



Examiners' Report

June 2022

International GCSE Human Biology 4HB1 02

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.



Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus. Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2022

Publications Code 4HB1_02_2206_ER

All the material in this publication is copyright

© Pearson Education Ltd 2022

Introduction

This paper drew varied responses from candidates some of which reflected a good knowledge of many of the topics being tested. Although learning was more than likely to have focussed on the Advanced Information disseminated to centres prior to the examination period, the information included in candidates work demonstrated, on the whole, a fair level of understanding of several scientific concepts. Both mathematical and practical skills were tested and there was evidence to suggest that candidates need more practice in each of these aspects of the course. In responses for questions related to practical work students appeared unfamiliar with some of the terminology linked to such activities such as validity and there was some vagueness in discussions on how a method could be improved. It was usual for candidates to extract the correct data from information given in questions but it was also usual to see this data used in incorrect calculations which limited the number of marks awarded to answers. Candidates struggled with the percentage change calculation in particular and it would be worthwhile considering incorporating more of these in their day-to-day learning. There were clearly topics that students struggled with and although praise is given to those that did attempt an answer to these the structure or language used in the response lacked clarity or the detail needed to obtain full marks. Candidates across the ability range struggled in particular with the genetics question presented for 8bii. The fluency of responses to this question was, at times, confusing and lacked clarity which cost marks for many. There were some candidates that gave two alternative answers to questions, one correct and one incorrect. This practice negates any marks awarded and students should be made aware that whatever response they wish to be marked is made clear and that the other is clearly crossed out.

Question 1 (b)

This question aimed to test students understanding of the circulatory system. A good number of students clearly read through the words in the box carefully prior to choosing their answers and gained full marks for their responses. However, in many responses seen common errors were made indicating some lack of knowledge about the heart, particularly regarding the type of blood being transported through each side.

Although candidates often chose the correct words from the box for this question, these words were often misplaced in the passage.

(b) The box gives words about the circulatory system.

body	oxygenated	lungs	ventricle
	deoxygenated	atrium	

Complete the sentences using words from the box.

(5)

Blood vessel Y transports oxygenated blood from the
..... atrium to the left ventricle of the heart.

Blood vessel Z transports blood from the left ventricle of the heart
to the lungs



This response gained one mark for correctly placing oxygenated in the passage. Although the other words selected are correct, they are in the wrong position.



Remember that when looking at a diagram of the heart on paper that you are looking at it as a mirror image. This means that the left side becomes the right side and vice versa.

It was less common to see fewer than two marks awarded for responses to this question, although there was indication that some candidates were unfamiliar with the structure of the heart and the role that each side played in this part of the circulatory system.

(b) The box gives words about the circulatory system.

body	oxygenated	lungs	ventricle
	deoxygenated	atrium	

Complete the sentences using words from the box.

(5)

Blood vessel Y transports deoxygenated blood from the lungs to the left ventricle of the heart.

Blood vessel Z transports blood from the left atrium of the heart to the body.



This candidate scored two marks for their response. Although they have identified the correct words from the box to use, they have not placed all of these correctly in the passage.



In questions structured this way, it is always wise to read back through a completed response to ensure that it makes sense.

The second most common error in responses to this question was identifying the role of the ventricle and atrium, the most common being the choice of deoxygenated rather than oxygenated. These two structures, therefore were sometimes seen in the wrong positions.

(b) The box gives words about the circulatory system.

body	oxygenated	lungs	ventricle
	deoxygenated	atrium	

Complete the sentences using words from the box.

(5)

Blood vessel Y transports oxygenated blood from the lungs to the left ~~atrium~~ ventricle of the heart.

Blood vessel Z transports blood from the left ventricle of the heart to the body.



ResultsPlus
Examiner Comments

This student has lost one mark for incorrectly placing ventricle. They have chosen this word twice although there is no instruction in the question to allow this.

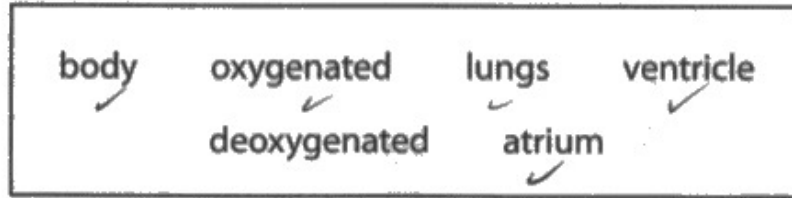


ResultsPlus
Examiner Tip

If a word can be used more than once then this information will be given in the question.

Five mark responses were seen frequently for this question and many candidates were able to gain full marks for correctly placing the chosen words.

(b) The box gives words about the circulatory system.



Complete the sentences using words from the box.

(5)

Blood vessel Y transports oxygenated blood from the lungs to the left atrium of the heart.

Blood vessel Z transports blood from the left ventricle of the heart to the body.



ResultsPlus
Examiner Comments

This candidate has correctly identified all five words and placed them in the right location in the passage.



ResultsPlus
Examiner Tip

Always read through the whole list of words before selecting answers.

Question 1 (c)

Overall this was a well answered question where students identified the two types of vessel shown in the diagram correctly and were able to make clear comparisons on their structure.

Most commonly, candidates were able to compare the thickness of the walls of the two vessels and the diameter of the lumen although there were some cases where this information was given the wrong way round. The mention of valves in response was the least common marking point seen.

Compare the structure of blood vessel X with the structure of blood vessel Y.

(3)

Blood vessel X has narrow lumen, while blood vessel Y has wide lumen. Blood vessel X has thick wall, but blood vessel Y has thin wall. Blood vessel X is an artery, and blood vessel Y is a vein.



ResultsPlus
Examiner Comments

Although this candidate has given correct details on the thickness of the walls and lumen diameter, there is no mention of valves for the third mark which has limited this answer to 2 marks. The vessels have been identified but this was not an instruction in the question.



ResultsPlus
Examiner Tip

Make sure that question is read carefully so that there is a full awareness of its expectation.

Some candidates gave information that was irrelevant. This usually included details that related structure to function which was not the expectation of the question.

Compare the structure of blood vessel X with the structure of blood vessel Y.

(3)

blood vessel X is an artery, it has thicker wall and a narrower lumen to maintain high blood pressure, it has elastic fibres to stretch and recoil, it has muscles to allow contraction, it has no valves, it transport blood under higher blood pressure. Blood vessel Y is a vein, it has thinner wall and a wider lumen to reduce resistance of blood flow, has valves to allow blood flow in one direction and prevent back flow of blood.

(Total for Question 1 = 9 marks)



This is a good 3 mark response that covers all marking points.



Refrain from adding unnecessary detail to answers. Read carefully what the question is asking and mold a response around this. Valuable time could be taken away from answering other questions otherwise.

Question 2 (a)(iii)

This question was aimed to test a mathematical skill not often tested in this paper and students, on the whole, scored well. Many appeared familiar with calculating ratios.

Candidates often identified correct values from the graph but placed these values in such a way in their working out that placed doubt on whether they were being presented as a ratio.

(iii) Determine the ratio of females at risk of developing a mental illness in 1999 compared with 2008.

Give your answer in the form n:1

(2)

Year	1999	2008
No. of People in millions	2.75	2.6

ratio =



ResultsPlus
Examiner Comments

This response clearly shows that the candidate has extracted the correct values from the graph but these have not been presented as a ratio. As these values have not then been given in the form of n:1 no marks can be awarded.



ResultsPlus
Examiner Tip

Maths questions will always arise in the examination paper and it is important that skills are developed across the range of different mathematical procedures highlighted in the specification.

There were several instances where students were able to identify the correct values from the graph given in the question but were unable to convert the values to the form of n:1.

(iii) Determine the ratio of females at risk of developing a mental illness in 1999 compared with 2008.

Give your answer in the form n:1

(2)

2.75 : 2.6 : ~~2.75~~ 2.6
~~2.75 : 2.6~~
:

ratio = ~~1:1~~
1:1



This response scored 1 mark for showing the correct two values from the graph as a ratio. However, they have not been able to translate this into n:1 for the second mark.



Always show any working out to a calculation in a clear, structured way.

There were several answers where candidates attempted to round up or down the values in their final ratio. On most occasions these were correct although there were times where efforts to do this were unsuccessful.

(iii) Determine the ratio of females at risk of developing a mental illness in 1999 compared with 2008.

Give your answer in the form n : 1

~~2.75~~ : 2.6

$$\frac{2750000}{2600000} \quad (2)$$

$$\begin{aligned} &2.75 \div 2.6 \\ &= 55 : 52 \\ &\quad : 1 \end{aligned}$$

$$\text{ratio} = 1.05 : 1$$



This candidate was awarded 2 marks for their final answer only. The first value in the ratio given here could be rounded up to 1:1 which was acceptable. If the final answer had been incorrect, then no mark could be awarded for the working out as the way it is displayed is confusing and the two values from the graph have not been given as a ratio.

Question 2 (a)(iv)

Students were not particularly challenged by this question and most scored the mark available. There were some more vague answers where candidates just failed to hit the marking point although with a little more thought put into their response could have scored the marking point.

There were several responses that gave more than one reason for an increase in the risk of developing mental illness. Where these were all correct the mark was awarded.

(iv) Suggest one possible reason why the number of females at risk of developing a mental illness increased from 2007 to 2008.

(1)

stress or drug abuse, poor
physical health.



This response covers several of the reasons given on the mark scheme, two of which are correct. Although they have added a third reason which is not on the mark scheme this is not so far wrong to justify implementing the list rule. The mark given to this answer could be for drug abuse or stress.



Follow instructions given by the question carefully and avoid giving lists of words or information if this is not what the question has asked for. There is a danger that if a word given in a list, when only one word was expected, it could cancel out a mark awarded.

There were some vague responses that needed to be clarified in order to gain a mark.

(iv) Suggest one possible reason why the number of females at risk of developing a mental illness increased from 2007 to 2008.

~~Because~~ ~~increase~~ females ~~at~~ had more life issues (1)



This response failed to gain the mark as it did not clarify what it meant by life issues. Had the candidate continued this sentence with 'such as..' then it is likely that the response would have been awarded.



At times, even one mark answers need a little more detail to gain the mark.

Question 2 (b)

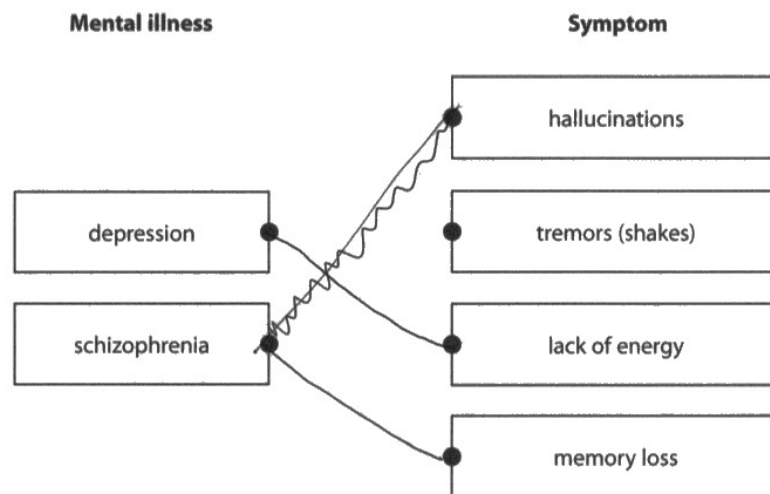
There was evidence to suggest that not all candidates are familiar with the symptoms of mental illness. There was also evidence to suggest that some students are not reading the question carefully and consequently not following the instructions given which lost a fair number of marks.

The range of errors made for this question was random. Some candidates are likely to have made an attempt to answer and guessed which symptoms linked to each mental illness.

(b) The boxes list two mental illnesses and some symptoms.

Draw one straight line from each mental illness to a symptom of the illness.

(2)



This candidate has correctly drawn one line from each of the illnesses given and so has followed the instructions in the question. However, only one mark can be awarded for identifying a symptom of depression.



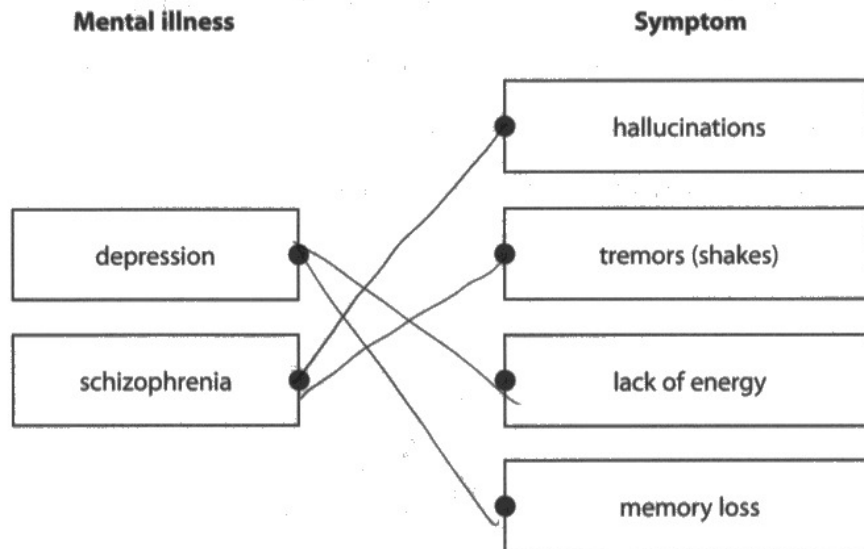
Make sure that any errors made for multiple choice questions are crossed out clearly.

There were several responses that indicated a misunderstanding of the question or its structure. It is quite common to see candidates linking all boxes because this is what they feel they have to do.

(b) The boxes list two mental illnesses and some symptoms.

Draw one straight line from each mental illness to a symptom of the illness.

(2)



ResultsPlus
Examiner Comments

This response has drawn more than one line from each mental illness which negates any correct answer they may have given.



ResultsPlus
Examiner Tip

For questions that are structured in this way, there is always likely to be more boxes on the left than are needed. The key here is to ensure that the question is read carefully.

Question 2 (d)

There were some very common errors in responses to this question and a fair number of candidates were challenged to identify two structures that control body temperature. Most candidates mentioned the correct same body structure for one mark answers.

There were several responses that gave a named type of blood vessel but these were incorrect at times. Two mark answers were less often seen for this question although plenty of options were given in responses.

(d) People who use the drug cocaine often have a raised body temperature.

Name two body structures that help to control body temperature.

(2)

1. sweat glands (skin)

2. arterioles (skin)



ResultsPlus
Examiner Comments

This is a good 2 mark answer where the candidate has given sweat glands and a correct, named blood vessel.



ResultsPlus
Examiner Tip

There is a danger that candidates may overlook key words in the question such as structures. Sweating, for example, as opposed to sweat glands would be incorrect even though it does help to control body temperature.

A good number of candidates obtained one out of the two marks allocated to this question and this was usually for mentioning the skin as a structure involved in controlling body temperature.

(d) People who use the drug cocaine often have a raised body temperature.

Name two body structures that help to control body temperature.

(2)

1 skin

2 sweat glands collecting ducts



This candidate may have confused the structures involved in controlling body temperature with those involved in water regulation. This response can only be awarded one mark for the mention of skin.



Ensure that a good understanding of the body structures of different homeostatic mechanisms is developed.

Although the most common answer for one mark answers was skin there are other responses, albeit fewer, that gave other structures. The most common incorrect answer which failed to gain a second marking point was liver.

(d) People who use the drug cocaine often have a raised body temperature.

Name two body structures that help to control body temperature.

(2)

- 1 *Hypothalamus*
- 2 *Liver*



This candidate has confused structures regulating blood glucose with structures regulating body temperature. One mark has been awarded for hypothalamus.



For revision purposes, it might be worth constructing a table with different homeostatic mechanisms as column headings and then listing the associated body structures in each column.

Question 3 (a)

This question presented few issues to candidates who, overall performed well. Many candidates gained full marks for their responses, showing good recall of a nerve pathway and the structures involved. There were a fair number of 4 mark responses, mostly due to candidates being unable to recall the most appropriate structure (receptors) to complete the first sentence. There was some confusion amongst less able candidates on where to place neurones, particularly the relay and sensory which were often muddled.

The most common error that candidates made in this question was in recalling the correct structure to complete the first sentence in the passage. It was generally the case that less able students were able to identify the correct structures but they were often misplaced indicating a lack of understanding amongst the cohort working below middle grade. Candidates working at higher levels were not phased by this question and performed well.

- 3 (a) The nervous system is adapted to transfer information rapidly from one part of the body to another.

Complete the passage about the nervous system by giving the correct words.

(4)

A change in the external environment is detected by skin in sense organs. These structures convert stimuli into electrical impulses which then travel along Sensory neurones to the central nervous system.

The central nervous system coordinates the incoming information using relay neurones. These neurones then transfer the electrical impulses to motor neurones.



ResultsPlus
Examiner Comments

This is a typical 4 mark response where the candidate has not been able to recall the correct structure to complete the first sentence. Had the candidate read back through what they had written they may have realised that the skin itself is a sense organ and that their answer had rendered the sentence incongruous.



ResultsPlus
Examiner Tip

For this type of question always read sentences in full before attempting to insert an answer. Then read back over the completed sentence to ensure it makes sense.

Question 3 (b)(ii)

Most candidates scored well on this question showing good recall of detail on transmission across the synapse. In some responses more information was given than what was necessary for the 2 marks available. Some candidates failed to gain a mark for omitting to state that the neurotransmitters *diffuse* and used more simple terms such as travel or move (across the synapse). Candidates scoring one mark inevitably obtained this by understanding that neurotransmitters were involved but failed to elaborate on this to gain a second mark.

Candidates scoring one mark tended to gain this by understanding that neurotransmitters were involved in nerve transmission in some way. Less able students were able to obtain this mark although there was no other detail in the response that could be awarded.

(ii) Describe how an impulse reaching the end of one neurone produces an impulse in the next neurone.

(2)

A chemical substances is released from vesicles known as neurotransmitters, which transmit electrical nerve impulses from sensory neurone to the next neurone and so the shape of neurotransmitter is complementary to shape of receptors.



This response is typical of a one mark answer. The candidate has understood that neurotransmitters are released. The remainder of the response implies some confusion on how neurotransmitters help neurones to communicate but this can be ignored.



Remember that electrical impulses cannot travel across the gap between neurones, just like an electrical current cannot travel across a gap in an electrical circuit.

Many candidates gave very clearly written responses which reflected excellent understanding of neural transmission across the synapse.

(ii) Describe how an impulse reaching the end of one neurone produces an impulse in the next neurone.

(2)

neurotransmitters are released from (presynaptic) neurone into synaptic ~~cell~~ cleft and diffuse across synapse and bind with specific complementary receptors on (postsynaptic) neurone which triggers a generation of a new impulse in the next neurone and the impulse is transmitted along.



This is a very good example of a response from a candidate working at a higher level. Although the detail presented is not all necessary for the 2 marks available it makes the response very clear and reflects excellent understanding of this topic.



Be wary of including too much information in responses. A good guide is to look at the number of marks available for the question and write the same number of key points in a response.

Question 3 (c)

Many candidates made good use of the formula for speed and most were able to rearrange this to arrive at the correct final answer. There were some cases where students failed to rearrange the formula which inevitably lost them marks. In most cases working out was shown and for some, where the correct figures were included, gained them one mark even if the final answer was incorrect.

Although most candidates were able to recall the formula for speed, there were a few cases where they failed to rearrange this correctly to determine the distance travelled by the neurone.

(c) A nerve impulse travels at a speed of 120 metres per second.

Calculate the distance that this nerve impulse will travel in 5.0 minutes.

$$\text{distance} = \text{Speed} / \text{time}$$

$$300\text{sec}$$

(2)

$$120 / 300$$

$$\text{distance} = \dots\dots\dots 0.4 \dots\dots\dots \text{m}$$



This candidate failed to score a mark as they were unable to determine the correct formula to work out the distance travelled by the nerve impulse. Although they have realised that speed and time are linked to distance in the formula needed to carry out the calculation they have carried out a division rather than a multiplication.



Memorise the speed triangle to prepare for similar questions that may arise in future examinations.

Few responses were confused on the units for time given for speed and time taken. Although many realised that a conversion needed to be carried out some failed to do this.

(c) A nerve impulse travels at a speed of 120 metres per second.

Calculate the distance that this nerve impulse will travel in 5.0 minutes.

(2)

$$120 \times 300 \quad \text{or} \quad 120 \times 5.0 \\ = 600$$

distance = 600 m



ResultsPlus
Examiner Comments

This candidate scored one mark for showing a correct conversion of minutes into seconds and then multiplying this by the speed. It is unfortunate that an alternative is shown which is what has been used to arrive at a final incorrect answer.



ResultsPlus
Examiner Tip

Always check units in questions carefully and provide your answer in the units instructed by the question. It is sometimes better to convert any units prior to carrying out a calculation.

Question 4 (c)

This question was generally well answered and most candidates were able to identify solution B as Benedict's solution. There was a little confusion amongst a few candidates where references were made to Biuret solution and starch. Some responses focussed solely on the safety aspects of this practical without including any details of a method although not all of the safety procedures incorporated into answers were correct.

One of the most common errors that candidates make when describing the Benedict's test is omitting to include details about heating or using a water bath. This will always cost a mark in examinations. The standard response from students who are asked to give safety precautions inevitably involves wearing goggles and although correct in this case there are practical activities where they are not necessary and students should be aware of this.

(c) Describe a safe method the student could use to test a food using solution B.

(4)

- Solution B is benedict's reagent
- add the solution in a test tube containing a sample of food
- then put the test tube in a water bath
- wear goggles during experiment
- then ~~comp~~ observe colour change



ResultsPlus
Examiner Comments

This candidate has lost one mark by failing to state that the contents of the test tube should be heated. Had they mentioned this then they would have gained full marks for their response.



ResultsPlus
Examiner Tip

Candidates should never state that the contents of tube containing Benedict's solution should be heated using a Bunsen burner. This creates a safety hazard.

It was rare to see responses that did not mention at least one safety precaution. Many candidates gave a list that included tie hair back, wear gloves or a lab coat, use tongs to hold the test tube and several others. Even though some of the precautions listed were unnecessary candidates were not penalised for this even if the list did include the correct answer.

(c) Describe a safe method the student could use to test a food using solution B.

(4)

- * ~~add~~ Adding the benedict's solution to the food
- * heat in water bath
- * if ~~it~~ ^{colour} turns from blue to green, yellow, orange ~~and~~ then brick red, then ~~no~~ glucose is present
- * if colour stays blue, then no glucose is present.
- * grind food and add it in ~~a~~ tube of water and ~~to~~ stir to make solution.



ResultsPlus
Examiner Comments

This response gained three marks for clearly describing a method to test a food using solution B. It is unfortunate that the candidate has not included a safety precaution as requested by the question and this has cost them a mark.



ResultsPlus
Examiner Tip

It is sometimes a good idea to identify and highlight the key words in a question. In this particular question the word safe would be one of the key words.

There were few responses that focussed entirely on the safety aspects of the practical with no mention of a method that could be used to test a food using solution B. This was surprising in that students are familiar with writing methods and this should not have caused an issue for the majority of candidates. In such cases if the precaution given was correct then a maximum of one mark was awarded.

(c) Describe a safe method the student could use to test a food using solution B.

(4)

- wear goggles so that the solution doesn't enter your eyes.
- wear gloves to prevent burning your hand.
- use a test tube holder
- Control the ~~the~~ temperature of the heart.



ResultsPlus
Examiner Comments

This candidate was able to identify that goggles would be needed as a safety precaution. The response lists further precautions but these are unnecessary and were not awarded.

Question 5 (a)(ii)

There were many vague responses for this question where lack of detail or named structures cost marks. Although a fair number of candidates appeared familiar with the direction in which sound waves travel, they seemed less aware of the role of the pinna in *collecting* sound waves. Poor terminology or lack of correct scientific terminology also cost marks where numerous candidates stated that the pinna collects sound rather than sound waves or vibrations.

Few responses failed to mention eardrum and in some cases this was the only mark that was obtained. Most commonly the auditory canal was omitted from answers.

(ii) Describe the function of the pinna.

(2)

it receives sound waves and transfer it to middle ear and allow passage of vibrations



This one mark response reflects some understanding of the role of the pinna. However, the candidate has missed out the structures that sound waves travel before they reach the middle ear so the number of marks awarded in this case were restricted.



Diagrams are sometimes included in questions and these can show details that could be used to help with answers.

A frequent error made by candidates was failing to mention sound *waves* or sound *vibrations* which was necessary to gain the first marking point for this question. It was very rare for students to refer to sound oscillations.

(ii) Describe the function of the pinna.

(2)

Detects the sound & ~~takes it~~ allows it to reach the ear drum.



One mark was awarded for this response as the candidate has shown an understanding that the sound waves reach the eardrum. Their initial wording of their answer is unfortunate. They have misunderstood the role of the pinna stating that it detects sound, which it does not and they have also failed to mention waves/vibrations/oscillations in relation to sound.

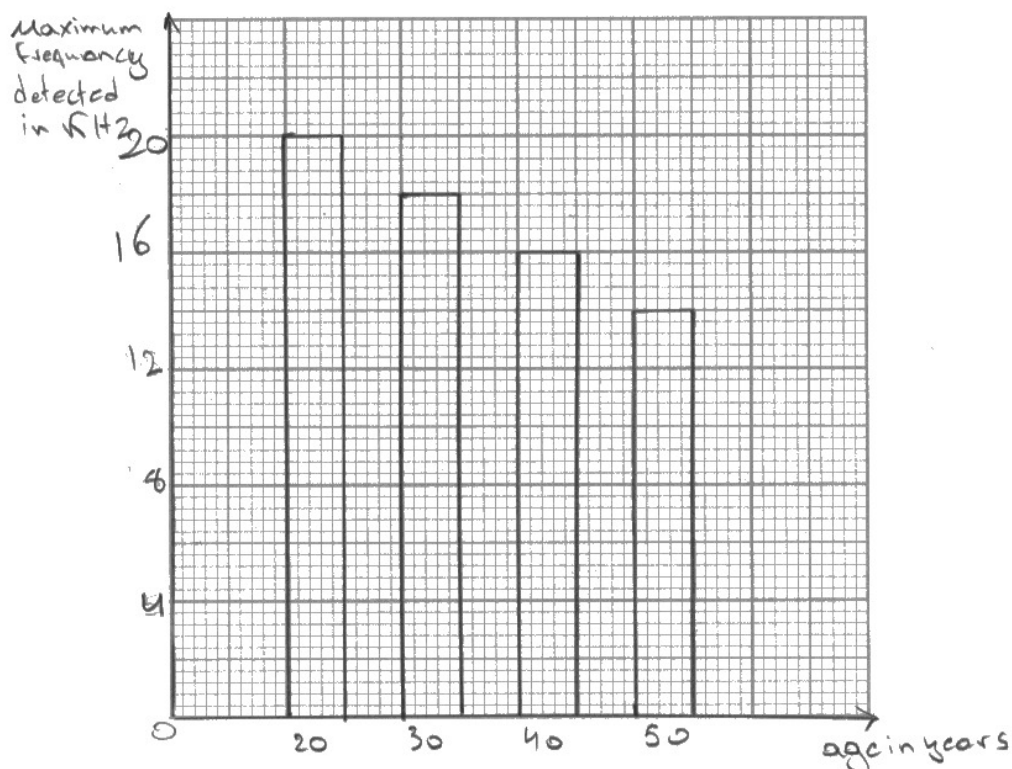


Questions on the ear appear fairly frequently in examinations. It is important to ensure that responses do not refer to sound alone but rather sound vibrations or sound waves.

Question 5 (b)(i)

There were many high scoring answers for this question with bar charts drawn clearly and including all of the necessary detail. There were some occasional line graphs which were penalised. A number of responses did not include the units for the axes labels which cost candidates a mark but on the whole a well answered question.

There were some very well drawn bar charts that gained maximum marks. Equally there were some very well drawn bar charts that failed to gain maximum marks simply because the units had been missed from the axes labels.



This is a good example of a response that gained 4 marks. The axes labels with their units are clear and the scales allow the maximum frequency and age to be identified easily.

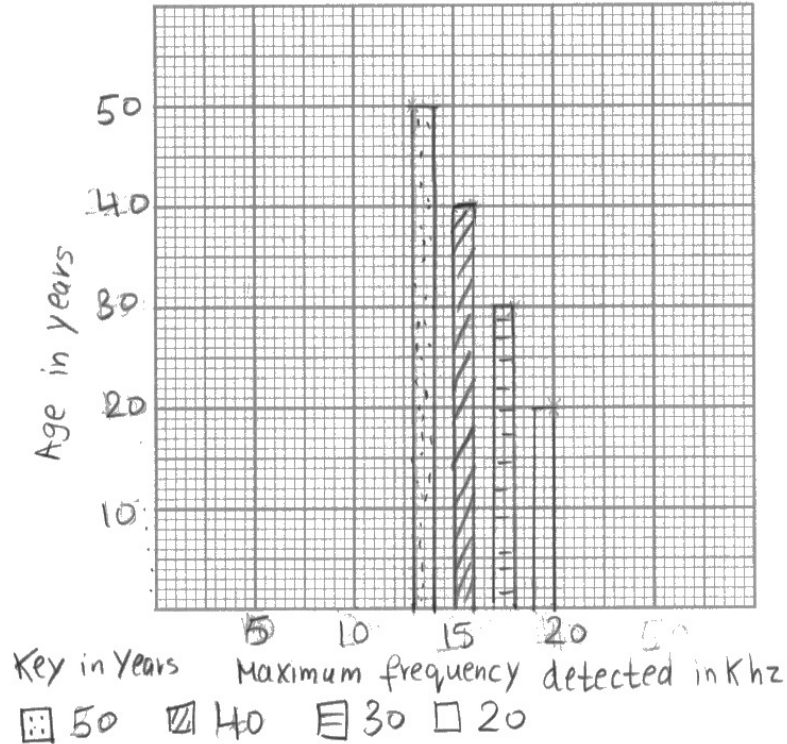


Always use a ruler to draw the bars in a bar chart. Drawing freehand could make the height of the bars dubious.

There were few responses where candidates struggled with drawing a bar chart. Most were very clear and included all of the necessary detail.

(i) Draw a bar chart to show how the maximum frequency detected varies with age.

(4)

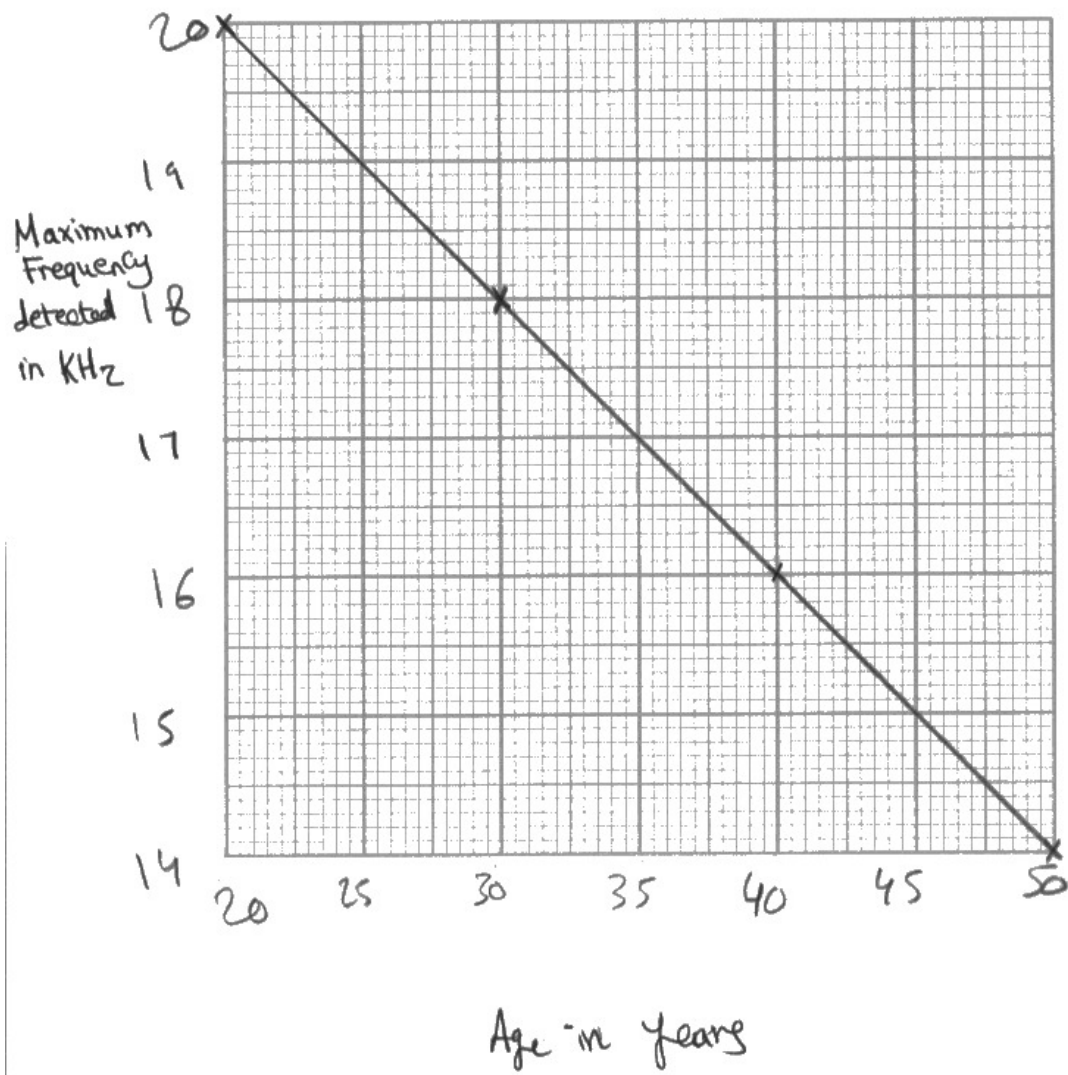


The bar chart obtained one mark for showing the units on the axes labels. No mark has been awarded for the labels themselves as they have been placed incorrectly. The scale on the X axis makes it very difficult to determine the maximum frequency so a further 2 marks have not been awarded here.



The first column heading in a table should form the label for the X axis and the second column heading should form the heading for the Y axis. Always remember to include units when labelling axes.

Although the question clearly stated that bar charts should be drawn there were still occasions where candidates drew a line graph.



This candidate scored 3 marks. Although all points have been plotted correctly it is unfortunate that a line was drawn through them rather than bars being plotted.



Instructions given in questions must always be followed when drafting a response. Failure to do this will cost marks.

Question 5 (b)(ii)

Although many candidates were able to calculate the percentage change in the maximum frequency, and gained full marks, carrying out this calculation for some students presented a real challenge. All sorts of working out were seen, many of which were confusing and presented poorly and it was unfortunate that these responses tended not to score. Students were unsure of how to use the values obtained from either the table or the bar chart they had drawn and so used them in a variety of ways in random calculations that led to incorrect final values. Although the actual final answer was a minus value, it was ignored if candidates did not indicate this in their response.

There were a fair number of responses where candidates were unclear on how to use the data extracted from the table. The range of incorrect calculations seen in working out was fairly diverse and most of these failed to score.

- (ii) Calculate the percentage change in the maximum frequency detected by people aged 20 and people aged 50.

(3)

$$\frac{14}{20} \times 100 = 70\%$$

percentage change = 70 %



ResultsPlus
Examiner Comments

This candidate has extracted the correct information from the table although has used them in an incorrect calculation. There is no detail in their working that can be awarded a mark.



ResultsPlus
Examiner Tip

Calculating percentage change is different to calculating a straightforward percentage. It is important that opportunities are provided to practice both techniques.

Question 5 (c)(i)

This question was poorly answered presumably because of confused understanding of the term 'valid'. A variety of responses were seen including answers that would have been more suited to question 5cii. A very large number of students mentioned repeating the test or using a greater number of people. Responses scoring one mark often included information related to ear defects but in some of these the detail was vague and could not be awarded. It was rare for candidates to identify that the variation in gender could produce invalid results.

The vast majority of responses made it quite clear that candidates misunderstood the term validity. Many answers included details on repeating the test or selecting a larger group of people. It was very rare for students to mention that the variation in gender would invalidate the results.

(c) A student suggests this method that could be used to produce the data shown in the table.

- select a person of each age to be tested
- use a signal generator to produce sounds at different frequencies
- record the maximum frequency detected by each person

(i) Give two reasons why this is unlikely to produce valid results.

(2)

- 1 Each person may hear different frequency so it is unfair.
- 2 ~~or~~ One person is not enough. ~~More people of~~ each age is not enough.



ResultsPlus
Examiner Comments

This candidate failed to score any marks. The response implies using a larger sample size which would not improve validity and it also makes reference to the test being unfair, a term which should not be used in a practical write-up.



A glossary could be distributed or displayed to help reinforce the expectations of key scientific terms.

It was rare to see a response gain full marks for this question. The majority of candidates scored either one mark or nothing at all.

(c) A student suggests this method that could be used to produce the data shown in the table.

- select a person of each age to be tested
- use a signal generator to produce sounds at different frequencies
- record the maximum frequency detected by each person

(i) Give two reasons why this is unlikely to produce valid results.

(2)

- 1 conditions of people tested not controlled (some may have ear conditions allowing them to hear better/worse than others)
- 2 control gender of people tested is not the same



This response clearly refers to ear defects and gender variation that are likely to cause invalid results. This candidate received 2 marks.



Responses should be phrased to ensure the best opportunity for gaining marks. For example, a named ear defect or even just ear defect is more likely to attract a mark than simply stating hearing problems.

One mark responses often referred to ear defects but in more simple terms although there were occasions when gender variation was mentioned.

(c) A student suggests this method that could be used to produce the data shown in the table.

- select a person of each age to be tested
- use a signal generator to produce sounds at different frequencies
- record the maximum frequency detected by each person

(i) Give two reasons why this is unlikely to produce valid results.

(2)

1 ~~external sound frequency~~ People do have different systems

2 The gender of the people are different



ResultsPlus
Examiner Comments

Although the first part of this response is confused the second statement which refers to gender variation gained the candidate one mark.



ResultsPlus
Examiner Tip

It would be a useful exercise to incorporate the range of key terms linked to practical activities into practical write-ups at every opportunity.

Question 6 (b)

Many candidates secured both marks for this question with sterilising equipment and heating the inoculating loop being the most common correct answers. The other marking points were seen randomly amongst responses but at times these were often poorly worded and lacked the clarity needed to gain credit. There were some answers that implied candidates were unsure of the purpose of sterilisation or were confused by its meaning as simple answers such as making sure the equipment was clean or put a cover over the dish were seen fairly frequently.

Responses that referred to the lid of the Petri dish often referred to the speed at which the lid should be closed rather than refraining from repeatedly exposing the dish to air. There were very few responses that gave a clear description of sealing the lid with tape.

(b) Give two improvements to this method that will reduce the risk of introducing unwanted microorganisms into the Petri dish.

(2)

1. minimize the space between the petri dish and lid when opening it to prevent the entry of microorganisms from air to petri dish
2. leave for shorter time to decrease microorganisms from entering



ResultsPlus
Examiner Comments

One mark was awarded for this response which makes it clear that the lid of the Petri dish should not be opened too much. The remainder of the response contains no detail that can be awarded.



ResultsPlus
Examiner Tip

When carrying out an aseptic technique it is important that the equipment does not become contaminated throughout. Students should know the different methods of sterilisation and understand the purpose of this technique.

Question 6 (c)

This was a very poorly answered question. The vast majority of responses provided ample evidence that candidates do not understand the reasoning behind limiting the incubation temperature. Most responses followed the same theme referring to enzymes and denaturing or bacteria being killed at higher temperatures.

It was unfortunate that many responses failed to score any marks for this question. Candidates that did not have the opportunity to access this practical may not have dealt with the finer details covering the reasons why certain stages were carried out when performing an aseptic technique.

(c) Explain why it is important that the Petri dish is incubated at a temperature no higher than 25°C.

(2)

- So the ~~the~~ enzymes inside the bacteria won't denature so ~~so~~ therefore the bacteria won't die
- So only the antibacterial cleaners kill the bacteria



ResultsPlus
Examiner Comments

This is a very typical response that was widely reflected across the cohort. The candidate has linked higher temperatures with the denaturing of enzymes or bacteria being killed which failed to gain any credit.



ResultsPlus
Examiner Tip

It is important to understand the reasons why certain steps are taken during practical procedures. It may be an idea to encourage the students to ask themselves why they are carrying out a step as they perform each stage of a practical activity.

Question 7 (a)(i)

This question generally scored very well. Responses reflected a sound understanding of the role of DNA and most used this understanding to provide details that linked to the damaging effects of free radicals. Few candidates, however, made the link between damaged genetic material and cancer which meant that this marking point was very rarely seen although students are overall familiar with the sequence of events that lead to the production of an ineffective protein.

Some candidates gave detailed information that covered the same marking point more than once. Most candidates gaining full marks for their answer scored these marks by including details on either a change in the base or amino acid sequence leading to an incorrect protein being produced.

(a) (i) Free radicals can damage genetic material in cells.

Describe one effect that this could have on body cells. (lines 2 and 3)

(2)

mutation, as ~~it~~ it can affect translation and transcription and cause change in base sequence that ~~se~~ change the gene and produce wrong protein



This is a good 2 mark answer that has included details on mutation and a change in the base sequence. This information covers the same marking point. The second mark is gained by the candidate stating that the wrong protein would be produced.



It is important to understand the structure of DNA and how it codes for proteins. By understanding this it is not difficult to see how damaged DNA can affect the final production of a protein.

Less able candidates tended to make the effort to answer the question although answers generally tended to lift information from the passage rather than delve more deeply into the effects of damaged DNA. Some were unable to make the link between damaged DNA and its effect on protein synthesis and therefore information in answers was quite random and vague at times.

(a) (i) Free radicals can damage genetic material in cells.

Describe one effect that this could have on body cells. (lines 2 and 3)

(2)

Cells won't be able to respire and have sufficient and
may die.



This answer failed to gain marks. There is no link in the details given to how damaged DNA would affect protein synthesis. It might have been the case here where the candidate could question why damaged DNA prevents cells from respiring and the initial sequence of events that lead to this eventuality.



Think carefully about the wording of questions and what they are asking. Questions related to damaged DNA or mutations are often testing a basic understanding of the structure of DNA and how it codes for protein production.

The information given in answers gaining one mark often stated that an incorrect protein was produced rather than give details on mutation or a change in a base sequence.

(a) (i) Free radicals can damage genetic material in cells.

Describe one effect that this could have on body cells. (lines 2 and 3)

(2)

It can change the genetic codes and can code for a completely different protein.



This candidate scored one mark for understanding that an incorrect protein would be produced. If the response had given more information on how the genetic code would be changed they could have possibly scored a second mark.



Use any extra time in an examination to read back over answers to see if any improvements or additions can be made to answers.

The majority of candidates were able to extract the correct values from the passage but then failed to use them correctly in subsequent calculations. However, if these values were clearly displayed in the working out then this was credited.

(iii) Calculate the mass, in grams, of boiled broccoli that should be eaten to provide the recommended daily intake of vitamin C. (lines 12 to 14)

Handwritten work:

$mg \xrightarrow{\times 100} g \xrightarrow{\div 1000} kg$

$40g$ 80% $\frac{60 \times 40}{100} = 24$ $\frac{mg}{g}$
 $40g$ 60% Boiled 40×0.9 (3)

Recommended Intake of vitamin C = 90mg Per day

$\frac{90mg}{100} = 0.9g$ 0.0

mass = g



This response shows 40g clearly aligned with 60% along with an annotation to make it clear that the values relate to boiled broccoli for one mark. It is unfortunate that this candidate was unable to convert the percentage into a mass and no clear final answer has been given.



Always ensure that final answers are written in the space provided for the answer. There is a danger that final answers left in the space for working out will be unclear or overlooked.

Question 7 (b)

There were many excellent, detailed answers for this question some of which included the formula to calculate the vitamin C content. Responses included either titrating orange juice into DCPIP or DCPIP into orange but both variants were acceptable. Some candidates lost a mark for discussing a colour change rather than a decolourisation, and it was not often that candidates included information about comparing the volumes of DCPIP (or orange juice) added to make a judgement on the vitamin C content.

Although this was generally a well answered question with the vast majority of candidates scoring marks, there were some responses that were structured particularly well. Information was set out in a clear, step-by-step fashion and provided excellent detail that reflected a thorough understanding of the procedures in this practical.

(b) DCPIP is a chemical used to determine the amount of vitamin C in food.

Describe a method, using DCPIP, to compare the amount of vitamin C in fresh orange juice with that in boiled orange juice.

(5)

Prepare two test tubes. Add 2cm^3 of ^{fresh} orange juice using syringe or graduated pipette ^{to a test tube}. Then, using a graduated pipette ^{with 1cm^3 of DCPIP}, drip slowly DCPIP drop by drop. After adding each drop, shake the test tube. Keep adding DCPIP drops and shaking until the blue dye of DCPIP is not decolourised, see volume of DCPIP left in graduated pipette. Repeat experiment for the boiled orange juice and the other test tube, compare volumes of DCPIP left in graduated pipettes. Fresh orange juice has higher vitamin C content, the higher the vitamin C content, the more DCPIP consumed.



This is an excellent example of a response that gained full marks. It gives all of the correct sequence of steps needed to compare the vitamin C content of the two types of orange juice and covers all marking points.



For this particular practical it is important to state that DCPIP should be added drop-by-drop.

Some responses were poorly worded which made the information given slightly confused. Few candidates had issues with remembering the correct order of steps in carrying out this practical and some missing detail which meant that answers led to some of the information given was ambiguous and could not be awarded.

(b) DCPIP is a chemical used to determine the amount of vitamin C in food.

Describe a method, using DCPIP, to compare the amount of vitamin C in fresh orange juice with that in boiled orange juice.

fresh (5)

Add a known volume of ^{fresh} orange juice in a ~~conical flask~~ ^{Pipette}, using a pipette do titration technique by adding ~~DCPIP~~ ^{orange juice} from pipette to conical flask while shaking it to ensure mixing substances. Record volume of ~~DCPIP~~ needed orange juice needed to decolorize DCPIP from blue to colorless. Repeat the same procedure but with boiled orange juice and compare between volumes used. Make sure temperature and concentration of DCPIP used is the same to ensure validity. Rinse the equipments before doing the second experiment to prevent contamination to ensure reliable result.



This response gained 3 marks. The candidate initially discusses adding orange juice to a conical flask using a pipette and although this could have been awarded a mark it becomes a little more clear later that the DCPIP is in the conical flask. However, the candidate has not actually stated this so marking point 1 could not be given. One mark can be awarded for recording the volume of orange juice needed to decolourise DCPIP and another mark for repeating with the boiled orange juice. The 3rd mark is given for comparing volumes.



When writing a method for a practical activity it is sometimes more clear to bullet point the steps taken.

Question 8 (a)

As evidenced in a previous question, candidates generally have a sound understanding of the structure of DNA and its role in protein synthesis. Consequently, candidates performed well for this question and across the responses seen all marking points were covered. It was pleasing to see that many candidates understood that a stop codon could be produced although there was little mention of altered codons. Where this was inferred, candidates preferred to use the term triplet code instead and in the correct context this was perfectly acceptable. Many answers referred to a change in base sequence with named mutations frequently seen and, similarly, responses often included information that implied that incorrect amino acids were inserted leading to an altered protein.

Responses given by candidates working at the higher level sometimes provided more detail than necessary and many were, nevertheless, excellent answers. It was quite evident that these candidates fully understood the expectations of the question although it was unfortunate, at times, that some missing detail meant that not all marks could be awarded.

- 8 (a)** Duchenne muscular dystrophy (DMD) is a sex-linked genetic disorder caused by a gene mutation.

The symptoms of DMD are caused by the absence of a protein called dystrophin.

Explain how a gene mutation can result in the absence of dystrophin.

(4)

A gene mutation, whether by addition, insertion, substitution or deletion, may cause a frame shift. This may result in more amino acids or fewer being made by the ribosome. This will result in a non-functional protein as the polypeptide is not made well, so dystrophin will not be made, causing these ~~symptoms~~ symptoms as the codons will have changed, so amino acids not produced.



This response has given a named mutation for one mark. There is some confusion about the role of ribosomes here where the information given states that the ribosomes make amino acids which is incorrect. Had the candidate mentioned that the wrong amino acid would be inserted at this point then another mark could have been gained although this is not the case. However, another mark is awarded for the production of a non-functional protein with the final mark given for a reference to altered codons. One further point made, such as producing a stop codon would have secured this response the 4th mark.



It is always a good example to give a named mutation in questions based on this topic.

Candidates working at lower grades were mostly able to score at least one mark, usually for their understanding that either the base sequence was changed or for a reference to an incorrect protein being made. In a fair number of these responses students often referred to the absence of dystrophin or that dystrophin would not be produced without really hitting the point that a faulty or incorrect protein would be made.

- 8 (a) Duchenne muscular dystrophy (DMD) is a sex-linked genetic disorder caused by a gene mutation.

The symptoms of DMD are caused by the absence of a protein called dystrophin.

Explain how a gene mutation can result in the absence of dystrophin.

(4)

gene mutation changes the base sequence
leading to a change in the cell's function
by making it not produce Dystrophin



This candidate scored one mark for recognising that a mutation would change the base sequence of DNA. If the response had included information about an incorrect protein being produced rather than just stating that dystrophin would not be produced then another mark could have been awarded.



Repeating information that is in the question will not gain marks in an examination.

Question 8 (b)(i)

There were many candidates that were on the right track with their answers to this question although few were able to score full marks. One mark was most often obtained from an understanding that a carrier does not show symptoms of the disease and this information was often followed by a discussion on how it can be passed to offspring. It was only more able candidates that were able to include information that linked to a heterozygous genotype.

Rather than state that a faulty allele is not expressed or that its effects are overridden by a dominant allele, candidates preferred to state that a carrier shows no symptoms of the disease. This was the case across all ability ranges.

(i) Explain what is meant by a carrier of DMD.

a person (female) who has 1 faulty allele⁽²⁾ but it isn't expressed due to presence of a dominant allele so carrier doesn't have symptoms of disorder



ResultsPlus
Examiner Comments

This response gained 2 marks. It clearly states that only one faulty allele is present for one mark and that this allele is not expressed for the second mark. It elaborates on this information to state that the faulty allele is not expressed due to the presence of a dominant allele, which although is the same marking point to that already awarded, would not have gained the mark as it has not stated that the dominant allele overrides the effect of the recessive faulty allele.



ResultsPlus
Examiner Tip

Always remember that a carrier of a disease has a heterozygous genotype, one dominant and one recessive allele. The faulty allele is always recessive.

Many responses included details about passing on the allele or disease to offspring which was irrelevant. Most one mark responses covered the second marking point stating that the carrier would not show any symptoms of the disease.

(i) Explain what is meant by a carrier of DMD.

(2)

No symptoms are shown but this person can give DMD to his child.



ResultsPlus
Examiner Comments

One mark was obtained by this candidate who understood that a carrier would not show any symptoms of the disease. It is a typical response in that it also implies that the allele can be passed to offspring.



ResultsPlus
Examiner Tip

Carriers will only have one recessive faulty allele and its effects are always overridden by a dominant allele.

Question 8 (b)(ii)

This question was the least well answered on the paper. Candidates were often confused on the sex-linkage and few mentioned the presence of the faulty allele on the X chromosome. There were many one mark answers where candidates were aware that carriers were present and, less frequently, a further mark was obtained in responses that indicated not all children were affected. There was no mention of the male not being able to 'carry' a dominant allele on the Y chromosome. There were few 3 mark responses from more able candidates although there were still marking points that could easily have been obtained by these students if some of these responses were more fluent in their structure and wording. Information was sometimes confused and it was often difficult to determine which part of the pedigree the candidate was referring to.

Two mark answers most often gained these from including details covering marking points 5 and 6. Other marking points were rarely covered in responses.

(ii) Explain how the diagram shows that DMD is caused by a recessive allele.

(3)

There are female carriers of the gene. Sex-linked disorder is carried on the X chromosome. Females genotype is XX meaning that if they are only a carrier of the gene then it must be heterozygous, a recessive allele along with a dominant allele.



ResultsPlus
Examiner Comments

This response gained two marks. The candidate has understood that carriers are present which would not be the case if the disease was caused by a faulty allele. It also states that the faulty allele is linked to the X chromosome for the second mark.



ResultsPlus
Examiner Tip

Sex-linked diseases caused by a recessive almost always affect males as they do not have a dominant allele to override the effects of a faulty allele.

Three mark responses were only seen by candidates performing at the highest grades. These tended to include details that referred to an affected male in generation 1, the faulty allele being linked to the X chromosome and that all offspring would be affected.

(ii) Explain how the diagram shows that DMD is caused by a recessive allele.

(3)

Female parent is carrier and is transmitted to offspring. In the first generation a male is diagnosed with DMD and a female is a carrier so alleles are passed to their offsprings and get the disorder DMD. Sex-linked so present on X-chromosome, recessive allele is passed to offsprings passing on the allele. Female carrier resulted in a male with DMD.



There is information here that clearly states that carriers are present for one mark. The student has also recognised that one male in generation 1 is affected and also that the faulty allele is carried on the X chromosome.



Always study pedigree diagrams carefully before attempting to answer questions. It is a good idea to write down the genotypes underneath each family member if they are not already provided.

Question 8 (b)(iii)

A good number of candidates scored full marks for their response to this question although a fair few were confused not only on the sex-linkage but also on the sex chromosomes of the male, often giving XX rather than XY. These responses often gained no marks. There were other responses that showed the faulty allele as dominant rather than recessive which also meant that these answers failed to score. It was surprising that more candidates did not present their genetic diagram as a Punnett square as these tend to be more successfully drawn and clearly displayed than the traditional genetic diagram which are often untidy, confused and difficult to decipher.

There were few answers that gave the correct parental genotypes but then failed to make the correct linkage for one mark. In most cases, where candidates had given the correct genotypes of the parent the correct genotypes of generation 1 were also given.

(iii) Draw a genetic diagram to show the inheritance of DMD from the parents to generation 1.

Use X^D for the dominant allele and X^d for the recessive allele.

(2)

	father		mother
parents genotype	$X^D Y$		$X^D X^d$
alleles	X^D, Y	,	X^D, X^d
children genotype	$X^d Y$,	$X^D Y, X^D X^d$
phenotype	Male (affected)	Male (unaffected)	Female (carrier)



ResultsPlus
Examiner Comments

One mark was awarded for the information given in this response for showing the correct parental genotypes. However, the genotypes of offspring in generation 1 are incorrect and incomplete so the second mark could not be awarded here.



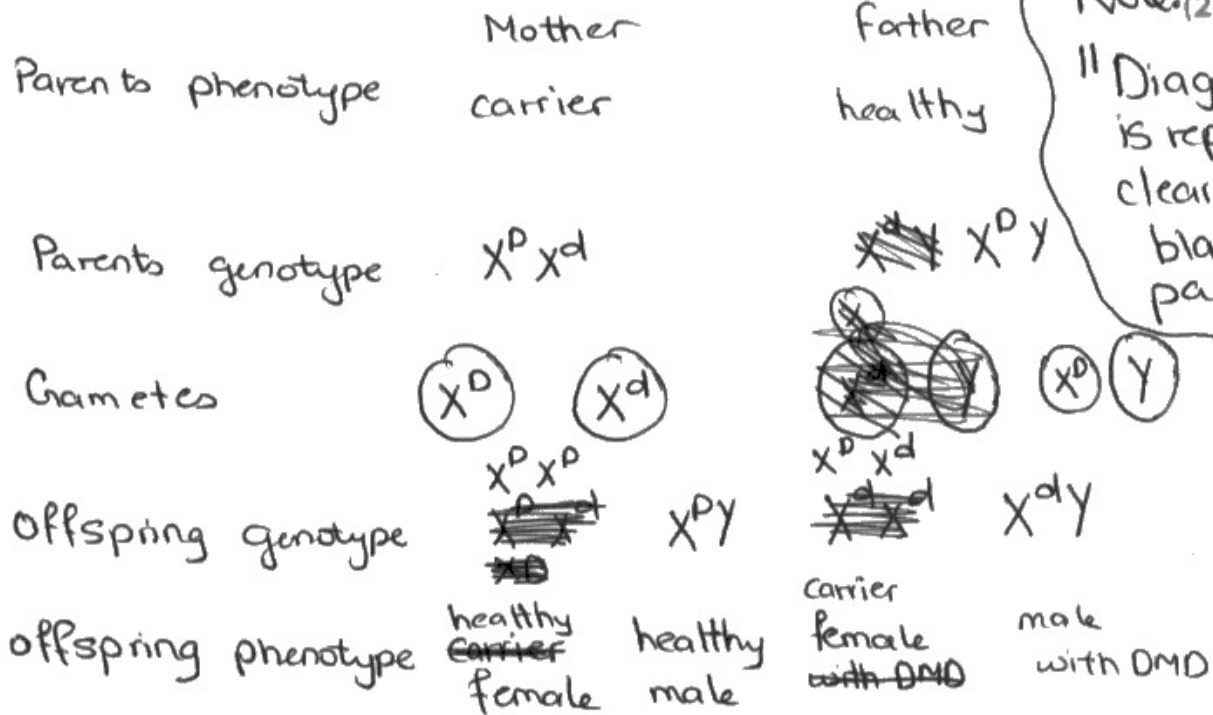
ResultsPlus
Examiner Tip

Genetic diagrams are much more clearly displayed as a Punnett Square.


Most candidates preferred to draw a Punnett square to present their genetic diagram. Other types of diagram drawn was often presented poorly with some being unlabelled so it was difficult, at times, to identify the parental and generation 1 genotypes.

(iii) Draw a genetic diagram to show the inheritance of DMD from the parents to generation 1.


Use X^D for the dominant allele and X^d for the recessive allele.



Note: (2)
 "Diagram is repeated clearly on blank page"



Although this candidate did present the diagram more clearly in extra space, the diagram presented here shows the correct genotypes of the parents and generation 1 for 2 marks.



If extra space is needed for a response always indicate this clearly within the space allocated for the answer otherwise it could be overlooked.

There were several responses that gave alternative answers to this question and despite one version most often being correct these could not be awarded.

Carriers female produce normal offspring
 (iii) Draw a genetic diagram to show the inheritance of DMD from the parents to generation 1. *~ affected.*

Use X^D for the dominant allele and X^d for the recessive allele. (2)

Parental genotype $X^d Y \times X^D X^D$

Gametes $X^d, Y \times X^D, X^D$

offspring genotype ~~$X^D X^d, X^D Y, X^D Y$~~

offspring phenotype ~~Carrier female, normal male, normal male~~

$X^D Y \times X^D X^d$

$X^D, Y \times X^D, X^d$

~~$X^D Y, X^d Y$~~

~~normal male, affected male, normal male with DMD~~

(Total for Question 8 = 11 marks)



This candidate has given alternative answers, one being correct and the other being incorrect. This negates any mark that can be awarded. If they had made it clear that the diagram on the right was the one that they wished to be marked and clearly crossed out the diagram on the left, then one mark could have been obtained for showing the correct parental genotypes. No mark would have been given for the generation 1 genotypes as they have not included all four offspring.



Make it clear which response is to be marked and which is to be ignored.

Question 9 (a)

It was interesting that few candidates mentioned gene mutation and cancer in their responses to this question based on the damage caused to the liver by alcohol. Despite this, responses implied a fair understanding of the various roles of the liver and information included in answers clearly referred to these. The least common answer was a reference to deamination with the most popular including details on the role of the liver as a detoxifying organ.

More able candidates were able to score the full 3 marks for their response. It was rare to see a reference to cancer in answers as was a mention of the role of the liver in deamination.

- 9 (a) Hepatitis is a disease of the liver. ~~cirrhosis~~
This disease can be caused by drinking too much alcohol. ~~cirrhosis~~
Explain the damaging effects of alcohol on the liver. ~~cirrhosis~~ (3)

Alcohol can cause liver failure, liver ~~cirrhosis~~
~~cirrhosis~~ cirrhosis, and liver cancer, so that
the liver can no longer deaminate excess amino
acids to urea so build up excess amino acids in blood.
Liver can longer break down toxins and hormones,
And if ~~diabetes~~ ^{insulin} is secreted due to high glucose level
in blood the liver is unable to change glucose to glycogen.



Three marks were awarded to this response. Both liver cirrhosis and cancer have been mentioned for 2 marks. The candidate has also stated that the process of deamination would not occur for the third mark.



There is a danger that candidates do not present their response in the context of the question. For example, in this case there is a chance that an answer may just discuss the roles of the liver rather than how its roles would be affected if it were damaged.

There were some vague responses that stated alcohol would cause liver failure or damage which were not awarded. In other cases, candidates stated a role of the liver but did not put their answer in the context of the question.

9 (a) Hepatitis is a disease of the liver.

This disease can be caused by drinking too much alcohol.

Explain the damaging effects of alcohol on the liver.

(3)

can Alcohol can cause liver cirrhosis or liver damage as it will over work liver to detoxify it. It can also cause live cancer



This candidate has scored 2 marks. They have identified that alcohol can cause cirrhosis and cancer. Although they have mentioned detoxification as a role of the liver they have not stated clearly that this process would be adversely affected if the liver was damaged.



If a question has a context the information given in the response should reflect this.

Candidates working at lower levels found this question challenging. Across the responses seen the information included in responses that did score was varied.

9 (a) Hepatitis is a disease of the liver.

This disease can be caused by drinking too much alcohol.

Explain the damaging effects of alcohol on the liver.

(3)

the liver may stop working
can have cancer in the liver



This candidate scored 1 mark for stating that alcohol could cause liver cancer. No mark can be awarded to the remainder of the response.



Candidates should know that the liver has many roles and should be able to recall these although the finer details of most of these do not need to be learnt.

Question 9 (b)

A vast number of responses to this question were very pleasing. If candidates did not have a detailed understanding of the reproduction of a virus then there was at least partial understanding and this gave credit to a large number of candidates. There were several responses that went into some high level detail by discussing the role of reverse transcriptase and the role of this enzyme in converting viral RNA into DNA. However, there were pitfalls. Too many candidates discussed the virus itself entering the cell and some talked about the viral genetic material entering the cytoplasm without any mention of it being incorporated into the host cell DNA. There were several responses that included details of mitosis or meiosis in relation to viral replication and whilst there was reference to protein synthesis the details given were sometimes unclear.

A fair number of responses discussed how the virus enters the cell and included information that just repeated the question i.e. the virus reproduces. These details were quite common in answers from students who had a more vague idea of viral reproduction but clearly had gaps in their knowledge.

(b) Hepatitis B is one type of virus that can cause hepatitis.

Describe the reproduction of a hepatitis B virus.

(6)

When the virus enters the body, it hides inside the cells of the body (to not be detected by ~~immunity~~^{immunity} system e.g. phagocytes & lymphocytes). The virus then starts reproducing inside the living cell (virus can only reproduce inside living cells which acts as host). The cell membrane is later damaged and the cell dies and bursts, releasing many virus cells into the blood stream, that does the same with ~~the~~ all other living cells. This virus in particular, chooses the liver cells to attack and ~~damage~~ reproduce inside and damage ~~the~~ so liver failure occurs.



The response from this candidate indicates some confusion on how viruses replicate. However some understanding is shown where the student states that the cell bursts to release viruses. This information gained 2 marks.



This is a tricky topic but it is important to remember that viruses cannot enter cells, they can only attach to the cell membrane from the outside.

More able candidates performed well in this question, scoring at least 4 out of the 6 marks available. The most common detail missed was clear details relating to protein synthesis or that the viral DNA.

(b) Hepatitis B is one type of virus that can cause hepatitis. U

Describe the reproduction of a hepatitis B virus.

(6)

- 1, It binds the cell surface membrane
- 2, injects its own RNA/genetic material
- 3, DNA incorporated into RNA/viral RNA
- 4, New proteins of virus are assembled
- 5, New virus particles are made
- 6, cell lysis.
- 7, many cells are effected and this process repeats, ^{entirely} damaging immune system.



ResultsPlus
Examiner Comments

This is a very clearly written and fluent answer that covers most of the marking points. If the candidate had included details about new viruses being released following cell lysis or had added information on protein synthesis then they would have scored full marks.



ResultsPlus
Examiner Tip

Viral reproduction is a step-by-step process and there is no reason why a response cannot be set out as numbered steps or bullet points.

Question 9 (c)

This was a popular question amongst candidates who often gained at least two marks for their response. There was some vagueness in detail around memory cells and this was the mark that was most often not awarded. Otherwise, candidates seemed familiar with how vaccines work to bring about immunity.

Many candidates had the idea of the secondary immune response being faster than the primary although not all students linked this to the memory cells. On the contrary, some candidates referred to memory cells but did not then go on to link these with a faster secondary response.

(c) Vaccinations can be used to prevent the spread of hepatitis.

Explain how vaccines can help people become immune to hepatitis.

(3)

A dead version of hepatitis B is injected into the body to stimulate the primary immune response so that lymphocytes produce memory cells and antibodies, this is a slow response process. ~~When~~ This is for if the ^{actual} virus enters the body, a secondary immune response occurs where it's a faster process due to memory cells so it divides rapidly and destroys the virus before a disease happens.

(Total for Question 9 = 12 marks)



ResultsPlus
Examiner Comments

This is a good 3 mark answer that clearly covers all three marking points. Although the candidate has stated that a dead form of the virus is injected this is perfectly acceptable for the first marking point. They understand how this causes the production antibodies by the white blood cells and that the production of antibodies by memory cells gives a faster secondary immune response.



ResultsPlus
Examiner Tip

It is important that candidates are able to interpret graphs relating to the primary and secondary immune responses.

Paper Summary

On the whole, many students managed to score on each of the questions in the paper. Although the spread of marks awarded for the questions related to practical work was variable it was made clear that the vast majority of candidates had accessed the practicals in whatever form and were, therefore, able to gain marks from the detail given in their responses. However, there are still some improvements that could be made in this area. It appears that candidates are less prepared in the written aspects of practical work and not so familiar with some of the terminology that is used. Percentage change calculations still pose a problem for candidates. The maths question in this paper related to this did not score particularly well. There were some very pleasing responses to some of the questions testing more tricky topics – many of these scored well although there were clearly areas of the specification that appear to require more focus. For example, candidates struggled somewhat with enzyme inhibition particularly when it came to drawing the graph and this could be that they have had limited practice in analysing graphs of this nature. Finally, it is important that candidates read all information given very carefully. There is a fair amount of evidence that this did not happen in several cases which meant that details were missed, incorrect information was extracted or that information was interpreted incorrectly.

Grade boundaries

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

<https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html>

