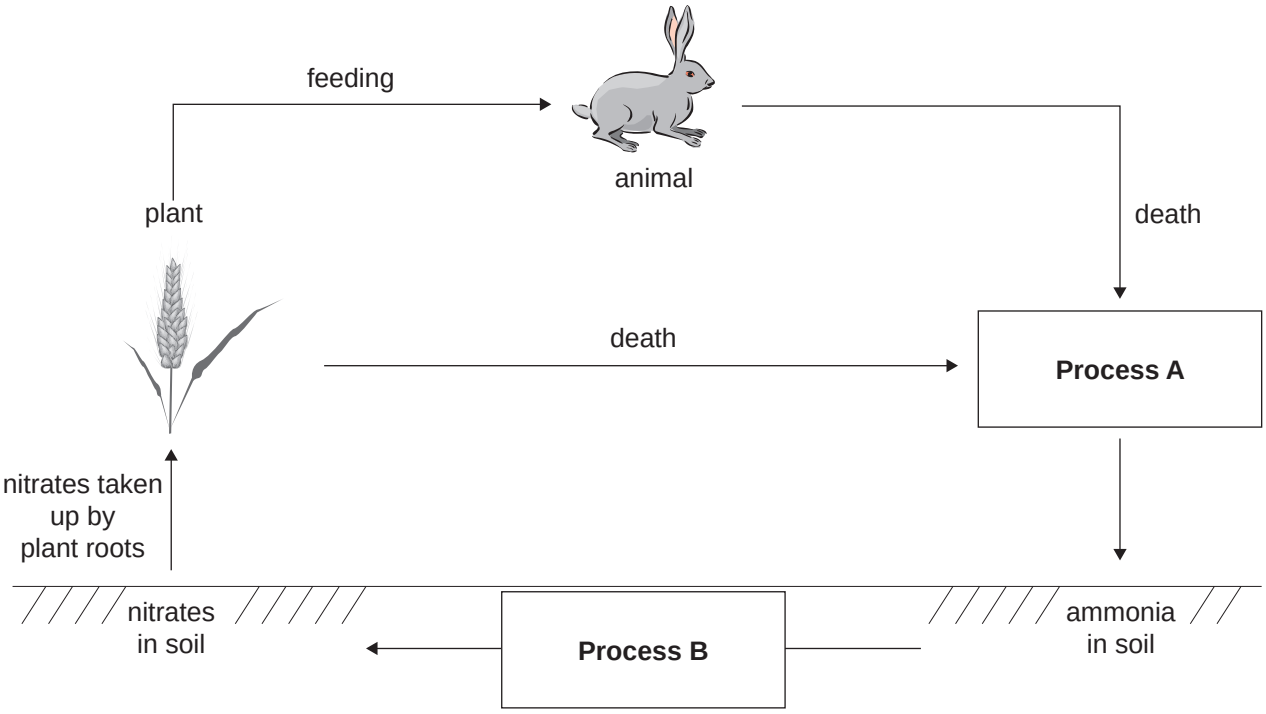
_____

_____ [1]



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**7** **(a)** The diagram below shows a simplified nitrogen cycle.




**(i)** Name the processes labelled **A** and **B** in the diagram.

Process **A** _____

Process **B** _____ [2]

**(ii)** Suggest why harvesting (removing crop plants) reduces the level of nitrates in the soil.

_____

_____

_____

_____

_____

_____ [3]

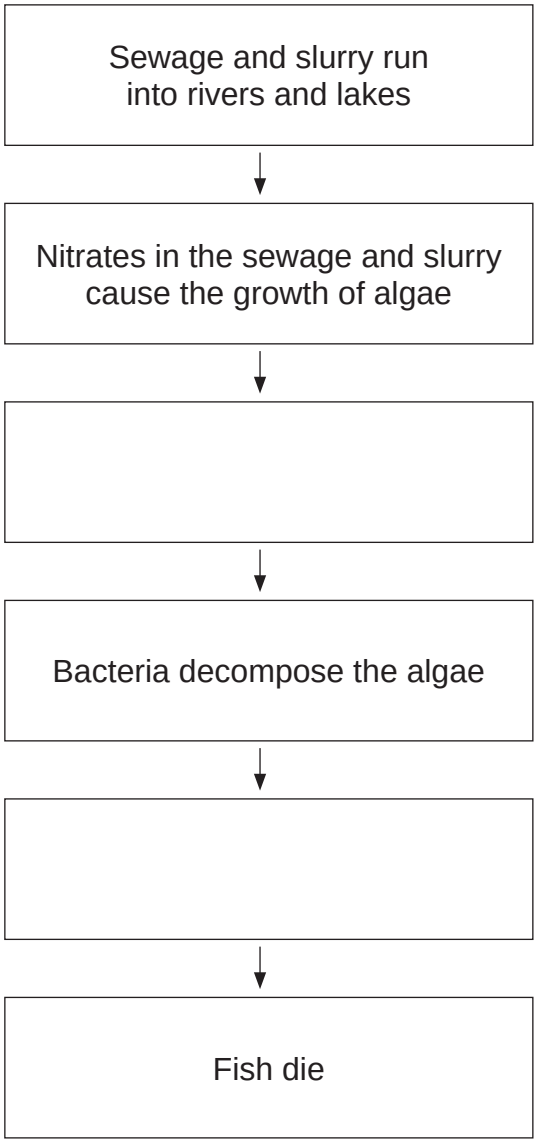
**[Turn over**



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**(b)** Sewage and slurry from farms is rich in nitrates and can cause harmful pollution if it drains into waterways.

**(i)** Complete the flow chart below to show what happens when sewage and slurry run into rivers and lakes.




[2]

**(ii)** Give **one** measure we can take to reduce water pollution by nitrates.

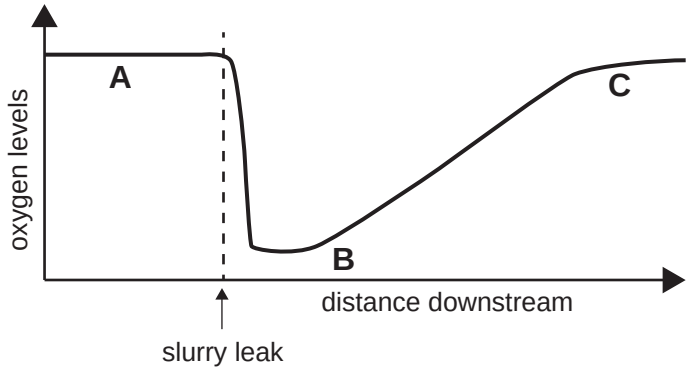
_____

_____ [1]



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**(c)** The graph below shows how oxygen levels change downstream in a river which has been polluted with farm slurry.




The presence of small animals in the river can be used to monitor the levels of pollution as shown in the table.

| **Small animals** | **Pollution level** |
|---|---|
| Stonefly larvae<br>Mayfly larvae | Low |
| Bloodworm<br>Water louse | Medium |
| Sludge worm<br>Rat-tailed maggot | High |

Water samples were taken from two locations along the river, **A** and **B**.

**(i)** Using the information above suggest which small animals were present in:

1. water sample **A**

_____

2. water sample **B**

_____ [2]

**(ii)** Suggest **one** reason why oxygen levels have recovered by location **C**.

_____

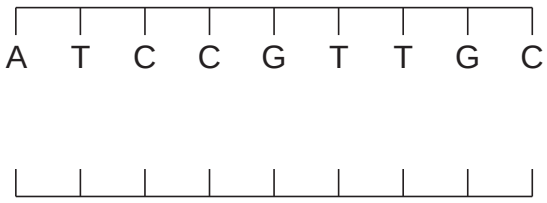
_____ [1]

**[Turn over**



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**8** **(a)** The diagram below shows 9 bases on a short section of a DNA coding strand.




**(i)** How many amino acids can be formed from this section of DNA?

_____ [1]

**(ii)** Each letter in the DNA coding strand represents a base. Which base is represented by the letter C?

_____ [1]

**(iii)** Complete the diagram by matching each base with its complementary base. [1]

**(b)** DNA sequencing is a method used to determine the order of the four bases in a strand of DNA. Recently, scientists in the UK gained the funding necessary to start sequencing the DNA of 100 000 people with cancer or a rare disease. The scientists are hoping that this will change the way these devastating diseases are diagnosed and allow for new drugs and therapies to be developed to treat these diseases.

The DNA sequencing project is also very important for the economy in the UK as it will create many new jobs. This will cost hundreds of millions of pounds. However, it is expected that around 400 000 NHS patients could benefit directly from the research. A big concern for anyone taking part in the research will be the way their personal information is used and whether it will be available to insurance companies and future employers.



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**(i)** Using this information, give **one** advantage and **one** disadvantage to the individual taking part in the sequencing project.

Advantage _____

_____

Disadvantage _____

_____ [2]

**(ii)** Suggest why some patients who are extremely ill with cancer and rare diseases will choose to take experimental drugs even before they are licensed for use.

_____ [1]

In 1950 Erwin Chargaff discovered that although the arrangement of bases in DNA varied, there was always an equal amount of the bases which paired together.

Other scientists built on the work of Erwin Chargaff.

**(c)** Name the scientists who **next** built on this work and describe what they discovered about DNA.

Names _____ and _____

Discovery _____

_____ [2]

**[Turn over**



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**9** The peppered moth exists in two genetically distinct forms, the light and dark varieties as shown below.

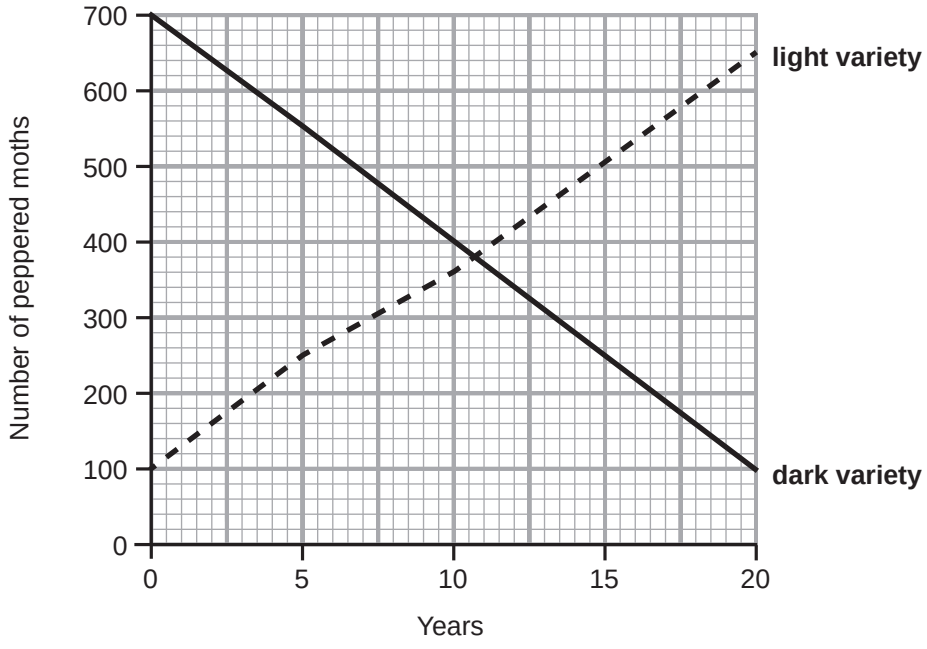


© Natural History Museum, London / Science Photo Library

Both types of moth spend a lot of time resting on tree trunks where they may be eaten by birds. Trees are easily blackened due to smoke (soot) pollution.

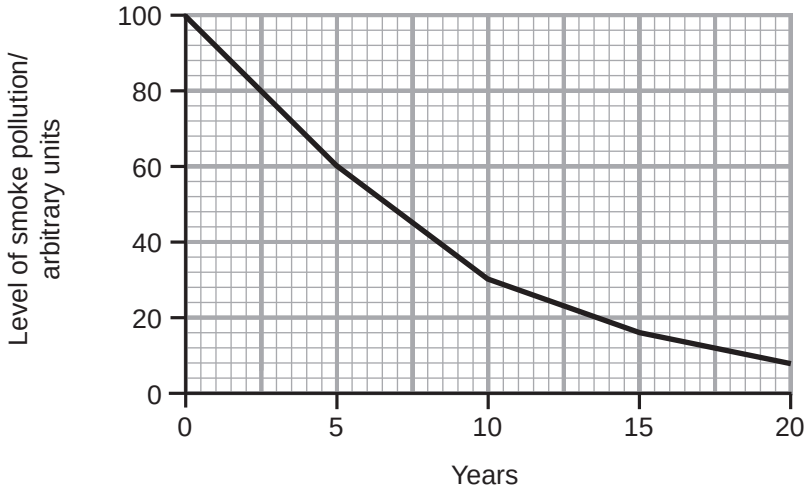
**Graph 1** shows the number of each variety of peppered moth in a wood over 20 years.

**Graph 1**



**Graph 2** shows the level of smoke pollution over the same period.

**Graph 2**




**(a)** Using all the information provided and your knowledge, describe and explain the change in the numbers of the dark variety of moth.

[3]

**[Turn over**



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**(b)** Charles Darwin used the theory of natural selection to explain the process of evolution.

**(i)** Give **two** reasons why not everyone accepts the theory of evolution.

1. _____

_____

2. _____

_____ [2]

**(ii)** Explain fully what is meant by the term 'evolution'.

_____

_____

_____

_____ [2]



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**10** Describe and explain how Louis Pasteur showed that contamination of food is caused by microorganisms.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

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| 3 | |
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| 6 | |
| 7 | |
| 8 | |
| 9 | |
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| **Total Marks** | |

**Examiner Number**

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Rewarding Learning

General Certificate of Secondary Education
2014–2015

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**TUESDAY 12 MAY 2015, AFTERNOON**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

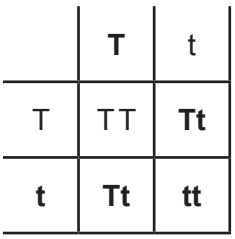
Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | **(i)** | Niamh [1]<br>received recessive alleles from both parents for blond hair/ and blue eyes/father did not pass on his dominant allele for brown hair [1] [2] | |
| | | **(ii)** | As he carries a recessive allele for eye colour (and neither parent has a recessive allele to give) [1] | |
| | **(b)** | **(i)** | Tt [1] | |
| | | **(ii)** | <br>Gametes correct [1]<br>Offspring correct [1] [2] | |
| | | **(iii)** | 3 [1] | |
| | | **(iv)** | Discontinuous [1] | 8 |
| **2** | **(a)** | **(i)** | Doctors and nurses have close contact with infected patients [1] | |
| | | **(ii)** | In vitro [1]<br>animal [1] (in correct order)<br>both stages present but in wrong order [1] [2] | |
| | **(b)** | **(i)** | Active [1]<br>slow to act/long lasting [1] [2] | |
| | | **(ii)** | So it does not give the person the disease [1] | |
| | | **(iii)** | If the initial vaccination does not produce enough antibodies/ so antibody level reaches level of immunity [1] | 7 |
| **3** | **(a)** | **(i)** | X in pancreas [1] | |
| | | **(ii)** | Lowers blood sugar levels [1]<br>as glucose is converted to glycogen/increased respiration/converted to fat [1] [2] | |
| | **(b)** | **(i)** | No increase in percentage of people (with diabetes) with long term effects between 40 and 160 arbitrary units of blood sugar [1]<br>sharp increase in percentage of people with long term effects from 160 – 200 arbitrary units of blood sugar [1] [2] | |
| | | **(ii)** | Blood sugar levels can fluctuate due to eating, exercise/ to check how much insulin to give themselves [1] | 6 |

**4 Indicative content**

- protein found in meat, nuts and seeds, seafood, beans and peas, poultry (named source)
- growth/repair
- place a little piece of the food in a test tube/boiling tube
- add Biuret reagent
- (if the Biuret reagent changes) colour from blue
- to purple/lilac/mauve then protein is present

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe how to carry out the food test investigation using **five or six** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe how to carry out the food test investigation using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe how to carry out the food test investigation using **one or two** of the points above. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

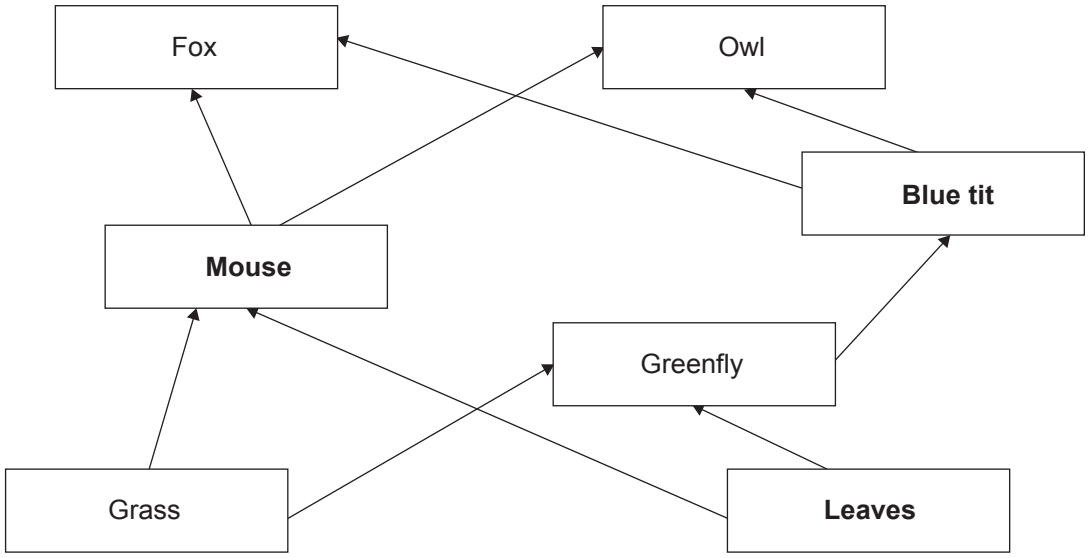
[6]

AVAILABLE MARKS

6

AVAILABLE MARKS

**5** **(a)** **(i)**




All organisms correct [2]
1/2 organisms correct [1] [2]

**(ii)** 2 [1]

**(b)** **(i)** 1. Close to the top of the leaf
2. many chloroplasts
3. tightly packed together (Any order) [3]

**(ii)** Through the pore [1] 7

**6** **(a)** **(i)** To show that it is antibiotic which is stopping growth of bacteria/ to act as a control [1]

**(ii)** Antibiotic A [1]
Largest area with no growth of bacteria/largest clear area/ killed most bacteria [1] [2]

**(iii)** Equal sized disks/same bacteria/same concentration of antibiotic [1]

**(b)** Mutation [1]
in chromosomes/genes/DNA [1] [2]

**(c)** **(i)** 15 – 3 = 12 [1]
12/15 x 100/1 = 80% [1] [2]

**(ii)** Number of antibiotics developed has decreased over time [1] 9



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **7** | **(a)** | **(i)** | Process A – decay/decomposition/rotting [1]<br>Process B – nitrification [1] | [2] | |
| | | **(ii)** | No/fewer dead plants/nitrate in soil taken in by plants then plants removed [1]<br>for decay bacteria/for decay/ammonia production/less ammonia produced [1]<br>less nitrification/less ammonia converted to nitrates [1] | [3] | |
| | **(b)** | **(i)** | Algae die [1]<br>(bacteria) use up oxygen/fall in oxygen levels [1] | [2] | |
| | | **(ii)** | Only spread sewage and slurry on farmland during growing season/ don't spread slurry on wet days/make sure sewage and slurry are properly stored before use | [1] | |
| | **(c)** | **(i)** | Stonefly larvae and mayfly larvae [1]<br>Sludge worm and rat tailed maggot [1] | [2] | |
| | | **(ii)** | Slurry has been broken down (by bacteria)/slurry has been diluted/ used by plants | [1] | 11 |
| **8** | **(a)** | **(i)** | 3 | [1] | |
| | | **(ii)** | Cytosine | [1] | |
| | | **(iii)** | A and T correctly paired up<br>C and G correctly paired up | [1] | |
| | **(b)** | **(i)** | Advantage – new drugs could be made available to treat their condition/new therapies could be discovered/could find a new cure [1]<br>Disadvantage – their personal information may be passed on to insurance companies and future employers [1] | [2] | |
| | | **(ii)** | Could prolong their life/cannot make their diagnosis any worse/ might help others | [1] | |
| | **(c)** | | Franklin and Wilkins [1]<br>(used X ray diffraction to show) overall shape of DNA/phosphate on outside [1] | [2] | 8 |



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| | AVAILABLE MARKS |
|---|---|

**9** **(a)** Any **three** from:
- (dark variety of) peppered moth is decreasing
- less soot on trees so dark moth are easier to spot
- (more are) eaten by birds/predation
- less of the dark variety survive to reproduce and pass on their genes so numbers decrease [3]

**(b)** **(i)** Any **two** from:
- contradicts the teaching of the church
- long time-scale involved
- complex concept [2]

**(ii)** Change/adaptation in a species/type of organism/new species form [1] over time [1] [2]

7

**10** **Indicative content**
- set up two flasks – one with a swan neck and one with neck broken
- add broth to (each) flask
- make sure the broth (and flasks) were sterilised at the start of the experiment
- keep the flasks at the same temperature/same type of broth
- leave the flasks for a set period of time
- the broth in the flask with the swan neck did not become contaminated
- the broth in the flask with the broken neck became contaminated
- microorganisms trapped in the swan neck could not gain entry to the broth

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe and explain how Louis Pasteur showed that contamination is caused by microorganisms, using **seven or eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe and explain how Louis Pasteur showed that contamination is caused by microorganisms, using **four, five or six** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe and explain how Louis Pasteur showed that contamination is caused by microorganisms, using **one, two or three** of the points above. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

[6] 6

**Total** **75**



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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

# Science: Single Award

GSS12

## Unit 1 (Biology)
## Higher Tier

## [GSS12]

## TUESDAY 24 FEBRUARY 2015, MORNING

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4(a)** and **10(a)**.

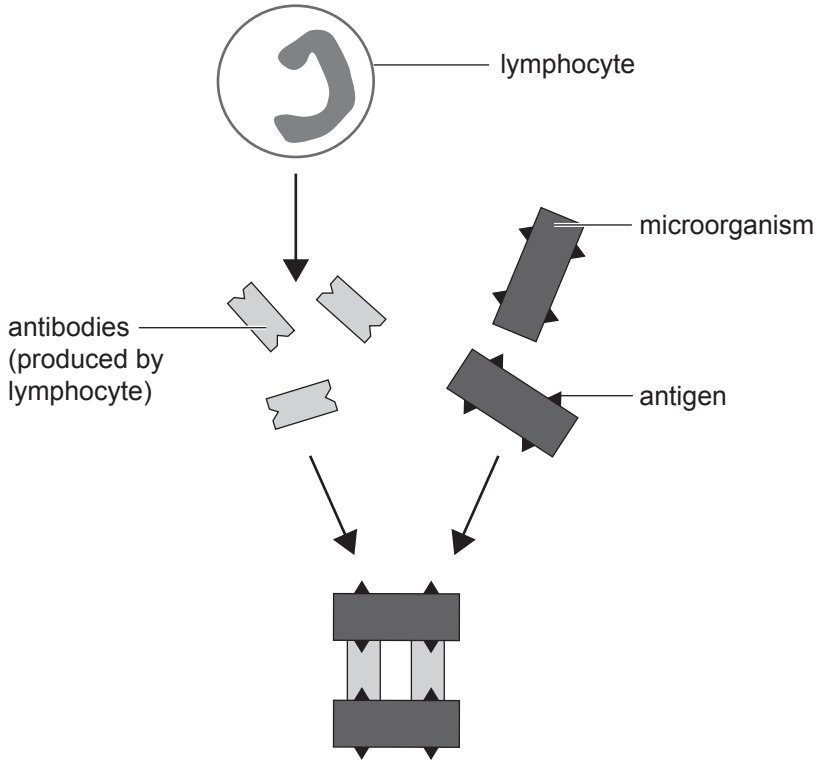
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| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** **(a)** The diagram below shows how lymphocytes (white blood cells) produce antibodies in response to infection by microorganisms.




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**(i)** Using the diagram and your knowledge, describe and explain how antibodies fight infection.

_____

_____

_____

_____

_____ [3]

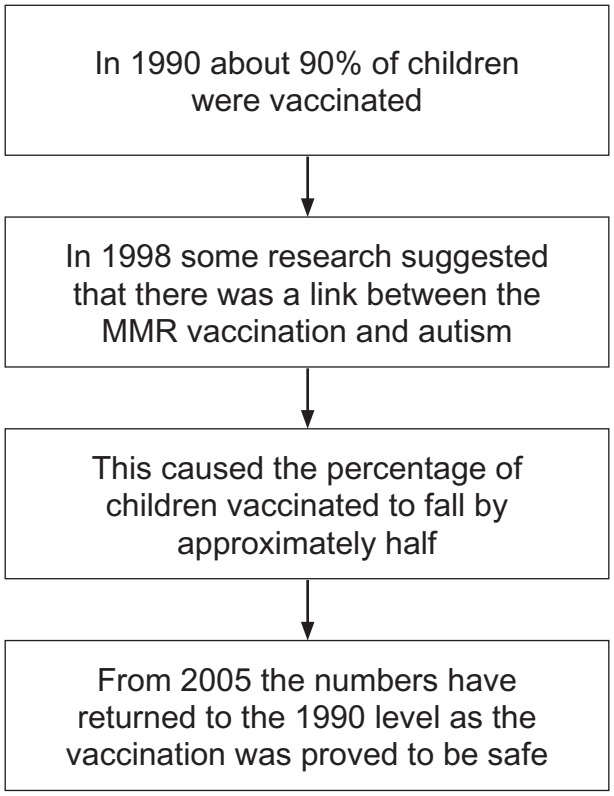
**(ii)** Another type of white blood cell also fights infection by phagocytosis. Describe the process of 'phagocytosis'.

_____

_____

_____ [2]

**(b)** The following flow chart outlines how the number of children being vaccinated for MMR changed between 1990 and the present.




**(i)** Describe how the number of children having the MMR vaccination changed between 1990 and today.

_____

_____

_____

_____ [2]

**(ii)** How does the information suggest that not all parents are convinced that the MMR vaccination is safe today?

_____ [1]

**(c)** Name the type of immunity produced by vaccinations.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**2** **(a)** Albinism is an inherited condition in which affected individuals are unable to make the skin pigment melanin. The melanin gives skin its colour, but more importantly, helps protect against the Sun's harmful UV rays.

Albinism is caused by a mutation in the gene that controls the production of melanin.

**(i)** Name the core component in a gene that is damaged in a mutation.

_____ [1]

**(ii)** Explain fully why people with albinism are advised to stay out of strong sunlight.

_____

_____

_____ [2]

**(b)** The allele that causes albinism is recessive to the normal allele.

**(i)** Complete the genetic diagram below to show the offspring of a cross between two parents who are **heterozygous** for albinism.

Use the symbols: A = normal allele; a = albino allele

| | | |
|---|---|---|
| | | a |
| A | AA | |
| | | |

[2]

**(ii)** Give the genotype that causes albinism.

_____ [1]

**(iii)** From the genetic diagram, what is the probability of a child **not** having albinism?

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

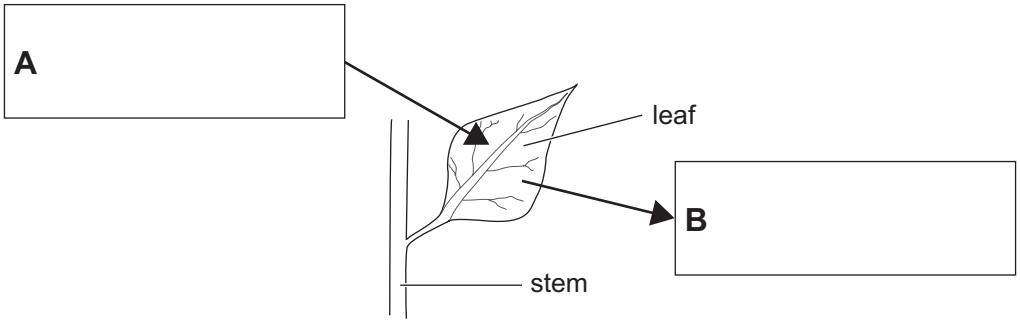


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| Examiner Only | |
|---|---|
| Marks | Remark |

**3** **(a)** The diagram below shows a leaf from a plant in darkness.

**(i)** Complete the diagram by naming the gases that enter (**A**) and leave (**B**) the leaf during **darkness**.

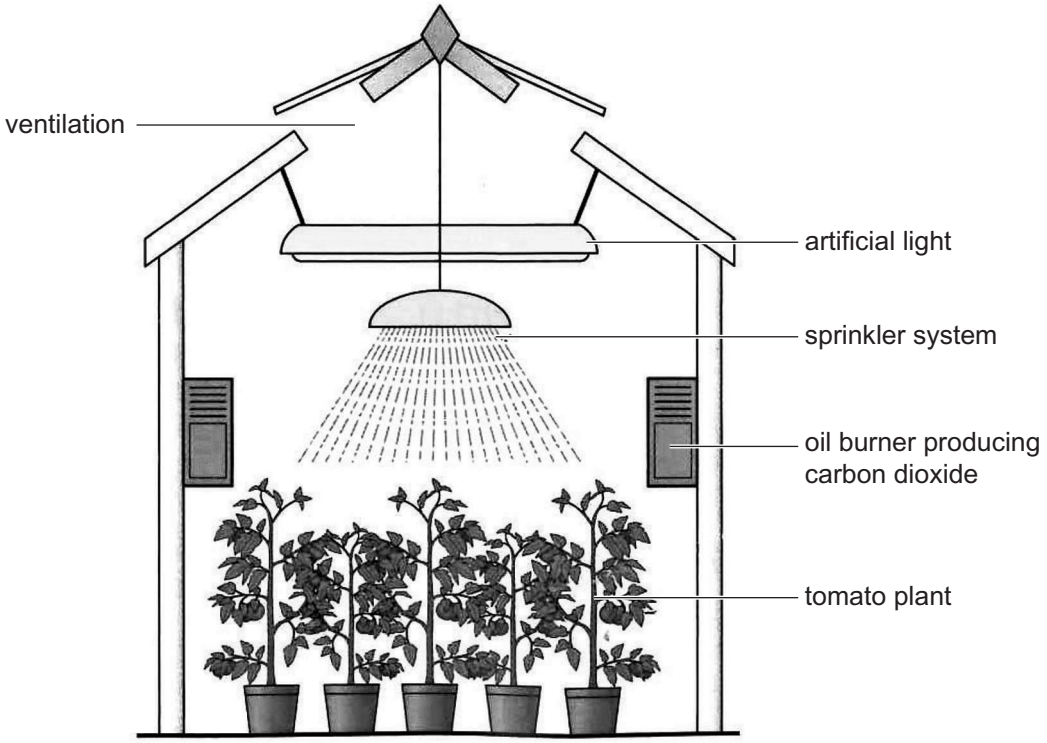



[1]

**(ii)** Name the process that causes this gas exchange.

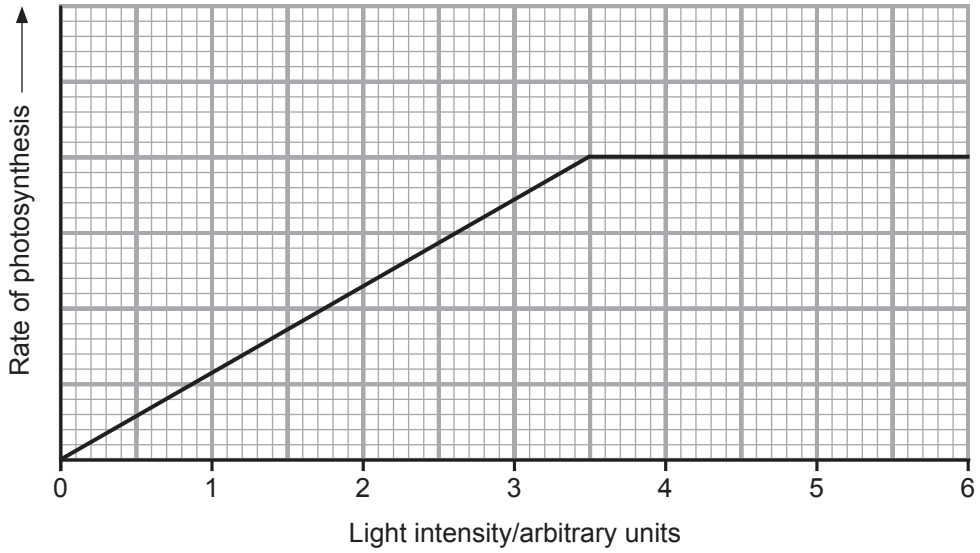
_____ [1]

**(b)** The diagram below shows tomato plants growing in a glasshouse.




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The graph below shows the effect of light intensity on the rate of photosynthesis in tomato plants in a glasshouse. In glasshouses, the light intensity can be increased by using artificial lighting.




**(i)** From the graph, state the best light intensity to use that would give the most profit if the tomatoes were grown for sale. Explain your choice.

Light intensity _____ arbitrary units

Explanation _____

_____

_____ [2]

**(ii)** Apart from artificial lighting to increase light intensity, explain **one** other way in which glasshouses are adapted for increasing the rate of plant growth.

_____

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |

**4** **(a)** Describe how you could investigate the effect of planting density (the number of seedlings in a pot) on plant growth.

Your answer should also include:

- **two** things that make the results valid (fair test)
- a description and explanation of the results you would expect.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** The grey squirrel is a competitive invasive species.

**(i)** Name **one** other competitive invasive species.

[1]

**(ii)** Suggest **one** feature that all competitive invasive species have in common.

[1]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**5** **(a)** The table below shows the amount of some food groups in **100 g** of a soft drink.

| Food group | Amount/g |
|---|---|
| protein | 0.10 |
| sugar (carbohydrate) | 13.00 |
| fat | 0.11 |
| fibre | 0.20 |
| iron (mineral) | 0.09 |

**(i)** Name the food group that is present in the smallest quantity.

_____ [1]

Not all the food groups contained in the drink are given in the table.

**(ii)** Calculate the percentage of those shown.

_____ % [1]

**(iii)** Suggest what makes up most of the rest of the drink.

_____ [1]

**(b)** Name the hormone that the body would produce after taking this drink. Explain your answer.

_____

_____

_____

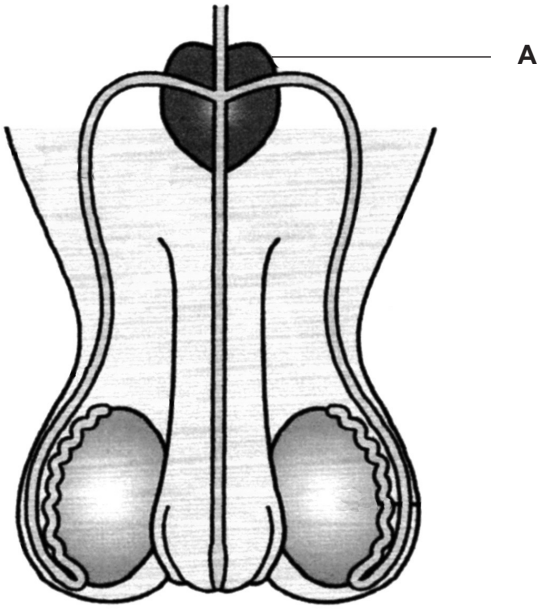
_____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**6** **(a)** The diagram below shows the male reproductive system.




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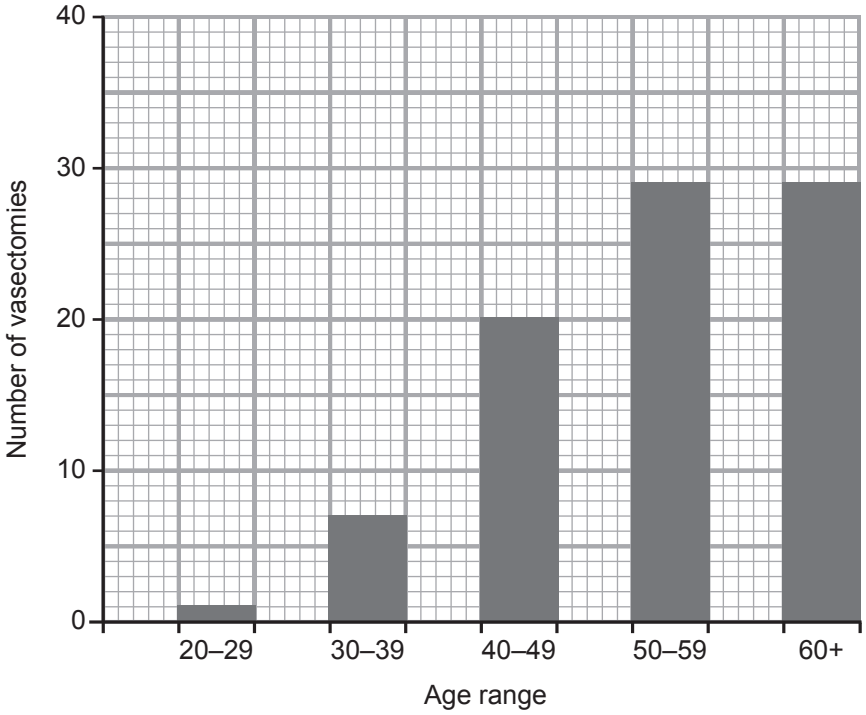
**(i)** Name and give the function of the structure labelled **A**.

Name _____

Function _____ [2]

**(ii)** Label with the letter **X**, the parts of the reproductive system that are cut during a vasectomy. [1]

**(b)** The bar chart below shows the number of men, in particular age groups, who have had vasectomies in a hospital in one year.




**(i)** Describe fully the trend shown by this information.

_____

_____

_____ [2]

**(ii)** Suggest **one** reason why no men under 20 years old had a vasectomy.

_____ [1]

**(c)** Progesterone is a reproductive hormone produced in females. Describe and explain **one** function of progesterone.

_____

_____

_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**7** **(a)** Atmospheric carbon dioxide levels were recorded every five years from 1980 to 2000 as shown in the table below.

| | Atmospheric carbon dioxide/parts per million (ppm) | | |
|---|---|---|---|
| **Year** | **Annual average** | **Summer average** | **Winter average** |
| 1980 | 342 | 337 | 348 |
| 1985 | 348 | 343 | 353 |
| 1990 | 354 | 350 | 359 |
| 1995 | 359 | 353 | 363 |
| 2000 | 365 | 360 | 369 |

**(i)** Predict what the **annual average** value for carbon dioxide would have been in 2010.

_____ ppm [1]

**(ii)** Describe the difference between the winter and summer averages. Suggest **one** reason for this difference.

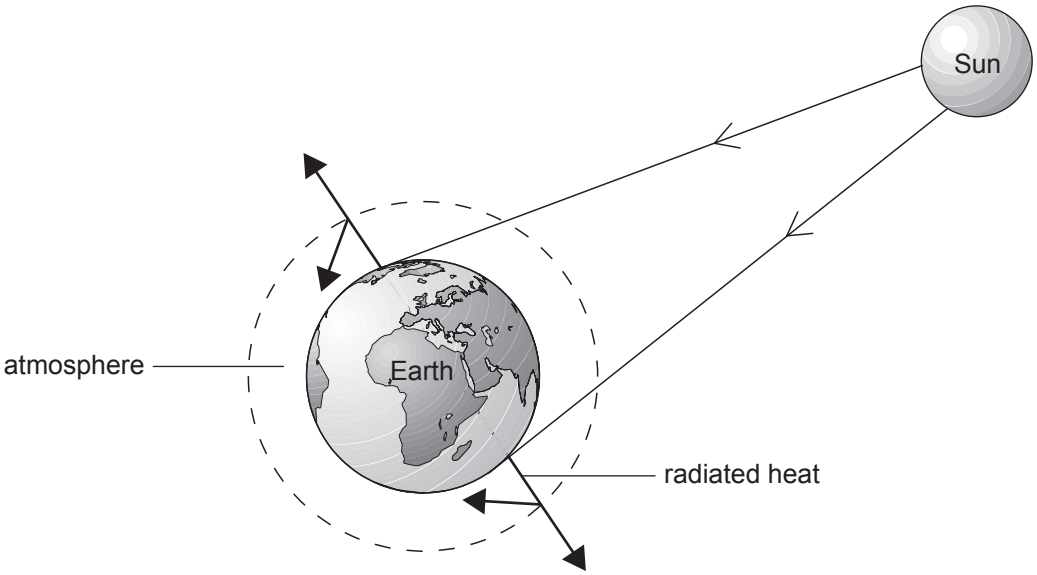
_____

_____

_____

_____ [2]

**(b)** The following diagram shows how global warming occurs.




© CCEA

Using the diagram and your knowledge, explain how global warming occurs.

_____

_____

_____

_____

_____ [3]

**(c)** Apart from temperature, name **one** abiotic factor that can be used to monitor global warming.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**8** **(a)** In early 2014, the Ebola virus caused an epidemic in west Africa killing up to 90% of those infected. By April, over 100 people had died from this infection. There was no vaccine for the virus and many of the people who lived there had poor health due to poor sanitation and the lack of health care available. The disease spreads through close contact with an infected person.

Medical experts were worried that the outbreak could develop into a pandemic.

**(i)** What is meant by the term 'pandemic'?

_____

_____ [1]

**(ii)** Using the information provided, give **two** reasons why medical experts thought that a pandemic was possible later in 2014.

1. _____

_____

2. _____

_____ [2]

**(b)** Alexander Fleming is credited with accidentally discovering the first antibiotic while working with bacteria in a Petri dish.

**(i)** Describe his observations that led to the discovery of penicillin.

_____

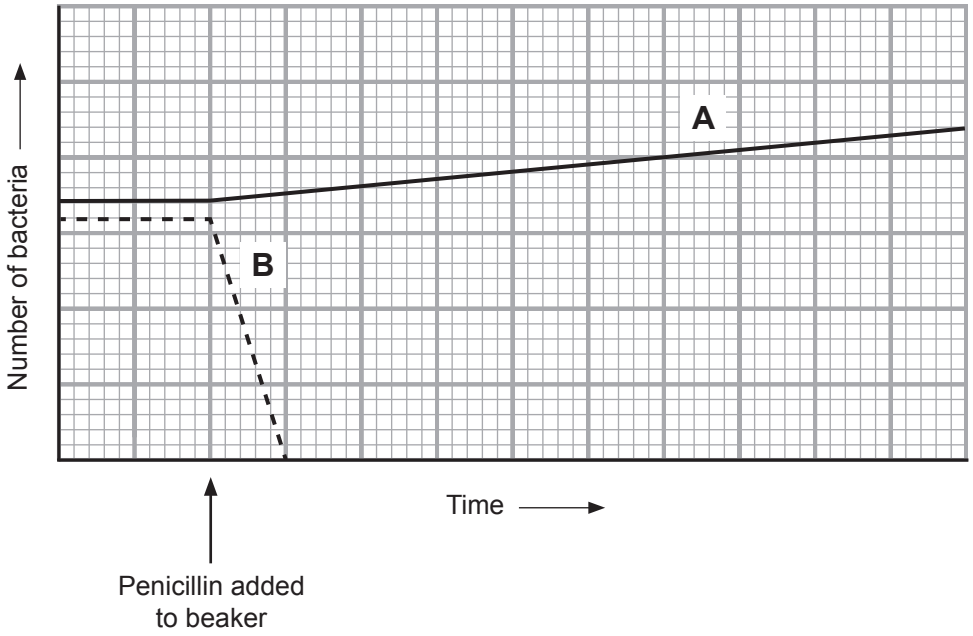
_____

_____

_____ [3]

Scientists cultured (grew) two types of bacteria (**A** and **B**) in a beaker. The following graph shows how the numbers of the two types changed after penicillin was added to the beaker.

| Examiner Only | |
|---|---|
| Marks | Remark |




**(ii)** Describe and explain the changes that took place after adding penicillin.

_____

_____

_____

_____

_____ [3]

**(c)** There are three stages in the development of a drug before licensing. List these stages, in order, up to the drug being licensed. [1]

_____ → _____ → _____ → licensed



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** **(a)** In parts of Ireland, an agreement has been made between conservationists and local councils not to cut some roadside hedgerows and their grass verges for a number of years. Conservationists are pleased to note that this is causing a rapid increase in biodiversity with the uncut hedgerows and verges producing a 'splash of colour' in the summer.

**(i)** Suggest what the 'splash of colour' represents.

_____

_____ [1]

**(ii)** Describe how you could carry out an investigation to compare biodiversity between uncut and cut areas.

_____

_____

_____

_____

_____

_____ [3]

**(iii)** Suggest **one** safety concern for road users if hedgerows and verges are not cut.

_____

_____ [1]

**(b)** The plants in hedgerows and verges are the producers in food chains. Describe the flow of energy through food chains.

_____

_____

_____

_____

_____ [3]

| Examiner Only | |
|---|---|
| Marks | Remark |

**10 (a)** Modern advances in genetics can provide many benefits for humans. However, new breakthroughs in this area of science raise many concerns.

Using your understanding of **genetic screening, gene therapy** and **GM crops**, describe and explain the benefits and problems associated with each of these developments.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** Advances in all areas of science are subject to peer review. State what is meant by the term 'peer review' and suggest **one** benefit it provides.

[2]

## THIS IS THE END OF THE QUESTION PAPER

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113166

Rewarding Learning

General Certificate of Secondary Education
2014–2015

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**TUESDAY 24 FEBRUARY 2015, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | **(i)** | Antibodies are complementary shape to antigens [1]<br>antibodies latch on to antigens/microorganisms [1]<br>clumping/immobilisation [1] [3] | |
| | | **(ii)** | Phagocyte/white blood cell surrounds/engulfs microorganism [1]<br>microorganism is digested/broken down/destroyed/killed [1] [2] | |
| | **(b)** | **(i)** | Percentage of children vaccinated fell to around 45%/half after 1998 [1]<br>from 2005 on the numbers vaccinated have risen to 90% [1] [2] | |
| | | **(ii)** | Number of children vaccinated never reaches 100% [1] | |
| | **(c)** | Active [1] | | 9 |
| **2** | **(a)** | **(i)** | DNA [1] | |
| | | **(ii)** | People with albinism do not have melanin/protection (against UV light) [1]<br>are at increased risk of (skin) cancer [1] [2] | |
| | **(b)** | **(i)** | <table><tr><td></td><td>A</td><td>a</td></tr><tr><td>A</td><td>AA</td><td>Aa</td></tr><tr><td>a</td><td>Aa</td><td>aa</td></tr></table><br>Gametes [1]<br>offspring [1] [2] | |
| | | **(ii)** | aa [1] | |
| | | **(iii)** | 75%/3 out of 4 children do not have albinism/3:1 [1] | 7 |
| **3** | **(a)** | **(i)** | **A** – oxygen; **B** – carbon dioxide (both needed) [1] | |
| | | **(ii)** | Respiration [1] | |
| | **(b)** | **(i)** | 3.5 arbitrary units [1]<br>maximum yield with minimum lighting (cost) [1] [2] | |
| | | **(ii)** | More carbon dioxide/light heat for photosynthesis/<br>other appropriate response (e.g. no damaging effect of wind) [1] | 5 |



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AVAILABLE MARKS

**4 (a) Indicative content**

- number of pots each with different number of seedlings
- **any two** from: same type/volume compost/same water/same light/same temperature/left for same length of time/same size of pot/same type of seed
- (at end measure) mass/number of leaves/any suitable plant feature
- most growth would be in pots with fewest seedlings (or converse)
- due to reduced competition between plants (or converse)

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe how to investigate the effect of planting density on plant growth using **five or six** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe how to investigate the effect of planting density on plant growth using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe how to investigate the effect of planting density on plant growth using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6]

**(b) (i)** Rhododendron/other appropriate example [1]

**(ii)** Introduced by man/spread rapidly/outcompete native species [1]

8

**5 (a) (i)** Iron/mineral [1]

**(ii)** 13.5 [1]

**(iii)** Water [1]

**(b)** Insulin [1]
large amount of sugar in the drink/insulin converts sugar to glycogen/reduces sugar levels/speeds up respiration [1] [2]

5



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **6** | **(a)** | **(i)** | Prostate gland [1]<br>provides food for sperm [1] | [2] | |
| | | **(ii)** | **Both** sperm tubes labelled X | [1] | |
| | **(b)** | **(i)** | Vasectomy numbers increase with age [1]<br>level off at age 50–59/at 29 [1] | [2] | |
| | | **(ii)** | Will want children later/not married yet/unsure of plans | [1] | |
| | **(c)** | | Maintains uterine lining [1]<br>to nourish embryo/foetus (in pregnancy)/for pregnancy [1] | [2] | 8 |
| **7** | **(a)** | **(i)** | 377–375 | [1] | |
| | | **(ii)** | (Carbon dioxide) levels higher in winter than summer (in any one year) [1]<br>(increased) burning of fossil fuels to provide heat/less photosynthesis in winter (or converse) [1] | [2] | |
| | **(b)** | | Increasing/high levels of carbon dioxide [1]<br>forms barrier in atmosphere/'greenhouse' layer [1]<br>traps/reflects heat back/stops heat escaping from atmosphere [1] | [3] | |
| | **(c)** | | Ice field areas/water levels/changing climates | [1] | 7 |
| **8** | **(a)** | **(i)** | Spread of disease over a large area (many countries)/many (thousands) of people affected | [1] | |
| | | **(ii)** | **Any two from**<br>• spreads easily/by close contact<br>• no vaccine/no cure<br>• virus so cannot be controlled by antibiotics | [2] | |
| | **(b)** | **(i)** | Fungus infected bacteria (in Petri dish) [1]<br>substance diffused/spread from fungus [1]<br>killing/stopping growth of bacteria [1] | [3] | |
| | | **(ii)** | **Any three from**<br>• type A increased (slightly) in number/unaffected<br>• type B all killed/numbers dropped sharply<br>• type A antibiotic resistant/penicillin killed B/B not resistant<br>• type A increased as less competition for space/food/resources | [3] | |
| | **(c)** | | Invitro – animal testing – clinical trials | [1] | 10 |



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 9 | (a) | (i) | Wide range/many flowers/plants | [1] | |
| | | (ii) | Sample uncut and cut sections of hedgerows and verges [1]<br>count number of species/types of plants and/or animals in each [1]<br>reliability explained, e.g. sample several uncut and cut hedgerows and verges/or comparison over time [1] | [3] | |
| | | (iii) | Reduced vision for motorists/cover safety signs | [1] | |
| | (b) | **Any three from**<br>• sun is original source of energy<br>• plants/producers convert light energy into food/chemical energy<br>• primary consumers eat producers (plants)/secondary consumers eat primary consumers<br>• idea of energy *flow* (i.e. not a cycle) – energy needs to continually enter chain | | [3] | 8 |

**10 (a) Indicative content**

- **genetic screening** can identify presence of genetic disease (in foetus)
- allowing mother to have abortion (or early treatment for foetus/child)
- screening can raise ethical issues for parents/insurance companies may not provide insurance or insurance could be more expensive/ disease may not be curable/could lead to miscarriage
- **gene therapy** allows 'normal' gene/allele to replace faulty gene/allele
- any benefit described, e.g. normal lung function in cystic fibrosis/treat cystic fibrosis
- any problem identified, e.g. introduced gene does not reach all affected parts/not passed on to offspring
- **GM crops** have (beneficial) gene introduced from another species
- any benefit described, e.g. faster growth/disease resistance/help solve world hunger problems
- any problem described, e.g. possibility of 'superweeds'/allergies/ negative public perception/expensive

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe the benefits and problems of genetic advances using **seven or more** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe the benefits and problems of genetic advances using **four to six** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe the benefits and problems of genetic advances using **one to three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

[6]

**(b)** The review of scientific progress by other scientists/experts [1] identifies errors/increases collaboration/increases knowledge/check the work is correct [1] [2]

AVAILABLE MARKS

8

**Total** **75**

Rewarding Learning

General Certificate of Secondary Education
2014–2015

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**WEDNESDAY 12 NOVEMBER 2014, MORNING**

# MARK SCHEME



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| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 1 | (a) | (i) | Faster/protective/does not involve thinking time | [1] | |
| | | (ii) | Spinal cord [1]<br>pulling his hand away [1] | [2] | |
| | (b) | | Any **two** from:<br>• hormones are produced by glands<br>• travel in the blood<br>• only affect certain organs called target organs<br>• act more slowly<br>• act over a longer period of time<br>• hormones are chemicals/nervous system is electrical | [2] | |
| | (c) | (i) | Any **two** from:<br>• blood glucose level is higher at start for a person with diabetes<br>• blood glucose levels rise more steeply/quickly for a person with diabetes<br>• blood glucose levels fall more slowly for a person with diabetes<br>• blood glucose levels do not level off for a person with diabetes<br>• blood glucose levels are higher for a person with diabetes | [2] | |
| | | (ii) | Pancreas | [1] | 8 |
| 2 | (a) | (i) | Time for antibodies to be made | [1] | |
| | | (ii) | Takes time for immunity level to be achieved [1]<br>antibody level remains high/immunity level maintained [1] | [2] | |
| | (b) | (i) | So they do not give the person the disease | [1] | |
| | | (ii) | Antigens | [1] | |
| | | (iii) | Any **three** from:<br>• antibodies latch on to microorganisms<br>• microbes clumped together/immobilised<br>• phagocyte surrounds/engulfs microorganisms<br>• break down/digest microorganisms | [3] | 8 |
| 3 | (a) | (i) | All points plotted correctly [2] 5 points correct [1]<br>correct line joining points [1] | [3] | |
| | | (ii) | Number of deaths increased from 2005 to 2008/to 31 over time [1]<br>peaked at 2008/31 then decreased [1] | [2] | |
| | (b) | | Cold or flu caused by a virus/don't work on viruses [1]<br>antibiotics only work on bacteria [1] | [2] | |
| | (c) | | After antibiotic only resistant bacteria remain<br>after reproduction only resistant bacteria but more of them | [1] | 8 |



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**4 Indicative content**

- extinction increasing from 1920
- species are extinct when there are no living examples left/have died out
- climate change or natural disasters/meteor hit the Earth/flooding/global warming
- loss of habitat/deforestation/pollution/invasive species
- hunting (by humans)/overfishing
- disease
- legislation (preventing the hunting of endangered species)/laws
- special programmes such as creating nature reserves/education/ breeding programmes/increased mesh sizes/reforestation [6]

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe extinction, the reasons why it is happening and what is being done to prevent it, using **six to eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe extinction, the reasons why it is happening and what is being done to prevent it, using **three to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe extinction, the reasons why it is happening and what is being done to prevent it, using **one or two** of the points above. However these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

AVAILABLE MARKS

6

AVAILABLE MARKS

**5** **(a)** **(i)** Her pulse does not go as high during exercise [1]
her pulse rate returns to normal quicker/her pulse rate after 5 minutes/ exercise is lower than others [1] [2]

**(ii)** Any **three** from:
- strengthens heart (muscle)
- increases output (when not exercising)
- therefore needs to beat less often/lower heart rate
- (high respiration rate) stops cholesterol/fat accumulating
- reduces obesity putting less strain on heart [3]

**(b)** **(i)** There is a greater percentage of obese adults in 2010 than 2009 **or** obesity increases with age up to 55/64 (and decreases in older age groups) [1]
Eating more junk food/less exercise or appropriate alternative [1] [2]

**(ii)** Large numbers of people/UK wide surveyed [1]

**(c)** Not insure/higher premiums/insured for lower amount [1]
Need more medical care/link to shorter life span/more likely to make claim [1] [2] 10

**6** **(a)** **(i)** T and C (both for 1 mark) [1]

**(ii)** Nucleus [1]

**(b)** **(i)** Base triplet is a series of three bases [1]
each sequence of three bases/base triplet codes for one amino acid [1]
(sequence of) amino acids is built up into a protein [1] [3]

**(ii)** 270 [1]

**(c)**

| **Scientist(s)** | **Discovery** |
|---|---|
| Chargaff | Quantitative analysis of bases. |
| Franklin and Wilkins (both needed for one mark) [1] | Used X-ray diffraction to show overall shape of DNA. |
| Watson and Crick | Used modelling to show double helix shape of DNA/A–T or C–G linked [1] |

[2] 8

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| 7 | (a) | (i) | Genes (DNA) have been transferred [1] from one type of organism (species) to another [1] | [2] | |
| | | (ii) | Any **two** from:<br>• could escape and produce superweeds<br>• cause allergies<br>• GM crops could be more expensive | [2] | |
| | (b) | | Any **two** from:<br>• if excess not used by plants<br>• builds up to toxic levels in the soil<br>• (if on sloping land) can run off into waterways<br>• increase in algal growth<br>• correct consequence of algal growth (e.g. fish die due to shortage of oxygen) | [2] | 6 |
| 8 | (a) | (i) | Number/range of species [1] that occur in a particular area [1] | [2] | |
| | | (ii) | Any **two** from:<br>• public access is restricted (to certain areas to avoid trampling of fragile habitats)<br>• habitat is managed by removing invasive shrubs or trees (to allow light to get to other plant species)/habitat protected from pollution/ building<br>• many nature reserves have education centres that educate the public about habitats and species that are being protected | [2] | |
| | (b) | | Produce oxygen for (animal) respiration [1]<br>are producers/provide food/provide shelter for animals [1] | [2] | 6 |
| 9 | (a) | (i) | Less risk of a miscarriage or damage to the foetus | [1] | |
| | | (ii) | Three chromosomes drawn | [1] | |
| | | (iii) | Whether to have a termination or not/parents may find it difficult to cope | [1] | |
| | (b) | (i) | Grandfather | [1] | |
| | | (ii) | Christine = Aa [1]<br>Sophia = aa [1] | [2] | |
| | (c) | | Addition of normal gene into individual with defective gene [1]<br>normal gene provides normal functioning in individual [1]<br>effect limited as difficult to target all areas of body/can cause allergies/ donor genes not replaced by body/next generation will still have condition [1] | [3] | 9 |

**10 Indicative content**

- decomposition/decay happens when the animal or plant dies/excretion (by animals)/animal waste
- (micro-organisms such as) bacteria/fungi
- break (their protein) down to ammonia
- (to be of use to plants) ammonia (needs to be) converted to nitrates
- by nitrifying bacteria
- in a process called nitrification
- plants use the nitrates to make proteins/plants absorb nitrates from the soil
- nitrates/proteins are needed for growth [6]

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe the nitrogen cycle, using **six to eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates must use appropriate specialist terms throughout to describe the nitrogen cycle, using **three to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe the nitrogen cycle, using **one or two** of the points above. However these are not presented in a logical sequence. They use limited spelling, punctuation and grammar. The form and style are of a limited standard. | [1]–[2] |
| D | Response not worthy of credit. | [0] |

**Total**

AVAILABLE MARKS

6

**75**



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Rewarding Learning

| Centre Number | |
|---|---|
| 71 | |

| Candidate Number |
|---|
| |

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**TUESDAY 13 MAY 2014, MORNING**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **4** and **10**.

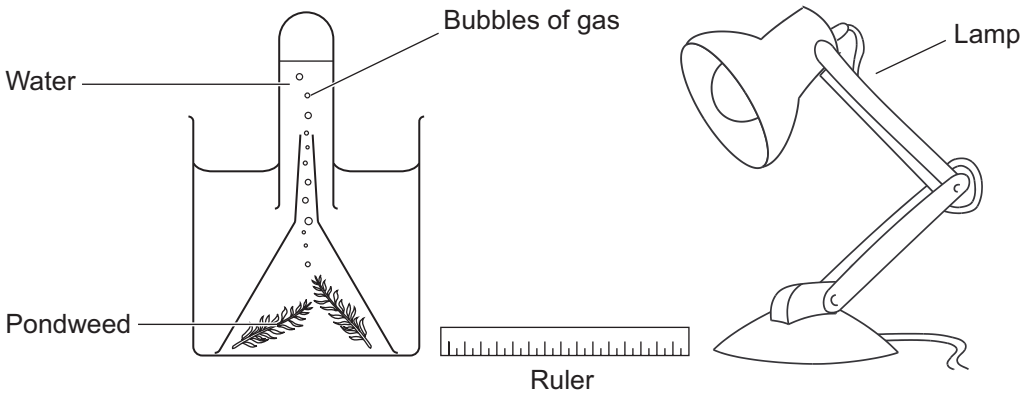
| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| Total Marks | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** The following experiment was set up to investigate the effect of light intensity on photosynthesis. The lamp was set at different distances from the plant and the number of bubbles of gas per minute was counted.

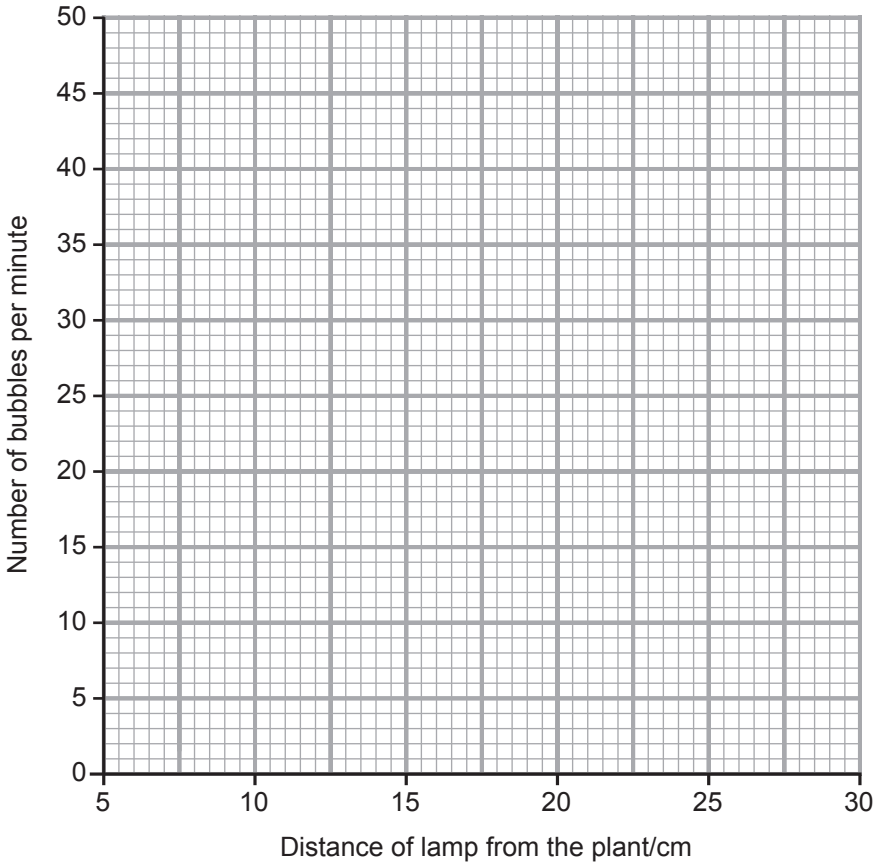



The results of the experiment are shown below.

| Distance of lamp from the plant/cm | Number of bubbles per minute |
|---|---|
| 5 | 50 |
| 10 | 45 |
| 15 | 36 |
| 20 | 20 |
| 25 | 8 |
| 30 | 8 |

| Examiner Only | |
|---|---|
| Marks | Remark |

**(a)** Use these results to plot a line graph on the grid below.




[3]

**(b)** **(i)** Name the gas produced during this experiment.

_____ [1]

**(ii)** Describe and explain the results of this investigation.

_____

_____

_____

_____ [3]

**(c)** In order to get the most light a plant will often grow in the direction of the sunlight.

What is this response to light called?

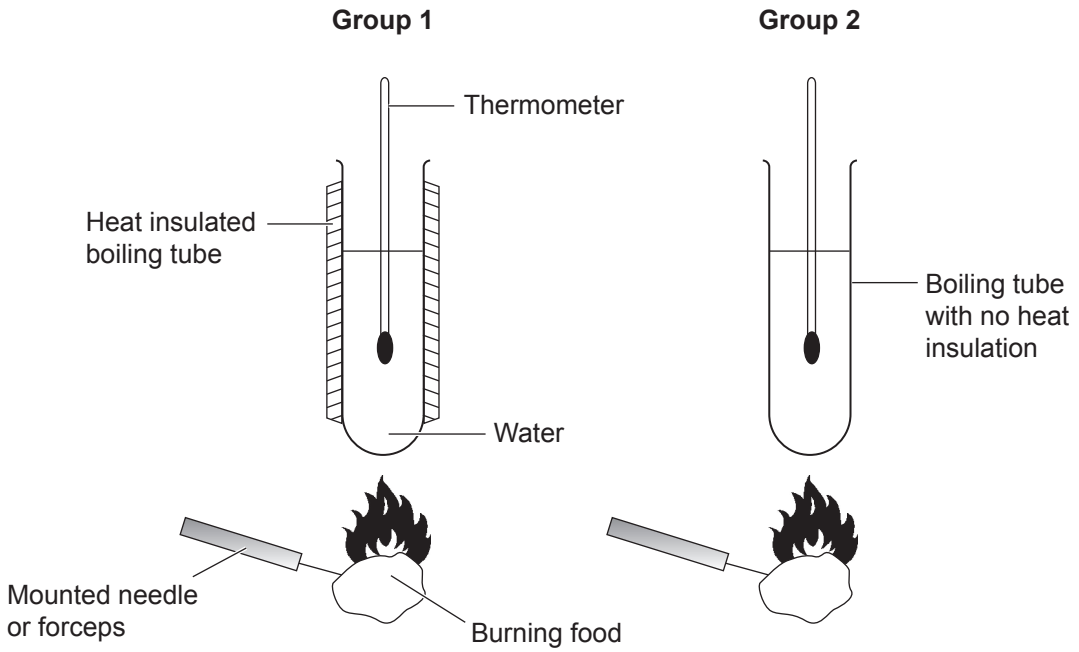
_____ [1]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**2** The energy content of food was investigated by two groups each using a different method as shown below. The methods were identical except Group 1 used a heat insulation material.




The results are shown below but two values are missing.

**(a)** Complete the **two** missing values in the tables.

**Group 1**

| Food | Temperature at the start/°C | Temperature at the end/°C | Temperature rise/°C |
|---|---|---|---|
| bacon | 18 | 64 | 46 |
| crisps | 18 | 52 | 34 |
| biscuit | 18 | 42 | |

**Group 2**

| Food | Temperature at the start/°C | Temperature at the end/°C | Temperature rise/°C |
|---|---|---|---|
| bacon | 18 | 54 | 36 |
| crisps | 18 | | 26 |
| biscuit | 18 | 36 | 18 |

[2]

**(b)** Using the information provided, explain fully why the temperature rises obtained by Group 2 were lower than that obtained by Group 1.

_____

_____

_____

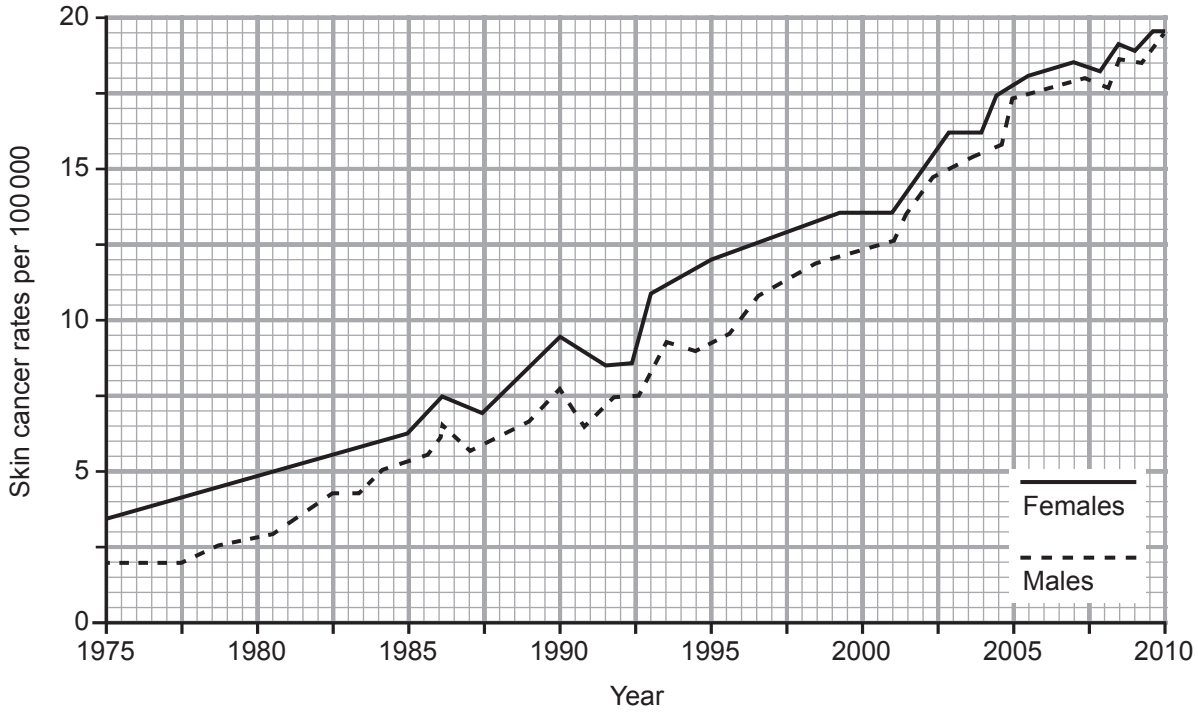
_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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**3** **(a)** The graph below shows the skin cancer rates (number per 100 000) in the UK between 1975 and 2010.




*Adapted from: © Cancer Research UK http://www.cancerresearchuk.org/cancer-info/cancerstats/types/skin/incidence/uk-skin-cancer-incidence-statistics 2013*

**(i)** State **two** conclusions that can be made from the information provided.

1. _____

_____

2. _____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

A new law in England and Wales bans people under 18 from using sunbeds.



© Boris Kaulin/iStock/Thinkstock

**(ii)** Describe and explain the effect this new law may have on the rates of skin cancer over the next ten years.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(b)** The table below shows how the age of a mother affects the risk of having a Down syndrome child.

| Age of mother/years | Risk of having a child with Down syndrome |
|---|---|
| 25 | 1 in 1350 |
| 30 | 1 in 940 |
| 35 | 1 in 350 |
| 40 | 1 in 85 |
| 45 | 1 in 35 |
| 50 | 1 in 10 |

A test can be carried out to see if a child has Down syndrome before it is born. However, there is a 1% (1 in 100) risk of a miscarriage (loss of baby) with this test.

**(i)** Using the information provided, explain fully why this test is normally only offered to mothers over the age of 35 and not offered to mothers aged under 35 years.

_____

_____

_____

_____ [2]

**(ii)** Apart from the risk involved, suggest **one** other factor that may influence a mother's decision whether to take the test or not.

_____

_____ [1]

**(c)** Skin cancer and Down syndrome are both caused by a change to genetic material in body cells. Give the general name that describes a change to genetic material.

_____ [1]



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**4** A completely new and unusual antibiotic has been extracted from a marine microorganism found in California.

Describe the stages this new antibiotic would have to go through before it can safely be prescribed by doctors.

Your account should include:

- the names of each stage and what is involved
- the reasons for each stage
- one ethical issue involved

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

_____

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_____

_____

_____ [6]

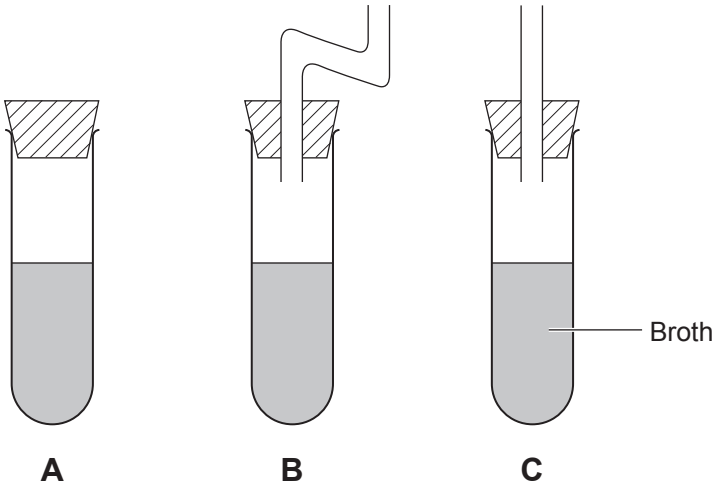
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**5** **(a)** The following experiment was set up to investigate the role of microorganisms in contamination. The apparatus, including the broth, was sterilised and left for a period of time.




**(i)** Which tube(s) (**A**, **B** or **C**) will contain contaminated broth after a period of time?

_____ [1]

**(ii)** State **two** things that must be done to ensure that the results are valid (fair test).

1. _____

_____

2. _____

_____ [2]

**(iii)** Name the scientist who used similar apparatus to investigate contamination by microorganisms.

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |

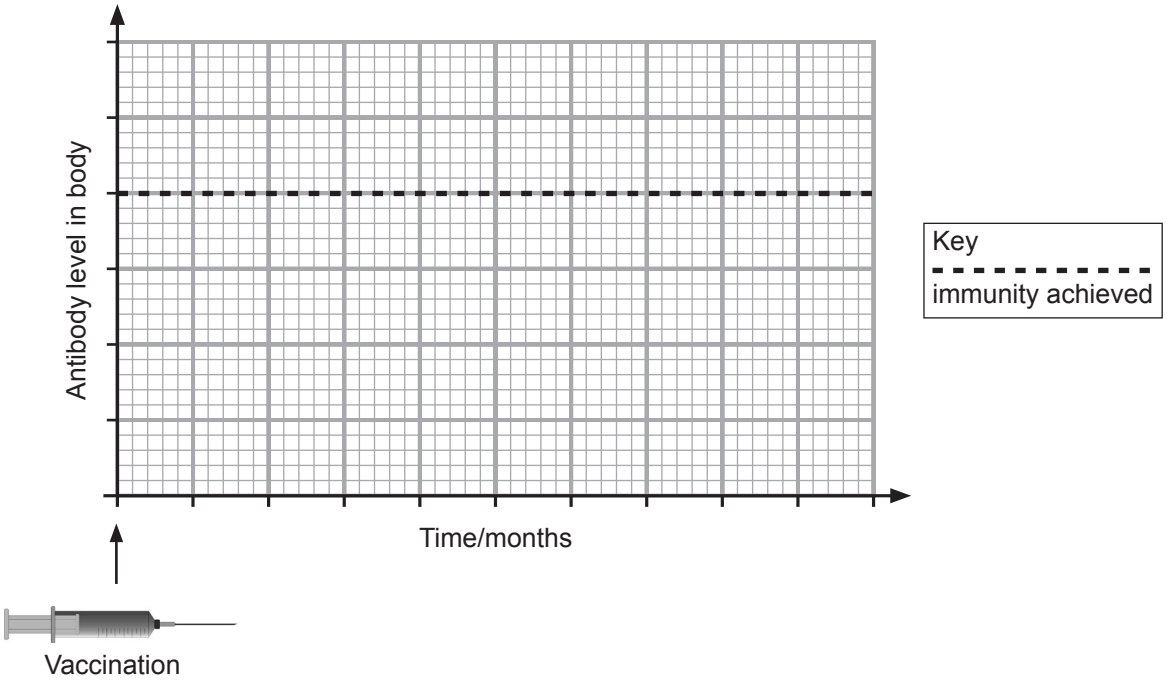
**(b)** Microorganisms can also cause disease in humans. We can avoid some types of disease by having a vaccination.

**(i)** What do vaccinations contain?

_____

_____ [1]

**(ii)** On the grid below, complete the diagram by drawing a line to show how antibody levels change after a vaccination.

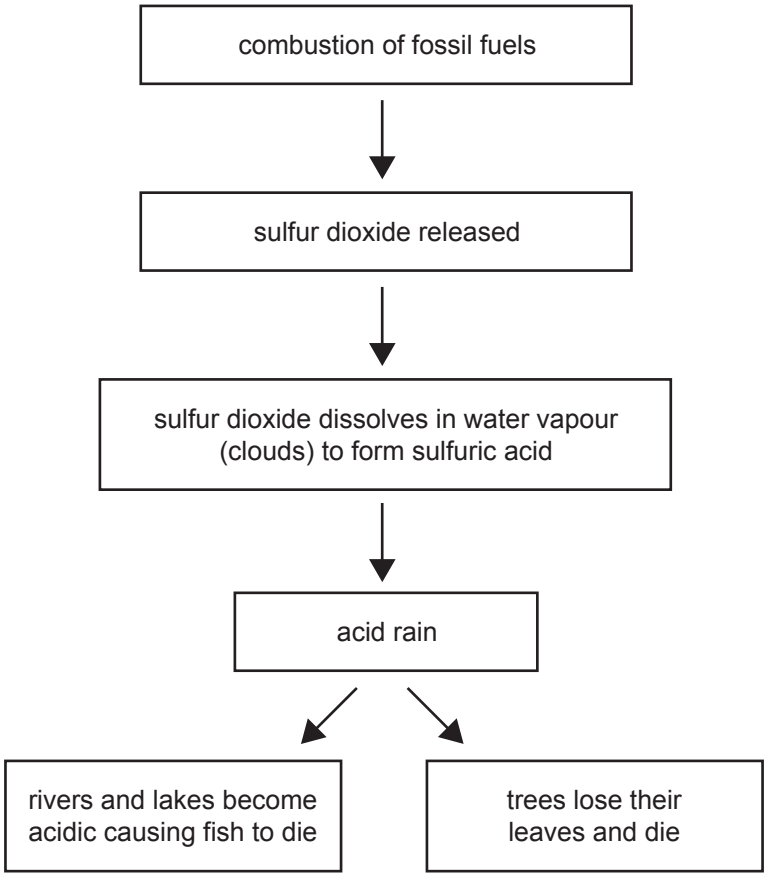



[2]


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| Examiner Only | |
|---|---|
| Marks | Remark |

**6** **(a)** The flow chart below shows how acid rain is produced and some of its effects.




Using the information provided and your knowledge, answer the following questions.

**(i)** Suggest why the effects of acid rain can occur a long distance away from the source of sulfur dioxide pollution.

_____

_____ [1]

**(ii)** Describe one way in which the **effects** of acid rain can be monitored over a period of time.

_____

_____

_____

_____ [2]

**(iii)** Acid rain is causing less pollution now than it did twenty years ago. Suggest **one** reason why.

_____ [1]

**(b)** Milford Nature Reserve in Co. Armagh runs along an old railway cutting. There are many different habitats over a small area including woodland, shrubs, marsh and grassland.

Each type of habitat supports a range of species of flowering plants, providing food for insects including rare butterflies. The insects support a large number of bird species.

Using the information provided, explain why this nature reserve has a high biodiversity.

_____

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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**7** Explain the difference between the following genetic terms.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(a)** Gene and allele

_____

_____

_____ [2]

**(b)** Dominant and recessive

_____

_____

_____ [2]

**(c)** Homozygous and heterozygous

_____

_____

_____ [2]



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**8** Regular exercise benefits the circulatory system.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(a)** Describe how exercise benefits the heart and heart muscle.

[3]

**(b)** Give **one** reason why treating circulatory diseases is very expensive. Explain your answer.

[2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** **(a)** The table below shows the percentage of DNA bases that are adenine and cytosine in an organism.

| bases/% | | | |
|---|---|---|---|
| adenine | guanine | cytosine | thymine |
| 20 | | 30 | |

**(i)** Complete the table to show the percentage of bases that are guanine and thymine. [1]

**(ii)** Explain what is meant by the unique nature of an individual's DNA.

_____

_____ [1]

**(iii)** Describe fully how DNA codes for protein.

_____

_____

_____

_____

_____

_____ [3]



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**(b)** DNA sequencing is a technique that works out the sequence of DNA bases in an organism, i.e. the order of bases along each chromosome in a cell.

The Human Genome Project was a massive multinational project, started in 1990 and completed by 2003; a project that took over a decade and billions of pounds to work out the sequence of bases in humans.

Sequencing techniques have improved so much that the complete base sequence in a human can be worked out in a few hours.

**(i)** Give **one** piece of evidence that suggests that the Human Genome Project involved scientific collaboration.

_____ [1]

**(ii)** Results from base sequencing provide information on how closely related different species are to each other. Suggest how the results for closely related species are different to those obtained for more distantly related species.

_____

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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**10** Hormones are important in controlling many processes in the body.

Describe what a hormone is and explain fully two examples of hormone action in humans.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

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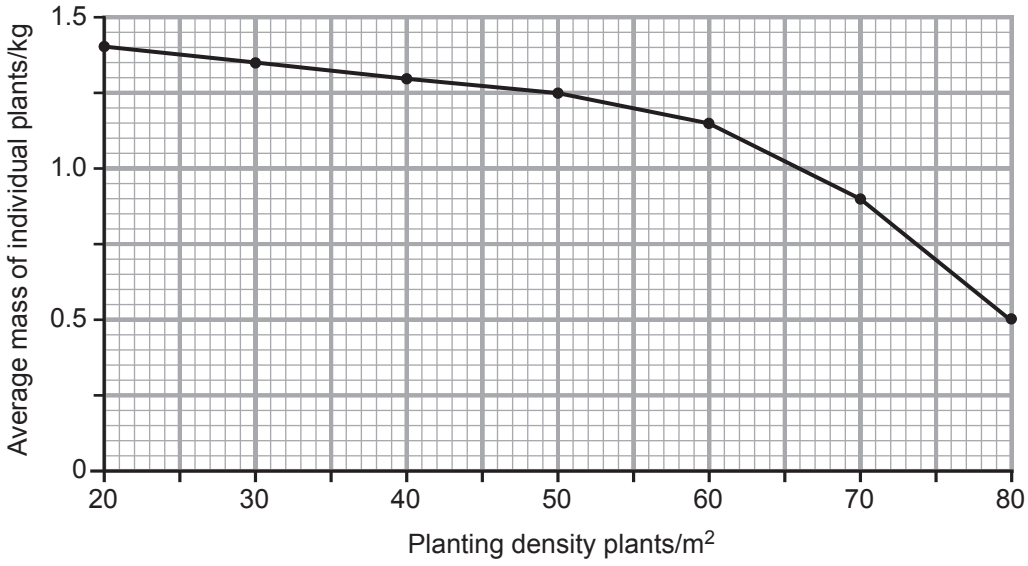
**11 (a)** The photograph below shows part of a maize crop. The maize plants are regularly spaced to maximise growth.



*Source: Chief Examiner*

**Graph A** below shows the effect of planting density (number of plants per square metre) on the average mass of individual plants.

**Graph A**



**(i)** In terms of competition between plants, describe and explain the results for **Graph A**.

Examiner Only

| Marks | Remark |
|---|---|
| | |

_____

_____

_____

_____

_____

_____ [3]

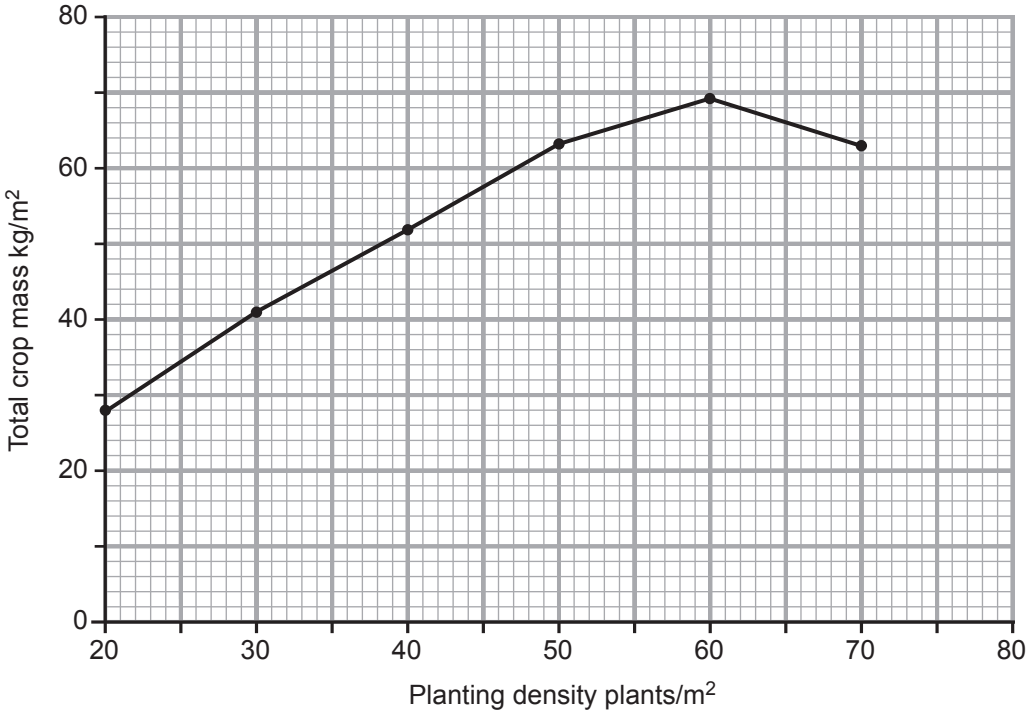


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**Graph B** below shows the total crop (maize) mass per square metre.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**Graph B**




**(ii)** Calculate the value for the total crop mass at a planting density of 80 plants/$m^2$.
You will need to refer to **Graph A**.

(Show your working out.)

_____ kg/$m^2$ [2]

**(iii)** Describe and explain the results for **Graph B**.

_____

_____

_____

_____

_____

_____ [3]

**(b)** Some varieties of maize are genetically modified (GM). One variety of GM maize produces a chemical that is toxic (poisonous) to leaf-eating insects.

**(i)** Explain the advantages of using this variety of GM maize.

_____

_____

_____

_____

_____

_____ [3]

**(ii)** Give **one** reason why so many people are opposed to GM crops.

_____

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

## THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**TUESDAY 13 MAY 2014, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | All points correct [2] 1 error [1] more than 1 error [0]<br>line joined between points [1] | [3] | |
| | **(b)** | **(i)** Oxygen | [1] | |
| | | **(ii)** The number of bubbles/oxygen given off decreases with distance from lamp [1]<br>reduced photosynthesis [1]<br>due to reduced light intensity [1] | [3] | |
| | **(c)** | Phototropism | [1] | 8 |
| **2** | **(a)** | Group 1 = 24 [1]<br>Group 2 = 44 [1] | [2] | |
| | **(b)** | The test tube in the apparatus set up by Group 2 is not insulated or converse [1]<br>so a lot of heat is lost out into the room or converse [1] | [2] | 4 |
| **3** | **(a)** | **(i)** Any **two** from:<br>• the number of people (males and females) with skin cancer has increased (every year) from 1975/over time<br>• the number of females with skin cancer is (always) higher than the number of males<br>• in 2010 the rates of skin cancer cases in both males and females is the same<br>• when the rate of skin cancer cases rises in females it also rises in males | [2] | |
| | | **(ii)** Rates will decrease [1]<br>Less exposure to UV rays [1] | [2] | |
| | **(b)** | **(i)** Any **two** from:<br>risk of Down Syndrome increases with age<br>under 35 risk of miscarriage exceeds that of Down Syndrome<br>over 35 risk of Down Syndrome greater than miscarriage | [2] | |
| | | **(ii)** Religious conviction/not wishing to have ethical decision to make/ if other children in family/other appropriate response | [1] | |
| | **(c)** | Mutation | [1] | 8 |

**4 Indicative content**

- in vitro testing medicines or drugs are developed in the laboratory/tested on cells
- does the drug work
- animal testing is testing on live animals/whole body systems
- many people are opposed to animal testing for ethical reasons
- a drug may have different effect on animal as on a human (due to humans being a different species)
- clinical trials/medicines or drugs are given to humans
- to see if the drug works on humans/what the required dose will be/if there are any side effects
- licensed for use when medicines or drugs are shown to be effective/safe (with no or limited side effects)

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate terms throughout to describe what stages this new antibiotic would have to go through before it could safely be given to humans using **six to eight** of the points above. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| B | Candidates use some appropriate specialist terms to describe what stages this new antibiotic would have to go through before it could safely be given to humans using **three to five** of the points above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| C | Candidates use **one to two** of the points above. They use limited spelling, punctuation and grammar to describe what stages this new antibiotic would have to go through before it could safely be given to humans. They have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| D | Response not worthy of credit. | [0] |

[6]

AVAILABLE MARKS

6

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **5** | **(a)** | **(i)** | C | [1] | |
| | | **(ii)** | Any **two** from<br>• tubes kept at same temperature<br>• left for same length of time<br>• same (type of) broth | [2] | |
| | | **(iii)** | Pasteur | [1] | |
| | **(b)** | **(i)** | Modified/weakened/dead microorganisms (allow antigens) | [1] | |
| | | **(ii)** | Line reaches immunity over time [1]<br>and remains above immunity achieved line [1] | [2] | 7 |
| **6** | **(a)** | **(i)** | Acid rain carried by clouds/water vapour (which can travel great distances) | [1] | |
| | | **(ii)** | Sample numbers of dead fish/defoliated/dead trees/record lake pH/erosion of buildings [1]<br>at specific intervals (e.g. weekly, monthly) [1] | [2] | |
| | | **(iii)** | Alternative fuels/chimney filters/desulfurisation of fuel | [1] | |
| | **(b)** | | Large number/range of habitats [1]<br>(each) with large number of different flowering plants/insects/birds [1] | [2] | 6 |
| **7** | **(a)** | | Gene is section of DNA/small part of chromosome that codes for a characteristic/protein [1]<br>alleles are alternative forms of a gene [1]<br>Not 2 different genes | [2] | |
| | **(b)** | | Dominant allele (gene) is expressed/characteristic shows if heterozygous/ overpowers recessive allele [1]<br>recessive allele is masked by dominant allele/characteristic only shows if homozygous [1] | [2] | |
| | **(c)** | | homozygous – both alleles (genes) are the same [1]<br>heterozygous – alleles (genes) are different [1] | [2] | 6 |
| **8** | **(a)** | | Any **three** from:<br>• strengthens heart (muscle)<br>• can pump more blood with each beat/increases output/bigger output<br>• therefore needs to beat less often/less wear and tear/lower heart rate<br>• explanation of burning up fat | [3] | |
| | **(b)** | | Reason:<br>Many people affected/long-term condition [1]<br>(explanation must link with reason) [1] | [2] | 5 |

AVAILABLE MARKS

**9** **(a)** **(i)** Guanine – 30; thymine – 20 [1]

**(ii)** Everyone's DNA is different [1]

**(iii)** Any **three** from
- sequence of three (DNA) bases code for an amino acid Not protein
- one strand/side of DNA used as coding strand
- base triplet
- amino acids join together to form protein [3]

**(b)** **(i)** Multinational/large amount of money/great time involved [1]

**(ii)** The more closely related species are the more similar their DNA/ base sequences [1]

7

**10** **Indicative content**

- a hormone is a **chemical** that travels in the **blood** to a **target organ** (points in bold – 1 mark each)
- Any named hormone from the list below
  - oestrogen
  - progesterone
  - testosterone
  - insulin (max 2)
- one explanation for each named hormone
  - oestrogen involved in repair of uterus/stimulates ovulation/controls secondary sexual characteristics
  - progesterone builds up/maintains lining in uterus/at low levels causes menstruation
  - testosterone controls secondary sexual characteristics
  - insulin reduces blood glucose levels/converting glucose to glycogen (max 2)

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate terms throughout to describe hormone action in humans using **six to seven** of the points above. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| B | Candidates use some appropriate specialist terms to describe hormone action in humans using **four to five** of the points above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| C | Candidates use **one to three** of the points above. They use limited spelling, punctuation and grammar to describe hormone action in humans. They have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| D | Not worthy of credit. | [0] |

[6]

6

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 11 | (a) | (i) | As planting density increases average mass of individual plants decreases [1]<br>decrease is greater at higher planting densities [1]<br>competition for space/light/competition for nutrients (minerals)/ water [1] [3] | |
| | | (ii) | At planting density of 80 average mass of individual plants = 0.5 kg [1]<br>80 × 0.5 = 40 [1] [2] | |
| | | (iii) | Any **three** from<br>• as planting density increases overall crop mass increases up to 60 ($m^2$)<br>• falls at higher planting densities<br>• (at lower planting densities) increase in plant number leads to greater total crop mass<br>• (at higher planting densities) total crop mass falls as reduction in individual plant mass has greater effect than increasing number of plants [3] | |
| | (b) | (i) | Any **three** from<br>• reduced damage by insects/insects unable to feed on maize/ kills insect pests<br>• less crop wastage/less money spent on insecticides/more crop harvested<br>• less pollution (by pesticides)<br>• other insects/food chains not affected [3] | |
| | | (ii) | Possibility of 'superweeds'/allergies/fear of 'unknown'/side effects unknown [1] | 12 |
| | | | **Total** | **75** |



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Rewarding Learning

| Centre Number | |
|---|---|
| 71 | |

| Candidate Number |
|---|
| |

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**MONDAY 24 FEBRUARY 2014, MORNING**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question **4(b)** and **8(b)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| Total Marks | |

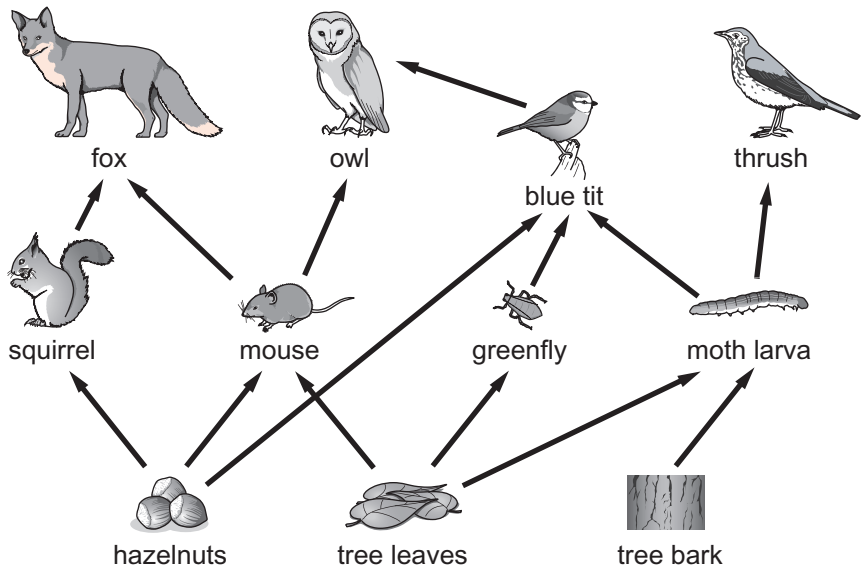


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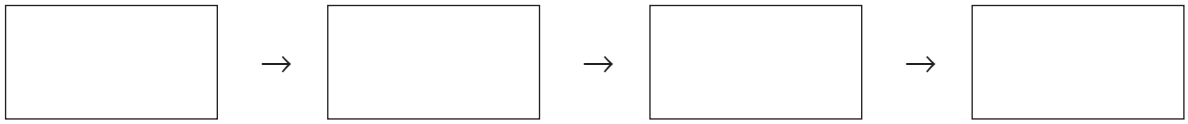
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** **(a)** The diagram below shows a food web.




*© KS3 science revision Level 5-7 by Patricia Millar, published by HarperCollins, 2006.*
*Reprinted by permission of HarperCollins Publishers Ltd*

**(i)** Using the diagram, complete a food chain containing **four** organisms in the boxes below.



[2]

**(ii)** Name **one** primary consumer from this food web.

_____ [1]

**(b)** Suggest what might happen to the number of squirrels if the fox numbers go down. Explain your answer.

_____

_____

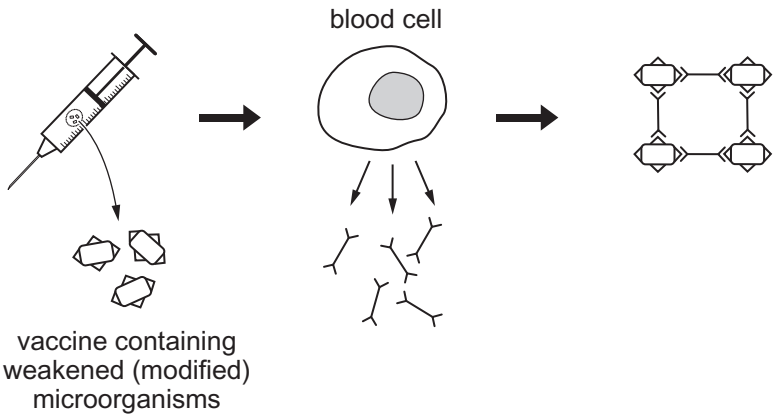
_____

_____ [2]



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**2** The diagram summarises how a vaccine works.




**(a)** Using the diagram and your knowledge describe how vaccinations protect against disease.

_____

_____

_____

_____

_____

_____

_____ [3]

**(b)** Before a vaccination is licensed for use it goes through a number of trials (in vitro, animal and clinical).

**(i)** Clinical trials test the drug on human volunteers. Give **two** reasons why it is necessary to carry out testing on humans.

1. _____

_____

2. _____

_____ [2]

**(ii)** Suggest **one** reason why many people are against testing on animals.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |



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The table below shows information about the development and production of different drugs by a company.

| | Antibiotics | Painkillers | Other medical drugs |
|---|---|---|---|
| Cost of producing drug/million pounds | 7.4 | 7.5 | 4.9 |
| Time to produce drug/years | 9.5 | 6.5 | 6.5 |
| Profit per drug/ million pounds | 2.1 | 2.9 | 4.2 |
| Number of drugs in development | 2 | 4 | 7 |

**(c)** Using the information provided, suggest **two** reasons why this company is more interested in developing 'other medical drugs' rather than antibiotics and painkillers.

1. _____

_____

_____

2. _____

_____

_____ [2]

**(d)** Explain fully why some antibiotics have become less effective in recent years.

_____

_____

_____

_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

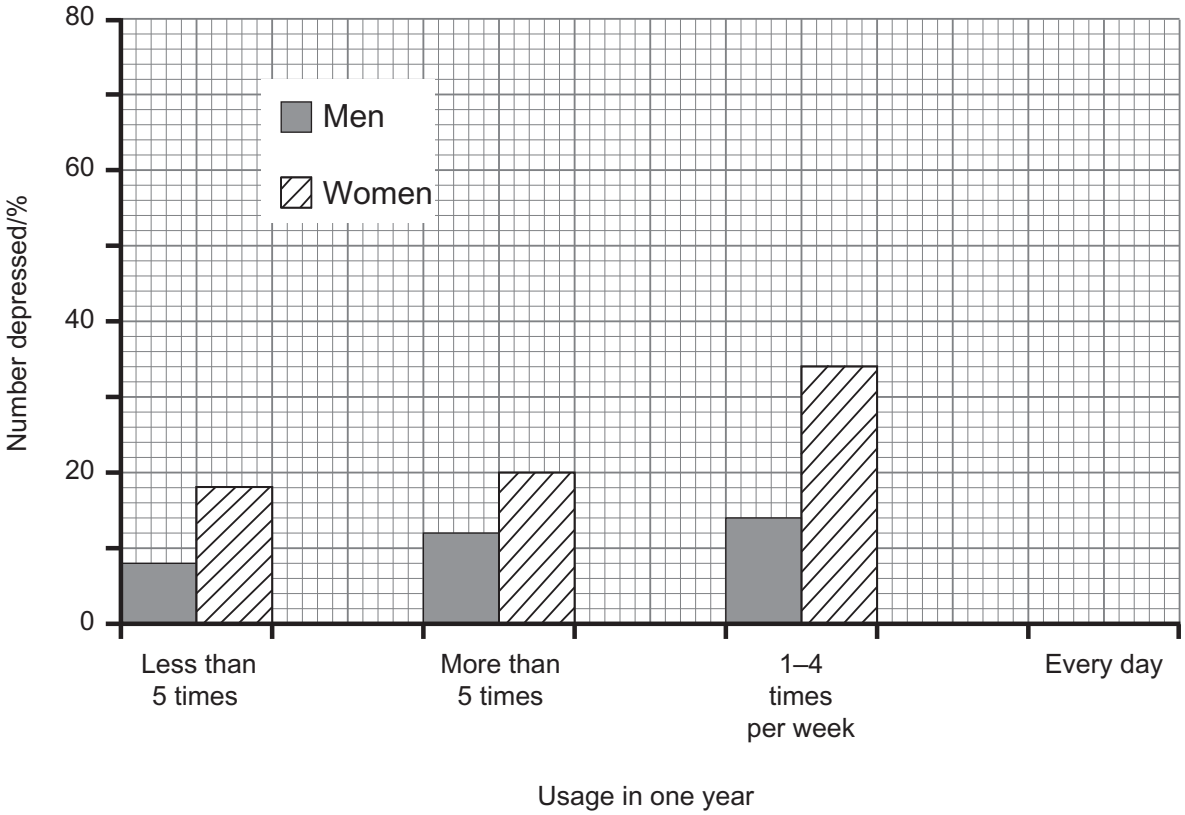
| Examiner Only | |
|---|---|
| Marks | Remark |

**3** Cannabis is the most widely used illegal drug in Britain. Some doctors think that taking cannabis can lead to depression.

Doctors investigated the use of cannabis by 800 males and 800 females who had used the drug. The results are shown below.

| Usage in one year | Men who became depressed/% | Women who became depressed/% |
|---|---|---|
| **Less than 5 times** | 8 | 18 |
| **More than 5 times** | 12 | 20 |
| **1–4 times per week** | 14 | 34 |
| **Every day** | 20 | 67 |

**(a)** Using the information in the table complete the bar chart below.




[1]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** A quarter ($\frac{1}{4}$) of the males in the investigation used cannabis **every day** throughout the year. Calculate the **number** of men who became depressed because of this.

(Show your working out.)

_____ [2]

**(c)** Explain how the results suggest that doctors are correct in linking depression to cannabis use.

_____

_____

_____ [1]

**(d)** Unlike cannabis, alcohol is a legal drug. However, it can still have an effect on a person's health. Give **one** harmful effect alcohol can have on a user and **one** harmful effect it can have on society.

User _____

_____

Society _____

_____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**4** **(a)** Abiotic factors can be used to measure the rate at which global warming is occurring.

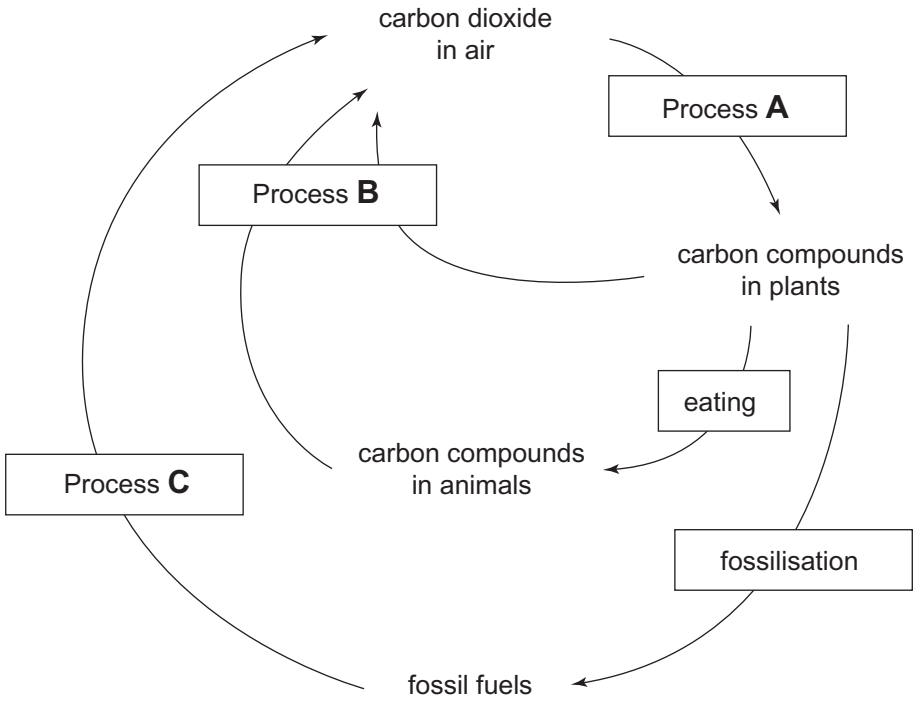
**(i)** What is meant by the term 'abiotic'?

_____ [1]

**(ii)** Apart from temperature, name **one** abiotic factor which could be used to measure the rate of global warming.

_____ [1]

**(b)** The diagram below shows a simple carbon cycle.




Using the diagram and your knowledge, explain the carbon cycle.

Your answer should include:

- the names of the processes labelled **A**, **B** and **C**,
- and how it has become unbalanced causing increased levels of carbon dioxide.



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**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**5** **(a)** Complete the table below about food groups and their function in the body.

| Food group | Function in the body |
|---|---|
| | growth and repair |
| carbohydrate | |
| | to give us energy and for insulation (reduce heat loss) |

[3]

**(b)** **(i)** Describe fully how you would carry out a food test for sugar.

_____

_____

_____

_____ [2]

**(ii)** Describe the colour change that would occur if the food contains sugar.

_____ to _____ [1]



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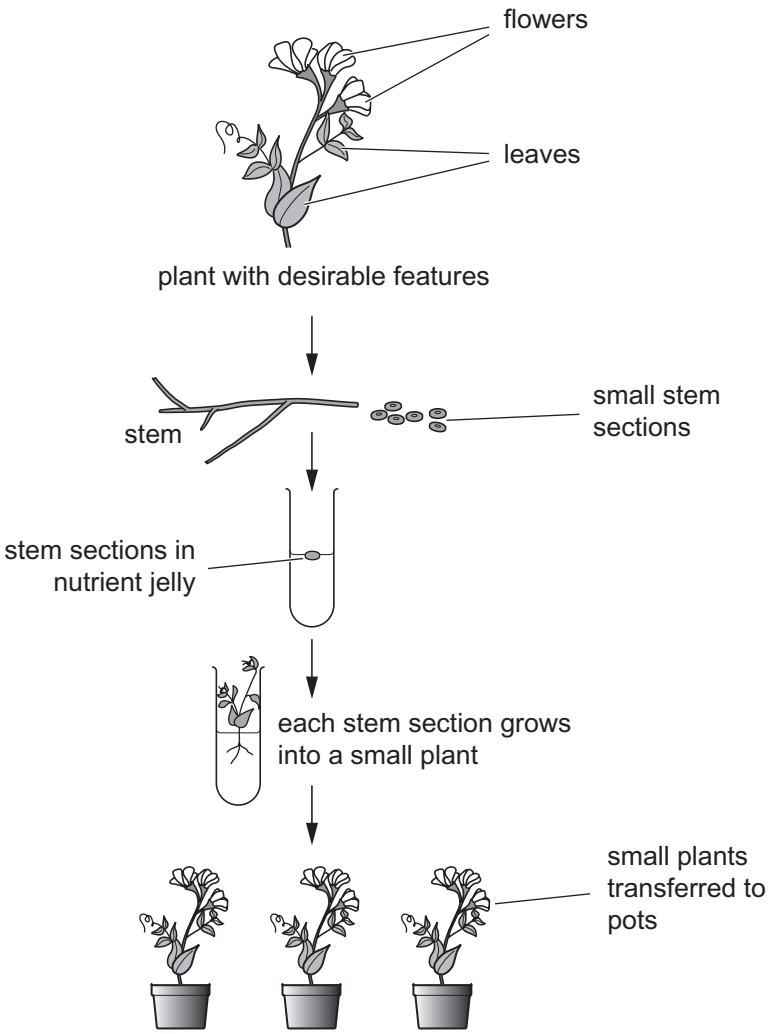
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**(Questions continue overleaf)**


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| Examiner Only | |
|---|---|
| Marks | Remark |

**6** Plants with desirable features can be grown asexually by using the method of tissue culture described in the following diagram.




*© GCSE Biology for CCEA (Second edition) by J Napier, published by Hodder Education, 2011. ISBN 978 0340 983805, " Reproduced by permission of Hodder Education"*

**(a)** Suggest **one** desirable feature the plant could have.

_____ [1]

**(b)** Using the diagram and your knowledge answer parts **(i)** and **(ii)** below.

**(i)** What is the evidence that tissue culture involves asexual reproduction?

_____ [1]

**(ii)** Suggest **two** advantages of using the process of tissue culture to grow plants asexually.

1. _____

_____

2. _____

_____ [2]

**(c)** The hormone oestrogen has an important function in the human female menstrual cycle.

**(i)** Describe fully what a hormone is.

_____

_____

_____ [2]

**(ii)** Describe and explain the role of oestrogen in the female menstrual cycle.

_____

_____

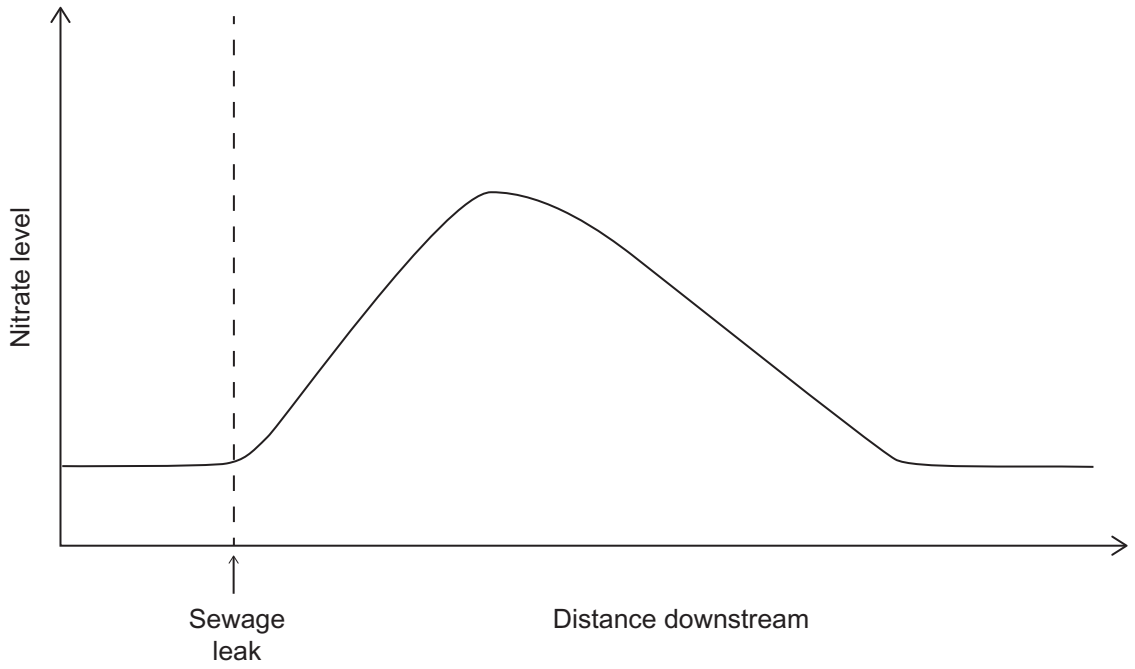
_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**7** **(a)** The graph below shows how a sewage leak affected the level of nitrate in a section of river.




**(i)** In terms of the nitrogen cycle, explain fully why the nitrate level rises after the sewage leak.

_____

_____

_____

_____

_____ [3]

**(ii)** Suggest **two** reasons why the nitrate level in the water eventually returns to normal.

1. _____

2. _____ [2]



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**(b)** Acid rain is another example of pollution. The table below shows the percentage of a Scottish forest damaged by acid rain over the last 50 years.

| Year | Area of forest damaged/% |
|---|---|
| 1960 | 20 |
| 1970 | 27 |
| 1980 | 30 |
| 1990 | 25 |
| 2000 | 15 |
| 2010 | 15 |

**(i)** Describe how the percentage area of forest damaged changed over time.

_____

_____

_____

_____ [2]

**(ii)** Explain fully the reason for the change in percentage of forest damaged between the years 1980–2000.

_____

_____

_____ [2]

**(iii)** What is the evidence from the table that acid rain is still produced?

_____ [1]

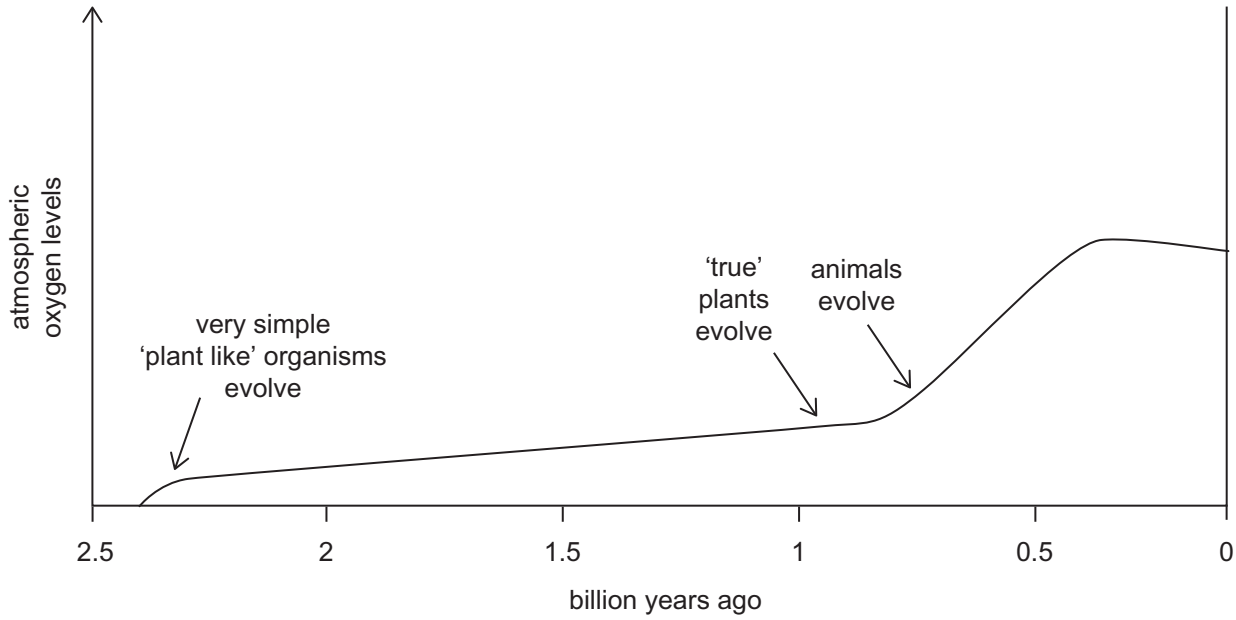
**(c)** Acid rain causes trees to lose their leaves. Suggest **one** reason why the leaves are the main part of a tree affected by acid rain.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

**8** **(a)** The following diagram shows how the levels of atmospheric oxygen have changed throughout the last 2.5 billion years.




**(i)** Name the process that caused the rise in oxygen levels around 2.4 billion years ago.

_____ [1]

**(ii)** Using the information provided and your knowledge, explain why animals evolved around 0.75 billion years ago.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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**(b)** When penicillin was first used to combat bacterial infections less than 5% of bacterial strains of *Staphylococcus aureus* (a bacterium that causes many common infections) were resistant. Now over 95% of strains are resistant to penicillin.

Resistance to penicillin (or related antibiotics) is caused by mutations in the bacterial genes.

When a new generation of antibiotics was produced, including methicillin, these initially proved successful against penicillin-resistant strains. However, some types of bacteria have become resistant to methicillin, hence methicillin-resistant *Staphylococcus aureus* (MRSA).

Using this information and your knowledge, explain how the development of MRSA demonstrates **natural selection** and **evolution**.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

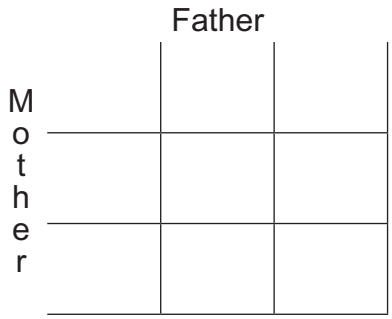
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** Huntington's disease is caused by the presence of a dominant allele in a particular gene.

**(a)** Complete the Punnett square and the offspring genotypes and phenotypes for:

- a father who is heterozygous for Huntington's disease
- a mother who does not have the Huntington allele.

Use the symbols: H = Huntington allele; h = normal allele

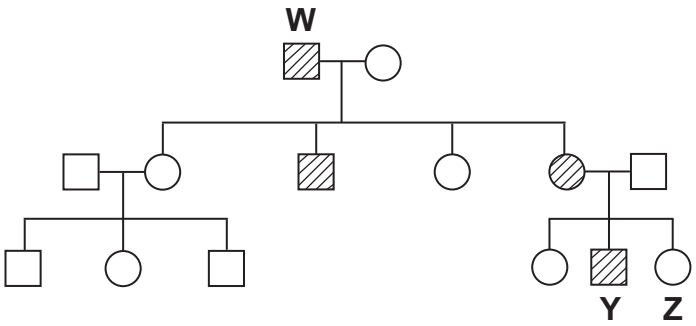



Offspring genotypes _____ _____ _____ _____

Offspring phenotypes _____ _____ _____ _____

[4]

**(b)** The following pedigree diagram shows the inheritance of Huntington's disease in a particular family.




**Key**

- normal male
- normal female
- male with Huntington's disease
- female with Huntington's disease

**(i)** What is the relationship of individual **Y** to **W**?

_____ [1]

**(ii)** What is the genotype of individual **Z**? Explain your answer.

Genotype _____

Explanation _____

_____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(c)** Huntington's disease leads to a gradual breakdown of the nervous system in middle age. There is no cure at present. It is possible to have a test to show if an individual will develop the disease.

**(i)** What general name is given to the process of testing for the possibility of developing inherited diseases?

_____ [1]

**(ii)** Suggest **one** reason why an 18 year old male, whose mother is starting to develop Huntington's disease, would decide **not** to have the test to show if he will develop the disease.

_____

_____ [1]

**(d)** Some genetic diseases (e.g. cystic fibrosis) can be treated by gene therapy. Describe what gene therapy is and give **one** reason why its effect as a treatment is limited.

_____

_____

_____

_____

_____

_____ [3]

**THIS IS THE END OF THE QUESTION PAPER**

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**MONDAY 24 FEBRUARY 2014, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | AVAILABLE MARKS |
|---|---|---|---|
| 1 | (a) (i) **Any one**<br>● leaves greenfly blue tit owl<br>● leaves moth larva blue tit owl<br>● bark moth larva blue tit owl (correct animals) [1]<br>Starts with producer [1] [2] | | |
| | **(ii)** Squirrel/mouse/greenfly/moth larva/blue tit [1] | | |
| | **(b)** The number of squirrels would increase [1]<br>as there are less foxes to eat them/more squirrels survive to breed or they survive longer to breed [1] [2] | | 5 |
| 2 | (a) **Any three from**<br>● Vaccines cause antibodies (to be produced) (by white blood cells)<br>● called lymphocytes<br>● these antibodies lock on to antigens on pathogen<br>● due to complementary shape<br>● clumping/immobilisation<br>● destroyed by phagocytes/phagocytosis/(other) white blood cells<br>● memory cells [3] | | |
| | **(b) (i) Any two from**<br>● to see how effective the drug is on humans<br>● to find out what the required dose is<br>● to see if there are any harmful side effects/to check if safe<br>● animals are a different species/react differently [2] | | |
| | **(ii)** People think it is cruel/harms the animals/any ethical issue [1] | | |
| | **(c)** Cheaper to produce (than antibiotics and painkillers) [1]<br>average profit per drug is greater (than antibiotics and painkillers) [1] [2] | | |
| | **(d)** Antibiotic resistance/bacteria have mutated [1]<br>due to overuse/not taking the full course [1] [2] | | 10 |
| 3 | **(a)** Both bars completed correctly and shading [1] | | |
| | **(b)** 200 [1]<br>40 [1] [2] | | |
| | **(c)** With increased cannabis use, increased number of users have depression [1] | | |
| | **(d)** User – Impaired judgement qualified/lack of inhibition qualified/liver or brain damage [1]<br>Society – Family breakdown/absenteeism at work/antisocial behaviour/violence/cost of treating alcohol linked diseases/ crime [1] [2] | | 6 |



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AVAILABLE MARKS

**4 (a) (i)** Non-living factors [1]

**(ii)** Climate change/size of polar ice caps/sea levels [1]

**(b) Indicative content**

- Plants take in/use carbon dioxide
- Process A is photosynthesis/by photosynthesis
- Plants and animals produce carbon dioxide
- Process B is respiration/by respiration
- Burning/use of fossil fuels produces carbon dioxide
- Process C is combustion/by combustion
- Deforestation
- Increased combustion/increased use of fossil fuels

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe the carbon cycle and why it has become unbalanced using **six to eight** of the points above, and which must include the names of at least two of the processes (A, B and C), in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe the carbon cycle and why it has become unbalanced using **three to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe the carbon cycle and/or why it has become unbalanced using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

[6] 8



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| | | | AVAILABLE MARKS |
|---|---|---|---|
| 5 | (a) | | |

| Food group | Function in the body |
|---|---|
| **protein** | growth and repair |
| carbohydrate | **to give us energy** |
| **fat** | to give us energy and for warmth |

[3]

**(b) (i)** Add Benedict's solution [1]
heat [1] [2]

**(ii)** Blue to orange/red [1] 6

**6 (a)** Brightly coloured flowers/scented/grows quickly/any appropriate characteristic [1]

**(b) (i)** Only one parent/offspring similar [1]

**(ii) Any two from**
- many offspring can be produced
- no variation explained (all will have desirable property)
- can be done indoors
- plants will grow quickly (seed stage avoided) [2]

**(c) (i) Any two from**
- chemicals
- that travel in blood
- to a target organ [2]

**(ii) Any two from**
- repairs the uterine lining (following menstruation)
- causes ovulation/release of eggs
- stimulates the production of progesterone
- explanation of any above point [2] 8

| | | AVAILABLE MARKS |
|---|---|---|
| 7 (a) (i) | **Any three from**<br>● nitrate in sewage<br>● sewage (rich in nitrogen-containing compounds) decomposes into ammonia<br>● by microorganisms/fungi/bacteria<br>● ammonia converted to nitrate/nitrification<br>● by nitrifying bacteria [3] | |
| (ii) | **Any two from**<br>● dilution in water<br>● used by plants<br>● sticking to river bank [2] | |
| (b) (i) | (From 1960) rises to a peak of 30%/in 1980 then falls [1]<br>levels off after year 2000/falls over the entire time [1] [2] | |
| (ii) | Less acid rain [1]<br>due to chimney filters/alternative fuels [1] [2] | |
| (iii) | In 2010 trees still (15% of forest) damaged [1] | |
| (c) | Part that receives most rain/most delicate part [1] | 11 |



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AVAILABLE MARKS

**8 (a) (i)** Photosynthesis [1]

**(ii)** (Significant) increase in atmospheric oxygen [1]
oxygen needed for respiration/active animals required a lot of oxygen/more plants for food [1] [2]

**(b) Indicative content**

- variation in bacteria (some with mutation/some not)
- mutated bacteria resistant to antibiotic (methicillin)
- they survive as others killed by antibiotic
- this is natural selection (must be linked to bullet point above)
- genes passed on to offspring/MRSA proportion increases over time
- MRSA is a new type of bacteria that demonstrates evolution/ increase in resistance over time demonstrates evolution

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe how the development of MRSA demonstrates both natural selection and evolution using **five or six** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5]–[6] |
| B | Candidates use some appropriate specialist terms to describe how the development of MRSA demonstrates both natural selection and evolution using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3]–[4] |
| C | Candidates describe how the development of MRSA demonstrates natural selection and/or evolution using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1]–[2] |
| D | Not worthy of credit. | [0] |

[6]

9

| | AVAILABLE MARKS |
|---|---|

**9** **(a)**

| | H | h |
|---|---|---|
| h | Hh | hh |
| h | Hh | hh |

gametes [1]

offspring based on gametes [1]

Offspring genotypes: Hh Hh hh hh [1]

Offspring phenotypes: Huntington's disease normal [1]

[4]

**(b)** **(i)** Grandson [1]

**(ii)** hh [1]
must be hh as if any H alleles present would show condition/cannot be carriers [1] [2]

**(c)** **(i)** Genetic screening [1]

**(ii)** No cure possible/prefers positive outlook/hopes he does not have the condition/many years until condition will have an effect/impact on insurance [1]

**(d)** Addition of normal gene/allele into individual with defective gene/allele(s) [1]
normal allele provides normal functioning in individual [1]
effect limited as difficult to target all areas of body/can cause allergies/other harm described/donor genes not replaced by body/next generation will still have condition [1] [3] — 12

**Total** — **75**

Rewarding Learning

Centre Number

| 71 | |
|---|---|

Candidate Number

| |
|---|
| |

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**WEDNESDAY 13 NOVEMBER 2013, AFTERNOON**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **4(a)** and **10(a)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |

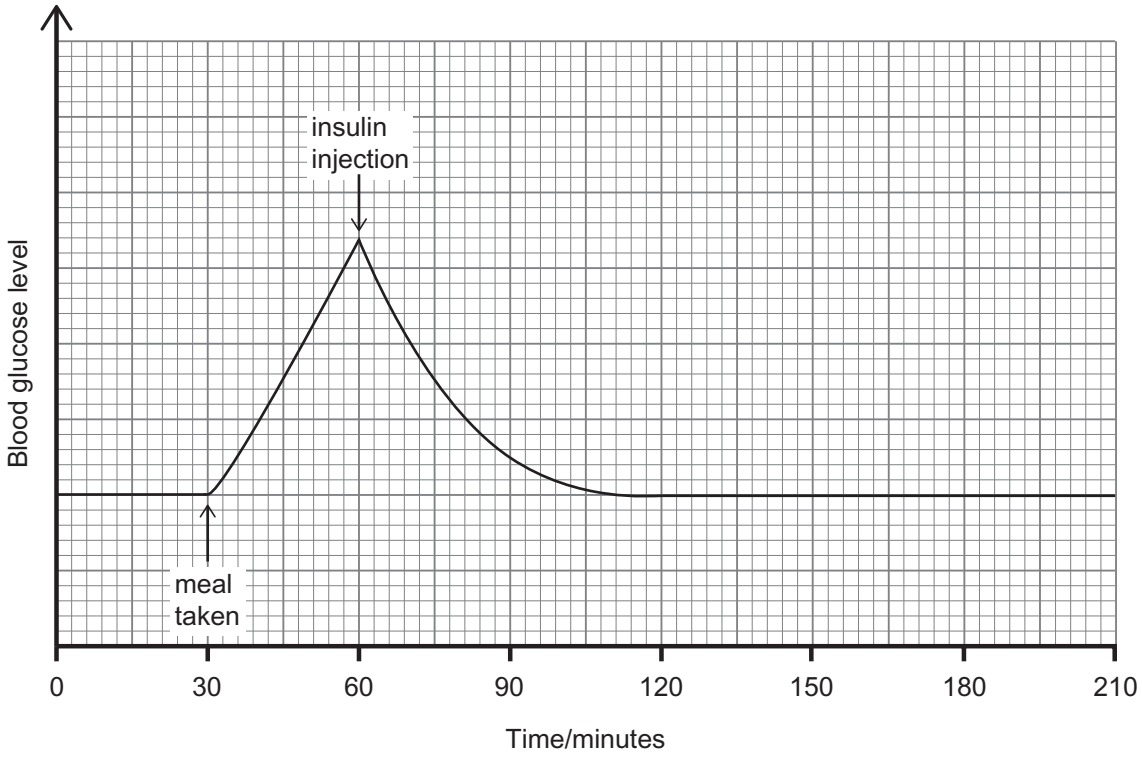


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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** Hormones such as insulin are produced by the body. However, sometimes insulin is injected if a person has diabetes.

**(a)** The graph below shows how the blood glucose level in a person with diabetes changes because of a meal and an insulin injection.




**(i)** Describe and explain the effect of the insulin on blood glucose level.

_____

_____

_____ [2]

**(ii)** Use the information provided to suggest which type of diabetes (Type 1 or Type 2) the person has. Explain your answer.

_____

_____ [1]



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**(b)** Insulin, like all medical drugs, had to be tested in trials before it could be used on humans. Testing involves clinical, in-vitro and animal trials.

**(i)** Put these trials (**clinical, in-vitro** and **animal**) in the order they take place.

_____ _____ _____ [1]

**(ii)** Describe what in-vitro testing is and suggest why it is a very expensive process.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |

**2** The red squirrel is at risk of extinction in Ireland. There are many reasons for its decline but a major factor has been the introduction of the grey squirrel (a competitive invasive species) into Ireland from North America. In comparison to the red squirrel, grey squirrels are a common woodland animal and their numbers are increasing rapidly.

The table below includes some information about red and grey squirrels.

| Feature | Red squirrel | Grey squirrel |
|---|---|---|
| **Average body length** | 21 cm | 26 cm |
| **Average body mass** | 290 g | 600 g |
| **Habitat** | coniferous (e.g. pine) forest | all types of forest |
| **Feeding area** | in the trees | in the trees and on the ground |
| **Diet** | ripe berries, nuts and seeds | ripe and unripe berries, nuts and seeds |
| **Response to poxvirus** | not immune to virus | immune to virus (but can carry it and spread it to other squirrels) |

**(a)** Use the information provided to answer parts **(i)**, **(ii)** and **(iii)**.

**(i)** Suggest **three** reasons for the grey squirrel being able to outcompete the red squirrel.

1. _____

_____

2. _____

_____

3. _____

_____ [3]

**(ii)** Suggest **one** reason why grey squirrels are much more likely to be killed by motor vehicles than red squirrels.

_____ [1]

**(iii)** Suggest **one** thing that could be done to increase the number of red squirrels.

_____ [1]

**(b)** Give **two** things that all competitive invasive species have in common.

1. _____

_____

2. _____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**3** **(a)** Cystic fibrosis is an inherited disease. Jack and Jill are heterozygous (carriers) for cystic fibrosis but do not have the condition.

**(i)** What is meant by the term inherited disease?

_____ [1]

**(ii)** Using the information provided, explain how you know the allele for cystic fibrosis is recessive.

_____

_____ [1]

**(b)** The following Punnett square shows how Jack and Jill could have a child with cystic fibrosis.

| | | Jack: C | Jack: c |
|---|---|---|---|
| Jill | C | CC | Cc |
| Jill | c | Cc | cc |

**(i)** Circle the genotype for cystic fibrosis in the Punnett square. [1]

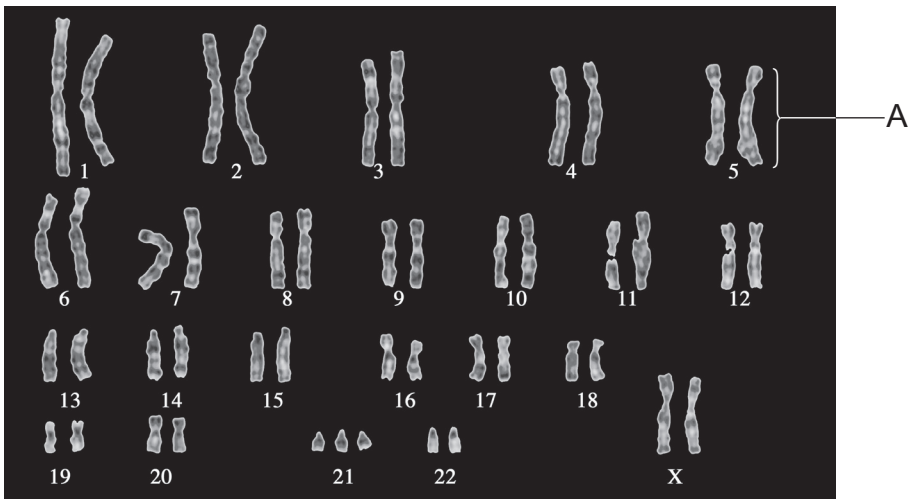
**(ii)** How many different genotypes are shown in the Punnett square?

_____ [1]



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**(c)** The photograph below shows a human karyotype.




© Look at Sciences / Science Photo Library

**(i)** What does structure A represent?

_____ [1]

**(ii)** What genetic disorder is shown by this karyotype? Explain your answer.

_____

_____

_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**4** **(a)** Describe how you would carry out an investigation to show that light is needed for photosynthesis.

In your account you should describe:

- the experimental set-up
- the results you would expect
- how the results show that light is necessary.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** State **two** ways in which palisade cells are adapted for the process of photosynthesis.

1. _____

2. _____

[2]

| Examiner Only | |
|---|---|
| Marks | Remark |

**5** The holly tree produces evergreen leaves (leaves that remain on the tree all year). The leaves also have sharp protective spikes at their edges as shown in the photograph below.




*Source: Photo: Chief Examiner*

**(a)** Suggest **one** advantage to the holly tree in having:

**(i)** evergreen leaves. _____

_____ [1]

**(ii)** sharp spikes. _____

_____ [1]



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**(b)** Pupils in a class collected a sample of leaves from a holly tree and counted the number of spikes on each leaf. Their results are shown in the table below.

| Number of spikes on leaf | Number of leaves |
|---|---|
| 7 | 2 |
| 8 | 4 |
| 9 | 14 |
| 10 | 19 |
| 11 | 12 |
| 12 | 14 |
| 13 | 10 |
| 14 | 6 |
| 15 | 3 |
| 16 | 2 |

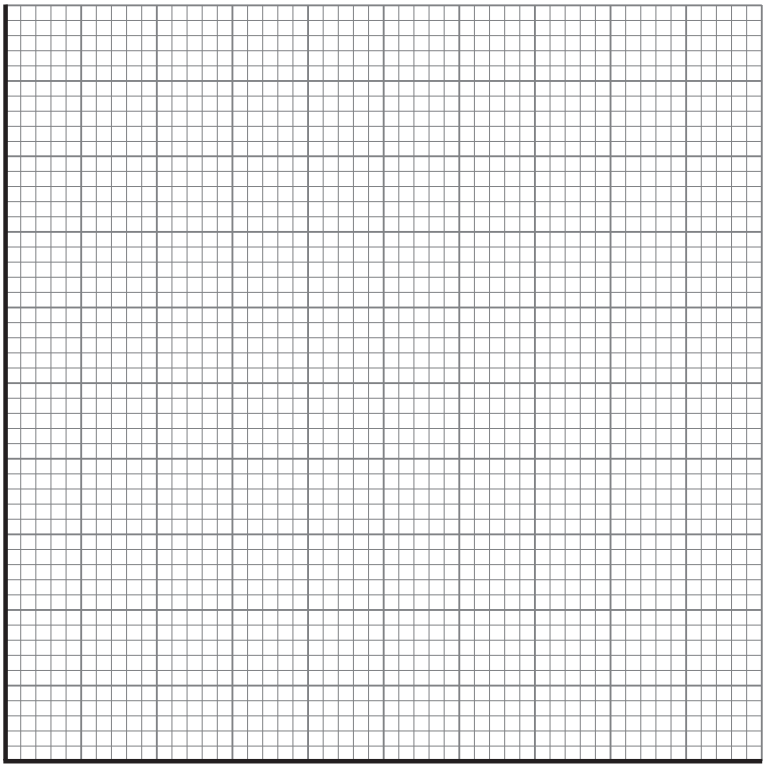
The pupils want to draw a graph of this information. They have to decide which is the best type of graph to use, e.g. bar chart, line graph or pie chart.

**(i)** On the grid opposite, **scale** and **label** the axes for the most appropriate graph type.

(Note: you do **not** need to draw in the bars/points).

Examiner Only

| Marks | Remark |
|---|---|
| | |



[2]

**(ii)** The variation shown by the holly leaves is discontinuous.
Describe what discontinuous variation is.

_____

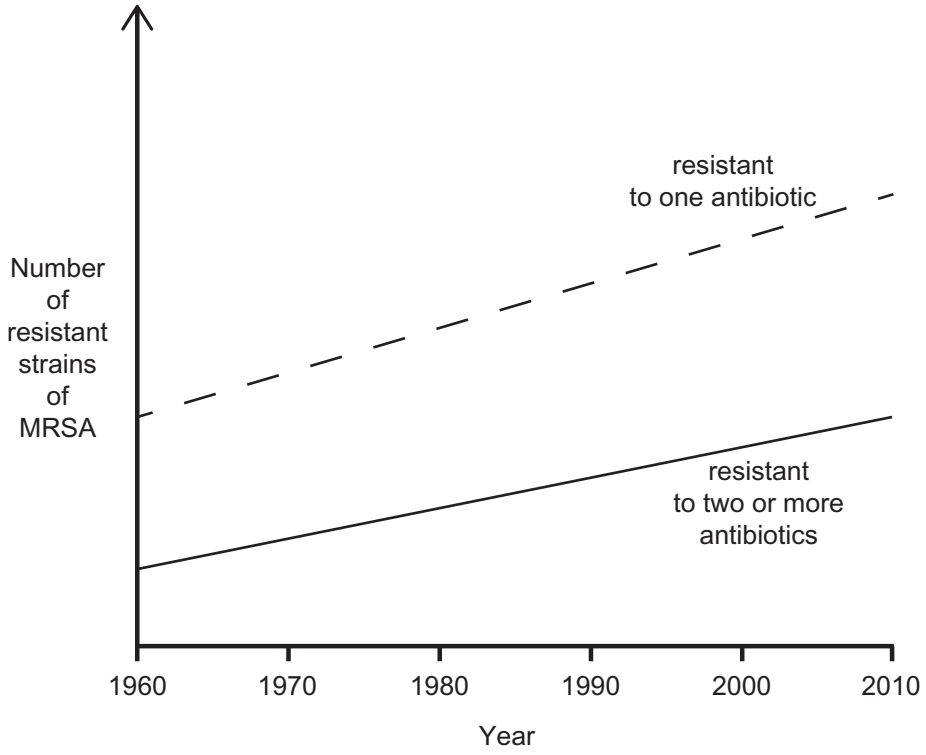
_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**6** **(a)** MRSA is a type of bacteria resistant to antibiotics. The graph below gives information on resistant strains of MRSA.




**(i)** Give **two** trends shown by the information in the graph.

_____

_____

_____ [2]

**(ii)** As part of their attempts to combat MRSA, scientists identify and classify the new strains as they appear. Suggest **one** reason why it is important to identify and classify the new strains of MRSA.

_____

_____ [1]



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**(b)** MRSA is found on the skin of many people. However, it only causes infection if it can get into the blood.

**(i)** Suggest **one** reason why most infections of MRSA take place in hospitals.

_____

_____ [1]

**(ii)** Suggest **two** measures that are used to restrict the spread of MRSA in hospitals.

1. _____

2. _____ [2]

**(c)** Explain fully in terms of changes within bacteria, how antibiotic resistance develops.

_____

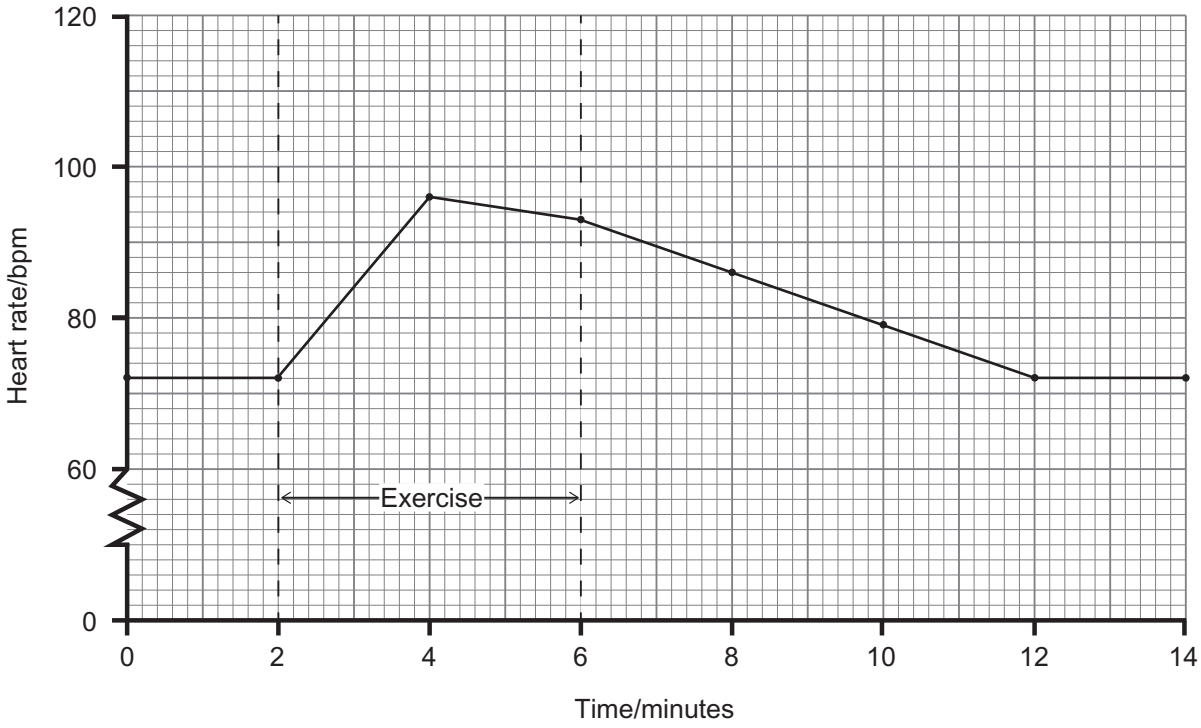
_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**7** **(a)** The graph below shows the effect of exercise on a student's heart rate. The student was unfit and usually did no exercise.




| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(i)** Calculate the maximum percentage increase in heart rate caused by the exercise.
(Show your working out.)

_____ % [3]

**(ii)** During the exercise the student began to tire. What is the evidence from the graph that shows this?

_____ [1]

**(b)** The student then trained regularly for a number of weeks becoming fitter.

**(i)** Compared to the graph opposite, suggest **one** change this will have on the student's heart rate if the exercise is repeated.

_____

_____ [1]

**(ii)** Describe fully how regular exercise benefits the heart.

_____

_____

_____

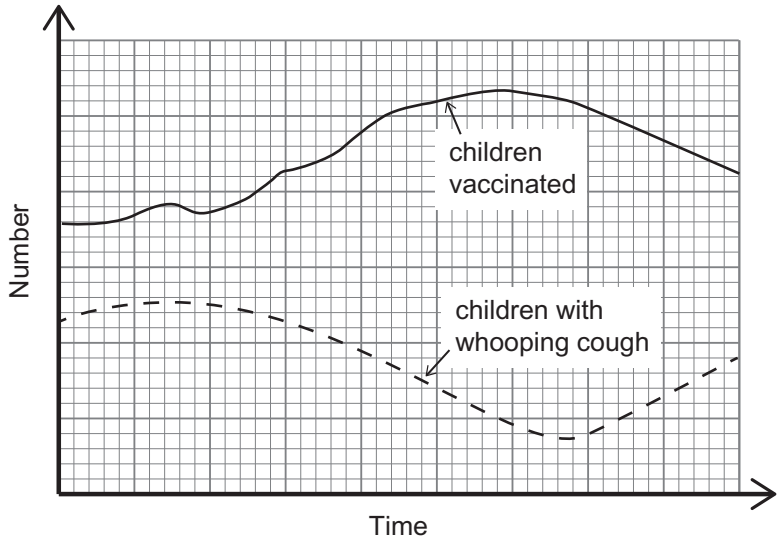
_____

_____ [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**8** Whooping cough is an infectious disease mainly affecting young children and is easily spread by coughing.




**(a)** Describe and explain the relationship between the number of children vaccinated and the number of children with whooping cough.

_____

_____

_____ [2]

**(b)** Whooping cough can often cause epidemic outbreaks.

**(i)** What is meant by the term 'epidemic'?

_____ [1]

**(ii)** Suggest why whooping cough can cause epidemic outbreaks.

_____ [1]

**(c)** Most children who have whooping cough are ill for a period of time and recover without medical intervention.

Using your knowledge of the body's defence systems, explain how this recovery occurs.

_____

_____

_____

_____

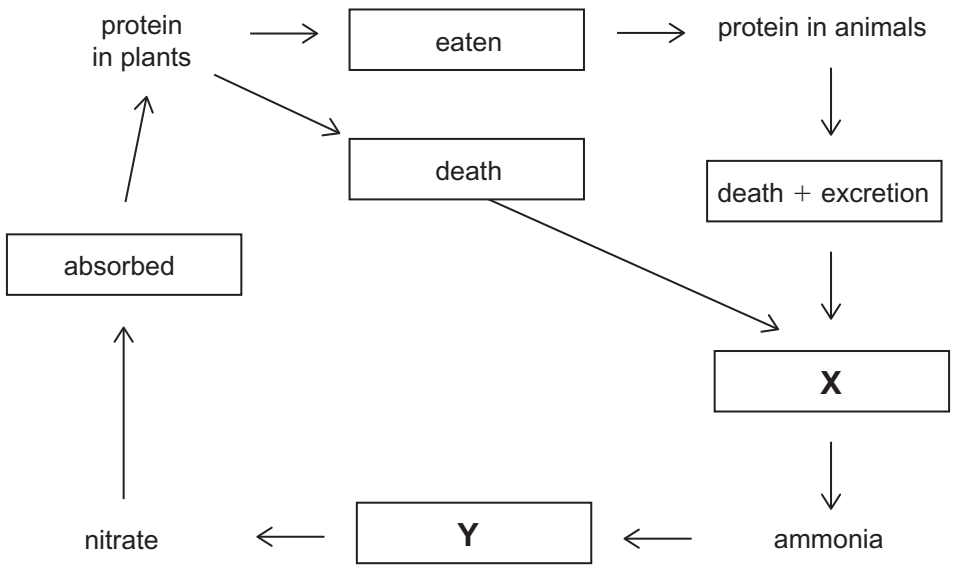
_____

_____ [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** The diagram shows part of the nitrogen cycle.




**(a)** Name the processes labelled **X** and **Y** in the diagram.

**X** _____

**Y** _____ [2]

**(b)** Farmers add fertiliser (a source of nitrate) to fields that are used for crop plants. Use the diagram and your knowledge to explain why this is necessary.

_____

_____

_____

_____

_____

_____ [3]

**(c)** When adding fertiliser there is a government requirement that the amount of fertiliser added is calculated to meet the requirements of the crop. Additionally, it must not be sprayed on sloping land too close to waterways. Suggest how excess fertiliser can cause pollution.

_____

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**10** The structure of DNA was worked out by Francis Crick and James Watson around 60 years ago following earlier work by other scientists.

**(a)** Describe how Crick and Watson worked out the structure of DNA, building on the work of earlier scientists. Your answer should name the earlier scientists involved and explain how they contributed to the understanding of the structure of DNA.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** Scientific discoveries such as working out the structure of DNA are subject to 'peer review'. Give **two** benefits of 'peer review'.

1.

2.

[2]

| Examiner Only | |
|---|---|
| Marks | Remark |

**(c) (i)** The genetic modification of crops builds on the collaborative work of Crick and Watson and other scientists.

Describe fully what a genetically modified (GM) crop is.

_____

_____

_____ [2]

**(ii)** Some varieties of GM crops can grow on much drier land than the normal varieties. Suggest **one** advantage of this. Explain your answer.

_____

_____

_____ [2]

**THIS IS THE END OF THE QUESTION PAPER**

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**WEDNESDAY 13 NOVEMBER 2013, AFTERNOON**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| 1 | (a) | (i) | Insulin causes reduction in blood glucose level [1]<br>converts glucose to glycogen (in liver) [1] [2] | |
| | | (ii) | Type 1 as insulin taken by injection [1] | |
| | (b) | (i) | Invitro ------ animal -------- clinical [1] | |
| | | (ii) | Testing on cells/in laboratory [1]<br>expensive equipment/specialist scientists needed/trial and error effect [1] [2] | 6 |
| 2 | (a) | (i) | **Any three from**<br>• can live in wider range of forests/habitats<br>• can feed on food (e.g. fallen seeds) on the ground/more places<br>• can eat unripe berries/nuts/seeds/wider range of food<br>• therefore can use up food before the red squirrels can use it<br>• immune to the virus (that can kill red squirrels) [3] | |
| | | (ii) | More likely to be on the ground/occur in larger numbers [1] | |
| | | (iii) | Plant more coniferous forests/vaccinate against virus/eliminate or prevent movement of grey squirrels/special feeders for reds/ breeding programmes [1] | |
| | (b) | | **Any two from**<br>• introduced from another country/by man<br>• spread rapidly/increase in numbers rapidly<br>• out-compete native species/better adapted than native species [2] | 7 |
| 3 | (a) | (i) | Passes genetically through the generations [1] | |
| | | (ii) | Jack and Jill are carriers/heterozygous/have allele but do not have CF [1] | |
| | (b) | (i) | cc [1] | |
| | | (ii) | 3 [1] | |
| | (c) | (i) | Chromosome [1] | |
| | | (ii) | Down syndrome [1]<br>an extra chromosome present [1] [2] | 7 |

AVAILABLE MARKS

**4 (a) Indicative content**

- plant with leaf (or part of leaf) covered and leaf (or part of leaf) uncovered/one plant in light and one in dark
- method of covering described
- plant left in bright light for e.g. 24 hours to 1 week
- iodine added
- blue black/starch only present where uncovered/in light
- if starch present iodine turns blue/black
- starch only present if photosynthesis takes place

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates use appropriate specialist terms throughout to describe an investigation showing that light is needed for photosynthesis using **five to seven** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialist terms to describe an investigation showing that light is needed for photosynthesis using **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| **C** | Candidates describe an investigation showing that light is needed for photosynthesis using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| **D** | Not worthy of credit. | [0] |

[6]

**(b) Any two from**

- close to top of leaf
- tightly packed
- rich in chloroplasts/chlorophyll [2]

8

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **5** | **(a)** | **(i)** | Evergreen leaves allows photosynthesis throughout year/for longer [1] | |
| | | **(ii)** | Sharp spikes give protection against herbivores/being eaten [1] | |
| | **(b)** | **(i)** | Appropriate scale making full use of grid [1]<br>appropriate labels, e.g. number of spikes on X-axis and number of leaves on the Y-axis [1] [2] | |
| | | **(ii)** | Discrete categories/no intermediate values [1] | 5 |
| **6** | **(a)** | **(i)** | The number of strains resistant to MRSA increases with time [1]<br>(at any time) there are more strains resistant to one antibiotic than two or more [1] [2] | |
| | | **(ii)** | Target treatment [1] | |
| | **(b)** | **(i)** | Open wounds/high concentration of MRSA/antibiotics in hospitals/ low immunity of patients/many sick people with MRSA [1] | |
| | | **(ii)** | **Any two from**<br>• medical staff washing hands (between contact with patients)<br>• use of gloves/disposable clothing/aprons<br>• sterilise equipment<br>• isolate infected patients<br>• restricted use of antibiotics<br>• cover open wounds<br>• testing before admission [2] | |
| | **(c)** | | Mutation [1]<br>in chromosomes/genes [1] [2] | 8 |
| **7** | **(a)** | **(i)** | 72 and 96 from graph [1]<br>24 increase [1]<br>33.3% [1] [allow ncm] [3] | |
| | | **(ii)** | Heart rate slowing down during the exercise/at four minutes [1] | |
| | **(b)** | **(i)** | Lower maximum rate/recovery time shorter/resting rate lower/will not slow down during exercise [1] | |
| | | **(ii)** | **Any three from**<br>• strengthens heart (muscle)<br>• increases output (when not exercising)<br>• therefore needs to beat less often/lower heart rate<br>• high respiration rate stops cholesterol/fat accumulating<br>• reduces obesity putting less strain on heart [3] | 8 |

| | | | AVAILABLE MARKS |
|---|---|---|---|
| 8 | **(a)** | When number of children vaccinated is high, number of children infected with whooping cough is low (or converse) [1]<br>vaccinated children unable to catch/spread whooping cough (or converse) [1] [2] | |
| | **(b)** **(i)** | A large number of individuals (in the one area) affected [1] | |
| | **(ii)** | Easily spread (by coughing)/young children weak immune systems (caught before vaccination) [1] | |
| | **(c)** | **Any three from**<br>• antigens (on microbes)<br>• cause production of antibodies<br>• take time to build up<br>• antibody – antigen reaction (or explained)<br>• clumping/immobilisation<br>• phagocytosis as explained (phagocytes/will engulf or destroy microbes [3] | 7 |
| 9 | **(a)** | X – decay/decomposition [1]<br>Y – nitrification [1] [2] | |
| | **(b)** | **Any three from**<br>• harvesting of crop<br>• removes nitrogen (nitrate)<br>• unable to decay/return nitrate to soil<br>• fertiliser replaces lost nitrate [3] | |
| | **(c)** | **Any two from**<br>• if excess not used by plants<br>• builds up to toxic levels in the soil<br>• if on sloping ground can run off into waterway<br>• adding nitrate to waterways/direct effect of increase in nitrate, e.g. algal growth<br>• correct consequence of algal growth (e.g. blocks light, bacteria use up oxygen, fish die as shortage of oxygen) [2] | 7 |

**10 (a) Indicative content**

- used modelling
- double helix shape/A-T and/or C-G combinations
- Franklin and Wilkins
- X-ray diffraction
- to show helical/spiral structure/3D shape
- Chargaff
- worked out that amount of A = T and amount of C = G
- clear sequence of development

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates use appropriate specialist terms throughout to describe working out the structure of DNA using **six to eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialist terms to describe working out the structure of DNA using **three to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| **C** | Candidates describe working out the structure of DNA using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| **D** | Not worthy of credit. | [0] |

[6]

**(b) Any two from**

- Checking results
- reviewed by experts in the field
- extending theory

[2]

**(c) (i)** A crop that contains new DNA/genes/chromosomes [1]
from another species [1] [2]

**(ii)** Extends range of crop [1]
more profit/more food/less irrigation costs [1] [2]

**Total**

| AVAILABLE MARKS |
|---|
| 12 |
| **75** |

Rewarding Learning

Centre Number

| 71 | |
|---|---|

Candidate Number

| |
|---|
| |

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**TUESDAY 14 MAY 2013, MORNING**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **4(a)** and **10(a)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |

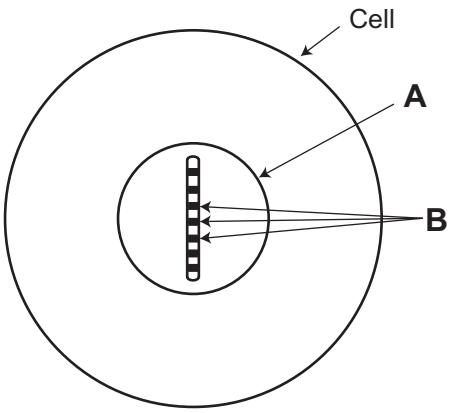


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| Examiner Only | |
|---|---|
| Marks | Remark |

**1** **(a)** The diagram represents an animal cell. Only one chromosome is shown.




**(i)** Name the structure labelled **A**.

_____ [1]

**(ii)** Name the structures labelled **B** on the chromosome.

_____ [1]

**(b)** Tulip flowers can be red or white. The allele for red colour is dominant to the allele for white colour.

**(i)** Complete the genetic diagram below to show the offspring of a cross between a **heterozygous** red tulip and a white tulip.

Use the symbols; R = red r = white

| | | Red | |
|---|---|---|---|
| | | R | |
| White | | Rr | |
| | r | | rr |

[2]

**(ii)** What percentage of the offspring are white?

_____ % [1]

**(iii)** Give the genotype of a **homozygous** red tulip.

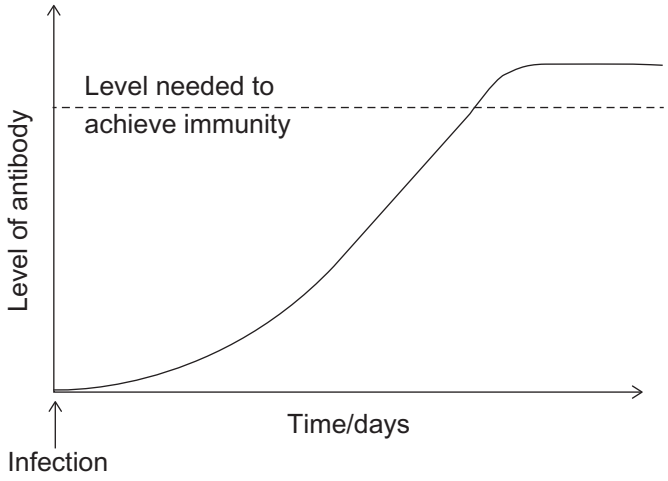
_____ [1]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**2** **(a)** The following graph shows how our antibody level changes when we have a bacterial infection.




**(i)** Suggest why there is a delay between infection and achieving immunity.

_____

_____ [1]

**(ii)** Using the graph above, give **two** pieces of evidence that show the immunity achieved is active immunity.

1. _____

_____

2. _____

_____ [2]

**(b)** Phagocytosis also helps protect against bacterial infection.

Describe fully the process of phagocytosis.

_____

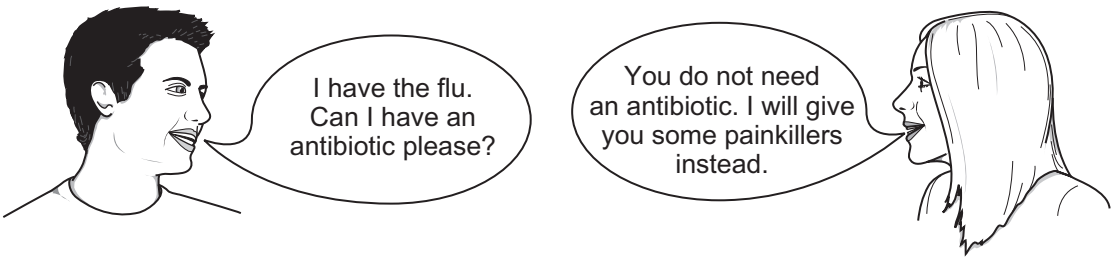
_____

_____ [2]



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**(c)** The following diagram shows Mr Wilson talking to his doctor.




Mr Wilson Doctor

**(i)** Explain fully why the doctor did not prescribe an antibiotic for Mr Wilson's flu.

_____

_____

_____ [2]

**(ii)** Suggest why new types of antibiotics need to be continually developed.

_____ [1]

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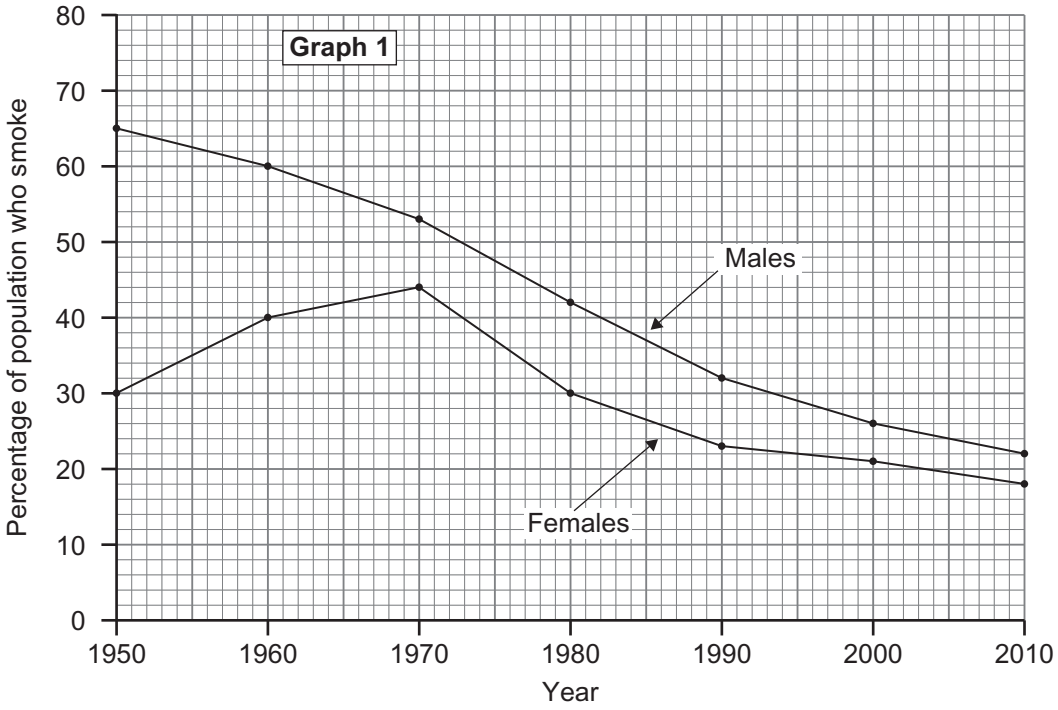
| Marks | Remark |
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| Marks | Remark |
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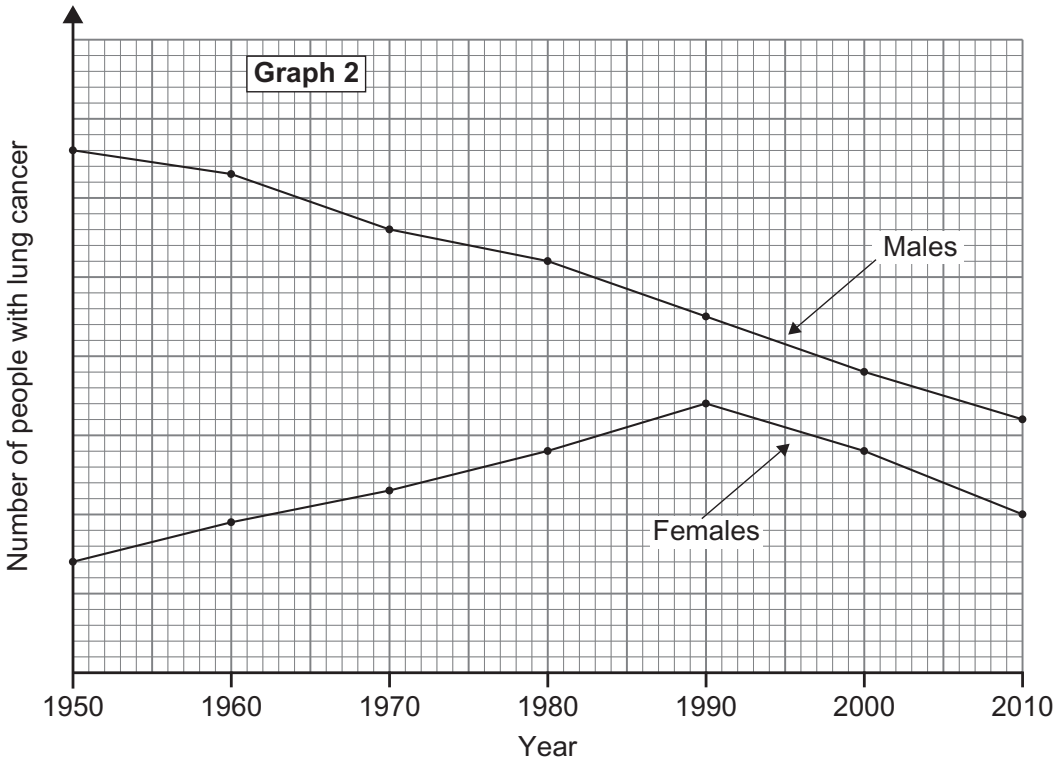
3 **Graph 1** shows the percentage of the population who were smokers between the years 1950–2010.




**(a)** Which year had the maximum percentage of female smokers?

_____ [1]

**Graph 2** shows how the number of people with lung cancer changed between the years 1950–2010.






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**(b)** Use **Graphs 1** and **2** to describe **and** explain the evidence that links smoking to lung cancer.

_____

_____

_____

_____

_____ [3]

**(c)** Apart from causing lung cancer, smoking affects smokers in many other ways. For example, many smokers often lack energy.

Explain why.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**4** **(a)** Global warming is a result of the carbon cycle becoming unbalanced. Give an account of global warming.

Your account should describe **and** explain:

- the causes
- the effects
- what can be done to reduce global warming.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** Pollution in the environment can be monitored through the use of biotic indicators such as lichens. Explain why lichens are effective in doing this.

[1]

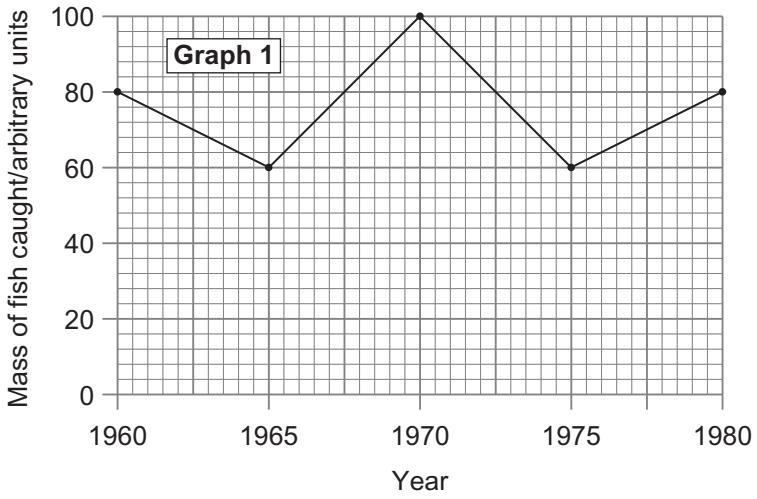
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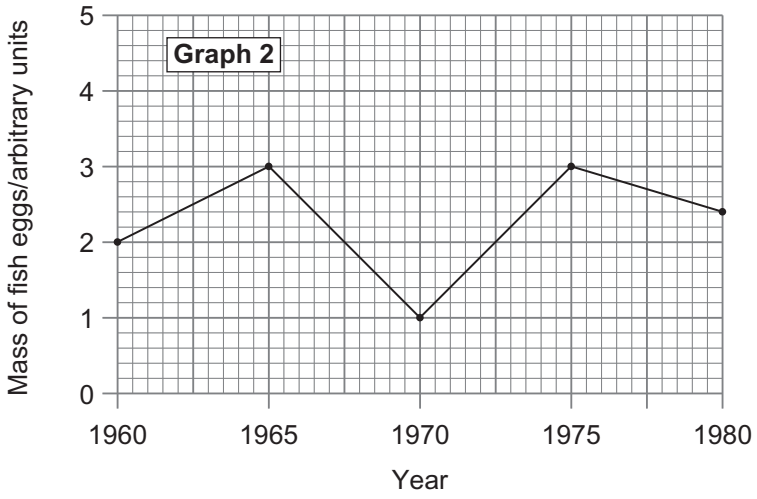
**(Questions continue overleaf)**


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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**5** **(a)** **Graph 1** shows the mass of fish caught in a part of the Irish Sea between 1960–1980. **Graph 2** shows the mass of fish eggs spawned (produced) in the same period.




**(i)** Describe **and** explain the relationship between **Graph 1** and **Graph 2**.

_____

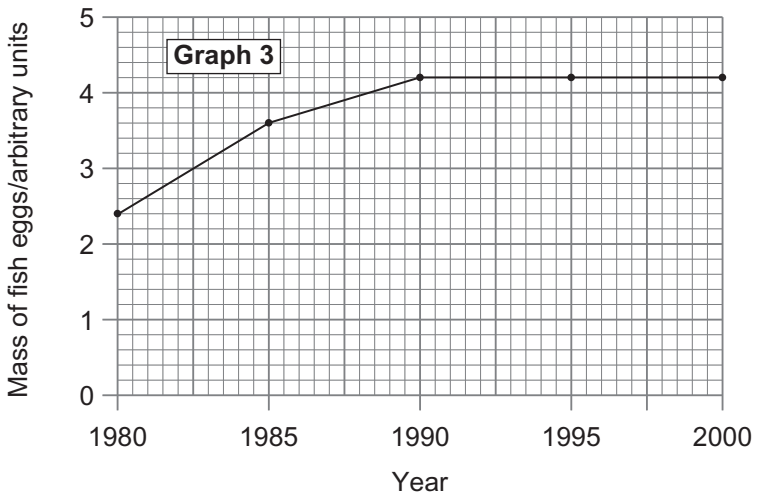
_____

_____ [2]



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In 1980 the fishing fleets fishing this area of the Irish Sea started using nets with larger mesh sizes. **Graph 3** shows the mass of fish eggs spawned in the sea in the same period.




**(ii)** Describe **and** explain the change in the mass of fish eggs spawned between **Graph 3** and **Graph 2**.

[3]

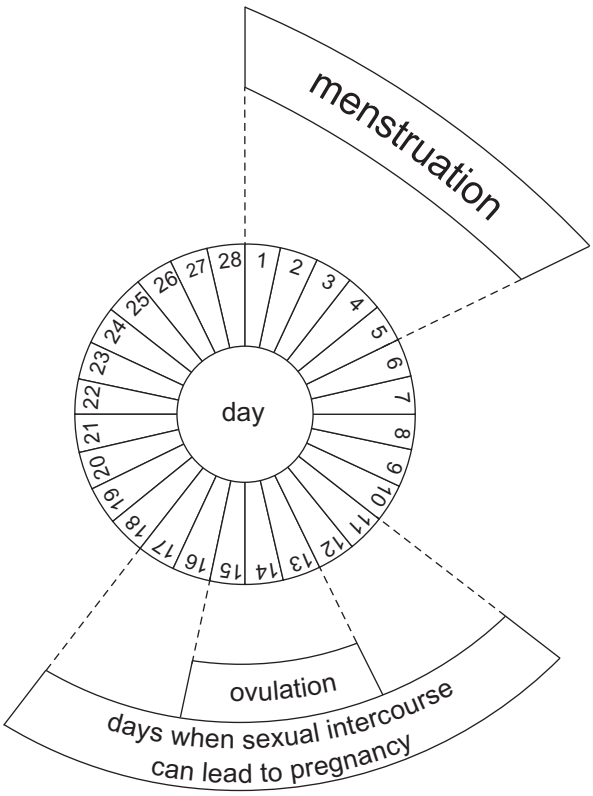
**(b)** Nitrate pollution of waterways is caused by 'run-off' from farming. Explain fully how nitrate pollution could reduce fish stocks in a river.

[3]

Examiner Only

| Marks | Remark |
|---|---|
| | |

**6** The diagram below shows the menstrual cycle.




*Adapted from: © GCSE Single Award Science for CCEA by T Laverty, J Napier & R White, published by Hodder Murray, 2006 ISBN 0340926007. "Reproduced by permission of Hodder Education"*

**(a)** Use this information to calculate the percentage of days in the cycle that can lead to pregnancy.

(Show your working out.)

_____ % [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(b)** The menstrual cycle is controlled by the hormones oestrogen and progesterone.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(i)** Describe fully what a hormone is.

_____

_____ [2]

**(ii)** The role of oestrogen is to stimulate ovulation. Use the diagram to suggest which day the level of oestrogen is likely to be at its highest.

Day _____ [1]

**(iii)** Describe fully the function of progesterone in the menstrual cycle.

_____

_____

_____ [2]

**(iv)** Describe fully how the female contraceptive pill prevents pregnancy.

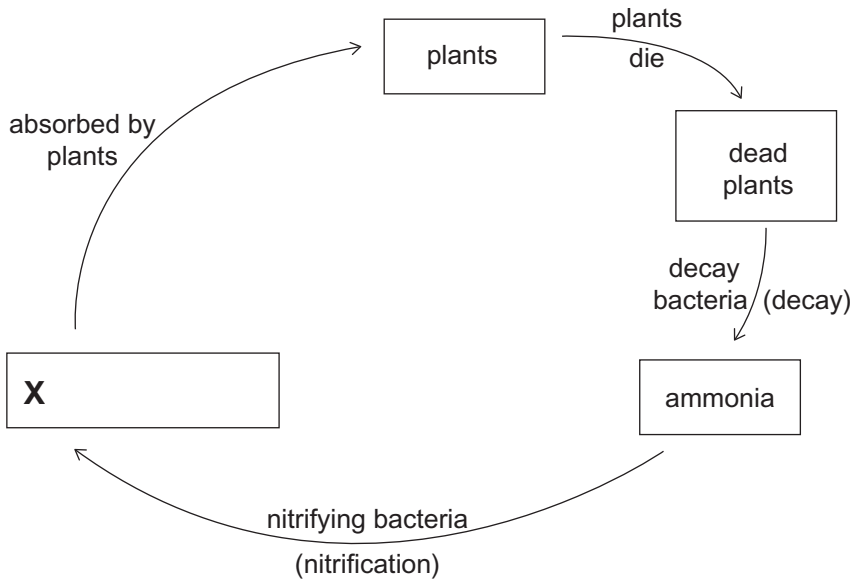
_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**7** **(a)** The following diagram shows part of the nitrogen cycle.




Use the diagram and your knowledge to answer the following questions.

**(i)** On the diagram, complete the label for box **X**. [1]

**(ii)** Explain why the harvesting of plants for food will cause a decrease in soil nitrogen levels.

_____

_____

_____

_____

_____ [3]

**(b)** The following table shows the activity of decay and nitrifying bacteria in a compost bin filled with grass cuttings. It also shows the temperature in the middle of the compost heap.

**Note:** 10 = maximum bacterial activity; 1 = minimum bacterial activity

| Day | Bacterial activity | | Temperature/°C |
|---|---|---|---|
| | Decay bacteria | Nitrifying bacteria | |
| **1** | 1 | 1 | 16 |
| **2** | 4 | 1 | 18 |
| **3** | 8 | 2 | 24 |
| **4** | 10 | 5 | 28 |
| **5** | 9 | 7 | 31 |
| **6** | 6 | 10 | 32 |
| **7** | 4 | 8 | 28 |
| **8** | 1 | 5 | 21 |
| **9** | 1 | 3 | 19 |
| **10** | 1 | 1 | 17 |

**(i)** What is the evidence from the table that the process of decay comes before nitrification?

_____

_____ [1]

**(ii)** Suggest on which day the process of **decay** was completed.

Day _____ [1]

**(iii)** Name the process that produced the heat energy in the bacteria to cause the temperature of the compost heap to rise.

_____ [1]

**(iv)** Suggest **one** environmental advantage of using garden waste to make compost.

_____ [1]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**8** Attacks by insect pests result in a loss of up to 30% of the world's crops each year leading to food shortages in many developing countries. Chemical pesticides can kill the pests but they will also harm or kill the natural predators of the pests, e.g. birds. Chemical pesticides also pollute the soil.

Genetically modified (GM) maize contains a bacterial gene (the *Bt* gene) that produces a protein that makes the maize poisonous to insect pests.

Some people are concerned about the use of GM crops. They claim that the long term effect of eating genetically modified maize is unknown and that the GM genes will transfer to native species forming 'super-weeds'. However, these claims are not supported by scientific evidence.

**(a)** Using GM maize as an example, describe what is meant by genetic engineering.

_____

_____

_____ [2]

**(b)** Name the secondary consumer listed in the passage.

_____ [1]

**(c)** Using the information provided, give **three** benefits of using genetically modified maize.

1. _____

2. _____

3. _____ [3]

**(d)** Many scientists claim that opposition to GM crops is based on public misunderstanding rather than being scientific.

What is the evidence in the passage that supports the scientists' claim?

_____

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |

**9** **(a)** Most British fields of grass have a small number of grass plants (usually <1%) that have a mutation that makes them tolerant to copper-rich soils. However, the mutation that provides copper-tolerance also makes the copper-tolerant plants grow much more slowly.

**(i)** Using your understanding of natural selection, explain why the proportion of copper-tolerant plants is so low in a typical British field.

[3]

**(ii)** In some areas of south west England where the soils contain high levels of copper, the proportion of copper-tolerant plants reaches almost 100%.

Explain this observation.

[2]

**(b)** Cancer in humans is caused by mutation.

Describe how excessive sunbathing can result in the presence of cancer in an individual's skin.

[2]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**10 (a)** Describe the structure of DNA and explain the link between the DNA code and the formation of proteins.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** The development of the understanding of DNA structure is an example of the collaborative nature of science.

With reference to this example, describe what is meant by the 'collaborative nature of science'.

[3]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**TUESDAY 14 MAY 2013, MORNING**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | **(i)** | Nucleus [1] | |
| | | **(ii)** | Genes [1] | |
| | **(b)** | **(i)** | | |

| | | |
|---|---|---|
| | | r |
| r | | rr |
| | Rr | |

Gametes correct [1] offspring correct [1] [2]

**(ii)** 50% [allow ncm] [1]

**(iii)** RR [1] 6

**2** **(a)** **(i)** Time for antibodies to be made/immune system responding to infection [1]

**(ii)** Takes time for immunity level to be achieved [1]
antibody level remains high [1] [2]

**(b)** Phagocytes engulf/surround/bacteria/microbes [1]
bacteria/microbes are digested/eaten/killed [1] [2]

**(c)** **(i)** Flu is a virus/antibiotics do not work on viruses [1]
Antibiotics only work on bacteria [1] [2]

**(ii)** Bacterial/microbe resistance/bacteria mutate [1] 8

**3** **(a)** 1970 [1]

**(b)** Any **three** from
- both percentage of males who smoke and lung cancer in males decreasing from 1950–2010/when percentage of male smokers high, number of males with cancer high
- when percentage of male smokers low/number of males with lung cancer low
- when percentage of female smokers rise so does number with lung cancer
- lag between smoking and lung cancer peaks due to time taken to develop lung cancer
- more male (than female) smokers, more males than females had lung cancer [3]

**(c)** Any **two** from
- carbon monoxide in cigarette smoke
- reduces blood's ability to carry oxygen/less oxygen
- for respiration [2] 6



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AVAILABLE MARKS

**4 (a) Indicative content**

- increased combustion/use of fossil fuels
- deforestation
- increases carbon dioxide in atmosphere/too much carbon dioxide
- greenhouse layer/carbon dioxide layer traps escaping heat energy/heat cannot escape from atmosphere
- climate change/more extreme weather conditions
- melting of ice caps/sea levels rise
- alternative fuels/reduced combustion/energy efficiency
- increase in forests

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe global warming using **six to eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| B | Candidates use some appropriate specialist terms to describe global warming using **three to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| C | Candidates describe global warming work using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| D | Not worthy of credit. | [0] |

[6]

**(b)** Only grow where pollution levels are low/high levels of pollution kills them [1]

7



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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **5** | **(a)** | **(i)** | Inversely proportional/when mass of fish caught high mass of fish eggs low/when mass of fish caught low mass of fish eggs high [1] if more fish caught fewer fish left to produce eggs/or converse [1] [2] | |
| | | **(ii)** | Any **three** from<br>● in 1980–2000 more eggs spawned/numbers increase<br>● in 1980–2000 fewer fluctuations<br>● use of nets with larger mesh sizes allowed smaller fish to escape/mature<br>● and lay eggs/breed [3] | |
| | **(b)** | | Any **three** from<br>● causes growth of algae/water plants<br>● block out light from submerged plants<br>● bacteria (decomposing dead plants)<br>● use up oxygen causing death of fish [3] | 8 |
| **6** | **(a)** | | 7/28 [1] 25% [1] [2] | |
| | **(b)** | **(i)** | **Chemical messengers** that travel in the **blood** to a **target organ** (all three components in bold included = 2; any two = 1) [2] | |
| | | **(ii)** | 12–14 [1] | |
| | | **(iii)** | Maintains the uterine lining [1] as preparation for pregnancy [1] [2] | |
| | | **(iv)** | Changes hormone levels [1] and stops the development of an ovum/stops ovulation [1] [2] | 9 |
| **7** | **(a)** | **(i)** | Nitrates [1] | |
| | | **(ii)** | No/fewer dead plants/plants containing nitrogen removed [1] for decay bacteria/for decay/ammonia production [1] less nitrification/fewer nitrates [1] [3] | |
| | **(b)** | **(i)** | Decay bacteria peak before nitrifying bacteria [1] | |
| | | **(ii)** | Day 8 [1] | |
| | | **(iii)** | Respiration [1] | |
| | | **(iv)** | Saves peat/moss/natural resources/less landfill/not adding chemicals to soil [1] | 8 |



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| | | | AVAILABLE MARKS |
|---|---|---|---|
| 8 | **(a)** | Transfer (or modification) of DNA/(Bt) genes [1] from one organism to another [1] [2] | |
| | **(b)** | Birds [1] | |
| | **(c)** | Less pollution/fewer chemical pesticides used [1]<br>do not kill natural predators of pest [1]<br>fewer food shortages/more food [1] [3] | |
| | **(d)** | No scientific evidence for GM crops causing harm [1] | 7 |
| 9 | **(a)** | **(i)** Any **three** from<br>● copper tolerance is a disadvantage/normal plants have an advantage<br>● copper tolerant plants selected against/eliminated by natural selection/out-competed<br>● explanation of how it is out-competed<br>● in typical British field/where there is no copper pollution [3] | |
| | | **(ii)** Normal/non copper tolerant plants cannot survive [1]<br>Copper tolerant plants can survive/have advantage in this environment [1] [2] | |
| | **(b)** | Any **two** from<br>● UV rays<br>● damages genes/chromosomes of skin<br>● leading to uncontrolled cell division [2] | 7 |



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**10 (a) Indicative content**

- double helix/two strands
- [backbone of] phosphate and sugar
- linked by bases/base pairing/or explained, e.g. A joins with T/ bases hold strands together
- bases form code/one side of DNA is coding strand
- base triplet is series of 3 bases
- base triplet/three bases code for an amino acid
- [sequence of] amino acids forms protein

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe DNA structure and function using **five to seven** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| B | Candidates use some appropriate specialist terms to describe DNA structure and function using **three to four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| C | Candidates describe DNA structure/function using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | [1–2] |
| D | Not worthy of credit. | [0] |

[6]

**(b)** New discoveries build on previous discoveries/scientists collaborate to produce new research above and beyond what they could do separately [1]

Any **two** from

- Chargaff worked on quantitative analysis of bases/discovered that amount of A=T/C=G
- Franklin then used X-ray diffraction to find overall shape of DNA
- Watson and Crick used modelling to identify double helix structure

[2]

**Total**

AVAILABLE MARKS

9

**75**

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| Centre Number | |
|---|---|
| 71 | |

| Candidate Number |
|---|
| |

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**MONDAY 25 FEBRUARY 2013, MORNING**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **4(a)** and **8(a)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| Total Marks | |

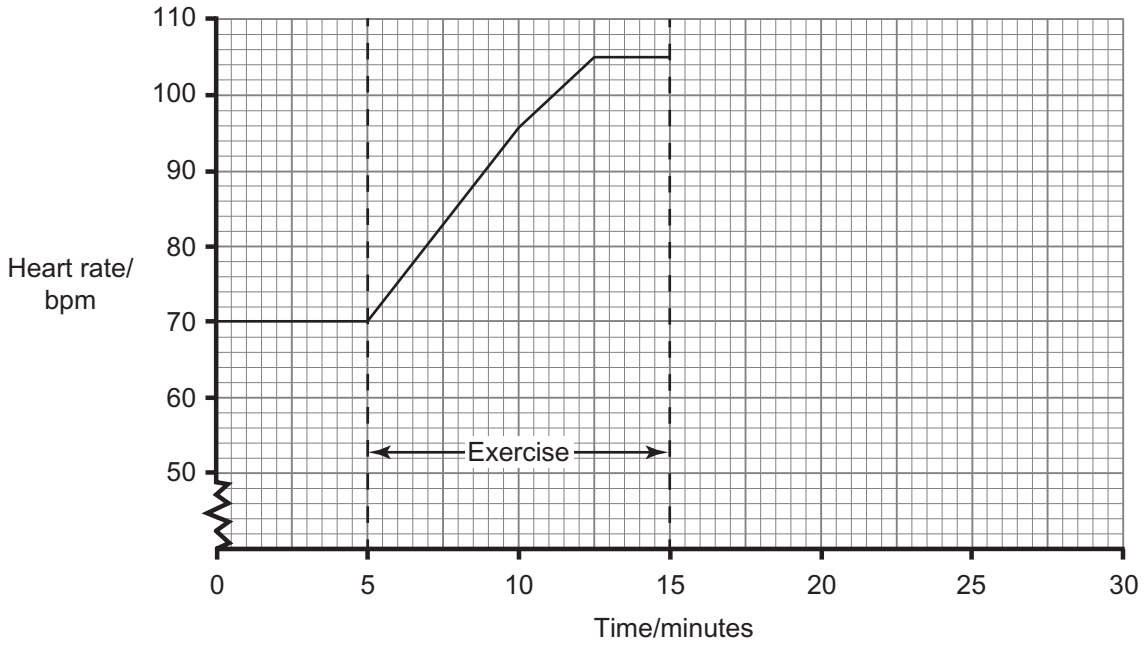


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| Examiner Only | |
|---|---|
| Marks | Remark |

**1** **(a)** The following graph shows the effect of exercise on Tracey's heart rate.




Tracey stopped exercising at 15 minutes and her heart rate steadily returned to her resting rate in 5 minutes.

**(i)** Complete the graph to show Tracey's heart rate between 15 and 30 minutes. [2]

**(ii)** Calculate the increase in Tracey's heart rate during exercise.

_____ bpm [1]

**(iii)** Calculate the percentage increase in Tracey's heart rate during exercise.

_____ % [1]

**(iv)** Explain fully why Tracey's heart rate increased during exercise.

_____

_____

_____

_____

_____ [3]



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The following table shows the average cholesterol levels for men and women in various age groups.

| Age | Average cholesterol level/arbitrary units | |
|---|---|---|
| | Men | Women |
| 15–24 | 4.2 | 4.1 |
| 25–34 | 5.2 | 4.8 |
| 35–44 | 5.5 | 5.1 |
| 45–54 | 5.9 | 5.8 |
| 55–64 | 6.5 | 6.3 |

**(b)** Give **two** trends shown by the information in the table.

1. _____

_____

2. _____

_____ [2]

**(c)** Give **two** lifestyle changes that can help reduce heart disease.

1. _____

2. _____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**2** The flowers of a particular plant can be either red or white. When two plants with red flowers were crossed the following colours were produced.

| | Red flowers | White flowers |
|---|---|---|
| **Number** | 150 | 50 |

**(a)** What is the ratio of red to white flowers?

_____ [1]

**(b)** **(i)** Complete the genetic diagram below to explain the outcome of the cross above.

| | | |
|---|---|---|
| | | r |
| | | |
| | Rr | |

[2]

**(ii)** Complete the offspring genotypes and phenotypes for the cross above.

**genotypes** _____ Rr _____ _____ [1]

**phenotypes** _____ Red _____ _____ [1]



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**3** The photograph below shows lichen growing on a tree.



*Source: Chief Examiner*

Lichen is a biotic pollution monitor as it only grows in large numbers where there is very little pollution.

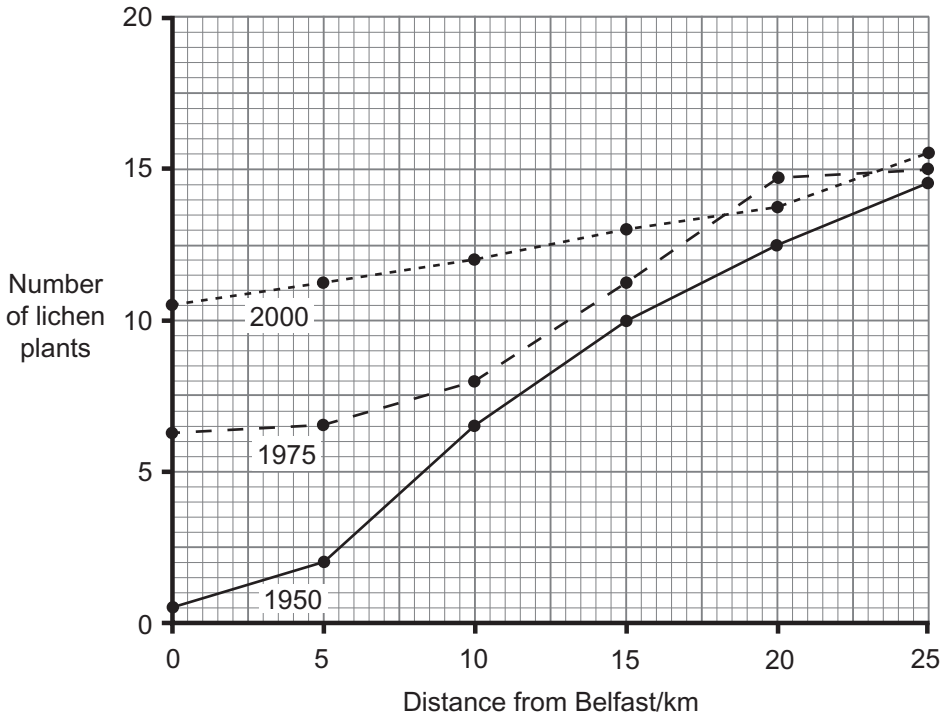
**(a)** What is meant by the term 'biotic'?

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** The graph shows the relationship between the number of lichen plants on trees and their distance from Belfast in the years 1950, 1975 and 2000.




**(i)** Using the information provided, describe and explain **one** trend about the change in **air pollution** in and around Belfast.

_____

_____

_____

_____ [2]

**(ii)** When collecting the data suggest **two** things that must be done to make the investigation valid (a fair test).

1. _____

2. _____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

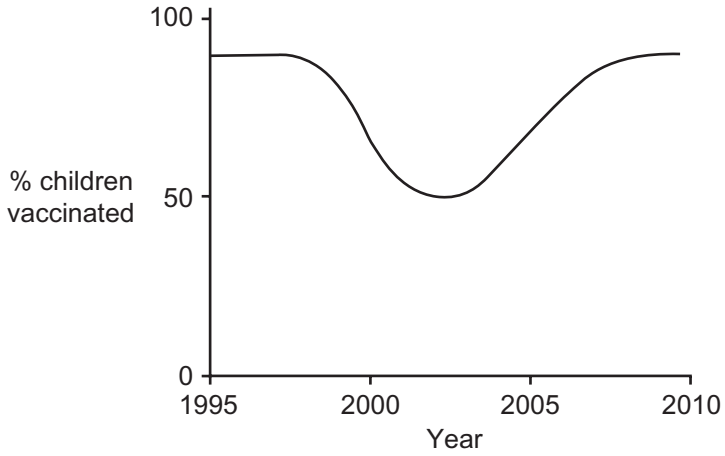
**4** **(a)** Vaccinations help us defend against disease by giving us active immunity.

Describe and explain how vaccinations protect against disease and why they provide long term active immunity.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** The following graph shows how the percentage of children being vaccinated against MMR has changed between 1995 and 2010.




Use the graph to answer the following questions.

**(i)** In 1998 a scientist suggested that there was a link between the MMR vaccination and autism. What is the evidence that the link between autism and the MMR vaccination has been disproved?

_____

_____ [1]

**(ii)** Give **one** piece of evidence that suggests that some parents still have other concerns about the MMR vaccination.

_____ [1]

**(c)** Penicillin is an antibiotic which protects against disease. Describe Fleming's role in the discovery of penicillin.

_____

_____

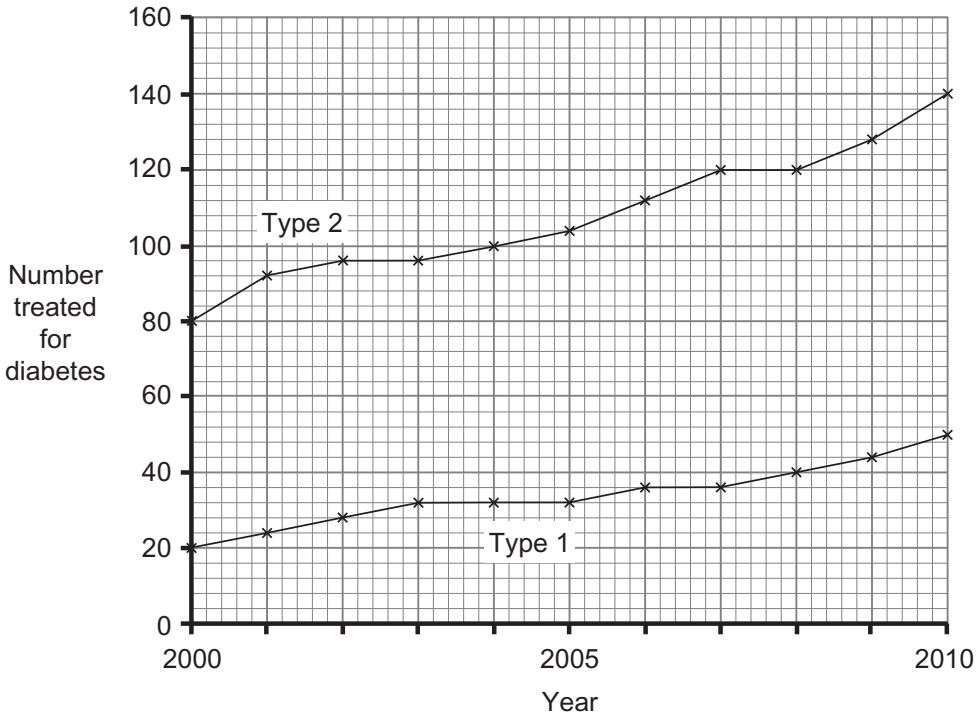
_____ [2]

Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**5** **(a)** The following graph shows the number of people with Type 1 and Type 2 diabetes attending a hospital over a ten year period.




**(i)** Calculate the percentage increase in the **total** number of people being treated for **diabetes** between 2000–2010.

(Show your working out.)

_____ % [2]

**(ii)** Give **one** reason for the increase in **Type 2** diabetes over the ten year period.

_____ [1]



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The cost of treating diabetes in the UK is increasing rapidly and currently takes up over 10% of the Health Service budget.

| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** Apart from the cost of producing insulin, suggest **one** reason why the treatment of diabetes is very expensive.

_____

_____ [1]

**(c)** Developing drugs such as insulin is an expensive and long term process. The drugs must be tested to ensure that they are effective and also that they have few or no side effects.

**(i)** Describe what is meant by the term 'side effect'.

_____

_____ [1]

**(ii)** Suggest why a drug could be licensed for use even though it has some side effects.

_____

_____ [1]

**(iii)** Apart from ethical considerations, give **one** advantage and **one** disadvantage of testing drugs on animals.

Advantage _____

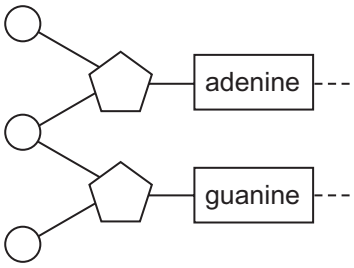
_____

Disadvantage _____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**6** **(a)** The following diagram shows part of a DNA molecule.




**(i)** Complete the diagram to show both strands of DNA. [2]

**(ii)** State what is meant by the unique nature of an individual's DNA.

_____

_____ [1]

**(b)** Cystic fibrosis (CF) is a condition caused by a mutation of a single gene that affects about 1 in 2500 babies.

The foetus can be screened for CF but as the test has a small (2%) risk of miscarriage (loss of baby) it is usually only done when the condition is suspected. All new born babies in the UK are tested for CF.

**(i)** Use the information provided to explain fully why all foetuses are not screened for cystic fibrosis.

_____

_____

_____ [2]

**(ii)** Suggest **one** advantage of testing for cystic fibrosis in all **new born babies**.

_____ [1]



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**(c)** Cystic fibrosis damages the lungs and the digestive system of those affected and can be treated by gene therapy. This involves spraying the normal alleles into the lungs using aerosols. The normal allele can pass into the lung cells that the spray reaches to give normal functioning in these cells.

Use this information and your knowledge to explain fully why gene therapy is only partially successful in the long term treatment of cystic fibrosis.

_____

_____

_____

_____ [3]

**(d)** Give **one** reason why most governments are not in favour of making genetic information available to insurance companies.

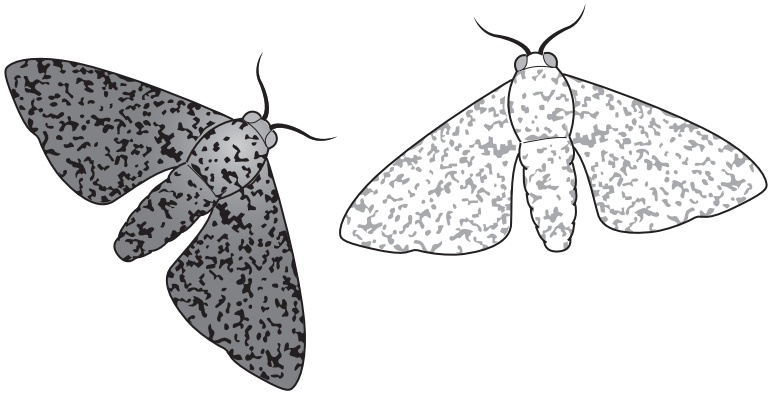
_____

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**7** The peppered moth exists in two genetically distinct forms, the light and dark variety as shown in the following diagram.



Both types of moth spend a lot of time resting on tree trunks where they are prone to being eaten by birds.

The table below shows the percentage of moths of each variety in two regions of England in 1950.

| Region | % moths | |
|---|---|---|
| | Light variety | Dark variety |
| Dorset | 96 | 4 |
| Manchester | 9 | 91 |

In highly industrialised Manchester the trees were blackened due to smoke (soot) pollution in 1950 whereas there was little pollution in the more rural Dorset.

**(a)** Describe and explain the results in the table.

[3]



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**(b)** Since 1950 Government legislation has reduced the amount of soot pollution throughout the UK.

Suggest how this may have changed the numbers of peppered moths in each region. Explain your answer.

_____

_____

_____ [2]

**(c)** **(i)** Explain fully what is meant by the term 'evolution'.

_____

_____

_____ [2]

**(ii)** Suggest why the theory of evolution is not universally accepted.

_____

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**8** **(a)** The planting of willow as a biofuel is an example of sustainable development that both conserves natural resources and does not add to global warming.

Describe and explain how the use of willow as a biofuel is a positive conservation measure.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

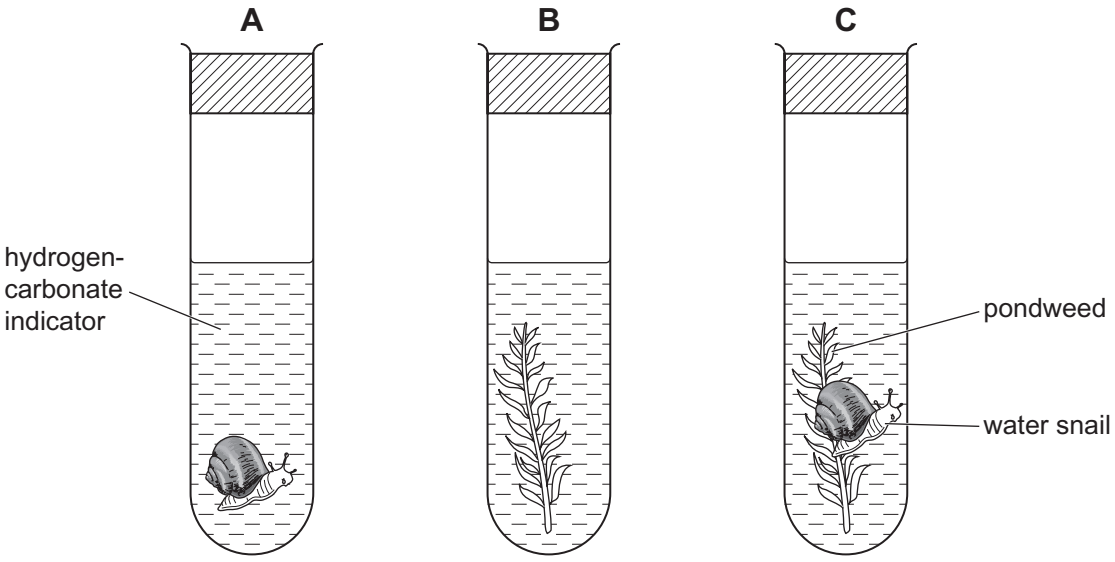
**(b)** In contrast to using willow, the introduction of competitive invasive species such as rhododendron creates conservation problems.

Explain why it is important to restrict the spread of rhododendron.

[3]

| Examiner Only | |
|---|---|
| Marks | Remark |

**9** **(a)** The diagram shows apparatus used to investigate gas exchange in animals and plants.




The hydrogencarbonate indicator shows the level of carbon dioxide by changing colour as below:

| **Reduced** carbon dioxide | **Normal** (atmospheric) carbon dioxide | **Increased** carbon dioxide |
|---|---|---|
| **Purple** | **Red** | **Yellow** |

Each tube was set up with normal indicator at the start and left in the light for two hours.

**(i)** Complete the table below to give the colour in each tube after two hours.

| | **Colour of indicator** | |
|---|---|---|
| **Tube** | **At start** | **After two hours** |
| **A** | red | |
| **B** | red | |
| **C** | red | |

[2]


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| Examiner Only | |
|---|---|
| Marks | Remark |

**(ii)** Plants and animals are interdependent.

Give **two** reasons why plants are necessary for animal life.

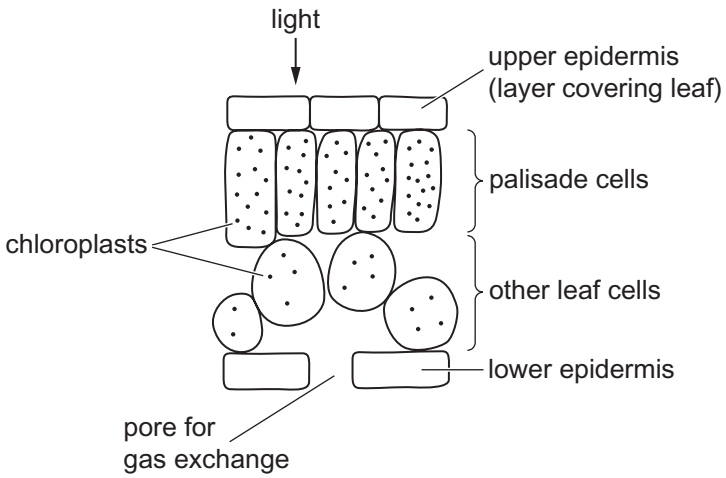
_____

_____

_____

_____ [2]

The diagram below shows a section through a leaf.




**(b)** Using the diagram, describe **two** ways in which palisade cells are adapted to maximise the rate of photosynthesis.

_____

_____

_____

_____ [2]

**(c)** Describe the term phototropism and explain fully how it affects the growth of plants.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

_____

_____

_____

_____ [3]

**THIS IS THE END OF THE QUESTION PAPER**

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**MONDAY 25 FEBRUARY 2013**
**9.30 am–10.45 am**

# MARK SCHEME



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## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | **(i)** | Each point accurate (20 min = 70 bpm; 30 min = 70 bpm) [1] with correct line joining points from end of exercise [1] [2] | |
| | | **(ii)** | 35 bpm [1] | |
| | | **(iii)** | 50% [1] | |
| | | **(iv)** | Any **three** from:<br>● more/quicker blood (or blood component)<br>● provides oxygen/glucose<br>● for respiration<br>● in muscles [3] | |
| | **(b)** | | Men have higher cholesterol levels than women [1] cholesterol levels increase with age (in both sexes) [1] [2] | |
| | **(c)** | | Any **two** from:<br>● reducing stress<br>● stopping smoking<br>● exercise<br>● reducing drinking of alcohol [2] | 11 |
| **2** | **(a)** | | 3 : 1/75%:25% [1] | |
| | **(b)** | **(i)** | Punnett Square<br>(gametes;)<br>(offspring based on gametes;) [2] | |

| | | |
|---|---|---|
| | R | |
| R | RR | Rr |
| r | | rr |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **(ii)** | Offspring genotypes (based on Punnett Sq) | RR | | Rr | rr [1] | |
| | | Offspring phenotypes (based on genotype) | Red | | Red | White [1] | 5 |

| | | AVAILABLE MARKS |
|---|---|---|
| **3** **(a)** Living/biological [1] | | |
| **(b)** **(i)** Decrease in pollution between 1950–2000/decrease in pollution the further away from Belfast [1]<br>less fossil fuels used/more alternative fuels used/Belfast more polluted as has more industry [1] [2] | | |
| **(ii)** Any **two** from:<br>● same number of trees sampled at each point<br>● same area of each tree sampled<br>● same place on each tree sampled<br>● same time of year/season<br>● same type of trees<br>● same trees/geographical area [2] | | 5 |

AVAILABLE MARKS

**4 (a) Indicative content**

- modified/weakened/dead microorganisms/pathogens/named microorganism
- (cause) antibody production
- by lymphocytes/white blood cells
- due to antigens present
- (if infected with same microorganism) antigens and antibodies combine/due to complementary shape
- causing clumping/immobilisation
- (long term immunity due to) creation of memory cells/antibody levels remain high/antibodies produced faster
- as antibodies produced by body is active immunity

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe how vaccinations work using **five to eight** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | 5–6 |
| B | Candidates use some appropriate specialist terms to describe how vaccinations work using **three to four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | 3–4 |
| C | Candidates describe how vaccinations work using **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | 1–2 |
| D | Not worthy of credit. | 0 |

[6]

**(b) (i)** The percentage of children vaccinated has increased [1]

**(ii)** The vaccination uptake does not reach 100%/not all children are vaccinated [1]

**(c)** Fleming discovered that some bacterial colonies were contaminated by fungi/mould [1]
the fungi stopped the growth/killed the bacteria [1] [2]

10



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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **5** | **(a)** | **(i)** | 190 – 100 [1]<br>90 = [1] [2] | |
| | | **(ii)** | People eating more/overweight/obesity/less exercise [1] | |
| | **(b)** | | Large number of people that have diabetes/cost of treating long term effects/long lasting condition/long term effect explained e.g. cost of treating blindness [1] | |
| | **(c)** | **(i)** | Harmful/abnormal consequence of taking drug/medicine [1] | |
| | | **(ii)** | Gain greater than problem caused due to side effect/no other alternative [1] | |
| | | **(iii)** | Advantage – Humans not harmed/whole body systems [1]<br>Disadvantage – humans different/will react differently [1] [2] | 8 |
| **6** | **(a)** | **(i)** | (Matching) strand completed [1]<br>Bases correctly match [1] [2] | |
| | | **(ii)** | Each individual has DNA different to everyone else [1] | |
| | **(b)** | **(i)** | Risk of miscarriage [1]<br>is greater than risk of developing cystic fibrosis/only a small chance of developing CF [1] [2] | |
| | | **(ii)** | Treatment can begin earlier [1] | |
| | **(c)** | | Any **three** from:<br>● will not affect damage to digestive system<br>● will not target/reach all cells<br>● needs to be continually done to target replacement cells/not permanent/short lived<br>● harmful condition still passes on to children affected<br>● side effects of using aerosols/harmful to own DNA [3] | |
| | **(d)** | | Patients may not get insurance/if get insurance may be more expensive [1] [1] | 10 |

AVAILABLE MARKS

**7** **(a)** Dorset mainly light and Manchester mainly dark [1]
appropriate reference to camouflage [1]
link between colour and predation [1] [3]

**(b)** Most moths are light variety (in all areas)/darkest moths decrease [1]
in all areas light variety better adapted/darker moths less well adapted [1] [2]

**(c)** **(i)** Change/adaptation in a species/type of organism/new species form [1]
over time [1] [2]

**(ii)** Contradicts the teaching of the Church/long time scales involved/complex concept [1] 8

**8** **(a)** **Indicative content**

- conserves fossil fuels
- renewable
- uses carbon dioxide
- in photosynthesis (when growing)
- to offset carbon dioxide produced/does not add to carbon dioxide levels
- during combustion of willow

| Band | Response | Mark |
|---|---|---|
| A | Candidates must use appropriate specialist terms throughout to describe the benefits of using willow including **five or six** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | 5–6 |
| B | Candidates use some appropriate specialist terms to describe the benefits of using willow including **three or four** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | 3–4 |
| C | Candidates describe the benefits of using willow including **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard. | 1–2 |
| D | Not worthy of credit. | 0 |

[6]

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| | **(b)** | Any **three** from:<br>● non-native<br>● spreads rapidly<br>● damages other species/habitats<br>● more successfully competing for light/nutrients/space/water<br>● maintain biodiversity | [3] | 9 |
| **9** | **(a)** **(i)** | A – yellow; B – purple; C – red – all correct [2]<br>1–2 correct [1] | [2] | |
| | **(ii)** | Produce oxygen for (animal) respiration [1]<br>are producers/provide food for animals [1] | [2] | |
| | **(b)** | Any **two** from:<br>● close to light<br>● tightly packed<br>● rich in chloroplasts/chlorophyll | [2] | |
| | **(c)** | ● plants grow towards light source [1]<br>Any **two** from:<br>● more light<br>● more photosynthesis<br>● more growth<br>● reference to hormones [2] | [3] | 9 |
| | | | **Total** | **75** |

New Specification

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| Centre Number | |
|---|---|
| 71 | |

| Candidate Number |
|---|
| |

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

GSS12

**MONDAY 12 NOVEMBER 2012, AFTERNOON**

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **2** and **8(a)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| Total Marks | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** **(a)** The ability to roll your tongue is caused by a dominant allele (R).

**(i)** Complete the diagram below to show how two parents who are tongue rollers can have a child who cannot roll his/her tongue.

| | | |
|---|---|---|
| | **R** | |
| | | |
| | **Rr** | |

[3]

**(ii)** What is the probability that they will have a child who cannot roll his/her tongue?

_____ [1]

**(b)** Tongue rolling is an example of discontinuous variation.

**(i)** What is meant by the term **discontinuous**?

_____ [1]

**(ii)** Suggest **one** other example of discontinuous variation.

_____ [1]

**(c)** The graph shows the result of recording the heights of a very large number of people. Complete the sketched line in the graph below.

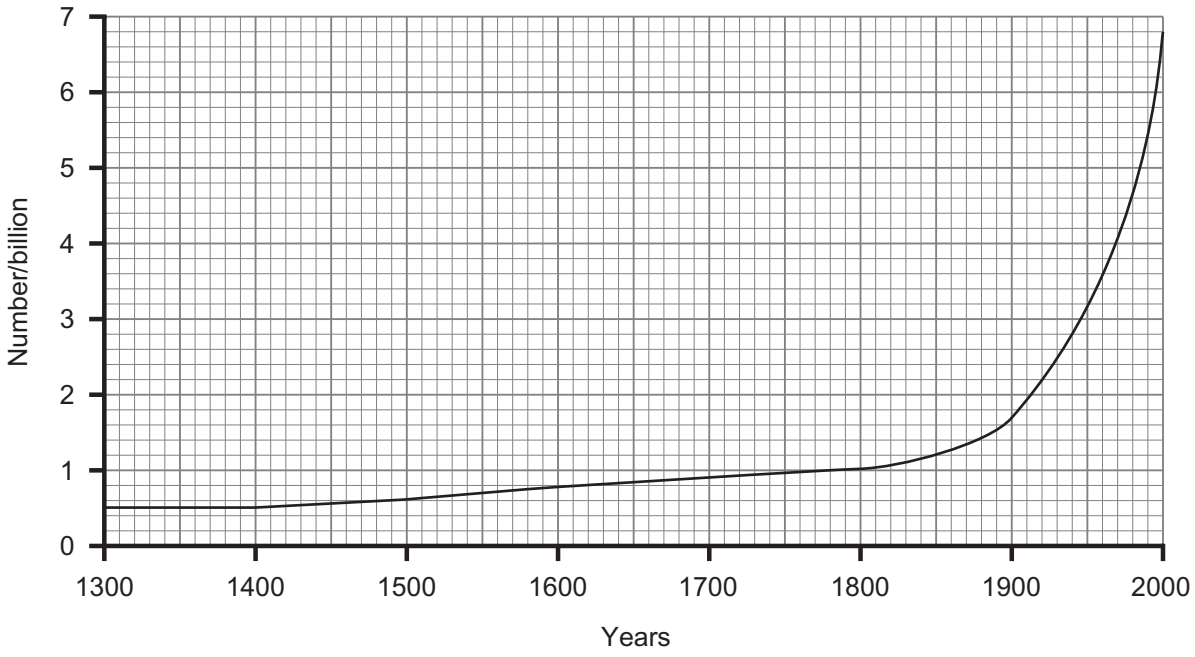



[2]



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**2** The graph below shows the human population from the year 1300 to the year 2000.




Use this graph and your knowledge to explain why there is concern that the human population size is putting planet Earth at risk.

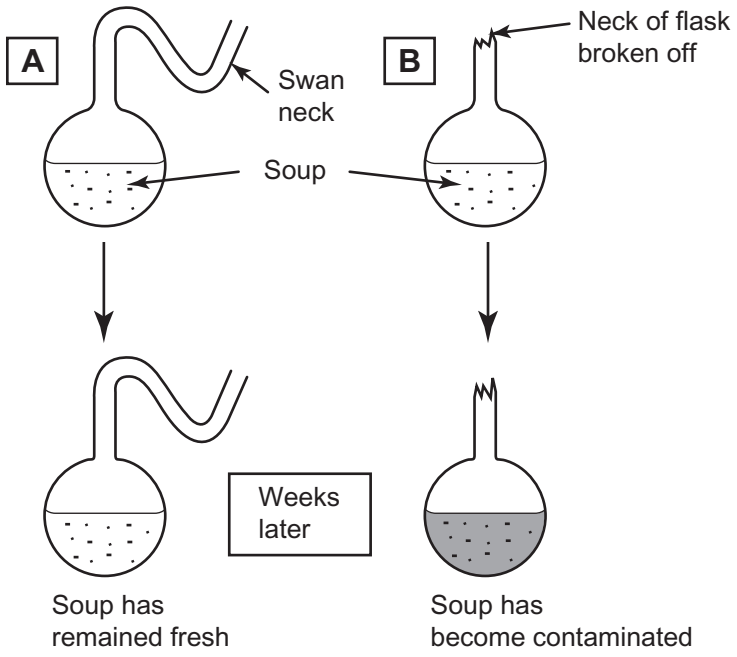
**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**3** **(a)** The following diagram shows the apparatus Louis Pasteur used to show that contamination of food was caused by microorganisms from the air.




**(i)** Explain fully why the soup in **A** stayed fresh and the soup in **B** did not.

_____

_____

_____

_____ [3]

**(ii)** Suggest **one** reason why there were less deaths from open wounds after Pasteur's discovery.

_____ [1]

**(b)** **(i)** Explain fully why diseases such as flu cannot be treated with antibiotics.

_____

_____

_____ [2]

**(ii)** Give **one** example of a disease that can be treated by antibiotics.

_____ [1]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**4** **(a)** Complete the table to show the differences between a voluntary and a reflex action.

Choose from:

**varies : fast : always the same : slow**

| Differences | Voluntary | Reflex |
|---|---|---|
| speed of response | | |
| response to stimulus | | |

[2]

**(b)** Describe the pathway taken when we respond to the stimulus of a loud noise by covering our ears with our hands. Include **three** structures of the nervous system in your answer.

_____

_____

_____

_____ [3]

**(c)** Describe the effect on the speed of reactions of:

alcohol. _____

_____

cocaine. _____

_____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**5** In a study, two methods were investigated to see which was better at reducing binge drinking. At the start one hundred men who were binge drinkers were divided into two groups of fifty.

**Group one** received one 5 minute session being given advice on how to reduce alcohol intake.

**Group two** received two 30 minute sessions being given advice on how to reduce alcohol intake.

Both groups were monitored over the following three weeks to note how many had been binge drinking.

Women were also involved in the trial. The same number were used and treated in the same way.

The results are shown in the table.

| | | Number binge drinking | | | | Overall decrease | |
|---|---|---|---|---|---|---|---|
| | | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Number** | **Percentage** |
| **Men** | Group 1 | 50 | 49 | 30 | 22 | 28 | 56 |
| | Group 2 | 50 | 37 | 15 | 12 | 38 | 76 |
| **Women** | Group 1 | 50 | 15 | 13 | 12 | 38 | 76 |
| | Group 2 | 50 | 9 | 7 | 5 | 45 | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(a)** Complete the table by calculating the overall percentage decrease for Group 2 women over the 4 week period. [1]

**(b)** Compare the effectiveness of the two methods in reducing binge drinking in the men in the study.

_____

_____ [1]

**(c)** It is often said that women take better care of their health than men.

Discuss the evidence from this study for and against this statement.

[3]

**(d)** State **two** reasons why any conclusions from this study may not be reliable.

[2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**6** The photograph below is of jewel anemones living in the sea off the Cornwall coast. It has been decided that this area is soon to be designated as a Marine Conservation Zone (a nature reserve in the sea).



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**(a)** Suggest **three** ways in which this decision will benefit the jewel anemones.

_____

_____

_____

_____ [3]

**(b)** Suggest **one** reason why representatives of the wind power industry made objections to this decision.

_____

_____ [1]

**(c)** This area contains a wide variety of species of marine organisms.

**(i)** What term is used to describe the variety of life on Earth?

_____ [1]

**(ii)** State **two** reasons why we need to maintain a wide variety of life on Earth.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**7** Below are three causes of pollution. For each, state which part of our environment is being polluted and give one strategy for reducing its effect.

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

Household waste

Acid rain

Nitrate levels

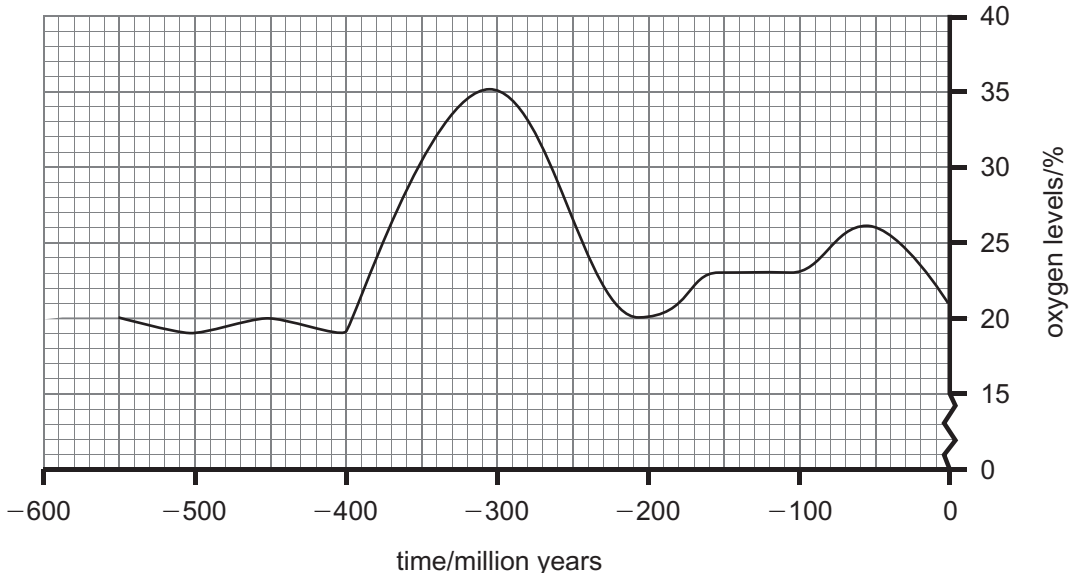
[3]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**8** **(a)** The graph below shows the percentage of oxygen in the Earth's atmosphere over the past 550 million years.




Describe and fully explain the change in oxygen levels between 400 and 200 million years ago.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

**(b)** Suggest **two** reasons why the Church was opposed to Darwin's theory of evolution.

[2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**9** **(a)** Rosalind Franklin and Maurice Wilkins collaborated to gain knowledge about the structure of DNA.

**(i)** Explain the term ‘collaborated’.

_____ [1]

**(ii)** State what Franklin and Wilkins discovered about the structure of DNA and name the practical process they used.

_____

_____

_____ [2]

**(b)** **(i)** Name the two scientists who used modelling to investigate the structure of DNA.

_____ and _____ [1]

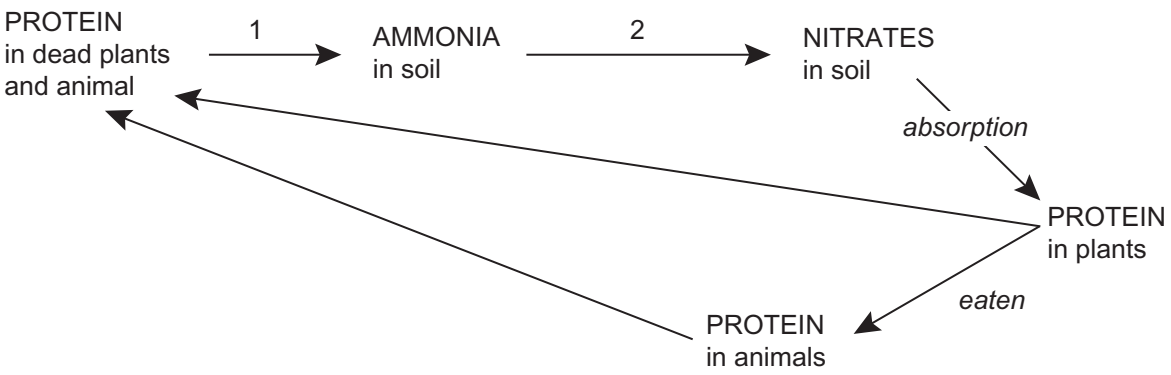
**(ii)** Erwin Chargaff also worked on the structure of DNA. Describe fully what he discovered.

_____

_____

_____ [2]

**10 (a)** Part of the nitrogen cycle is shown below.




**(i)** Name the processes labelled 1 and 2 in the diagram above.

Process 1 _____

Process 2 _____ [2]

**(ii)** Describe and explain **one** way that human activity could upset the balance of the nitrogen cycle.

_____

_____

_____ [2]

**(b)** Describe how the **carbon cycle** has become unbalanced and state the effect this is having.

_____

_____

_____

_____

_____ [3]

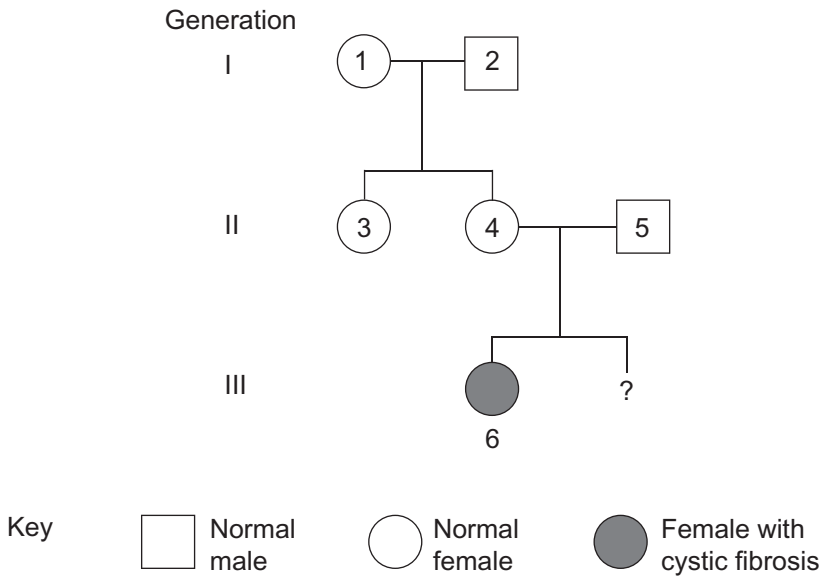
Examiner Only

| Marks | Remark |
|---|---|
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**11 (a)** Below is an example of a pedigree diagram showing how the condition cystic fibrosis is inherited.

Cystic fibrosis is a medical condition caused by a recessive allele.




**(i)** What is the relationship between person 3 and person 4?

_____ [1]

**(ii)** Using the symbol c to represent the cystic fibrosis allele, give the genotypes of person 4 and person 6.

person 4 _____

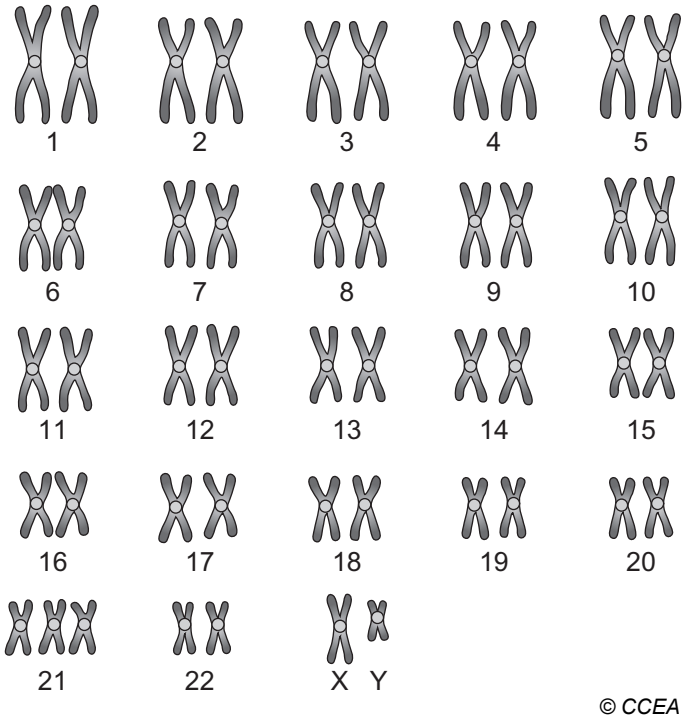
person 6 _____ [2]

**(iii)** The first child of persons 4 and 5 inherited cystic fibrosis. What is the probability that their second child will also inherit it?

_____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(b)** Below is a diagram showing the karyotype of someone who has Down syndrome.




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**(i)** Fully describe the mutation shown in this karyotype.

_____

_____ [2]

**(ii)** Suggest a reason why this mutation affects more parts of the body than the mutation that causes cystic fibrosis.

_____

_____

_____

_____ [3]

## THIS IS THE END OF THE QUESTION PAPER

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General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**MONDAY 12 NOVEMBER 2012**
**1.30 pm–2.45 pm**

# MARK SCHEME



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| | AVAILABLE MARKS |
|---|---|

**1 (a) (i)**

| | R | **r** |
|---|---|---|
| **r** | **Rr** | **rr** |
| **R** | RR | **Rr** |

1 – parents [1]
1 – each row F1 [2]
[use ncm for offspring if parents incorrect]

**(ii)** 25%/1 in 4/1:3 [allow ncm] [1]

**(b) (i)** does not change/narrow range/discrete groups/small number of groups [not can be put into groups] [1]

**(ii)** Any example (e.g. eye colour, blood groups, ear lobes, sex) [1]

**(c)** descending curve [1]
levelling out [1] [2]

8

**2 Indicative content**

- (Huge) increase over short time/1800–2000
- Increase more in future
- Increased demand for resources/supplies, e.g. food/will run out quicker
- Increased *pollution*
- Example of *pollution* ×2 e.g. carbon dioxide/sewage/nitrate/more fossil fuels burnt/more global warming [any two of final bullet point]

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates must use appropriate specialised terms throughout to explain the concern in a logical sequence using 5 or 6 of the IC. SPG, form and style is of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialised terms to partially describe the concern using 3 or 4 of the IC. SPG, form and style is of a satisfactory standard. | [3–4] |
| **C** | Candidates describe the concern using 1 or 2 of the IC. However these are not in a logical sequence. SPG, form, style and use of specialised terms are limited. | [1–2] |
| **D** | Not worthy of credit. | [0] |

6


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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **3** | **(a)** | **(i)** | A-microorganisms trapped [1] swan neck/bend [1] could not reach soup [1]/B – not trapped [1] no bend [1] could reach soup [1] [not just can or cannot cause contamination] [3] | |
| | | **(ii)** | knew to stop microorganisms getting in/cover wounds [1] | |
| | **(b)** | **(i)** | only affect diseases caused by bacteria [1] flu viral [1] [2] | |
| | | **(ii)** | TB/gonorrhoea/salmonella/chlamydia/MRSA/tonsillitis/meningitis/ acne/tetanus [1] | 7 |

**4** **(a)**

| Differences | Voluntary | Reflex |
|---|---|---|
| speed of response | *slow/varies* | *fast* |
| response to stimulus | *varies* | *always the same* |

$\frac{1}{2}$ mark each response, rounded down [2]

**(b)** (sound) receptors/ear sends signal [1] signal to coordinator/brain [1] effector/muscles [1]
*or* sensory neurone [1] sends signal to relay neurone [1] sends signal to motor neurone [1] [3]

**(c)** slows reactions/depressant [1]
quicker/more alert/stimulant [1] [2] — 7

**5** **(a)** 90% [1]

**(b)** Group two more effective (as reduced more)
[not just reference to or quoting figures] [1]

**(c)** bigger drop for female groups than men [1]
bigger drop initially [1]
did not stop all of the women [1] [3]

**(d)** small numbers [1]
short time [1] [2] — 7

**6** **(a)** protect (species) numbers [1] protect habitat [1] protect food supply [1] less pollution [1] no fishing [1] no wind turbines [1]
[not just protected on own] *Any* 3 [3]

**(b)** restricts operations/financial implications [1]

**(c)** **(i)** biodiversity [1]

**(ii)** economic benefits e.g. food/clothing/shelter/fuel/medicines ecological/recreational/cultural/aesthetic *Any* 2 [2] — 7


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| | AVAILABLE MARKS |
|---|---|

**7** land – recycling/reducing/reusing/any valid [1]
land/water/air – scrubbers/desulphurisation methods/catalytic converters/renewable sources/alternative energy [1]
water – reduce use of fertilisers/do not use when raining/any valid [1] [3] — 3

**8** **(a)** **Indicative content**

- 19% to 35% (+/−1) or doubled/it increases and decreases
- Plants (evolved)
- Photosynthesis started/$O_2$ produced
- Animals (evolved)
- Animal respiration possible
- Uses oxygen

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates must use appropriate specialist terms throughout to describe **five or six** points above. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialist terms to describe **three** or **four** of the points above in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| **C** | Candidates describe **one or two** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard. | [1–2] |
| **D** | Response not worthy of credit. | [0] |

[6]

**(b)** denied role of God/uniqueness of man/reduced power *Any* 2 [2] — 8

**9** **(a)** **(i)** worked together/helped each other [1]

**(ii)** 3D structure/spiral shape/helix shape/bases inside [1] x-ray diffraction [1] [2]

**(b)** **(i)** Watson and Crick [1]

**(ii)** Equal <u>amounts</u> [1] A and T/C and G [1]
[A = T and C = G; 2 marks] [2] — 6


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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **10** | **(a)** | **(i)** | decay/decomposition [1]<br>nitrification [1] [2] | |
| | | **(ii)** | (over)farming/deforestation/(any valid answer that implies man stopping decomposition) [1] with suitable explanation [1] [2] | |
| | **(b)** | | increase in combustion/use of fossil fuels [1] more $CO_2$/global warming/greenhouse effect [1] deforestation/reduced photosynthesis [1] [3] | 7 |
| **11** | **(a)** | **(i)** | sisters [1] | |
| | | **(ii)** | person 4 – Cc [1]<br>person 6 – cc [1] [2] | |
| | | **(iii)** | 25%/1 in 4/1:3 [1] | |
| | **(b)** | **(i)** | extra chromosome [1] 21st pair [1] [2] | |
| | | **(ii)** | cf. one allele/gene affected [1] one amino acid/protein affected [1] Down syndrome many genes affected [1] many amino acids/ proteins affected [1] *Any* 3 [3] | 9 |
| | | | **Total** | **75** |



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New Specification

Rewarding Learning

Centre Number

| 71 | |
|---|---|

Candidate Number

| |
|---|
| |

General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**MONDAY 27 FEBRUARY 2012**
**9.30 am–10.45 am**

GSS12

**TIME**

1 hour 15 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **2(a)** and **7(a)**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| Total Marks | |

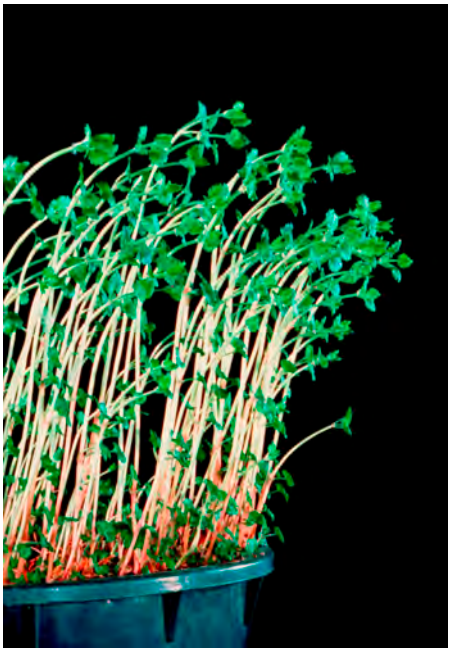


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| Examiner Only | |
|---|---|
| Marks | Remark |

**1** The picture below shows cress plant seedlings.




© Jerome Wexler / Science Photo Library

**(a)** Name and fully explain the process that causes the seedlings to bend to one side.

_____

_____

_____

_____ [3]

**(b)** Photosynthesis is the process which enables plants to make food.

In the box below write the word equation for photosynthesis.

[3]

**(c)** Name a process carried out by **both** plants and animals and state its function.

_____

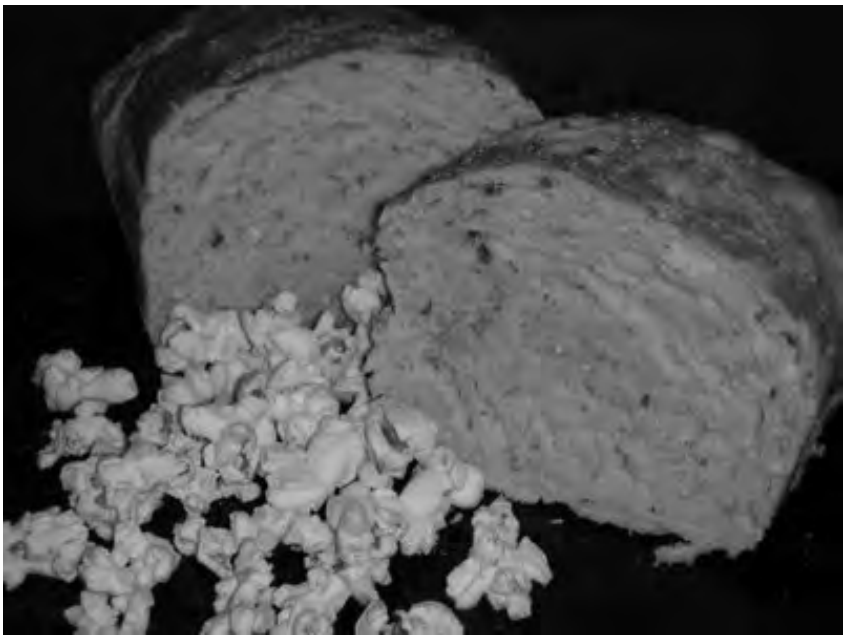
_____ [2]



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**2** **(a)** Below is a picture of bread and popcorn.



Describe an experiment to find which of these foods contains the most energy. All common laboratory equipment including thermometers and boiling tubes is available. Your answer should include how you make your results valid (fair test) and also reliable.

**In this question you will be assessed on your written communication skills including the use of scientific terms.**

[6]

**(b)** A doctor has to decide which of three different brands of iron supplements (A, B or C) to prescribe to his patients. He collected facts about each brand and the table below shows his findings.

**Key**
High = 3
Low = 1

| Brand | Number of side effects | Swallowing problems | Cost per unit |
|---|---|---|---|
| A | 3 | 3 | 2 |
| B | 3 | 2 | 3 |
| C | 2 | 1 | 3 |

**(i)** Analyse the facts for each brand and state which one he should prescribe. Referring to each brand fully explain your choice.

_____

_____

_____

_____

_____ [3]

**(ii)** Suggest **one** other fact about each brand that he should consider before making his decision.

_____ [1]

Examiner Only

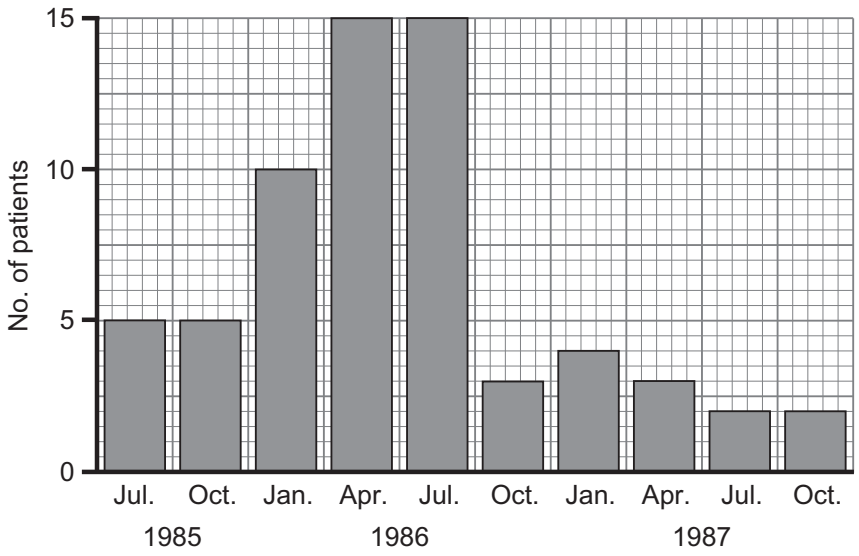
| Marks | Remark |
|---|---|
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**3** **(a)** The bar chart shows the number of patients who caught MRSA in a hospital between July 1985 and October 1987. Part of their treatment involved antibiotics.




*Source: National Institutes of Health*

**(i)** Suggest when the hospital started to take measures to control the spread of MRSA. Explain your answer.

_____

_____ [2]

**(ii)** What is the evidence in the graph that suggests that MRSA bacteria are resistant to antibiotics?

_____

_____ [1]



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| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** **(i)** One of the measures to control the spread of MRSA is to put infected patients into isolation wards. Suggest a reason why this method is not widely used in hospitals.

_____

_____ [1]

**(ii)** Apart from isolation describe **one** measure that controls the spread of MRSA and suggest why it is effective.

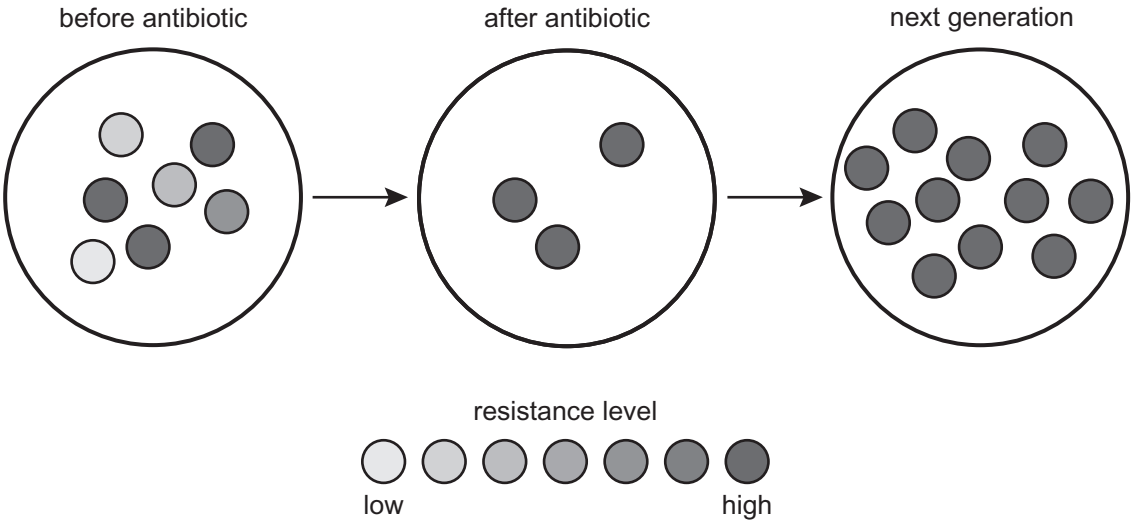
_____

_____

_____

_____ [2]

**(c)** MRSA is caused by a type of skin bacteria becoming resistant to antibiotics. The diagram below shows how this would have happened.




Use the diagram and your knowledge to explain how the population of skin bacteria became resistant.

_____

_____

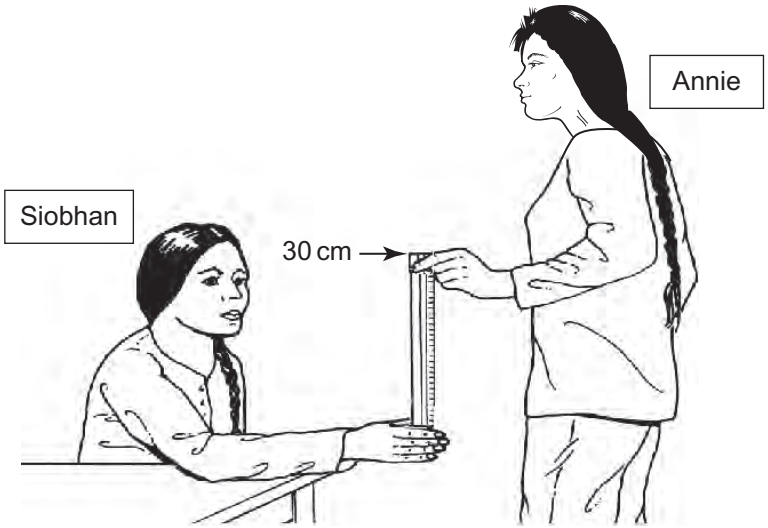
_____

_____ [3]

| Examiner Only | |
|---|---|
| Marks | Remark |

**4** **(a)** The pupils in the drawing below are investigating how practice affects the speed of a voluntary action.

Siobhan has to catch the ruler after Annie drops it.




*© Science at Work by L Mooney and A Rivers, published by Longman Publishers, 1992. ISBN 0582078245. Further duplication other than for teaching and study is prohibited – Pearson Education Ltd, copyright holders.*

Below are the results for this investigation.

| Try | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Ruler reading/cm | 29 | 25 | 22 | 28 | 16 | 13 |

**(i)** Give a trend for these results.

_____

_____ [1]

**(ii)** The pupils think that one of the results is incorrect. State which result this is and give a reason for your answer.

_____

_____ [1]

**(iii)** Apart from the ruler being held at 30 cm for each try, suggest one other factor that has to be kept the same to make this test valid.

_____

_____ [1]

**(iv)** What would have to be done in this investigation to reliably conclude that practice speeds up peoples' reactions?

_____ [1]

**(b)** State **two** ways that voluntary actions differ from reflex actions.

_____

_____ [2]

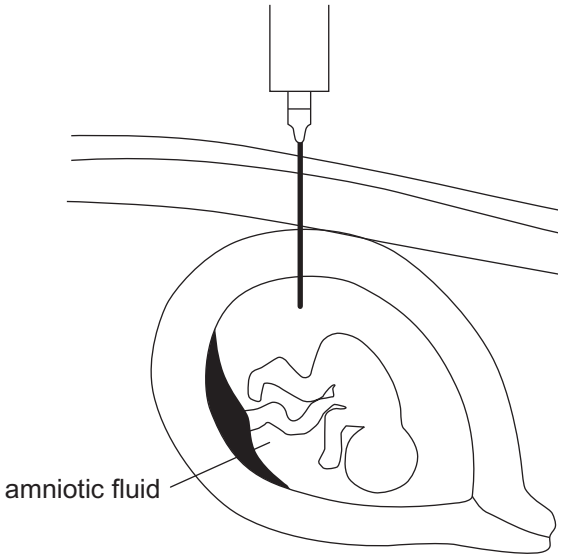
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**5** **(a)** The amniocentesis test shown below is an example of genetic screening.




*© GCSE Single Award Science for CCEA by T Laverty, J Napier & R White, published by Hodder Education 2006. ISBN 978 0340 926000. "Reproduced by permission of Hodder Education".*

Some of the amniotic fluid is drawn up into the syringe and analysed in a laboratory.

**(i)** Suggest what is in the amniotic fluid that is analysed during genetic screening.

_____

_____ [2]

**(ii)** Explain why amniocentesis testing may cause an increase in the number of people seeking abortions.

_____

_____

_____ [2]

**(b)** Life insurance companies have a financial interest in an individual's general health. Fully explain how and why someone with an inherited disease might be disadvantaged by these companies.

_____

_____

_____

_____ [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |



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| Examiner Only | |
|---|---|
| Marks | Remark |

**6** **(a)** The willow shown below is being grown by a farmer to reduce the use of oil for fuel.



*© US Forest Service/John Stanturf*

**(i)** Suggest **two** ways that this is an example of sustainable development.

_____

_____

_____ [2]

**(ii)** Suggest **two** ways that growing large numbers of willow plants might cause some other plants to become endangered.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |

**(b)** The picture below was taken at Rostrevor Oakland Nature Reserve which is a woodland on a steep slope overlooking Carlingford Lough.



© Crown copyright http://www.doeni.gov.uk/niea

This woodland dates from the 1780s and has a wide range of native species. These include mature oaks, ash, hazel, holly and wild cherry and the ground vegetation consists mostly of woodrush, wild garlic and bluebells. There are also insects, particularly butterflies, woodland birds such as blackcaps, willow warblers, chiffchaffs, jays, buzzards and mammals such as red squirrels.

**(i)** Suggest a reason why this area has existed as a woodland for so long.

_____

_____ [1]

**(ii)** Explain fully why this woodland was chosen to be a nature reserve.

_____

_____

_____

_____

_____ [3]

**(iii)** Give **two** ways that species are protected by living in a nature reserve.

_____

_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**7** **(a)** Explain fully the main difference between active and passive immunity. Suggest an advantage and disadvantage for each type.

**In this question you will be assessed on your written communication skills including the use of scientific terms.**

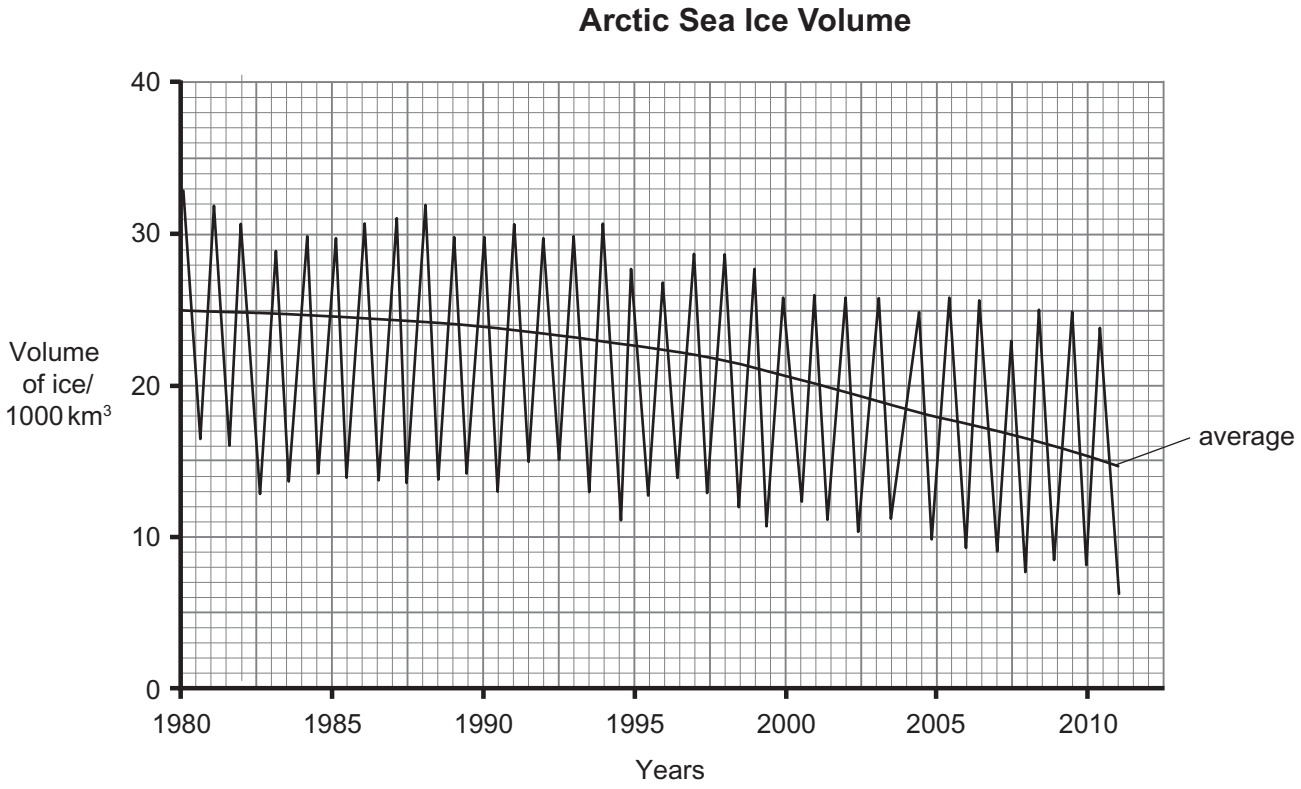
[6]

**(b)** Sometimes diseases spread rapidly in a short period of time and become epidemics.

Explain fully why epidemics are more likely to happen when the disease is caused by microbes that are more likely to mutate.

[3]

**8** **(a)** The graph below shows the changes in the volume of the ice fields in the Arctic Circle. This data was obtained by many scientists analysing many thousands of images of the Arctic Circle obtained from satellites.




| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**(i)** The graph shows changes in the volume of ice over time. Describe and explain fully the change **within each year**.

_____

_____

_____ [2]

**(ii)** State fully the trend shown by this graph.

_____

_____

_____ [2]

**(iii)** The data in this graph is considered to be evidence of global warming. Suggest **three** reasons why it is reliable.

1. _____

2. _____

3. _____ [3]

**(b)** Before the data was published it was subject to peer review.

Describe the process of peer review.

_____

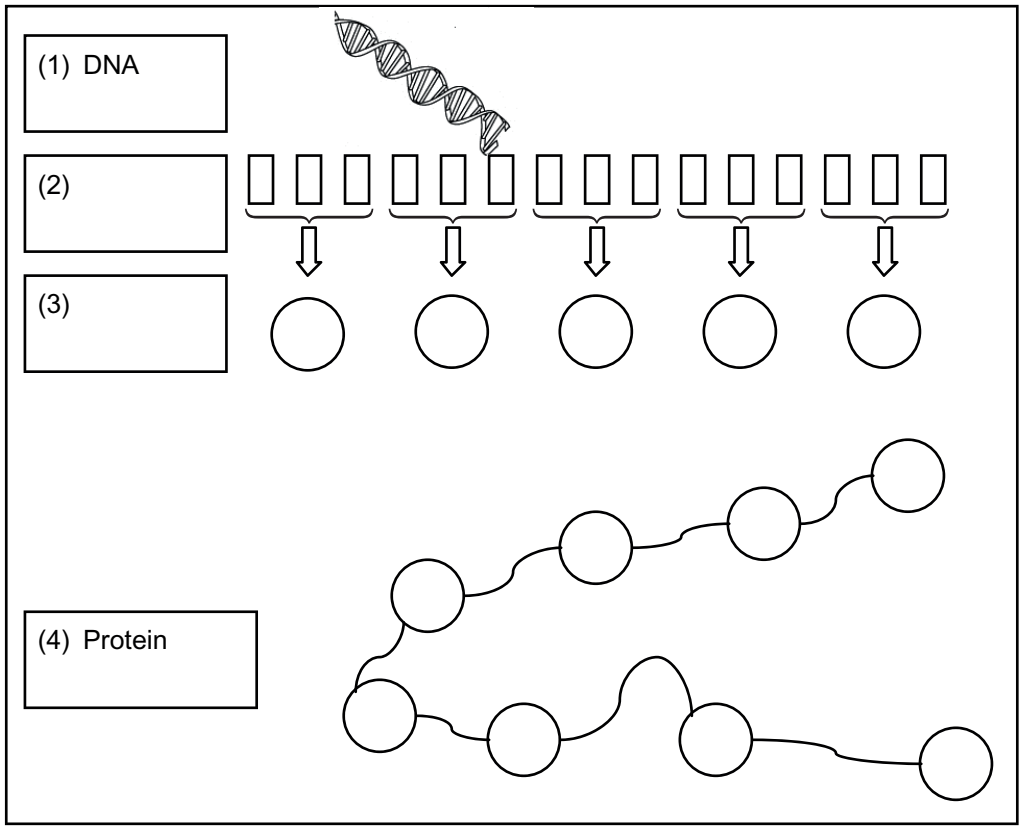
_____

_____ [2]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |

**9** **(a)** The diagram shows how DNA codes for protein. Complete the diagram by labelling layers 2 and 3 in the respective boxes.




[2]

**(b)** State the name of the hypothesis which explains how DNA codes for proteins.

_____ [1]

**(c)** **(i)** The structures in layer 2 can become out of order due to a mutation.

Describe and explain the effect of this.

_____

_____ [2]

**(ii)** Complete the sentence below.

Mutations can be caused by environmental factors, e.g.

_____ from the Sun can

cause _____ . [2]



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THIS IS THE END OF THE QUESTION PAPER

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General Certificate of Secondary Education
2012–2013

# Science: Single Award

## Unit 1 (Biology)

## Higher Tier

**[GSS12]**

**MONDAY 27 FEBRUARY 2012**
**9.30 am–10.30 am**

# MARK SCHEME



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| | AVAILABLE MARKS |
|---|---|

**1** **(a)** any three from: they respond/grow to light, for more photosynthesis controlled by auxins, phototropism [3]

**(b)** carbon dioxide + water ⟶ sugar/starch/glucose + oxygen [3]
[1 mark each side – 1 mark for arrow]

**(c)** respiration: energy *or* reproduction: produce young *or* excretion: to get rid of waste [2] — 8

**2** **(a)** Indicative content

- Use BB/other to set alight to each food
- Same mass food/volume water/distance lit food from tube same distance from bunsen/time to get lit food under tube
- Place under boiling tube of water
- Record temperature difference
- Repeat experiment

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates must use appropriate specialist terms throughout to describe all **four or five** points above, including two or more controlled variables (listed in second point) in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialist terms to describe **three** of the points above in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard. | [3–4] |
| **C** | Candidates describe the experimental procedure using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard. | [1–2] |
| **D** | Response not worthy of credit. | [0] |

[6]

**(b)** **(i)** C;

C – better than A as has fewer swallowing problems/fewer side effects;

C – better than B as has fewer swallowing problems/fewer side effects; [3]

**(ii)** effectiveness/how strong it is/amount of iron it contains [1] — 10



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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **3** | **(a)** | **(i)** | July – October 1986 (July/October 1986); biggest fall/lowest cases/less cases/numbers dropped [2] | |
| | | **(ii)** | never no patients/rise in numbers [1] | |
| | **(b)** | **(i)** | lack of space/lack of funds/lack of facilities [1] | |
| | | **(ii)** | hand/good hygiene, gloving, mouth/nose/eye protection, gowning, (thorough) cleaning/wiping spillages<br>cannot spread as easily cross contamination (not hygiene on own) *any 1 mark* [2] | |
| | **(c)** | | before antibiotic variation in resistance/different levels of resistance;<br>only those with strongest resistance survived/[or converse];<br>all offspring inherited strong resistance/resistant survivors reproduce [3] | 9 |
| **4** | **(a)** | **(i)** | more tries and ruler reading gets less/with practice gets faster [1] | |
| | | **(ii)** | try 4: should be lower than try 3/higher than try 3/off trend [1] | |
| | | **(iii)** | height of ruler/Siobhan's arm stays on table/hand touching (not touching) ruler in advance/uses same hand/arm stays in same place [1] | |
| | | **(iv)** | more people/different ages/gender; [1] | |
| | **(b)** | | use brain/<u>reflex</u> only spinal cord think about it/don't think about it;<br>slower/<u>reflex</u> faster/doesn't happen straight away/immediate [2] | 6 |
| **5** | **(a)** | **(i)** | cells/genetic material (not waste); from baby [2] | |
| | | **(ii)** | if positive: parents may not want to keep pregnancy [2] | |
| | **(b)** | | not insure, higher premiums; insured for lower amount (any two) [2]<br>need more medical care/link to shorter life span/more likely to make claim [1] [3] | 7 |
| **6** | **(a)** | **(i)** | renewable energy source/doesn't run out; carbon neutral [2] | |
| | | **(ii)** | habitats destroyed; competition; threat of organic fertiliser *any two* [2] | |
| | **(b)** | **(i)** | steep slope so hard to clear [1] | |
| | | **(ii)** | wide range of species; high biodiversity; habitats; native species; endangered/rare species *any* 3 [3] | |
| | | **(iii)** | safeguards habitats; no invasive species; raises public awareness *any* 2 [2] | 10 |


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AVAILABLE MARKS

**7** **(a)** Indicative content

- Active own antibodies produced
- Passive antibodies injected
- Active long lasting/produces memory cells
- Passive acts quickly
- Active time factor before immune/slow to act
- Passive short/no memory cells

| Band | Response | Mark |
|---|---|---|
| **A** | Candidates must use appropriate specialised terms throughout to describe the differences, pros and cons of active and passive immunity in a logical sequence using 5 or 6 of the IC. SPG, form and style is of a high standard. | [5–6] |
| **B** | Candidates use some appropriate specialised terms to partially describe the differences, pros and cons of active and passive using 3 or 4 IC. SPG, form and style is of a satisfactory standard. | [3–4] |
| **C** | Candidates describe the differences, pros and cons of active and passive using 1 or 2 of the IC. However these are not in a logical sequence. SPG, form, style and use of specialised terms are limited. | [1–2] |
| **D** | Not worthy of credit. | [0] |

[6]

**(b)** mutated microbes/new antigens;
no immune response/will not recognise/antibodies won't work as microbes changes;
no vaccination programme/new vaccines needed/new medicines needed
more time to spread/people infected for longer *Any* [3] 9

**8** **(a)** **(i)** peak in winter/min. in summer/decrease then increases; seasonal temp. differences [2]

**(ii)** volume of ice decreases; rate increases over time [2]

**(iii)** longitudinal; satellites (accurate); (many) images; many scientists/reviewed by many scientist/large area (any three) [3]

**(b)** read over/scrutinised (not reviewed); by other experts/scientists in the field [2] 9



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| | | | AVAILABLE MARKS |
|---|---|---|---|
| 9 | **(a)** 2 – bases/base triplets, 3 – amino acids [2] | | |
| | **(b)** base triplet [1] | | |
| | **(c)** **(i)** different amino acid; different protein/no protein/inherited disease [2] | | |
| | **(ii)** UV rays, skin cancer [2] | | 7 |
| | | **Total** | **75** |



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