



Rewarding Learning

General Certificate of Secondary Education  
2012–2013

## Science: Single Award

Unit 1 (Biology)

Higher Tier

[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)**.

Centre Number

71

Candidate Number

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

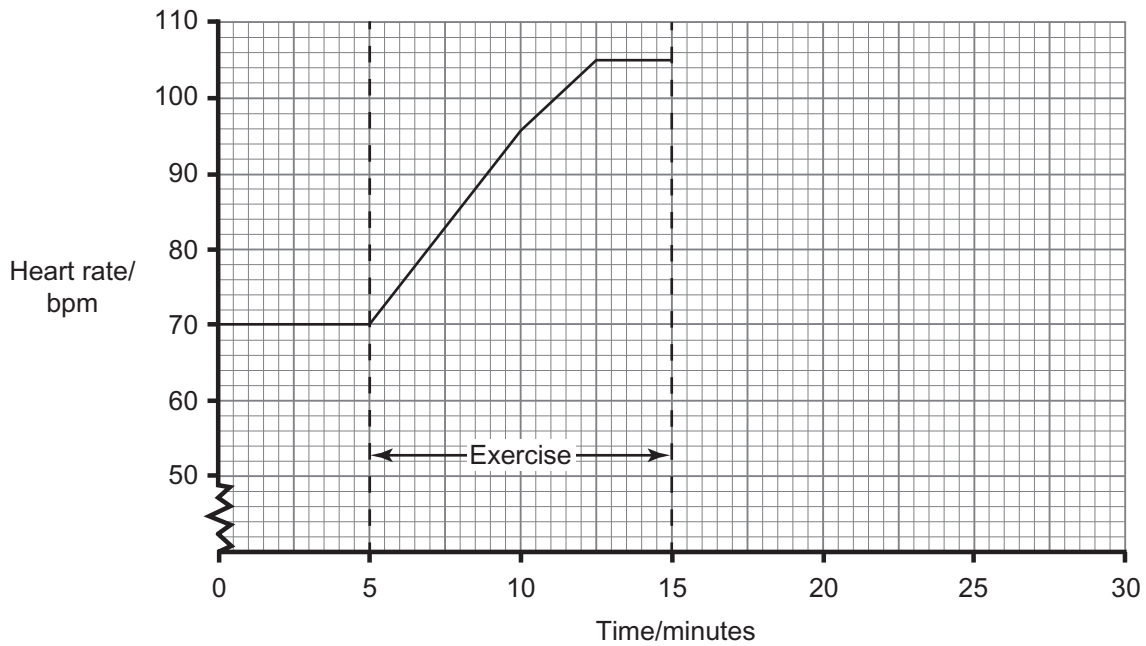
Total Marks



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1 (a) The following graph shows the effect of exercise on Tracey's heart rate.

Examiner Only	
Marks	Remark



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]

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

- 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]

Examiner Only

Marks Remark

3 The photograph below shows lichen growing on a tree.



Source: Chief Examiner

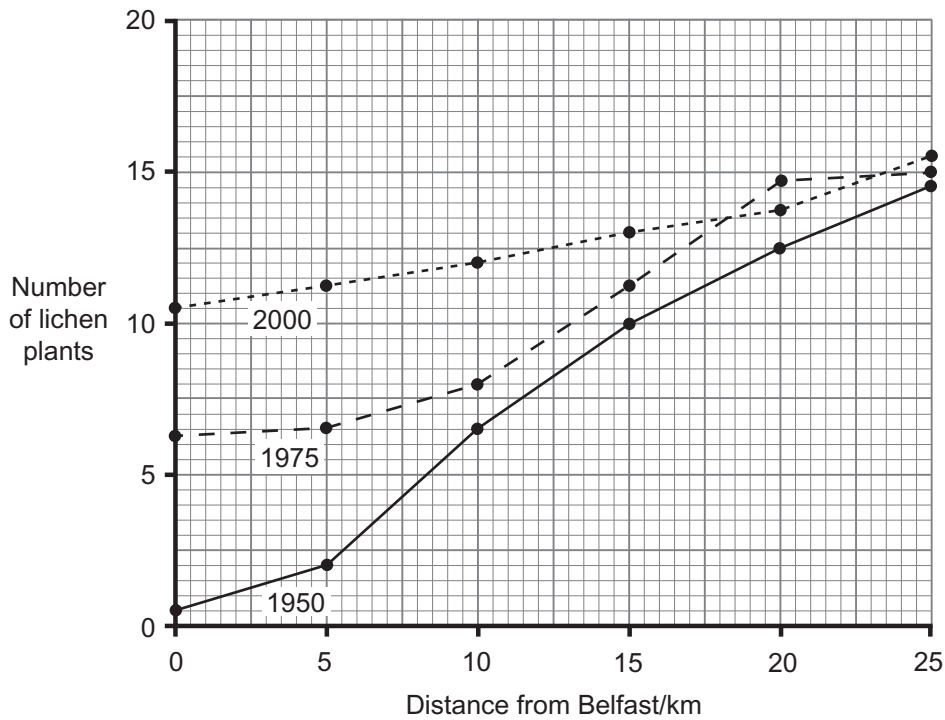
Lichen is a biotic pollution monitor as it only grows in large numbers where there is very little pollution.

(a) What is meant by the term 'biotic'?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

(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.

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[2]

(ii) When collecting the data suggest **two** things that must be done to make the investigation valid (a fair test).

1. \_\_\_\_\_

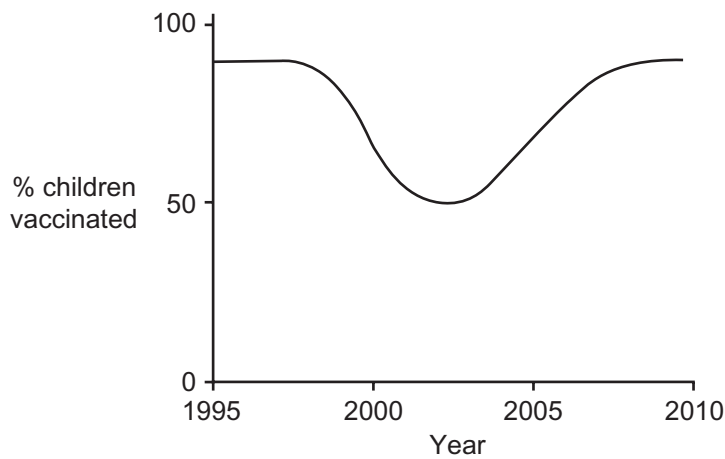
2. \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark





(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.

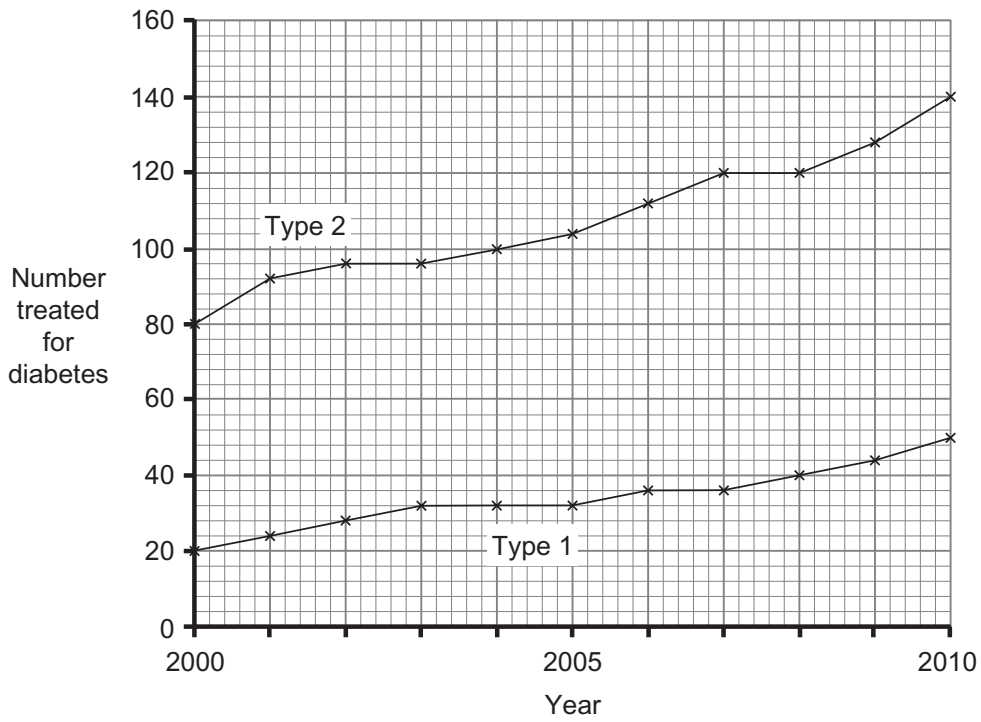
\_\_\_\_\_ [1]

(c) Penicillin is an antibiotic which protects against disease. Describe Fleming’s role in the discovery of penicillin.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

- 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]

Examiner Only	
Marks	Remark

The cost of treating diabetes in the UK is increasing rapidly and currently takes up over 10% of the Health Service budget.

(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 \_\_\_\_\_

\_\_\_\_\_

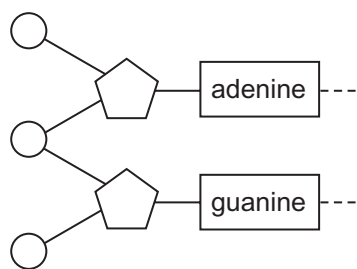
Disadvantage \_\_\_\_\_

\_\_\_\_\_ [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]

Examiner Only	
Marks	Remark

- (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.

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[3]

- (d) Give **one** reason why most governments are not in favour of making genetic information available to insurance companies.

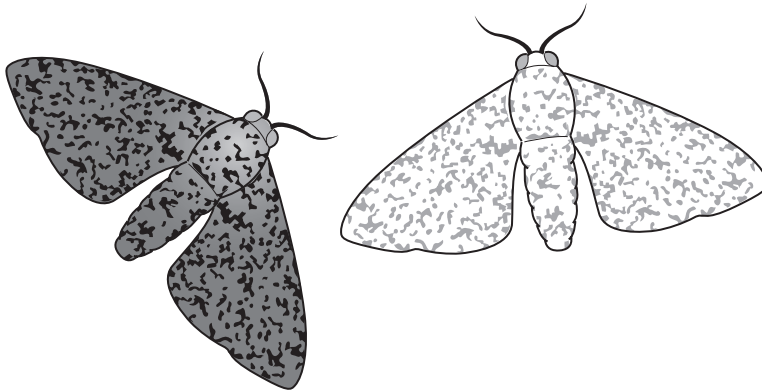
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[1]

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.

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[3]

Examiner Only	
Marks	Remark

**(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.

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[2]

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

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[2]

**(ii)** Suggest why the theory of evolution is not universally accepted.

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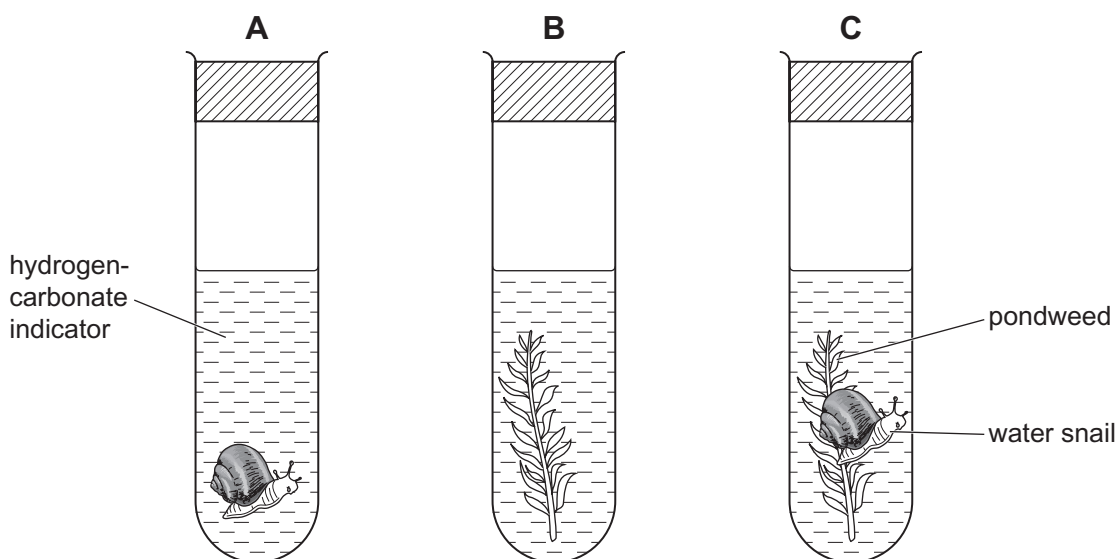
[1]

Examiner Only	
Marks	Remark

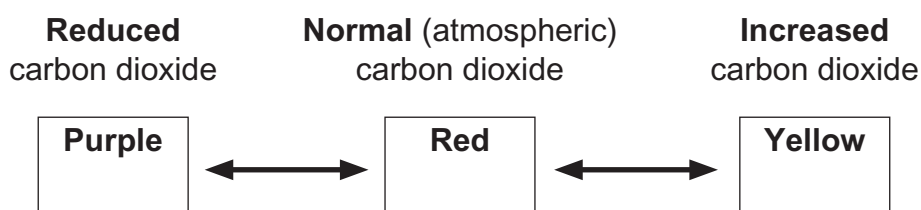




- 9 (a) The diagram shows apparatus used to investigate gas exchange in animals and plants.



The hydrogen carbonate indicator shows the level of carbon dioxide by changing colour as below:



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.

Tube	Colour of indicator	
	At start	After two hours
A	red	
B	red	
C	red	

[2]

Examiner Only

Marks    Remark

(ii) Plants and animals are interdependent.

Give **two** reasons why plants are necessary for animal life.

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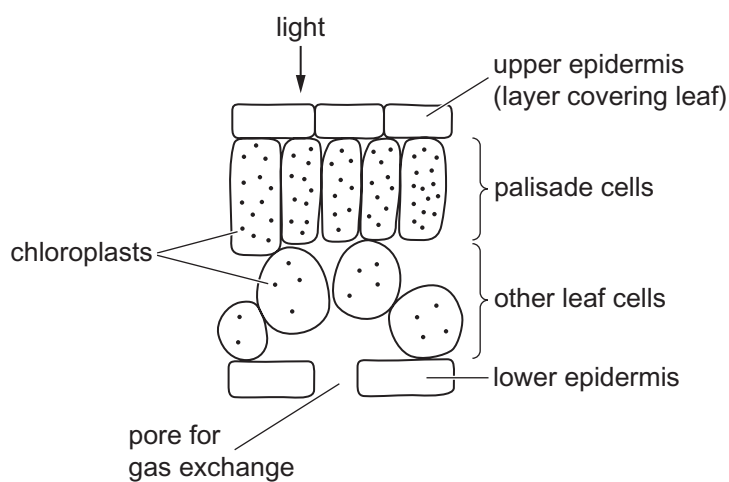
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[2]

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.

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[2]

Examiner Only

Marks Remark

(c) Describe the term phototropism and explain fully how it affects the growth of plants.

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[3]

Examiner Only	
Marks	Remark

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

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