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Examiners' Report
June 2019

GCSE Biology 1BI0 1H

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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 second assessment of the GCSE (9-1) Biology specification and the qualification follows a linear assessment model whereby candidates must complete the two papers in the same single year of certification.

Paper 1: Biology (Higher tier) is awarded a total of 100 marks and it 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.

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.

The Paper 1: Biology (Higher tier) paper 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 food testing, mitosis and meiosis, the immune system, the evolution of antibiotic resistance, the eye, bacterial cells and genetic engineering, viruses and immunisation, the effect of medication on heart disease risk, sexually transmitted infections, protein synthesis, blood group inheritance and the nervous system including myelination and transmission at a synapse.

Questions designed to assess practical work included writing a plan to determine the optimum temperature of an enzyme, the use of a calorimeter, the extraction of DNA from fruit including identifying controlled variables and improvements, the effect of enzyme concentration on rate of reaction including an understanding of the need to control variables. The maths skills assessment in this paper related to questions requiring mean calculations, unit conversions, magnification and percentages as well as the use of significant figures and standard form.

Question 1 (a) (ii)

This item looked at the method for testing for reducing sugars. The first marking point was for identifying that the reagent is Benedict's solution. The second mark was for the idea of heating the sample. Candidates could also obtain this mark for giving the correct positive result. The full range of colours that indicate a positive result were credited although the colour had to be in the correct context, brick red to blue was not credited. The mark points were independent, so the colour change could be awarded if the solution used is incorrect. Many candidates obtained full marks on this question. A small number of candidates gave the tests and results for fats or starch.

(ii) Describe how a solution of food can be tested for reducing sugars.

(2)

Add Benedicts Reagent to the solution. Heat the solution ~~up~~ using a water bath. If the solution of food contains reducing sugars a coloured precipitate will form. You can use the colour to work out the concentration of reducing sugars.

ResultsPlus
Examiner Comments

This candidate obtained the full 2 marks for naming the reagent and the method of heating. However, had the colour change been required they would not have been given a mark as they did not give any specific details.

(ii) Describe how a solution of food can be tested for reducing sugars.

(2)

To the solution of food and ~~Biru~~ Biuret solution. If the solution turns a brick red colour it contains reducing sugars.

ResultsPlus
Examiner Comments

This candidate obtained 1 mark as the points were independent. They give the incorrect reagent but the correct colour change.

(ii) Describe how a solution of food can be tested for reducing sugars.

(2)

add Benedict's solution to the food. Then Heat it in a water bath. The colour will change from blue to green → yellow → orange → red (depending on how much sugar is present - Red = most sugar).

ResultsPlus
Examiner Comments

This is a detailed response scoring the full 2 marks. They correctly name the reagent and give the idea of heating. They also give the full range of colour change which could be expected and indicate that red shows the most sugar.

ResultsPlus
Examiner Tip

Learn the reagents needed to test for starch, reducing sugars, fats and protein as well as what you would expect to observe for a positive and negative result.

Question 1 (b)

For this question candidates had to identify how the calorimeter in figure 2 could be used to determine the energy content of 10g of food. The first mark was for measuring the start and end temperature of the water or for using the thermometer to measure the temperature. The second mark was the idea of burning the food. Combusting or igniting the food were accepted but heat the food was insufficient. The final marking point was for using the temperature increase or a temperature change to calculate the energy content. The response needed to indicate that the temperature change or increase could be used to find, measure or calculate the energy content. Just the idea that the temperature rise is the energy content or shows the energy content was insufficient. The details of the calculation were not required, and the mark was awarded if it indicated the requirement for a calculation. A range of marks were awarded for this item but many higher ability candidates obtained full marks and even gave the correct calculation. Common errors that led to marks being lost were just the idea of measuring the end temperature of the water, heating the food rather than burning it and just indicating that the temperature rise was the energy content.

(b) Figure 2 shows a calorimeter.

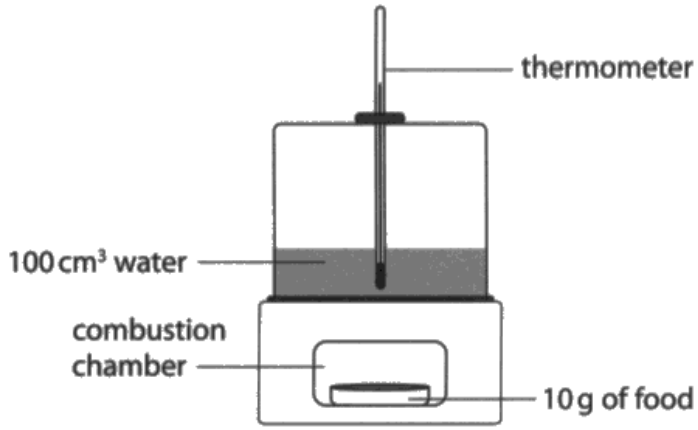

Figure 2

Describe how this calorimeter can be used to find the energy content of 10 g of food.

(3)

measure the temp of water at the beginning then after the 10g of food has fully combusted, mease the temp of water again. calculate the change in temp of 100cm³ of water.

ResultsPlus
Examiner Comments

This candidate scored 2 marks for measuring the start and end temperature of the water and combusted the food was sufficient for marking point 2. Just calculating the difference in the temperature of the water was insufficient for marking point 3.

(b) Figure 2 shows a calorimeter.

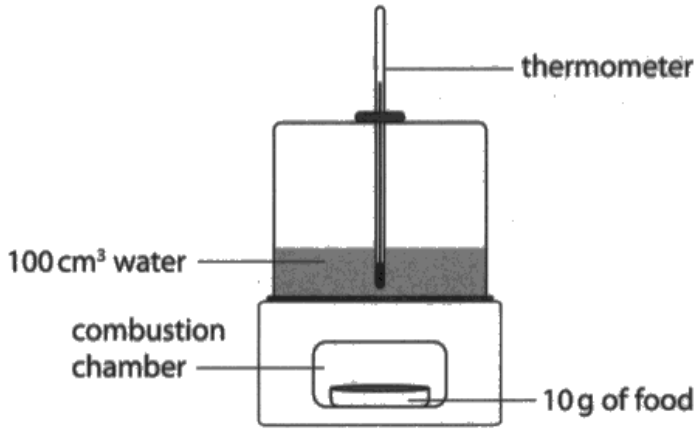

Figure 2

Describe how this calorimeter can be used to find the energy content of 10 g of food.

(3)

First, record the starting temperature of the water. Then set the food alight under the water in the combustion chamber. When the food sample has completely burned, then record the temperature of the water again. We can then use the formula to work out the energy content.

energy content = mass of water (100) × temperature change × 4.2

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Examiner Comments

This scored full marks. The final mark needed the idea of calculating the energy content from the difference in the temperature of the water. The specific equation is not required although many candidates sitting the paper will also be studying physics and it was seen on a significant number of responses.

Question 2 (a)

There are two aspects to this question, the knowledge that haploid cells contain half the genetic material of diploid cells and the unit conversion from nanograms to picograms. Full marks were awarded for the correct answer but if this was not obtained there was a mark for either dividing the mass by 2 or completing the unit conversion, the answer for this could be given in standard form. The most common mistake was only completing one aspect of the question. Some responses doubled the amount of DNA.

2 (a) A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms.

(1 nanogram = 1000 picograms)

(2)

0.0062 x 1000 = 6.2

6.2 ÷ 2 = 3.1

3.1 picograms

ResultsPlus
Examiner Comments

This response shows both aspects of the calculation and the correct answer was obtained scoring the full 2 marks.

2 (a) A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms. 10^{-3}

(1 nanogram = 1000 picograms) ~~nait~~ mm

(2)

nano nano

0.0062 ÷ 2 = 0.0031 ÷ 10^{-3} = 0.0000031

m

0.0030000

0.0000031

nano = 10^{-9} pico = 10^{-12}

0.0000031 picograms

ResultsPlus
Examiner Comments

This response scored 1 mark for dividing the mass in the diploid cell by 2. They have divided by a 1000 so the unit conversion was not correct.

2 (a) A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms.

(1 nanogram = 1000 picograms)

(2)

0.0062 x
1000
6.2 pico grams

6.2 picograms

ResultsPlus
Examiner Comments

This response also scored 1 mark. This candidate has halved the DNA from the diploid cell but not given the answer in picograms.

Question 2 (b) (i)

This question addressed the method for extracting DNA from fruit cells, specifically the role of ethanol. The mark was awarded for causing the precipitation of the DNA although the idea of it making the DNA visible, so the DNA could be seen or that DNA is insoluble in ethanol were all credited. The idea that it extracts the DNA or separates the DNA from cell fragments was insufficient as it was given in the question.

(b) A student used the method shown in Figure 3 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

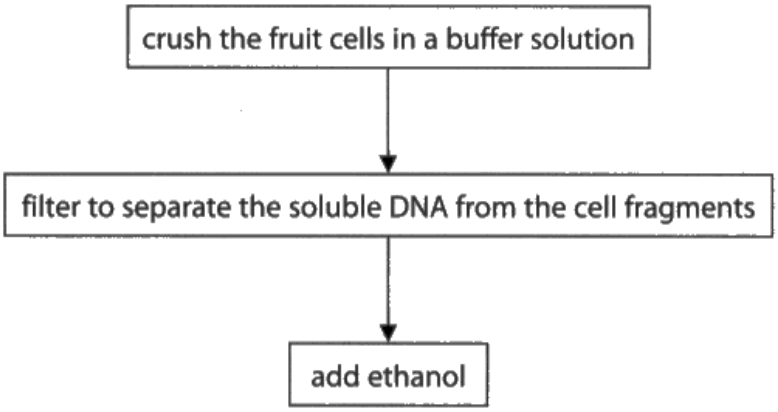

Figure 3

(i) State why ethanol is used.

(1)

Because DNA is insoluble in cold alcohol.

ResultsPlus
Examiner Comments

This response correctly identifies why ethanol is added and was awarded the mark. Adding the ethanol will cause the precipitation of the DNA because it is not soluble in ethanol.

(b) A student used the method shown in Figure 3 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

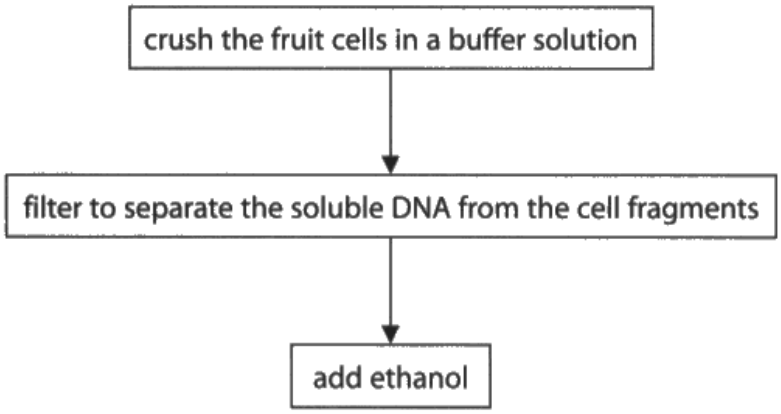

Figure 3

(i) State why ethanol is used.

(1)

To precipitate the DNA

ResultsPlus
Examiner Comments

The ethanol is added to precipitate the DNA so this response scored the mark.

(b) A student used the method shown in Figure 3 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

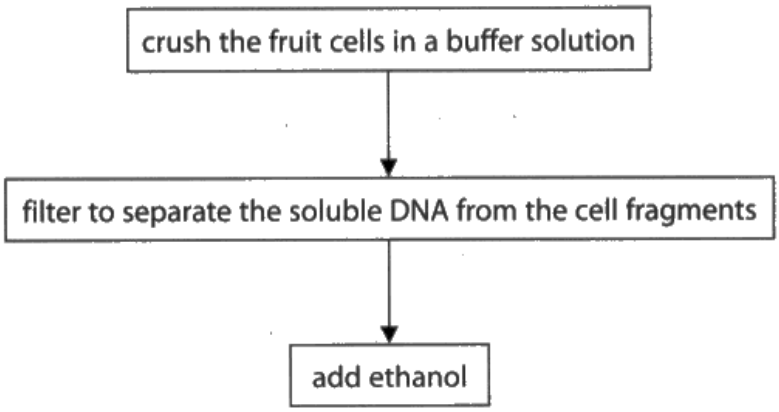

Figure 3

(i) State why ethanol is used.

(1)

Ethanol was used to kill any excess bacteria or contamination of any soil

ResultsPlus
Examiner Comments

This does not answer the question. This idea was seen a number of times in responses that did not obtain the mark.

Question 2 (b) (ii)

With practical skills being assessed in exams with this specification the skill of identifying variables is one that candidates need to develop. There are a lot of correct responses as indicated on the mark scheme and only two were required. The list rule was applied as the same amount of DNA and the same fruits are incorrect responses and some candidates are confusing independent and dependent variables with controlled variables. Candidates are still losing marks for using the term amount and not the more scientific terms of mass or volume. Volume of solution was awarded a mark but not in combination with volume of ethanol or volume of buffer. Weight is accepted for mass as well as using the units for volume such as cm^3 or ml. The idea of the age or quality of the fruit was also accepted as was the specific idea of the mass of salt or volume of detergent which was given by higher ability candidates who showed extensive knowledge of this method. The idea of using the same equipment was ignored as it does not demonstrate sufficient knowledge of the method.

(ii) State **two** variables the student needs to control when using this method to compare the mass of DNA from these two fruits.

(2)

1 Use the same mass of kiwi and strawberry cells.

2 Use the same filter paper, or filtration techniques so no DNA is lost during filtration.

ResultsPlus
Examiner Comments

There were a lot of possible responses to this question. This was awarded the mark for the mass of fruit as they have used to correct scientific terminology. The response was also awarded a second mark for the filtration technique being the same as it is equivalent to fully filtered.

(ii) State **two** variables the student needs to control when using this method to compare the mass of DNA from these two fruits.

(2)

1 Keep the weight of the two fruits the same.

2 The same volume of buffer solution

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Examiner Comments

This response scored maximum marks. It illustrates the accurate use of terminology for measuring quantities. Weight was accepted for mass and volume was used for the buffer solution.

(ii) State **two** variables the student needs to control when using this method to compare the mass of DNA from these two fruits.

(2)

1 Temperature

2 Amount of ethanol

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Examiner Comments

This was awarded 1 mark for controlling temperature. The mark was not awarded for amount as it does not use the correct terminology.

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Examiner Tip

When measuring solids use the term mass or weight and volume should be used for the measurements of liquids and gases.

Question 2 (b) (iii)

Repeating an experiment to get more data is about improving reliability or confirming that results are correct. It also allows for the identification of anomalies or calculating a mean. It does not give more accurate results - this was the most frequent error given by candidates for this question. Candidates are frequently using these scientific terms incorrectly in responses. The idea of a fair test is insufficient and precision was also not creditworthy.

(iii) The student repeated the experiment.

Give **one** reason why.

(1)

To give her a more accurate result.

ResultsPlus
Examiner Comments

The accuracy of the results will not be improved just from repeating the method so this was not credited.

ResultsPlus
Examiner Tip

Ensure that working scientifically terms such as valid, reliable, accurate and precise are used correctly if quoted in a response.

(iii) The student repeated the experiment.

Give **one** reason why.

(1)

to ensure it is a fair test and to compare the results to get an average.

ResultsPlus
Examiner Comments

Fair test is not relevant to repeating the experiment and is not credited at GCSE level. However, allowing the results to be compared and obtain an average was sufficient for the mark.

(iii) The student repeated the experiment.

Give **one** reason why.

(1)

So that she can compare all her results to eliminate anomalies.

ResultsPlus
Examiner Comments

This shows a good candidate response with the idea of being able to identify anomalies if the experiment is repeated.

Question 2 (c)

To compare mitosis and meiosis candidates were required to give the marking point response for both mitosis and meiosis within their answer. Candidates should consider how they lay out their response to this type of question, a table or bullet points for each aspect might improve scores as they would clearly see whether they had given the detail for each process as well as preventing contradictions. The idea of the number of division stages and where the processes occur was ignored as question asks for outcomes. Identical DNA, chromosomes or genetic material was acceptable for genetically identical but this level of detail was required, just identical and non-identical was insufficient. For diploid and haploid the idea of a full set or half set of chromosomes, or 46 chromosomes versus 23 chromosomes was creditworthy. Named sex cells for gametes was also given the fourth marking point.

(c) Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

(3)

Mitosis results in 2 diploid genetically identicle cells however the outcomes of meiosis are 4 daughter cells which are genetically unidentical and haploid.

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Examiner Comments

This is a concise and good response which scored 3 marks. It gives the number of cells, the details of the chromosome numbers with haploid and diploid as well as the idea that the cells produced by mitosis are genetically identical and that those produced by meiosis are genetically unidentical.

(c) Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

(3)

Meiosis produces 4 haploid daughter cells, whereas mitosis goes through various stages such as Interphase, Prophase, Metaphase, Anaphase and Cytokenesis and will produce 2 haploid cells

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Examiner Comments

This response scored 1. The question asks for the outcomes so details of mitosis are not required. They have the correct number of cells for each process but incorrectly state that mitosis produces haploid cells.

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Examiner Tip

Think about alternative ways to present an answer when asked to compare. A table or list that aligns the detail for each aspect would ensure that comparisons are made and reduce errors.

(c) Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

(3)

Mitosis is the division of cells which results in two diploid cells after cytokinesis. However, meiosis results in four identical daughter cells once the process of telephase is completed. These are genetically identical and have two pairs of chromosomes each.

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Examiner Comments

This response was awarded 1 mark for the number of cells produced. They use the term diploid for mitosis but the comparative for meiosis is incorrect with reference to two pairs of chromosomes.

Question 3 (a)

The knowledge required to answer this question is similar to a question on 2018 paper and was answered very well suggesting candidates are accessing past papers for revision. Candidates answered the question from two perspectives. Some gave the primary immune response process leading to the productions of memory lymphocytes and the ability to produce a secondary immune response. Some started from the aspect of the presence of memory lymphocytes which result from vaccination enabling a secondary immune response which produced antibodies. Both approaches were able to score full marks. Where marks were lost it was generally for scientific inaccuracies or insufficient detail. For example, the vaccine contains dead or weakened tetanus or dead disease is incorrect - it needed the idea of antigens or inactive bacteria, the bacterial name was accepted. Memory cells or lymphocytes alone was insufficient for marking point 3. The final marking point was for the secondary immune response idea or a faster response on second exposure resulting in the bacteria being killed. The idea of a response before the child gets ill or gets symptoms was given in the question.

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

Their body has memory lymphocytes from the vaccination so ~~when~~ if the bacteria enters the body through a cut the body will detect the antigens on the surface of the cell ~~or~~ meaning the lymphocytes release antibodies that are complementary to the antigen. This destroys the bacteria quickly meaning the child does not get infected with ~~tetnus~~ a tetnus.

ResultsPlus
Examiner Comments

This response scored maximum marks. They show the level of detail required including the idea that the bacteria have antigens, the cells involved are memory lymphocytes and the production of antibodies to destroy the pathogen quickly.

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

The tetanus vaccination is when they're given a weak or dead form of the infection. The body produces Memory lymphocytes which will prepare the body for when the child comes into contact with the infection again later on. If the bacteria enters the body, they won't get tetanus as they're immune to it.

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Examiner Comments

This response scored 2 marks for the production of memory lymphocytes and immune. A dead or weakened version of the infection was not sufficiently accurate for the mark to be awarded.

ResultsPlus
Examiner Tip

Consider the scientific terminology you are using in responses to ensure you are using the correct term.

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

After their vaccination, their bodies have already been exposed to the bacteria and their immune system has fought it before. Their memory cells remember the pathogen and it's correct antibody so if they are exposed to the bacteria again their body is prepared and can produce the correct antibody before there are symptoms.

ResultsPlus
Examiner Comments

This scored 1 mark for the production of antibodies. There was insufficient detail for any further marks to be awarded.

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

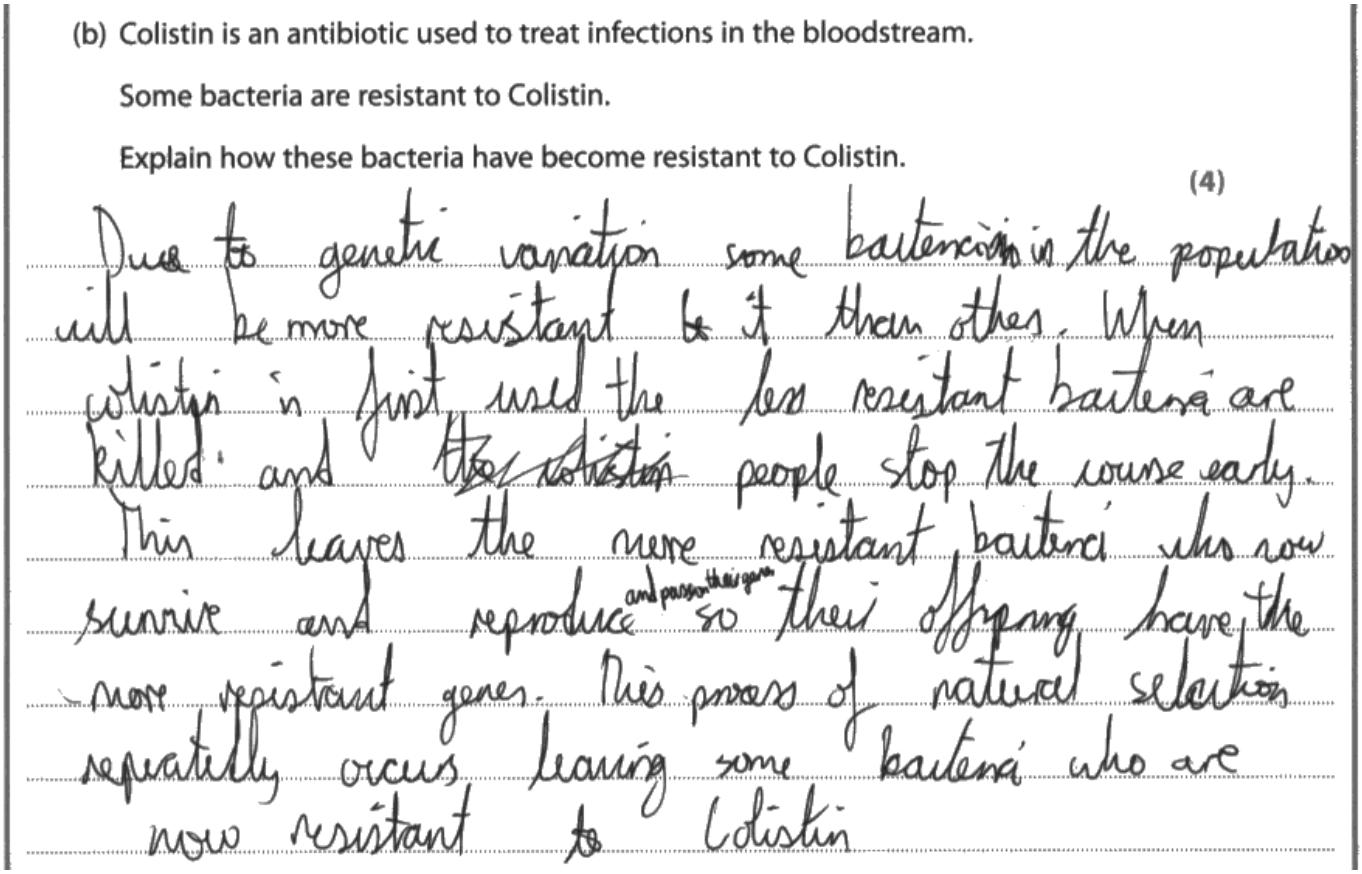
Vaccinations work by infecting the body with either dead or inactive pathogens, so that B lymphocyte cells produce antibodies (to help kill the pathogen) and memory cells. These memory cells can remain in the body for up to a lifetime, meaning that ~~when~~ the children next get infected, memory cells produce antibodies so so rapidly, that to kill the pathogen ever before any symptoms are shown.

ResultsPlus
Examiner Comments

This response scored maximum marks for inactive pathogens in the vaccination, the production of antibodies and killing the pathogen quickly as part of a secondary immune response. It would not have been given the mark for memory cells, memory lymphocytes was required.

Question 3 (b)

Responses to this question showed a wide range of understanding across the topic and a full range of marks were awarded. Many did not use the term evolution or natural selection. The first marking point is about the selection pressure aspect of not completing a course of antibiotics or the over-use. The idea that the bacteria are resistant to the antibiotic is given in the question so marking point three is about identifying the cause of the resistance. The final marking point is about survival and reproduction. Immune or strongest bacteria was ignored as it is incorrect but adapted bacteria was accepted.



(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

Due to genetic variation some bacteria in the population will be more resistant to it than others. When colistin is first used the less resistant bacteria are killed and the ~~colistin~~ people stop the course early. This leaves the more resistant bacteria who now survive and reproduce (and pass on their genes) so their offspring have the more resistant genes. This process of natural selection repeatedly occurs leaving some bacteria who are now resistant to Colistin

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Examiner Comments

This response obtained all 4 marking points. They have the idea of the selection pressure of not completing the course of colistin, genetic variation was sufficient for the cause of some bacteria being resistant and they have the idea of survival and reproduction linked to the concept of natural selection.

(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

Bacteria can evolve. If a bacteria was resistant due to a mutation then it would not die. Other bacteria which are not resistant would. Therefore the resistant bacteria could divide by mitosis resulting in many resistant bacteria cells over a period of time as they would all contain the resistant allele.

ResultsPlus
Examiner Comments

This scored 3 marks for a very good description of the process of natural selection. However, they have omitted the idea of the selection pressure of taking the antibiotics repeatedly or not completing the course.

(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

- Through natural selection, some bacteria are naturally more resistant to bacteria. This is because they randomly have mutations that make them *
- ~~the Colistin antibiotic is started~~ A course of the Colistin antibiotic is begun by a person
- over time, more & more of the bacteria are killed
- then the antibiotics are stopped too early, leaving the more resistant bacteria still in the blood
- over time these surviving bacteria reproduce until eventually all of the bacteria are resistant to Colistin.

* more resistant than others.

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Examiner Comments

This is another example of a detailed response which scores all 4 marks. The process is described fully including reference to the selection pressure and mutations.

(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

Because of evolution, some bacteria are more resistant to antibiotics than others. These bacteria that survive the antibiotics go on to ~~breed~~ reproduce so all of the bacteria are resistant to that exact antibiotic.

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Examiner Comments

This response scored 2 marks for evolution and the idea of survival and reproduction. They do not give the cause of some bacteria being more resistant or details about the use of antibiotics. Some bacteria are resistant is given in the question so this point must be expanded.

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Examiner Tip

Avoid just repeating information given in the question.

Question 4 (a) (i)

This question was a simple mean calculation with the answer expressed to three significant figures. Full marks were given for the correct answer but if this was not obtained the first mark is for the addition of all three numbers. Some candidates excluded one as an anomaly which cannot be justified from the data. The second mark was for obtaining the mean of their total and the final mark for expressing the answer to 3 significant figures. Other than the numerical values shown on the mark scheme error carried marks can only be awarded if the working is shown.

1 mark was awarded for or (292+301+297) ÷ 3 with no answer stated. 292+301+297÷3 without brackets around the addition was not creditworthy. The most frequent errors leading to loss of marks were the misinterpretation of recurring numbers and incorrect rounding.

4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 4 shows the results.

age of volunteers	distance (mm)			mean distance (mm)
	person 1	person 2	person 3	
40	256	261	257	258
45	282	275	280	279
50	292	301	297	?
55	311	309	307	309

Figure 4

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

$\frac{292 + 301 + 297}{3} = 296.67$

297 mm

ResultsPlus
Examiner Comments

This response clearly shows the working and the correct answer is obtained. Full marks are awarded for the correct answer whether or not workings are shown.

4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 4 shows the results.

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45	282	275	280	279
50	292	301	297	?
55	311	309	307	309

Figure 4

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

292 + 301 + 297 = 890

$\frac{890}{3} = 296.6\dot{}$

296.6 mm

ResultsPlus
Examiner Comments

This was awarded 2 marks for the correct answer for the mean calculation but not expressed to three significant figures.

ResultsPlus
Examiner Tip

Make sure you read the maths questions carefully so that the answer you give is presented correctly.

4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

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55	311	309	307	309

Figure 4

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

292 + 301 + 297 = 890

890 ÷ 3 = ~~296~~ 296.6

296.6 mm

ResultsPlus
Examiner Comments

This was awarded 1 mark. The answer has been incorrectly rounded and expressed to 4 significant figures.

4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 4 shows the results.

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	person 1	person 2	person 3	
40	256	261	257	258
45	282	275	280	279
50	292	301	297	?
55	311	309	307	309

Figure 4

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

mean = $\frac{292 + 301 + 297}{3} = \frac{890}{3} = 296.6 = 296$ 3 s.f

296 mm

ResultsPlus
Examiner Comments

This was awarded 2 marks. The answer has been incorrectly rounded but is given to 3 significant figures.

Question 4 (a) (ii)

For this question a conclusion was required based on the data in the table. The minimum requirement for the mark was for the idea that as age increases mean distance also increases. The idea that eyesight gets worse with age or focus distance gets worse was insufficient. References to people getting more long-sighted as they get older was credited as was a conclusion linked to an age group eg age 55 had the longest focus distance. Errors that were most frequently seen linked increasing age to becoming more short sighted or that the older people could not see distant objects which cannot be interpreted from the data.

(ii) Give **one** conclusion that can be made from the data in Figure 4.

(1)

As the age of volunteers increases, the focusing distance increases

ResultsPlus
Examiner Comments

This response scored 1 mark for successfully identifying that focussing distance increases with age.

(ii) Give **one** conclusion that can be made from the data in Figure 4.

(1)

Short sight focusing deteriorates with age.

ResultsPlus
Examiner Comments

This response was not creditworthy as the focus distance is not linked to short-sightedness.

(ii) Give **one** conclusion that can be made from the data in Figure 4.

(1)

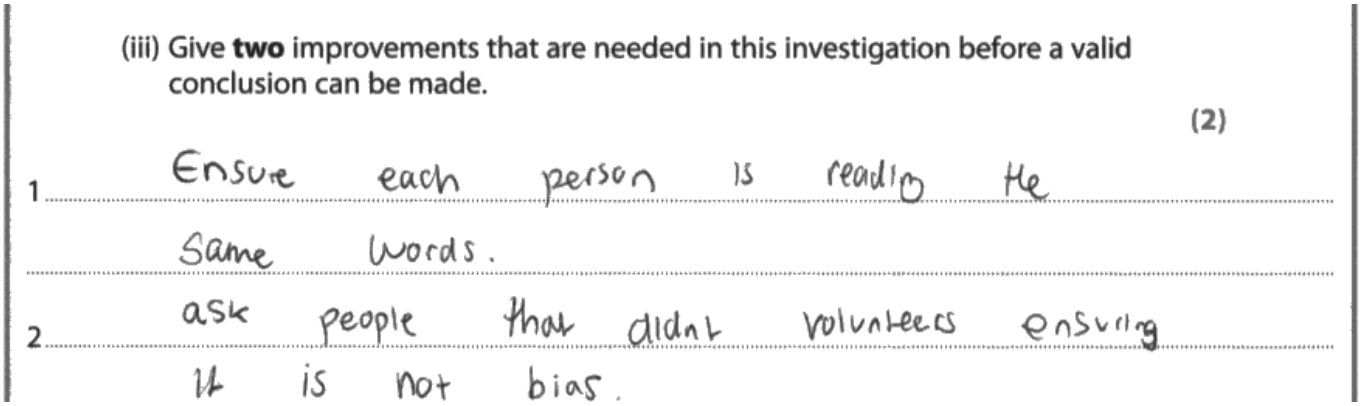
The older you age, the worse your eyesite becomes.

ResultsPlus
Examiner Comments

This was insufficient for the mark as it does not utilise the data from the table.

Question 4 (a) (iii)

This question is about improving the investigation so that a more valid conclusion can be made. There were a number of correct answers as shown on the mark scheme and candidates generally answered this question well. Correct responses addressed the idea of obtaining more data in several ways or improving the experimental method to ensure that the results obtained were valid. The most common correct responses were about getting data from more people, from more age ranges and more than one measurement from each person. The main incorrect error seen was ensure that no one was short or long-sighted which is the purpose of the investigation.



(iii) Give **two** improvements that are needed in this investigation before a valid conclusion can be made.

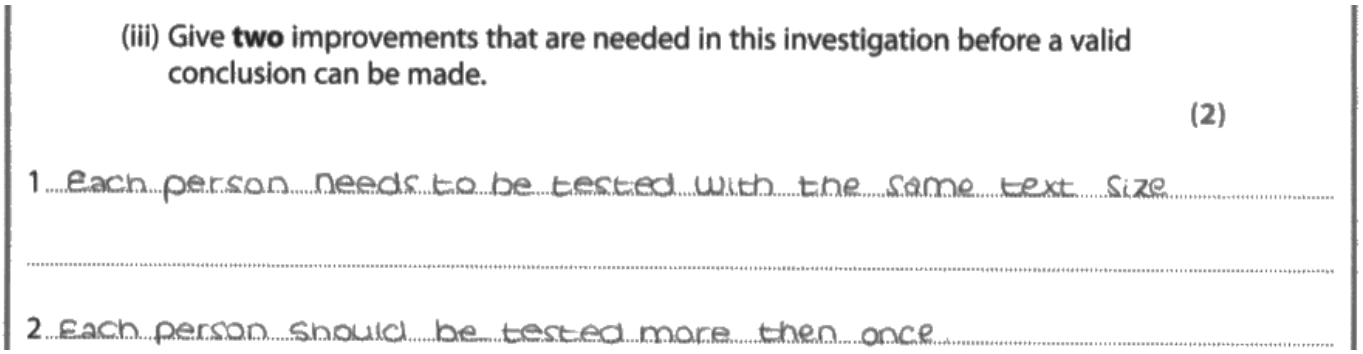
(2)

1 Ensure each person is reading the same words.

2 ask people that didnt volunteers ensuring it is not bias.

ResultsPlus
Examiner Comments

This was awarded 1 mark for the idea of each person reading the same words which would be an improvement to the method.



(iii) Give **two** improvements that are needed in this investigation before a valid conclusion can be made.

(2)

1 Each person needs to be tested with the same text size

2 Each person should be tested more then once

ResultsPlus
Examiner Comments

This was awarded full marks for the idea of using the same sized text which would improve the validity of the method and the idea of testing each person more than once which would get more data for a more valid conclusion.

Question 4 (c) (i)

To obtain full marks on this question required knowledge of the cornea or lens and the retina. The first mark was for refraction of light by the cornea or lens. The involvement in focussing light rays was credited. The second mark is for the idea that the light rays meet on the retina. Many candidates were able to answer this correctly. Some incorrect responses included the idea that the iris is involved in refracting light or that light is focused on the optic nerve.

(c) Figure 5 shows light rays entering the eye of a person with normal vision.

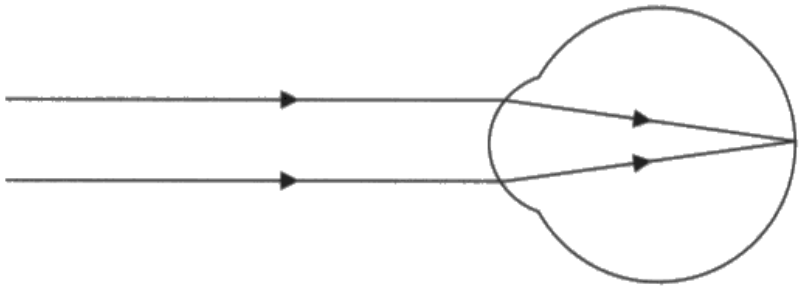


Figure 5

(i) Describe how light rays are focused to give normal vision.

(2)

Light is refracted (bent) by the cornea and focuses at the back of the eyes.

ResultsPlus
Examiner Comments

This response scored 1 mark for light being refracted by the cornea. The back of the eye was insufficient for the second mark.

(c) Figure 5 shows light rays entering the eye of a person with normal vision.

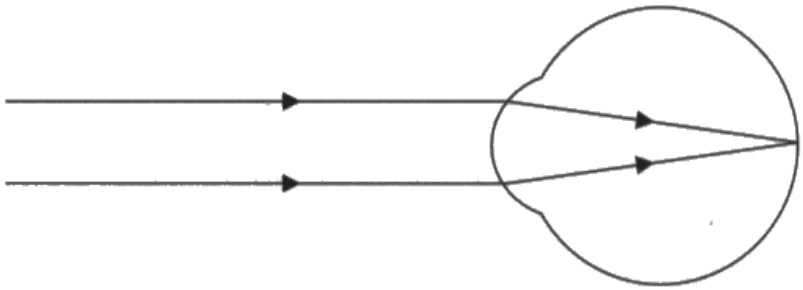


Figure 5

(i) Describe how light rays are focused to give normal vision.

(2)

As light passes through the (cornea and) lens, it is refracted (bent). The light rays converge and come together so they are focused on the retina which produces a clear image

ResultsPlus
Examiner Comments

This response scored the full 2 marks and shows good use of the correct terms with respect to normal vision. It includes the idea of refraction by the cornea and the lens and the light rays converging together on the retina.

Question 4 (c) (ii)

For the first mark of this question just stating that lens X was required was insufficient as there are only two options. Candidates needed to recognise that it was a diverging or concave lens. The second mark was for it spreading out or diverging the light rays. If lens Y was given, only marking point 2 could be awarded and only if they refer to a concave or diverging lens spreading out or diverging light rays. Other incorrect responses gave the idea that lens X would refract the light rays less so they would meet on the retina.

(ii) Figure 6 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

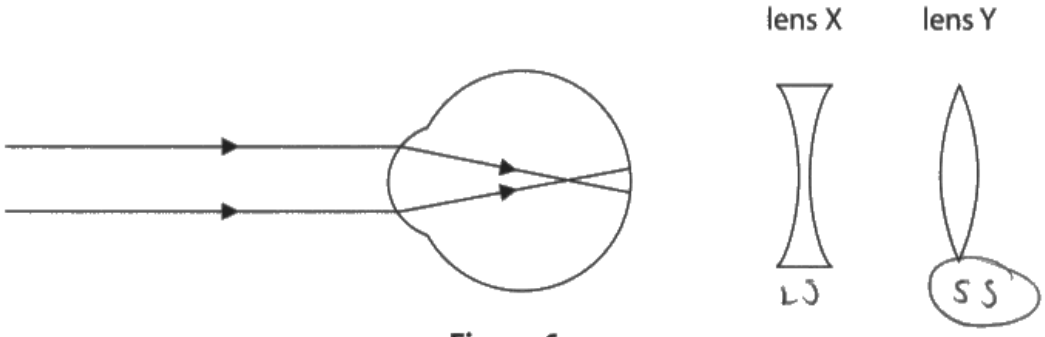


Figure 6

Explain which lens would correct the eye defect shown in Figure 6.

(2)

Lens Y, it's a concave lens, which can be used to correct short-sightedness. If you are short sighted, you cannot see far away, because your lens is too strong, making the image blurred, as it forms in front of the retina.

ResultsPlus
Examiner Comments

This did not score a mark. They suggest that lens Y is concave which is incorrect and the response gives no further details about how a concave lens would correct the defect.

(ii) Figure 6 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

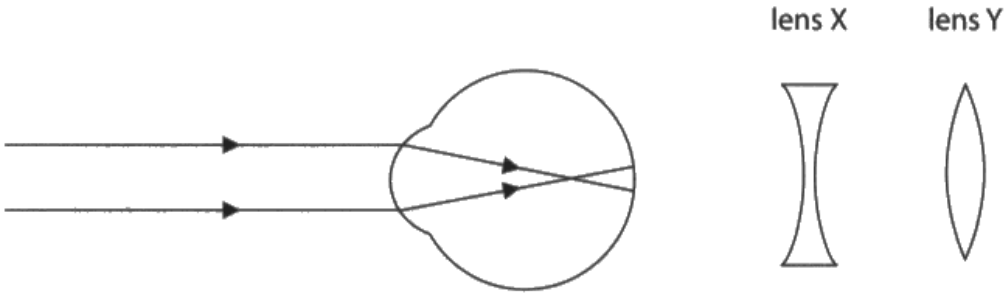


Figure 6

Explain which lens would correct the eye defect shown in Figure 6.

(2)

lens x would correct the eye defect. The concave lens will refract (bend) the light rays away from each other first. Then the lens in the eye will naturally refract (bend) the light rays so they focus on the retina.

ResultsPlus
Examiner Comments

This response scored full marks for identifying that lens X was a concave lens and giving the linked explanation that the light rays would be refracted away from each other which would correct the defect in vision.

(ii) Figure 6 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

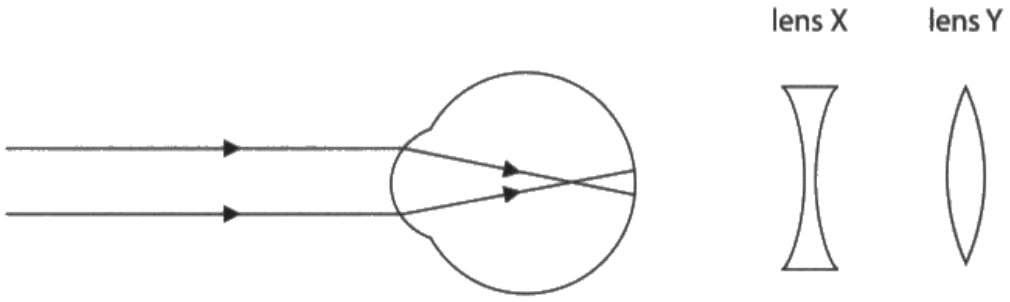


Figure 6

Explain which lens would correct the eye defect shown in Figure 6.

(2)

The eye defect shown is short sightedness as the refracted light rays are focused in front of the retina so ~~the~~ lens X which is a diverging lens ~~that~~ would correct the eye defect by bending the light rays less.

ResultsPlus
Examiner Comments

This response is worth 1 mark for identifying lens X as a diverging lens. It shows a common misconception seen in candidate responses that the diverging lens would bend the light rays less.

Question 5 (a) (iii)

The content covered by this question is new for this specification. It required candidates to recognise that the three domain classification method is based on genetic analysis. Many candidates did not recognise this and gave ideas around improved microscopy or the idea that not all organisms can be classified using the five kingdom method. Where candidates showed the required knowledge it was often at a high level of detail referring to the idea of non-coding regions of genes, but these were the minority.

(iii) Give a reason why the three domain method of classification has been suggested.

(1)

Archaea were discovered by Carl Woese, and they were found to have no nucleus, like prokaryotes, but did have unused sections of DNA, like eukaryotes.

ResultsPlus
Examiner Comments

This response was worthy of the mark. It recognised that differences in the DNA was the basis for the introduction of the three domain method.

(iii) Give a reason why the three domain method of classification has been suggested.

(1)

It categorises the organisms by their cell structure

ResultsPlus
Examiner Comments

Using cell structure to categorise organisms was too vague to achieve the mark on this question.

(iii) Give a reason why the three domain method of classification has been suggested.

(1)

DNA analysis has allowed DNA to be looked at in more detail, all organisms fit one of three domains. They the

ResultsPlus
Examiner Comments

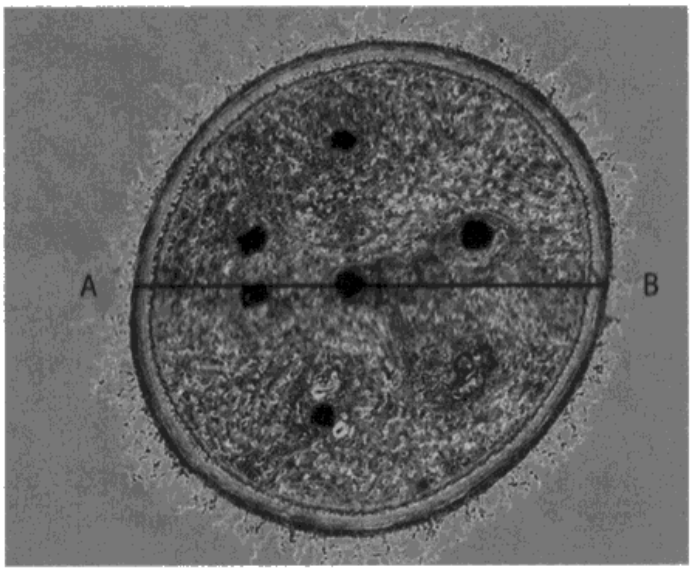
This response indicates that genetic analysis has enabled the introduction of the three domain system.

Question 5 (b) (i)

The use of the magnification equation and unit conversion was required for this question and many candidates demonstrated the required mathematical skills, showing an improvement in understanding of this topic. Full marks are given for the correct answer but if this was not obtained there were working marks for the measurement, a division by 50 000 and a unit conversion of x1000 or x10 000 if the candidate measured in cm. Candidates who measured in cm were more likely to make an error during the calculation. Some candidates divided by 1000 rather than multiplied or did not attempt a unit conversion.

(b) Figure 7 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 7

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (µm).

(3)

6·5cm
65mm

$\frac{65}{1000} = 0.065\ \mu m$

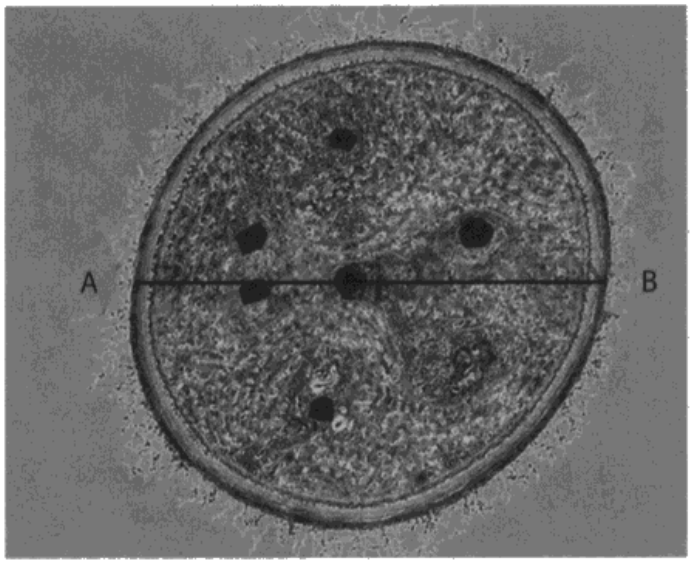
0·065 µm

ResultsPlus
Examiner Comments

This response is awarded 1 mark for the correct measurement. There is no attempt to use the magnification and the unit conversion attempt is incorrect.

(b) Figure 7 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 7

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (µm).

I
A M

(3)

mm → µm ×1000

$\frac{65\text{mm}}{50{,}000} = 0.0013\text{mm}$

×1000

$= 1.3$

1.3 µm

ResultsPlus
Examiner Comments

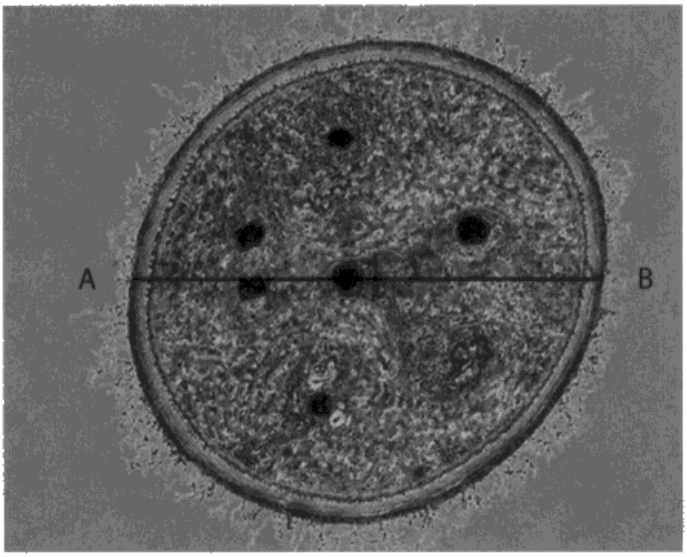
This shows a good model answer. The workings are shown and the measurement, magnification calculation and unit conversion are clearly shown.

ResultsPlus
Examiner Tip

Always show your workings for magnification calculations including the units used to make measurements.

(b) Figure 7 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 7

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (µm).

(3)

A I M

6.5cm diameter

$\frac{6.5\text{cm}}{50,000} = 1.3 \times 10^{-4}$ micro 10^{-6} nano 10^{-9} pico 10^{-12}

130 µm

ResultsPlus
Examiner Comments

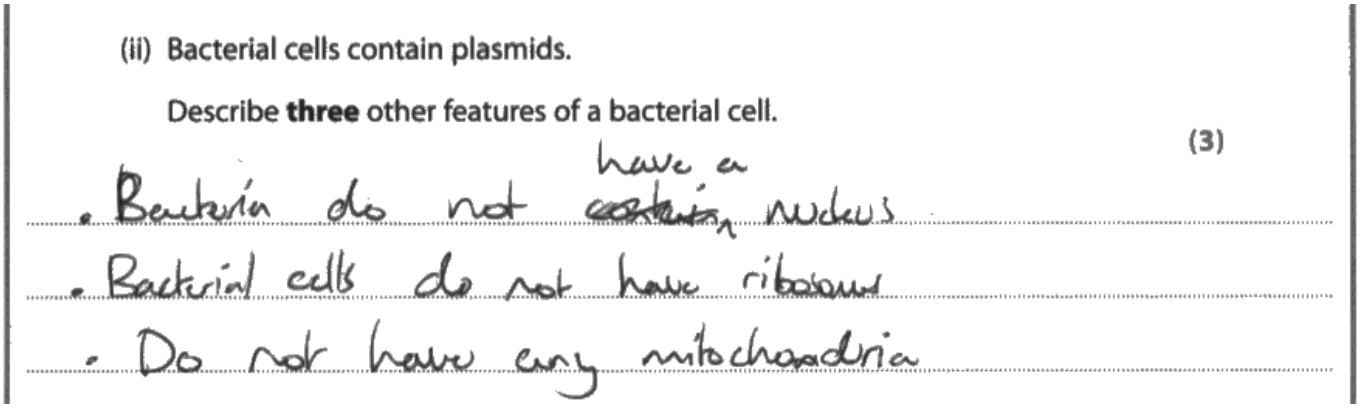
This response shows a common error but still obtained 2 marks highlighting the importance of showing workings. The measurement is correct in cm which are given and this has correctly been divided by 50 000. The x1000 unit conversion is incorrect because the distance has been measured in cm.

ResultsPlus
Examiner Tip

Always measure in mm which is a standard unit.

Question 5 (b) (ii)

This question asked for three features of bacterial cells. The question stated that they contained plasmids as this is given in the rest of the question, consequently loops of DNA was insufficient, they needed chromosomal DNA or the idea of no nucleus. All cells have a cell membrane and cytoplasm so these were insufficient. The most common correct responses were chromosomal DNA in the cytoplasm, flagella and cell wall. Some candidates stated that the cell wall was not made of cellulose but this was not required. A list rule was applied for the reject responses of nucleus and mitochondria and these were the most common incorrect responses seen.



(ii) Bacterial cells contain plasmids.

Describe **three** other features of a bacterial cell. (3)

- Bacteria do not have a nucleus
- Bacterial cells do not have ribosomes
- Do not have any mitochondria

ResultsPlus
Examiner Comments

This response scored 2 marks for no nucleus and no mitochondria. Ribosomes are found in bacterial cells.

(ii) Bacterial cells contain plasmids.

Describe **three** other features of a bacterial cell.

(3)

Bacterial cells contain chromosomal DNA used to code for proteins.
Bacterial cells may contain flagella for movement and capsules for protection.
Bacterial cells contain ribosomes for protein synthesis.

ResultsPlus
Examiner Comments

This response scored the full 3 marks although each point they make is correct for a bacterial cell. The explanation of each feature was not required.

(ii) Bacterial cells contain plasmids.

Describe **three** other features of a bacterial cell.

(3)

~~They~~ bacterial cells don't have a nucleus
bacterial cells have a cell wall

ResultsPlus
Examiner Comments

This response is concise but clear and scored 2 marks.

Question 5 (c)

This question was very well answered by candidates of all abilities possibly reflecting that similar knowledge was needed for a question in 2018. Restriction enzymes had to be phonetically correct, restricted or restrictive enzymes was not accepted. Candidates needed to clarify the role or function of the sticky ends, for example the idea that they are complementary or match up. Lipase was rejected against the mark of ligase as it is the incorrect enzyme. The use of key scientific terms was crucial in answering this question.

(c) Figure 8 shows a plasmid containing the human insulin gene.

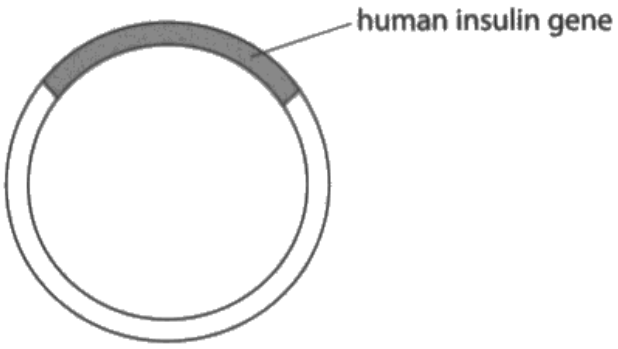


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

(3)

A human gene can be entered* by using restricting enzymes to cut out the undesired gene and then using lipase to stick in the useful gene.

in* the bacteria

(Total for Question 5 = 12 marks)

genetic breeding

ResultsPlus
Examiner Comments

This response was not creditworthy. Restricting enzymes and lipase are incorrect.

(c) Figure 8 shows a plasmid containing the human insulin gene.

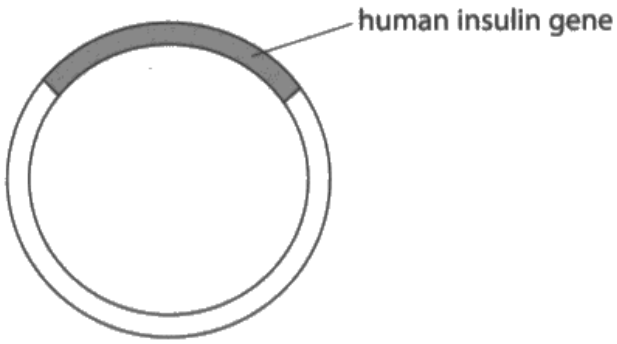


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

(3)

Using enzymes the plasmid is cut apart. The insulin is then inserted. The ligase enzyme then sticks the cut parts back together using sticky ends.

ResultsPlus
Examiner Comments

This response scored 1 for the correct use of ligase. Enzymes is insufficient as the specification requires restriction enzymes.

(c) Figure 8 shows a plasmid containing the human insulin gene.

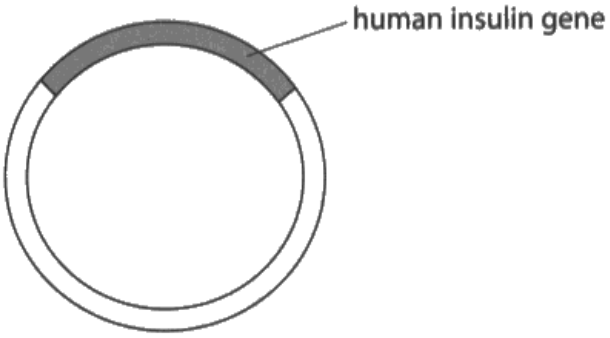


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

(3)

The gene for human insulin can be cut out of human DNA using restriction enzymes which ~~the~~ leave sticky ends. The plasmid is then cut using the same restriction enzymes to produce complementary sticky ends. The human insulin gene is mixed with the plasmids and ligase is added to connect the gene and plasmid into a continuous circle of recombinant DNA.

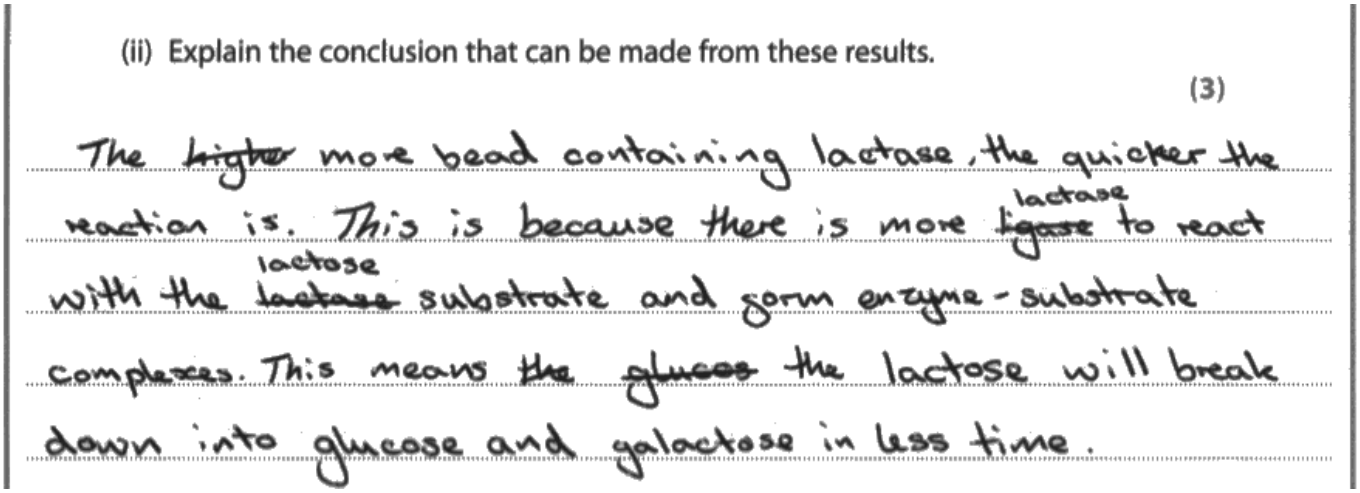
(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

This shows a model correct answer for all 3 marks. The explanation contains all the marking points from the mark scheme in a logical sequence.

Question 6 (a) (ii)

To answer this question and obtain full marks candidates had to give a conclusion and explain it using their knowledge on enzyme activity. A conclusion that combined increasing the amount of beads with the idea that they contained lactase and that this decreases the time taken or increases the rate of reaction was worthy of 2 marks. Higher ability candidates were able to combine this idea with increased chances of collisions or substrates fitting into the active sites of enzymes and went on to obtain full marks. Candidates must take care with handwriting especially when words have similar letter formations, for example lactase and lactose. Candidates who did not score on this item were most likely to get the conclusion incorrect, giving the idea that adding more beads increased the time. Some candidates gave a conclusion and described data from the table rather than recognising that the command word was 'explain'.



(ii) Explain the conclusion that can be made from these results.

(3)

The ~~higher~~ more bead containing lactase, the quicker the reaction is. This is because there is more ~~lactose~~ lactase to react with the ~~lactase~~ lactose substrate and form enzyme-substrate complexes. This means the ~~glucose~~ the lactose will break down into glucose and galactose in less time.

ResultsPlus
Examiner Comments

This response scores full marks as it links the conclusion that the reaction is quicker with more beads and refers to lactase as the enzyme. It includes some enzyme theory including the formation of enzyme-substrate complexes.

(ii) Explain the conclusion that can be made from these results.

(3)

The higher amount OS beads the faster the reaction occurs. The more beads you use the less time taken to produce glucose e.g. with 10 beads it took 240 seconds, However with 25 beads it took 120 seconds.

ResultsPlus
Examiner Comments

This response scored 1 mark. They have given a conclusion referring both to reaction rate and time taken. They do not link this to lactase or give any explanation on enzyme theory. They have described the data rather than explaining it.

(ii) Explain the conclusion that can be made from these results.

(3)

A the number of beads containing lactase increases the time taken to produce glucose also increases. Making correlation between number of beads and time taken to produce glucose negative.

ResultsPlus
Examiner Comments

This is an incorrect conclusion and was not creditworthy. The time decreases and the number of beads of lactase increases.

ResultsPlus
Examiner Tip

Read your answers to check you have not made a mistake.

(ii) Explain the conclusion that can be made from these results.

(3)

the higher the number of beads, the shorter the time. when 10 beads were used the time taken was 240s. however when 25 beads were used the time taken was 120s meaning the more lactase the quicker the rate of reaction

ResultsPlus
Examiner Comments

This response scores 2 marks for the conclusion on the reaction time being linked to lactase.

Question 6 (a) (iii)

This question required candidates to recognise that the volume of lactose is a controlled variable in this investigation. The explanation for this links to the idea that it is the substrate for the reaction, allows results to be compared or a valid conclusion to be drawn. Just the idea that changing the volume of lactose would change the rate of reaction was insufficient for an explanation. The idea that it is a control was also not accepted. Many candidates' explanations lacked sufficient detail to be awarded full marks on this question. A good understanding of the practical is required to answer this type of question.

(iii) Explain why the same volume of lactose solution was used for each test.

(2)

This is so the concentration of substrates stay the same and the results are accurate and fair. As the volume of lactose is the control variable

ResultsPlus
Examiner Comments

This response scored full marks for recognising that lactose is the substrate and that it is a controlled variable.

ResultsPlus
Examiner Tip

Understand the difference between independent and dependent variables, controlled variables and a control.

(iii) Explain why the same volume of lactose solution was used for each test.

(2)

It was a control to make sure the test was fair and accurate

ResultsPlus
Examiner Comments

This is a misconception seen in some candidate responses. The volume of lactose is a controlled variable and not a control.

(iii) Explain why the same volume of lactose solution was used for each test.

(2)

It is a controlled variable so the results are ~~valid~~ accurate and results can be compared better.

ResultsPlus
Examiner Comments

This response also scored 2 marks for the idea of a controlled variable and for allowing results to be compared.

Question 6 (b)

The ability to devise a method is a key practical skill that students need to develop during the course of their GCSE studies. A response that would successfully find the optimum temperature for the enzyme lactase needed to include the idea that lactase and lactose needed to be combined and the quantities controlled, the reaction should be done at a range of different temperatures and the time taken to produce glucose recorded. The idea that the temperature should be continually increased by heating the sample was not credited for the second marking point. Many candidates were not given marking point one because they did not control the volume of lactose and the number of beads.

(b) Devise a method to find the optimum temperature for the enzyme lactase. amount of enzymes. (3)

- In a beaker we place the enzyme lactase as well as the lactose and mix them.
- We place this in a water bath and let it heat at a certain temp (20°C) for ~~at least~~ 5 minutes
- After 5 minutes, test to see how much glucose has been produced
- Then repeat across different temperatures.

(Total for Question 6 = 9 marks)

- Compare the results at the end to see which temperature was the best and which produced more glucose.

ResultsPlus
Examiner Comments

This response was awarded the second two marking points. The method mixes lactose and lactase but not in controlled quantities so marking point one was not awarded.

(b) Devise a method to find the optimum temperature for the enzyme lactase.

(3)

- Use 25 beads in 20cm^3 of lactase putting 5 different test tubes in to 5 different temperature water baths.
- Place the first beaker in 25°C, the second in 30°C, the third in 35°C, the fourth in 45°C and the fifth in 50°C
- After each are have produced glucose stop the timer and record the time taken.

The optimum temperature will be the temperature at which glucose is produced the fastest.

(Total for Question 6 = 9 marks)

ResultsPlus
Examiner Comments

This illustrates a good response which obtains full marks. They have combined controlled quantities of lactose and lactase at different temperatures and recorded the time taken to produce glucose.

Question 7 (a)

This question asked for the lytic pathway of a virus and not the whole life cycle. References to the lysogenic cycle and the idea of taking over the DNA were ignored. No marks are awarded for the common stage of entering the host cell. Marks could be obtained using diagrams, provided they were labelled. The mark for the host cell machinery could be obtained by referring to enzyme or organelles. For the second marking point just replicating viral components was insufficient, it needed to be genetic material or proteins. Finally, viruses lyse host cells not the host. Higher ability candidates gave very detailed responses to this question. Where marks were lost it was often a response that focused on binding and entry to the cell and lacked the detail to obtain the mark points about the lytic pathway. There were also incorrect references to viruses reproducing which were not creditworthy.

7 Measles is a disease caused by a virus.

(a) Describe the lytic pathway for a virus.

(3)

the virus injects its DNA into a host cell, the virus inside the host cell then replicates itself inside this virus then bursts out of the host cell producing more viruses and destroying the host cell.

ResultsPlus
Examiner Comments

This response lacks sufficient detail for full marks but it scores 2 marks for the viruses replicating in the host cell and causing the host cell to burst to release the viruses.

7 Measles is a disease caused by a virus.

(a) Describe the lytic pathway for a virus.

(3)

The virus attaches itself to the host cell and injects its genetic material into the host cell. Proteins and enzymes replicate the genetic material and synthesise new viral components. The viral components are then assembled producing many new viruses. Then cell lysis which is the complete breakdown of cell ~~cell~~ releases all the new viruses into the bloodstream.

ResultsPlus
Examiner Comments

This is a high level response with detail of the lytic cycle. It has the idea of using host machinery to relicate genetic material and viral components before the viruses assembles and lyses the host cell.

Question 7 (b) (i)

This was a straightforward question to identify the region of the brain. Many candidates were successful on this question and we saw a range of terms used, all covered by the mark scheme. The most frequent incorrect response was the cerebellum.

Question 7 (b) (ii)

Some candidates found this a challenging question. It combined percentages and standard form. It required candidates to use the death rate to calculate the number of people infected and convert the response to standard form. Those who did not obtain the correct final answer were able to pick up marks for their workings. Two marks were given for the correct answer not in standard form or the 8.9×10^5 as there is only one error in the response. These were the most frequent answers seen for two marks. This question highlights the importance of candidates showing their workings to calculations clearly.

(ii) The death rate from measles is 0.15%.

In 2015, 134 250 people died from measles.

Calculate the number of people infected with measles in 2015.

Give your answer in standard form.

(3)

134250 = 0.15

1342500 = 1.5

895000 = 1

89500000 = 100

895 00000 people

ResultsPlus
Examiner Comments

This response was awarded 2 marks. They have the correct numerical value but it is not given in standard form.

ResultsPlus
Examiner Tip

Read the question carefully to ensure you give mathematical answers in the format requested.

(ii) The death rate from measles is 0.15%.

In 2015, 134 250 people died from measles.

Calculate the number of people infected with measles in 2015.

Give your answer in standard form.

(3)

134 250 ÷ 0.15

895 000

5

8.95 x 10^5 people

ResultsPlus
Examiner Comments

During the working of this the candidate has not divided 0.15 by 100 to take account of the percentage. The response has one mistake in the workings and was awarded 2 marks as it was given in standard form.

(ii) The death rate from measles is 0.15%.

In 2015, 134 250 people died from measles.

Calculate the number of people infected with measles in 2015.

Give your answer in standard form.

(3)

0.15 × 100 = 134 250

134 250 x 100 / 0.15

89 500 000 = 8.95 x 10^7

8.95 x 10^7 people

ResultsPlus
Examiner Comments

This response was awarded full marks for the correct answer in standard form.

Question 7 (c) (i)

This question asked why people might decide not to get immunised. Some candidates answered the question 'why people might not be immune to measles' with ideas around an insufficient immune response which does not answer the question. The most common correct answers from the mark scheme were the idea of side effects to the vaccination or not being able to have the vaccination, either due to immune deficiency or it not being available to them. Religious and ethical objections were ignored unless specifically named. Some candidates recognised that you would not need the immunisation if they had already had measles and were immune. The idea of measles not being a serious disease were not credited.

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 They did not receive the measles vaccination

2

ResultsPlus
Examiner Comments

This repeats the question and was not awarded any marks.

ResultsPlus
Examiner Tip

Do not repeat the information given in the question.

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 They are too young or have already had the disease

2 Their immune system is too weak, body is not strong enough to fight the virus.

ResultsPlus
Examiner Comments

This was awarded full marks as both statements are valid reasons for not having been immunised.

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 If they are allergic to the ~~immunisation~~ the vaccine

2 If they cannot access places that have vaccination treatment.

ResultsPlus
Examiner Comments

This response was awarded 2 marks for the idea of being allergic to the vaccine and not being able to access healthcare which are valid reasons for not being immunised.

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 They may see it as unethical so they are against it

2 Its against certain beliefs

ResultsPlus
Examiner Comments

These statements are too vague and do not answer the question with scientific knowledge. No marks were awarded.

Question 7 (c) (ii)

There are two aspects to fully answer this question. The first mark was more frequently obtained for the idea that the majority of the population are immune or immunised and was given for responses that indicated the idea of a threshold being reached. The aspect addressed by the second marking point is that unvaccinated people are protected with a reason based on the idea that it cannot spread through the population or they are unlikely to come into contact with the pathogen or someone with measles. Some candidates suggested that non-immunised people are immune which was not credited.

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

herd immunity: enough people are vaccinated that it protects the unvaccinated people

ResultsPlus
Examiner Comments

This response was awarded 1 mark for the idea that enough people are vaccinated. It does not give any details on the protection of the unvaccinated people.

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

If one person is a immune to measels and they reproduce then the offspring will also be a immune and then there offspring also [redacted] and so on meaning [redacted] the herd is immune.

ResultsPlus
Examiner Comments

This shows a misconception seen occasionally in candidates, the idea that immunity spreads through reproduction is incorrect and no marks were awarded.

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

Herd immunity is when a large number of individuals are immunised, therefore meaning that those who aren't immunised cannot get the disease, as the people surrounding them can't get it, to pass onto them.

(Total for Question 7 = 11 marks)

ResultsPlus
Examiner Comments

This response scored the full 2 marks for the large number of people being immunised and that this prevents those that the not immunised cannot get it as people around them do not get the disease.

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

If around 95% of the community is immunised, there is a very small chance that someone who is not immunised will come into contact with the ~~disease~~ pathogen. This reduces the risk of developing the disease.

(Total for Question 7 = 11 marks)

ResultsPlus
Examiner Comments

This response also scored 2 marks. They give the idea of a threshold level of immunisation and how this protects those who are not immunised.

Question 8 (a) (i)

This question required data to be extracted correctly from the graph. The first mark obtained by nearly all candidates who attempted a question was awarded for a decrease of LDL cholesterol. The second mark required accurate reading of a graph including the unit of measurement. Many candidates were able either to give the start and end point for the level of cholesterol or calculated a decrease. Some candidates misread the month and gave data for the start of May, not June.

8 (a) LDL cholesterol is a type of cholesterol which increases the risk of heart disease.

Statins are drugs used to reduce LDL cholesterol levels.

Figure 12 shows the cholesterol levels in the blood of a man.

He started taking statins at the beginning of February and stopped taking them four months later.

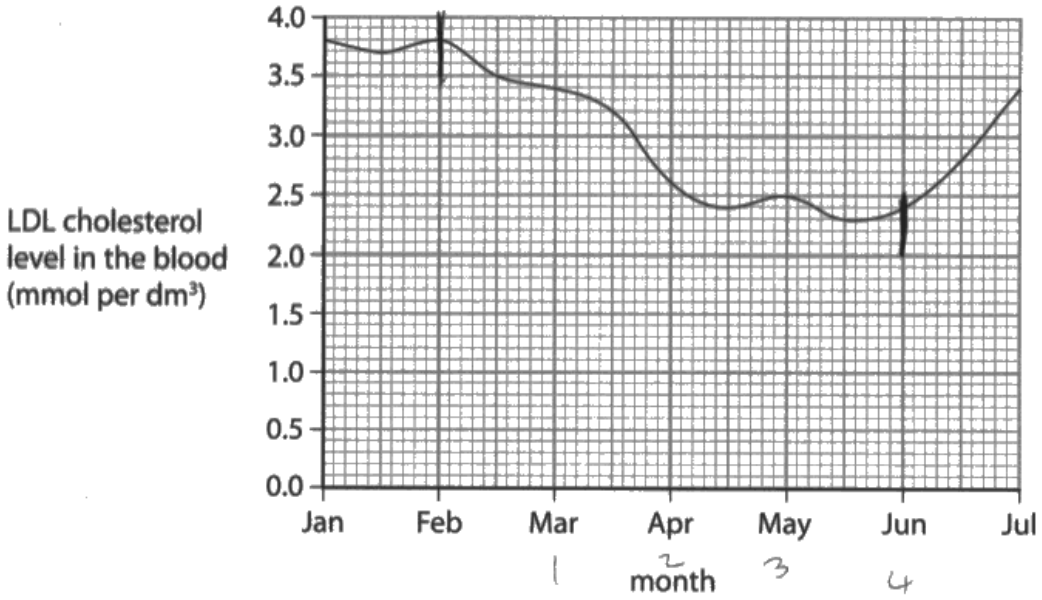


Figure 12

(i) Describe the effect of statins on LDL cholesterol levels in the blood.

Use data from the graph to support your answer.

(2)

Statins decrease the ~~amount~~ levels of LDL cholesterol in the blood as from February all the way until the end of May, the LDL levels were more by dropping

ResultsPlus
Examiner Comments

This response scored 1 mark for a decrease in the levels of LDL cholesterol. They did not extract data from the graph for a further mark.

ResultsPlus
Examiner Tip

To get full marks you will need data with units, when it is requested in the question.

8 (a) LDL cholesterol is a type of cholesterol which increases the risk of heart disease.

Statins are drugs used to reduce LDL cholesterol levels.

Figure 12 shows the cholesterol levels in the blood of a man.

He started taking statins at the beginning of February and stopped taking them four months later.

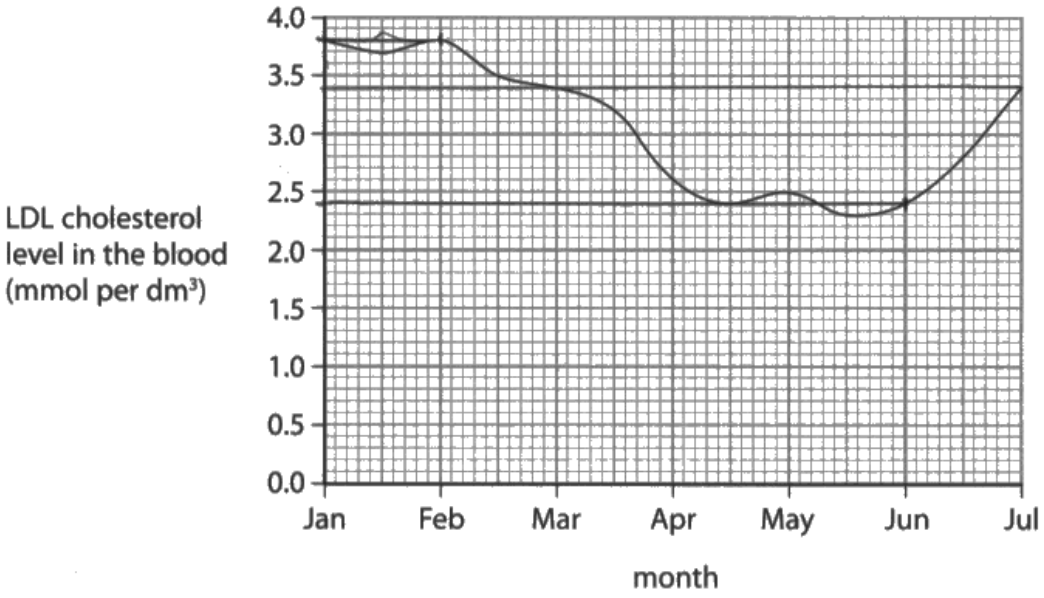


Figure 12

(i) Describe the effect of statins on LDL cholesterol levels in the blood.

Use data from the graph to support your answer.

(2)

Statins help to reduce LDL cholesterol levels in the blood. Within four months the patients LDL cholesterol level reduced from 3.8 mmol/dm³ to 2.4 mmol/dm³. There was still a bit of fluctuation.

ResultsPlus
Examiner Comments

This response scored the full 2 marks as it used data from the graph to describe the effect of statins on LDL cholesterol levels.

Question 8 (a) (ii)

The command word for this question is 'explain' and not 'describe' which was the most common error made by candidates who did not obtain full marks. The first mark for this question was recognising from the graph that when the man stopped taking statins his cholesterol levels increased. The linked explanation is that this will increase his risk of heart disease and other named consequences of high cholesterol were also accepted. Many candidates obtained the first mark for this question.

(ii) Use evidence from the graph to explain why statins are usually prescribed as life-long medication.

(2)

The graph shows that ~~statins~~ the usage of statins decreases LDL cholesterol levels, however when someone stops taking them LDL cholesterol levels increase again and therefore to make sure levels stay down statins must be used continually as a life long medication.

ResultsPlus
Examiner Comments

This response scored 1 mark for the idea that the levels of LDL cholesterol rise when statins are stopped. They do not explain the impact of this.

(ii) Use evidence from the graph to explain why statins are usually prescribed as life-long medication.

(2)

After he stops taking them, his cholesterol immediately increases again. (June - 2.4 mmol per dm^3 → July - 3.4 mol per dm^3). This would increase fatty deposits in the arteries again, which can lead to heart attacks and heart disease.

ResultsPlus
Examiner Comments

This scored full marks for the idea that when he stopped taking them the levels increased and this would increase fatty deposits and the risk of heart disease.

Question 8 (c)

This question required candidates to apply their knowledge about the transmission and prevention of STIs as well as the synoptic connection between bacterial infections and the use of antibiotics to treat them. The level was determined by the application of knowledge about spread of STIs, prevention of spread and methods for treating bacterial infections. The mark awarded within the band was then determined by the justification which needed interpretation of the data so it could be used as evidence to support their answer. The method of spread had to be more than sexually transmitted as this is in the question but because it was an applied question incorrect science for the spread of gonorrhoea by the sharing of needles was ignored and correct responses credited. Some candidates recognised that gonorrhoea can be spread during childbirth. Higher ability candidates were able to make comparative statements using the data to support their answers and some recognised that antibiotic resistance could be a barrier to reducing transmission.

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

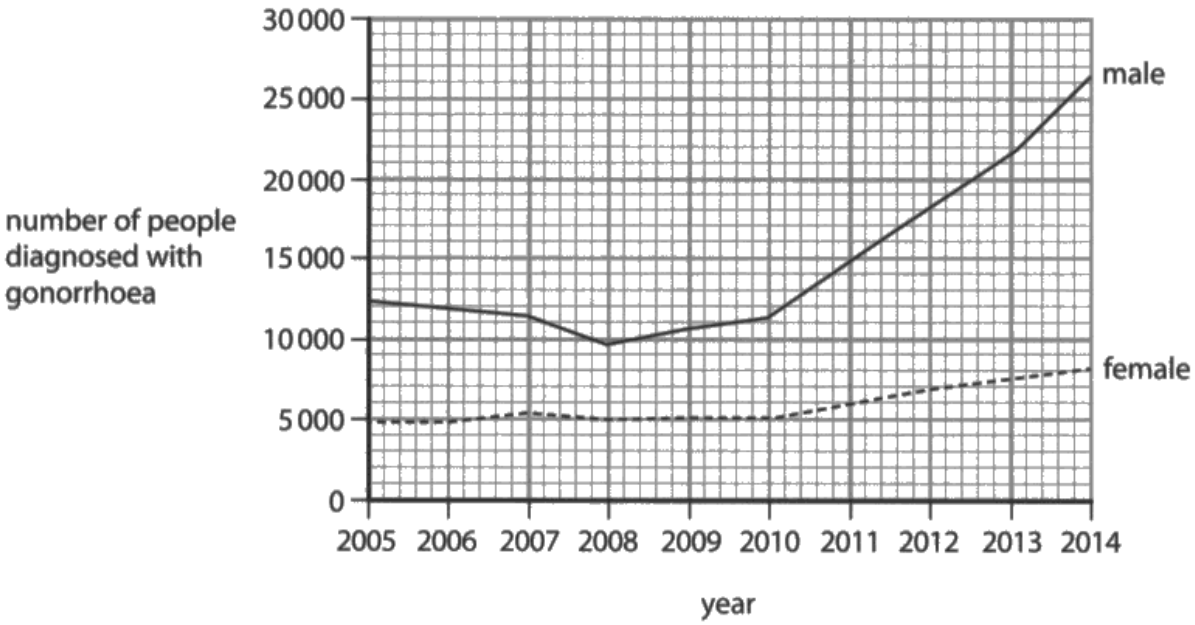


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

Gonorrhoea is a bacterial disease so its is spread via skin to skin contact, drinking or eating bad food and living in ~~unclean~~ unclean areas. This needs to be sorted out soon because the number of females and males diagnosed with gonorrhoea have increased. Rapidly for males and less rapidly for females.

This should be prevented by giving clean food and water, cleaning and ventalting areas and making sure people don't ~~sped~~ ~~sext~~ sleep together.

ResultsPlus
Examiner Comments

This response scored level 1 and 1 mark. No mark was awarded for the application of knowledge but the interpretation of the data indicating that the number of cases in females was increased was sufficient for 1 mark.

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

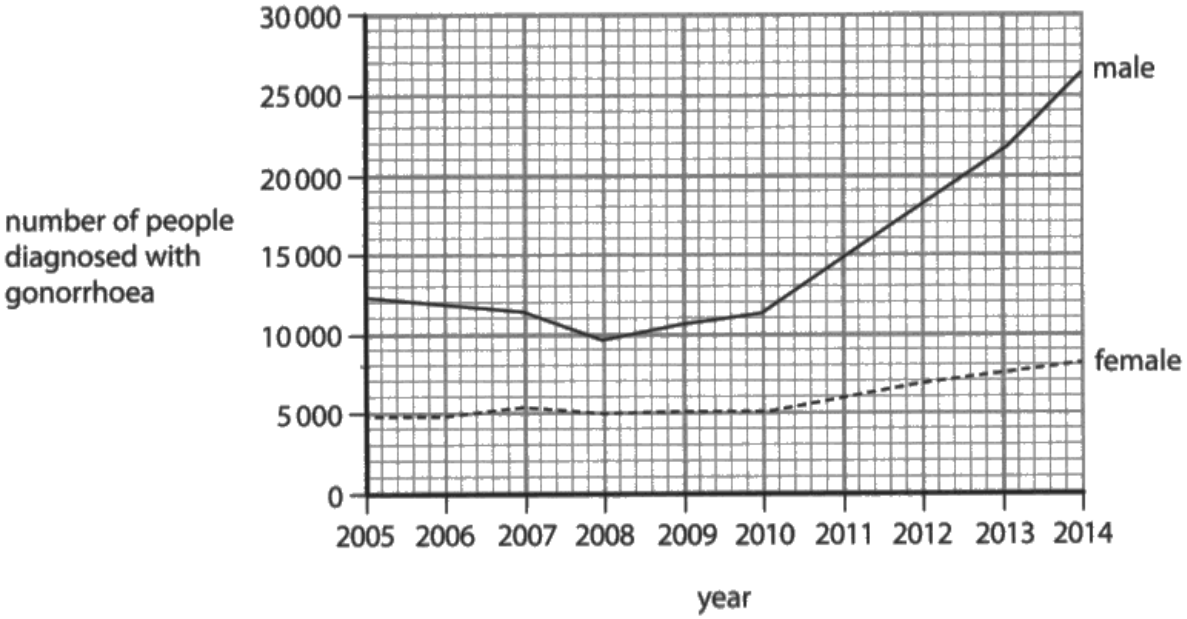


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

Gonorrhoea is transmitted from bodily fluids and sexual contact, when this happens the pathogen can enter your body and you will be infected with it. This will harm you and other body cells. one way the number of people infected can be reduced by wearing a condom. another way it can be prevented is through education about it and so people are aware of the risks of it. Another way is to medicate the patients who have Gonorrhoea so they are less susceptible to getting it. In 2014 26000 men where diagnosed with it but only 8000 women were diagnosed. It is nessary to reduce the number of people with Gonorrhoea because it is harmful and can be prevented.

Because there are a high number of males with gonorrhoea this may increase the number of females with gonorrhoea and so this is why the number of males needs reducing.

ResultsPlus
Examiner Comments

This scored level 2 for application of knowledge on the spread and prevention of spread of gonorrhoea. There is sufficient interpretation of the data including numerical values for the top of the level to be awarded and 4 marks were given.

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

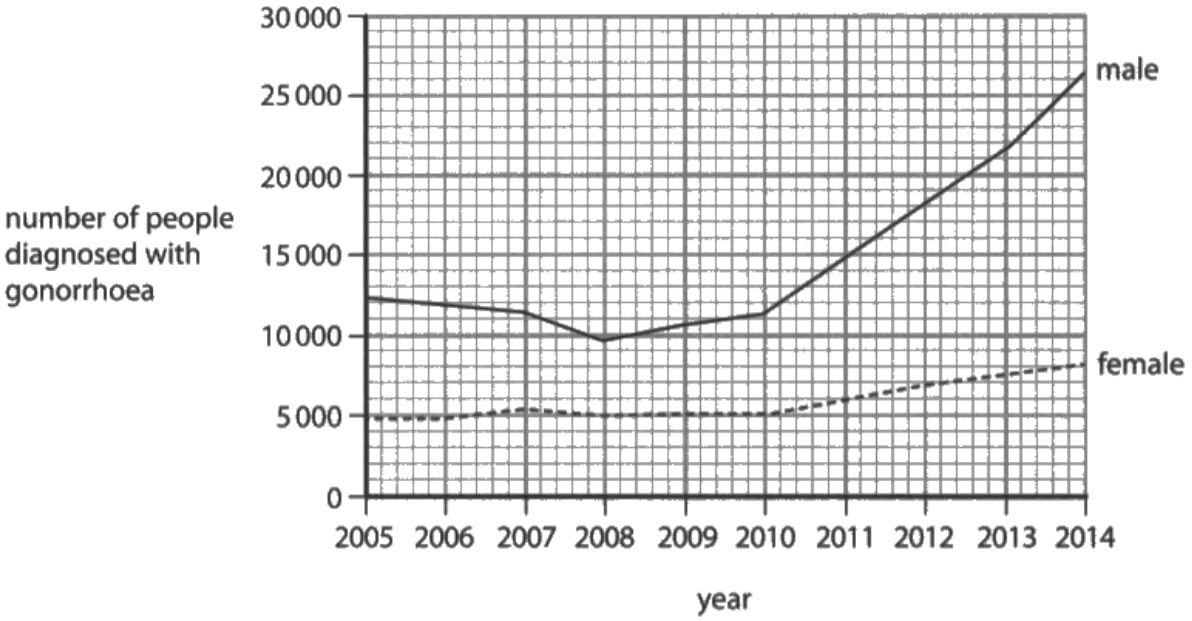


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

Gonorrhoea is ~~usually~~ an STI which means that it is aquired by the exchange of ~~sex~~ body sexual fluids. It can be aquired when no protection is used and ~~when~~ it can go undetected for some time if no checkups are made. ~~The graph shows~~ The number of people with gonorrhoea can be reduced if protection is used while performing the sexual act and if ~~the~~ antibiotics are taken to combat the infection. Also to minimize risks checkups can be done so that you can

be made aware if you ~~had~~ happen to have the infection. The

The graph's data shows that from 2008 in the males case and 2010 in womens case there has been an increase of the number of gonorrhoea cases diagnosed in the UK. The number of people has infected has to go down because gonorrhoea is an STI so the higher the number of cases the higher the probability of you of contracting it. Also the gono gonorrhoea is harmfull for your health and it can have lifelong consequences.

ResultsPlus
Examiner Comments

This response was awarded level 3 for the application of knowledge on the spread, prevention of spread and treatment of gonorrhoea with antibiotics. There was not a comparative analysis of the data in the figure to obtain this aspect of level 3 so 5 marks were awarded.

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

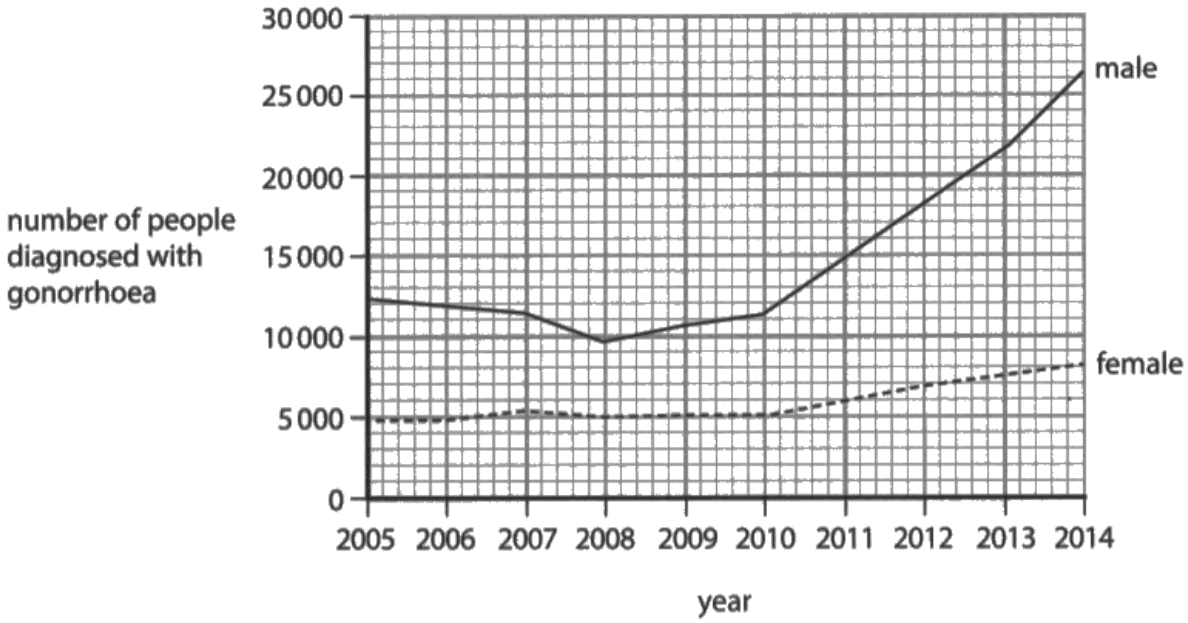


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

Gonorrhea is transmitted through bodily fluids (eg. vaginal mucus or semen). It is necessary to reduce the number of people infected because since 2010, the number of people diagnosed has increased significantly, with the number of men diagnosed increasing from just over 11,000 in 2010, to just over 26,000 by 2014. Female cases have increased by not as much, but still very clear between 2010 (5,000) and 2014 (8,000). The number of people infected can be reduced by the using of physical barriers for example, male and female condoms. This stops the bodily fluids from entering the other person's body by blocking it physically. Chemical barriers can also be used and taken by the female, which increases the production of vaginal mucus, meaning that the semen has a lore chance of entering. People can also be ~~to~~ educated

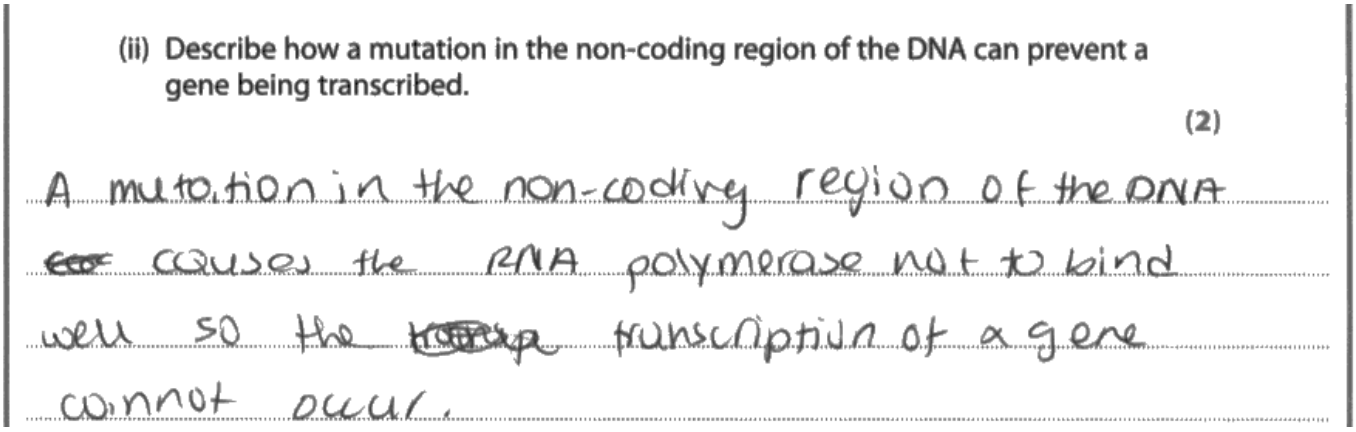
on how to reduce the risk of contracting the STI, and being screened to see if they have it, and so cannot spread it on. Also It is also a bacterial infection, this means that antibiotics can be used to inhibit the growth of the cell wall as the bacteria divides, therefore reducing the risk of infection.

This is a level 3 response worth 6 marks for the application of sufficient knowledge on the spread, prevention of spread and treatment of the STI. The comparative data statements are sufficient for the top of the level to be awarded.

Always quote data from a graph when referring to trends.

Question 9 (a) (ii)

Higher only specification content was examined by this question. The question asked for a description of how a mutation in a non-coding region of gene could prevent transcription. The first mark needed a reduction or prevention of binding for the RNA polymerase. For the second mark, preventing transcription is given in the question, it needed to be that mRNA is not produced. Candidates were more likely to get the first marking point and then only link it to preventing transcription for 1 mark. Some candidates described the effect of a change in the coding sequence and this was not worthy of credit.



(ii) Describe how a mutation in the non-coding region of the DNA can prevent a gene being transcribed.

(2)

A mutation in the non-coding region of the DNA causes the RNA polymerase not to bind well so the transcription of a gene cannot occur.

ResultsPlus
Examiner Comments

This was a typical response that scored 1 mark. The candidate correctly identifies that the mutation causes RNA polymerase not to bind but they just repeat the question that this prevents transcription without referring to mRNA.

(ii) Describe how a mutation in the non-coding region of the DNA can prevent a gene being transcribed.

(2)

a mutation in the non-coding region can affect how often RNA polymerase binds to the DNA, and therefore affects how often mRNA is produced (transcription). If the mutation prevents RNA polymerase from binding, no genes will be transcribed as no mRNA is made.

ResultsPlus
Examiner Comments

This response scored full marks as they give the idea that RNA polymerase cannot bind and that no mRNA is produced.

(ii) Describe how a mutation in the non-coding region of the DNA can prevent a gene being transcribed.

(2)

It may mean that the ~~RNA polymerase~~ mRNA cannot be produced in the nucleus as the bases may have changed

ResultsPlus
Examiner Comments

This response states that the mRNA cannot be produced for 1 mark. They do not relate this to the binding of RNA polymerase which limits them to 1 mark.

Question 9 (b)

This question required candidates to interpret the information in the figure by linking the change in the base sequence to the change of Gln to Glu and how this relates to the functioning of a protein by changing in the amino acid sequence affecting the folding of a protein. Those candidates that used the information in the question were able to score at least 2 marks with high ability candidates linking this to the protein shape being different for full marks. Some responses did not fully use the information they were given and just stated that the amino acid was different or that a totally different protein would be produced.

(b) A gene coding for a protein has two alleles.

Figure 14 shows the first 5 codons of an mRNA strand for these alleles.

Allele 1 – AUG CCA CAG GAG UUC

Allele 2 – AUG CCA GAG GAG UUC

Figure 14

Allele 2 has a mutation.

Figure 15 shows the key needed to predict the translated amino acid sequence of the protein.

codon	AUG	CCA	CAG	GAG	UUC
amino acid	Met	Pro	Gln	Glu	Phe

Figure 15

Explain how the mutation in allele 2 could affect the functioning of this protein.

(3)

In allele 1 the amino acid sequence should be Met Pro Gln Glu and Phe however in allele 2 the sequence is Met Pro Glu Glu Phe. This means the order of amino acids is different and therefore a different shaped protein with a different shaped active site will be formed so it won't bind to the substrate as they're no longer complementary & won't function properly.

ResultsPlus
Examiner Comments

This response scored full marks for using the information in the figure to give the specific amino acid change and that this changes the sequence of the amino acids in the protein which could change the shape.

(b) A gene coding for a protein has two alleles.

Figure 14 shows the first 5 codons of an mRNA strand for these alleles.

Allele 1 – AUG CCA CAG GAG UUC

Allele 2 – AUG CCA GAG GAG UUC

Figure 14

Allele 2 has a mutation.

Figure 15 shows the key needed to predict the translated amino acid sequence of the protein.

codon	AUG	CCA	CAG	GAG	UUC
amino acid	Met	Pro	Gln	Glu	Phe

Figure 15

Explain how the mutation in allele 2 could affect the functioning of this protein.

(3)

As the CAG was read as GAG, a completely different amino acid will be placed in the polypeptide chain, making it fold into a completely different shape and create a different protein than the one needed. This could also affect size, all factors which if not correct, then won't be able to function properly.

ResultsPlus
Examiner Comments

This scored 2 marks for identifiying the change in the bases from the figure and for the idea that the protein folds in a different shape. They do not give the change in the amino acid from the information in the figure or relate this to a change in the sequence of the amino acids for any further marks.

Question 9 (c)

This applied extended open response question needed candidates to use their knowledge on the inheritance of blood group alleles using a Punnett square to give the probability a child having a specific phenotype. The level of knowledge demonstrated the level of the response and the mark within the level was determined by the accuracy of the use of the genetic terms. The most common errors made were not to give the genotypes for the parents either in the text or by labelling the Punnett square or showing phenotypes and not genotypes in the Punnett square. Many candidates were inconsistent with the use of terms like phenotype, genotype, allele and gene. This is a skill that needs developing in open response texts.

*(c) The inheritance of different alleles affects the phenotype of an individual.

A child is blood group O.

The child's mother is blood group A and the child's father is blood group B.

Explain how this child is blood group O.

Use the Punnett square and probability in your answer.

(6)

Mother

Father	A	O
B	AB	BO
O	OA	OO

* The probability of the child being in blood group O is 1/4.
* The 'O' allele is recessive to both allele 'A' and 'B' which the parents are carrying.
* The child inherited genotype 'OO' which means the child is in blood group O.

ResultsPlus
Examiner Comments

This response is brief but scores level 3. The Punnett square although not showing the alleles is sufficient to identify the genotypes of the parents and is completed. The text gives rules on blood group inheritance and the probability of 1/4. The lack of alleles in the Punnett squares restricts the mark to 5.

*(c) The inheritance of different alleles affects the phenotype of an individual.

A child is blood group O.

The child's mother is blood group A and the child's father is blood group B.

Explain how this child is blood group O.

Use the Punnett square and probability in your answer.

(6)

	A	O
B	AB	BO
O	AO	OO

The allele for blood group O is recessive, both alleles for blood group A and B are dominant so for the child to have group O they must be homozygous recessive, meaning both alleles are O, therefore both his mother and father must have ~~a dominant recessive~~ an A/B allele and a recessive O allele, this is the only way both parents could have a dominant blood group whilst their child has a recessive blood group. ~~As can be seen This is~~ This variation is due to the variation caused by the random selection of alleles given to each gamete in meiosis, there is a 25% chance that ~~each~~ both gametes have the recessive allele, as can be seen in the punnet square above.

ResultsPlus
Examiner Comments

This is a level 2 response as they do not give the genotypes for the parents. They have some blood group rules, a Punnett square and probability but the lack of alleles in the Punnett square restricts the response to 3. The candidate has good use of terminology in the text.

ResultsPlus
Examiner Tip

Label the male and female on a Punnett square.

*(c) The inheritance of different alleles affects the phenotype of an individual.

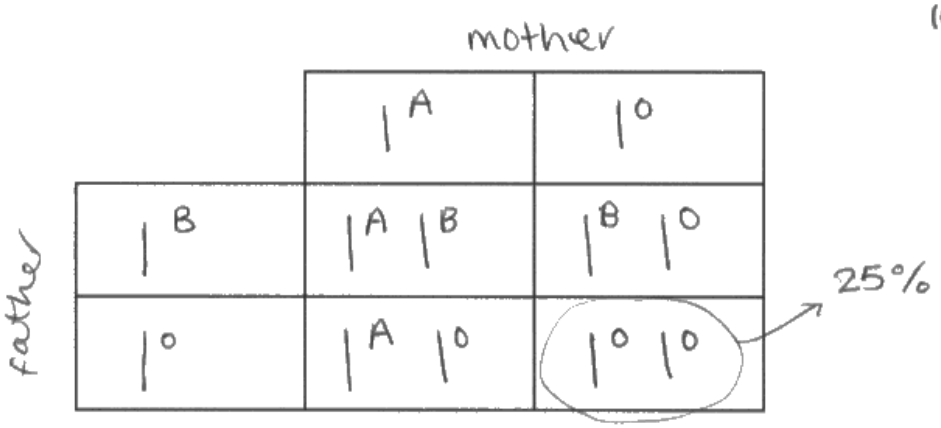
A child is blood group O.

The child's mother is blood group A and the child's father is blood group B.

Explain how this child is blood group O.

Use the Punnett square and probability in your answer.

(6)



The mother and father are both heterozygous. The father has the alleles I^B and I^O and the mother has the alleles I^A and I^O. The I^O allele is recessive so the mother and father do not show traits of the O blood group. The child is blood group O so they must be homozygous for the I^O allele as I^O is recessive they have two I^O alleles. They inherited one I^O allele from each parent. There is a 25% chance that parents with the genotypes $I^A I^O$ and $I^B I^O$ will have a child with genotype $I^O I^O$ and be in blood group O.

ResultsPlus
Examiner Comments

This is a higher level 3 response. They have a correct Punnett square showing the parental genotypes, the probability and rules of blood group inheritance. The accurate use of terminology enables the top of the level to be awarded and the response scored 6 marks.

Question 10 (a) (i)

This maths question required candidates to calculate the difference in the number of neurones between the rat and the frog in standard form. Many candidates were able to gain both marks, candidates could have used a calculator giving the answer in standard form. Candidates were more likely to make and error if they wrote out the full numbers. 1 mark was given for the correct answer not in standard form. No marks were awarded if the incorrect data was used.

10 (a) Figure 16 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	1.0×10^5
frog	1.6×10^7
rat	2.0×10^8
human	8.6×10^{10}

Figure 16

(i) Calculate the difference between the number of neurones in the brain of the rat and the brain of the frog.

Give your answer in standard form. 16000000

(2)

20 $(2.0 \times 10^8) \div (1.6 \times 10^7) = 12.5$

$$\begin{array}{r} 200000000 \\ -\ 160000000 \\ \hline 040000000 \end{array} = 184000000$$

184000000 neurones

ResultsPlus
Examiner Comments

This response was awarded 1 mark for the correct mathematical answer but not in standard form.

10 (a) Figure 16 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	1.0×10^5
frog	1.6×10^7
rat	2.0×10^8
human	8.6×10^{10}

Figure 16

(i) Calculate the difference between the number of neurones in the brain of the rat and the brain of the frog.

Give your answer in standard form.

(2)

$2.0 \times 10^8 - 1.6 \times 10^7 = 1.84 \times 10^8$

1.84×10^8 neurones

ResultsPlus
Examiner Comments

This response is worth full marks for the correct answer in standard form.

Question 10 (a) (ii)

Candidates of higher ability scored well on these questions as their responses were accurate and concisely presented. This question revealed a number of misconceptions and candidates frequently lost marks because of the phrasing in their responses. Myelination speeds up the electrical impulses and not neurotransmission. The idea that it prevents messages getting lost was insufficient. Messages travel long distances along motor neurones, the neurones do not travel long distances. Descriptions of saltatory conduction were accepted for the idea of speeding up the impulse. In addition, the concept that motor neurones are involved in reflex arcs and therefore impulses need to be transmitted quickly. Speeding up impulses was the most common mark awarded.

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

The motor neurons have very long axons. Through this long axon, electrical impulses must be transferred from the cell body to an effector. Myelination is used to insulate the axon, causing the electrical impulses to move to the effector much faster. The neurons in the brain don't need myelination because they don't have to travel as far so don't need to go as fast. Effectors causes the body to move so the impulses need to be fast so people can quickly move so the motor neurons are insulated.

ResultsPlus
Examiner Comments

This shows a good response, full marks were awarded. They have the idea that impulses have to travel long distances and to effectors. They also give the role of myelination insulating the axon causing the electrical impulses to travel faster.

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

myelin sheath insulate the neurone so that it can transmit the electrical impulse faster. Myelination is needed on motor neurones because they need insulation but the neurones in the brain don't. As they don't need to be myelinated for their purpose and they don't transmit electrical impulses to muscles but motor neurone's roles are to transmit information to the muscles

ResultsPlus
Examiner Comments

This response scored full marks for insulating the neuron causing the electrical impulses to be transmitted faster and to muscles which are a named effector.

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

Myelination is a process where the axon and dendrons of a neurone are covered by a fatty layer called the myelin sheath, this sheath electrically insulates the neurone. Motor neurones need myelination as it speeds up the neurones by making sure no energy escapes.

ResultsPlus
Examiner Comments

This response scored 1 mark for insulation. It does not speed up neurones and preventing energy escaping is not creditworthy.

ResultsPlus
Examiner Tip

Take care when talking about the nervous system that you refer to electrical impulses travelling along the neurones and not the neurones travelling.

Question 10 (b) (i)

Candidates of a range of abilities found this item challenging suggesting they were not familiar with the structure of neurones. The label had to be after the cell body in the direction of travel. A bracket of the whole section was accepted. The line needed to point to the axon or into a node of Ranvier and not the myelin sheath.

(b) Figure 17 shows a sensory neurone.

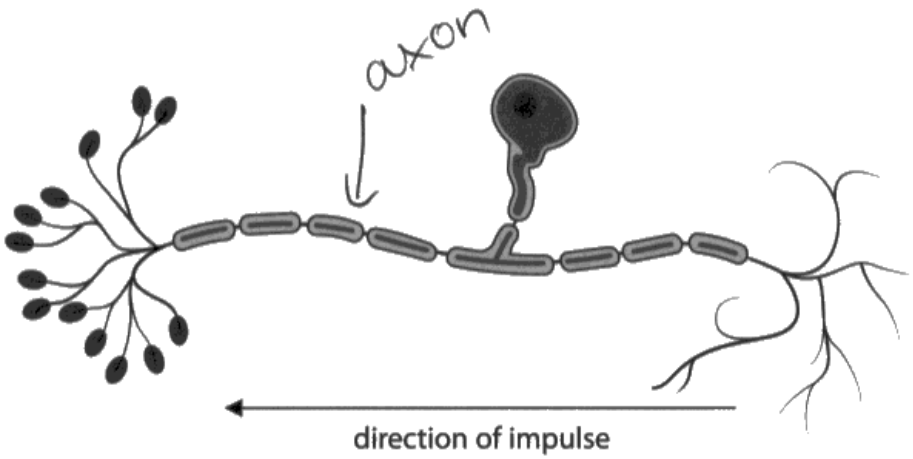


Figure 17

(i) Label the axon on Figure 17.

ResultsPlus
Examiner Comments

This was not awarded a mark as it is not clear where the arrow is pointing to.

(b) Figure 17 shows a sensory neurone.

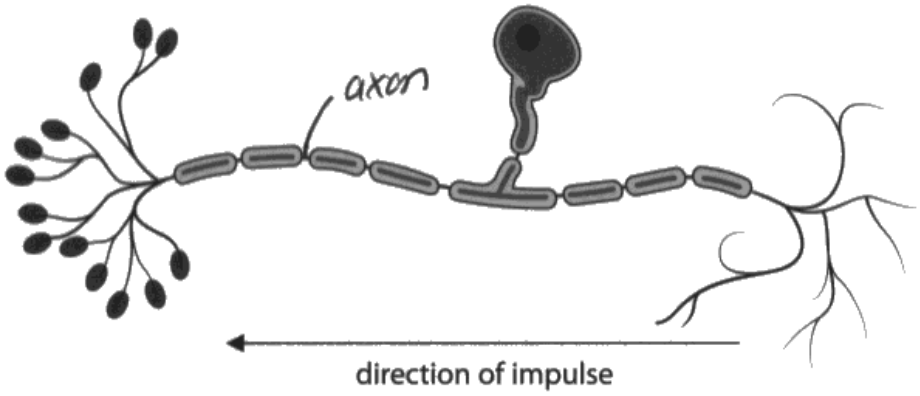


Figure 17

(i) Label the axon on Figure 17.

ResultsPlus
Examiner Comments

This was awarded the mark as the line touches the axon.

(b) Figure 17 shows a sensory neurone.

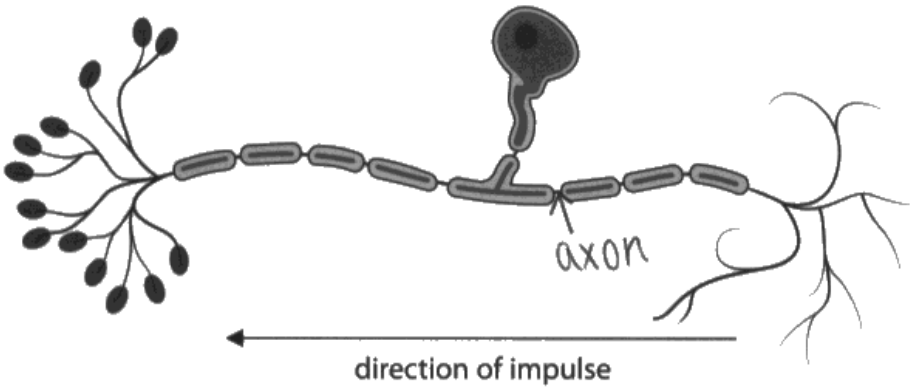


Figure 17

(i) Label the axon on Figure 17.

ResultsPlus
Examiner Comments

The axon is after the cell body in the direction of the impulse, no mark was awarded.

ResultsPlus
Examiner Tip

Learn the structure of neurones and make sure label lines point to structures.

Question 10 (b) (ii)

The role of a sensory neurone is to transmit electrical impulses from receptors to the central nervous system. The first aspect of this needed to be electrical message. For the second mark candidates had to have both aspects, where the signal is taken from and where it is taken, too. Many candidates did not give the electrical impulse. Some confused sensory neurones with motor neurones and signals were taken to effectors.

(ii) Describe the role of sensory neurones.

(2)

To carry the impulse from the receptor (after stimuli has been stimulated) and towards the relay neurones / CNS (ultimately)

ResultsPlus
Examiner Comments

This was awarded 1 mark for taking the impulse from the receptor to relay neurones or the CNS.

(ii) Describe the role of sensory neurones.

(2)

The sensory neurone role is to transmit electrical signals from the receptors to the Central nervous system.

ResultsPlus
Examiner Comments

This response is worth full marks as the impulse is clarified as electrical and it is transmitted from the receptor to the central nervous system.

Question 10 (c)

Higher ability candidates answered this question well. The explanations were required to be accurate as this is the end of the paper. The electrical impulse needed to initiate the release of the chemical for the second marking point. The idea of electrical impulses turning into chemical messages is insufficient. Neurotransmitters was given as a standalone mark but if linked to the idea of diffusing across the gap this was awarded 2 marks. Electrical impulses diffusing or jumping across the gap was not credited. The chemical needed to initiate a new impulse in the second neurone for the final marking point. By neurotransmission was given as an additional accepted mark. Neurotransmitters was the most frequently awarded mark alongside the idea that a synapse is a gap between two neurones. The lack of detail and accuracy in the explanation restricted the marks awarded for many candidates.

(c) Explain how impulses are transmitted at synapses.

(4)

Synapses are gaps between the neurone. The neurontransmitters allow the electrical impulses to travel along the gap.

ResultsPlus
Examiner Comments

This response is brief but concise and scored 2 marks for the gap between neurones and neurotransmitters.

(c) Explain how impulses are transmitted at synapses.

(4)

A synapse is the gap between two neurones. When a nerve impulse reaches the end of a neurone a chemical is released. This chemical is a ~~neuronetransmitter~~ neurotransmitter. It diffuses across the gap and then into the neurone from an area of high to low concentration. The neurotransmitter then stimulates the release of an electrical signal in the next neurone.

ResultsPlus
Examiner Comments

This is a clear response awarded full marks. They have a mark for the gap between the neurones, the electrical impulse triggering the release of a chemical, neurotransmitter, diffusion across the synapse and the stimulation of the electrical signal in the next neurone.

ResultsPlus
Examiner Tip

Especially towards the end of the paper make sure you are using scientific terms accurately in responses.

(c) Explain how impulses are transmitted at synapses.

(4)

Synapses are gaps between neurones where neurones meet. At synapses, the information that was travelling as ~~stat~~ electrical impulses down the neurones are converted to neurotransmitters which are chemicals that diffuse across the synapse into the next neurone where the chemicals are converted back into electrical signals and continue travelling down the next neurone. Synapses slow down the travelling of information within the body as diffusion of neurotransmitter chemicals across synapses takes time and is longer than the time it takes for electrical signals to travel.

ResultsPlus
Examiner Comments

This response scored 3. They have identified that synapses are the gaps between neurones and that neurotransmitters diffuse across the synpase but incorrectly infer that electrical impulses are converted into neurotransmitters and vice versa.

Paper Summary

Most candidates were able to access both extended writing responses, demonstrating good knowledge on the inheritance of blood groups and methods of transmission of STIs as well as how their spread could be prevented. Higher ability candidates recognised that bacterial infections could be treated using antibiotics. For the extended open response on blood group inheritance some candidates did not use genetic terms with sufficient accuracy, which led to them obtaining a slightly lower mark.

Many candidates were able to demonstrate a good level of knowledge in the early questions, including food testing, calorimetry, the eye, bacterial cells and genetic engineering. The evolution of antibiotic resistance challenged some candidates who were able to give some details of the process but not a complete explanation. Across the paper candidates showed they could extract data from graphs and calculate differences between two values.

The level of knowledge shown about mitosis and meiosis, immunity and genetic engineering was very good for most candidates possibly reflecting the use of past papers as a revision strategy. However, when candidates are asked to compare two processes they must ensure they give details for both processes for each aspect they include in their answer. Candidates also showed a relatively good understanding of the lytic pathway of a virus as well as the reasons why people might not get immunised and the process of herd immunity.

Two short-answer questions proved to be challenging for candidates of all abilities, the increased understanding of genetics as a reason for the proposal of the domain classification system and labelling the axon of a neurone. The role of non-coding DNA in protein transcription as well as the effect of a mutation on translation of a protein also challenged lower ability candidates. Other challenging questions to lower ability candidates included the role of myelination and transmission at the synapse. Many candidates lost marks on these questions because although they showed they did have some knowledge about the topic their responses were inaccurate and their choice of language meant the response was scientifically incorrect.

The responses to the questions assessing aspects of practical work have improved since last year. This is a new component for this specification and the improvement is expected as teachers increase their understanding of this aspect. Candidates of all abilities were able to answer questions using their practical skills knowledge, including the identification of controlled variables and improvements. However, candidates still need to ensure they use scientific terms, including volume and mass, accurately. Most candidates were able to recall methods, including the food test for reducing sugars and the role of calorimetry. Many candidates were able to write good methods for determining the optimum temperature for the enzyme lactase using knowledge they were given in the question. Explaining why a variable needed to be controlled was more challenging, especially as this question was not based on a core practical. When explaining conclusions many candidates described the data and did not offer scientific knowledge to justify their conclusion statement.

Candidates of all abilities were able to access the straightforward maths questions of calculating a mean. Although candidates lost marks on this for excluding some values as anomalies incorrectly and not expressing the answer to the number of significant figures required. Candidates must answer the questions in the form requested. More candidates than previously were able to correctly convert units of measurements correctly and complete a magnification calculation. The calculation of the number of people affected by measles based on a death rate was more challenging.

Based on their performance on this paper, candidates are offered the following advice:

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Use all the information given in the question to help construct the answer but avoid repeating the information which has already been given, and giving a vague response which will not gain credit.
- Develop their practical skills knowledge to ensure they understand the difference between the factors being investigated, controlled variables and improvements.
- If terms such as valid, reliable, accurate and precise are used candidates should ensure they know the scientific meaning of these terms.
- Ensure they know the structure of neurones, including the role of myelination and the transmission at synapses.
- Ensure that they can understand the different stages of protein synthesis including the role of coding and non-coding regions of DNA.
- Use genetic scientific terminology accurately in open responses.
- Ensure they consistently apply rules for rounding up numerical answers and understand recurring numbers.
- Read mathematical questions carefully to note whether an answer is required in standard form or to a specified number of significant figures.
- Always show the mathematical workings when doing calculations as a mark can be awarded for errors carried forward.
- Consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks awarded.

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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