OCR

Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

GATEWAY SCIENCE BIOLOGY A

J247
For first teaching in 2016

J247/02 Summer 2022 series

Contents

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 are 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.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our website.

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Paper 2 series overview

J247/02 is the second paper candidates take for Gateway GCSE Biology Foundation Tier. It assesses content from specification topics B4-6 and B7 practical skills. There is a multiple choice question section and a short answer question section, which includes one Level of Response type question. The Level of Response question accesses the quality of communication as well as knowledge and understanding. For candidates to perform well on this paper they will need to have a sound knowledge of the theory covered in B4-6 and be able to apply this to novel situations. The candidates will also need to apply the skills and understanding that they have developed in the practical activities covered in B7. This paper includes synoptic assessment and therefore the paper assumes knowledge of B1-3 in addition to B4-6. There are also questions that involve the assessment of key mathematical requirements from Appendix 5f of the specification.

This is the first examination of the GCSE Gateway Specification A since examinations have resumed after an absence of two series. The candidates have been given advance information of the key areas of the specification which was assessed since their education has been disrupted over the last two years.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
- Demonstrating knowledge and understanding on genetic modification in Question 17(b), inherited characteristics in Question 18(b) and Darwin in Question 20(bii). - Analyse information and ideas and extracting information from a graph on heart bypass and angioplasty in Question 16(dii) and extracting information from a table on GM v's non GM costs in Question 17(a). - Question 18(d) this 'Level of Response' question candidates will be scoring at least Level 1, 2 marks here on controlling plant diseases. - Demonstrate good application of knowledge and understanding in Question 20(a) on generating food webs and Question 20(b) on natural selection. - Candidates correctly calculated the loss of mass per week here on this cross over question with the higher tier paper in Question 23(bi). - Correctly identifying the independent variable on the cross over question with the higher tier paper in Question 23(biv).	- Could not recall knowledge and understanding and analyse information to draw conclusions in Questions 16(dii), 17(a) and 20(ciii) - Found it difficult to perform calculations in Questions 23(bi) - Could not recall knowledge and understanding of a virus in Question 21(a) - Could not demonstrate knowledge and understanding of random sampling in Question 22(a), photosynthesis in Question 20(c) and coronary heart disease in Question 16(a) - Failed to gain any marks on the 'Level of Response' Question 18(d) - Responded to answers with a 'no response' instead of attempting the questions

Section A overview

Candidates coped well with selecting choices, however there were some instances where candidates used lower case letters in their response. This should be discouraged as it can be difficult due to handwriting styles to distinguish the desired letter.

Question 5

5   Which sperm would fertilise an egg to produce a female baby?

   A   A sperm with one X chromosome.

   B   A sperm with one Y chromosome.

   C   A sperm with two X chromosomes.

   D   A sperm with X and Y chromosomes.

   Your answer [ ]   **[1]**

The majority of candidates could not identify A as the correct answer for the sex chromosome the sperm would carry to produce a female baby. The most common incorrect answers were B and D where both would result in a boy and D would have Klinefelter syndrome which the candidates wouldn't be expected to know but should be able to identify that gaining an Y chromosome from the sperm would not produce a female baby.

Assessment for learning

Centres could focus on sex inheritance to improve understanding of haploid and diploid cells and that sperm and egg sex cells carry one sex chromosome.

Question 6

6 The table gives some information about four types of strawberry.

Type	Month when strawberries are ripe	Yield
Calypso	September	medium
Cambridge Vigour	June	very high
Elvira	May	high
Pegasus	July	high

A farmer wants strawberry plants which produce very high yields of ripe strawberries as early as possible in the year.

Which two types of strawberry would a farmer use to produce these plants by selective breeding?

A   Calypso and Cambridge Vigour

B   Cambridge Vigour and Elvira

C   Elvira and Pegasus

D   Pegasus and Calypso

Your answer [ ]   **[1]**

This question was the most accessible questions in the multiple choice Section A, with most candidates correctly answering B by correctly retrieving information from the table for the best two types of strawberries the farmer would use to selective breed to produce a high yield and as early as possible in the year.

Question 8

8   Which disease is classed as a communicable disease?

   A   Cirrhosis of the liver

   B   Tuberculosis

   C   Type 1 diabetes

   D   Type 2 diabetes

   Your answer [ ]   **[1]**

This question assessed the knowledge and understanding of communicable diseases and most candidates correctly identified B Tuberculosis.

Question 9

9   Which process causes the loss of biomass from a food web?

   A   Growth

   B   Photosynthesis

   C   Predation

   D   Respiration

   Your answer [ ]   **[1]**

This question also proved to be challenging to the candidates in Section A. It was testing the knowledge and understanding of energy transfer through a food chain. The majority of candidates did not understand that respiration, answer D would cause loss of biomass. Most incorrect answers were A and C.

Misconception

? | The majority of candidates did not understand that respiration would cause loss of biomass in a food chain and the main misconception they had was that growth would cause loss of biomass instead of gaining biomass.

Question 12

12 Which is the order for the levels of organisation in an ecosystem, starting with the **smallest**?

    A   community $\longrightarrow$ population $\longrightarrow$ organism $\longrightarrow$ ecosystem

    B   ecosystem $\longrightarrow$ population $\longrightarrow$ community $\longrightarrow$ organism

    C   organism $\longrightarrow$ population $\longrightarrow$ community $\longrightarrow$ ecosystem

    D   population $\longrightarrow$ organism $\longrightarrow$ ecosystem $\longrightarrow$ community

Your answer [ ]   **[1]**

This multiple choice question was accessed well by the candidates, correctly identifying the order for the levels of organisation in an ecosystem as C.

Section B overview

Candidates coped well with the low demand questions which required choosing the correct word from a list and where they were required to tick the correct box which tested their knowledge and understanding AO1 skills. The candidates could apply their knowledge and understanding of family tree inheritance and food chains well. Not surprisingly, the candidates were well informed in how to reduce the spread of an airborne pathogen.

However, candidates found it challenging to respond to questions where they had to analyse information to draw conclusions such as in the Level of Response question. Candidates should also further develop their ability in AO2 assessment objectives to applying their knowledge and understanding of scientific ideas and scientific enquiry.

Assessment for learning

Also, there were some candidates who had 'no response' answers frequently throughout Section B which could be easily overcome through developing examination technique. For example, the Level of Response Question 18d a significant number of candidates did not even attempt. There should always be a response from a candidate, even where uncertainty exists in the candidate, as there is still an opportunity to gain a mark.

Question 16 (a)

16   The diagram shows the heart of a person who has heart disease.
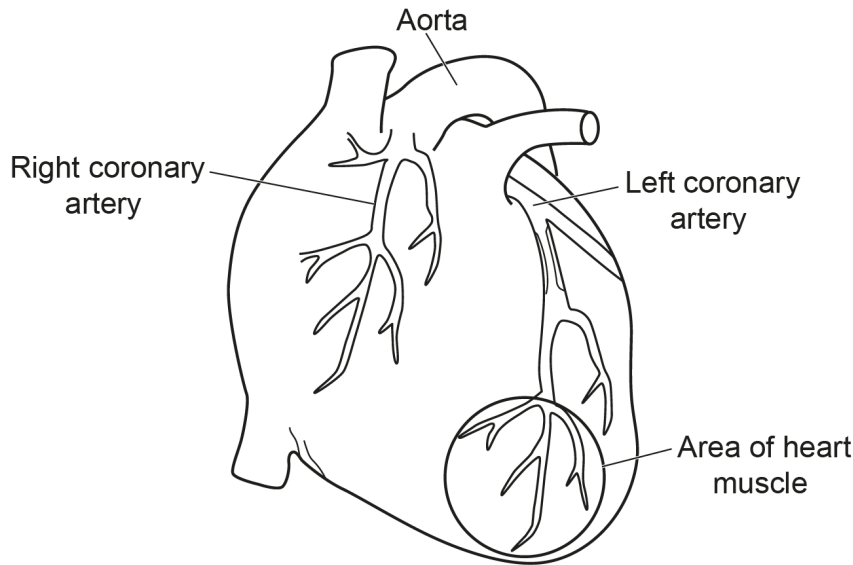
(a)   Complete each sentence below about the diagram. Use words from the list.

attack	carbon dioxide	fat	fibre
infection	nitrogen	oxygen	water

Heart disease is caused by .... blocking the blood vessels that supply the heart muscle.

This means that the area of heart muscle circled in the diagram will not get enough glucose

or .... for respiration.

This may cause it to stop beating. This is called a heart ....

[3]

This question testing knowledge and understanding was one of the most assessable questions in section B. The majority of candidates achieved full marks here for correctly completing each sentence from the list of words about heart disease.

Question 16 (b)

(b) Which factors can **increase** the risk of a person getting heart disease?

Tick (✓) **two** boxes.

eating vegetables	
inheriting certain genes	
regular exercise	
smoking cigarettes	

[1]

Again this was correctly answered by the most candidates by correctly identifying the two factors which can increase the risk of heart disease from a list. Those candidates who did not gain this mark only ticked one box.

Question 16 (c)

(c) This diagram shows the heart after a type of operation called a bypass.
A bypass is when a blood vessel from another part of the body is transplanted into the blood vessel of the heart.
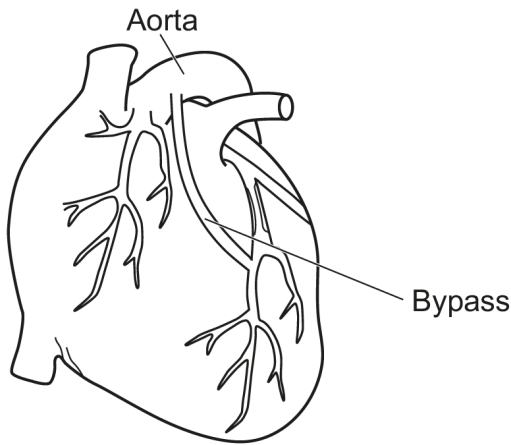
Explain how the operation would help to reduce the risk of heart disease.

....

....

....

.... **[2]**
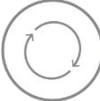
The majority of candidates did not score maximum marks for this question which was assessing their application of knowledge and understanding of heart bypass surgery. The candidates who gained a mark mostly correctly identified the heart able to gain oxygen through the bypass.

Assessment for learning

Centres could reinforce learning about the heart and circulation to consolidate candidates understanding of the heart as a muscle which need to respire to contract to function.
Candidate's responses focused on increased blood flow to the body rather than the direct result of the bypass surgery on the heart muscle.

Question 16 (d) (i)

(d) An angioplasty can also be used to treat heart disease.

The graph shows the number of both types of operations performed in the USA from 1990 to 2015. It also shows the number of people considered to be at high risk of a heart attack.
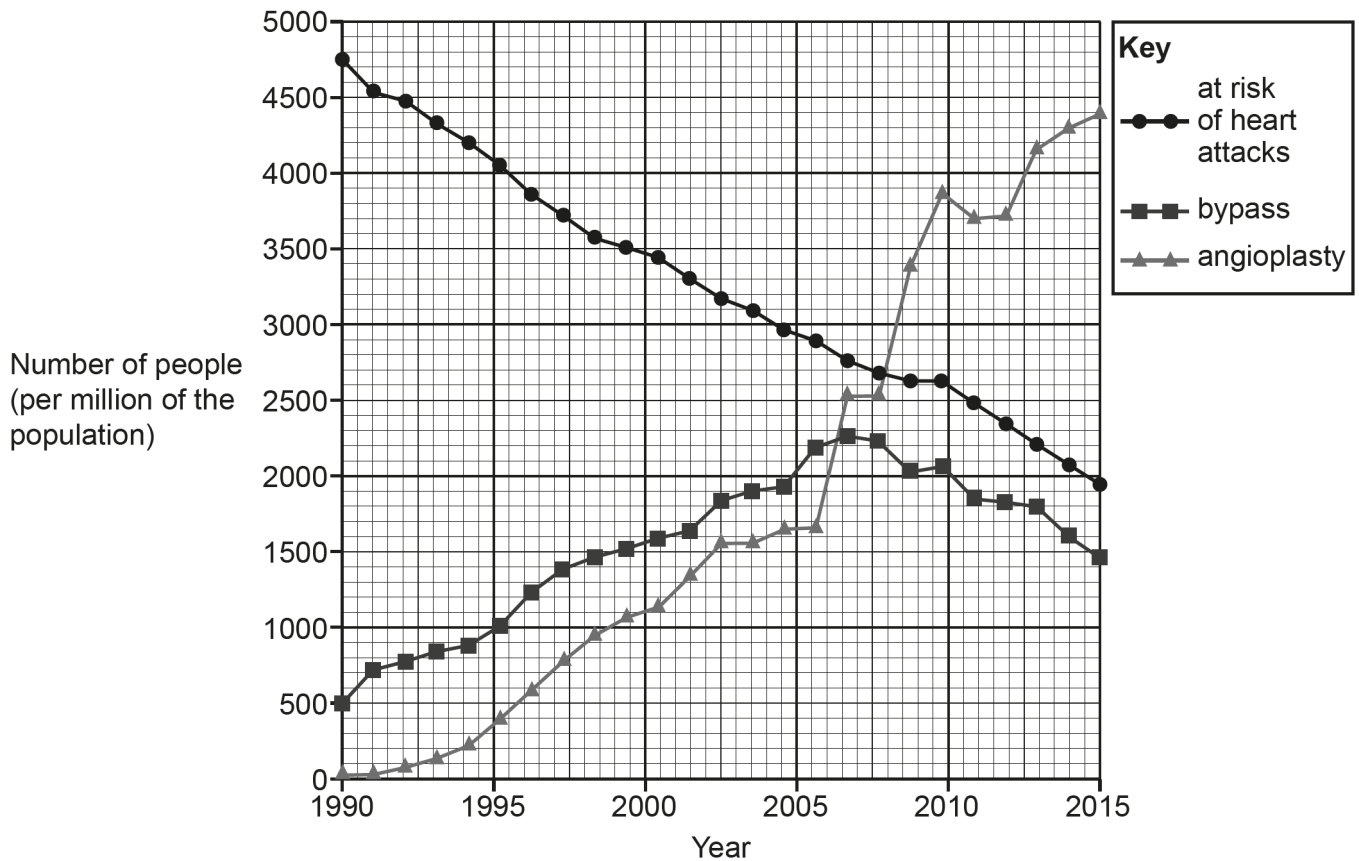
(i) In 1990, the population of the USA was 250 million.

Calculate the number of people that had a bypass operation in the USA in 1990.

Number of people = ... **[2]**

The majority of candidates did not score this mark by correctly calculating the number of people who had a bypass operation in the USA in 1990 by times the number form the graph by the total population provided in the USA. Most answers stated 500 which the number (per million of population) from the graph without any further processing.

Question 16 (d) (ii)

(ii) Use the graph to suggest **two** reasons why the number of bypass operations decreased from 2006 to 2015.

1 ....

....

2 ....

....

[2]

> This question differentiated well between higher and lower ability candidates, where they had to analyse information from a graph to evaluate. The candidates who did not score here did not extract the information from the graph and instead wrote about improved diets and awareness of heart disease.

Question 16 (e)

(e) Heart disease causes damage as muscle cells can be replaced with scar tissue.

This makes the heart less efficient at pumping blood, which affects all the cells of the body. Doctors can treat heart disease by injecting the heart muscle with stem cells.

Explain how this could improve the lives of people with heart disease.

....

....

....

....

.... **[3]**

> This question proved challenging for the candidates with a high level of no response to the question. Those candidates who scored only gained one mark and very few gained full marks. The most common given mark was correctly identifying that the heart will beat more efficiently. Candidates who did not gain marks stated what stem cells are without applying it to the question and referring that those cells would specialise into muscle/heart cells.

Question 17 (a)

17 Some farmers in Ireland want to start growing genetically modified (GM) wheat.

Growing GM wheat would mean that they need to spray less pesticides on their fields.

The table shows an estimate of the costs of growing non-GM wheat compared to GM wheat.

Type of expense	Cost to farmer in euros per hectare (10 000 metres squared)	
	Non-GM wheat	**GM wheat**
seeds	63	72
government charge	0	25
pesticide costs	165	113

(a) Use data from the table to suggest why the farmers want to start growing GM crops.

....

....

....

.... **[2]**

A significant number of candidates scored a mark here correctly identifying that the pesticide cost is lower for GM crops. Candidates who did not gain any marks on this question mixed up the cost to produce the crops for the farmer with selling costs and profits.

Question 17 (b)

(b) The wheat has been genetically modified.

Which type of chemical is inserted into the wheat cells to genetically modify them?

Put a (ring) around the correct answer.

DNA   fertiliser   hormone   pesticide

[1]

The majority of candidates did not correctly identify DNA is inserted into wheat cells to genetically modify it. This tested their knowledge and understanding of genetic engineering and incorrect answers ranged from all the other alternative answers.

Question 17 (c)

(c) Some other farmers are concerned about growing GM wheat. They think that some people may not buy it.

Suggest **two** reasons why some people may **not** want to buy GM wheat.

1 ....

....
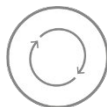
2 ....

....

[2]

Very few candidates gained full marks for this question on concerns of genetic modification crops. The most given mark was for ethically wrong. Most common incorrect answers were unnatural or talking about costs from the previous question.

Assessment for learning
Benefits and consequences of genetic engineering is a common assessed topic and centres could benefit using past papers as a useful revision tool.

Question 18 (a)

18   The diagram shows a tulip plant. Many gardeners like to grow tulip plants.
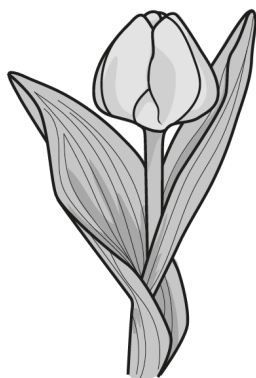
(a)   Tulips can be grown from seeds produced from sexual reproduction.

They can also be grown from bulbs that are produced by asexual reproduction.

Which statements explain why gardeners usually choose to plant bulbs that were produced asexually?

Tick (✓) **two** boxes.

Bulbs will grow much faster than seeds. ☐

The gardener will know the colour of the flowers from bulbs. ☐

Tulip plants grown from seed will not need to photosynthesise. ☐

Tulips grown from seeds will not require water. ☐

Tulips grown from seeds will all look exactly the same. ☐

[2]

The majority of candidates gained at least one mark here for correctly choosing the correct a statement on asexual reproduction.

Question 18 (b)

(b) In 1637, tulip growers found that a small number of their tulip plants produced flowers with different coloured stripes.

The growers did not know what was causing the colour changes.

Complete the sentences to show **two** possible explanations for the colour changes.
Use words from the list.

antibody	**gene**	**mutation**
pathogen	**phenotype**	**producer**

The tulips could be diseased because they have been infected by a ....

This has altered the production of a chemical that colours the flowers.

Another explanation is that a .... has occurred in the DNA of the tulip.

This is a change in the .... that codes for a coloured chemical.

[3]

This question differentiated well between lower and higher ability candidates. Candidates had to correctly complete each sentence from the list of words about genetics. Most candidates gained at least one mark.

Question 18 (c)

(c) It was not until 1960 that scientists could show that the tulips were infected with a virus.

Viruses are much smaller than human cells.

Suggest why it took so long to identify the cause of the infection.

....

.... **[1]**

Candidates found this question challenging and were unable to identify that microscopes would not have had the resolution or magnification ability to see the virus. Most answers which did not gain any marks wrote about technology not advanced.

Question 18 (d)*

(d)* This virus is spread by insects that feed on the tulips.

Although infected bulbs produced attractive flowers, growers found that the bulbs became weaker every year until they died.

To stop the spread of the disease, growers can use two approaches:

- Dig up and burn any tulips as soon as they show signs of infection
- Spray their fields with insecticides.

Explain how these **two** different methods would control the disease.
Discuss the advantages and disadvantages of each method.

....

....

....

....

....

.... **[6]**

The Level of Response question had a high level of no responses, whereby if those candidates had attempted the question could have gained some marks. Those candidates who attempted to answer mainly produced Level 1 and Level 2 answers and very few were able to explain how each method would control the disease plus discuss the advantages and disadvantages of each method. A number of candidates got confused that pesticides would kill the infection not the insects and harm the tulips.

Exemplar 1

If they dig up and burn any tulips as soon as they show signs of infection this can cause pollution into the environment and could potentially damage other tulips around the surrounding area. However, an advantage of this is the infection will be killed.

A disadvantage of spraying their fields with insecticides is it could also kill the tulips, as well preventing the infection from spreading.

Exemplar 1 shows a Level 2, 4 marks response where the candidate has correctly identified how digging up and burning the tulips would control the disease by killing the infection with a correct evaluation of a method, by causing pollution. They did not identify how insecticides would reduce the spread of infection and incorrectly stated that tulips would be killed.

Question 19 (a) (i)

19 Amyloidosis is a group of inherited conditions that affect people's health.

The most common type of amyloidosis is caused by a dominant allele (**A**) of a gene.

The allele **A** codes for a harmful protein called amyloid.

(a) The diagram shows the inheritance of the allele in a family.
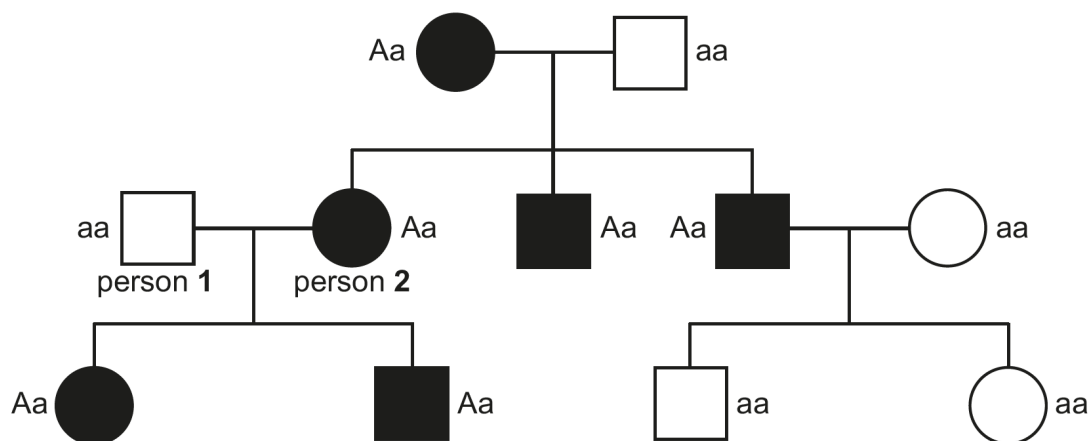
(i) Complete the table about the family tree.

The first row has been done for you.

	Number in the family
Number of males	6
Number of people who are homozygous recessive for the gene	
Number of people who have amyloidosis	

[2]

More than half the candidates gained full marks here applying knowledge and understanding of genetic family tress and drawing conclusions on number of people who have amyloidosis. This question did differentiate well between ability of candidates.

Question 19 (a) (ii)

(ii) Person **1** and person **2** are expecting another baby.

Complete the genetic diagram to find the probability that the baby will have amyloidosis.

Person **1**

Person **2**			
	A		
	a		

Probability = ...

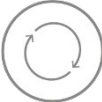**[2]**

Again this question on genetic inheritance differentiated well between the candidates. Those who did not correctly complete the genetic diagram would gain the correct probability mark as an error carried forward.

Assessment for learning

Candidates who could not complete the genetic cross correctly could be easily overcome through developing examination technique and practice.

Question 19 (b)

(b) Amyloid protein is made by blood cells called plasma cells.
Amyloid can stop the pancreas releasing insulin.
It can also prevent sensory neurones from working.

Explain why person **2** starts to develop symptoms of amyloidosis **and** suggest what these symptoms might be.

....

....

....

....

....

.... **[3]**

This question had one of the highest no responses. The question tested the application of knowledge and understanding of scientific ideas and analysis of information to interpret. Over half of candidates scored here but very few gained full marks. The most common mark given was for symptoms of diabetes. Very few candidates identified the person had inherited the dominant allele.

Question 20 (a)

20 Pine processionary moths lay eggs that develop into caterpillars, as shown in the diagram.

 Moth
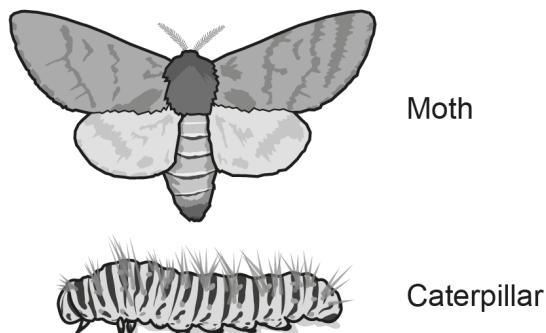
 Caterpillar

(a) The caterpillars eat pine trees.
The caterpillars are eaten by birds such as cuckoos. The caterpillars are also parasitised by fungi.

Draw a food web to show these feeding relationships.

[2]

Most candidates did not score here generating a food web, by using lines instead of arrows. Some candidates were confused where the fungi went in relation to the feeding relationship. More candidates gained full marks rather than just one.

Assessment for learning
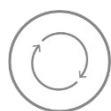
Candidates could practice generating food webs which could be easily overcome the lack of understanding through developing examination technique.

Question 20 (b) (i)

(b) The caterpillars have hairs on their bodies that cause irritation to predators.

Cuckoos have a special sticky membrane lining their guts that traps these hairs.

This allows the cuckoos to eat the caterpillars.

(i) Cuckoos evolved this sticky membrane by the process of natural selection.

The statements **A–E** show steps in this process.
They are **not** in the correct order.

A The gene for sticky membranes increases in the population.

B Cuckoos with sticky membranes reproduce and pass on the gene.

C Cuckoos with sticky membranes are more likely to survive.

D A change in a gene in the cuckoo produces a sticky membrane.

E Over many generations the cuckoos all have sticky membranes.

Write a letter in each box to show the correct order.
One has been done for you.

				E

[3]

The majority of candidates scored 2 or full marks on this natural selection question showing the correct order.

Question 20 (b) (ii)

(ii) Name the scientist who first published a book describing the theory of natural selection.

.... **[1]**

Over half the candidates correctly identified Darwin as the scientist who published a book describing the theory of natural selection. Most candidates who did not gain this mark did not answer with a no response.

Question 20 (c) (i)

(c) Scientists use a fungus to kill the caterpillars to protect the pine trees.
The fungus is sprayed as spores which develop into the fungus.

Table 20.1 shows three treatments the scientists try.

Table 20.1

	Site of spraying	Concentration of fungal spores used (million spores/ml)	How long the treatment lasts
Treatment 1	on the tops of the pine trees	100	a few months
Treatment 2	on the soil around the pine trees	100 000	many years
Treatment 3	control (spraying with water)	0	

(i) Why is the use of the fungal spores an example of biological control?

.... **[1]**

This question was one of the most challenging for the candidates whereby they did not know what a biological control was. Therefore it had a high no response from the candidates or provided a guess.

Assessment for learning

Centres could make sure that candidates are aware of biological control in controlling pest numbers.

Question 20 (c) (ii)

(ii) How many times **more concentrated** are the spores in the spray used on the soil compared to the spray used on the tops of the pine trees?

Answer .... **[1]**

Roughly half of all candidates could calculate that spores were x1000 more concentrated sprayed on the soil than the tops of trees. Most answers which did not gain the mark subtracted 100 from 100 000.

Question 20 (c) (iii)

(iii) **Table 20.2** shows the results of the scientists' spraying in one year.

Table 20.2

Site of spraying	Caterpillars killed (%)
on the tops of the pine trees	86.9
on soil	80.0
control (spraying with water)	3.7

The scientists made this statement:

> The fungal spores are an effective way to kill the caterpillars.
> The fungal spores should be sprayed on the soil not in the trees.

Discuss why the scientists are correct.
Use data from **Table 20.1** and **Table 20.2**.

....

....

....

....

....

.... **[3]**

This question proved challenging for the candidates. It was testing the ability to interpret and analyse information from tables. It had a fairly high no response from candidates but those who attempted and gained a mark were able to identify that the fungal spores last longer/contained more when sprayed on the soil. Most candidates were not able to identify that using spores killed more caterpillars than the water/control. Candidates who did not gain any marks were not comparative with their answers between spores sprayed on the tops of the tree and the soil.

Exemplar 2

Some may think Spraying on top is better than in soil as it kills 86.9% of caterpillars however this will only last a few months and they are not as concentrated as or spraying on soil. Spraying on Soil lasts for many years and kills 80% therefore it is better as it lasts longer. therefore in the long run **[3]** it will kill more. On soil is also much more concentrated than on top of trees. Evidently fungal spores are an effective way as they will more than what water does. water only kill 5.7% which significantly lower.

Exemplar 2 gained full marks for correctly identifying spores kills more caterpillars than the control/water and spraying on the soil last longer and has a higher concentration.

Question 21 (a)

21   Measles is an infectious disease caused by a virus.

(a)   Most people recover well from measles but often get other diseases afterwards.
Doctors think that this is because the measles virus weakens the immune system.

Name **one** other virus that severely weakens the immune system.

.... **[1]**

This question tested the knowledge and understanding of microbes and roughly half of candidates could correctly identify a virus that weakens the immune system. Incorrect answers ranged from named bacteria and protist pathogens.

Question 21 (b) (i)

(b) Measles spreads easily from one person to the next as it spreads through the air.

　　(i) Describe **one** way that a person who has measles can try and reduce the chance of passing it on to another person.

　　..

　　.. **[1]**

This was one of the most assessable questions on the examination paper. The candidates were well informed how to reduce the spread of an airborne pathogen.

Question 21 (b) (ii)

　　(ii) Describe **one** way that the natural defence mechanisms of the human body may prevent the virus from entering the lungs.

　　..

　　..

　　..

　　.. **[2]**

The candidates found this question requiring knowledge and understanding on defence barriers challenging and mistook this as an immune response answer. Most candidates referred to antibodies, white blood cells. Those candidates who did recognise that the answer required barrier of defence made generic answers such as coughing and hairs, without knowing the technical terms of mucus and cilia. This question had a significant number of candidates which answered with a 'no response'.

Misconception

? Candidates did not recognise that to prevent entry of microbes into the lungs the barriers of defence are producing mucus by goblet cells and cilia removing the trapped microbes in the mucus. Centres could reinforce subject specific key words when teaching these key ideas.

Question 21 (c)

(c) A vaccine is available to protect people against measles.

What does the measles vaccine contain to provide this protection?

....

.... **[1]**

This question tested the knowledge and understanding of vaccines and most candidates did not know what is found in a vaccine. I lot of answers which did not gain nay marks were responses such as antibodies and the virus. This question had a significant number of candidates which answered with a 'no response'.

Misconception
?   A significant number of students did not recognise that a dead / weakened version of the pathogen is found in a measles vaccine and incorrectly answered antibodies.

Question 21 (d) (i)

(d) The graph shows the number of cases of measles in the UK from 1940 to 2012.
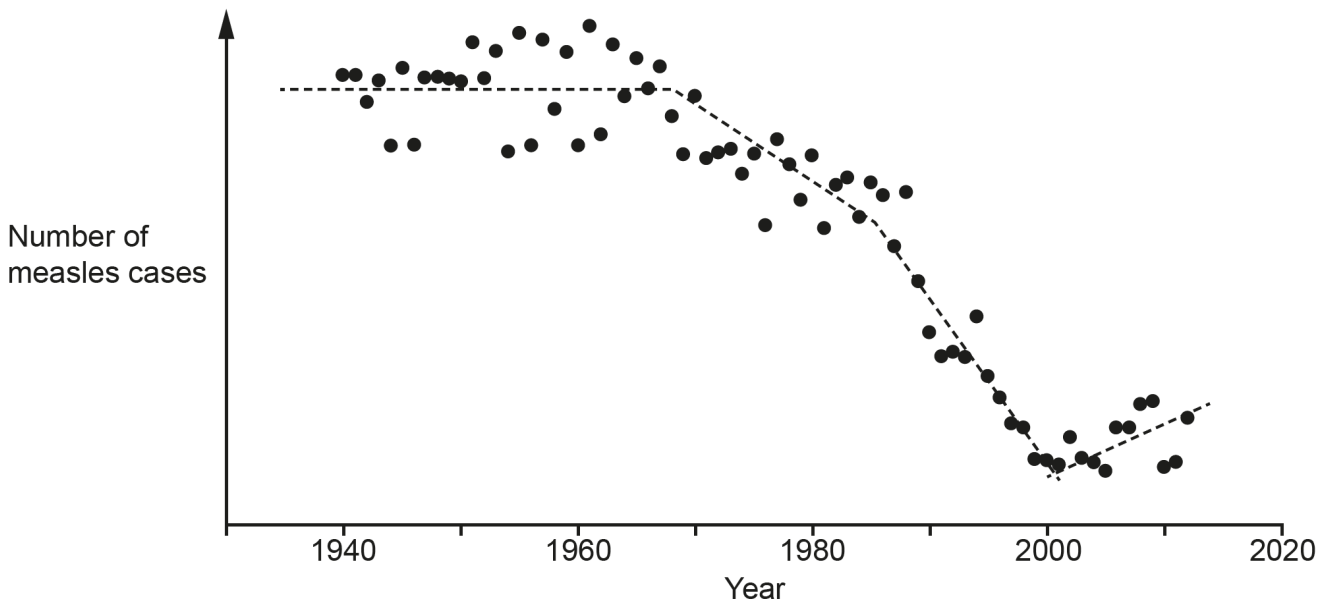
During these years, two events have affected the number of measles cases.

(i) In 1968, vaccinations against measles started for children.

Explain the effect that this had on the number of measles cases.

....

....

.... **[2]**

The majority of candidates scored one mark here for recognising that the measles cases would decrease after the introduction of the vaccine. This question was testing their ability to analyse information and ideas to draw conclusions.

Question 21 (d) (ii)

(ii) In 1998, a report claimed a link between the measles vaccine and an increased risk of a disorder called autism.

Explain the effect that this had on the number of measles cases.

....

....

.... **[2]**

The majority of candidates scored one mark here for recognising that the measles cases would increase after the 1998 report. This question was testing their ability to analyse information and ideas to draw conclusions.

Question 22 (a)

22 A gardener grows thistle plants as weeds in his grass lawns.
He wants to see if thistle plants grow better in the front garden than in the back garden.

The diagram shows a plan of the grass lawns in each garden.

(a) The gardener estimates the number of thistle plants in each metre squared of the **back** garden. He gets an estimate of 2.5 thistle plants/m^2.

Describe an experimental method the gardener uses to get this estimate.

Include the name of the piece of apparatus he uses.

....

....

....

....

.... **[3]**

This question tested the candidate's knowledge and understanding of sampling using a quadrat and the candidates found this challenging to articulate. The majority of students did not score and those students who did gained one or 2 marks, which mainly were gained from the first any 2 marking points. This question had a significant number of candidates which answered with a 'no response'.

Exemplar 3

sampling, he used a quadrat and placed it in an area, where he counted how many thristle plants in that section. the the gardener then multiplied the numbe total by how many quadrats could fit in the whole area of the garden. he counted how many plants coll in each set section of each square in the quadrat which gave 2.5m².

Exemplar 3 gained 2 marks for stating the use of a quadrat and idea they count the number of thistles in each quadrat.

Question 22 (b)

(b) The **front** garden is smaller so he counts all the thistle plants growing in the lawn.
He counts 36 plants.

Calculate the number of thistle plants per metre squared in the front garden.
Use the formula: area of a triangle = ½ × base × height

Number of thistles = ... /m^2 **[2]**

The candidates found this calculation challenging. Most candidates calculated the area of the triangle and nothing else. Those candidates that scored gained full marks.

Assessment for learning
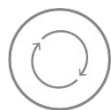
Centres could use the opportunity when teaching this required practical to also highlight the mathematical calculations required and practice these.

Question 22 (c)

(c) The gardener cuts the grass more often in the back garden. He thinks thistles grow better when he mows the grass more often.

The diagram shows the grass lawns before and after he has mown them.

Before mowing　　　　　　　　　　　　**After mowing**
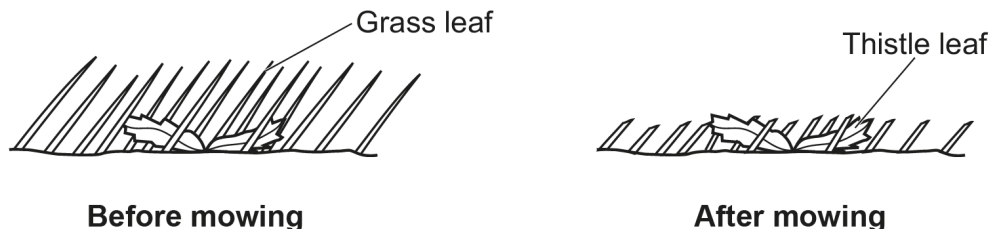
Explain how cutting the grass more often can affect how well the thistles grow.

Use ideas about competition and photosynthesis.

....

....

....

....

.... **[3]**

This question was standard demand and did discriminate well among the candidates which an even number of candidates gaining 0-2 marks. However very few were able to gain full marks by omitting that more sugars/glucose would be made. Most common marking response was the thistles would gain more light. Answers which did not score any marks stated competition between the grass and thistles for water/space and minerals.

Question 23 (a)

23   Some students investigate decomposition of dead plant waste.
They make a composter from two plastic bottles.

- Tape
- Air holes
- Dead plant waste
- Drain hole to let water out so the waste does not get waterlogged
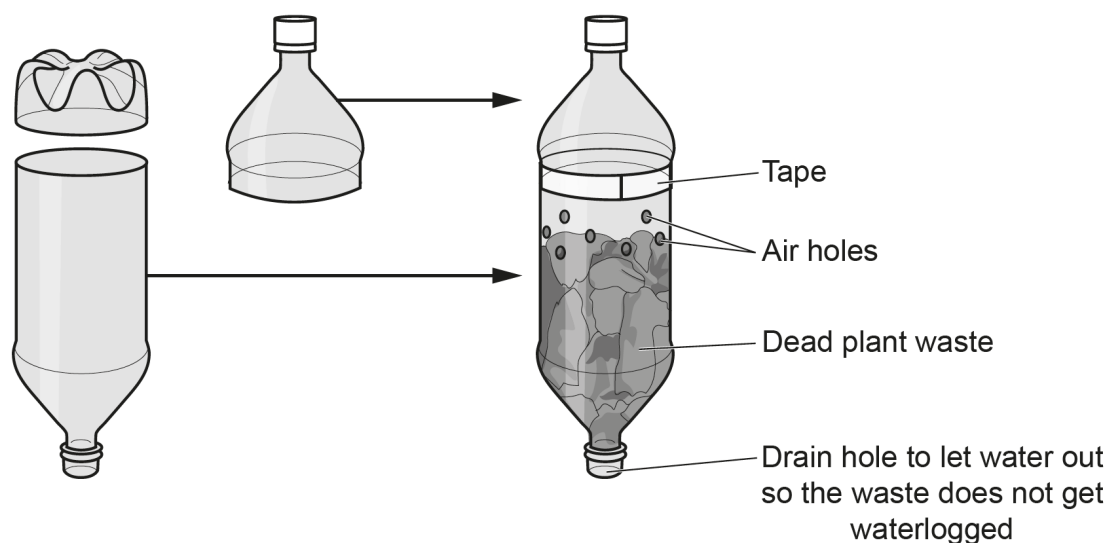
(a)   Why do the students make air holes in the bottle?
Tick (✓) **one** box.

To allow heat into the bottle.

To allow oxygen gas into the bottle.

To prevent the build-up of nitrogen gas in the bottle.

So that carbon dioxide gas can enter.

[1]

Roughly half of all candidates scored this mark correctly identifying air holes will allow oxygen gas into the bottle.

Question 23 (b) (i)

(b) The students want to see if the number of air holes in the bottles affects the rate of decomposition.

- They set up bottles with different numbers of air holes.
- They then measure the mass of the bottle and compost at the start and after four weeks.

The table shows their results.

Number of air holes	Mass of bottles and plant waste (g)	
	At the start	**After 4 weeks**
2	300	270
4	300	250
8	300	240
16	300	235

(i) Calculate the loss in mass **per week** of the bottle and plant waste with 16 air holes.

Give your answer to **3** significant figures.

Loss in mass = ... grams / week **[3]**

This question had a significant number of candidates which answered with a 'no response'. However out of the candidates who did attempt the calculation it did differentiate well between different ability candidates with a range of marks between one and full marks.

Question 23 (b) (ii)

(ii) Describe the effect of the number of air holes on the rate of decomposition of the plant waste.

....

....

....

.... **[2]**

Candidates either gained a mark for recognising the relationship between number of air holes and decomposition or did not gain a mark. The candidates who attempted the question but did not gain any marks it was because they stated the relationship between the air holes and the loss in mass. This question had a significant number of candidates which answered with a 'no response'.

Question 23 (b) (iii)

(iii) The students checked that all the bottles and plant waste had a mass of 300 g at the start of the experiment.

Explain why this helps the students to analyse the results.

....

.... **[1]**

Candidates found this question difficult to answer. Most responses which did not gain any marks were for a fair test. This question had a significant number of candidates which answered with a 'no response'.

Question 23 (b) (iv)

(iv) What is the independent variable in the students' investigation?

.... **[1]**

Slight under half of students could correctly identify the independent variable. This question had a significant number of candidates which answered with a 'no response'.

Question 23 (b) (v)

(v) The students notice that during the experiment, water drips through the drain hole at the bottom of the apparatus on to the floor.

Explain why this can produce inaccurate results **and** how the students can change their method to correct this.

....

....

....

.... **[2]**

This is an overlap question with the higher tier paper and proved challenging to the candidates which candidates who scored only gained one mark. The most scored mark given was idea water would not have weighed. Some candidates wrote about the effect on decomposition or vague responses about inaccurate results. This question had a significant number of candidates which answered with a 'no response'.

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