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Examiners' Report
June 2019

GCSE Combined Science 1SC0 1BH

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Introduction

The Pearson Edexcel GCSE (9-1) Paper 1 Combined Science (Higher tier) paper is the first of six papers taken as part of the GCSE (9-1) Combined Science qualification. This is the second assessment of the GCSE (9-1) Combined Science 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: Combined Science (Higher tier) is awarded a total of 60 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 10 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) Combined Science qualification assesses practical knowledge and maths skills, the requirements of which are given in the specification. Furthermore, there are 6 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: Combined Science (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, bacterial cells and genetic engineering, viruses and immunisation, the effect of medication on heart disease risk, sexually transmitted infections, 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 extraction of DNA from fruit including identifying controlled variables and improvements, and 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 unit conversions, magnification and percentages as well as the use of significant figures and standard form.

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.

Many candidates were able to demonstrate a good level of knowledge in the early questions, including food testing, 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 process for each aspect they include in their answer.

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

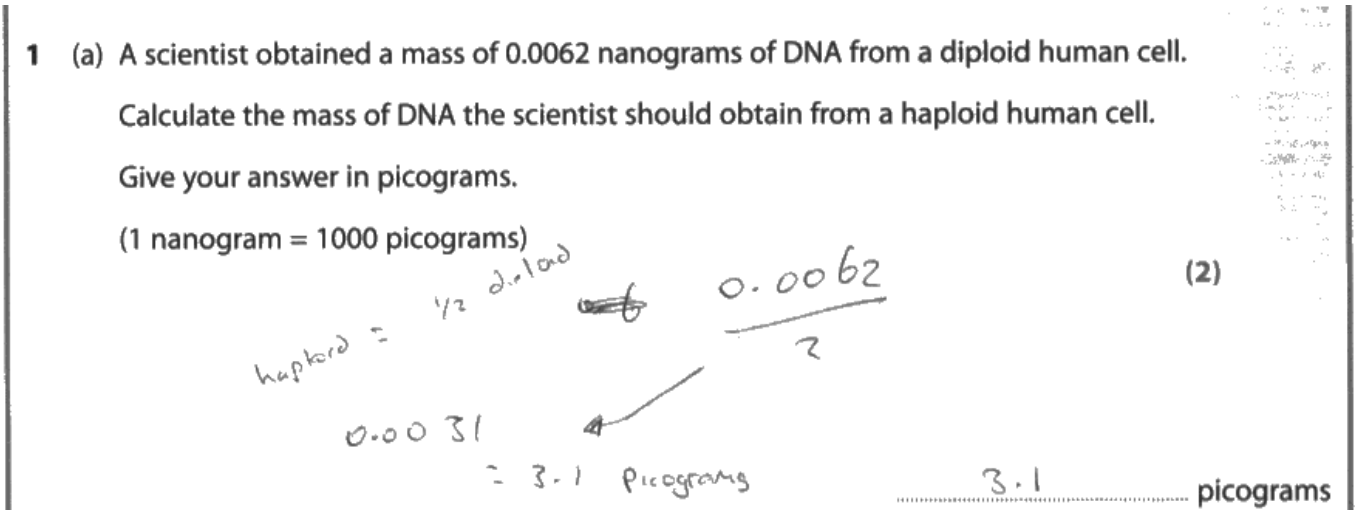
labelling the axon of a neurone. Other challenging questions to lower ability candidates included the role of myelination and transmission at the synapse. Many candidates lost marks on these questions because although they showed they did have some knowledge about the topic, their responses were inaccurate 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. 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. Candidates must answer the questions in the form requested. More candidates than previously were able to correctly convert units of measurements and complete a magnification calculation.

Question 1 (a)

There are two aspects to this question: the knowledge that haploid cells contain half the genetic material of a 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.



1 (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)

haploid = 1/2 diploid ~~6~~ 0.0062 / 2

0.0031

= 3.1 Picograms

3.1 picograms

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Examiner Comments

Both marks can be awarded for the correct answer on the answer line. All working was shown so even without a correct answer 1 mark could have been awarded.

ResultsPlus
Examiner Tip

Always make sure that in a mathematical question the answer you want to be marked is on the answer line. Examiners cannot pick and choose the correct answer from several.

1 (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 × 1000 = 6.2

6.2 picograms

ResultsPlus
Examiner Comments

This candidate correctly coverted the answer by multiplying by 1000 for 1 mark. In order to attain the second mark they would need to divide by 2 to show they knew the difference between haploid and diploid.

Question 1 (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 1 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

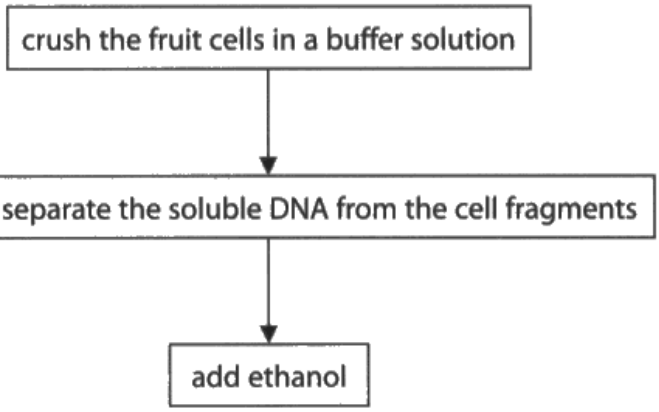

Figure 1

(i) State why ethanol is used.

(1)

It extracts DNA from the nucleus. Acidic. contains enzymes.

ResultsPlus
Examiner Comments

There were many confused responses regarding the role of the ethanol, mainly to do with breaking down the membranes/cells etc. This candidate scored 0 marks.

Question 1 (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 ~~the same weight.~~ let dry for the same amount of time.

2 added same amount of ethanol

ResultsPlus
Examiner Comments

There were no marks awarded here. Amount is not acceptable, we need to see either volume or mass as a correct control of variables.

ResultsPlus
Examiner Tip

Always refer to volume when taking about solutions or water. The word 'amount' wil not be credited for scientific variables.

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

(2)

1 the volume of buffer solution used

2 the volume of ethanol/alcohol

ResultsPlus
Examiner Comments

In this case both marks can be awarded. It is important to use volume for liquids and mass for solids when referring to controlling variables.

(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 the same mass of fruit size

2 ~~temperature~~ same volume of ethanol.

ResultsPlus
Examiner Comments

Both marks can be awarded here for mass of fruit and volume of ethanol, as this shows the candidate knows how to control the variables.

Question 1 (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 make sure the initial results were not anomalous outliers/anomolys. anomalys.

ResultsPlus
Examiner Comments

For this question we are accepting 'to identify anomolies' for a mark.

Question 1 (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 the 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)

In the process of mitosis, the outcome is two daughter cells produced, each containing 23 chromosomes by asexual reproduction. In the process of meiosis, four new daughter cells are produced, each with 23 pairs of chromosomes. By sexual reproduction.

ResultsPlus
Examiner Comments

This candidate has clearly distinguished between the different outcomes for mitosis and meiosis for 3 marks. We allowed the differentiation between asexual and sexual reproduction for mitosis and meiosis as an acceptable mark.

ResultsPlus
Examiner Tip

When comparing two things it is easier to give all the outcomes of mitosis followed by the outcomes of meiosis so there is no confusion in the answer. This may be written in tabular form.

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

Compare the outcomes of mitosis and meiosis.

(3)

Mitosis is ~~one~~ a cell division. Mitosis can be used for growth, repairing cells and asexual reproduction. However, Meiosis is when there are 4 daughter cells. It is to do with the sperm and egg. How they divide. Meiosis and mitosis both produce new cells. ~~however~~

ResultsPlus
Examiner Comments

In this case the candidate scores 1 mark. Both outcomes for mitosis and meiosis are needed as this is a comparison question, so although they mentioned 4 cells for meiosis there was no mention of 2 cells for mitosis.

Question 2 (a)

The knowledge required to answer this question is similar to a question on the 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.

2 (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)

This is because the skin has a physical defence barriers, if the skin is damaged (e.g. a wond) blood clots quicuily seal cuts and keep microorganisms out (pathogens). This means the children don't get bacteria into the body because the cut is already sealed. The vaccine adds a weak or dead / inactive pathogen that fights off an infectious disease (making + Immune)

ResultsPlus
Examiner Comments

Several responses were similar to this, with the candidate focusing on the cut rather than the role of the vaccination. The question specifically states these children, ie those that were vaccinated against tetanus, so the response has to be about the vaccination. This response scored 0 marks.

ResultsPlus
Examiner Tip

Make sure you read the questions very carefully to ensure that you are answering the question posed.

2 (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)

Getting a vaccination for the bacteium helps fight the pathogen. There are many antibodies produced that will kill the antigen, bacteria, ~~This is why~~ The children then are prone to it, meaning that if the same bacteia were to come then the antibodies ~~will~~ will fight against it.

ResultsPlus
Examiner Comments

This candidate has attained 1 mark for the idea that there are antibodies present in the body due to the vaccination. It is always worth trying to answer a question in order to try to maximise marks.

Question 2 (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)

these bacteria are non resistant as they evolved to not be effected by the Colistin meaning that not all the bacteria where killed completly after the first use. This bacteria then reproduced and grew in strength as a result as now being resistant to the antibiotics.

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Examiner Comments

This candidate correctly identified that bacteria have become resistant due to evolution. They have also linked this to those bacteria that survived the Colistin reproducing and that those were the resistant ones. 2 marks.

(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 the process of Natural Selection. If somebody had an infection in the blood, Colistin would've killed the majority of the Bacteria. However, some bacteria would've survived the anti-biotics and developed a resistance to it. These bacteria would've multiplied meaning that even more Colistin-immune Bacteria would be produced. This is similiar to MRSA bacteria.

ResultsPlus
Examiner Comments

This candidate has the correct idea that the bacteria survived to reproduce, scoring 2 marks.

Question 3 (a) (iii)

The content covered by this question is new for this specification. It required candidates to recognised 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)

To be properly categorise substances into a group / kingdom

ResultsPlus
Examiner Comments

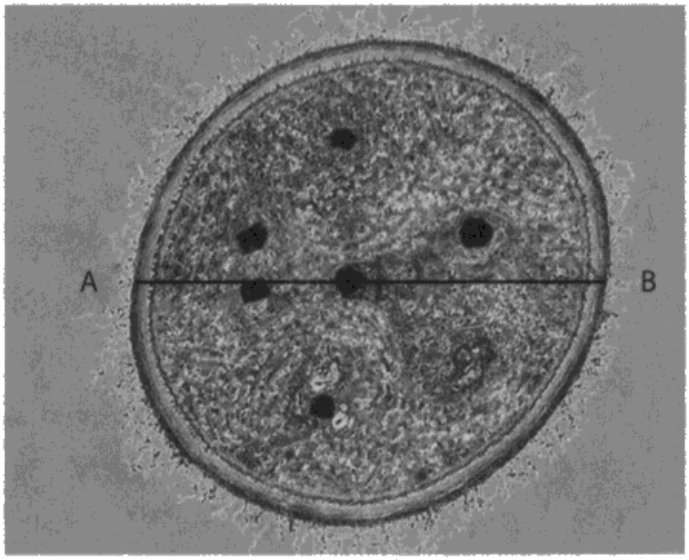
Many candidates had problems with this question, with many giving a similar response to this one where they are giving reasons why the kingdom theory was given rather than the domain theory. No marks could be awarded here.

Question 3 (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 workings 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 2 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 2

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (µm).

(3)

$\frac{7.5}{50\,000} = 0.00015$

0.00015×1000

$= 0.15$

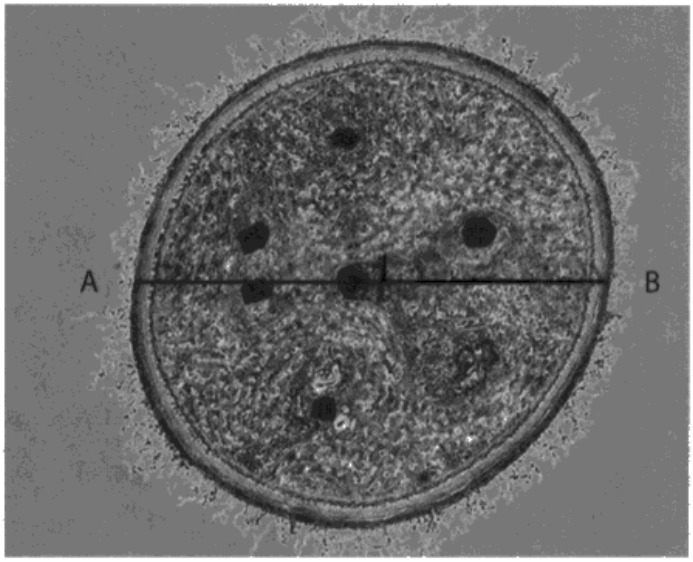
..... µm

ResultsPlus
Examiner Comments

It is always worth showing the working even if the correct answer is not given. This candidate gained 1 mark for correctly dividing by 50000.

(b) Figure 2 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 2

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (µm).

(3)

πr2

6·5cm

6·5 / 50,000 = 1·3×10⁴

13

..... µm

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Examiner Comments

This candidate gained 2 marks, for correctly dividing by 50000 and also a correct measurement of the cell.

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Examiner Tip

If a line is drawn on a diagram and you need a measurement, always measure along that line.

Question 3 (b) (ii)

This question asked for three features of bacterial cells. The question stated that they contained plasmids; consequently 'loops of DNA' was insufficient and 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)

Bacterial cells have a single loop of chromosonal DNA (where the majority of genetic information is stored). They also have a slime coat and a flagellum ~~(which helps them swim)~~.

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Examiner Comments

This candidate correctly identified three structures found in a bacterial cell. Full marks.

(ii) Bacterial cells contain plasmids.

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

(3)

1. flagella - used to move around
2. loop of DNA - stores genetic material
3. cell membrane - controls what goes in and out.

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Examiner Comments

'Loop of DNA' is not enough for a mark, we required chromosomal DNA as a plasmid is also a loop of DNA. All cells have a cell membrane, thus this was not awarded any marks, but the candidate correctly identified the flagella for 1 mark.

Question 3 (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 3 shows a plasmid containing the human insulin gene.

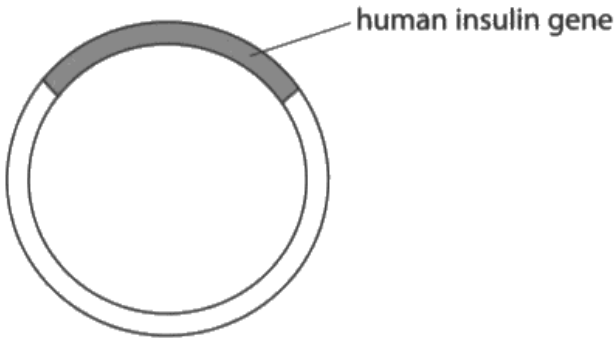

Figure 3

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

(3)

Restriction enzymes are used to cut the ~~desired~~ insulin gene, ~~[illegible]~~ and the undesired gene out from the chromatids. This leaves sticky ends. The insulin gene is then stuck ~~to~~ to the plasmid, matching the bases using the same restriction enzyme.

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Examiner Comments

This candidate correctly identified the use of restriction enzymes in the cutting of DNA both in the plasmid and of the DNA required. As in previous questions of this type we require named ligases to join the DNA and the idea of complementary or matching sticky ends for the remaining marks. One mark overall.

(c) Figure 3 shows a plasmid containing the human insulin gene.

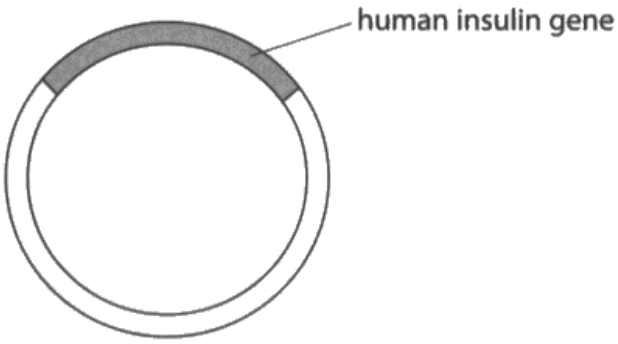

Figure 3

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

(3)

The human insulin gene is cut out from the plasmid. It has to be the same size.

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Examiner Comments

It is insufficient to just refer to cutting and sticking enzymes; we do require restriction enzymes and ligase to score on these higher demand questions. No marks could be awarded here.

Question 4 (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 two 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'.

Question 4 (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 it 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.

Question 4 (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.

(3)

Put it in a later bath as soon as the test starts. Once finished take note of the time taken to produce. Do this with a variety of ~~later~~ temperatures and the one with the least time is the optimum temperature.

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This answer gives the idea that the same thing is being tested over and over again. When writing a plan, consider what is being tested, so in this case we need the idea that the same number of beads is being tested with the same volume of solution at different temperatures. A list of those temperatures would be acceptable here. No marks could be awarded for this response.

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

(3)

Do the same ~~experiment~~ experiment in a water bath - using 10°c or 20°c increments. this will allow you to find the rough optimum temperature, and allow you to narrow it down further and further until the real, precise optimum is found.

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This candidate has indicated doing the experiment at different temperatures for 1 mark.

Question 5 (a) (i)

This question required data to be extracted correctly from the graph. The first mark was obtained by nearly all candidates who attempted the question, 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.

5 (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 6 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.

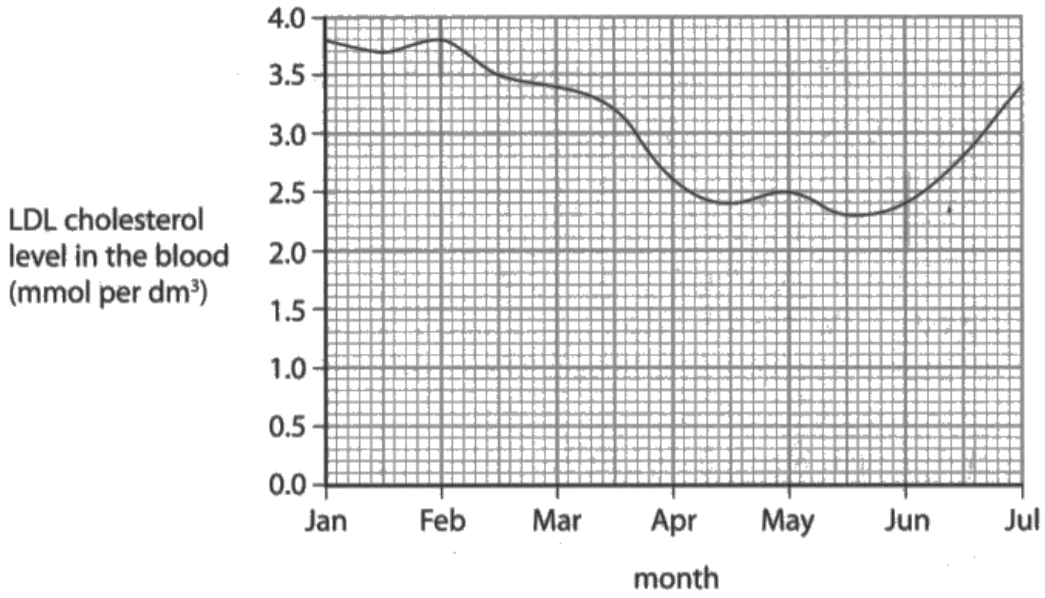

Figure 6

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

Use data from the graph to support your answer.

(2)

overall his cholestreal levels dropped ~~[illegible]~~ ~~[illegible]~~ ~~whilst on the drug~~ or decreased whilst on the drug as in febuary when He started taking them it was at 3.7 (mmol per dm³) and in June it was at 2.4 (mmol per dm³) so overall they dropped. Decreases cholestreol levels.

ResultsPlus
Examiner Comments

This candidate gained just 1 mark for recognising the decrease within the time but needed to quote data to back up the observation.

Question 5 (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.

Question 5 (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 7 shows the number of people diagnosed with gonorrhoea in the UK.

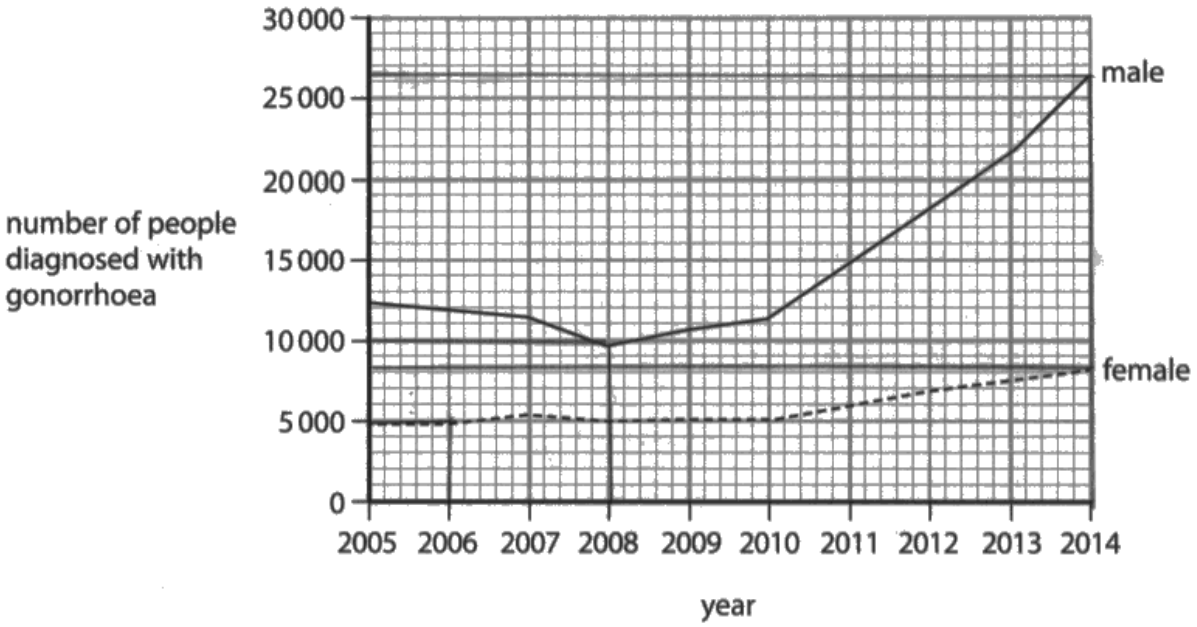

Figure 7

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 type of sexual transmitted bacterium that is passed from person to person by the exchange of bodily fluids i.e sperm, saliva, blood and pus. to reduce the people infected you'd need to either not have any sex or intercourse with someone who is infected or use a condom ~~and~~ to protect from this exchange of fluids. You could also use antibiotics to reduce the rash it gives you but strains are becoming resistant to the anti-biotic. The year is very dependant because of unprotected sex has

become more popular also more people are catching it as in 2008 only 10,000 men and 5000 women were diagnosed with gonorreah but in 2014 the number rised significantly to 8000 women and over 26,000 men to have been diagnosed.

ResultsPlus
Examiner Comments

This candidate was able to correctly give data from the graph as well as describing how to prevent and treat infections of sexually transmitted diseases, achieving Level 3 with 6 marks.

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

Figure 7 shows the number of people diagnosed with gonorrhoea in the UK.

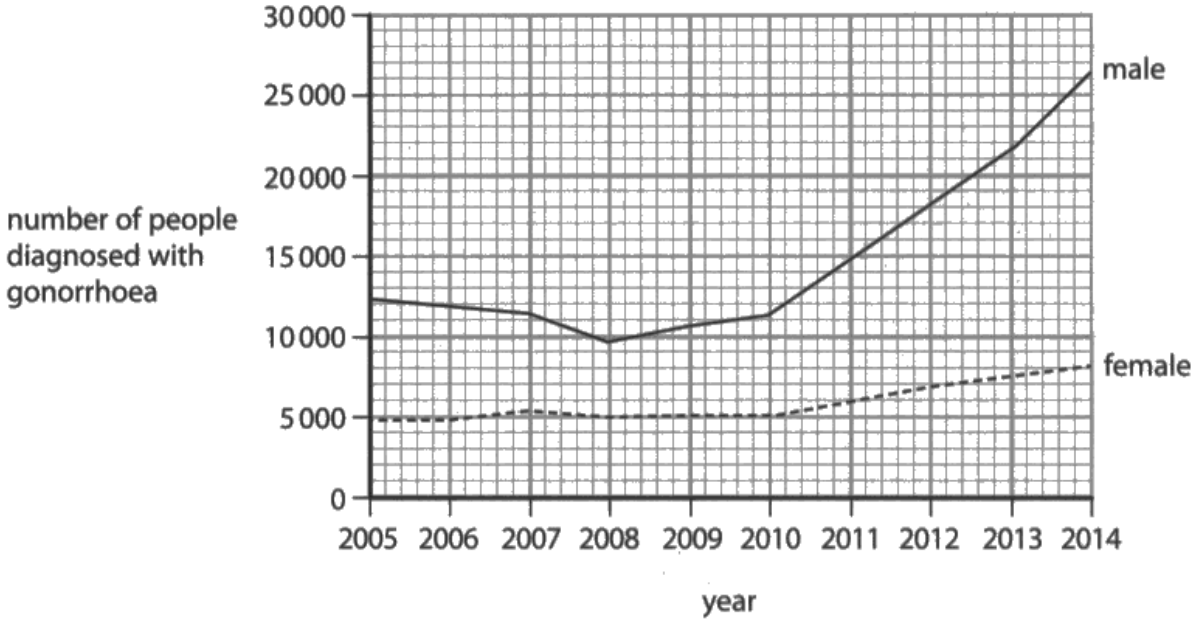

Figure 7

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)

Gonorrehoea is a disease that is transmitted through Sexual contact with the opposite sex.

The reason males are getting these diseases is because more men like having sex with different females which makes them extremely vulnerable to be getting this disease. This is the same with females by the graph it suggest that it is the females

who are spreading this disease.
You can stop this disease by wearing
any contraception e.g. condom ~~just so that~~
just because the states show that male
are more likely which means they should
protect themselves by using contraception.

ResultsPlus
Examiner Comments

Although this candidate recognised that this is spread by sexual contact and that it can be prevented by using a condom there was no information quoted from the graph. Also no mention of how to treat these infections with antibiotics, so only Level 2 and 3 marks could be given.

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

Figure 7 shows the number of people diagnosed with gonorrhoea in the UK.

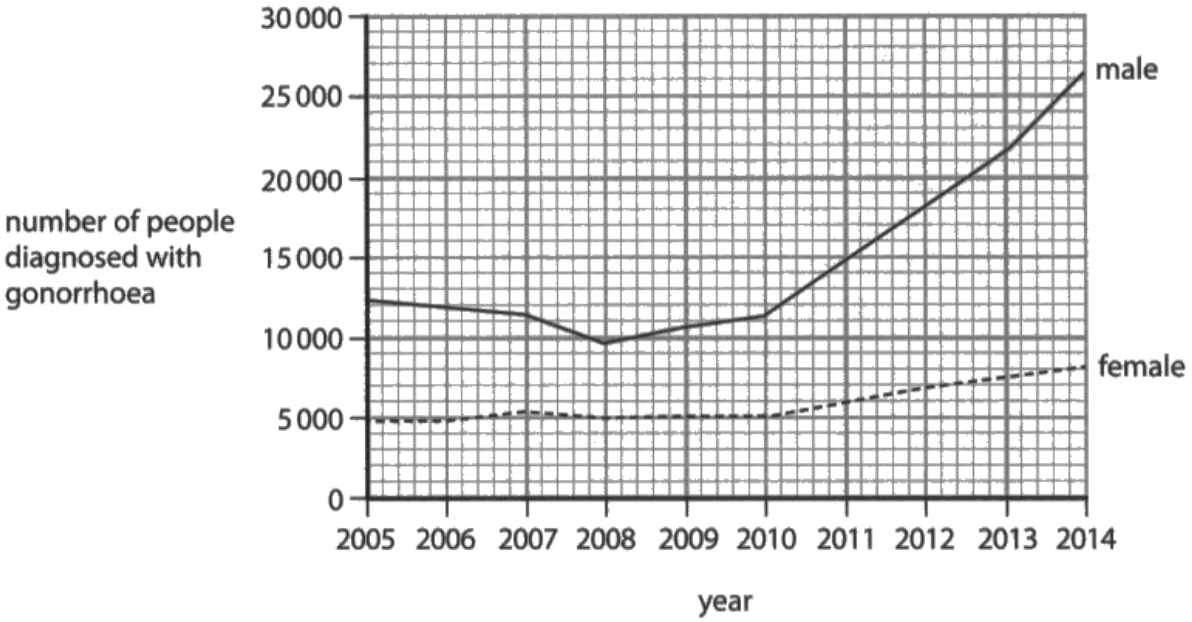

Figure 7

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 through bodily fluids in sexual ~~interactions~~ contact. Its important to reduce the amount of ~~time~~ people infected as theres more of a chance of the bacteria developing resistance to the anti-biotics that are used to treat it. The amount of people infected has increased since 2008. This means less people are having protected sex.
The number of people infected can be reduced by using anti-biotics, and the number can stop increasing by using protection like condoms.

ResultsPlus
Examiner Comments

All of the scientific information required was given by the candidate in this response but they did not use the graph to justify this, so they were awarded 5 marks.

Question 6 (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 an error if they wrote out the full numbers. One mark was given for the correct answer not in standard form. No marks were awarded if the incorrect data was used.

6 (a) Figure 8 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 8

(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)

rat – 200000000

frog – 16000000

= 184000000

= 1.984×10^8

1.984×10^8 neurones

ResultsPlus
Examiner Comments

This candidate converted the numbers into long form and then unfortunately did not calculate correctly, so scored 0.

ResultsPlus
Examiner Tip

Candidates should use their calculators to add and subtract numbers in standard form, especially as the answer was required in standard form.

6 (a) Figure 8 shows the number of neurones in the brain of different animals.

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lobster	1.0×10^5
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Figure 8

(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)

$1.6 \times 10^7 = 16000000$

$2.0 \times 10^8 = 200000000$

200000000
− 16000000
184000000

1.84×10^8 neurones

ResultsPlus
Examiner Comments

Both marks can be awarded as the candidate correctly answered the question and gave the answer in standard form as requested.

ResultsPlus
Examiner Tip

Make sure that you read the whole question. For mathematical questions check that there is no extra request at the end of the question as this will be worth valuable marks.

Question 6 (a) (ii)

Candidates of higher ability scored well on this question 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, as was 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)

because neurones in the brain have a short axon so not much difference in speed of the electrical impulses whereas in the motor neurone they have mylien sheath insulating the axon the speed up the rate of reaction.

ResultsPlus
Examiner Comments

This candidate was awarded 1 mark for the idea that the neurones in the brain are shorter than motor neurones.

(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)

This is needed on motor nurones to insulate the motor nuerone and speed up its electrical impulse. They are not needed in the brain as insulation is not needed and the Brain sends impulse to the CNS.

ResultsPlus
Examiner Comments

The understanding that myelination insulates the neurone is worthy of a mark, as is the idea that this speeds up the impulse which is not important in the brain. The candidate scores 2 marks.

Question 6 (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 9 shows a sensory neurone.

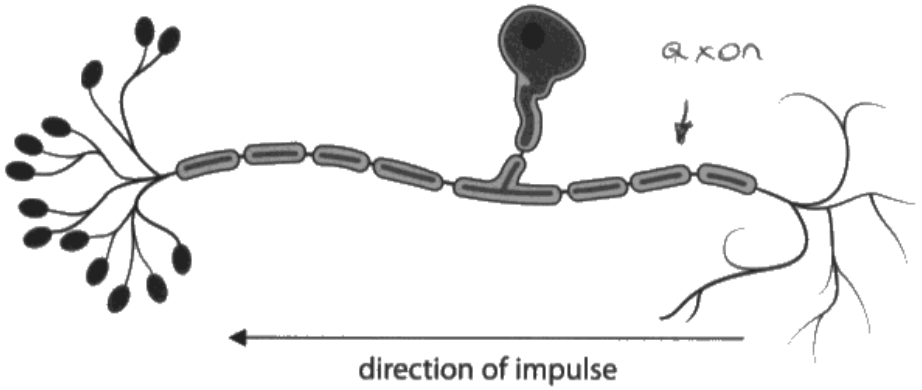


Figure 9

(i) Label the axon on Figure 9.

ResultsPlus
Examiner Comments

This indication of where the axon is is too vague to be awarded the mark.

(b) Figure 9 shows a sensory neurone.

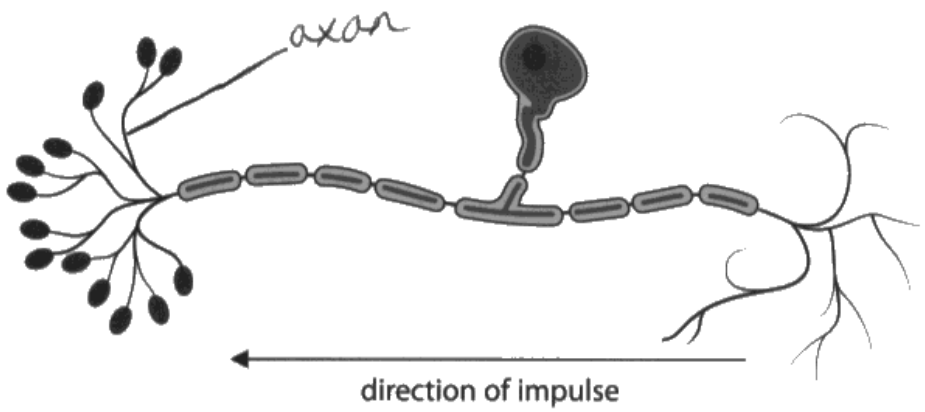


Figure 9

(i) Label the axon on Figure 9.

ResultsPlus
Examiner Comments

Anywhere along the axon as long as it was implicit that this was the axon and not the myelin sheath scored the mark, as here.

Question 6 (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 to. 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)

Sensory ~~neurones~~ neurones transfer ~~impulses~~ impulses from receptors to relay neurones.

ResultsPlus
Examiner Comments

1 mark was awarded for the idea of the direction of travel along the sensory neurone as in this case.

(ii) Describe the role of sensory neurones.

(2)

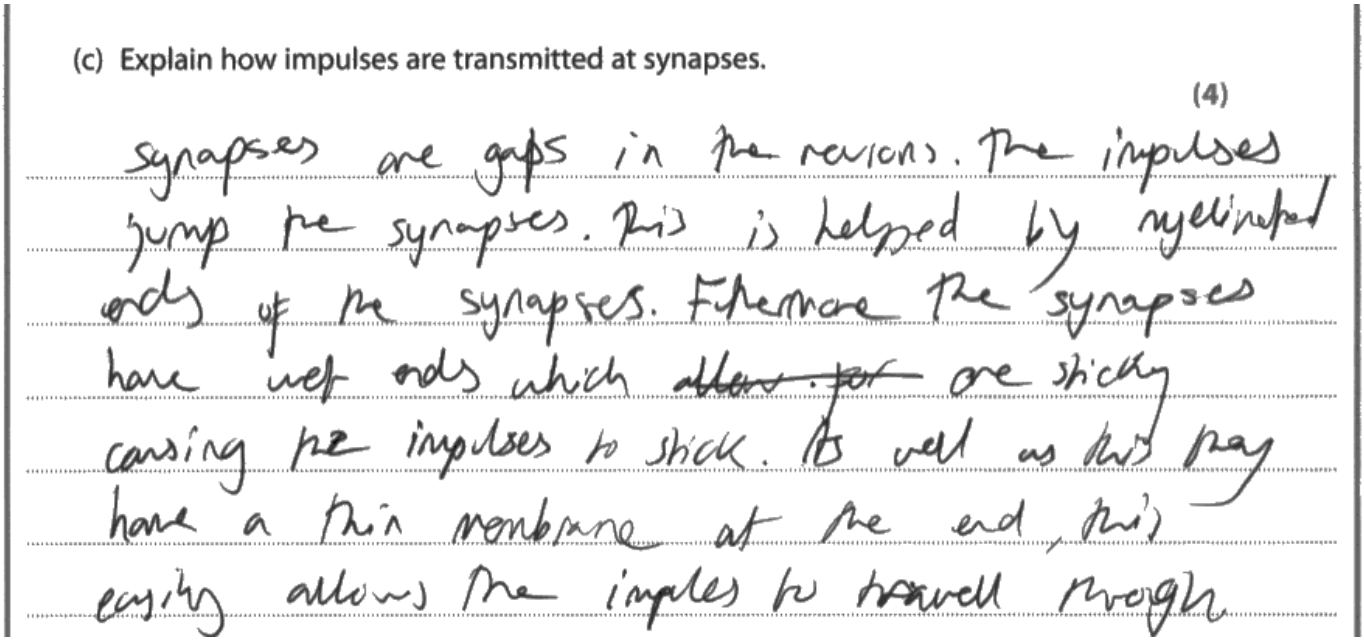
They carry the electrical impulses from the receptor to the Brain. They sense (make you feel) the stimulant.

ResultsPlus
Examiner Comments

This candidate scored both marks as they stated the direction of travel and that the neurone is carrying electrical impulses.

Question 6 (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 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 in the neurons. The impulses jump the synapses. This is helped by myelinated ends of the synapses. Furthermore the synapses have wet ends which ~~allow for~~ are sticky causing the impulses to stick. As well as this may have a thin membrane at the end, this easily allows the impules to travell trough

ResultsPlus
Examiner Comments

The idea of the synapse being a gap between two neurones is sufficient for one mark.

(c) Explain how impulses are transmitted at synapses.

(4)

A synapse is a gap between two neurones and impulses can not cross this gap alone. However, when an impulse reaches the end of a neurone, neurotransmitters are released. Neurotransmitters are a chemical that allows these impulses to reach the other neurone, essentially forming a chemical bridge.

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Examiner Comments

This candidate scores 3 marks for a description of the synapse, the idea that neurotransmitters carry the impulses across and the idea that the neurotransmitters are released. The only part missing is the neurotransmitters triggering a response in the next neurone.

Paper Summary

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, or giving a vague response, which will not gain credit.
- Develop practical skills knowledge to ensure a good understanding of 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.
- 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:

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