



Rewarding Learning

General Certificate of Secondary Education  
2015–2016

Centre Number

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Candidate Number

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## Science: Single Award

Unit 1 (Biology)  
Higher Tier

MV18

[GSS12]

**WEDNESDAY 11 NOVEMBER 2015, MORNING**

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### Time

1 hour 15 minutes, plus your additional time allowance.

### 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 at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Questions **2** and **11**.

1 (a) The diagram below shows a short section of DNA.



(i) What name is given to the shape of DNA? [1 mark]

\_\_\_\_\_

(ii) DNA is formed into chromosomes. What are short sections of chromosomes called? [1 mark]

\_\_\_\_\_

(b) In sweet pea plants, the allele for red flowers (**R**) is dominant to the allele for white flowers (**r**).

(i) Give the two possible **genotypes** of a plant producing red flowers. [2 marks]

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

2. \_\_\_\_\_

A red flowered plant and a white flowered plant were bred together. There were four offspring produced; two that produced red flowers and two that produced white flowers.

- (ii) Complete the Punnett square to show the gametes of the parent plants and the genotypes of the offspring plants. [3 marks]

	red flowered plant	
	R	
white flowered plant	Rr	
r		

- (c) Another type of plant can produce many different colours of flower between red and white. For example, dark red, light red, pink and white.

Name this type of variation. Explain your answer.  
[2 marks]

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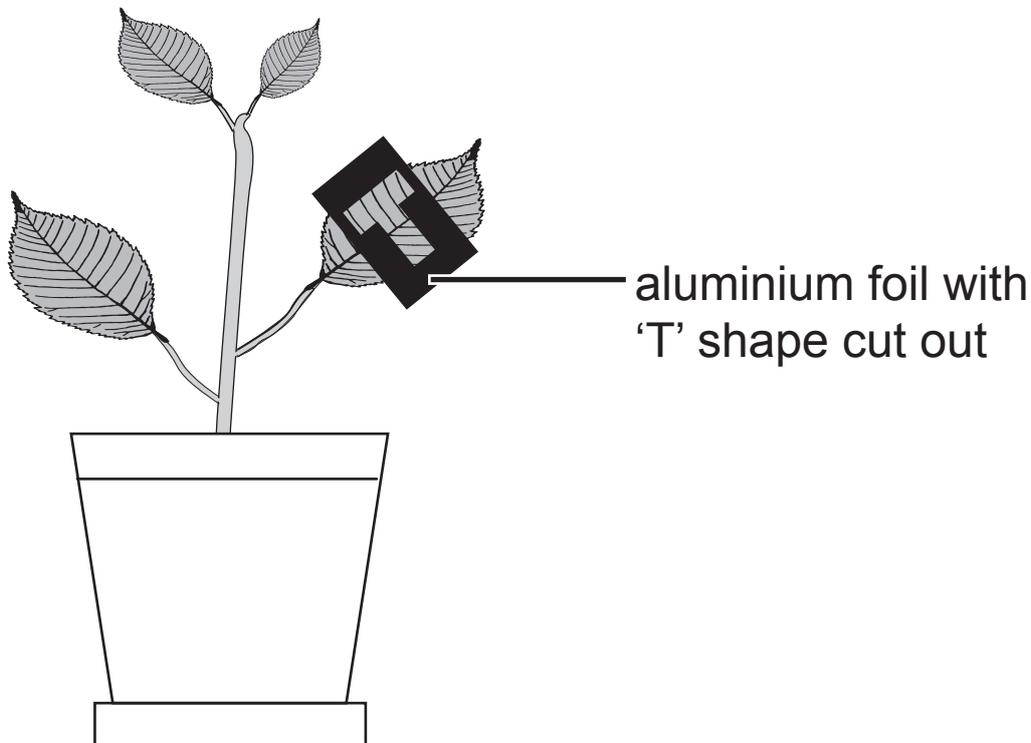


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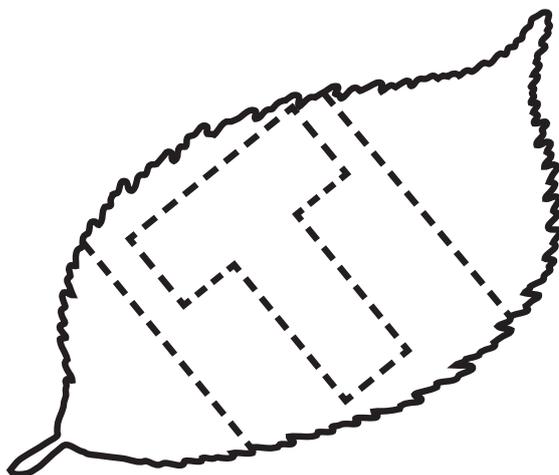
- 3 Photosynthesis is a light-requiring process that takes place in plants.

In a photosynthesis investigation a leaf of a plant was partly covered with aluminium foil and placed in bright light.

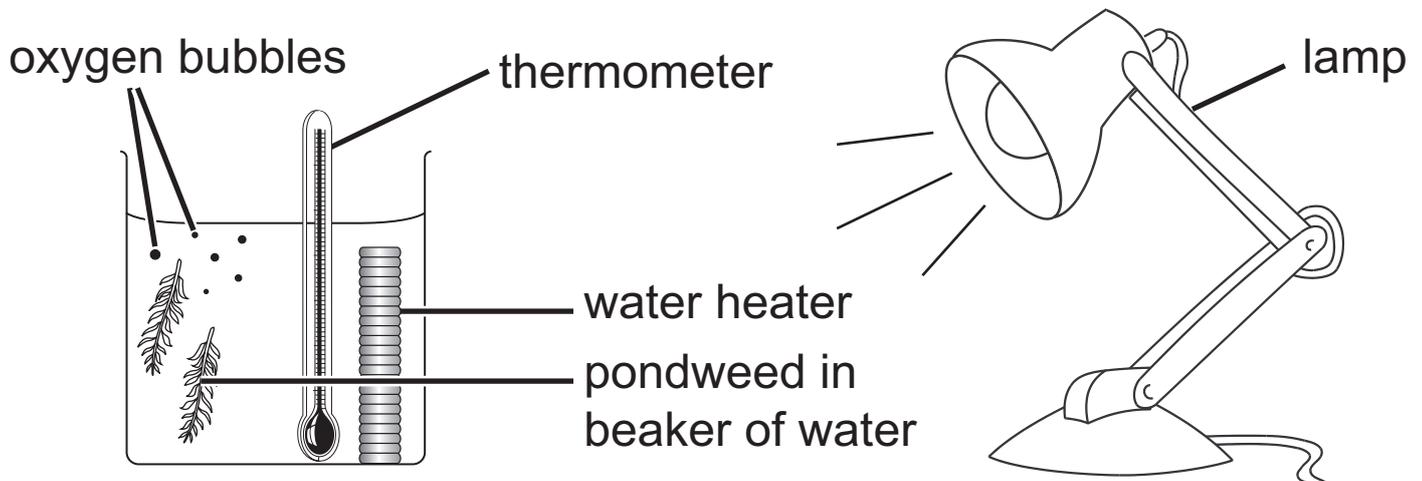


After five days in bright light the aluminium foil was removed and the leaf tested for starch.

- (a) Using the outline of the leaf below, shade **all** the parts where you would expect to find starch. [1 mark]



- (b) In another investigation, the effects of light intensity and temperature on photosynthesis were analysed. The apparatus used is shown in the diagram below.



- (i) Suggest **one** way the light intensity could be changed. [1 mark]

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- (ii) Suggest why it is important to have a thermometer in the beaker when investigating the effect of light intensity. [1 mark]

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The results of the investigation are shown in the table below.

		Number of oxygen bubbles per minute		
		Low	Medium	High
Temperature/°C	Light intensity			
	10	3	5	12
	15	5	10	22
	20	8	12	30

(iii) Describe and explain the effect of **light intensity** on the number of oxygen bubbles produced. [3 marks]

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(iv) Apart from the effect of light intensity, state **one** other trend shown by these results. [1 mark]

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(c) Palisade cells form a layer of leaf cells, highly adapted for photosynthesis. Each cell contains chloroplasts rich in chlorophyll (the pigment that traps light).

Describe and explain how the palisade layer benefits the plant's ability to photosynthesise. [2 marks]

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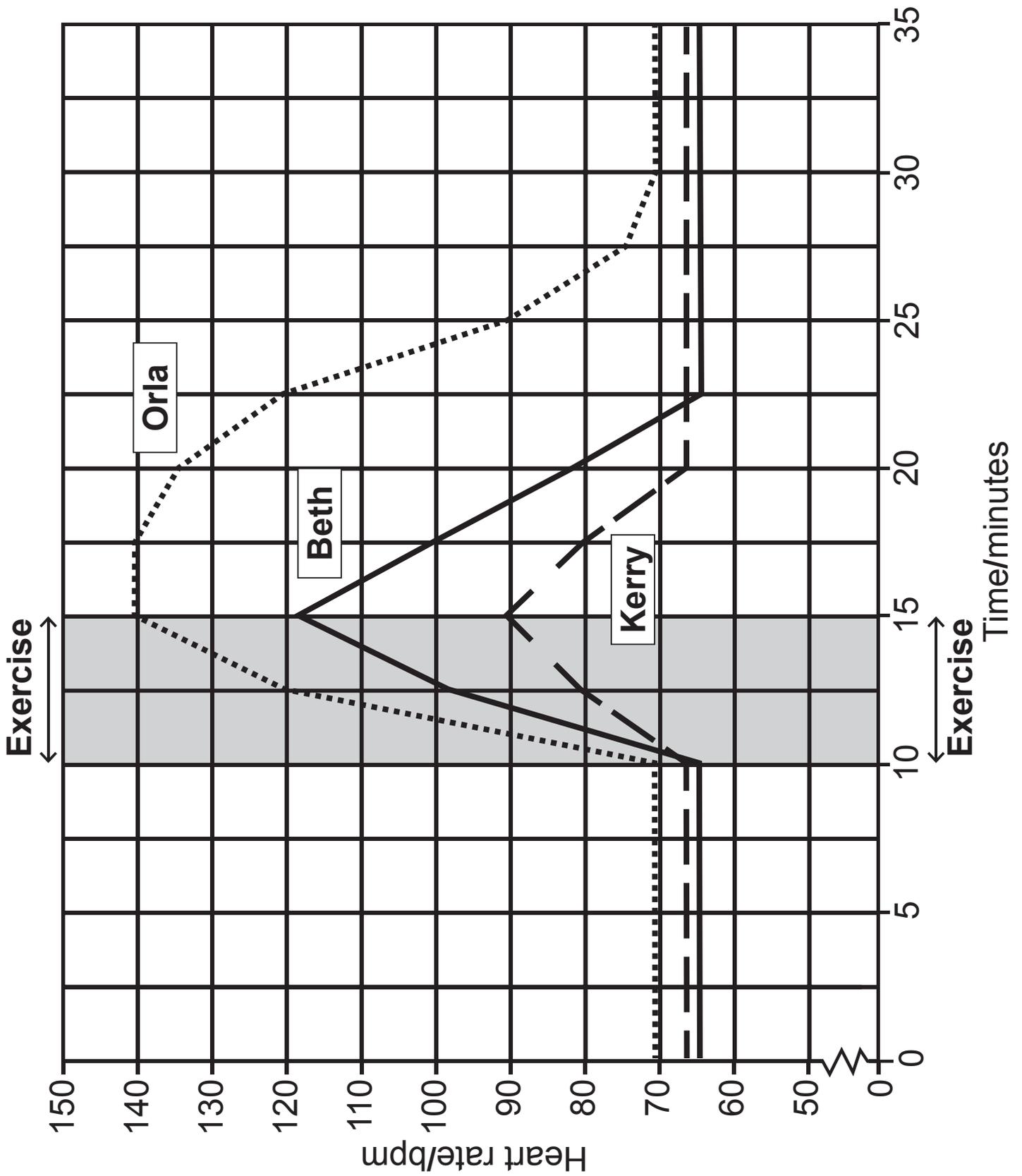
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**(Questions continue overleaf)**

- 4 (a) The graph below shows the effect of exercise on the heart rates of three girls.



(i) Calculate the maximum increase in **Orla's** heart rate during exercise. [1 mark]

\_\_\_\_\_ bpm

(ii) Calculate the percentage increase in **Orla's** heart rate during exercise. [1 mark]

\_\_\_\_\_ %

(iii) Using the graph, name the girl who is the fittest. Explain your answer giving **one** piece of evidence. [2 marks]

Name \_\_\_\_\_

Explanation \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(b) Exercise helps prevent heart disease.

Describe and explain how heart disease can affect the wider family. [2 marks]

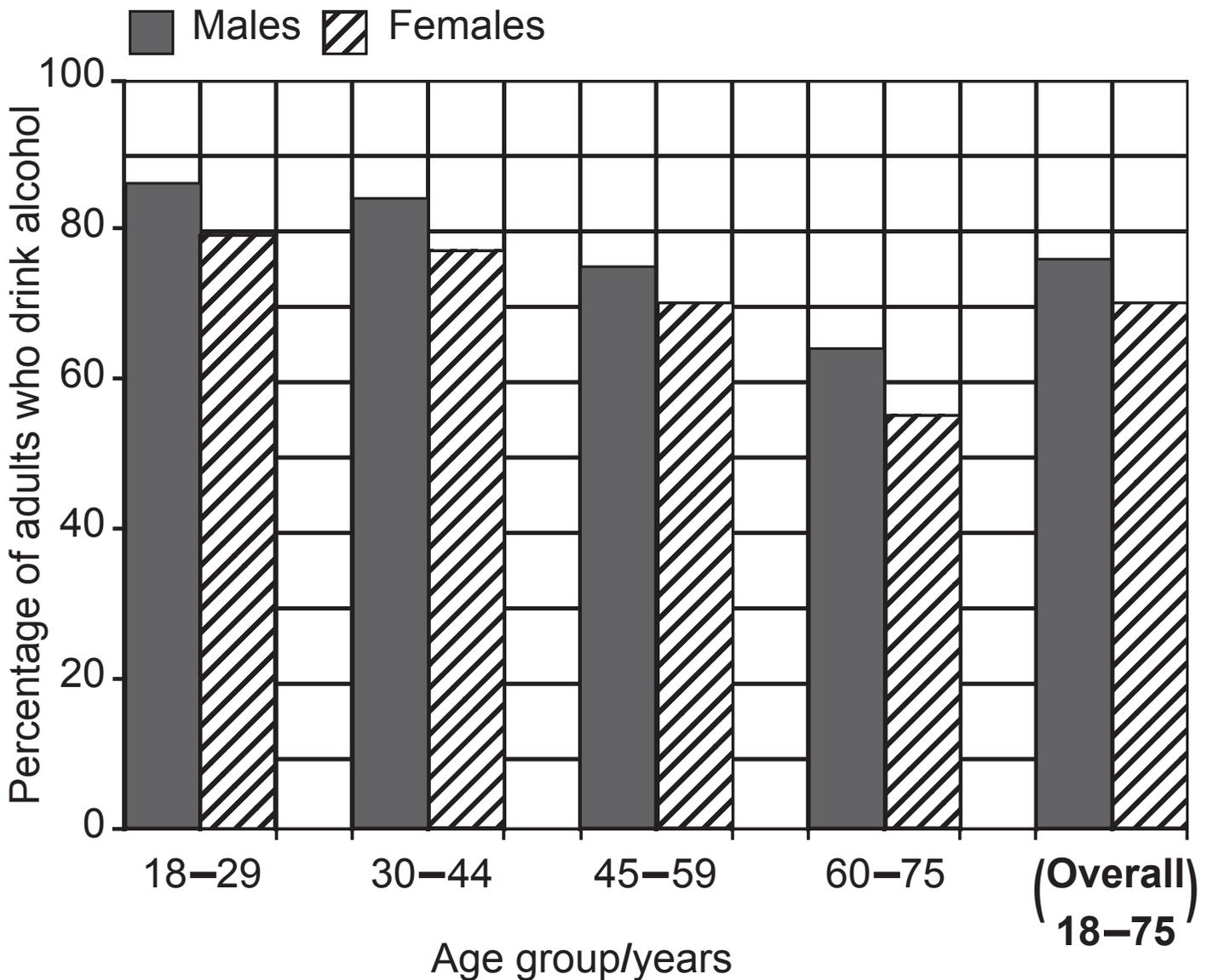
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- 5 (a) The graph below shows the percentage of adults who drink alcohol in different age groups in Northern Ireland. The data was collected in 2013.



Give **two** trends shown by this data. [2 marks]

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

(b) Binge drinking is more common in younger age groups.

(i) What is meant by the term 'binge drinking'?  
[1 mark]

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(ii) Suggest **one** reason why binge drinking is more common in younger age groups. [1 mark]

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(iii) Suggest **one** reason why many people think that increasing the cost of alcohol will help reduce binge drinking. [1 mark]

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6 (a) New medicines and medical drugs in development have to pass through a number of stages before they can be prescribed to the public. These stages are in vitro testing, animal testing, clinical trials and licensing.

(i) Suggest **two** reasons why in vitro testing is very expensive. [2 marks]

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

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(ii) Give **two** reasons for using animals in drug testing. [2 marks]

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

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(iii) Explain the term 'clinical trial' and give **one** reason for carrying out clinical trials. [2 marks]

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(b) The growing of genetically modified (GM) crops is also subject to licensing.

(i) Describe fully the term 'genetically modified'.  
[1 mark]

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(ii) Give **two** advantages of growing GM crops.  
[2 marks]

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

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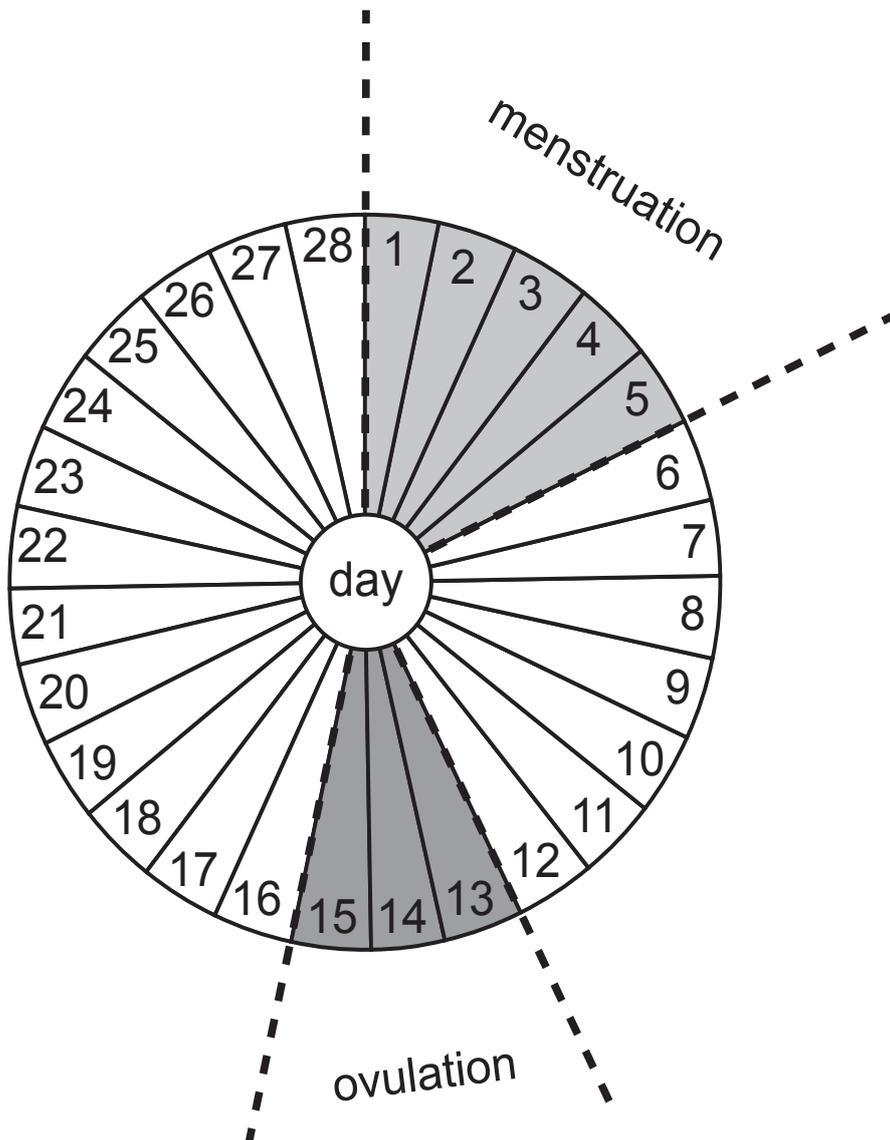
2. \_\_\_\_\_

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(iii) Give **one** reason why many people are opposed to growing GM crops. [1 mark]

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7 (a) The diagram below shows the menstrual cycle.



(i) Name **one** hormone important in stimulating ovulation. [1 mark]

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(ii) Describe **one** change that would happen in the uterus between day six and day twelve. [1 mark]

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**(iii)** Name, in order, the four parts of the female reproductive system that sperm must pass through to fertilise an egg. [2 marks]

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**(b)** Explain what causes menstruation to occur after twenty-eight days. [2 marks]

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8 DNA is the core component of genes and chromosomes.

(a) In terms of bases, explain what is meant by the 'unique nature of an individual's DNA'. [1 mark]

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(b) Explain what is meant by the 'base triplet hypothesis.' [1 mark]

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(c) Complete the table below describing how the structure of DNA was worked out. [3 marks]

Scientist(s)	Discovery
	Quantitative analysis of bases
Franklin and Wilkins	
Watson and Crick	

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**(Questions continue overleaf)**

- 9 Wild garlic is a common plant in many of our woodlands. It is native to Britain and Ireland and is a successful competitor as shown in the photograph below.



Wild garlic covering woodland floor

Wild garlic is able to reproduce both sexually and asexually.

(a) Use the information provided and your knowledge to answer the questions below.

- (i) Explain why wild garlic is **not** described as a 'competitive invasive species'. [1 mark]

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- (ii) Suggest **one** reason why wild garlic is a successful competitor. [1 mark]

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**(iii)** Suggest the effect, if any, wild garlic has on woodland biodiversity. [1 mark]

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Wild garlic plants contain high levels of protein. In woodland habitats it is important that this protein is recycled and converted back to nitrates in the soil.

**(b)** Using your knowledge of the nitrogen cycle, describe how the protein in wild garlic eventually becomes nitrate in soil. [3 marks]

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**10** Scientists have observed that many species of insects on islands are wingless. They think this is because being wingless means they live on the ground and so are not at risk of being carried by strong winds out to sea as winged insects could be.

**(a)** Describe how scientists could carry out an investigation to compare the percentage of all insect species that are wingless on an island compared to the mainland.

[3 marks]

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**(b)** It was also suggested that many of these wingless species originally had wings millions of years ago, but that the wings have been lost as a result of natural selection over time.

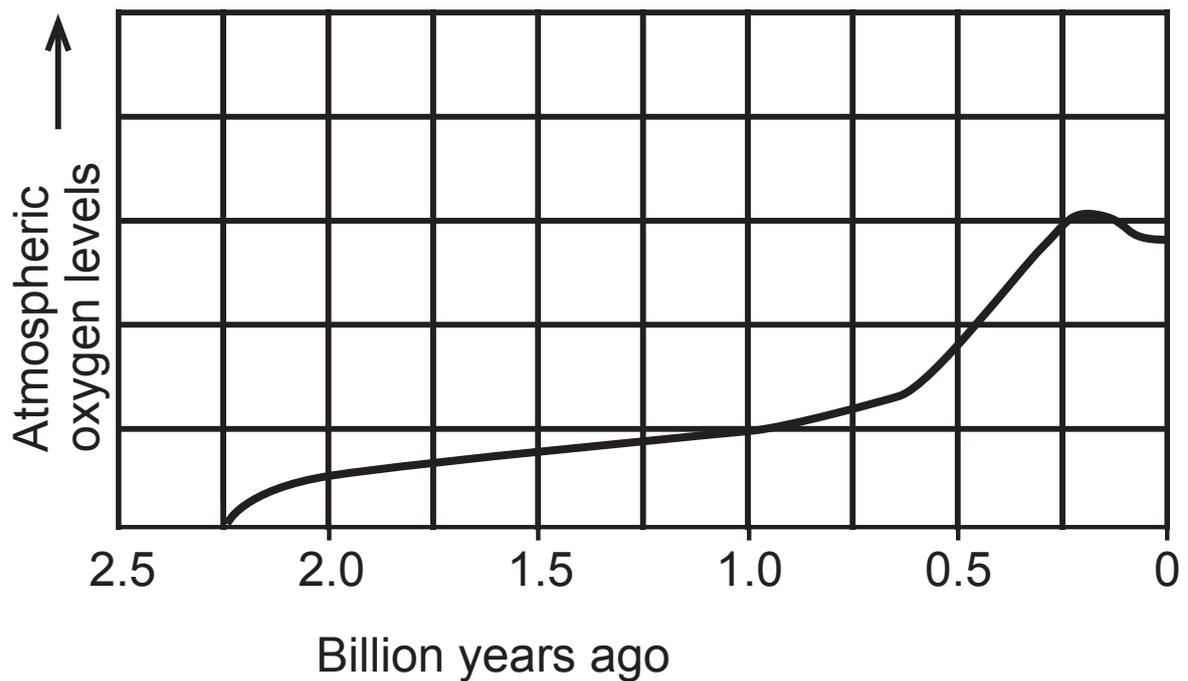
**(i)** Name the theory that describes a change in a species over time. [1 mark]

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**(ii)** Name the scientist who is credited with developing this theory. [1 mark]

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(c) The graph below shows how the atmospheric oxygen levels have changed over time.



Winged insects have high energy requirements when in flight. Using the information provided, suggest why the number of species of winged insects rapidly increased around about 0.3 billion years ago. [2 marks]

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- 11** The table below shows the number of deaths in Northern Ireland linked to the bacterial infection MRSA between 2002–2012.

<b>Year</b>	<b>Number of deaths linked to MRSA</b>
2002	26
2003	30
2004	44
2005	69
2006	56
2007	59
2008	84
2009	50
2010	29
2011	30
2012	18

Describe fully the trend shown by this information and give reasons to explain the trend. [6 marks]

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

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

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## SOURCES

Q1(a) ..... Diagram of a short section of DNA © luismmolina/ iStock/ Thinkstock.com

Q3 ..... Image of a plant in a photosynthesis investigation © CCEA

Q3(b).. Image of pondweed in beaker of water © CCEA

Q3(b).. Image of a lamp © CCEA

Q5(a) .....Graph showing the percentage of adults who drink alcohol in different age groups in Northern Ireland © CCEA

Q7(a) .....Diagram showing menstrual cycle © GCSE Science Single Award for CCEA Foundation and Higher Tier by James Napier, Alyn McFarland and Roy White. Hodder Education (2013). ISBN: 9781444195729. Reproduced by permission of Hodder Education.

Q9..... Source: Chief Examiner

Q11 .....Table showing the number of deaths in Northern Ireland between 2002-2012, that are linked to MRSA © Crown Copyright 2010 / Adapted from "Adult drinking patterns survey in Northern Ireland 2013".

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Question Number	Marks
1	
2	
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11	
<b>Total Marks</b>	

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