Qualification Accredited



GCSE (9-1)

Examiners' report

GATEWAY SCIENCE COMBINED SCIENCE A

J250

For first teaching in 2016

J250/08 Summer 2024 series

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Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

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Paper 8 series overview

J250/08 is the second of two Higher Tier papers that determine the Biology content of the GCSE (9-1) Gateway Science Combined Science A course. It assesses the content from the specification topics B4-B6 and B7. This paper is synoptic and so does contain material covered by topics B1-B3. There are also questions that involve the assessment of key mathematical requirements form Appendix 5f of the specification.

Candidates attempted all multiple-choice questions and, in the main part, all other questions. Candidates generally performed well with the questions which tested the mathematical requirements of the specification. However, candidates would benefit from more practice of answering questions to a particular number of significant figures and decimal places as there did appear to be some confusion with this.

Candidates who did well on this paper Candidates who did less well on this paper generally: generally: · were able to compare the genetic material in suggested a factor to be considered when eukaryotic and prokaryotic cells in Question 12 marking an insect in Question 12 (b) (i) calculated percentage change in mass but · were able to complete the genetic cross and were unable to convert to three significant state the genotype offspring ratio in Question figures in Question 14 (a) (i) 12 (b) (ii) showed understanding of the terms biotic and described how mildew is spread in Question abiotic factors 13 (a) were unable to make the link between reduced explained why reduced efficiency of efficiency in chloroplast and photosynthesis. chloroplasts leads to reduced respiration in Question 13 (b) • named the enzymes used in genetic engineering and described how scientists find out if the process has been successful in Question 13 (c) (i).

Section A overview

Section A consisted of multiple-choice questions. Most candidates attempted all of these questions. Of these questions, candidates tended to be more successful on Questions 1, 3, 8 and 10 and less successful on Questions 4 and 6. Where candidates decide to change their answer, they should be encouraged to cross out their original answer. They should then write the correct answer next to the box rather than try and write one letter over the original choice of letter.

Question 1

	1	Gardeners	are	changing	the wa	y they	care fo	or their	garden
--	---	-----------	-----	----------	--------	--------	---------	----------	--------

Which change would increase biodiversity?

- A Adding chemical fertilisers to a grass lawn
- B Cutting a grass lawn more often than usual
- C Removing a grass lawn area and putting down paving stones
- D Replacing a grass lawn area with a wild flower meadow

Your answer		[1]
-------------	--	-----

Most candidates identified D as the correct answer. Option A was a common incorrect answer.

Question 2

2 Which row is a correct comparison of meiosis and mitosis?

	Involves cell division	Halves the number of chromosomes	Requires DNA replication
Α	both	meiosis only	both
В	both	both	both
С	meiosis only	both	mitosis only
D	mitosis only	meiosis only	mitosis only

Your answer		[1]
-------------	--	-----

Many candidates successfully identified A as the correct answer. There was no clear pattern to the incorrect answers seen.

answer of B.

3	Wh	ich statement describes a difference between red blood cells and white blood cells?	
	Α	Red blood cells contain enzymes.	
	В	Red blood cells make antibodies.	
	С	White blood cells contain proteins.	
	D	White blood cells respond to antigens.	
	You	ır answer	[1]
	-	ndidates successfully identified D as the correct response. There was no clear pattern to the answers seen.	
Qu	estic	on 4	
4	Wh	ich disease may develop due to an interaction with HPV?	
	Α	AIDS	
	В	Cervical cancer	
	С	Tuberculosis	
	D	Type 2 diabetes	
	You	or answer	[1]
	•	the lower performing candidates were unable to correctly answer this question. Candidates I HPV with HIV and therefore A was commonly incorrectly selected rather than the correct	

- 5 Why does a plant scientist use antibodies specific to a type of antigen?
 - A To develop new plants using selective breeding
 - B To find new species of plants growing around the world
 - C To identify communicable diseases in plants
 - D To study the evolution of plants

Your answer		[1]
-------------	--	-----

The majority of higher performing overall candidates correctly selected C. Option A was seen as a common incorrect answer.

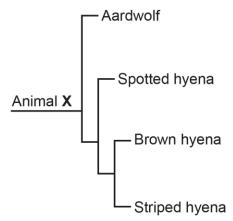
Question 6

- 6 Which row shows the correct order of some processes in the water cycle?
 - A Condensation \rightarrow evaporation \rightarrow precipitation \rightarrow condensation
 - **B** Condensation \rightarrow precipitation \rightarrow evaporation \rightarrow condensation
 - C Precipitation \rightarrow condensation \rightarrow evaporation \rightarrow precipitation
 - **D** Precipitation \rightarrow evaporation \rightarrow condensation \rightarrow evaporation

Your answer	[1]
-------------	-----

Many of the lower performing candidates overall were unable to select the correct answer, B. There was no clear pattern to the incorrect answers seen.

7 The diagram shows a phylogenetic tree for a group of related animals.



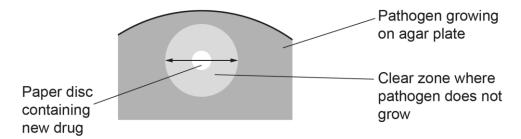
Which statement is correct?

- A Aardwolf is not related to the striped hyena.
- **B** Animal **X** is a common ancestor to all the hyenas.
- C Brown hyena and striped hyena are the same species.
- **D** The closest relation to the striped hyena is the spotted hyena.

Your answer		[1]
-------------	--	-----

Most candidates selected the correct answer of B. Options C and A were commonly selected as answers.

8 Scientists test the effect of new drugs on the growth of a pathogen.



The area of the clear zone is used to indicate the effectiveness of the drug.

The diameter is 2.4 cm.

What is the area of the clear zone (including the area of the paper disc)?

Use the formula $A = \pi r^2$ $\pi = 3.14$

- **A** 37.68 mm²
- **B** 75.36 mm²
- C 452.16 mm²
- **D** 1808.64 mm²

Your answer [1]

Most candidates selected the correct answer, C. Many candidates incorrectly selected option D due to using the value of the diameter in the formula rather than the radius.

9 Which row shows how a high cholesterol diet is linked to cardiovascular disease?

	Coronary vessel blocked by cholesterol	Gas unable to be transported to cardiac muscle, damaging the heart
Α	artery	carbon dioxide
В	artery	oxygen
С	vein	carbon dioxide
D	vein	oxygen

Your answer		[1]
-------------	--	-----

Many candidates selected the correct answer, B. Option D was the most commonly selected incorrect answer.

Question 10

10 To function correctly, the brain needs to make a chemical called dopamine. Parkinson's disease is where the brain does not make enough dopamine. Embryonic stem cells might be used to treat Parkinson's disease.

What is an ethical consideration in this kind of treatment?

- A The embryonic stem cells are obtained from a human fetus.
- **B** The embryonic stem cells may not produce the correct type of dopamine.
- **C** The embryonic stem cells may be rejected by the patient's immune system.
- **D** The embryonic stem cells will not have the same genome as the patient.

Your answer		[1]
-------------	--	-----

Most candidates correctly selected the correct answer, A. Options C and D were equally chosen as incorrect responses, indicating the candidates' misunderstanding of the term ethical.

Section B overview

Section B consisted of structured questions ranging from 1 to 6 marks, assessing AO1 (knowledge and understanding), AO2 (application of knowledge and understanding) and AO3 (the ability to analyse information and ideas). Candidates performed better with AO1 style questions than when they were asked to apply that knowledge to a particular situation. Candidates appeared to have enough time to complete the paper, with the majority attempting most of the questions in Section B.

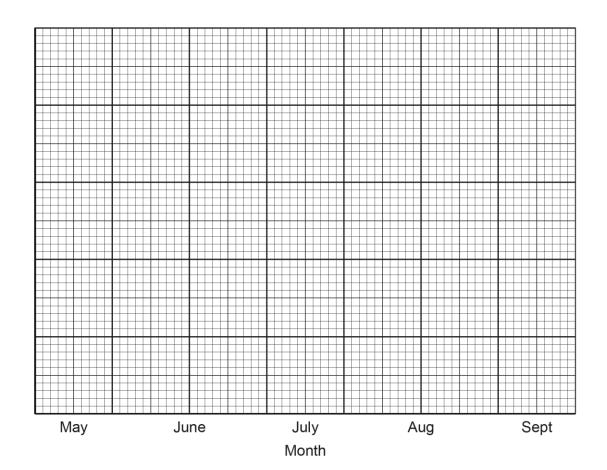
Question 11 (a) (i)

- 11 Scientists are concerned that increased pollution in a forest is affecting the population of insects living in the forest.
- (a) In an investigation, scientists estimated the population of flying insects in a forest.
 - They trap the insects using nets.
 - The mass of insects collected each month is then recorded. The data is collected in two different years, 1995 and 2015.

The table shows their results.

Month	Mass of insects trapped (g)		
WOTH	1995	2015	
May	450	50	
June	520	120	
July	920	160	
August	420	110	
September	100	20	

(i) Complete the bar chart to show the mass of insects collected each year. Both years should be included on the same grid. Include a Key to identify which year the bars represent.



13

[4]

The majority of candidates attempted to draw a graph. Many candidates added a scale which was suitable and labelled the *y*-axis appropriately including the units. Some candidates attempted to draw stacked bar charts. While this is acceptable, candidates should be aware that this will change the size of the bars as they must show one value on top of the other rather than one value within the other. The majority of candidates remembered to make it clear which bar was which by adding a key or labelling the bars.

Qu	estion 11 (a) (ii)	
(ii)	What two conclusions can be made about the mass of flying insects in 1995 compared to 201	5?
	1	
	2	
	2	
		 [2]

Many candidates achieved 1 out of 2 marks for this question. Many candidates wrote about what they thought the data showed about the number or population of insects rather than the mass. Many candidates were able to spot a similarity between the two sets of data.

Question 11 (a) (iii)

(iii) How can the scientists' method be developed to investigate biodiversity in the forest?

Tick (✓) one box.

Place traps in different parts of the forest.	
Record the number of different species found in the nets.	
Repeat their method again in 2025 to see if mass changes.	
Use their data to calculate mean mass for each year.	

[1]

Many candidates showed that they understood the term biodiversity by selecting the correct response.

Question 11 (b) (i)

(b) In a separate investigation, scientists estimated the population of insects that live on the forest ground.

The scientists trap insects using a pitfall trap.

This is a hole in the ground that the insects fall into when they crawl along the ground.

For each estimate they use this method:

- Place pitfall traps in different areas of the forest.
- Count the total number of insects caught in the pitfall traps.
- Mark the insects.
- Release the insects where they are collected from.

A week later they trap a second sample of insects.

	[1]
	State one other precaution that they should take when deciding how to mark the insects.
(i)	The scientists used an ink that is not easily washed off to mark the insects for identification.

The majority of candidates attempted this question and were successful. A common misconception was thinking that the ink should be brightly coloured so that the scientists could spot the insects easily.

Question 11 (b) (ii)

(ii) They complete their investigation during July 1995 and July 2015. This table shows the results of this investigation.

Year	Number of insects in first sample	Total number of insects in second sample	Number of marked insects in second sample
1995	114	60	8
2015	146	63	6

The scientists use this formula to estimate the population of insects living on the forest ground:

Estimated population size =

number in first sample × total number in second sample

number of marked insects in second sample

The population of insects in 1995 is estimated to be 855.

Use the formula to estimate the population size of insects in **2015**. Give your answer to **3 significant figures**.

Estimated population of insects =[2]

Many candidates were given 2 marks out of 2 for this question. Some candidates scored 1 out of 2 as they did not give their response to three significant figures. All candidates should be encouraged to show their working out so that marks can be given even if the final answer is incorrect. There was some confusion among some candidates regarding what was expected for three significant figures. Some converted their initial answer of 1553 to 153 rather than 1530.

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OCR support



Our <u>Mathematical Skills Handbook</u> and <u>check in tasks</u> can be used with candidates to familiarise them with the mathematical skills required in GCSE Science, and where they may be used.

Question 11 (c)

(c) The aim of each investigation is to see if increased pollution has affected the insect population.

The population of insects living on the forest ground increased between 1995 and 2015.

Which statements about the two investigations are **true**, and which are **false**?

Tick (✓) one box in each row.

	True	False
Both investigations came to the same conclusion about changes in insect population.		
All insects living in the forest have been negatively affected by the increased pollution.		
Only one investigation shows how the insect population changes with each month.		
The two methods used to trap the insects will result in different types of insects being trapped.		

[2]

Many lower performing candidates were unable to select the correct answers. Some candidates put ticks in some true boxes and then left the others blank. It is difficult to tell whether this was due to the candidate being unsure and so not selecting an answer or trying to represent false with a blank. Candidates should be encouraged to select true or false for every statement when presented with a similar question.

Question 12 (a)

12	Genetic material is required for inneritance in eukaryotic and prokaryotic cells.
(a)	Compare the genetic material found in eukaryotic and prokaryotic cells.

Some candidates who were not given marks for this question gave a comparison of a eukaryotic cell and a prokaryotic cell rather than a comparison about the genetic material found within them. For example, stating that eukaryotic cells have a nucleus and prokaryotic cells do not but not going on to say that the genetic material is found within the nucleus in a eukaryotic cell. Higher performing candidates overall were generally credited 2 marks as they showed clear knowledge of the genetic material found within these cells including the presence of plasmids within prokaryotic cells.

Question 12 (b) (i)

(b) Peas develop inside pods.



(i) Pea pods are either green or yellow. The allele for green is dominant over the allele for yellow.

The table shows some information about three different pea pods.

Complete the table.

Phenotype Genotype		Description of genotype		
yellow	99	homozygous		
green	GG	homozygous dominant		
	Gg			

[2]

The majority of candidates were able to interpret the information in the table and correctly fill in the blanks. Many candidates however completed the description of Gg genotype as heterozygous dominant/recessive rather than just heterozygous.

Question 12 (b) (ii)

(ii) A gardener crosses a plant that has green pods with a plant that has yellow pods. The gardener thinks both these plants have a homozygous genotype.

The result is 15 new plants with green pods and 3 plants with yellow pods.

Show that the gardener's green plant did **not** have a homozygous genotype by completing the two genetic diagrams.

Use letters G and g for the alleles.

If the green plant has a homozygous genotype:

	yellow pods	
green pods		
green pous		

Offspring ratio

If the green plant does **not** have a homozygous genotype:

	yellow pods	
groon node		
green pods		

Offspring ratio[3]

The majority of high performing candidates overall were successful in answering this question correctly. Some common mistakes seen were giving two pairs of alleles for each parent and giving the offspring percentage rather than a ratio.

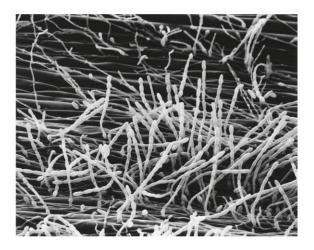
Question	12 ((b)	(iii)
----------	------	-----	-------

(iii)	The ratio the gardener achieved was 5 green to 1 yellow.
	Suggest why this does not match either of the offspring ratios.
	[1]

Very few candidates were able to suggest why the ratio obtained by the gardener did not match either of the offspring ratios.

Question 13 (a)

13 The picture shows the plant pathogen that causes powdery mildew.



(a)	Describe how powdery mildew is spread from one plant to another.
	[2]

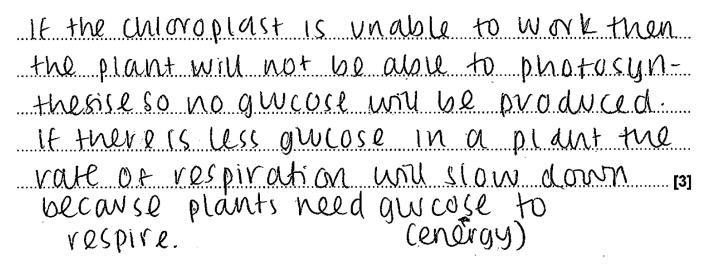
Some candidates did not attempt this question. The lower performing candidates did suggest that powdery mildew is spread from plant to plant by the wind. Only the higher performing candidates were able to recognise that it produced spores/is a fungus. Some candidates showed confusion between this concept and pollination.

Question 13 (b)

b)	Powdery mildew reduces the efficiency of chloroplasts.
	Explain how this might reduce the rate of respiration in a plant.
	[3]

The majority of candidates were able to link the reduced efficiency of chloroplasts to reduced photosynthesis and so achieved at least 1 mark out of 3.

Exemplar 1



This exemplar is from a candidate who was given 3 marks. They demonstrate knowledge of chloroplasts being involved in photosynthesis. They have correctly linked lack of photosynthesis to lack of glucose being made which they then identify is needed for respiration.

Question 15 (c) (i)	Questic	on 13	(c)	(i)
---------------------	---------	-------	-----	-----

Qu	
(c)	Plants resistant to powdery mildew are developed by genetic engineering.
(i)	Complete the sentences about genetic engineering.
	The gene for resistance is cut out of DNA using a enzyme.
	The gene is then joined to bacterial DNA using a enzyme.
	To find out if the bacteria contain the gene, scientists use
	[3]
sco	ny candidates did not attempt to answer this question. Only higher performing candidates overall red 3 marks out of 3. The most common marking point was restrictive enzyme. Some candidates fused ligase with lipase.
Qu	estion 13 (c) (ii)
(ii)	Explain why the process of cutting the DNA is prevented by high temperatures.
	Use your knowledge of enzymes.

Candidates showed good knowledge of the term denatured. Some higher performing candidates could describe what this means and why it makes enzymes ineffective.

Question 13 (d)

(d) Powdery mildew can be controlled using chemicals.

Producing plants resistant to powdery mildew is better for biodiversity compared to using chemicals.

Suggest two reasons why.	
1	
2	
	[2]

Candidates seemed to find this question challenging. Some candidates did identify that the chemicals may directly harm other species but did not identify how the chemicals could indirectly harm other species either by reducing food for animals higher up in the food chain or by bioaccumulation.

Question 14 (a) (i)

- 14 The moisture content in soil affects the growth of plants.
- (a) Two students investigate the moisture content of different soils.

This is the method used by student X:

- Measure the mass of each soil sample.
- Place the soil samples in a warm oven to dry for 4 hours.
- Measure the mass of each soil sample again.

The table shows their results.

Soil sample	Mass of soil sample at start (g)	Mass of soil sample after drying (g)	Percentage change in mass of soil sample (%)
Α	120.1	97.3	19.0
В	154.2	125.5	18.6
С	126.3	121.3	

(i) Calculate the percentage change in mass of soil sample C.

Give your answer to **3** significant figures. Write your answer in the table.

[3]

Many candidates successfully answered this question and were given 3 marks. Many candidates who were not given 3 marks were able to be given 1 or 2 marks due to them showing correct working out. The most common errors were not stating their answer to three significant figures (there was some confusion between significant figures and decimal places) and dividing five by their end mass rather than their starting mass.

GCSE	E (9-1) Gateway Science Combined Science A - J250/08 - Summer 2024	Examiners' repor
Que	estion 14 (a) (ii)	
(ii)	Soil sample A lost less mass than soil sample B .	
	Why is the percentage change in mass greater for soil sample A?	
		[1]
	didates found it challenging to answer this question correctly. Many candidates referred bunt of mass or water lost rather than using the information in the table.	to the
Que	estion 14 (a) (iii)	
(iii)	The two students compare their results.	
	 Student Y used a similar method but left the soil in the oven for a different length Student Y found the moisture content of soil sample C to be much higher than st 	
	Explain why student Y found the moisture content of soil sample C to be higher than	student X.
		,
		[2]
more	ny candidates seemed to misunderstand the question and answered as to why the soil st e water at the end of the time in the oven rather than appreciating that the amount of wa tained was determined by drying out the soil and so therefore must have been in the over	ter the soil
Que	estion 14 (a) (iv)	
(iv)	What could both students do to check that the moisture content they measured is acc	:urate?

Very few candidates were given this mark. Where candidates did gain the mark, it was generally for using a moisture level probe rather than making adjustments to the investigation.

Question 14 (b)

(b) Moisture content is one factor that affects plan	(b)	Moisture	content i	is one	factor that	affects	plants
--	-----	----------	-----------	--------	-------------	---------	--------

The amount of microorganisms in the soil can also affect plant growth.
Explain why soil microorganisms are important for plant growth.
[3]

Candidates seemed to find this question challenging. Only the higher performing candidates overall used detailed knowledge to explain why soil microorganisms are important for plant growth. Candidates should be encouraged to use the correct scientific terminology when describing minerals which plants need for growth. The term nutrients should be discouraged when describing what the plants obtain from the soil.

Misconception



Many candidates think that microorganisms are decomposing to return minerals to the soil rather than carrying out the action of decomposition.

Exemplar 2

Microorganisms in soil and up forming mutualistic relationshins with different parts of the plant (e.g. nitrogen fixing basteria and begunner)

Nutrients to make which can help the plant to gain more DNA and pratain for their growth. Therefore thou can be involved in the cycling at important nutrients.

Microorganisms can also add nutrients to the soil by decomposing longanic [3]

This exemplar is from a candidate who was given 3 marks. They demonstrate knowledge of microorganisms being required for decomposition. They have named nitrogen fixing bacteria and linked protein to growth. As demonstrated here, the candidate is using the incorrect term of nutrient, however this did not stop the 3 marks being awarded as they had three other marking points.

Question	14 ((c)
-, -,	'	(- /

(c)	Why are microorganisms described as a biotic factor and soil moisture as an abiotic factor?
	[1]

This question was successfully answered by the majority of candidates demonstrating knowledge of the key terms biotic and abiotic.

Question 15 (a)*

15

Dodo

The dodo lived in the forests on the island of Mauritius.

They evolved from a much smaller pigeon that flew to the island.

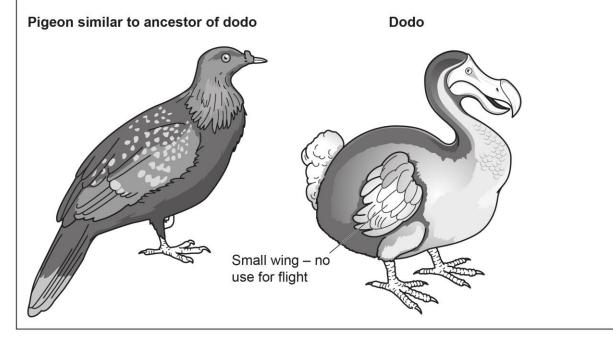
Pigeons escape predators by flying away; they nest in trees so predators find it harder to eat their eggs.

There were originally no predators or humans on Mauritius.

Dodos nested on the ground and did not fly.

Humans arrived on the island in 1598. They brought with them animals that spread across the island destroying forests and eating eggs.

The dodo became extinct by 1700.



(a)*	Explain how the dodo evolved to become a flightless bird and how the arrival of humans resulted in its extinction.	
	T6	 31

The majority of candidates demonstrated some understanding of evolution and extinction and were able to apply that knowledge to this example. Some responses saw candidates tend to pick out relevant information in the stem or only answered in terms of evolution or extinction and so were limited to Level 1. Other candidates were awarded Level 2 as they were able to develop the information given in the stem to explain how the dodo had evolved over time to have smaller wings and how the introduction of humans affected their survival. To secure Level 3, candidates had to explain why smaller wings may have been an advantage or explain their inheritance in terms of mutations or alleles and explain why the dodos were not able to adapt to the arrival of humans.

Exemplar 3

The dodo had no natural productors on the island. This meant that no slight was needed. This meant that their wings werent used and there was a mutation of of an allele. This lead to variation in the species. The bird with the allele Survived as there were no predators. The dodo bre procreated and passed on the alleles to its offspring. This also meant that the no flight wings was in the gene pool and was passed on the gene pool and was passed on the year of and was passed on the gene pool and was passed they couldn't sty away. No evolution could happen as the eggs were being destroyed and there was it is the pool of the period of the per

This is a response that gained Level 3, 5 marks. The candidate has a mutation occurring to causing variation within the species. They have explained that this bird could survive due to lack of predators and so the allele was passed down. The candidate has also stated that the dodos were killed and their eggs destroyed. They link this and a lack of time to evolve to their extinction. To secure 6 marks, the communication around the lack of time to evolve would need to be clearer.

Question 15 (b)

(b)	Suggest one way scientists could find evidence that the pigeon and the dodo have a common ancestor.	
		[1]

Many vague responses given here incorrectly linked to classification systems and comparing characteristics.

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Question 13: Powdery mildew, © DR. TONY BRAIN/SCIENCE PHOTO LIBRARY.

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