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Examiners' Report
June 2024

GCSE Biology 1BI0 1H

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June 2024

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Introduction

The Pearson Edexcel GCSE (9-1) Paper 1 Biology (Higher tier) paper is the first of two papers taken as part of the GCSE (9-1) Biology qualification. This is the seventh assessment of the GCSE (9-1) which takes place in May each year, with the exception of 2020 and 2021 where the paper was sat in the autumn with a much lower entry. In 2022 to compensate for lost learning candidates had access to an advanced information document for this paper which detailed some of the content that would be included in the exam and some that was not included. In line with last year, candidates this year did not have advanced information and had to prepare for questions from all the topics of the specification included in this paper.

The Biology specification and the qualification follows a linear assessment model whereby candidates must complete the two papers, worth 100 marks each, in the same single year of certification. Paper 1: Biology (Higher tier) is assessed by a variety of question types, including multiple-choice questions, short-answer questions, calculations and extended open-response questions. Candidates should answer all questions in a time period of 1 hour and 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically. There are two such questions in this paper. In addition, the GCSE (9-1) Biology qualification assesses practical knowledge and maths skills; the requirements of which are given in the specification. Furthermore, there are 8 mandatory core practicals which candidates must complete prior to the examination, as aspects of working scientifically are also assessed in questions throughout the paper. Paper 1: Biology (Higher tier) contains questions assessing the content from Topics 1 to 5, as identified in the specification.

In this examination series, candidates were required to respond to questions that tested their knowledge and understanding of Charles Darwin and the processes behind the stages of evolution, enzymes and the effect of pH on their activity, the communicable diseases of malaria and measles, the immune system, Mendel's genetic crosses in pea plants, the structure of DNA, human evolution and stone tools, plant defences, biological control, transcription and drug development processes. The first extended open-response question assessed knowledge on mitosis and the second required candidates to apply their knowledge of the lytic cycle of a bacteriophage to consider its use as an alternative to antibiotics. Questions designed to assess practical skills included the use of a water bath to control temperature, the use of a microscope to view cells, the extraction of DNA from cells, designing a method that could be used to monitor growth in a child and the core practical for Topic 5, testing the effectiveness of antibiotics. The math skills assessed in this paper related to calculating percentage probabilities, ratios, magnification calculations, percentages and giving numbers to a specific number of significant figures.

There are now many past papers with mark schemes and examiners' reports available as well as practical support booklets for this qualification and it is clear that these resources are being utilised as part of the revision process. The use of scientific terminology in responses continues to improve, not just in higher ability candidates. Most candidates were able to access both extended writing responses and the responses to practical questions on microscopes, DNA extraction and testing antibiotics, showing improved understanding. The process of drug discovery and testing had not previously been examined to the level of detail it was assessed at this year and candidates found it challenging to explain the reasons behind the processes involved. Analysis of the data from a clinical trial lacked detail. In contrast, candidates were able to effectively explain the decrease in the number of cases of measles as a result of vaccination and analyse differences in stone tools linked to human evolution. They were also able to describe changes that have occurred during human evolution and the outcomes of the Human Genome Project. The question on evolution indicated some confusion between causes of variation and the role of selection pressures. Candidates struggled to expand explanations on the role of biological control beyond the idea that it would increase crop yield. In contrast the question on transcription, which is a higher specification statement, showed a very good understanding of the process.

There was an improvement in the level of detail given in answers to practical questions. It is clear that many candidates had completed the practical to extract DNA from cells, used a microscope and were familiar with aseptic techniques and the manipulation of agar plates with bacteria growing on them to test the effectiveness of antibiotics. In general, maths questions showed a good level of understanding. Although some candidates did not give answers to the correct order of magnitude when calculating the actual size of a mitochondrion, when given the image size and magnification. When calculating the number of people involved in a trial, some candidates did not give the answer to the number of significant figures requested in the question.

Question 1 (a)(ii)

This question asked for two causes of variation. The first marking point related to genetics, mutation or alleles, the second marking point was causes linked to sexual reproduction and the final marking point was around the influence of the environment or named environmental factors. Most candidates gained two marks. Where marks were lost it was because candidates explained the consequences of variation and related their answers to the idea of adapting or evolving to the environment.

(ii) Figure 1 shows some stages of the theory of evolution.

overproduction → variation → survival of the fittest

Figure 1

State **two** causes of variation in organisms.

(2)

1 genetics

2 environment

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Examiner Comments

This response refers to the two causes of variation stated on the specification.

(ii) Figure 1 shows some stages of the theory of evolution.

overproduction → variation → survival of the fittest

Figure 1

State **two** causes of variation in organisms.

(2)

1 Mutations

2 Change in environment

ResultsPlus
Examiner Comments

This response scored two marks. Although a change in the environment is a selection pressure, environment was credited as one of the causes of variation. Named environmental factors were also credited against this marking point.

ResultsPlus
Examiner Tip

Make sure you understand the difference between the causes of variation and the selection pressures in the theory of evolution.

This scored one mark for genetic mutation. Organisms evolving different characteristics as a result of selection pressures is not the cause of the variation.

(ii) Figure 1 shows some stages of the theory of evolution.

overproduction → variation → survival of the fittest

Figure 1

State **two** causes of variation in organisms.

(2)

1 Random mutations in the DNA bases of organisms

2 Organisms develop ~~acquired~~ evolve to different characteristics from different selection pressures in different geographical areas through a process called natural selection.

ResultsPlus
Examiner Comments

Make sure you understand the differences between variation, adaptations and selection pressures.

Question 1 (a)(iii)

This question gave disease as an example of a selection pressure and asked for another example. Marks were awarded for changes in the environment, competition, predators, ideas around a change in prey or food source or natural disaster. Most candidates gained the mark for the idea of a change in the environment or predators, some gave specific examples such as famine or climate change. The mark was not awarded for climate or environment unless it was linked to the idea of a change.

(iii) Disease is an example of a selection pressure.

Give **one** other example of a selection pressure that leads to survival of the fittest.

change in weather / climate

ResultsPlus
Examiner Comments

This gained one mark for change in the weather/climate which would create a selection pressure.

(iii) Disease is an example of a selection pressure.

Give **one** other example of a selection pressure that leads to survival of the fittest.

Competition for mates

ResultsPlus
Examiner Comments

Competition is a selection pressure that will result in survival of the fittest so the response gained the mark.

(iii) Disease is an example of a selection pressure.

Give **one** other example of a selection pressure that leads to survival of the fittest.

Climate

ResultsPlus
Examiner Comments

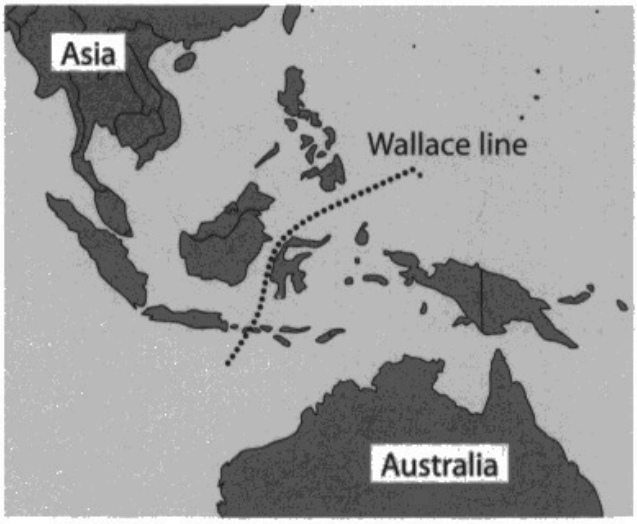
Climate was insufficient for the mark as it did not give any indication that there was a change in climate which would be needed to create a selection pressure.

Question 1 (b)(i)

This question asked for reasons why animals to the west of the Wallace line were different to animals to the east of the Wallace line. Most candidates recognised that this is likely to be due to differences in the environment or differences in food, predators or prey. Some responses gave the idea of geographical isolation or that they had different ancestors. Marks were not awarded for the idea that they've evolved or that natural selection or adaptations had occurred as this is not a reason for the differences.

(b) Figure 2 shows the location of the Wallace line, an imaginary line Alfred Wallace suggested, based on his research.

Wallace found that animals to the west of the line were different from animals to the east of the line.



(Source: https://www.dailymail.co.uk/sciencetech/article-4279382/Animal-evolution-shaped-movements-Earth.html)

Figure 2

(i) Suggest **two** possible reasons why animals to the west of the Wallace line are different from animals to the east of the Wallace line.

(2)

1 Different ~~climat~~ predators climate/weather

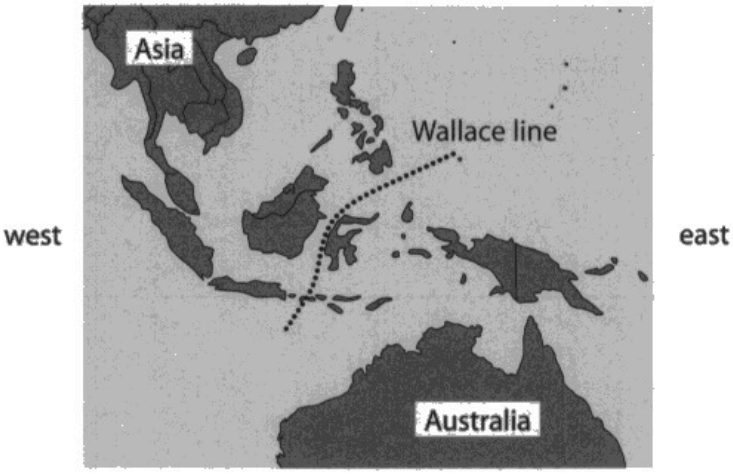
2 Different food sources e.g. different types of plants.

ResultsPlus
Examiner Comments

The reasons stated in this response were sufficiently different to gain two marks. The response gave specific examples including weather and food sources.

(b) Figure 2 shows the location of the Wallace line, an imaginary line Alfred Wallace suggested, based on his research.

Wallace found that animals to the west of the line were different from animals to the east of the line.



(Source: https://www.dailymail.co.uk/sciencetech/article-4279382/Animal-evolution-shaped-movements-Earth.html)

Figure 2

(i) Suggest **two** possible reasons why animals to the west of the Wallace line are different from animals to the east of the Wallace line.

(2)

1 adapted to different climates

2 competing for different resources

ResultsPlus
Examiner Comments

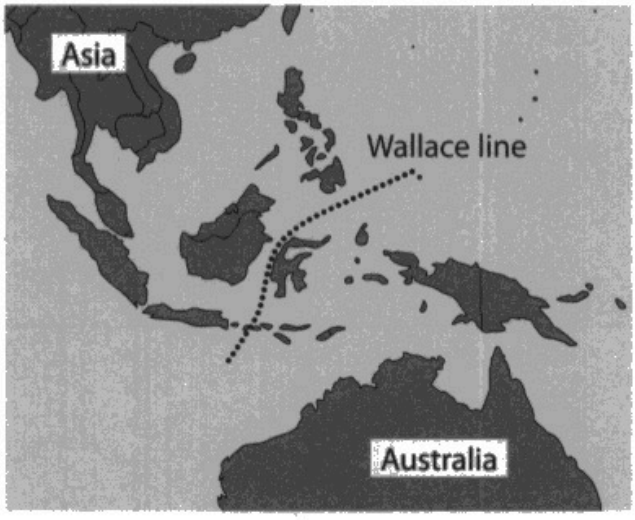
This gained one mark for different climates. Different resources was too vague.

ResultsPlus
Examiner Tip

Avoid terms like resources which is vague and does not demonstrate sufficient scientific knowledge.

(b) Figure 2 shows the location of the Wallace line, an imaginary line Alfred Wallace suggested, based on his research.

Wallace found that animals to the west of the line were different from animals to the east of the line.



west east

(Source: https://www.dailymail.co.uk/sciencetech/article-4279382/Animal-evolution-shaped-movements-Earth.html)

Figure 2

(i) Suggest **two** possible reasons why animals to the west of the Wallace line are different from animals to the east of the Wallace line.

(2)

1 There are different selection pressures in each area

2 ~~different environments~~ evolution due to natural selection

ResultsPlus
Examiner Comments

This gains one mark for different selection pressures. Ideas such as evolution, natural selection or adaptations are not reasons why there are differences.

Question 1 (b)(ii)

Most candidates were able to give a correct reason for why the work of Alfred Wallace encouraged Charles Darwin to publish his theory of evolution. A range of different reasons were given including the idea that the work of Wallace provided more evidence, supported Darwin's theory or showed that animal populations could adapt or evolve to their environment. Some candidates were credited for suggesting Darwin wanted to get the credit.

(ii) Give **one** reason why the work of Alfred Wallace encouraged Charles Darwin to publish his theory of evolution.

(1)

Because he showed that there was genetic variation in a species based on location

ResultsPlus Examiner Comments

This was not sufficient for the mark as Darwin and Wallace did not show that there was genetic variation.

(ii) Give **one** reason why the work of Alfred Wallace encouraged Charles Darwin to publish his theory of evolution.

(1)

It showed that ~~animals~~ migrated the ancestors of animals migrated and then evolved to ~~fit~~ adapt to their environment rather than being completely native to the land

ResultsPlus Examiner Comments

The link between organisms evolving due to their environment was credited as a reason as it indicates that the work from both scientists came to the same conclusions.

(ii) Give **one** reason why the work of Alfred Wallace encouraged Charles Darwin to publish his theory of evolution.

(1)

It supported Darwin's ideas of natural selection and evolution.

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Examiner Comments

This was sufficient for the mark, the idea that the work of Wallace supported the work of Darwin.

Question 2 (a)(ii)

This question asked for a description of the trend from the graph for the enzyme pepsin. Marks were awarded for the idea that activity increased up to pH2, that pH2 was the optimum and at a pH higher than 2 the activity decreased again. Nearly all candidates identified pH2 as the optimum or the most effective pH. Candidates did not always gain full marks when they tried to explain the trend as they often did not give a sufficient description of the trend increasing and then decreasing. Very few candidates described the trend for trypsin indicating that they had read the question correctly.

(ii) Describe the trend in the graph for the enzyme pepsin.

Use data from the graph to support your answer.

(3)

Pepsin works best at it's optimum pH 2, but is quickly denatured once it goes past a pH of 3.2 and so trypsin works at any pH higher.

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Examiner Comments

This gained one mark for the optimum of pH2. The response does not fully describe the trend.

This shows a detailed description of the trend shown in the figure and gained full marks.

(ii) Describe the trend in the graph for the enzyme pepsin.

Use data from the graph to support your answer.

(3)

- As the pH increases, the enzyme activity also increases
- The optimum ~~point~~ pH for pepsin is 2 because the enzyme activity is highest at this point
- As the pH increases past pH 2 the enzyme activity decreases
- The enzyme activity increases between pH 0 and pH 2 and decreases between pH 2 and pH 4

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Examiner Comments

Describing trends in graphs and data tables is a skill which should be taught during delivery of the course. It doesn't require any specific revision to gain the marks in the exam.

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Examiner Tip

When describing a trend, say what you can see happening in the graph and use data to support your answer.

Question 2 (a)(iii)

Nearly all candidates were able to identify that pH8 was the optimum for the enzyme trypsin. Those candidates who did not gain the mark gave pH2 which is the optimum for pepsin.

Question 2 (a)(iv)

This question was answered well by most candidates, they were asked to explain why there is no trypsin activity at pH5. Marks were credited for a linked explanation that included points from pH5 being too acidic, that the active site had changed, so the substrate would not fit, resulting in no enzyme substrate complexes forming and that this meant that the enzyme was denatured. Most candidates linked pH5 being too acidic to causing the enzyme to denature and the active site to change shape.

(iv) Explain why there is no trypsin activity at pH 5.

(3)

pH 5 is ~~attracti~~ acidic and therefore the enzyme trypsin is denatured and ~~can~~ cannot work.

ResultsPlus
Examiner Comments

This response scored one mark for the enzyme being denatured. Cannot work repeats the idea of no activity from the question. pH5 is acidic was insufficient as it needed to be the idea of too acidic or too low pH. Further details on the effect of pH on the enzyme were needed to gain full marks.

ResultsPlus
Examiner Tip

If you use a key word such as denatured, make sure you explain what it means to gain additional marks.

(iv) Explain why there is no trypsin activity at pH 5.

(3)

The pH is too low so too acidic so the enzyme becomes denatured ~~as the active~~ so no ~~less~~ collisions between the substrate and active site so ~~less~~ no enzyme substrate complexes formed so no activity. The active site changes shape.

ResultsPlus
Examiner Comments

This response scored full marks for pH is too low/too acidic, the enzyme denatures, no enzyme-substrate complexes formed and the active site has changed shape. We did not credit the idea of no collisions between the substrate and active site as this may still occur. The correct use of key scientific terms such as active site and denatured helped this candidate gain full marks.

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Examiner Tip

Make sure you include key words in your answers to 'explain' questions.

(iv) Explain why there is no trypsin activity at pH 5.

(3)

Because the pH is too low and the active site of the enzyme will denature. Meaning the substrate will not be able to bind correctly to the enzyme ~~preventing~~ preventing any enzyme activity

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Examiner Comments

This response also gained three marks. These were credited for the pH is too low and the active site will denature which is worth two marks and they also have the idea of the substrate not being able to bind.

Question 2 (a)(v)

This practical based question asked how temperature could be controlled in an investigation. The marks were awarded for using a water bath or incubator. Other methods that indicated how temperature would be controlled were credited. It was not sufficient to just state that it would be done in the same room or that a thermometer would be used as these do not indicate how temperature is controlled.

(v) Temperature is a variable that should be controlled in this investigation.

Give **one** way the temperature could be controlled.

(1)

using a thermometer to make sure the temperature is constant.

ResultsPlus
Examiner Comments

This response scored zero. A thermometer measures temperature but it cannot control it, this is a common misconception that has been seen on this paper and previously.

(v) Temperature is a variable that should be controlled in this investigation.

Give **one** way the temperature could be controlled.

(1)

Do the investigation in an incubator.

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Examiner Comments

An incubator would control temperature so this was accepted as a possible answer.

(v) Temperature is a variable that should be controlled in this investigation.

Give **one** way the temperature could be controlled.

(1)

Temperature should be kept constant e.g by peforming this investigation at 40° c so the temperature is optimum

(Total for Question 2 = 9 marks)

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Examiner Comments

This does not describe how the temperature would be maintained at 40°C and was not credited the mark.

(v) Temperature is a variable that should be controlled in this investigation.

Give **one** way the temperature could be controlled.

Use of a water bath

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Examiner Comments

A water bath would control the temperature so this response gained the mark.

Question 3 (a)(ii)

Many candidates gained the mark for knowing that malaria is transmitted by mosquitoes or vectors. Through the blood, blood transfusions or needle sharing was also accepted. Incorrect answers that were commonly seen were airborne, by water or body fluids.

(ii) State how the pathogen that causes malaria is spread.

(1)

exchange of bodily fluids

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This was insufficient for the mark, the idea of through blood was accepted.

(ii) State how the pathogen that causes malaria is spread.

(1)

Through a vector. The vector is a mosquito that injects the pathogen into the body.

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This response scored one, vector was sufficient although this response also refers to the role of the mosquito.

Question 3 (b)

This question had a table of data on the number of measles cases reported between 1985 and 2015 which showed a significant decrease in the number of cases over time. Candidates were asked to explain one conclusion with most candidates gaining full marks. The marks were awarded for recognising the decreased number of cases and giving the cause as immunisation or the idea of being immune. Herd immunity was accepted but the idea of better medicines, hygiene or treatment was not.

(b) Measles is a disease caused by a virus.

Figure 4 shows the number of measles cases reported in England and Wales from 1985 to 2015.

year	number of measles cases reported
1985	97 408
1995	7 447
2005	2 089
2015	1 193

Figure 4

Explain **one** conclusion that can be made about the change in the number of measles cases reported from 1985 to 2015.

(2)

The number of measles cases have dropped significantly from 1985 to 2015. They have gone from 97,408 to 1,193. From 1995 to 1995, they dropped by around 90,000.

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Examiner Comments

This response gave a description of the decrease in cases but does not explain it so was only awarded one mark.

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Examiner Tip

Candidates should ensure they understand the difference between describing and explaining data.

(b) Measles is a disease caused by a virus.

Figure 4 shows the number of measles cases reported in England and Wales from 1985 to 2015.

year	number of measles cases reported
1985	97 408
1995	7 447
2005	2 089
2015	1 193

Figure 4

Explain **one** conclusion that can be made about the change in the number of measles cases reported from 1985 to 2015.

(2)

The number of measles cases have decreased from 1985 to 2015 showing more people are immune to it.
It shows herd immunity.

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Examiner Comments

This gained full marks for the decrease in the number of cases and the reference to immunity.

(b) Measles is a disease caused by a virus.

Figure 4 shows the number of measles cases reported in England and Wales from 1985 to 2015.

year	number of measles cases reported
1985	97 408
1995	7 447
2005	2 089
2015	1 193

decreases

Figure 4

Explain **one** conclusion that can be made about the change in the number of measles cases reported from 1985 to 2015.

(2)

From 1985 to 2015, measle cases have hugely decreased (by 96215 cases) This could be because an increase of human immunity to the pathogen due to the vaccine.

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Examiner Comments

This has a detailed explanation for the decrease, referring to immunity and vaccination and was awarded full marks.

Question 3 (c)

Most candidates gained full marks on this question by giving two different immune system responses to infection. Creditworthy ideas included white blood cells destroying pathogens or phagocytosis, the production of antibodies or antitoxins, or the production of memory lymphocytes. Some responses confused antibodies with antigens. Ideas that are correct but not covered on the specification including the production of more white blood cells and inflammation were credited as an additional marking point.

(c) Describe **two** ways the immune system will respond to an infection by a pathogen.

(2)

1 white blood cells will attack the pathogen by

2 lymphocytes will code an antigen to fit the pathogen's antibodies

ResultsPlus
Examiner Comments

This response scored zero. White blood cells attacking pathogens in insufficient, responses need to give the details of the role of the white blood cells. This response is also confused between antigens and antibodies which is commonly seen in weaker responses to the question.

(c) Describe **two** ways the immune system will respond to an infection by a pathogen.

(2)

1 B-lymphocytes will produce antibodies for the antigen on the pathogen

2 ~~Once~~ infected, it will create memory lymphocytes that remember the specific antigen

ResultsPlus
Examiner Comments

This gained full marks for the production of antibodies and for memory lymphocytes. Memory cells was accepted for memory lymphocytes.

ResultsPlus
Examiner Tip

Learn the different roles of white blood cells in the immune system.

(c) Describe **two** ways the immune system will respond to an infection by a pathogen.

(2)

1 By realising ~~Lymphocytes that release~~ antibodies from lymphocytes to attach to the Pathogen

2 It will destroy the infected cells with phagocytes.

ResultsPlus
Examiner Comments

This response gave two clear and distinct roles of the immune system in response to infection and was awarded full marks.

Question 3 (d)

This question asked why Beriberi is not a communicable disease and candidates were required to communicate that it was not spread from person to person or between people or that it was not caused by a pathogen. That it was a deficiency or caused by lifestyle was not credited as it was indicated in the question. Many candidates of all abilities were able to obtain this mark.

(d) Beriberi is a disease caused by a lack of vitamin B1 in the diet.

Give **one** reason why beriberi is classed as a non-communicable disease.

(1)

It cannot be transferred between individuals

ResultsPlus
Examiner Comments

This response indicates the transfer from person to person and was awarded the mark.

(d) Beriberi is a disease caused by a lack of vitamin B1 in the diet.

Give **one** reason why beriberi is classed as a non-communicable disease.

(1)

because it is a deficiency meaning it only comes from a lack of a nutrient and so cannot spread.

ResultsPlus
Examiner Comments

With this response, deficiency is repeating the idea given in the question and it cannot be spread is not sufficient. The answer needs to indicate that it is not person to person spread.

(d) Beriberi is a disease caused by a lack of vitamin B1 in the diet.

Give **one** reason why beriberi is classed as a non-communicable disease.

(1)

It is not passed from person to person

ResultsPlus
Examiner Comments

This is a clear reason why a disease would be classed as non-communicable.

Question 4 (a)(ii)

For this maths question candidates had to calculate the expected number of pea plants with purple flowers in a sample of 160 plants using the 3:1 ratio. Two marks were awarded to most candidates for correctly calculating 120 and those who made a mistake could gain one mark for a partial calculation.

(ii) Mendel used two of the offspring with purple flowers in another cross.

The pea plants he obtained from this cross produced purple flowers or white flowers in a ratio of 3:1.

Calculate the expected number of pea plants with purple flowers, in a sample of 160 pea plants.

(2)

Purple : white
3 : 1 = 4

$\frac{160}{4} = 40 \times 3 = 120$

Number of pea plants with purple flowers = 120

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Examiner Comments

This shows correct workings out to obtain the correct answer for two marks.

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Examiner Tip

Always include your workings even if you are confident that you have the correct answer.

(ii) Mendel used two of the offspring with purple flowers in another cross.

The pea plants he obtained from this cross produced purple flowers or white flowers in a ratio of 3:1.

Calculate the expected number of pea plants with purple flowers, in a sample of 160 pea plants.

(2)

3+1=4

160÷4=40 40×3=120

Number of pea plants with purple flowers = 120; 40

ResultsPlus
Examiner Comments

This shows the ratio rather than the number of pea plants with purple flowers but it was credited two marks as it is presented in the correct order for the 3:1 ratio.

(ii) Mendel used two of the offspring with purple flowers in another cross.

The pea plants he obtained from this cross produced purple flowers or white flowers in a ratio of 3:1.

Calculate the expected number of pea plants with purple flowers, in a sample of 160 pea plants.

(2)

P : W

3 : 1 = 160

120 : 40

1 part = 40

3 = 120

Number of pea plants with purple flowers = 146

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Examiner Comments

This candidate has correctly calculated the answer but introduced an error transferring it to the answer line. Examiners will mark the response on the answer line before looking for possible marks in the workings.

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Examiner Tip

Always check your answers.

Question 4 (a)(iii)

Using a Punnett square, candidates needed to calculate the percentage of pea plants that produced white flowers in this question. They were given the heterozygous genotype for purple flowers and needed to identify that a pea plant producing white flowers had a genotype of aa. Completion of the Punnett square gives a percentage probability of 50%. No marks were awarded for Punnett squares using letters other than A/a. If the white flower genotype was stated incorrectly, it was possible to gain two marks with the error carried forward for correctly completing the Punnett square and percentage of white flowers.

(iii) A pea plant producing purple flowers had the genotype Aa.

This pea plant was crossed with a pea plant producing white flowers.

Complete the Punnett square to show the possible genotypes of the offspring.

Show the percentage of pea plants that produce white flowers in your answer.

(3)

		white flowers	
		A	a
purple flowers	A	AA	Aa
	a	Aa	aa

Percentage of pea plants that produce white flowers = 50 %

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Examiner Comments

This response gained two marks, it did not gain the mark for the white flower genotype. However they have completed the Punnett square correctly, applying the error carried forward. They have 50% on the answer line which is the correct answer on the mark scheme (even though it is not correct for their Punnett square).

(iii) A pea plant producing purple flowers had the genotype Aa.

This pea plant was crossed with a pea plant producing white flowers.

Complete the Punnett square to show the possible genotypes of the offspring.

Show the percentage of pea plants that produce white flowers in your answer.

(3)

white flowers = bb recessive

		white flowers	
		b	b
purple flowers	A	Ab	Ab
	a	ab	ab

need homozygous recessive for white allele to be expressed

Percentage of pea plants that produce white flowers = 0 %

ResultsPlus
Examiner Comments

If the letters used were not A/a then no marks were awarded for the genotype of white flowers or the offspring. There is no error carried forward for the percentage as it cannot be determined. However, if 50% was on the answer line it gained a mark as it is the correct answer.

(iii) A pea plant producing purple flowers had the genotype Aa.

This pea plant was crossed with a pea plant producing white flowers.

Complete the Punnett square to show the possible genotypes of the offspring.

Show the percentage of pea plants that produce white flowers in your answer.

(3)

		white flowers	
		a	a
purple flowers	A	A a	A a
	a	aa	aa

Percentage of pea plants that produce white flowers = 50 %

ResultsPlus
Examiner Comments

This response shows the correct genotype for white flowers, the correct offspring and the correct percentage of 50% so full marks were awarded.

Question 4 (b)

In this question candidates were asked for two advantages of asexual reproduction. Marks were awarded for producing genetically identical offspring, having the same desired characteristics, producing the plants faster and only needing one parent. The idea of not needing to find a mate was credited against the final marking point. Suggestions related to more plants produced, easier and cheaper were not credited. Most candidates gained both marks for only one parent or genetically identical and that the process was quicker or more rapid than using sexual reproduction.

(b) Asexual reproduction can be used to produce flowering plants.

Give **two** advantages of using asexual reproduction to produce flowering plants.

(2)

1 It is less time consuming because you don't need to find a mate.

2 A desirable characteristic can be present in all offspring because they are genetically identical to parent plant.

ResultsPlus
Examiner Comments

This response scored full marks and it includes multiple possible marking points including the idea of taking less time, not finding a mate, selecting the desired characteristics and genetically identical.

(b) Asexual reproduction → mitosis can be used to produce flowering plants.

Give **two** advantages of using asexual reproduction to produce flowering plants.

(2)

1 only one gamete is needed to produce plants

2 ~~No~~ flowering plants can be produced easier

ResultsPlus
Examiner Comments

This response scored zero as only one gamete is incorrect and ideas around producing them easier were not credited as in some cases it would not be easier than growing plants from seed.

(b) Asexual reproduction can be used to produce flowering plants.

Give **two** advantages of using asexual reproduction to produce flowering plants.

(2)

1 Farmers don't have to buy seeds to replant the plants, so it is cheaper and more cost effective and leads to more profit

2 It is a rapid process and produces genetically identical offspring

ResultsPlus
Examiner Comments

There is no creditworthy content on the first two lines in this response. References to cost / getting more plants / needing less resources / energy efficient were too vague and not specific. This response gained two marks for the second two lines for a rapid process and genetically identical offspring. Candidates did frequently combine more than one marking point in one sentence and were credited accordingly.

Question 4 (c)(ii)

This question was well-answered by all candidates with some going into the level of detail seen at A-level. Candidates were asked to describe how complementary bases are linked in a DNA molecule. By weak hydrogen bonds was worthy of two marks and the base pairing combinations were an additional mark. The number of hydrogen bonds between bases was not required but seen in a number of responses.

(ii) The two strands of a DNA molecule are linked by complementary bases.

Describe how the complementary bases are linked in a DNA molecule.

(2)

Bases A, T, G and C are complementary to each other, so Each base is specific to the other, so they bind together is similar to a lock and key mechanism.

ResultsPlus
Examiner Comments

This response scored zero, although they have named the bases A, T, G and C and stated that they are complementary that term is in the question. They have not indicated that A pairs with T or G pairs with C.

(ii) The two strands of a DNA molecule are linked by complementary bases.

Describe how the complementary bases are linked in a DNA molecule.

(2)

Adenine and ~~Guanine~~ Thymine are complimentary bases and ~~Thymine~~ Guanine and cytosine are complimentary. They are linked by ~~an enzyme~~ a phosphate and a sugar in between the double helix strands of DNA

(Total for Question 4 = 11 marks)

a g + c

t c a g

ResultsPlus
Examiner Comments

This response scored one for showing the correct base pairings but the bonding is incorrect.

(ii) The two strands of a DNA molecule are linked by complementary bases.

Describe how the complementary bases are linked in a DNA molecule.

(2)

They are [redacted] linked by weak hydrogen bonds where the base A is complementary to T and base C is complimentary to G.

ResultsPlus
Examiner Comments

This answer has a good level of detail. A mark is awarded for weak, for hydrogen bonds and that A is complementary to T and C is complementary to G.

Question 5 (a)(i)

The question on precautions links to general practical skills covered in working scientifically. For taking a swab of cheek cells the appropriate precautions that were credited included using a sterile swab, the idea of not coming into contact with another surface, disposing of the swab or not swabbing too hard. Sanitised and disinfected were accepted for sterile but clean was insufficient. Many candidates identified one of these points but marks were lost where gloves, which is given in the question, a face mask or details on slide preparation were the only answer given as these were not credited.

5 (a) A student made a microscope slide of cells taken from the inside of their mouth.

(i) The student wore gloves while using a swab to collect cells from their mouth.

Give **one** other safety precaution the student should take.

(1)

Make Sure the swab is clean

ResultsPlus
Examiner Comments

Clean was not sufficient for the mark, it needed to be sterilised, sanitised or disinfected.

ResultsPlus
Examiner Tip

Ensure you use correct scientific vocabulary in your answers.

5 (a) A student made a microscope slide of cells taken from the inside of their mouth.

(i) The student wore gloves while using a swab to collect cells from their mouth.

Give **one** other safety precaution the student should take.

(1)

Sterilise the swab

ResultsPlus
Examiner Comments

Sterilise the swab gained the mark.

5 (a) A student made a microscope slide of cells taken from the inside of their mouth.

(i) The student wore gloves while using a swab to collect cells from their mouth.

Give **one** other safety precaution the student should take.

(1)

Wash hands before and after the experiment.

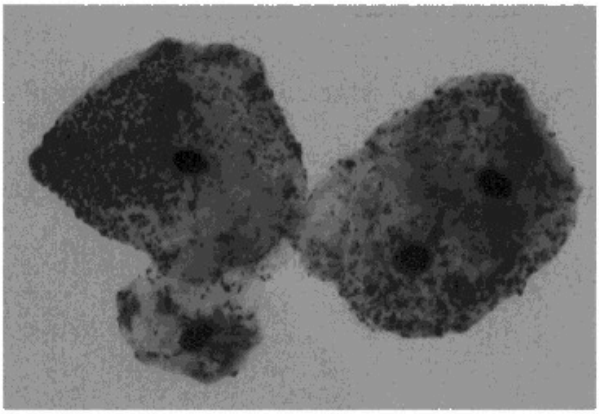
ResultsPlus
Examiner Comments

Washing hands before and after the experiment is irrelevant because the student wore gloves so no mark was awarded.

Question 5 (a)(ii)

One of the core practicals for Topic 1 is the use of a microscope and this question required detail on how to view cells with a magnification of x400. This question was generally well-answered and candidates who named both lenses correctly usually obtained two marks. Candidates who didn't name a lens were able to obtain one mark for using the lowest power lens or focusing the microscope. It was possible to gain marks for different magnification combinations which totalled x400 with x20 and x20 the most commonly seen alternatives.

(ii) A light microscope was used to obtain an image similar to the one shown in Figure 6.



(Source: © STEVE GSCHMEISSNER/SCIENCE PHOTO LIBRARY)

Figure 6

Describe how the student used the light microscope to view these cells at a magnification of ×400.

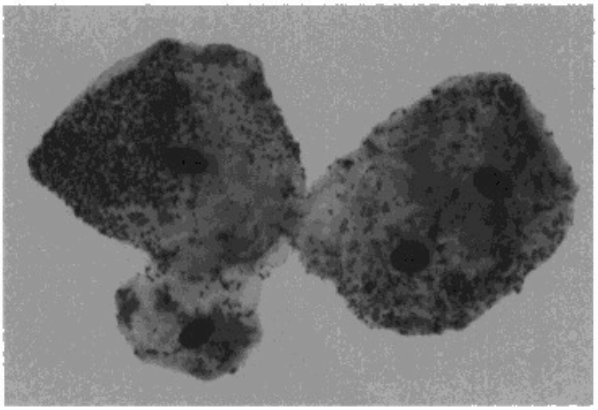
(3)

The student used the focussing knob to increase the magnification

ResultsPlus
Examiner Comments

This was sufficient for one mark for needing to focus the microscope. The idea of increasing the magnification was not sufficient for the detail on the eye piece and objective lens.

(ii) A light microscope was used to obtain an image similar to the one shown in Figure 6.



(Source: © STEVE GSCHMEISSNER/SCIENCE PHOTO LIBRARY)

Figure 6

Describe how the student used the light microscope to view these cells at a magnification of ×400.

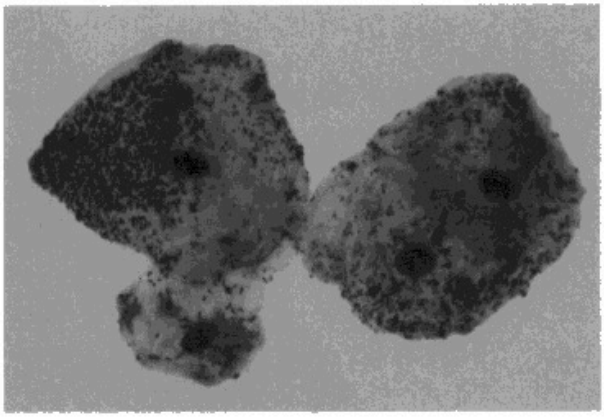
(3)

A Cover Slip was placed on the cells. It was then put a under a light microscope with the light turned on. The Student started with the Lowest objective Lens magnification and Maved up one by one until x400 ~~x~~. Each time, the Course and fine (ours) wheels ~~the~~ were turned to increase resolution and get a clear image

ResultsPlus
Examiner Comments

This response gained three marks. It includes starting with the lowest power lens, it gains a mark for a x 400 objective lens and the third mark for focusing. They have the lens named and no magnification given for the eye piece lens thus the total magnification would be x400.

(ii) A light microscope was used to obtain an image similar to the one shown in Figure 6.



(Source: © STEVE GSCHMEISSNER/SCIENCE PHOTO LIBRARY)

Figure 6

Describe how the student used the light microscope to view these cells at a magnification of ×400.

(3)

- Place your cells on a slide and stain them with iodine.
- Place a cover slip over the cells using a mounted needle.
- Use ~~and~~ an eyepiece lens of ×10 and an objective lens of ×40
- Use the focusing wheel to adjust the height of the stage and bring the cells into focus.

ResultsPlus
Examiner Comments

This response gained full marks for an eyepiece lens of x 10, an objective lens of x 40 and using the focus wheel.

Question 5 (b)

This question was answered well by most candidates who explained the role of either mitochondria or ribosomes. It should be noted that the cytoplasm itself is not a structure. Producing or creating energy was not credited, it needed to be released. Some candidates stated that a chloroplast was a structure in animal cells and did not gain any marks.

(b) The cytoplasm of a cell contains a nucleus.

Explain the role of **one** other structure in the cytoplasm of a human cell.

(2)

The mitochondria store energy for reactions

ResultsPlus
Examiner Comments

This gained one mark for mitochondria, storing energy for reactions was not sufficient for the explanation.

(b) The cytoplasm of a cell contains a nucleus.

Explain the role of **one** other structure in the cytoplasm of a human cell.

(2)

Mitochondria release energy through respiration.

ResultsPlus
Examiner Comments

This response gained two marks, for mitochondria and for either release energy or respiration.

ResultsPlus
Examiner Tip

Make sure that you state that energy is released and not that energy is produced or created as this is incorrect science.

(b) The cytoplasm of a cell contains a nucleus.

Explain the role of **one** other structure in the cytoplasm of a human cell.

(2)

The ribosomes translate ~~the~~ mRNA. ~~and then form~~ By reading each codon and attracting tRNA with has the complimentry bases and the amino acids that the codon codes for.

ResultsPlus
Examiner Comments

This response gained full marks. They named the ribosomes and give details of the protein synthesis process that happens at the ribosome for the second mark.

(b) The cytoplasm of a cell contains a nucleus.

Explain the role of **one** other structure in the cytoplasm of a human cell.

(2)

Contains the mitochondria which is the site of aerobic respiration which produces energy

ResultsPlus
Examiner Comments

This scored two marks for mitochondria and aerobic respiration. Producing energy was ignored but did not prevent the awarding of the mark for respiration.

Question 5 (c)

Although not a core practical, the specification requires candidates to explain the process of DNA extraction. This question was answered with detailed responses indicating that most candidates had completed the practical and were able to gain full marks. Although not required for the marks, many candidates gave the reasons for each step in the method.

(c) DNA can be extracted from human cells in a similar way to the method used to extract DNA from fruits.

Describe the stages of the method used to extract DNA from cells.

(3)

The DNA can be extracted using starch, which breaks down the proteins in the cell membrane, allowing a sample of DNA to be extracted. As DNA is insoluble in the solution, ethanol can be used to precipitate the DNA. Then, a sample of DNA can be extracted.

ResultsPlus
Examiner Comments

This response scored one mark, the irrelevant content is ignored and the mark credited for the use of ethanol to precipitate the DNA.

(c) DNA can be extracted from human cells in a similar way to the method used to extract DNA from fruits.

Describe the stages of the method used to extract DNA from cells.

(3)

- Human cells are collected using a swab in places such as the inside of the cheek
- The cells are then mixed with detergent to break down the cell membrane, releasing the DNA
- This solution is then mixed with ethanol which precipitates the DNA making, forming a milky emulsion layer which is the visible DNA.

ResultsPlus
Examiner Comments

This was awarded two marks for mixing with detergent and with ethanol.

(c) DNA can be extracted from human cells in a similar way to the method used to extract DNA from fruits.

Describe the stages of the method used to extract DNA from cells.

(3)

- Crush grist and add salt and detergent
- Filter it
- Add ethanol.

ResultsPlus
Examiner Comments

This response gained full marks as it is a detailed description of the method.

ResultsPlus
Examiner Tip

Use bullet points to produce a concise answer which ensures you meet the required number of facts to gain the marks.

Question 5 (d)

The Human Genome Project has not been examined on this paper for a number of years, meaning there were less past paper questions for revision. However, many candidates were able to give two outcomes of the project with the most common answers being the idea of increased understanding or testing for genetic diseases and ideas that related to personalised medicines. The idea of it being used to track migration or ancestry was seen quite frequently. The most common incorrect idea was that it identified the cause of genetic variation.

(d) The Human Genome Project sequenced the order of the bases in the human genome.

Give **two** other outcomes from the Human Genome Project.

(2)

Can remove it using a wire loop.

1 discovered genetic, inherited diseases and the pattern of them to predict and prevent disease.

2 development of better suited medicine to genetic diseases, especially tailored to certain inherited diseases

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

This gains two marks for predicting and preventing genetic diseases and the idea of personalised medicines.

(d) The Human Genome Project sequenced the order of the bases in the human genome.

Give **two** other outcomes from the Human Genome Project.

(2)

1 Migration patterns ~~and evolution~~ can be tracked, leading to discoveries in evolution

2 Genetic disorders can be easily investigated and discovered in a patient

ResultsPlus
Examiner Comments

Tracking migration was an additional marking point and investigating and discovering genetic disorders shows the idea of testing/identifying genetic diseases and disorders so this response gained full marks.

(d) The Human Genome Project sequenced the order of the bases in the human genome.

Give **two** other outcomes from the Human Genome Project.

(2)

1 Human genome project may also find out what disease are caused by which genes.

2 Human genome project may also discover what genes code for different physical characteristics

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

This response gained two marks. The first point for an understanding of diseases by finding out what diseases are caused by which genes and the second point for the idea of discovering the role of each gene.

(d) The Human Genome Project sequenced the order of the bases in the human genome.

Give **two** other outcomes from the Human Genome Project.

(2)

1 Mutations could be identified so specialised treatments for those who suffer from diseases arisen from mutations

2 Genetic variation between organisms was discovered.

ResultsPlus
Examiner Comments

This response was awarded two marks within point 1. Identifying mutations and specialised treatments are separate marking points. The second point was ignored as the HGP did not discover genetic variation.

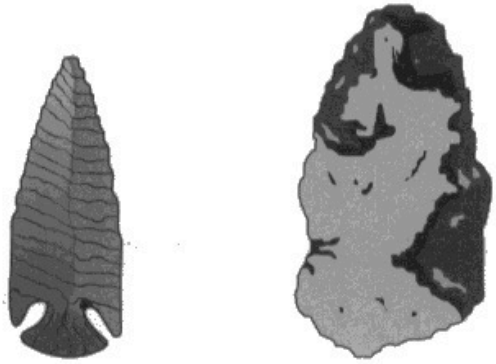
Question 6 (a)(i)

For this question candidates were given images of two tools and asked to suggest why one was used by a more recent human ancestor. Most candidates were awarded this mark for stating that it was sharper, more complex, more carved or related ideas.

6 (a) Figure 7 shows images of two stone tools.

Scientists think that tool A was probably used by *Homo erectus* around 1.6 million years ago.

Tool B was probably used by *Homo habilis* around 2 million years ago.



tool A tool B

Figure 7

(i) Give **one** reason, using Figure 7, why scientists think that tool A was used by a more recent human ancestor.

(1)

Has more detail which be done by the Bore larger brains of recent ancestors.

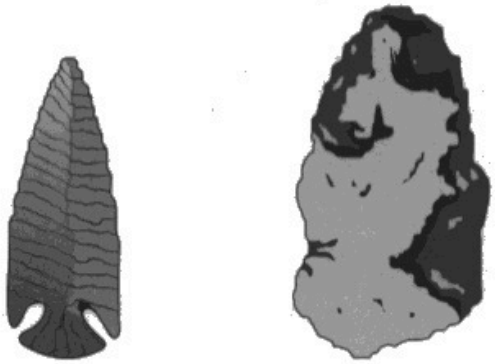
ResultsPlus
Examiner Comments

More detail is equivalent to more sophisticated so the mark was awarded. Candidates conveyed this in many different ways including more detail, intricate, constructed, advanced and crafted.

6 (a) Figure 7 shows images of two stone tools.

Scientists think that tool A was probably used by *Homo erectus* around 1.6 million years ago.

Tool B was probably used by *Homo habilis* around 2 million years ago.



tool A tool B

Figure 7

(i) Give **one** reason, using Figure 7, why scientists think that tool A was used by a more recent human ancestor.

(1)

It is sharper which took more intelligence to ~~get~~ create and can be used for more things.

ResultsPlus
Examiner Comments

The mark was awarded for sharper.

Question 6 (a)(ii)

This question required candidates to describe how stone tools could be dated, based on where they were discovered. Most candidates identified that this could be done based on rock layers with some going on to describe that older tools were deeper, gaining two marks. A few responses also gained credit for the idea that other fossils from the location could be used. Radiometric dating was accepted but not just the idea of measuring the radioactivity of rocks and carbon dating was not credited.

(ii) Describe how scientists can date stone tools using information from where the tools were discovered.

(2)

The scientists can measure the depth of the stone tools and see how much rock was layered above it or by carbon dating the rock around above the tools.

ResultsPlus
Examiner Comments

This response scored one for the depth of the stone tools in the rock layer. Carbon dating was ignored for dating stone tools.

(ii) Describe how scientists can date stone tools using information from where the tools were discovered.

(2)

The further down the tools were the older we can tell the tools are, Scientists can also date tools by the fossils eg. bones surrounding them Comparing the bones to those of which we have already discovered to find out roughly when it from.

ResultsPlus
Examiner Comments

This response illustrated all three marking points. Linking the depth of the tool to the idea that deeper tools are older scored two marks. The response also had the idea of dating the tools by the fossils in the surroundings.

(ii) Describe how scientists can date stone tools using information from where the tools were discovered.

(2)

Using rock layers, the deeper a stone tool is, the older the stone tool must have been. The more recent stone tools ~~were closer~~ are ~~closer~~ less deeper in rock layers.

ResultsPlus
Examiner Comments

This response combined using the rock layers with a deeper tool being older and scored full marks.

ResultsPlus
Examiner Tip

Where possible include as much detail in your answers.

Question 6 (b)

Candidates demonstrated good knowledge on the structural changes that have occurred during human evolution, with many gaining full marks on this question. Marks were awarded for larger skull or brain, bipedalism or more upright walking, taller or structural changes that occurred as result of the change in habitat from trees to land including opposable thumbs, shorter toes, arched feet or changes in arm:leg.

(b) Differences in fossilised bones indicate structural changes that have occurred during the evolution of humans.

Describe **two** structural changes that have occurred during human evolution. **(2)**

1 one change is that we have less ~~fragment~~ people with wisdom teeth

2 another is we have a evolved to be taller with straighter backs

ResultsPlus
Examiner Comments

This gained the mark from the additional guidance for changes to teeth and the second mark for taller. It would have also gained a mark for straighter backs as this indicates upright.

(b) Differences in fossilised bones indicate structural changes that have occurred during the evolution of humans.

Describe **two** structural changes that have occurred during human evolution.

(2)

1 Head sizes have increased due to larger brain sizes.

2 Limb length has decreased due to ~~more~~ less ape like behaviours and more human like behaviours.

ResultsPlus
Examiner Comments

This response has one mark for head sizes have increased as an indication of a larger skull. Limb length is too vague as it does not indicate if they are talking about arms or legs. Behaviours are not structural changes. Limbs changing shape or limbs getting longer or shorter were ignored as well as general references to bone structure changing.

ResultsPlus
Examiner Tip

Be specific in your answers. Something changing is often insufficient you need to state how it has changed.

(b) Differences in fossilised bones indicate structural changes that have occurred during the evolution of humans.

Describe **two** structural changes that have occurred during human evolution.

(2)

1 Skull volume has increased

2 Feet have become more suitable for walking upright e.g more arched, smaller toes that are less curved

ResultsPlus
Examiner Comments

This answer has one mark for skull volume has increased and a second for arched feet/smaller toes. They would also have gained a mark for walking upright.

Question 6 (c)(i)

This question examines the application of maths to a magnification calculation. Given an image length, candidates had to use the magnification to calculate the actual size of a mitochondrion, giving the answer in micrometres. Candidates' ability to calculate magnification is improving year on year and many candidates obtained full marks. The most commonly seen error was the unit conversion and the answer of 7 given to the incorrect order of magnitude was awarded two marks in recognition that only one error had been made in the calculation.

(c) The migration patterns of humans can be tracked by analysing DNA in mitochondria.

Figure 8 shows a mitochondrion viewed using an electron microscope.

(Source: © CNRI/SCIENCE PHOTO LIBRARY)

Figure 8

(i) At a magnification of ×62 000 this mitochondrion has a length of 434 mm.

Calculate the actual length of this mitochondrion.

Give your answer in micrometres (µm).

(3)

434 × 62000 =
26908000 mm
× 1000 = 2.6908 × 10^10 µm

m
mm
µm

2.6908 × 10^10 µm

ResultsPlus
Examiner Comments

This response scored one mark x 1000. They have done the substitution incorrectly but the conversion of x1000 can be seen in the workings.

ResultsPlus
Examiner Tip

Always show your workings for maths questions.

(c) The migration patterns of humans can be tracked by analysing DNA in mitochondria.

Figure 8 shows a mitochondrion viewed using an electron microscope.

(Source: © CNRI/SCIENCE PHOTO LIBRARY)

Figure 8

(i) At a magnification of ×62 000 this mitochondrion has a length of 434 mm.

Calculate the actual length of this mitochondrion.

Give your answer in micrometres (μm).

(3)

$A = \frac{434}{62000} = 7 \times 10^{-3}$

$\frac{7 \times 10^{-3}}{1000} = 7 \times 10^{-6}$

7×10^{-6} μm

ResultsPlus
Examiner Comments

This scored two marks as they have done the correct substitution and got the correct evaluation of 0.007. They have converted from mm to m by dividing by 1000. The only error is the conversion. 7 to any incorrect order of magnitude was awarded two marks.

(c) The migration patterns of humans can be tracked by analysing DNA in mitochondria.

Figure 8 shows a mitochondrion viewed using an electron microscope.

(Source: © CNRI/SCIENCE PHOTO LIBRARY)

Figure 8

(i) At a magnification of ×62 000 this mitochondrion has a length of 434 mm.

Calculate the actual length of this mitochondrion.

Give your answer in micrometres (µm).

(3)

434 ÷ 62000 = 0.007 mm

7 µm

ResultsPlus
Examiner Comments

This response scored full marks for the correct answer on the answer line.

Question 6 (c)(ii)

Following from the electron microscope image of the mitochondrion candidates were asked to explain why an electron microscope is used to see mitochondria clearly. The main marking points were for greater resolution and greater magnification. Frequently candidates only gave one of these and just linked it to the idea of being able to see more detail. Some higher ability candidates explained that an electron beam has a shorter wavelength than light accounting for the increased resolution.

(ii) Explain why an electron microscope is used to see mitochondria clearly.

(2)

The electron microscope has a higher resolution and a higher magnification which allows us to see a much clearer image with greater detail ~~and~~ and quality.

ResultsPlus
Examiner Comments

This gained both marks for higher resolution and higher magnification. The idea of seeing more clearly or in detail repeats the information from the question.

(ii) Explain why an electron microscope is used to see mitochondria clearly.

(2)

An electron microscope ~~can~~ can be used to enlarge the image of an object by a Significantly larger amount than a light microscope and since the mitochondria is very small 7µm, you must use the microscope with the larger magnification to see it clearly.

ResultsPlus
Examiner Comments

This response has larger magnification for one mark.

(ii) Explain why an electron microscope is used to see mitochondria clearly.

(2)

Mitochondria are subcellular organisms and very small ~~so~~ and an electron microscope has a magnification high enough to view it.

ResultsPlus
Examiner Comments

This indicated a high magnification and was just sufficient for a mark.

Question 7 (a)(ii)

Candidates were asked to describe the physical barriers of a leaf that the virus gets through when being injected an as aphid feeds. The marks were awarded for the waxy cuticle and cell wall. Most candidates identified the waxy cuticle but less also referred to the cell wall and were only awarded one mark.

(ii) Describe the physical barriers of a leaf that the virus gets through when an aphid feeds.

(2)

Leaves have thick waxy cuticles to prevent viruses getting in. Strong, rigid cell walls protect the cells from viruses.

ResultsPlus
Examiner Comments

This gained two marks for waxy cuticle and cell wall.

(ii) Describe the physical barriers of a leaf that the virus gets through when an aphid feeds.

(2)

- Plants have thick waxy ~~cuticle~~ cuticle that prevents the virus to enter.
- Plants also have hair like structures that prevent the virus to ~~not~~ enter as well.

ResultsPlus
Examiner Comments

This gained one mark for waxy cuticle. References to hairs, spines or spikes on leaves were ignored as they don't relate to the aphid feeding.

(ii) Describe the physical barriers of a leaf that the virus gets through when an aphid feeds.

(2)

The aphid gets through the cell wall and epidermis of the leaf

ResultsPlus
Examiner Comments

This gained one mark for going through the cell wall.

Question 7 (b)(i)

The level of detail included in many answers to this question demonstrated a very good level of understanding of how mRNA is produced during transcription. The marks were awarded for DNA helix unwinding, RNA polymerase, binding to the non-coding region of the gene, producing a complementary mRNA strand and that mRNA contains U not T. Candidates were able to obtain the first marking point by describing the process and were also awarded the mark even if they indicated that the unwinding was completed by RNA polymerase as the role of DNA helicase is beyond the specification. Some candidates indicated that mRNA was a copy of the DNA rather than complementary but overall, the question was high scoring.

(b) The genetic material from the virus is transcribed by the plant cell.

(i) Describe how mRNA is produced during transcription.

(4)

Double stranded DNA unzips and one strand is used as template in the form of mRNA. RNA polymerase binds the mRNA template together

ResultsPlus
Examiner Comments

This gained two marks. DNA unzips is one mark and naming the enzyme RNA polymerase is the second mark.

(b) The genetic material from the virus is transcribed by the plant cell.

(i) Describe how mRNA is produced during transcription.

(4)

Firstly, the enzyme RNA polymerase binds to the DNA in a non-coding gene, infront of the required gene. Then, the RNA polymerase moves along the DNA strand unzipping the weak hydrogen bonds as it goes. Also, as the RNA polymerase moves along the gene, it provides free nucleotides which bind to their complementary bases on the normal DNA strand (during transcription T-Thymine, becomes U-uracil). These nucleotides then join together as the RNA polymerase moves along, forming a messenger RNA or 'mRNA' strand. That strand is then ready to leave the nucleus and go to the ribosome.

ResultsPlus
Examiner Comments

This response has scored four but has all five marking points. RNA polymerase, binding to the non-coding region, the unzipping of the DNA, for nucleotides being joined together and for uracil instead of thymine.

(b) The genetic material from the virus is transcribed by the plant cell.

(i) Describe how mRNA is produced during transcription.

(4)

The DNA strands unwinds.

RNA polymerase attach to the [illegible] complementary bases.

The complementary bases mutate so A pairs with U.

A strand of mRNA is produced.

ResultsPlus
Examiner Comments

This response scored three marks. DNA strands unwind, RNA polymerase and A pairing with U. There was no indication that the mRNA/sequence is complementary or that the nucleotides are being joined together.

Question 7 (b)(ii)

For this short answer question candidates needed to name translation as the stage of protein synthesis after transcription. Most candidates gained the mark, incorrect answers included transpiration and transformation.

Question 7 (c)

Biological control is one of the biology only specification points and this question asked candidates to use their knowledge to explain the advantages of using biological control on aphid populations. Most candidate responses limited their explanation to an increase in crop yield or less damage to crops. Some candidates scored more marks by linking this to the idea that pesticides did not need to be used or that it was more environmentally friendly. Only a small proportion of candidates gained full marks by conveying the knowledge that biological control uses another species which is specific or that resistance would not develop.

(c) Biological control can be used on aphid populations feeding on crops.

Explain the advantages of using biological control on aphid populations.

(3)

Biological control is specific to only one pest ~~so~~ and doesn't involve chemicals. This means that ~~other~~ other animals are not harmed, protecting biodiversity. Bidogical control only needs to be applied once, making it low maintenance for farmers. It ~~has~~ decreases amount of aphids so less crop damage, higher yeild to sell, for profit.

(Total for Question 7 = 11 marks)

ResultsPlus
Examiner Comments

This response scored three. One mark for it being specific to only one pest, a second for not needing to use chemicals/only needing to apply it once, and the third for protecting biodiversity. It also had additional correct content which could have been credited including less crop damage or higher yield.

(c) Biological control can be used on aphid populations feeding on crops.

Explain the advantages of using biological control on aphid populations.

(3)

It avoid the risk of the crops being ingested by a virus, therefore keeping them safe. It also protects crops from being eaten by the aphids, avoiding any damage to the population of crops. It also helps keep the ecosystem stable and avoids overpopulation of the aphids

ResultsPlus
Examiner Comments

This response scored one for protecting the crops from being eaten by aphids or for avoiding any damage to the population of crops. Keeping the ecosystem stable was too vague for the idea of biodiversity. Many candidates gained this marking point only as they were not explaining the advantages.

(c) Biological control can be used on aphid populations feeding on crops.

Explain the advantages of using biological control on aphid populations.

(3)

Biological control introduces a predator of the aphid populations to consume the aphid and control aphid population. Biological control is more environmentally friendly because pesticides don't need to be used. Not needing to use chemicals means the farmer can promote the plants as 'organically grown' which sells for higher prices. Finally, biological control can be introduced to only kill the aphids, whilst not harming other insects that are not pests.

(Total for Question 7 = 11 marks)

ResultsPlus
Examiner Comments

This response scored full marks. Introducing a predator of the aphid population, being environmentally friendly was just sufficient although this response clarifies it by pesticides do not need to be used and for higher prices as equivalent to more profit. They also had the idea of only killing aphids. Using on organic farms would have been credited had this marking point not already been awarded.

Question 8 (a)(i)

This question asked for the benefits of a double-blind trial. The question had already stated that neither the doctor nor the patient knew whether the patient had been given the statin or not so repeating this was not creditworthy. Many candidates scored one, with marks most frequently awarded for the idea of avoiding bias. Higher level responses went on to gain further credit for the marking points of the placebo effect, knowing whether the side effect or muscle pains effects are due to statins or that the effectiveness of statins could be determined.

8 Statins are a type of medicine used to treat cardiovascular disease.

Some people taking statins have reported muscle pain as a side effect.

Scientists analysed data from double-blind trials to determine if there was a correlation between statin use and muscle pain.

In these double-blind trials, neither doctors nor patients knew whether the patient had been given statins or not.

(a) (i) Describe the benefits of using double-blind trials.

(2)

This is done to see if the statin is actualy
effective or if its just a placebo ~~effect~~ ~~effect~~ effect.
If its just a placebo effect then the statin will be sent back
to the ~~testing~~ development stages to be tested on animals.

ResultsPlus
Examiner Comments

This response scored two for to see if the statins are actually effective and the placebo effect.

8 Statins are a type of medicine used to treat cardiovascular disease.

Some people taking statins have reported muscle pain as a side effect.

Scientists analysed data from double-blind trials to determine if there was a correlation between statin use and muscle pain.

In these double-blind trials, neither doctors nor patients knew whether the patient had been given statins or not.

(a) (i) Describe the benefits of using double-blind trials.

(2)

It is easier to see the effects as if you knew if you had you had the statins, ^ muscle pain would you would put it down to the statins but this way nobody knows whether you had the statins or not

ResultsPlus
Examiner Comments

This response scored one mark for a description of knowing whether the side effects are due to statins. Not knowing if the patient has the statins or not repeats the information given in the question.

ResultsPlus
Examiner Tip

Avoid repeating information given in the stem of the question.

8 Statins are a type of medicine used to treat cardiovascular disease.

Some people taking statins have reported muscle pain as a side effect.

Scientists analysed data from double-blind trials to determine if there was a correlation between statin use and muscle pain.

In these double-blind trials, neither doctors nor patients knew whether the patient had been given statins or not.

(a) (i) Describe the benefits of using double-blind trials.

(2)

Remove any potential bias from the doctor, and ensure that statins are the medication which cause muscle pain, and not any other factors such as physical activity etc.

ResultsPlus
Examiner Comments

This response scored full marks for removing any potential bias and for ensuring that statins are the medication which causes the muscle pain.

Question 8 (b)(i)

This question required a mathematical manipulation using percentages to calculate the total number of people taking statins in the study, giving the answer to 4 significant figures. Many candidates correctly calculated the total number of people although some limited their marks to two by not stating the answer to 4 significant figures. An error carried forward was applied for those with an incorrect calculation which demonstrated the mathematical skill of 4 significant figures, allowing them to gain one mark.

(b) In a study, people were given statins or a placebo.

The percentage of people who reported muscle pain was recorded.

Figure 10 shows the results of this study.

years after starting to take statins or placebo	people reporting muscle pain taking statins (%)	people reporting muscle pain taking placebo (%)
1	14.8	14.0
2	7.4	7.5
3	5.1	5.3
4	3.0	3.1

Figure 10

(i) In year one, 9 199 people taking statins reported muscle pain.

Calculate the total number of people taking statins in this study.

Give your answer to 4 significant figures.

(3)

9199

14.8 = 4428%

÷14.8 ÷14.8

14.8% x 9199

1% = 621.5540

100% = 62155.4

62160 people

ResultsPlus
Examiner Comments

This response scored full marks for the correct answer to four significant figures on the answer line. The workings shows the method they used.

(b) In a study, people were given statins or a placebo.

The percentage of people who reported muscle pain was recorded.

Figure 10 shows the results of this study.

years after starting to take statins or placebo	people reporting muscle pain taking statins (%)	people reporting muscle pain taking placebo (%)
1	14.8	14.0
2	7.4	7.5
3	5.1	5.3
4	3.0	3.1

Figure 10

(i) In year one, 9 199 people taking statins reported muscle pain.

Calculate the total number of people taking statins in this study.

Give your answer to 4 significant figures.

(3)

$\frac{9199}{14.8}$ # x50 = 31080

31080 ~~3105~~ people

ResultsPlus
Examiner Comments

This response scored two marks. They have done 9199 / 14.8 for the first mark. They have multiplied by 50 as they have not identified that the number is only the people taking statins. The working is clear and the answer has been given to 4 s.f for the second mark.

Question 8 (b)(ii)

Candidates found this question challenging with many only identifying one piece of evidence that supported the conclusion made by the scientists that the muscle pain was not due to statins. Marks were awarded for the idea that the data for the placebo and statins were very similar, that in year 1 more people reported pain on statins, a calculated difference for any year, that muscle pain decreased over time taking statins and that after year 1 more people taking the placebo reported pain. The most frequently awarded marks were for the data being similar or that the number of people reporting muscle pain and taking statins decreased over time. Most did not use the data from the table to calculate a difference between the two groups in the trial.

(ii) The scientists concluded that most of the muscle pain reported was not due to the use of statins.

Explain, using information from the table in Figure 10, why the scientists made this conclusion.

(3)

This is because the percentage of people who reported muscle pain with or without Statins were around the same. ~~This means~~ there was not much of a difference ~~the~~ meaning it was most likely a placebo

ResultsPlus
Examiner Comments

This response scored one for the percentage of people who reported muscle pain with or without statins being around the same. They have only used one piece of evidence from the table.

ResultsPlus
Examiner Tip

Try to complete some mathematical analysis on data given in a table if you are told to use it.

(ii) The scientists concluded that most of the muscle pain reported was not due to the use of statins.

Explain, using information from the table in Figure 10, why the scientists made this conclusion.

(3)

The scientists made this conclusion as for each year the percentage are similar for people taking statins and people taking placebo. For example, in year 1 there was a higher percentage of 0.8% for people having muscle pain with statins than those without it. However, in year 2 there was a higher percentage of a difference of 0.1%. for people having placebo and those taking statins. This unexpected change in the two years suggest muscle pain occurs either way.

ResultsPlus
Examiner Comments

This response scored three marks. They have for each year the percentage are similar for people taking statins and people taking placebo, in year one there was a higher percentage of 0.8% for people having muscle pain with statins gains two marks for the calculated difference and year one being higher. Had they not already been awarded full marks they would also have gained credit for in year two there was a higher percentage of people taking the placebo with muscle pain.

(ii) The scientists concluded that most of the muscle pain reported was not due to the use of statins.

Explain, using information from the table in Figure 10, why the scientists made this conclusion.

(3)

The difference in the people reporting muscle pain taking statins and placebo was very low. After year 1 more people were reporting muscle pain from using the placebo. In year 2, placebo's percentage was 0.1% more than the statin's percentage. In year 3 the percentage of people reporting muscle pain taking statins was 0.2% lower than the placebo.

ResultsPlus
Examiner Comments

This scored full marks for the difference in people reporting muscle pain being very low, after year 1 more people were reporting muscle pain from the placebo and for the year 2 calculation of 0.1% more. They have manipulated the data from the table as well as extracting more than one piece of information. This was something few candidates did on this question.

(ii) The scientists concluded that most of the muscle pain reported was not due to the use of statins.

Explain, using information from the table in Figure 10, why the scientists made this conclusion.

(3)

The number of people reporting muscle pain whilst taking the placebo was similar to the number of people experiencing muscle pain whilst taking the statins. This shows how the use of statins did not have an effect on the amount of people experiencing muscle pain, so most of the muscle pain was not due to the use of statins. The results were all between 1% of eachother, showing little difference.

ResultsPlus
Examiner Comments

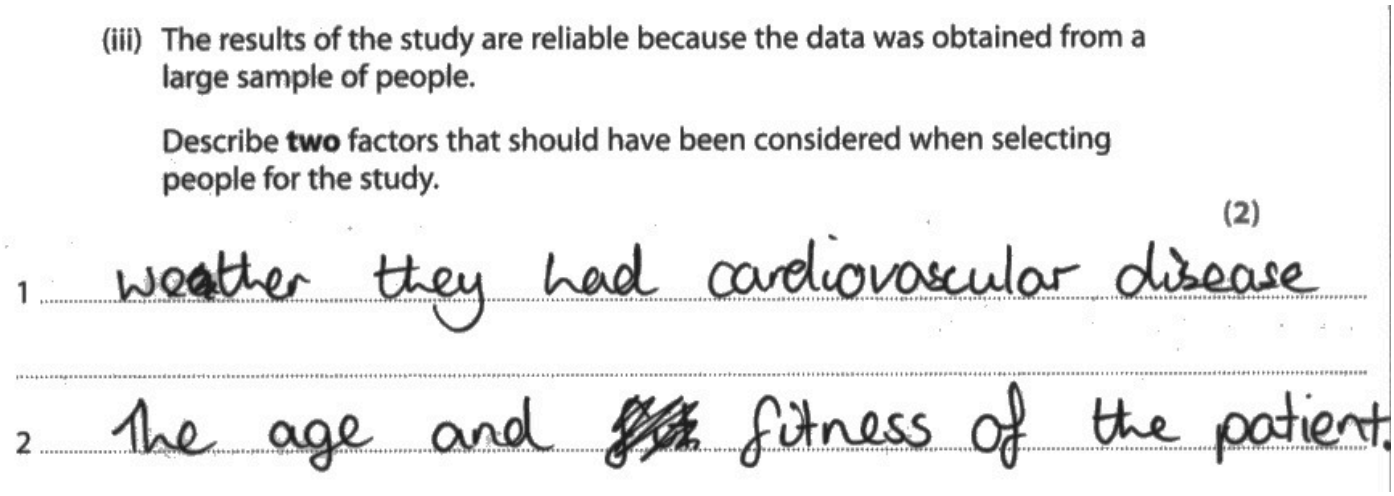
This response scored one for a similar number of people experiencing muscle pain. The majority of the response repeats information given in the question. The results were all between 1% of each other was not sufficient as a specific value was required.

ResultsPlus
Examiner Tip

Give specific mathematical values for differences and not approximates or ranges.

Question 8 (b)(iii)

This question enabled the practical skill of identifying and controlling variables to be demonstrated. Candidates were asked to describe two factors that should have been considered when people were selected for the trial. The marks were awarded for factors including age, sex, ethnicity, mass/weight, medical history and lifestyle.



(iii) The results of the study are reliable because the data was obtained from a large sample of people.

Describe **two** factors that should have been considered when selecting people for the study.

(2)

1 weather they had cardiovascular disease

2 the age and fitness of the patient

ResultsPlus
Examiner Comments

This response scored two marks. Whether they had cardiovascular disease was in the additional guidance, age and fitness of the patient were also independent marks.

(iii) The results of the study are reliable because the data was obtained from a large sample of people.

Describe **two** factors that should have been considered when selecting people for the study.

(2)

1 The BMI/weight of the people

2 the age of the people

ResultsPlus
Examiner Comments

BMI was accepted against the marking point of mass/weight/height and age was a second mark so the response gained full marks.

(iii) The results of the study are reliable because the data was obtained from a large sample of people.

Describe **two** factors that should have been considered when selecting people for the study.

(2)

1 Similar cardiovascular problems

2 No other medications being taken that would cause issues

ResultsPlus
Examiner Comments

This only scored one mark as cardiovascular problems and any other medication were all within the same marking point which covered ideas around medical history.

Question 9 (a)(i)

This was the first extended open-response question of the paper. Candidates were given a diagram of the stages of the cell cycle and asked to describe the three stages. These items are marked using a levels-based mark scheme and not points based. To gain Level 1, only one stage of the cell cycle or some of the processes within a stage were needed. If there was linkage between a process at that stage and the name of the stage, the top of the level was awarded. For Level 2 candidates needed to describe processes within two stages of the cell cycle. If this was linked to the names of the stages of the cell cycle the top of the level was awarded. Level 2 was also awarded for a detailed description of mitosis in the absence of processes within interphase or cytokinesis. Many candidates gave very detailed and accurate descriptions and gained Level 3 by describing all three stages of the cell cycle including a complete description of mitosis. The top of Level 3 was awarded frequently, where all three stages of the cell cycle and the steps of mitosis were named. There were a number of responses that included steps of mitosis in stage 1 or stage 3 of the cell cycle, and these were limited to Level 2.

9 (a) When one cell goes through the stages of the cell cycle, two cells are produced.

Figure 11 shows the three stages of the cell cycle.

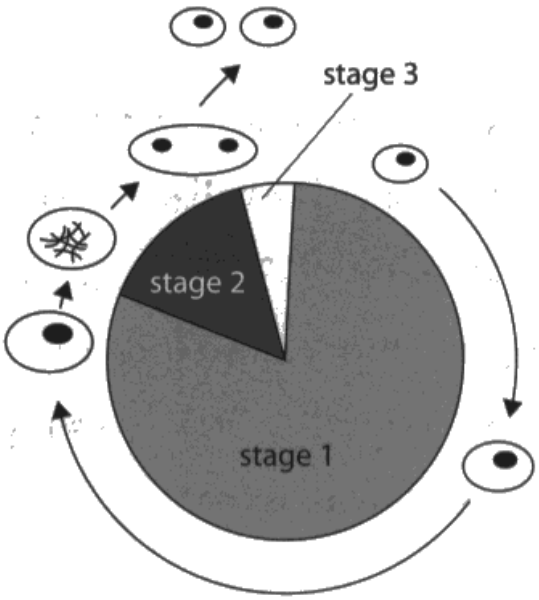


Figure 11

*(i) Describe the three stages of the cell cycle shown in Figure 11.

(6)

stage 1 which is the long stage where the cell spends most of its time it is called interphase here the cell replicates stage 2 this where mitosis begins and starts with prophase here the chromosome thicken and become visible then the nucleus membrane dissolve and became long then the next ~~step~~ phase metaphase here the chromosome and their duplicates line up in the middle of the cell. then the next ~~stage~~ phase anaphase here the the chromosomes are then pulled apart to different ends of the cell then telephase the nucleus starts to form again and the nucleus membrane starts to pinch in and then finally in stage 3 it divides and the the the cycle is repeated

ResultsPlus
Examiner Comments

This is a Level 3 response. They have identified interphase as the longest stage. They describe all the stages of mitosis and that in stage 3 the cell divides. They do not name cytokinesis so gain five marks. Level 3 requires a description of all the stages of the cell cycle and a description of all the stages of mitosis. The top of the band is awarded if all the names are given for the cell cycle and mitosis.

9 (a) When one cell goes through the stages of the cell cycle, two cells are produced.

Figure 11 shows the three stages of the cell cycle.

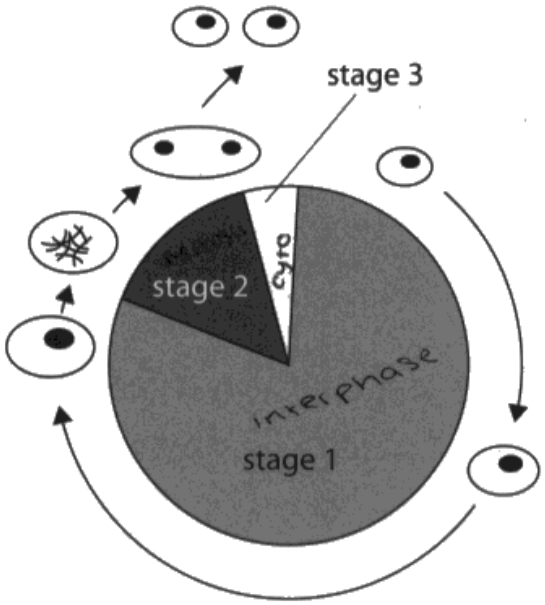


Figure 11

*(i) Describe the three stages of the cell cycle shown in Figure 11.

(6)

Stage 1 is interphase. In this stage all the DNA and ~~cellular~~ structures are duplicated in the nucleus, so before there were only 2 pairs of each chromosome and now there are four pairs. Stage 2 is called Mitosis. There are 4 stages of mitosis: Prophase, this is where the nucleus membranes are broken down and spindle fibres are made, Metaphase, where the spindle fibres pull the chromosomes to the middle of the cell, Anaphase, where the fibres pull the pair chromosomes apart to either side of the cell,

and Telephase, where nucleus membranes form around the two seperate sets of chromosomes. Stage 3 is cytokinesis where cell membranes form around the two nuclei, forming two seperate daughter

ResultsPlus
Examiner Comments

This gains Level 3 because they have described interphase, cytokinesis and their response includes all stages of mitosis in step 2. For each step, one process that occurs must be included in the response. They gain the top of the band for naming interphase, mitosis including all four stages and cytokinesis.

9 (a) When one cell goes through the stages of the cell cycle, two cells are produced.

Figure 11 shows the three stages of the cell cycle.

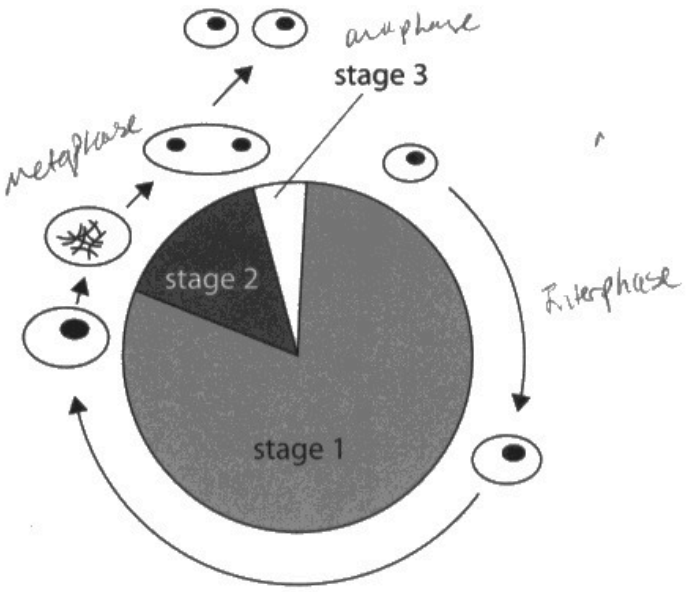


Figure 11

*(i) Describe the three stages of the cell cycle shown in Figure 11.

(6)

Stage 1 is ~~the~~ interphase where chromosomes are kept inside a cell. They are in this stage majority of the cell cycle. The second stage is metaphase. This is where the chromosomes are split up. They are then brought back together as spindle fibres. The cells then divide into two to produce two genetically identical cells

ResultsPlus
Examiner Comments

This is a Level 2 response. It has some details from more than one stage of the cell cycle. It did not get Level 3 as not all the stages of mitosis are included. It gained three marks as it incorrectly labels stage 3 on the diagram as anaphase and it does not name mitosis.

9 (a) When one cell goes through the stages of the cell cycle, two cells are produced.

Figure 11 shows the three stages of the cell cycle.

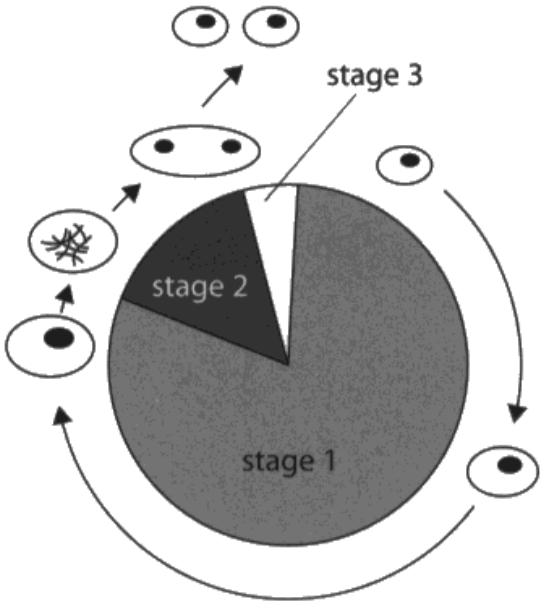


Figure 11

*(i) Describe the three stages of the cell cycle shown in Figure 11.

(6)

Stage 1 is interphase where the cell replicates its ~~dna~~ chromosomes ~~and the nuclei membrane is broken down~~ Stage ~~two~~ is Mitosis where the nuclei membrane is broken down the chromosomes are lined up in the centre of the cell by spindle fibres and the chromatids are pulled to opposite sides of the cell by the spindle fibres then during stage 3 the cell ~~membrane~~ cytoplasms splits ~~in~~ ~~half~~ and then the cell splits forming 2 genetically identical daughter cells

In Stage 1 the organelles of the cell are also replicated

ResultsPlus
Examiner Comments

This is a Level 2 response. They have described all three stages of the cell cycle but mitosis is incomplete as there is no reference to a process during telophase. They gain four marks as they have named two stages of the cell cycle.

9 (a) When one cell goes through the stages of the cell cycle, two cells are produced.

Figure 11 shows the three stages of the cell cycle.

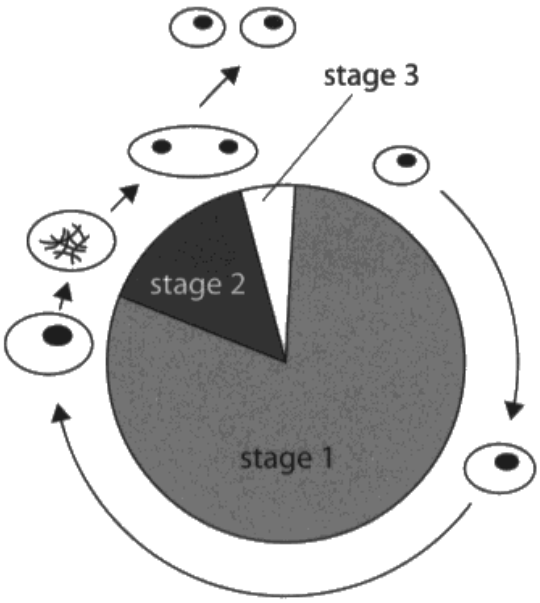


Figure 11

*(i) Describe the three stages of the cell cycle shown in Figure 11.

(6)

In Mitosis the cell first goes through interphase where the cell ~~duplicates~~ grows in size ready to duplicate it's DNA this is Stage 1. In stage 2 prophase happens where all DNA and bits are duplicated to place in another cell. Metaphase also happens here where all the genetic material is lined up in the centre of the cell. In Stage 3 anaphase happens where the genetic material is pulled apart to either half of the cell this is done by strings that are at either side of the cell. Telophase also happens here where the cells are separated from each other to create to identical diploid daughter cells.

ResultsPlus
Examiner Comments

This response includes content for stage 1 and stage 2 of the cell cycle. The cell grows in size and the description of metaphase and anaphase are correct. They gained three marks in Level 2 as they have linked mitosis to stage 1 and anaphase to stage 3. They have only correctly identified interphase. Responses that included stages of mitosis in either interphase/stage 1 or cytokinesis/stage 3 were not awarded Level 3.

Question 9 (a)(ii)

Nearly all candidates gained a mark for this question by stating that the cell cycle is more rapid or uncontrolled in cancerous cells. The idea that the cells divide quicker or don't stop was also accepted.

(ii) State what happens to the cell cycle in cancerous cells.

(1)

The cells divide at a rapid, uncontrolled speed.

ResultsPlus
Examiner Comments

The cells divide rapidly was accepted for the mark.

(ii) State what happens to the cell cycle in cancerous cells.

(1)

The Interphase become for short, leads to the cells being in mitosis for more often.

ResultsPlus
Examiner Comments

This response indicates that the cell cycle is quicker and was awarded the mark.

(ii) State what happens to the cell cycle in cancerous cells.

(1)

It rapidly increases and mere are uncontrollable mutations.

ResultsPlus
Examiner Comments

It in the response was read as the cell cycle and therefore this gained the mark for quicker/rapid cell cycle.

ResultsPlus
Examiner Tip

Avoid using terms such as 'it or 'they', be specific and say what you actually mean.

Question 9 (b)(ii)

In this four-mark question candidates needed to describe how a doctor might determine if a child was growing as expected. To gain full marks, the response needed to refer to a measurement that could be taken, the use of a percentile chart, comparisons to children of the same age and the idea of monitoring growth over time or by tracking a percentile. A very common misconception seen was that children above the 95th percentile or below the 5th percentile are not growing properly which limited many higher ability candidates to three marks.

(ii) A parent is concerned that their child is not growing as much as other children.

Describe how a doctor might determine if the child is growing as expected.

(4)

Measure the mass and height of the child. These can then be compared with a percentile graph* If the child falls into a very low or very high percentile, there may be reason for concern, however if they are central, they should be growing as expected.

* of children the same age.

ResultsPlus
Examiner Comments

This gained three marks for measuring the mass / height, comparing to a percentile graph and children the same age. A very low or very high percentile is not sufficient for a concern and this response illustrates this common misconception.

(ii) A parent is concerned that their child is not growing as much as other children.

Describe how a doctor might determine if the child is growing as expected.

(4)

The doctor can measure their height and weight and compare it to other children the same age on a percentile graph (distribution of this data among others the same age). Here they can see what percentile they were on as a baby, and track whether they have changed percentile. If they have dropped range of percentile, health checks may be carried out. They can also compare BMI and waist:hip ratio with other children of the same ~~age~~ age and gender.

ResultsPlus
Examiner Comments

This response gained full marks. The marks were awarded for a measurement of height / weight, comparing the measurement to other children the same age, a percentile graph and for indicating that they track whether the child changes percentile.

(ii) A parent is concerned that their child is not growing as much as other children.

Describe how a doctor might determine if the child is growing as expected.

(4)

A doctor would measure the child, the weight, the height, the head circumgrance. They would then plot the childs measurements on a percentile graph. Using the graph the doctor would see whether the child is below, on or above the average. If the child is below the average the doctor would ~~dertrose~~ determine that the child is not growing as expected.

ResultsPlus
Examiner Comments

This gained three marks for measuring weight / height or head circumference and plotting the child's measurements on a percentile chart. There was no indication of this being linked to age. Being above or below average is not sufficient for a growth concern and was not credited.

Question 10 (a)(i)

This question required direct recall of the name of the bacteria which causes stomach ulcers. Many candidates did not know the answer and a high degree of tolerance was applied to the spelling, if it was clear that the candidate was attempting to recall the correct bacteria from the specification. For example, Heliobacter was accepted as it is only one letter difference and significantly closer to the correct answer than many responses seen, such as variations on Ulcerium, *Salmonella* or *E. coli.*

10 Stomach ulcers can be caused by bacteria.

(a) (i) Name the bacteria that cause stomach ulcers.

(1)

~~helicobacter~~ helicobacter methene

ResultsPlus
Examiner Comments

This was awarded the mark for the correct Genus name.

10 Stomach ulcers can be caused by bacteria.

(a) (i) Name the bacteria that cause stomach ulcers.

(1)

Heliobacter

ResultsPlus
Examiner Comments

This was sufficiently close to Helicobacter with only one letter missing and gained the mark.

ResultsPlus
Examiner Tip

Make sure you learn the names of pathogens and other key terms from the specification.

10 Stomach ulcers can be caused by bacteria.

(a) (i) Name the bacteria that cause stomach ulcers.

(1)

Helicobacter pylori

ResultsPlus
Examiner Comments

This is the correct answer but was not seen very often in responses.

Question 10 (a)(ii)

To gain the marks on this question candidates were required to deduce that an alkaline medicine would neutralise or reduce the acidity of the stomach. The idea that the pH would be increased or that the stomach is acidic was also accepted. A mark was not awarded for the idea that it reduced symptoms as this is given in the question. Some candidates gave conflicting answers that the pH and acidity would be reduced.

(ii) People with a stomach ulcer are treated with antibiotics and an alkaline medicine to reduce symptoms.

Give a reason why the alkaline medicine is used.

(1)

To neutralise the stomach acid

ResultsPlus
Examiner Comments

Neutralising stomach acid was awarded the mark for this question.

(ii) People with a stomach ulcer are treated with antibiotics and an alkaline medicine to reduce symptoms.

Give a reason why the alkaline medicine is used.

(1)

~~to neutralise the pH~~
to denature the stomach ulcer's enzymes.

ResultsPlus
Examiner Comments

This is not correct and was not credited a mark.

Question 10 (b)

The was the final practical skills question on the paper and related to the core practical from Topic 5. The scientist in the question has an agar plate with bacteria spread on the surface and antibiotic discs. The question required a description of how the scientist would be able to determine which antibiotic would kill the bacteria. The question was answered very well, possibly reflecting that it has been an extended open-response question on a previous paper. Most candidates gave the idea of placing the discs on the agar plate and measuring the zone of inhibition. Stronger responses included an aseptic technique and/or a time period for incubation. Less responses included a control or an incubation temperature.

(b) Antibiotics are used to treat stomach ulcers.

Bacteria have become resistant to some antibiotics.

A scientist has an agar plate spread with the bacteria that cause stomach ulcers and discs containing different antibiotics.

Describe how the scientist could use these to determine which antibiotic can kill the bacteria.

(3)

Soak discs in antibiotics and place them on agar plate, spread out. Leave one disc not soaked in anything as a control. Leave agar plate for 48 hours at 25°C. The area around the discs where bacteria has not grown is the inhibition zone. Calculate the area of the inhibition zone for each disc using πr^2. The disc with the largest inhibition zone is the most effective at killing bacteria.

ResultsPlus
Examiner Comments

This response has multiple marking points and gained full marks. It includes placing the discs on the plate, using a control, 48 hours as an acceptable incubation time, the temperature is within the accepted range and calculating the area of the zone of inhibition is the final mark point.

ResultsPlus
Examiner Tip

Including specific temperatures and time periods for incubations is good practice when answering practical questions.

(b) Antibiotics are used to treat stomach ulcers.

Bacteria have become resistant to some antibiotics.

A scientist has an agar plate spread with the bacteria that cause stomach ulcers and discs containing different antibiotics.

Describe how the scientist could use these to determine which antibiotic can kill the bacteria.

(3)

The ~~A~~ On the agar plate, the scientist would need to measure the area ~~of inhibition~~ around each antibiotic where bacteria ~~ices~~ was unable to grow. This area (known as the 'area of inhibition') would be larger around ~~effective~~ antibiotics ~~and~~ effective at killing the bacteria, and much smaller, ~~or~~ or not present around anti-biotics the ~~bacteria~~ bacteria is immune to.

ResultsPlus
Examiner Comments

This scores one mark for measuring the area where the bacteria were unable to grow, it does not include any further practical details.

(b) Antibiotics are used to treat stomach ulcers.

Bacteria have become resistant to some antibiotics.

A scientist has an agar plate spread with the bacteria that cause stomach ulcers and discs containing different antibiotics.

Describe how the scientist could use these to determine which antibiotic can kill the bacteria.

(3)

the scientist should place the antibiotic disc and a control (not antibiotic) disc equal distances across the plate of bacteria. if the antibiotic is effective against the bacteria a clear circle will form and, if the bacteria is resistant, there will be no change around that circle.

ResultsPlus
Examiner Comments

This response scored three marks for placing the discs and a control disc on the plate and for the clear circle indicating that the antibiotic is effective.

Question 10 (c)

The final question on the paper was the second extended open-response question which asked for a description of the lytic lifecycle of a bacteriophage and suggestions on why it could be used as an alternative to antibiotic. A diagram of a bacteriophage infecting a bacterial cell was given in the question stimulus. The responses showed a range of understanding and detail on the lytic lifecycle. Level 1 was awarded for a brief description of the lytic cycle with the top of the level being awarded for a suggestion on why the bacteriophage could be an alternative to antibiotics. Level 2 was awarded for a more extensive description of the lytic cycle that indicated more than just the idea that the virus is copied and the cell lysed, if this was linked to why the bacteriophage could be an alternative to antibiotics the top of the level could be awarded. Level 3 required the details of the lytic cycle to include the involvement of the host cell machinery and that viral proteins are produced before the virus can assemble. To gain the top of the level at least two reasons why the bacteriophage could be an alternative to antibiotics needed to be given. This meant that the response needed to include more than just the idea that the bacteria were killed. Detailed responses gave ideas around the bacteriophage replicating to continue to kill bacteria, that host cells were not affected or that it might help overcome the problems of antibiotic resistance.

*(c) A bacteriophage is a type of virus that can infect bacterial cells.

Figure 12 shows a bacteriophage infecting a bacterial cell.

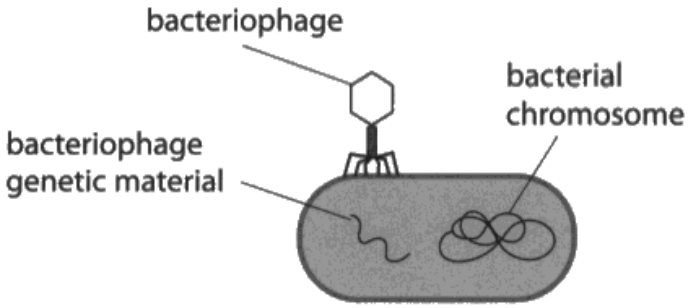


Figure 12

Scientists are investigating if a bacteriophage could be used as an alternative to antibiotics.

Describe the lytic lifecycle of a virus and suggest why a bacteriophage could be used as an alternative to antibiotics.

(6)

The lytic lifecycle starts with a virus that infects the cell by injecting itself. The virus will then divide ~~with the cell where its DNA will be replicated~~. The virus will make so many copies of itself that the bacterial chromosome will lose it's shape and the cell will explode from the amount of copies. The virus will then infect neighbouring cells and complete the same process. The bacteriophage may be a better alternative as it will complete the lytic cycle alongside ~~with~~ the virus, stopping it infecting. This could be a process that is alot faster and more effective than antibiotics.

(Total for Question 10 = 11 marks)

ResultsPlus
Examiner Comments

This is a Level 1 response which includes the idea of the virus copying itself by dividing and exploding the cell. It is isolated knowledge and not sufficient detail to be classed as a good description so Level 2 was not given. The response does not give a good reason for its use as an alternative to antibiotics so one mark was awarded.

*(c) A bacteriophage is a type of virus that can infect bacterial cells.

Figure 12 shows a bacteriophage infecting a bacterial cell.

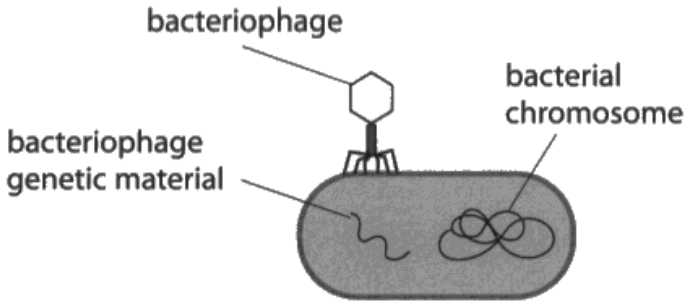


Figure 12

Scientists are investigating if a bacteriophage could be used as an alternative to antibiotics.

Describe the lytic lifecycle of a virus and suggest why a bacteriophage could be used as an alternative to antibiotics.

(6)

During the lytic cyle the virus injects its genetic material into the host cell, then uses the cell's machinery to divide within the cell during mitosis. When there is enough viral DNA in the host cell, the viral components assemble, this causes the cell to burst and the viruses go on to infect the bloodstream and immune system.

If the bacteriophage was geneticaly engineered to contain medicine or antibiotic then it could fight the bacterial pathogen when the viral DNA is injected and assembled inside the cell. This would be beneficial as many bacteria are becoming resistant to antibiotics through natural selection, it would be more effective because the viral antibiotic would be injected straight into the bacterium.

(Total for Question 10 = 11 marks)

ResultsPlus
Examiner Comments

The level of detail for the infection and lytic stage determine the level for this question. This is a Level 2 answer. It has a good description of the lytic cycle but does not demonstrate the knowledge that viral proteins are produced in the host cell so Level 3 was not given. The response makes links to the lysogenic cycle with dividing by mitosis preventing the top of the band being awarded as the response lacks coherency. They mentioned antibiotic resistance as a problem which would have been credited for the top of the band had they not referred to the lysogenic cycle.

*(c) A bacteriophage is a type of virus that can infect bacterial cells.

Figure 12 shows a bacteriophage infecting a bacterial cell.

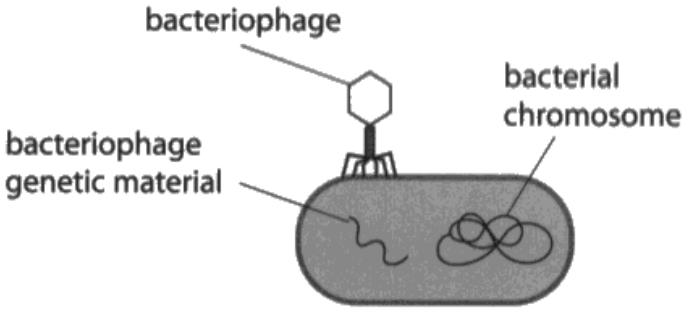


Figure 12

Scientists are investigating if a bacteriophage could be used as an alternative to antibiotics.

Describe the lytic lifecycle of a virus and suggest why a bacteriophage could be used as an alternative to antibiotics.

(6)

The lytic cycle of a virus begins with the virus injecting viral DNA onto the host cell and using it to replicate and produce ~~of~~ lots of viral particles in the cell. It hijacks the cells machinery to mass produce these viral particles quickly and when too many are formed the cell ~~lyses and~~ bursts (lyses) and the viral particles infect all surrounding cells. Bacteriophage can be used because it actively enters the cell and ~~kills~~ stops its process along with all the cells surrounding it very quickly in comparison to antibiotics and bacteria will not become resistant to this. **(Total for Question 10 = 11 marks)**

This is a Level 2 answer. It has a good description of the lytic cycle but does not demonstrate the knowledge that viral proteins are produced in the host cell so Level 3 was not given. It has the idea of stopping processes in the bacterial cell and the bacteria not developing resistance for the use of bacteriophage and was awarded four marks.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure they answer the actual question in the paper. Written responses to a number of questions indicated that candidates used past papers as part of their revision process, which is commendable, but care must be taken to ensure that candidates answer the actual question in the paper, as although the knowledge may be similar the question is rarely identical.
- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given and the quantity of additional information given should reflect the number of marks awarded for the question.
- Read the information given in the introduction to the question but avoid repeating it in the answer as it will not gain credit. Candidates should also read mathematical questions carefully to note whether an answer is required in a specific format, such as number of significant figures. They should ensure they consistently apply rules for rounding up numerical answers.
- Ensure that when describing data from tables they identify as many different patterns as possible and avoid writing the same pattern multiple times. If data is numerical then a mathematical manipulation of the data is likely to be creditworthy.
- Make sure that key scientific terms from the specification are understood including selection pressure, variation, pathogen, sexual and asexual reproduction, vector and biological control. When completing Punnett squares for inheritance, ensure that the same letter is used for the alleles.
- Always show the mathematical workings when doing calculations as a mark can be awarded for errors carried forward.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks awarded.
- Consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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