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Examiners' Report
June 2023

Int GCSE Human Biology 4HB1 02R

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Introduction

Candidate performance is this examination was quite impressive. The majority of candidates demonstrated a solid grasp of the fundamental concepts and were able to apply their knowledge to a range of practical scenarios. For example, Q02(b) was based on an investigation involving enzymes. Nearly three quarters of the cohort were able to achieve a maximum score. Similarly for Q04(a)(iii) where candidates were asked to produce a practical method, nearly half gained full marks. Performance in questions that focussed on mathematical skills were equally well done if not better. Candidate responses reflected a confidence in specific mathematical techniques that resulted in top scores being awarded for the vast majority. Candidates performed particularly well in questions related to genetic mutation, cell structure, enzymes and to some extent cell adaptations. Answers to questions covering these topics reflected a sound understanding of biological principles that again attracted excellent scores. There are areas, however, that indicate room for improvement. Some candidates struggled with more complex questions that required joined-up thinking and synthesis of information from different topics or skill areas. Candidates also had difficulty in distinguishing between command words. For example, Q02(b)(ii) required candidates to apply their biological understanding of enzymes to make conclusions from an enzyme activity graph. Many candidates described enzyme activity rather than explained it, but there was also an issue with many candidates who were unable to relate the knowledge that they had to explain why an enzyme in the graph would show no activity at a lower pH. Some candidates made errors in recalling information. For Q03(a) less than a fifth of candidates were unable to describe what was meant by a specialised cell and similarly for Q05(a)(i), where only a quarter of the cohort were able to gain full marks. Although just over a half of the candidates gained the mark allocated for Q08(b)(i) this simple recall question was expected to score higher. Candidates that did not score the mark were unable to state the name of the organism causing AIDS.

Overall, this particular examination session for Human Biology revealed a high level of candidate engagement and commitment to learning. They are a credit to centres who worked hard to ensure that their candidates were fully prepared for this examination.

Question 1 (a)(i)

On the whole, candidates scored very well on this question with most showing good knowledge of cell structure and gaining full marks. Very few candidates lost marks by not following the instruction given by the question and completing the table incorrectly.

There were a vast number of candidates that were able to score the full three marks for correctly completing the table to show the function of each cell structure given.

1 (a) The table shows some cell structures and their functions.

(i) Place one tick (✓) in each row to show the function of each cell structure.

(3)

Cell structure	Function		
	makes proteins	contains DNA	allows substances in and out of cells
nucleus		✓	
ribosomes	✓		
cell membrane			✓

ResultsPlus
Examiner Comments

This response gained three marks for correctly placing three ticks in the table.

ResultsPlus
Examiner Tip

Even if you are unsure of the answers to questions structured in this way, just add the correct number of ticks and the chances are that the placement of one or more of them could be correct.

There were very few candidates that gained one mark for their response as most were able to score highly on this question. Marks lost were due to either candidates placing more than one tick in a row (or none at all) but also because of their lack of knowledge of the function of the cell structures given in the question.

1 (a) The table shows some cell structures and their functions.

(i) Place one tick (✓) in each row to show the function of each cell structure.

(3)

Cell structure	Function		
	makes proteins	contains DNA	allows substances in and out of cells
nucleus	✓		
ribosomes		✓	
cell membrane			✓

ResultsPlus
Examiner Comments

One mark was awarded to this response that was correctly able to identify the function of the cell membrane.

ResultsPlus
Examiner Tip

Cells and their components will always likely be a common exam question and looking through past papers to practice these would help to reinforce knowledge.

Question 1 (a)(ii)

Overall, this question was answered well by most candidates who were clearly familiar with the structure of bacterial cells. By far the most common response was plasmids with flagellum and cell membrane also being popular. Responses that failed to gain a mark for this question were rare.

Most candidates were able to identify plasmids as a component of bacterial cells. This was the response seen most frequently.

(ii) Give a structure found in bacterial cells.

(1)

plasmid

ResultsPlus Examiner Comments

This candidate gained one mark for identifying plasmids as a component of bacterial cells.

ResultsPlus Examiner Tip

Be wary about giving lists of structures. If one is wrong it will cancel out any right answer given. This is called the list rule.

Although plasmids was the most popular answer given by candidates, cell membrane was also seen often for one mark.

(ii) Give a structure found in bacterial cells.

(1)

cell membrane

ResultsPlus Examiner Comments

Cell membrane was a popular answer amongst candidates. This response gained one mark.

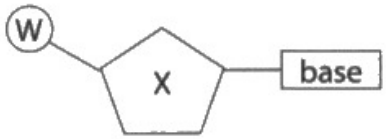
Question 1 (b)(i)

Approximately a third of candidates were unable to gain full marks for their answer to this question. A fair percentage of them failed to score at all but most candidates made the effort to give a response even if it was incorrect. Common answers that were not credited included placing the correct labels on the wrong answer lines or naming one or both parts incorrectly. Candidates often gave pentose sugar instead of deoxyribose although the latter was the overall preferred response.

A fair number of candidates scored full marks for their response, giving phosphate and, most often, deoxyribose sugar.

(b) (i) DNA is made of two chains of nucleotides.

The diagram shows one nucleotide.



Name part W and part X.

(2)

W Phosphate

X (deoxyribose) sugar

ResultsPlus Examiner Comments

This candidate gained full marks for correctly naming parts W and X.

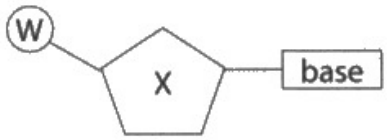
ResultsPlus Examiner Tip

As well as knowing the components of a nucleotide it is also important to understand how they link together.

Although most candidates attempted an answer to this question, some failed to gain any marks for not fully understanding the components of a nucleotide.

(b) (i) DNA is made of two chains of nucleotides.

The diagram shows one nucleotide.



Name part W and part X.

(2)

W nitrogen

X amino acid

ResultsPlus
Examiner Comments

This response failed to gain any marks. Although it was very rare to see nitrogen as an answer, amino acid(s) and also protein were seen quite often.

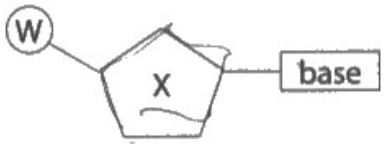
ResultsPlus
Examiner Tip

Remember the link between nucleotides and amino acids. A set of three nucleotides, or a codon, gives the code for one amino acid.

Some answers often included phosphorus rather than phosphate and it was quite common to see responses that referred in some way to amino acids.

(b) (i) DNA is made of two chains of nucleotides.

The diagram shows one nucleotide.



Name part W and part X.

(2)

W phosphorus molecule.

X amine group.

ResultsPlus
Examiner Comments

This candidate has confused phosphate with phosphorus and was also awarded no credit for giving amine group as the name for part X.

Question 1 (b)(ii)

Specific detail was missing from many answers which meant that a fair percentage of responses did not gain full marks. Most often, complimentary base-pairing was omitted from responses despite many candidates hinting at an understanding of this by correctly detailing how the bases, A,T, C and G were paired. It was pleasing to see a vast number of candidates gaining a mark for stating that hydrogen bonds were found between bases.

Many candidates identified that the bases were held together by hydrogen bonds and in some cases candidates also recalled how many bonds were found between the bases. Some responses were poorly structured and missed details that cost candidates marks.

(ii) Describe how bases hold the two chains of nucleotides together.

(3)

The bases have pair and is connected by a hydrogen bond. this cause the two chain of nucleotide to be held together. There fore, the bases connected ~~by hydrogen~~ 2 chains of nucleotides together.

ResultsPlus
Examiner Comments

This response was unclear on how the bases were paired and, therefore, lost two marks. One mark was awarded for including details on hydrogen bonds connecting the base-pairs together.

ResultsPlus
Examiner Tip

When discussing the structure of DNA always include information on which base pairs with another. This is an easy mark in an exam.

A surprising number of candidates omitted information in their responses on complementary base-pairing which restricted the number of marks awarded. Candidates working at higher levels tended to provide thorough and well-structured answers which scored well.

(ii) Describe how bases hold the two chains of nucleotides together.

(3)

There are Hydrogen bonds between complementary bases (G with C and T with A) according to complementary base pairing rule, the Hydrogen bonds are formed by condensation reaction (catalysed by DNA polymerase) & wind together and causing the two chains to form a double helix

ResultsPlus Examiner Comments

This clearly written and detailed response covered all three marking points gaining the candidate three marks. Although the information provided is slightly more than expected at this level and is not all entirely correct, it was not so bad that it negated marks.

ResultsPlus Examiner Tip

Take care when adding more information than necessary in an answer. Although this can be hard to judge at times, extra details that are scientifically incorrect could cost marks.

The percentage of candidates that failed to gain any marks for their response was lower that the percentage of candidates that obtained at least one mark. Answers that were not credited tended to be very vague and although many candidates hinted at an understanding on how the bases held the two nucleotide chains together using scientific terminology, the detail given was not enough to credit.

(ii) Describe how bases hold the two chains of nucleotides together.

(3)

It's a double helix and holds the chains of nucleotides together

ResultsPlus
Examiner Comments

This response did not cover any of the marking points and was particularly vague. No marks could be awarded in this case.

ResultsPlus
Examiner Tip

Always be aware of how many marks are assigned to a question and use this as a guide to how many key points need to be made.

Question 1 (c)

This question was answered particularly well by the majority of candidates who were easily able to score the two full marks. Usual mathematical errors were made in some cases such as multiplication rather than division and, of course, using incorrect figures in the calculation where some candidates appeared unaware that each amino acid is coded for by three bases.

A generous 'error carried forward (ecf)' was applied to some division calculations despite responses not using a correct figure. Candidates that were awarded the ecf gained one mark.

(c) The gene for the hormone insulin contains 153 bases.

Determine the number of amino acids in insulin.

(2)

153 ÷ 23 = 6.65

6.65 = 7 (1 sf).

number of amino acids = 7

ResultsPlus Examiner Comments

This candidate's response was given one mark for providing a correct final answer to a division calculation. However, the candidate was clearly unsure of how many bases code for one amino acid in order to correctly determine the number of amino acids in insulin.

ResultsPlus Examiner Tip

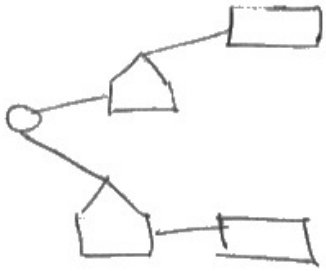
Remember that three bases together provide a code for one amino acid.

There were some values that were given for responses that were either guesses or a result of some random calculation carried out. Where working out was absent for these, no mark could be awarded.

(c) The gene for the hormone insulin contains 153 bases.

Determine the number of amino acids in insulin.

(2)



number of amino acids = 152

ResultsPlus
Examiner Comments

This candidate failed to score any marks for the answer given. There is no indication on how the candidate arrived at this value.

ResultsPlus
Examiner Tip

Always show working out to any calculation.

When a fully correct response was given it was almost always accompanied with clear working out using the space given.

(c) The gene for the hormone insulin contains 153 bases.

Determine the number of amino acids in insulin.

(2)

$\frac{153}{3} = 51$

number of amino acids = 51

ResultsPlus
Examiner Comments

Clear working out and a correct final answer awarded this response full marks.

ResultsPlus
Examiner Tip

Always show step-by-step, in a well laid out way, how to arrive at a final answer.

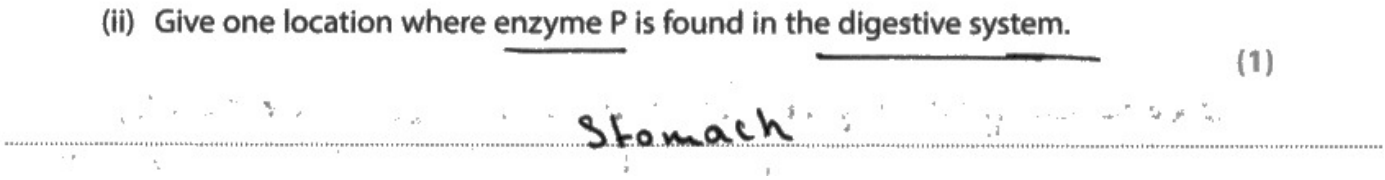
Question 2 (a)(i)

This question posed little challenge for the vast majority of candidates who studied the information given carefully to arrive at the correct responses. This was not always the case, however, as some candidates overlooked the names given to the substrates. This led to errors being given in answers with several candidates choosing amylase for their first answer rather than protease. Subsequent incorrect answers tended to follow from this, where candidates then gave starch and sugar to complete the question.

Question 2 (a)(ii)

The mark scheme gave candidates a range of locations in the digestive system to choose from and this helped a very high percentage of candidates obtain a mark. The stomach was by far the most common answer given and small intestine was also popular. Those candidates that were unsuccessful in their response tended to state the mouth or salivary glands as locations where the protease was found or simply gave intestine without any further information given.

Stomach appeared to be the most popular answer amongst candidates who answered this question correctly. Apart from the small intestine the other options given in the mark scheme were seen less frequently.


(ii) Give one location where enzyme P is found in the digestive system.

(1)

Stomach

ResultsPlus
Examiner Comments

This candidate correctly identified the stomach as a location where enzyme P was found.

ResultsPlus
Examiner Tip

Be aware that some enzymes are produced in specific locations but their site of action may be in a different location. Read questions carefully to understand clearly what they are asking.

Very few candidates failed to achieve a mark for their response, although there were no locations given that did not form part of the digestive system.

(ii) Give one location where enzyme P is found in the digestive system.

(1)

large intestine

ResultsPlus
Examiner Comments

No mark was awarded to this candidate's response. An unfortunate choice of location.

ResultsPlus
Examiner Tip

Be clear in responses on the substrates for each group of digestive enzyme and the final products of the reaction that each catalyses.

Question 2 (a)(iii)

More candidates failed to score a mark for this question than those that were awarded one mark. It is likely that some candidates were unable to link enzyme P being a protein although it was interesting that a large number of answers referred to protein or amino acids. Other incorrect responses referred to the stomach, ribosomes or substrates. The candidates that did obtain one mark most often gave DNA; mRNA was rarely seen in responses.

Answers commonly referred to proteins and amino acids, suggesting some confusion on what type of molecule enzyme P actually was.

(iii) Name the molecule that codes for the production of enzyme P.

(1)

Proteins.

ResultsPlus Examiner Comments

This candidate was one of many that possibly did not recognise the enzyme as being a protein itself. No mark was awarded for this response.

ResultsPlus Examiner Tip

All enzymes are proteins and DNA holds the code that produces them.

Incorrect answers varied although ribosomes came up fairly frequently, possibly linking the actual production of enzyme P with protein synthesis.

(iii) Name the molecule that codes for the production of enzyme P.

(1)

ribosomes

ResultsPlus Examiner Comments

Although this candidate has identified the site of production of enzyme P they failed to gain a mark for stating that either DNA or mRNA codes for its production which is what the question asked.

Question 2 (b)(i)

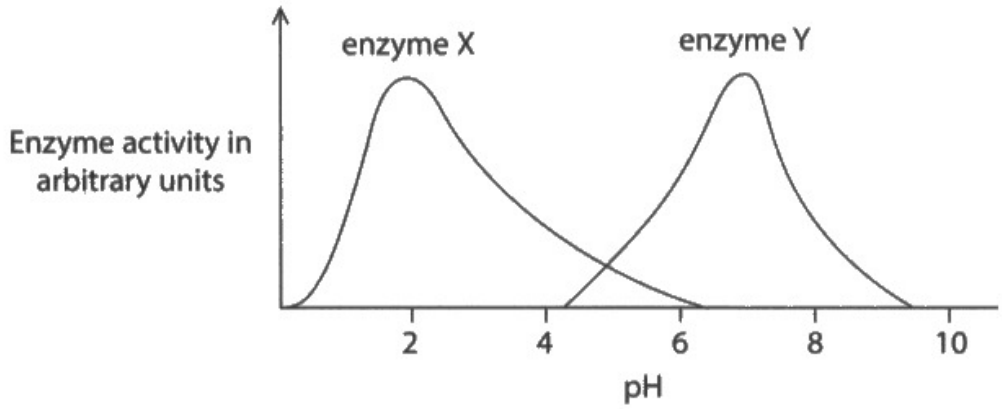
Although this was generally a well-answered question there were a number of candidates that explained rather than described the data. There were many references to enzymes denaturing and loss of active sites were also referred to, giving details that would have been much better placed as an answer to Q02(b)(ii). Candidates tended to gain two or three marks for the information provided that was based on a description with the vast majority, including those that obtained one mark, identifying the peak of activity at pH2.

Just under one third of candidates scored two marks which were often obtained for identifying the peak at pH2 and for also describing the decrease in activity after this. There were a large number of candidates that continued to explain the reason for the decline but who missed out detail in their responses that referred to activity at pH's lower than 2.

(b) A student investigates the effect of ~~pH~~ on the activity of two enzymes, X and Y.

The student measures the activity of each enzyme once, using different pH values.

The graph shows the results of their investigation.



(i) Describe how the activity of enzyme X changes with pH.

(3)

As the pH increases activity increases until pH 2 the which is the optimum ~~temperature~~ pH after that the enzymes starts to denature. Change in active site.

ResultsPlus
Examiner Comments

This candidate received two marks for identifying the increase in enzyme activity as the pH increases and also the peak in activity at pH2. Like many other candidates, an explanation was given for the decrease in activity after pH2 without actually stating that the activity decreased.

ResultsPlus
Examiner Tip

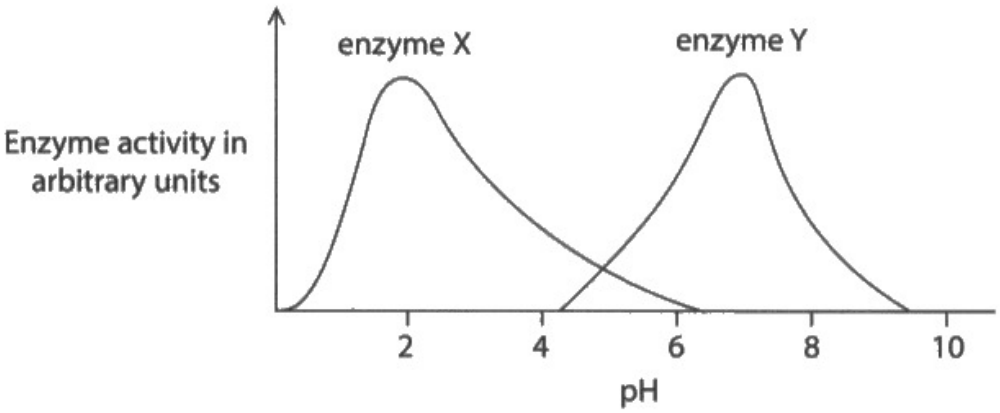
It is important to understand the expectations of command words. Describe and explain are often confused by candidates.

Time and space was wasted by explanations being given as responses to this question rather than descriptions. This cost a fair number of candidates marks.

(b) A student investigates the effect of pH on the activity of two enzymes, X and Y.

The student measures the activity of each enzyme once, using different pH values.

The graph shows the results of their investigation.



(i) Describe how the activity of enzyme X changes with pH.

(3)

Enzyme activity for enzyme X is greatest at pH 2. More enzyme substrate & subcomplexes form. More collisions between enzymes and substrate. pH 2 is the optimum pH. After pH passes the optimum pH. Enzyme activity decreases because high pH cause enzymes to denature changing the shape of enzyme active site. Therefore substrate no longer fit.

ResultsPlus
Examiner Comments

Much of this answer gives an explanation of why activity changes as the pH changes. However, this candidate has managed to gain two marks for providing information on the peak of activity at pH2 and for describing the decrease after this.

ResultsPlus
Examiner Tip

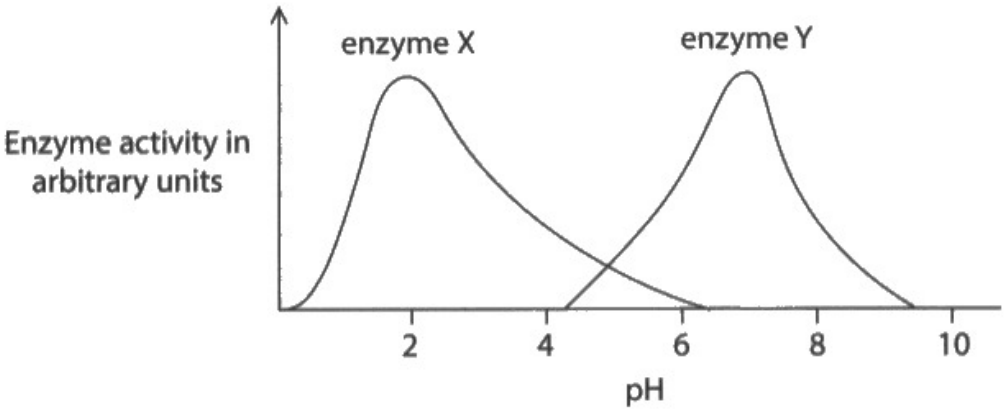
Most enzyme graphs show a similar pattern with pH and temperature changes. It would be an idea to break a graph down into its different regions and then discuss each.

A very small percentage of candidates were not able to obtain a mark. This was mostly due, as mentioned previously, to giving an explanation to a question requiring a description. It was not often, however, for candidates to also miss out on other marking points.

(b) A student investigates the effect of pH on the activity of two enzymes, X and Y.

The student measures the activity of each enzyme once, using different pH values.

The graph shows the results of their investigation.



(i) Describe how the activity of enzyme X changes with pH.

(3)

as the pH increase the enzyme starts to denature, causing it to slowly drop their activity.

ResultsPlus
Examiner Comments

This response did not include any information on the increase in activity as the pH climbs towards 2 and similarly does not identify the pH where the peak of activity is shown. It is also too vague on when the decrease in activity occurs.

Question 2 (b)(ii)

Answers to this question varied greatly although many candidates were able to gain at least one of the two marks available. Where candidates had given details for the previous question that were more suited to this question it is possible that this deterred them from providing similar information again in some cases. However, there were some very good answers which reflected sound knowledge of a topic that has always been tested successfully in previous series. Candidates that scored both of the marks available were able to explain that change in the active site led to less binding of the substrate or that enzyme-substrate complexes were formed. Many candidates also repeated information on the enzyme denaturing.

This question challenged some candidates although presented no difficulty for others. All three marking points were covered by the better answers and candidates that did not manage to achieve full marks generally recognised that the enzyme denatured and/or included details about a change in the active site.

(ii) Explain why no activity is shown for enzyme Y at pH2.

(2)

Because the active site is altered so no substrate-enzyme complexes can form so enzyme is inactive because if temperature increases it will start functioning.

ResultsPlus Examiner Comments

This answer received the full two marks for providing information on how enzyme – substrate complexes were affected by a change in the active site. The information provided later about temperature is irrelevant to the question and was ignored.

ResultsPlus Examiner Tip

pH affects enzyme activity in a slightly different way to temperature. On either side of the optimum pH an enzyme will become denatured so a description of a graph showing activity at different pH's will be described or explained differently to one showing the effect of temperature on enzyme activity.

Question 2 (b)(iii)

Candidates are becoming far more confident in answering questions related to practical work and this question was no exception. Candidates are familiar with the term reliability and many used this to their advantage, gaining the full two marks for their responses. Where some candidates lost marks it was generally for including details on control variables such as temperature although most of these answers managed to gain one mark, mainly for stating that the investigation should be repeated.

Answers gaining two marks obviously covered both marking points in the information given although very few candidates mentioned removing anomalous data. The preferred answer for the second marking point was to calculate a mean.

(iii) **Describe how the student could make the results of this investigation more reliable.**

(2)

He could repeat the experiment / investigation many times then find a mean result after deleting / removing an anomalous results.

ResultsPlus
Examiner Comments

This was a thorough response from a candidate that understands that any anomalous results need to be discounted before calculating a mean. This was not mentioned frequently in the responses seen. The candidate has also clearly stated that the investigation should be repeated for full marks.

ResultsPlus
Examiner Tip

Anomalous results should be ignored when calculating a mean, the mode, median and identifying a range.

Candidates scoring one mark generally obtained this for stating that the investigation should be repeated rather than calculating a mean or discarding anomalous data.

(iii) Describe how the student could make the results of this investigation more reliable.

(2)

Student could repeat results using different pH values and also use enzyme as control variable for comparision

ResultsPlus
Examiner Comments

Had this candidate added further detail to state that a mean could be calculated using repeat data then the response would have scored full marks.

ResultsPlus
Examiner Tip

Answers provided for calculations that involve decimals should all be given to the same decimal place.

Responses unsuccessful in gaining any marks tended to focus on providing control variables although a fair number mentioned about using more pH's or making graphs more detailed.

(iii) **Describe how the student could make the results of this investigation more reliable.**

(2)

More plotting points on the x-axis of the graph. Using same ~~we~~ volume of solution: water.

ResultsPlus
Examiner Comments

This candidate made the decision that more points needed to be plotted on the graph to improve reliability. Their unsurety of reliability cost them the two marks available despite similar types of questions being seen many times in previous examination series.

ResultsPlus
Examiner Tip

Reliability, reproducibility, repeatability, accuracy, validity and precision are all practically related words that could be tested in an examination.

Question 2 (b)(iv)

Many candidates opted for the most obvious control variable related to an enzyme practical investigation and were awarded one marking for stating temperature. The few that were not awarded the mark gave a range of incorrect answers including pH, which was the incorrect answer most commonly seen, and timings of the investigation. Responses that used the term amount rather than volumes of enzyme or substrate were not credited.

The most common correct answer by far was temperature although a minority of candidates provided equally valid responses in stating that enzyme concentration or, less common, substrate concentration were also control variables in this investigation.

(iv) Name one control variable in the student's investigation.

(1)

Concentration of enzyme.

ResultsPlus Examiner Comments

This candidate gained one mark for identifying enzyme concentration as a control variable. This choice of answer was less frequently seen in responses to this question.

ResultsPlus Examiner Tip

Use of the term amount as an alternative to volume is very unlikely to be credited in an examination.

Responses from some candidates reflected some misunderstanding of the actual investigation that the question was based on and often named the independent as a control variable.

(iv) Name one control variable in the student's investigation.

(1)

pH values

ResultsPlus
Examiner Comments

This response was not awarded although was commonly seen amongst other incorrect responses. There were several candidates that gave pH as a control variable despite it being the independent variable.

ResultsPlus
Examiner Tip

Understand the differences between independent, dependent and control variables in an investigation and be able to identify them.

Some incorrect answers showed some misconception amongst candidates who were clearly unsure of what control variables were.

(iv) Name one control variable in the student's investigation.

(1)

repeat the investigation again

ResultsPlus
Examiner Comments

This candidate seemed confused on what a control variable was and failed to obtain a mark for stating repeat the investigation.

ResultsPlus
Examiner Tip

Repeating an investigation improves the reliability of the investigation and is not linked to variables.

Question 3 (a)

Candidates struggled to obtain the two marks allocated to this question. Although many understood that a specialised cell had a specific function and were also able to name specialised cells, many candidates failed to mention that they contained particular features/characteristics/adaptations that helped the cells to carry out a certain function. This limited the majority of answers to one mark with over 60% of candidates achieving this. The percentage of candidates that were not awarded marks was greater than the percentage of candidates that were awarded three.

A large proportion of the cohort were able to describe how specialised cells had a specific function but very few gave details linked to particular features.

3 (a) Describe what is meant by a specialised cell.

(2)

A cell not found in all parts of the body. it has a specific unique function and is formed from stem cells.

ResultsPlus
Examiner Comments

This was a typical one mark response where the candidate has failed to state that specialised cells have certain features or adaptations. This candidate was awarded the mark for understanding that specialised cells have a particular function.

ResultsPlus
Examiner Tip

There are many different types of specialised cells that could be included in examinations. Make sure you know how to link the particular features of each to their function.

There were several responses that mixed ideas of specialised cells with stem cells showing a lack of understanding by some candidates. As whole responses focussed on this content many marks were lost.

3 (a) Describe what is meant by a specialised cell.

(2)

- A cell that can differentiate to other types of cells has the ability to

ResultsPlus
Examiner Comments

This candidate has made an attempt at describing a stem cell rather than a specialised cell, incorrect detail that failed to gain them a mark.

ResultsPlus
Examiner Tip

Specialised cells are derived from stem cells. It is important to know the difference between the two.

Two mark answers were not commonly seen amongst candidate responses and it was only the more able candidates that were able to achieve this.

3 (a) Describe what is meant by a specialised cell.

(2)

A specialised cell is a cell that has a particular structure, shape or the type and amount of organelles, that ~~made them ab~~ gives them the ability to perform a particular function. e.g. RBC has no nucleus so that more oxygen

ResultsPlus
Examiner Comments

This example defines specialised cells well, including all information given in the marking points as well as providing a very valid answer. This answer demonstrates a good understanding of this area of the specification.

ResultsPlus
Examiner Tip

Be prepared to give examples of specialised cells in examinations and to state clearly how they are adapted with particular features to help them carry out their function.

Question 3 (b)(i)

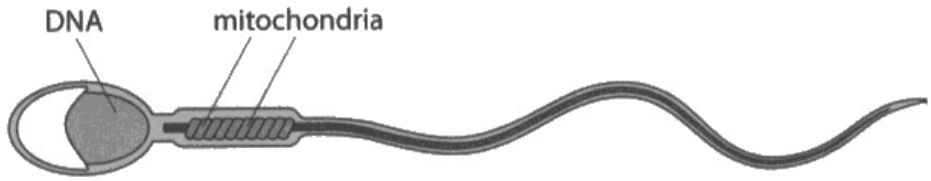
This question aimed to test not only the mathematical skills required to calculate magnification but also to encourage candidates to think about the data given and use it in a sum to arrive at the correct answer. Although this type of question has been tested frequently in the past in this series the equation to work out magnification was not given. Candidates were expected to know this and if not, simply extract details from the information given to them. This was a very straightforward question and candidates performed particularly well accessing both marks allocated. Candidates that obtained less than full marks tended to arrange the equation for calculating magnification incorrectly although mostly used the correct figures in their calculation.

Almost all responses were credited with full marks with very low percentages of candidates awarded no mark or one mark.

(b) The sperm cell is an example of a specialised cell.

The diagram shows a sperm cell.

NOT TO SCALE



(i) The sperm cell in the diagram has an actual length of 0.0060 mm.

The length of the image of the sperm cell is 84 mm.

Calculate the magnification of the sperm cell.

(2)

$m = \frac{I}{A}$

$m = \frac{84}{0.006} = 14000$

magnification = x 14000

ResultsPlus
Examiner Comments

A well-structured response for two marks. This very clearly shows the equation used, substitution of values and the correct final answer placed where it should be on the answer line.

An error carried forward (ecf) was applied to responses that carried out a calculation that used the figures given in the question. However, this rarely needed to be applied as calculations carried out by the candidates were generally correct. One mark was awarded if the final answer to their calculation was correct.

(b) The sperm cell is an example of a specialised cell.

The diagram shows a sperm cell.

NOT TO SCALE

(i) The sperm cell in the diagram has an actual length of 0.0060 mm.

The length of the image of the sperm cell is 84 mm.

Calculate the magnification of the sperm cell.

(2)

= 84mm - 0.0060mm
= 83.994 mm

magnification = x 83.994 mm

ResultsPlus
Examiner Comments

This candidate has used the appropriate figures although has carried out a subtraction rather than a division calculation. One mark was awarded for an error carried forward. If this candidate has not shown their working out then the response would not have been credited.

ResultsPlus
Examiner Tip

Always show working out to mathematical calculations.

Question 3 (b)(ii)

Almost a third of candidates failed to gain credit for their answer to this question. Answers in many of these cases were too vague and commonly included simple details such as the sperm contains less (or more) DNA without going into any more detail. Other answers stated that the sperm had double the DNA or focussed on the body cell in their discussion which were not always incorrect. Some use of key terms such as haploid was given in better answers with additional information being given that covered the same marking point.

Most answers that failed to gain a mark were too vague to award but some candidates got their information mixed making any differences mentioned incorrect.

(ii) The head of the sperm contains DNA.

Give the difference in the amount of DNA found in the head of the sperm and in a nucleus of a body cell.

(1)

It is double, the sperm has double the amount of DNA.

ResultsPlus
Examiner Comments

This candidate might have easily turned this response around by replacing sperm with body cell. This would have then been credited a mark.

ResultsPlus
Examiner Tip

An understanding and use of key terms such as haploid in answering questions such as this would more often than not gain a mark.

Although some candidates understood that sperm cells contained less DNA than a body cell, this was all the detail given. No further information was provided in these responses on how much less it contained.

(ii) The head of the sperm contains DNA.

Give the difference in the amount of DNA found in the head of the sperm and in a nucleus of a body cell.

(1)

Less DNA because it is used to digest the wall of the egg cell.

ResultsPlus
Examiner Comments

This response did not get the mark that was allocated to the question as they failed to state how much less DNA was present in the sperm cell. The candidate could have quoted the number of chromosomes or used the term haploid to gain a mark.

ResultsPlus
Examiner Tip

Sperm cells are haploid which means they contain half the amount of DNA (or 23 chromosomes) than a body cell.

Candidates that provided responses that were credited were generally quite generous with their details giving more information than was necessary for the one mark.

(ii) The head of the sperm contains DNA.

Give the difference in the amount of DNA found in the head of the sperm and in a nucleus of a body cell.

(1)

→ the sperm has 23 chromosomes only to restore the diploid number of chromosomes after fusing with the egg cell.

→ the baby cell has 46 chromosomes (diploid).

ResultsPlus
Examiner Comments

This was a good one mark response that discusses that amount of DNA in the sperm cell and in the body cell. The candidate has demonstrated understanding of key scientific terms and used them in a well-structured answer.

Question 3 (b)(iii)

This question, similar to the first question in this section of the paper focussed on an adaptation of the sperm cell and how this adaptation, the presence of many mitochondria, helped the sperm to perform its function. This question was another that was answered exceptionally well by candidates, where over 90% achieved full marks. This demonstrated a sound understanding of the function of mitochondria and the role they played in providing the energy needed for the sperm to swim. Details implying some sort of movement of the sperm were common in almost all answers and very few missed out this and/or the energy mark to gain less than full marks.

Marks were lost for candidates mostly missing the energy mark in their response. Most candidates achieved at least one mark for including details about the movement of the sperm in some way.

(iii) Explain why the sperm cell has many mitochondria.

(2)

It needs to respire to move its flagellum to be motile & so it can reach egg cells

ResultsPlus
Examiner Comments

It was unfortunate that this candidate omitted to state respire to release energy as otherwise this response could have been awarded the full two marks.

ResultsPlus
Examiner Tip

It is important to know the function of all cell organelles covered in the question. These are frequently the focus of examination questions.

There were many good, two mark answers that provided clear details covering both marking points well. This question was accessible by all except the very weakest candidates.

(iii) Explain why the sperm cell has many mitochondria. (2)

Because the flagellum needs alot of energy to ~~Because the sperm needs a lot of energy~~ to move propel the sperm to the egg cell for fertilization, energy is ~~not~~ released from aerobic respiration in mitochondria.

ResultsPlus Examiner Comments

This is a strong two mark answer that gives detailed information about the function of mitochondria and its role in sperm cells.

ResultsPlus Examiner Tip

Always avoid stating that energy is produced in any exam question. This is scientifically incorrect. Instead remember to state that energy is released.

Question 3 (b)(iv)

More candidates failed to score any marks for this question than those who gained one or two marks. This was mostly due to an inability to rearrange the formula given to calculate the time taken for the sperm to reach the egg and also confusion over converting values calculated into minutes. However, as in the previous maths questions on the paper, an ecf was allocated to responses that provided evidence of a division of a given value by 60 and several candidates were awarded this. There was a high percentage of candidates that scored the full three marks for their calculations with several final answers being rounded to 43 which was perfectly acceptable.

There were few equations that were rearranged incorrectly to calculate time. Where these did occur it was often the case that candidates were awarded one mark for dividing the value from their calculation by 60 and arriving at a correct answer from this.

(iv) A sperm cell travels at a speed of 0.070 mm/s.

It travels a distance of 180 mm to fertilise an egg.

Use this equation to calculate the time it takes for the sperm to reach the egg.

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Give your answer in minutes.

(3)

time = speed X distance

0.070 X 180 = 12.6

time taken = 12.6 minutes

ResultsPlus
Examiner Comments

It was unfortunate that this candidate not only carried out an incorrect calculation but also did not divide their answer by 60 to convert the value given into minutes.

ResultsPlus
Examiner Tip

Converting values into different units are commonly found in maths questions. Usually these conversions carry extra marks.

There were many three mark answers that reflected candidates familiarity with not only rearranging equations but also in converting units. This question was accessible to candidates across the ability range.

(iv) A sperm cell travels at a speed of 0.070 mm/s.

It travels a distance of 180 mm to fertilise an egg.

Use this equation to calculate the time it takes for the sperm to reach the egg.

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Give your answer in minutes.

(3)

time = d/s = 180/0.07 = 2571.43 sec

60

= 42.8

= 43 min

time taken = 43 minutes

ResultsPlus
Examiner Comments

The response provided by this candidate was awarded full marks. It shows the correct rearrangement of the equation with the right values substituted in. It also clearly shows the division of the value arrived at by 60 and a correct final answer that the candidate has chosen to round to 43.

ResultsPlus
Examiner Tip

It is a good idea to round figures up (or down) to whole numbers or if decimals are given then to one decimal place.

Slightly more candidates obtained two marks than those obtaining one mark. The most common reason for the loss of the third mark was incorrectly converting a correct value into minutes with candidates frequently multiplying by 60 rather than dividing.

(iv) A sperm cell travels at a speed of 0.070 mm/s.

It travels a distance of 180 mm to fertilise an egg.

Use this equation to calculate the time it takes for the sperm to reach the egg.

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Give your answer in minutes.

~~0.070~~ (3)

$\text{speed} = \frac{\text{dist}}{\text{time}}$

$\text{time} = \frac{\text{dist}}{\text{speed}} = \frac{180\text{mm}}{0.070\text{mm/s}} = 2571.43$

$\times 60$

$= 154285.7$

time taken = 154285.7 minutes

ResultsPlus
Examiner Comments

This candidate was correctly able to rearrange the equation and substitute in the correct values to arrive at a right answer of 2571. However, they had lost a mark by multiplying this value by 60 to convert it to minutes.

ResultsPlus
Examiner Tip

Always display working out neatly and clearly so that any potential marks are not lost.

Question 3 (c)

Although not as successful as Q03(b)(iv) and other previous questions in this section of the paper, there were still a good number of candidates gaining full marks. In this instance however, a much greater percentage of candidates gained one mark. It was fairly rare to view responses that were not awarded at all. Answers that lost marks just didn't provide enough detailed information and were written using, in some cases, language that needed further clarity. For example, details were seen such as (the electron microscope) can zoom in more, or that it could see bigger structures. There was little reference to seeing structures in more detail and only slightly more reference to being able to see more structures. Candidates being credited with two marks most often gained these for stating that the electron microscope had greater magnification and resolution.

Some of the terminology used in responses needed further clarification and rewording was needed in some cases, using more appropriate scientific language, in order to award any marks.

(c) An electron microscope can be used to view structures in specialised cells.

Explain why an electron microscope is more useful than a light microscope to view cell structure.

(2)

can zoom in further and provides higher quality images that aren't affected by light so cell structures can be seen better

ResultsPlus
Examiner Comments

The language used by this candidate has made the details provided vague and uncreditworthy. Although it appears at some points that the candidate is almost there with an awardable answer, further clarification is needed. Describing the electron microscope as being able to zoom in more is not an acceptable alternative to greater magnification. Similarly, being able to see structures better is not a suitable alternative to being able to see structures more clearly or in greater detail.

ResultsPlus
Examiner Tip

Microscopy is a well-tested area of the specification and usually carries questions that involve calculations. Be prepared to use estimations to carry out calculations that involve determining the relative size or area of cell components seen under a microscope.

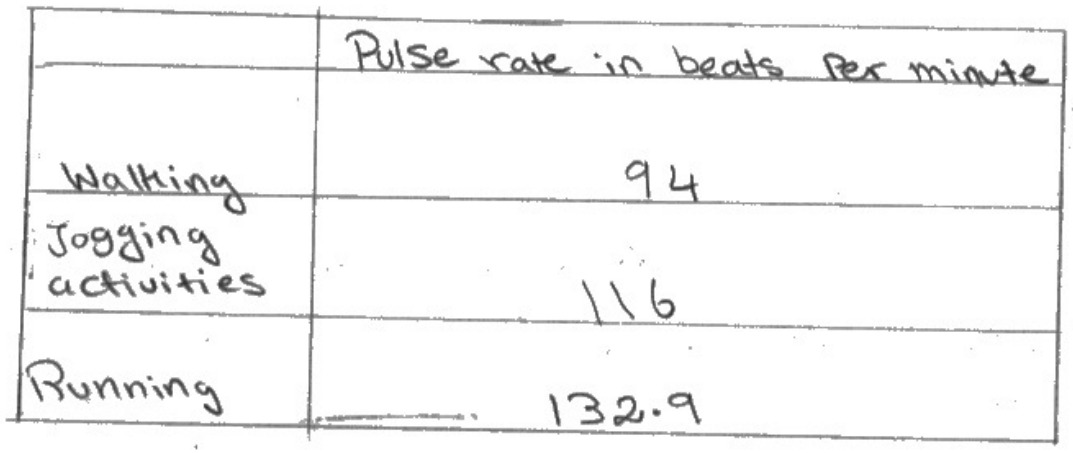
Question 4 (a)(i)

The usual errors were made in the drawings that some candidates gave for the table. Units and column headings were missed in few cases although most candidates were able to score a mark from the actual drawing itself. A few candidates attempted to draw a graph rather than a table. There were a variety of different constructions provided for the tables although the majority were clear and unambiguous allowing for clear presentation of data (needed for Q04(a)(ii)) and also for allowing most candidates to gain full marks.

The most common reason for candidates not obtaining full marks was the omission of one or more of the column headings rather than the construction of the table itself.

(i) Draw a table that the student could use to record these results.

(3)



	Pulse rate in beats per minute
Walking	94
Jogging activities	116
Running	132.9

ResultsPlus
Examiner Comments

This response was given two marks for a valid table which included the units for pulse rate. However, the candidate omitted one column heading which cost them a mark.

ResultsPlus
Examiner Tip

Always ensure that all column headings for tables are included along with any units assigned to them.

The majority of the tables were drawn clearly and included all details necessary to gain full marks. This allowed the majority of candidates to the full range of marks allocated to this question.

(i) Draw a table that the student could use to record these results.

(3)

Activity	Pulse rate in beats per minute
walking	94
jogging	116
running	133

ResultsPlus
Examiner Comments

This candidate produced a table that was typical of a three mark answer. Although many tables were not drawn in a similar style they were still adequate and were, therefore, awarded appropriately.

ResultsPlus
Examiner Tip

Tables, graphs and scientific diagrams, where appropriate, should be drawn using a ruler.

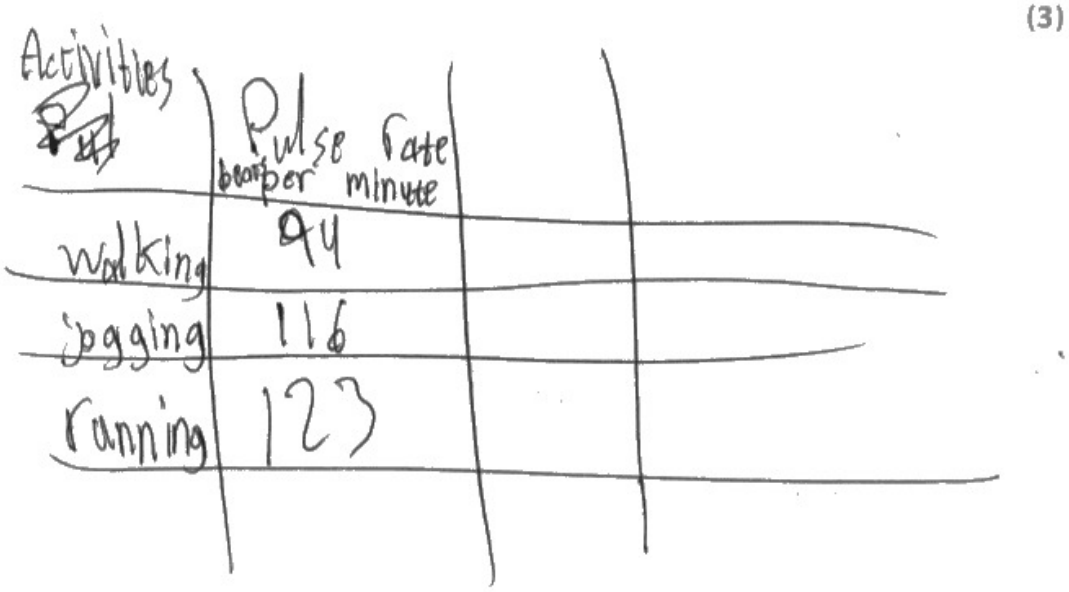
Question 4 (a)(ii)

Candidates were asked to complete the table from Q04(a)(i) with data extracted from the bar chart. Some responses reflected misinterpretation of the small increments on the axes scales and were, therefore, not able to gain full marks for their answer. There were a fair number of values entered that were way off track and it was difficult to determine how they were derived. Some candidates gave their answer to +/ – half a square for running which were acceptable. Again, however, the vast majority, nearly 85%, were able to correctly read from the bar chart and use their extracted data to complete the table for full marks.

The most common error was misreading from the bar chart. In a few cases values given were a significant distance away from the correct answer. This cost some candidates marks.

(i) Draw a table that the student could use to record these results.

(3)



(ii) Complete the table by adding the student's results.

ResultsPlus
Examiner Comments

In this case, the candidate lost a mark for inserting an incorrect value for running. The figure of 123 given was out of the tolerance range.

ResultsPlus
Examiner Tip

Read scales of bar charts and graphs carefully so that they are not misinterpreted.

Most tables were drawn appropriately so that the inserted data could be displayed clearly. This was the case with the majority of two mark answers.

(i) Draw a table that the student could use to record these results. (3)

Activity	pulse rate in beats per minute
walking	94
jogging	116
running	133

(ii) Complete the table by adding the student's results.

ResultsPlus
Examiner Comments

This was a very clearly drawn table that displayed the data from the bar chart well. The candidate was awarded two marks for this response.

Question 4 (a)(iii)

Many candidates failed to recognise the importance of taking a resting pulse and how to take it although there were far more references to the use of smart watches and other electronic devices than in other previous examination series. Other responses were vague on whether any exercise was actually carried out and some candidates, albeit few, failed to add information about taking a pulse rate after exercise. There were several decent methods given that included descriptions of monitoring heart rate although, on this occasion, these were not penalised. Despite these errors, nearly 50% of candidates managed to achieve four marks although at the other extreme double the number of candidates failed to gain any marks compared to those that were able to achieve one mark.

Only a small number of candidates achieved one mark for their answer given to this question. It was completely random what they obtained this mark for although it seemed more common for candidates to include measurement of pulse rate at some point in the response or to carry out an exercise.

(iii) **Describe a method that the student could use to obtain the results shown in the bar chart.**

(4)

Pulse rate could be obtained by a student placing finger gently on artery on wrist and counts the pulses every 20 seconds and then multiply. or student could benefit from advanced technology and use a watch that records pulse rate and check results, repeat to ensure reliability and validity.

ResultsPlus
Examiner Comments

Unfortunately this response mainly discusses how to take a pulse rate without stating strongly enough whether is it before or after exercise. Although this part of the response was very borderline it was deemed not clear enough to award a mark. The information given clearly describes how to take a pulse using a finger placed on an artery in the wrist and this gave the candidate the one mark awarded for the entire answer. Towards the end of the response repeats are given a mention although it appears that this is referring to measuring the pulse rate so no further mark was awarded here.

ResultsPlus
Examiner Tip

When writing methods for practical activities it helps to add structure and flow to answers if the response is laid out in numbered steps.

Although there were relatively few responses that did not score a mark compared to most other mark scores, the ones that were seen were indicative of a lack of familiarity with either writing a method or the practical itself.

(iii) **Describe a method that the student could use to obtain the results shown in the bar chart.**

(4)

The student could draw a circle and ~~put~~ use the equation : ~~pulse rate of~~

$$\frac{\text{pulse rate of activity}}{\text{pulse rate of total activities}} \times 360$$

to see the angle at which the sector takes place ~~that~~ then ~~it~~ the students should take a protractor ~~and~~, a ruler and a compass to draw the shape of the circle, sectors and angle of sectors. Then ~~it~~ plot the activities in its right sector on a bar chart

ResultsPlus
Examiner Comments

The response that this candidate has given implies that they have not been exposed to this practical activity previously. There was no detail given that could be awarded.

ResultsPlus
Examiner Tip

A practical method should set out clearly how to complete an activity to gain valid, reliable results. The method should, where possible, include information about variables.

Candidates working at grades 5 upwards were easily able to access the four marks given for this question. Although some responses were more lengthy than necessary they covered all the points needed to gain full credit.

(iii) Describe a method that the student could use to obtain the results shown in the bar chart.

(4)

measure pulse at rest using fingers and placing them on your wrist's pulse point. Walk for 5 for 60 seconds then walk for 5 mins and measure pulse after. Repeat this for jogging and running. Make sure to take 5 minutes break between each activity

ResultsPlus
Examiner Comments

This candidate covered four out of the five marking points in their response. Here there is discussion on how to measure resting pulse. There is also mention of undertaking an activity as well as repeating for each activity. The candidate makes a valid point about taking a break between each activity although does not state why so if this had been a further marking point it would not have been awarded.

ResultsPlus
Examiner Tip

Understand the effect that random errors can have on results collected from practical activities.

Question 4 (b)

The percentage of candidates not obtaining a mark for their response was less for this question than for Q04(a)(iii) although performance otherwise was very similar. This last question in this section of the paper asked candidates to explain the difference in pulse rate at the end of walking and running and for most part, they did this well. Less able candidates were mostly able to obtain one or two marks by providing details of increased blood flow and more oxygen or energy was needed during running whereas candidates working at higher grades were comfortably able to cover most marking points with information on muscle contraction most often omitted.

Only a few candidates gained one mark and this obtained in a variety of ways, with details picked mostly from marking points 2, 3 or 4.

(b) The pulse rates at the end of walking and running are different.

Explain this difference.

(4)

- The more effort you add the more pulse rate will increase So in the bar Chart The ~~big~~ one that has more effort which is running had the highest pulse rate and the walking had the lowest because less effort and energy is used while walking.

ResultsPlus Examiner Comments

The response provided by this candidate was awarded one mark for stating, towards the end of their answer, that less energy is needed for walking. This was the reverse argument for marking point given.

ResultsPlus Examiner Tip

As well as the effects of exercise on pulse rate, it's effect on heart rate or breathing rate or even the rate of sweat production could also be tested during an examination. Make sure you understand why all of these body processes change during exercise.

Probably the most common marking points covered for two mark responses were marking points 2, 4 or 5. Candidates of all abilities were most able to identify an increase in blood flow and more energy or oxygen was needed during running.

(b) The pulse rates at the end of walking and running are different.

Explain this difference.

(4)

Because when you're walking you aren't using lots of energy so there won't be any sweat produced from your body so your heart rate will remain normal and steady, but for running you're using lots of energy and there's more sweat being produced from your body which causes your heart beat to increase rapidly and for your pulse to increase rapidly. Because more sweat is being produced [illegible] there'll be more blood [illegible] needed to be pumped to your body which will increase the heart rate as you're heart is working faster causing your pulse rate [illegible] to also increase.

ResultsPlus
Examiner Comments

This candidate received two marks overall for this response. They have shown an understanding that less energy is needed for walking (and have also stated that more energy is used for running which is the same marking point) as well as describing how more blood needs to be pumped.

ResultsPlus
Examiner Tip

Release of energy to keep muscles working should more often than not always be linked to aerobic respiration and a greater demand for oxygen.

Responses that were credited with four marks tended to include most of the marking points shown on the mark scheme. However, many candidates failed to state that there was greater muscle contraction during more strenuous activity. This detail was regularly missed.

(b) The pulse rates at the end of walking and running are different.

Explain this difference.

(4)

As running is a more vigorous exercise than walking so muscles contract more while running and their energy demand is greater for running than walking and so their rate of aerobic respiration is greater while running than walking, so heart rate is quicker to supply oxygen to muscles more quickly for respiration and breathing rate and depth is greater while running to take in more oxygen more quickly and to remove carbon dioxide more quickly. when rate of aerobic respiration is more, more carbon dioxide is produced and its concentration in blood increases which is detected by sensors in aorta and carotid artery so they send nerve impulses to medulla which sends signals to heart pacemaker along accelerator nerve causing heart rate to increase and that is why pulse rate is greater while running since rate of aerobic respiration is greater while running than walking

(Total for Question 4 = 13 marks)

ResultsPlus
Examiner Comments

Many responses gained four marks in the first few sentences written. Here the candidate has included information about more muscle contraction, a faster rate of aerobic respiration, a greater energy demand and more oxygen in the first five lines of their lengthy response. Other marking points are also covered in the details provided as well as information that is repeated. This is a strong four mark answer and comes across well.

ResultsPlus
Examiner Tip

Remember to use the terms 'more' and 'increased' when discussing the changes in body processes during exercise or the substances required for more strenuous activity to take place. More oxygen, more energy, increased blood flow, heart rate and breathing rate and so on.

Question 5 (a)(i)

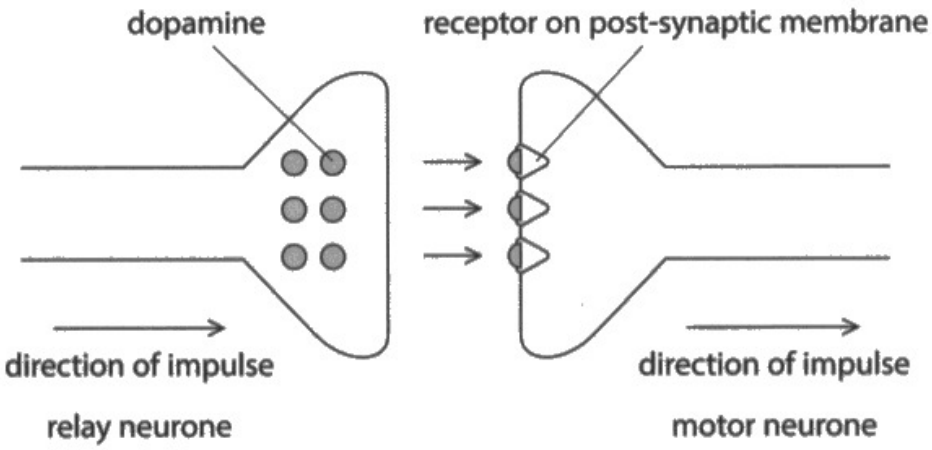
There were too many responses that stated impulses were carried across the synapse, sometimes by neurotransmitters and, surprisingly few responses that named neurotransmitters as chemicals. This left a situation where the majority of candidates received one out of the two available marks. Only the more able candidates were able to access a second mark which often included information on the chemicals binding to postsynaptic receptors. In some cases the wording of answers was weak and it was difficult to determine at times whether a response or part of a response did actually cover a marking point. This was particularly the case for marking point two where candidates had difficulty in trying to express ideas about neurones communicating.

There were many responses that referred to neurotransmitters carrying electrical impulses and marks were forfeited as a result.

5 (a) Dopamine is a neurotransmitter produced by nerve cells in the brain.

The nerve cells that produce dopamine are involved in stimulating movement and increasing heart rate.

The diagram shows how dopamine travels from a relay neurone to a motor neurone in the brain.



(i) Describe what is meant by a neurotransmitter.

(2)

Neurotransmitter is a chemical that carries electrical impulses ~~and~~ in the synapse to another neurone.

This response was not credited due the detail given by the candidate that referred to neurotransmitters carrying impulses. Although the answer touches on neurone communication the information given makes the candidates description scientifically incorrect.

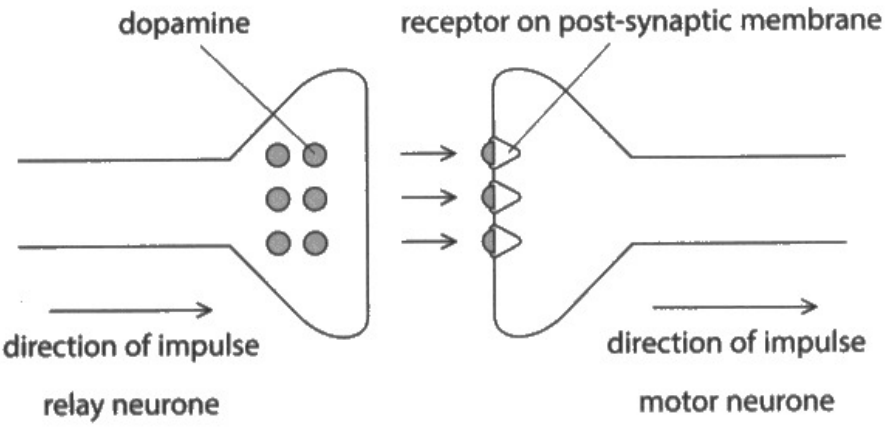
Neurotransmitters are stimulated by electrical impulses. Don't be tempted to state that they transfer or transport them in any way.

Not the best terminology was used in many responses to communicate thoughts and some answers were very borderline.

5 (a) Dopamine is a neurotransmitter produced by nerve cells in the brain.

The nerve cells that produce dopamine are involved in stimulating movement and increasing heart rate.

The diagram shows how dopamine travels from a relay neurone to a motor neurone in the brain.



(i) Describe what is meant by a neurotransmitter.

(2)

A neurotransmitter is a chemical released at the synapses of neuronal cells to transfer a ~~signal to~~ signal to another neuronal cell.

ResultsPlus
Examiner Comments

This candidate was awarded two marks first for stating that the neurotransmitter was a chemical and secondly for implying that they allow neurones to communicate. The terminology used in the response was very simple and could have been improved with the use of more scientific key words.

ResultsPlus
Examiner Tip

Remember that neurotransmitters diffuse across a synapse allowing one neurone to communicate with another.

Question 5 (a)(ii)

The percentages of candidates gaining no marks, 1 mark and two marks was almost equally distributed within the cohort. Again, there were several issues with structure and use of scientific terminology in several responses, even from candidates working at higher levels. The lack of clear and coherent structure in these responses made it a challenge at times to follow the descriptions given by the candidates. Responses from weaker candidates lacked relevant detail about the process of transmission between the relay and motor neurone lacking information about the key steps involved in this communication, such neurotransmitter diffusion and their binding to postsynaptic receptors. There was also evident misunderstandings in some answers, where similar to details given in the previous question, candidates discussed neurotransmitters transferring impulses. This was a common misconception. Each marking points cropped up in responses as frequently as each other but over 66% of candidates were not able gain both.

A fair number of responses lacked the scientific detail needed to gain two marks although one mark answers often gave information about neurotransmitters binding to receptors.

(ii) Describe how information is transmitted from the relay neurone to the motor neurone.

(2)

Nerve impulses released in vesicles, bind to neurotransmitter and travel across the synapse until they reach receptors on post-synaptic membrane and the neurotransmitter dissolve ~~inst~~ in the synapse.

ResultsPlus
Examiner Comments

This candidate lost one mark for stating that electrical impulses bind to neurotransmitters to travel across the synapse which was incorrect. However, they did gain a mark for describing their binding to receptors on the post-synaptic membrane.

ResultsPlus
Examiner Tip

Accurate information needs to be expressed clearly, and preferably in logical steps that can add clarity to longer answers to questions.

Some answers were very succinct and more coherent than others. The clear-cut information that was given made these responses more accessible and easier to award.

(ii) Describe how information is transmitted from the relay neurone to the motor neurone.

(2)

vesicles release neurotransmitters from axon terminals which diffuse across synapse to bind to receptors to generate an impulse

ResultsPlus
Examiner Comments

The detail provided in this response was clear and concise. It included correct information on how the neurotransmitter was transmitted across the synapse and it's subsequent binding to receptors. Some good terminology was made use of in this answer which obtained two marks.

ResultsPlus
Examiner Tip

When answering questions that require a lengthier answer, is it important to be concise and focussed on the key topic in the response. Try not to fill up answer lines with information that is irrelevant and will not draw marks.

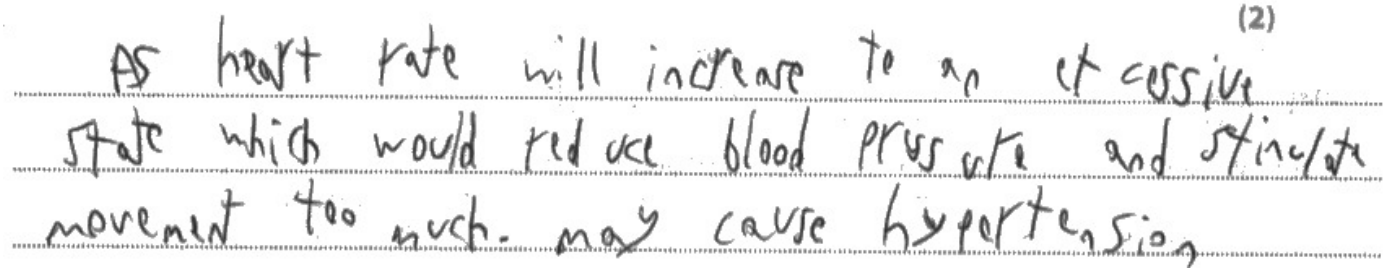
Question 5 (a)(iii)

This question asked candidates to suggest the effects of excess dopamine on bodily functions. Most candidates scored one mark where the number of candidates obtaining two marks was the least in the cohort. Two mark responses appeared mostly to glean information from the passage prior to the diagram of the synapse and included effects such as increased heart rate and movement. However, many of these candidates were able to reconstruct the wording in the passage to put details into their own words. Some answers included symptoms of Parkinson's disease so reflected some confusion. There was very little mention in responses of sleeping difficulties or anxiety and although hallucinations was given credit it infrequently came up. A very large number of candidates gave schizophrenia as an effect of excess dopamine on the body and although an excess can lead to this condition, it is not itself a bodily function so was not awarded.

Candidates scoring two marks often mentioned increased heart rate and or an increase in blood pressure which covered the same marking point. The second mark was generally gained for including information on increased movement. Little mention was made of more energy.

(iii) Suggest how an excess of dopamine will affect bodily functions.

(2)



ResultsPlus Examiner Comments

This candidate received two marks for their response by including an increase in heart rate and movement in the details they gave. The information that the candidate has given on blood pressure is contradictory and would not have been awarded if the mark for increased blood pressure had not been gained.

ResultsPlus Examiner Tip

Questions structured in this way almost demand that a list of effects should be given. Be sure to understand that the two marks allocated to the question mean that two points should be made, or in this case two effects.

The majority of candidates scored one mark by suggesting that an effect of excess dopamine on bodily functions was an increased heart rate.

(iii) Suggest how an excess of dopamine will affect bodily functions.

(2)

~~Acces~~ Excess of dopamine can abnormdly increase heart rate and cause Heart diseases.

ResultsPlus
Examiner Comments

The only mark obtained by this candidate was for an increase in blood pressure. No credit was given for heart disease.

ResultsPlus
Examiner Tip

A lot of information can be obtained to help answer questions from the written information and/or diagrams provided with the question.

Question 5 (b)(i)

Some candidates were confused between the symptoms of Parkinson's disease and the effects of excess dopamine on the body. However, this question, asking candidates to give two symptoms of Parkinson's disease was answered better than Q05(a)(iii) by more candidates who were award two marks for their answer. There were also far less responses gaining zero marks compared to the previous question. Answers from candidates covered the range of marking points shown in the mark scheme and there appeared to be no particular popularity for any of these. Generally a well-answered question that allowed a good range of abilities within the cohort to demonstrate understanding.

Correct information included in responses was completely random but all details given on the mark scheme was covered at one point or another during this examination series.

(b) In 2017 in the United Kingdom, 145 000 people were diagnosed with Parkinson's disease.

This figure is expected to have an 18% increase by 2025.

(i) Give two symptoms of Parkinson's disease.

(2)

1 slower movement

2 Poor posture

ResultsPlus
Examiner Comments

This was clear-cut two mark response where the candidate chose slower movement and poor posture to complete their answer.

ResultsPlus
Examiner Tip

Responses that are straight to the point and avoid using unnecessary detail are far more beneficial to the candidate and the examiner. For the candidate because they are able to demonstrate understanding effectively and for the examiner because it facilitates the task of assessing knowledge accurately and fairly

Nearly 40% of candidates gained one mark for their responses to this question. Details given for the mark lost, however, were not so far from being corrected with some educated detail given.

(b) In 2017 in the United Kingdom, 145 000 people were diagnosed with Parkinson's disease.

This figure is expected to have an 18% increase by 2025.

(i) Give two symptoms of Parkinson's disease.

(2)

1 Shaky hands

2 ~~Strange beha~~ Mood ~~changes~~ Fa Mood changes

ResultsPlus
Examiner Comments

Mood changes was not a symptom of Parkinson's disease given in the mark scheme. More specific detail was necessary for this candidate to gain a further mark such as anxiety or depression. One mark was credited for this candidate stating that shaky hands was a symptom of the disease.

ResultsPlus
Examiner Tip

Vague responses could cause you to spend more time rephrasing or clarifying points made. This could limit that the time that you have left to answer other questions in an examination paper.

Question 5 (b)(ii)

Candidates performed particularly well on this calculation that asked them to calculate the number of people expected to be diagnosed with Parkinson's disease. Candidates were expected to extract data from the previous question and use the figures in not such a straightforward percentage calculation to arrive at a value of 171 100. As with previous calculations on the paper, candidate responses were again awarded an ecf if an incorrect value was obtained for the first part of the calculation but then this value was added to 145 000. Arriving at a correct final to their answer for their calculation awarded candidates one mark. This score was obtained by less than 5% of candidates with one of the reasons being that the vast majority gained full marks.

Although there were more responses that were awarded zero marks for incorrect calculations that did not include the addition of 145 000, there were still relatively few. Candidates scoring zero tended to use random figures in calculations that did not make very much sense.

(ii) Calculate the number of people expected to be diagnosed with Parkinson's disease in 2025.

(2)

100 − 18 = 82

145 000 ÷ 0.82 = 176 829.2

number of people = 176 829

ResultsPlus
Examiner Comments

Even though this response shows the use of 145 000 in a calculation, it has been used in the wrong way so could be awarded the ecf mark. This candidate was unable to score any marks for this response.

ResultsPlus
Examiner Tip

The values needed to carry out and complete calculations in an examination are usually given in the question. It is these values that need to be used in any mathematical steps taken to arrive at the correct answer.

For this question the working out was mostly laid out well clearly showing the steps taken to complete the calculation successfully.

(ii) Calculate the number of people expected to be diagnosed with Parkinson's disease in 2025.

(2)

~~145000 = 100%~~
~~x = 118%~~

145000 = 100%

1% = $\frac{145000}{100}$ = 1450

118% = 1450 x 118 = 171100

number of people = 171100

ResultsPlus
Examiner Comments

Although the candidates method of working is dissimilar to that shown in the mark scheme, it still led to the correct final answer for two marks.

ResultsPlus
Examiner Tip

Examiners will first look on the answer line for the correct answer to a calculation. Make sure it is clearly written on the line provided so that it is not overlooked or confused with other information given in the working out.

Some responses did not gain one mark due to an ecf being awarded. Candidates demonstrated a variety of different ways to work out answers and, even if the final answer was wrong, correct details given in the working were recognised.

(ii) Calculate the number of people expected to be diagnosed with Parkinson's disease in 2025.

(2)

$\frac{18}{100} \times 145000$

$= 26100$

number of people = 26100

ResultsPlus
Examiner Comments

This candidate has carried an initial calculation that differs slightly from the one shown in the mark scheme. However, their working is still correct and have given a value of 26 100 which is the first marking points. Unfortunately they failed to then take the calculation a step further and add this value to 145 000 to gain a second mark.

ResultsPlus
Examiner Tip

If units for a final answer are not given next to an answer line then you will be expected to provide them. Failing to do this will cost you a mark.

Question 6 (a)

The marks awarded to candidate responses were distributed fairly uniformly between one and two. There much fewer answers that were awarded zero marks. Most often candidates omitted to include details of the sperm and egg fusing at conception although many recognised that fertilisation took place for one mark. The quality of two mark answers varied greatly with some including key terms that reflected sound knowledge. Others preferred to write in more simple language although enough detail was given to credit them with full marks.

One mark answers tended to name fertilisation as the process occurring at conception although no further, creditable information was given.

6 Read the passage below.

Use the information in the passage and your own knowledge to answer the questions that follow.

Pregnancy begins with the formation of a zygote. This stage is known as conception. The zygote develops into an embryo. By day five the embryo is transformed into a blastocyst, a hollow ball of about 100 genetically identical cells. These cells have not yet differentiated and they can provide a source of embryonic stem cells for use in medical research. Embryos produced following IVF treatment can be used as a source of embryonic stem cells.

In the second week following conception, the blastocyst begins the process of implantation and releases a hormone, called hCG. This hormone maintains the corpus luteum, a structure formed in the ovary following ovulation. After implantation the amniotic sac forms, which is where the blastocyst and later the fetus develop.

In the fourth and fifth week after conception, the umbilical cord forms. This connects the embryo to the placenta by week eight. The placenta is not fully developed until week ten when it begins to produce progesterone and oestrogen. All organ systems are present at this time in pregnancy.

Fetal development begins at about month four and it is possible to distinguish males from females at this time. In males the testes, which develop in the abdominal cavity, release testosterone. Female characteristics are produced in the fetus if testosterone is not released at the stage.

Hormones are important in starting labour and the birth process, about nine months after conception. The cervix dilates, with the head of the baby pushing against the cervix to help the process of dilation. Once the child is born and breathing normally, the umbilical cord is tied and cut, separating the child from the placenta.

(a) Describe the process that occurs at conception. (lines 1 and 2) **(2)**

7th fertilization of egg, becomes a zygote, which divides mitosisly to become an embryo

ResultsPlus
Examiner Comments

The response provided by this candidate gained one mark for naming fertilisation. The remainder of the response contained no further relevant information.

ResultsPlus
Examiner Tip

Remember that at conception fertilisation occurs where two haploid gametes, the sperm and the egg, fuse to become a diploid zygote.

Candidates tended to word their answer in different ways for two mark responses. Some were very simply written and others made good use of scientific terminology to describe the process that occurred at conception.

6 Read the passage below.

Use the information in the passage and your own knowledge to answer the questions that follow.

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(a) Describe the process that occurs at conception. (lines 1 and 2)

(2)

is the fertilization of egg cell by sperm, when the sperm head fuses with the zona pellucida of the egg cell.

ResultsPlus
Examiner Comments

This two mark response was provided by a more able candidate who was able to correctly use scientific terms to describe the process occurring at conception.

ResultsPlus
Examiner Tip

Comprehension questions that those that are based on a passage of information. Avoid repeating information directly from the passage in answers as this is highly unlikely to score any marks.

Question 6 (b)

This question was answered well by a good number of candidates who were able to make sound conclusions from the information given in the passage about how a blastocyst was formed. Many identified mitosis as the type of cell division that took place and gave detailed responses on the stages involved. Many also recalled the names of the stages. Marks were also often given to candidates working at lower grades for identifying that cell division took place or that the zygote divides without necessarily mentioning mitosis. Some of these responses also attempted to give a description of the events of mitosis although the work presented lacked detail and minimal further marks were achieved. The mark most commonly awarded to answers was four with over six times more candidates obtaining this score as those that obtained a mark of three.

Lower scoring candidates made a good attempt at answering this question with very few, if any, answer lines being left blank. Mitosis and cell division were the two points in responses that were credited most frequently.

(b) Describe the process that forms a blastocyst. (lines 2 to 4)

(4)

After fertilization occurs a zygote is formed which divides by mitosis into an embro which keeps diving by actively dividing cells by mitosis ~~ethics~~ forming a ball of actively dividing cells called a blastocyst

zygote is swept by ciliated cells in the Fallopian tube

ResultsPlus
Examiner Comments

This candidate showed some understanding in how a blastocyst was formed detailing mitosis and cell division for two marks.

ResultsPlus
Examiner Tip

It helps to make up acronyms for the stages found in a process such as mitosis. The stages of mitosis in order can be represented by PMAT. Remember short acronyms like this can help to jog memories of the events that occur at each stage.

Very few candidates scored three marks and the number that did was surprisingly low compared to the number of candidates gaining more or less marks. Candidates that were credited with three marks sometimes just took pickings from the mark scheme to put together information that was sometimes not as clearly expressed as those produced by candidates scoring less marks.

(b) Describe the process that forms a blastocyst. (lines 2 to 4)

(4)

the embryo divides by mitosis to produce daughter cells that are genetically identical after copying DNA and diploid and keeps dividing until 100 cells that are identical are produced during this time some stem cells specialize into extra embryonic stem cells on the outer surface which form the placenta and umbilical cord and embryonic stem cells which can form body parts of the foetus as stem cells are unspecialised cells with the capacity to actively divide and renew their selfs while also having the ability to specialise. so cells go from totipotent cells to pluripotent cell limiting their choices of specialising

ResultsPlus
Examiner Comments

This answer claimed three marking points in the first two lines of the information provided. The candidate mentioned cell division in the correct context, mitosis and DNA replication. The remainder of the response provided irrelevant detail that did not answer the question.

ResultsPlus
Examiner Tip

For examination questions that require extended writing always remember to use the extra lined paper given at the back of the exam paper if you need to further space to complete your answer.

Much detail was put into most four mark answers that covered all marking points. Most responses were logically and coherently laid out, easy to read and most easy to award.

(b) Describe the process that forms a blastocyst. (lines 2 to 4)

(4)

The zygote (diploid) formed by the fusing of two sex cells (haploid) ~~produce~~ starts dividing (mitosis). ~~The chromosomes line up at the equator of the cell (prophase~~ The DNA is copied producing an indentical copy (prophase). Chromosomes in the cell lineup at the equator (metaphase) and spindle fibres occur (during metaphase). Spindle fibres then go towards the centrioles of the lined up chromosomes and pull them away (anaphase). Chromosomes ared at separate ends and cytokynesis starts (cytoplasm is divided) (telophase) - 2 daughter cells are produced (identical). Cells keep dividing until a blastocyst is formed.

ResultsPlus
Examiner Comments

The response obtained four marks. Many points are included in this detailed description of mitosis, including the names of the stages which in this case was not awarded as marks were awarded elsewhere. All five marking points could be found in this response.

ResultsPlus
Examiner Tip

It is important that you are able to recognise and identify the stages of mitosis from diagrams as questions are sometimes based on diagrams in examinations.

Question 6 (d)

Candidates did well to read the passage carefully to gain some understanding of the corpus luteum and its role in progesterone production in the early stages of pregnancy. Although there were many candidates that gained zero marks for their answer some excellent responses were seen that indicated a sound understanding of processes not often tested in examinations. One mark answers were far less common than either zero or two mark answers. These often omitted information on either the production of progesterone or its role in maintaining the uterus lining. It was unfortunate that some answers mentioned uterus wall instead of lining. These were not given credit.

There were several responses that failed to score for this question and named hormones other than progesterone were mentioned along with incorrect details of the function.

(d) Explain why it is important that hCG maintains the corpus luteum. (lines 7 to 9)

(2)

It is important that hCG maintains the corpus luteum so that it releases the hormones necessary for women during pregnancy i.e. estrogen, and to maintain the vaginal living.

ResultsPlus
Examiner Comments

This candidate was unable to gain credit for the information given in their answer. Only oestrogen has been mentioned and the candidate has incorrectly referred to hormones maintaining the vaginal lining rather than the uterus lining.

ResultsPlus
Examiner Tip

The menstrual cycle hormones and the hormones involved in pregnancy are common topics tested in examinations. Drawing diagrams to show their interaction with each may help to retain and refresh knowledge.

It was little challenge for more able candidates to obtain two marks. Both the role of the corpus luteum and progesterone were explained clearly in most cases.

(d) Explain why it is important that hCG maintains the corpus luteum. (lines 7 to 9)

(2)

The corpus luteum is the main source of progesterone, it is used up until the formation of the placenta. Progesterone maintains the thickness of the uterine lining

ResultsPlus
Examiner Comments

This candidate has correctly identified that the corpus luteum produces progesterone to maintain the lining of the uterus for two marks. Although the information about the placenta is correct this was surplus information that would not have gained a mark had the candidate not given the two other correct responses from the mark scheme.

ResultsPlus
Examiner Tip

Graphs showing the hormonal changes during the menstrual cycle and pregnancy often appear in exams. Graphs give an alternative, visual representation of the interaction of different hormones and this may help with understanding or during revision.

In several cases, the way that one mark responses were written implied lack of understanding and knowledge in this topic area. Awarding of a mark was sometimes a 'benefit of the doubt' decision.

(d) Explain why it is important that hCG maintains the corpus luteum. (lines 7 to 9)

(2)

The corpus luteum is for maintain the progesterone, if fertilisation occurs, the progesterone is keeped release to inhibit the FSH & LH release, if the fertilisation is not occured, the ~~ovum~~ corpus luteum has to stop the progesterone, the ovum has to remove out with the lining of uterus.

ResultsPlus
Examiner Comments

This one mark response lacks some coherence and clarity but the candidate has managed to loosely link the corpus luteum to progesterone production.

ResultsPlus
Examiner Tip

You will also need an understanding of the role that progesterone plays in preventing pregnancy rather than maintaining it. Contraception is another frequently tested topic.

Question 6 (e)

There were very few responses seen that failed to obtain full marks for question. Again, information had to be derived from the passage to answer the question and candidates came across fluently in both their description and understanding of the role of the umbilical cord. The few candidates that did not achieve two marks often named the placenta as an alternative to the umbilical cord and omitted one of the remaining two marking points from their answer.

Approximately 15% of candidates scored one mark and this was mostly for identifying the establishment of the umbilical cord in the fourth and fifth week of the after conception. Many of these responses lacked structure and some included information irrelevant to the question.

(e) Explain the importance of the development that takes place in the fourth and fifth week after conception. (lines 12 and 13)

(2)

The umbilical chord forms so that the ~~baby~~ fetus is stable and connected to the mother ~~until the~~ so that the placenta could form for nutrient exchange to take place.

ResultsPlus
Examiner Comments

This candidate has used the passage to identify the formation of the umbilical cord and although they have mentioned nutrient exchange later in their answer this information has been linked to the placenta. This response obtained one mark.

ResultsPlus
Examiner Tip

Examination questions may sometimes ask to distinguish between the role of the placenta and the role of the umbilical cord in pregnancy. It is worth having a sound understanding of each.

It was the case where some two mark answers were difficult to read, from a presentation perspective and also due to the illogical way that some responses were written. Answers with better structure but gaining less marks were often seen.

(e) Explain the importance of the development that takes place in the fourth and fifth week after conception. (lines 12 and 13)

(2)

as umbilical cord develops it connects placenta to fetus so allow exchange of O_2 and nutrients, for aerobic respiration to release energy for growth from mother to fetus in vein and removal of waste like urea from fetus to mother in umbilical artery

ResultsPlus
Examiner Comments

This candidate has detailed the role of the umbilical cord and although the response is rather obscure in places it covers all three marking points.

ResultsPlus
Examiner Tip

Think about how to approach your answer carefully before writing it down on the exam paper. This can help to avoid crossing out and other mistakes that can obscure parts of an answer and make it difficult to read.

Question 6 (f)

Many candidates omitted crucial information to this question which asked them to suggest the role of testosterone in the development of the fetus. Although the vast majority of candidates were aware that this hormone controlled human characteristics in some way, many failed to specify whether they were male or female characteristics but most importantly what type of characteristics. This was such a simple omission in so many answers but it resulted in well over two thirds of candidates receiving zero marks. Candidates should be well aware that testosterone causes the development of the male sexual characteristics and could easily have applied this knowledge to their answer to gain one mark.

Performance by candidates was disappointing at all ability ranges. Candidates very often failed to refer to the male sexual characteristics and this cost them the mark.

(f) Suggest the role of testosterone in the development of the fetus. (lines 17 to 19)

(1)

Produces male characteristics -

ResultsPlus
Examiner Comments

This response is very typical of what seen particularly frequently with the cohort. This candidate did not obtain a mark as he omitted to state male sexual characteristics.

ResultsPlus
Examiner Tip

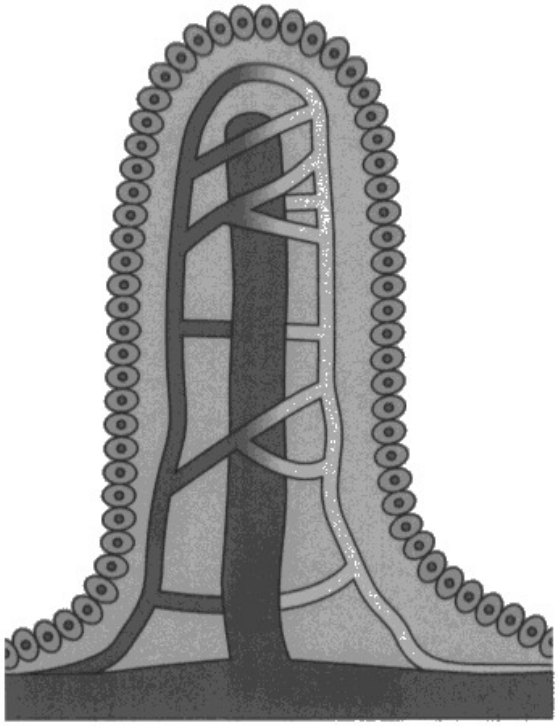
The production of the hormones oestrogen and progesterone cause the development of the female and male secondary sexual characteristics. You may be asked to give examples of these in examinations.

Question 7 (a)

There were some candidates that were unable to link features of the villus to their function and this was required for any of the marking points to be awarded. Again the marks awarded were almost equally distributed in the zero to four mark range with little evidence of one group of candidates outperforming or underperforming another. Marks were not credited to responses that stated that the villus was one cell thick or that it had a cell wall that was one cell thick or simply that it is one cell thick. This was a relatively common mistake that candidates made at the expense of a mark. Several candidates were unable to describe clearly how the close network of blood vessels aided nutrient absorption although there were some better responses that did describe how the blood vessels maintained a gradient. The presence of lacteals was not often included in details given but where they were a mark was always awarded. Similarly, when microvilli were included in the response it was almost always linked to larger surface area and, therefore, candidates inevitably gained a mark.

Candidates often talked about the villus have a large surface area to volume ratio and linked this often to the presence of villi. Although this was strictly incorrect use of terminology a generous mark was awarded in this case.

7 The diagram shows a villus in the small intestine of the digestive system.



(a) Explain how the villus is adapted to its function in the digestive system.

(3)

The villus ~~has~~ have a ~~huge~~ large surface area to volume ratio which increases the rate of diffusion and provides a short diffusion pathway, this result to a quick/more efficient exchange of minerals/nutrients or substances.

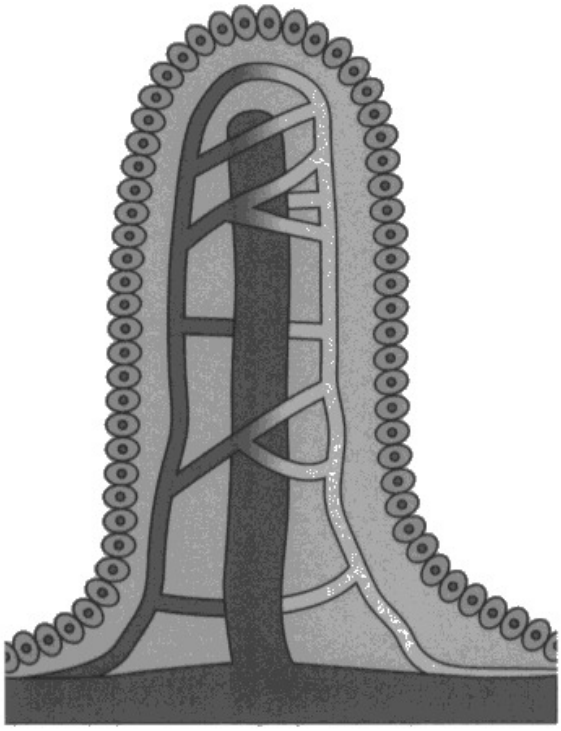
ResultsPlus
Examiner Comments

The candidate refers to large surface area to volume ratio in this response but has failed to link this to microvilli. They have also included details that refer to a short diffusion pathway but, again, there is no link to an adaptation. The remainder of the response also does not include any relevant points so this answer failed to score.

In answering examination questions that ask about how structures are adapted for a particular function it is important to identify a feature and describe how that feature helps the structure to carry out the job it is supposed to do.

It was common for candidates to refer to the villus as being 'one cell thick' or that it's 'cell wall is one cell thick'. This is poor use of language that could prevent candidates achieving a mark. In this case, 'the villus is one cell thick' was a generous mark and awarded.

7 The diagram shows a villus in the small intestine of the digestive system.



(a) Explain how the villus is adapted to its function in the digestive system.

(3)

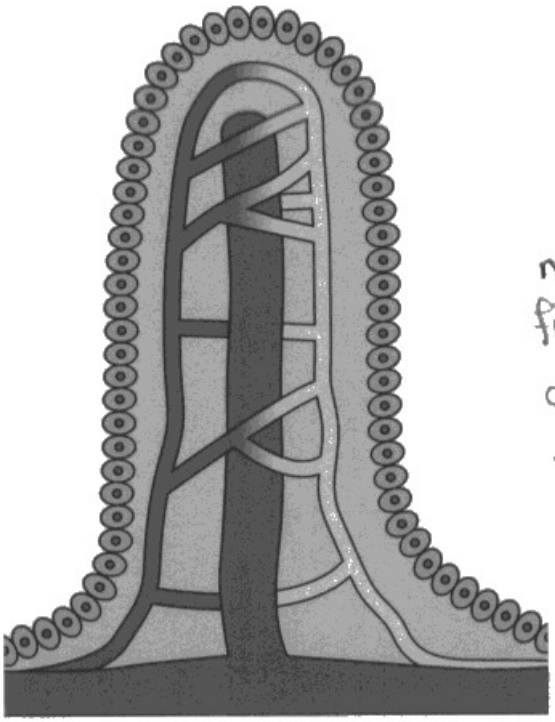
Villus have high surface area because it is covered with microvilli on the surface for greater surface area. villus is one cell thick for short diffusion distance villus is rich in blood supply for a steep concentration gradient to be maintained for faster and more effecient absorption.

This three mark response links three adaptations of the villus to their function. Despite the candidate stating that the villus is one cell thick this was allowed although candidates need to be encouraged to structure their wording more appropriately. The candidate has linked this feature to its correct function. They have also stated that microvilli give a greater surface area and that it has a rich blood supply for steep concentration gradient.

It is much better to state that the villus has a wall that is one cell thick rather than alternatives such as 'the villus is one cell thick'. Never state the 'cell wall of the villus is one cell thick' as only plant cells have cell walls.

The content of one mark answers varied greatly although lacteals were rarely mentioned here. Instead the candidates would gain a mark most commonly from either including details on microvilli or the thickness of the wall of the villus.

7 The diagram shows a villus in the small intestine of the digestive system.



muscle fibres once cell thick.

(a) Explain how the villus is adapted to its function in the digestive system.

(3)

The epithial lining of the villus is one-cell thick this reduces the diffusion distance, products of digestion can easily enter the capillaries. Each villus contain muscle fibres that ~~keep~~ contract to keep the keep the villus in constant motion with the gut contents. ~~They~~ Villus contains many mitochondria that provides energy for the active transport of some substances.

ResultsPlus
Examiner Comments

This candidate gave a very nice introduction which was well-worded and gained one mark. They discuss how the epithelial lining is one cell thick and link this to a decreased diffusion distance. The remainder of the response, unfortunately, contained no further creditable detail.

ResultsPlus
Examiner Tip

For questions that are based on describing or explaining how a structure is adapted to carry out its function make a note of the number of marks available. This will tell you how many adaptations you need to include in an answer but they must be linked details on how the adaptation helps the structure to carry out its function for the mark.

Question 7 (b)(i)

Very few candidates were able to link their prior learning on transplants and rejection to this question. Nearly two thirds of candidates failed to score a mark. Candidates failed to realise that the immune system responds to non-self or foreign antigens and that antibodies will bind to these antigens even though are found on a person's own body cells. This, unfortunately, cost many candidates two marks as they were unable to obtain marking points 1 and 3. More popular was marking point 2 where candidates demonstrated good understanding of the action of white blood cells and approximately a quarter of candidates gained this mark. There were several responses that discussed the process of phagocytosis and also candidates that included a statement about white blood cells without linking this to the production of antibodies. Similarly, some responses stated that antibodies were produced but failed to state by what.

Candidates working at lower grades inevitably failed to score at all although the vast majority attempted an answer.

(b) (i) Coeliac disease is an autoimmune disease.

The immune system of people with coeliac disease attacks the body's own tissue and damages the lining of the small intestine.

Describe how the immune system of people with coeliac disease damages the lining of the small intestine.

(2)

The coeliac disease is harmful to the body since it damages tissues and the lining of the small intestine

ResultsPlus
Examiner Comments

This response is just a repeat of the question and failed to achieve a mark.

ResultsPlus
Examiner Tip

In exams, no marks will be awarded if the answer just repeats the question.

There were several answers that were based on the immune system recognising cells as foreign rather than focussing on antigens. These were generally borderline responses and as not strictly scientifically correct, were not awarded.

(b) (i) Coeliac disease is an autoimmune disease.

The immune system of people with coeliac disease attacks the body's own tissue and damages the lining of the small intestine.

Describe how the immune system of people with coeliac disease damages the lining of the small intestine.

(2)

the lymphocytes and phagocytes will view cells of lining of small intestine as foreign so they will attack them and destroy them by lymphocyte producing antibodies or by phagocytosis.

ResultsPlus
Examiner Comments

This candidate has some idea of autoimmunity although has not included details of foreign or non-self antigens in their answer. Consequently they were not awarded marking point 1. However, there is a description of lymphocytes producing antibodies so overall this response gained one mark.

ResultsPlus
Examiner Tip

The immune system reacts to foreign antigens, not whole cells. It would be worthwhile to remember that this is the case for autoimmune diseases and transplant organs.

Responses that gained full marks were rare but when they did appear it was usually the case that the information they contained included correct details about non-self antigens and the production of antibodies by white blood cells.

(b) (i) Coeliac disease is an autoimmune disease.

The immune system of people with coeliac disease attacks the body's own tissue and damages the lining of the small intestine.

Describe how the immune system of people with coeliac disease damages the lining of the small intestine.

(2)

Immune System recognizes the ~~antigen~~ antigens on the cells in the lining of small intestine as foreign so it produces antibodies that bind to the antigen and kill the cells

ResultsPlus
Examiner Comments

This response received two marks and is very well structured. It clearly states that the immune system responds to foreign antigens for one mark. For the second mark it describes the action of the antibodies as binding to the (non-self) antigens.

ResultsPlus
Examiner Tip

The immune system treats autoimmune diseases in the same way as organ transplants. Make sure you can give at least two advantages and at least two disadvantages of organ transplants in an exam.

Question 7 (b)(ii)

Candidate performance on this question was significantly better than on the previous question with nearly 70% of candidates gaining at least two marks. Candidates were able to apply their understanding of digestion and absorption to give a good explanation on how nutrient absorption was disrupted in people with coeliac disease. Many responses included details about how damaged villi would decrease the rate of absorption and some candidates also recognised that damaged villi would lead to a decreased surface area. Less able candidates tended to base their answer around marking point three and described how the absorption of nutrients would slow down.

Candidates gaining one mark would often discuss how the rate of nutrient absorption would be affected by coeliac disease although there were responses in this category that, as an alternative, would state that there were less villi or that villi were damaged/lost.

(ii) Explain how coeliac disease affects the absorption of nutrients in the small intestine.

(3)

~~cote~~ Coeliac disease reduces amount of nutrients absorbed in small intestine as nutrients are excreted in diarrhea and less nutrients absorbed and causes unbalanced diet and deficiencies.

this Lowers water potential and water leaves by Osmosis.

ResultsPlus
Examiner Comments

This response was awarded one mark for correctly describing the effect of coeliac disease on the rate of nutrient absorption.

ResultsPlus
Examiner Tip

In an exam, always discuss the role of the villi and microvilli in increasing the surface area of the small intestine. If the villi are damaged, the surface area will decrease.

There were a number of strong three mark answers that clearly described the effect of coeliac disease on nutrient absorption using well-structured sentences. Most of these answers reflected a sound understanding of the topic being tested.

(ii) Explain how coeliac disease affects the absorption of nutrients in the small intestine.

(3)

Coeliac disease destroys microvilli and villi which flattens the small intestine. This decreases effective surface area, which ~~dec~~ decreases the rate of ~~diffusion of~~ absorption of nutrients.

ResultsPlus
Examiner Comments

This response was very concise and well-written. The candidate states how the destroyed villi reduce the surface area of the small intestine for two marks and then continues to provide details on how nutrient absorption would be reduced for a third mark.

ResultsPlus
Examiner Tip

Many enzymes are produced in the wall of the small intestine. It might be worth considering what effect diseases of the small intestine might have on nutrient absorption.

Responses obtaining one or two marks often missed out information on how the surface area of the small intestine was affected by coeliac disease.

(ii) Explain how coeliac disease affects the absorption of nutrients in the small intestine.

(3)

Coeliac disease destroys the lining of small intestine so no villi or micro villi structures for absorption of nutrients in small intestine as nutrients will not be able to diffuse from the structures in the lining to the blood.

ResultsPlus
Examiner Comments

Here the candidate has discussed the effect of no villi reduces the rate of nutrient absorption in the intestine for two marks.

Question 8 (a)(i)

Candidates working at grade 4 and above did particularly well on this question although candidates across the ability range displayed knowledge in distinct aspects of this topic. Although there were candidates that were unable to receive a mark for their response the vast majority gained at least one mark. Candidates were confident in discussing virus structures and mention of a protein coat or capsid was a common theme running throughout most answers. In addition to this many candidates were aware that the virus contained genetic material or DNA. RNA was very infrequently included in the information given by candidates. Of the responses that were awarded zero marks there was some confusion between the structure of a virus and the structure of a bacterium. Some candidates stated that viruses contained plasmids or a cell wall.

There was confusion between the structure of a virus and the structure of a bacterium in some responses. Several candidates stated that viruses contained a cell wall or a plasmid.

8 (a) (i) Describe the structure of a virus.

(2)

A virus has a plasmid (containing it's DNA) and a flagellum or cilia for movement.

ResultsPlus
Examiner Comments

This response failed to gain a mark. Although the candidate has mentioned DNA in their answer they have stated that this is in the plasmid which was not awarded. This candidate has clearly confused a virus with a bacterium.

ResultsPlus
Examiner Tip

In exams, you could be asked a question that compares the structure of a virus and a bacterium. To help learn this information you could draw labelled diagrams to compare the two structures.

There was very little mention of the virus having protein spikes on its outer surface. Two mark answers revolved around the first two marking points in the mark scheme.

8 (a) (i) Describe the structure of a virus.

(2)

genetic material (can either be RNA or DNA) that is surrounded by a protein coat called capsid, it might have a bilipid envelope as well. has viral attachment particles.

ResultsPlus
Examiner Comments

This was a typical two mark response where most candidates stated that the virus contained genetic material surrounded by a protein coat. This gained marking points 1 and 2. This is a particularly good response that makes excellent use of scientific terminology.

ResultsPlus
Examiner Tip

In exams you will be expected to know some diseases caused by viruses and how they are transferred from person to person. You could make up a table naming the different viruses, the disease that each cause and their mode of transmission.

It was not often that candidates described a virus as containing RNA rather than DNA or genetic material. Most responses focussed on the latter for the first marking point.

8 (a) (i) Describe the structure of a virus.

(2)

It is smaller than a cell and has a single strand of RNA with a cell membrane.

ResultsPlus
Examiner Comments

This candidate gained one mark for stating that the virus contained RNA.

Question 8 (a)(ii)

This was a challenging question for candidates and a range of scores was seen across the cohort. Just under a third of candidates received a top score whereas well over a quarter failed to gain a mark. Some candidates were very careless in their description of transcription and translation and sometimes the two were muddled. Although many key scientific terms were used, they were often in the wrong context implying some lack of understanding in their meaning. Although this question focussed on protein synthesis, many candidates took the time to give details on how the virus enters the cell, injects it's genetic material and other information that describe processes that take place prior to mark-yielding events of protein synthesis. There was confusion about how translation took place at the ribosomes in particular, with some candidates providing disordered details and confused information on the linkage between this process and amino acid assembly. A few candidates stated that fRNA makes amino acids and others gave incomprehensible detail about anticodons and/or codons. There were, however, some excellent answers that were set out in a clear manner, were easy to read, used key terms appropriately and included concise and accurate information.

The percentage of candidates gaining one mark was one of the lowest. Attempts were made at describing protein synthesis and most often the mark gained was from making reference to amino acids joining to form proteins. However, responses in general had little structure and there tended to be scientific errors that confused the overall response.

(ii) Viruses attach to cells of various body tissues.

The virus uses the host cell's genetic material to produce new viral proteins.

Describe how the host cell carries out protein synthesis to produce new viral proteins.

(5)

RNA sequences move to the ribosomes of the host cell. The sequences include amino acids arranged such to produce viral proteins. Each amino acid is coded for by 3 codons which is a base on the RNA sequence. The ribosomes include synthesis proteins which respond to ~~particular~~ amino acids to synthesise specific proteins. Protein synthesis ends on an end ~~protein~~, and the protein as a whole is complete.

which have anticodons

complementary

amino acid

ResultsPlus
Examiner Comments

This candidate gained one mark for stating that amino acids are arranged to produce viral proteins. Little sense can be made of the remainder of the response so no further marks could be awarded.

ResultsPlus
Examiner Tip

Questions sometimes appear in exams that ask for a comparison between the structure of DNA and RNA. There are distinct similarities and differences that you need to know.

There were a fair number of candidates that failed to score any marks. Although the vast majority of candidates attempted to answer the question the information given was, more often than not, irrelevant and relayed very little understanding of the topic.

(ii) Viruses attach to cells of various body tissues.

The virus uses the host cell's genetic material to produce new viral proteins.

Describe how the host cell carries out protein synthesis to produce new viral proteins.

(5)

The host cell contains of multiple genes and has a specific role which is to carry out protein synthesis to produce more new viruses that is infectious. The host cell has genes which can help in fertilising other new viral proteins, The host cell's also consists of pathogens that can be harmful and transfered to another virus.

ResultsPlus
Examiner Comments

This candidate has made an attempt at answering the question but the response is incoherent and shows no knowledge in this specification area. No marks were awarded for this response.

ResultsPlus
Examiner Tip

Sometimes it is worth remembering key words in a process. For example, mRNA, tRNA, transcription and translation would be key words used in protein synthesis. Just stating key words in extended writing can gain a mark.

It was interesting that some of the stronger candidates managed to give good descriptions of protein synthesis but then missed out some key terminology. Four and five mark responses tended to include terms such as transcription and translation accompanied by written detail that clearly described these events.

(ii) **Viruses attach to cells of various body tissues.**

The virus uses the host cell's genetic material to produce new viral proteins.

Describe how the host cell carries out protein synthesis to produce new viral proteins.

(5)

as the virus enters the host cells genetic material present in the nucleus allows the cells to undergo transcription, which produces a mRNA strand and in the cytoplasm ~~tRNA travels to the ribosome forming an amino acid and~~ the anticodon on the tRNA binds to the codon on the ~~new~~ mRNA and joins the amino acids together to form proteins, ~~as these proteins, consist of viral DNA they~~ this process is repeated leading to the growth of the cells and greater cell division leading to increased number of viral Protein being produced, as the ~~proteins~~ genetic material in the nucleus undergoes mutations which causes a change in the base sequence of DNA leading it to ~~form a~~ produce a protein coding for something incorrect, all proteins produced as a result of this are viral proteins.

ResultsPlus
Examiner Comments

This candidate was able to score four marks by stating that mRNA is produced by transcription for two marks. A third mark is gained where the candidate makes reference to the anticodon on tRNA binding to the codon and the information given about amino acids joining to form proteins give the final fourth mark. Although the candidate has described translation, they did not include details about **translation** occurring at the ribosomes. This lost them the fifth mark.

ResultsPlus
Examiner Tip

Use key terminology in the correct context wherever possible.

Question 8 (b)(ii)

This question was answered particularly well by the majority of candidates who were able to manipulate data involving some quite large figures to calculate a percentage decrease in the number of people dying from AIDS. Candidates were able to use the data provided to them and although many final answers gave an unrounded figure, this was perfectly acceptable on the condition that the final value given rounded to 54. As always in questions involving calculations, there were several candidates that failed to show working out and other candidates that left their final answer in the space for working out leaving the answer line blank.

There were a number of candidates that gave a final value although no working out was given.

(ii) Calculate the percentage decrease in the number of people dying from AIDS-related illnesses between 2010 and 2020.

(2)

46.4

percentage decrease = 46.4 %

ResultsPlus
Examiner Comments

This candidate scored zero marks for an incorrect final answer.

ResultsPlus
Examiner Tip

Always show working out when a question involves a calculation.

Many candidates gave a 'raw' final score and as long as this score rounded to 54 then it was awarded a mark.

(ii) Calculate the percentage decrease in the number of people dying from AIDS-related illnesses between 2010 and 2020.

(2)

$$\frac{650\,000 - 1\,400\,000}{1\,400\,000} \times 100$$

$$= 53.6\,\%$$

percentage decrease = 53.6 %

ResultsPlus
Examiner Comments

This response gained two marks for a correct final answer. The score given can be rounded to 54.

ResultsPlus
Examiner Tip

If a calculation has more than one step, it is best to show each set individually rather than combine them. Marks are awarded for each correct step carried out correctly.

Paper Summary

Based on their performance on this paper, candidates should:

- Use scientific terminology. Some candidates failed to use this and some used it in the wrong context.
- Make links with and across topics. Candidates struggled to link adaptation to function.
- Practice analysing graphical data. Mistakes were made when reading from graphs.
- Apply their knowledge. There were cases where candidates struggled to apply knowledge and understanding to unfamiliar contexts.
- Remember their sentence structure and fluidity in extended writing. There were several cases where candidate responses were not set out in a logical way making them difficult to assess.
- Incorporate short activities into lessons that focus on key words, their spelling and meaning. Lesson starters could be given over to recall and include key words.
- Practice past papers, where possible, and focus on questions that require candidates to make links or to analyse data or to apply knowledge in very contextualised questions.
- Use exemplar extended writing tasks, some written well and some that are less well written. Candidates can read through both and give reasons why one is better than the other. They could also rewrite less well written tasks to give improvements.

Grade boundaries

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