



Examiners' Report

June 2024

GCSE Biology 1BI0 1F

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June 2024

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Introduction

Biology Paper 1BI0 1F is the first of two papers taken as part of the GCSE (9-1) Biology qualification. The qualification follows a linear assessment model whereby candidates must complete the two papers in the same single year of certification.

The paper consists of 100 marks and is assessed by a variety of question types. These include, multiple-choice, short answer questions, calculations and extended open-response question. Candidates should answer all questions in a time period of 1 hour and 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are awarded for the ability to demonstrate biological understanding as well as to give a response that shows structure and coherence.

In addition, Biology Paper 1BI0_1F assesses practical knowledge and maths skills, the requirements of which are given in the specification. Furthermore, there are eight mandatory core practicals in the specification, which candidates must complete prior to sitting the examination. Candidates need to use their knowledge and understanding of these practical techniques and procedures in the written assessments.

Biology Paper 1 contains questions assessing the content of Topics 1 to 5 from the specification. In this examination series, candidates were required to answer questions that tested their knowledge and understanding of bacterial cells, pathogens and disease, the immune system, eye structure and function, cell division, human evolution, the evolution of antibiotic resistant bacteria, enzymes and genetic crosses.

The first extended open-response question on the paper was in the context of physical defences used by plants to protect against attack by pests and pathogens. The second extended open-response question involved a description of the path taken by electrical impulses in a reflex arc.

Questions designed to assess practical work included extracting DNA from fruit, measuring the energy content of foods and tissue culture.

The assessment of maths skills included calculating the range of a set of values, calculating a mean, plotting points on a graph, describing the trend in a graph, calculating the energy released from burning food and calculating the expected number of plants from a genetic cross.

Some good examination technique was seen, including annotating diagrams, underlining or highlighting key words, listing key words by the question particularly and showing working for calculations.

The more straightforward questions where marks could be gained by interpreting given information were answered well. It was also pleasing to see some excellent answers accurately applying relevant scientific information to items that required extended prose.

It was pleasing to note that there were fewer blank answer spaces on the paper this year, particularly on the six mark questions, perhaps indicating an increase in accessibility of the paper to candidates. In general, candidates made good use of the diagrams provided for many of the questions. However, some candidates ignored the instruction in the stem of questions to refer to these diagrams, thus limiting the number of marks that could be awarded. Improvement in the quality of answers to items based on practical biology were seen, but there is still work to be done on areas such as identifying relevant variables to control and how the temperature of reactions can be controlled.

Many candidates had clearly been taught how to interpret the different command words used in questions, but some confusion between the requirements of describe / explain questions was seen. Explain items were often only partly answered because candidates only included a description in their response. In addition, it was not uncommon to see responses to questions with the command word describe being extended to include an explanation.

Question 1 (a)(ii)

In this question candidates had to give the name of structure Z on the diagram of a bacterial cell. The item was very accessible to candidates with an overwhelming majority scoring the mark. Phonetic spellings of flagellum were credited.

Question 1 (a)(iii)

This was also a very accessible item, with most candidates stating that the flagellum allows the bacterial cell to move or swim.

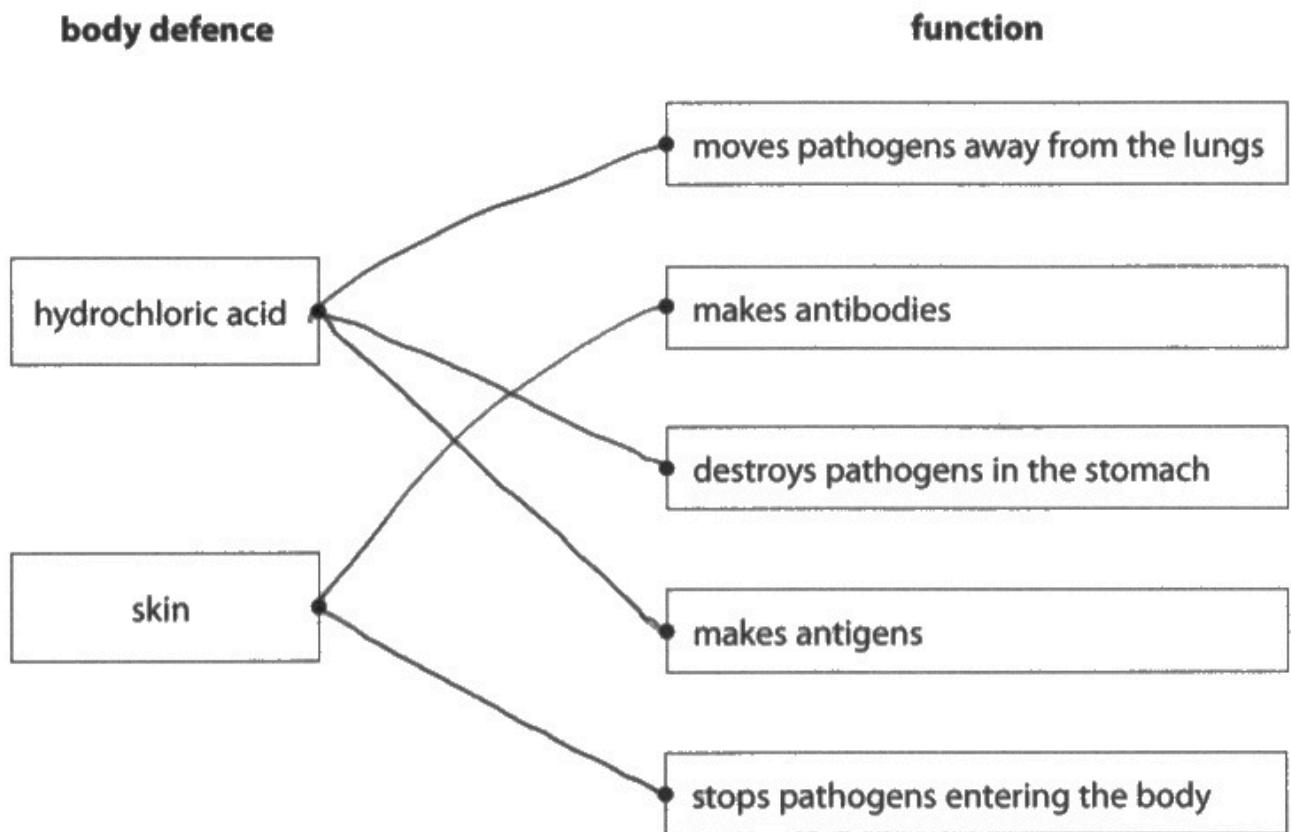
Question 1 (b)

Q01(b) required candidates to draw lines from two body defences (hydrochloric acid and the skin) to their functions. The vast majority of candidates completed this correctly, but a small number of candidates lost marks by joining one or both of the body defences to more than one function. This style of question is common in foundation science papers and it must be stressed that the instruction is always to draw **one** straight line from one thing to another.

(b) The human body has defences to protect against infection by bacteria.

Draw **one** straight line from each body defence to its function.

(2)





This response does not score any marks.

The candidate has drawn more than one line from each body defence to a function.



Always follow the instructions given in the question. In this case, only **one** line should be drawn from each body defence to its function.

Question 1 (c)

This question tested candidates' knowledge of lifestyle factors that cause disease. The question was answered well, with a large proportion of candidates scoring both marks. All points on the mark scheme were seen across all of the responses marked. The reason why some answers did not score full marks include referring to drinking instead of drinking alcohol and repeating smoking (tobacco) from the stem of the question.

(c) Smoking tobacco is a lifestyle factor that can cause disease.

Name **two** other lifestyle factors that can cause disease.

(2)

- 1 your diet
- 2 where you live



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Examiner Comments

This response did not gain any credit. If the candidate had stated that poor diet, malnutrition or overeating can cause disease, then a mark would have been awarded. 'Where you live' is not specific enough to be creditworthy, but stating poor living conditions, such as damp houses, would have scored a mark.



ResultsPlus
Examiner Tip

Examiners are not looking for lots of detail in this type of question, but try to make your answers as specific as possible.

(c) Smoking tobacco is a lifestyle factor that can cause disease.

Name **two** other lifestyle factors that can cause disease.

(2)

- 1 drinking alcohol
- 2 sedentary lifestyle



ResultsPlus
Examiner Comments

This response scores both marks. Sedentary lifestyle is acceptable for a lack of exercise.

(c) Smoking tobacco is a lifestyle factor that can cause disease.

Name **two** other lifestyle factors that can cause disease.

(2)

- 1 Addicted to alcohol substance.
- 2 Obesity.



ResultsPlus
Examiner Comments

This response scored one mark for the link to alcohol.

Obesity was not credited because this is a consequence of lifestyle rather than a lifestyle factor.



ResultsPlus
Examiner Tip

Make sure that your answer is clearly linked to the question asked.

Question 2 (a)(i)

This was a very accessible sentence completion item linked to extracting DNA from fruit. The vast majority of candidates correctly chose 'salt' and 'membranes' from the list of words provided. A small minority scored just one mark, usually selecting indicator instead of salt.

Question 2 (a)(ii)

Q02(a)(ii) was linked to the specification point on extracting DNA from fruit. The question required candidates to look at diagrams showing the process of extracting DNA from strawberries and to describe the method shown in one of these diagrams. Marks were awarded for describing filtration, ie pouring the contents of the beaker into a funnel lined with filter paper, to separate out the solution containing DNA. It was evident that some candidates did not study the diagram carefully enough because many responses involved pouring the contents of the beaker directly into the boiling tube without filtering. In addition, it was apparent that some candidates were unfamiliar with extracting DNA from plants.

(ii) Describe the method shown in stage 2.

(2)

in stage 2 they are filtering the salt solution, strawberries and washing up liquid by using a funnel and filter paper to separate the insoluble and soluble substances.



This response scores two marks. The candidate has recognised that a funnel with filter paper is being used in stage 2. The reference to separating insoluble and soluble substances is also a creditworthy point.

(ii) Describe the method shown in stage 2.

(2)

The crushed strawberries, salt solution and washing up liquid is being poured into a test tube via filtration.



ResultsPlus
Examiner Comments

Stating that the process is filtration scores one mark. There is no reference to the use of a funnel, filter paper or separating DNA from the crushed strawberry mixture.



ResultsPlus
Examiner Tip

In this type of question always look at diagrams carefully, then describe what you can see. Also apply your own knowledge of the procedure.

(ii) Describe the method shown in stage 2.

(2)

Crushed Strawberrys, salt solution and washing up liquid is mixed together in a beaker, then that gets pored into a be boiling tube with liquid containing DNA inside



ResultsPlus
Examiner Comments

This response describes the crushed strawberry mixture being poured directly into the boiling tube. The candidate has not recognised that the mixture is being filtered so that the soluble DNA can be collected in the boiling tube. Zero marks scored.

Question 2 (b)(ii)

The vast majority of candidates scored the mark for calculating the mean mass of DNA. A small number of candidates added the values from the table, then forgot to divide the total by 4, thus failing to score the mark.

Question 3 (a)(ii)

Q03 was based on the structure and function of the eye and defects of the eye.

In Q03(a)(ii) it was surprising that a large proportion of candidates were unable to identify the cornea on the diagram of the eye. Iris and lens were common answers that did not score marks.

Question 3 (a)(iii)

This proved to be a challenging question, with many candidates unable to name structure R as the iris and then explain how this structure controls the amount of light entering the eye. It was expected that candidates would explain that muscles (in the iris) contract or relax, thus altering the size of the pupil, which allows more or less light into the eye. Candidates who used less technical terms to refer to changes in structure R and the pupil, such as expand or decrease, did not gain credit.

(iii) Explain how structure R controls the amount of light entering the eye.

(2)

The iris controls the amount of light entering the eye because it is connected to the retina which controls the receptor cells (rods and cones.)



This response scores one mark for identifying structure R as the iris. There is no explanation of how structure R controls the amount of light entering the eye, so no further marks can be scored.

(iii) Explain how structure R controls the amount of light entering the eye.

(2)
it contracts and relaxes which makes
the hole the light passes through to the
pupil ~~wider or~~ bigger or smaller which
limits the amount of light that goes in.



ResultsPlus
Examiner Comments

This response scores two marks.

The candidate has not named structure R, but one mark is gained for 'it (structure R) contracts and relaxes'. A second mark is awarded for the correct reference to the pupil becoming bigger or smaller.



ResultsPlus
Examiner Tip

Make sure that you can name the structures of the eye and can give their functions.

Question 3 (b)

Q03(b) was linked to a diagram showing light rays entering the eye and meeting behind the retina. Candidates were asked to explain why the person cannot see near objects clearly.

Most candidates attempted the question, but relatively few good explanations were seen. Many candidates scored one mark for stating that the person is long-sighted. Clear explanations linking a short eyeball, or a cornea / lens that is not curved enough, to light not being focused on the retina were seen infrequently. Responses that referred to light rays not meeting on the optic nerve were relatively common, but did not gain credit.

(b) Figure 5 shows a diagram of light entering an eye.

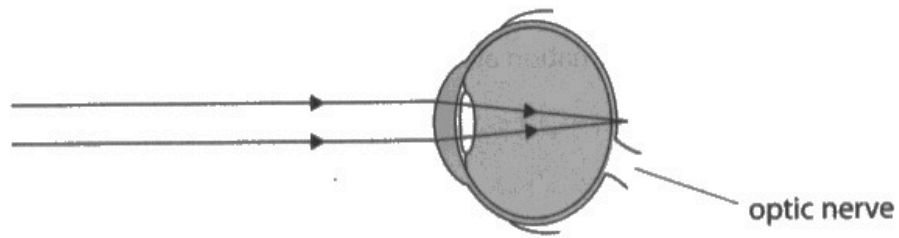


Figure 5

Explain why this person cannot see near objects clearly.

(2)

Because the eyeball is too small which is causing the light rays to go through the eye. Also the optic nerve is very small and low down



ResultsPlus
Examiner Comments

This response scores zero marks. References to the eyeball being too small were not credited, but 'the eyeball is too short' would have scored one mark. There are no references to where the light rays come to a point of focus.



ResultsPlus
Examiner Tip

Make sure that you learn the features of the main defects of the eye and know how these defects can be corrected.

(b) Figure 5 shows a diagram of light entering an eye.

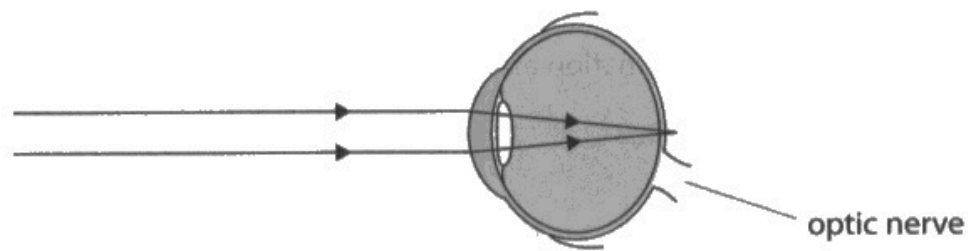


Figure 5

Explain why this person cannot see near objects clearly.

(2)

The light wasn't converged into the retina correctly, so it couldn't be spread out over the cornea.



This is a clear response that scores both marks for explaining that light wasn't converged on the retina correctly.

(b) Figure 5 shows a diagram of light entering an eye.

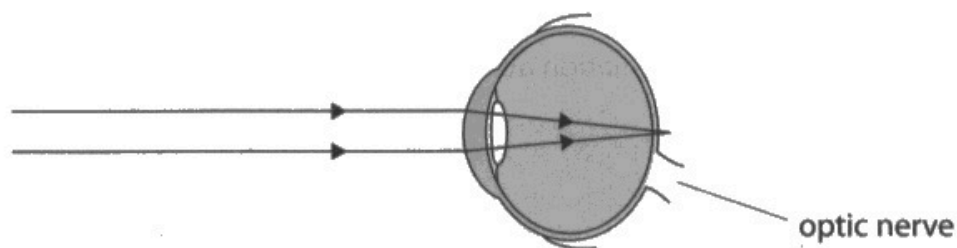


Figure 5

Explain why this person cannot see near objects clearly.

(2)

This person cannot see near objects clearly because the light rays are focused behind the retina. Also, the cornea is not curved enough and the eyeball is not long enough.



ResultsPlus
Examiner Comments

This first sentence of this response scores two marks for 'light rays are focused behind the retina'. The candidate has a good knowledge of eye defects. They have given some additional creditworthy detail about the shape of the cornea and eyeball.

Question 3 (c)(i)

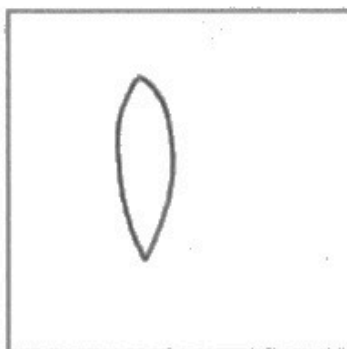
This question required candidates to draw the shape of the lens needed to correct long-sightedness.

A large proportion of candidates could recall the shapes of convex lenses and concave lenses, but the correct lens was not always drawn in the box.

(c) Long-sightedness and short-sightedness are defects of the eye.

(i) Draw, in the box, the shape of the lens needed to correct long-sightedness.

(1)



ResultsPlus
Examiner Comments

The shape of the lens is drawn correctly, so one mark scored.

(c) Long-sightedness and short-sightedness are defects of the eye.

(i) Draw, in the box, the shape of the lens needed to correct long-sightedness.

(1)



ResultsPlus
Examiner Comments

The candidate has opted to draw a convex lens and a concave lens in the box. This response does not score the mark because one answer is correct and the other is incorrect.



ResultsPlus
Examiner Tip

This is a one mark question, so make sure that you only give one answer.

Question 3 (c)(ii)

This question asked for the name of one defect of the eye, other than long-sightedness or short-sightedness. Cataracts and colour blindness were the most common answers seen. Astigmatism and glaucoma were also creditable responses. Some candidates were unaware of eye defects other than long-sightedness and short-sightedness and many simply gave 'blindness' as their answer.

(ii) Name **one** other defect of the eye.

(1)

astigmatism colour blindness



ResultsPlus
Examiner Comments

Colour blindness scores the mark. Astigmatism has been crossed out, but this too would have scored the mark.



ResultsPlus
Examiner Tip

The stem of the question gives long-sightedness and short-sightedness as defects of the eye. This question asks for the name of **one other** defect of the eye. Always follow the instructions in the question. Giving more than one other defect of the eye could result in you losing the mark if you make a mistake.

(ii) Name **one** other defect of the eye.

(1)

Cataract is very common disease of eyes.
glaucoma is a eye disease spread by
genetically .

(Total for Question 3 = 8 marks)



ResultsPlus
Examiner Comments

There are two defects of the eye named here. Both are correct. The misspelling of cataracts is not penalised.



ResultsPlus
Examiner Tip

Remember that the question asks you to name **one** other defect of the eye.

Question 4 (a)

This question required candidates to apply the principles of selective breeding to the context of breeding chickens that lay large numbers of eggs. The introduction to the question gave some brief information about the domestication of chickens from red junglefowl and basic data about the birds was provided. Marks were awarded for the selection of birds with the highest egg production, breeding these birds, selecting offspring with the highest egg production and repeating the whole process over several generations. Descriptions of breeding birds (with the highest egg production) resulted in some confused answers, but by applying some understanding of selective breeding, the majority of candidates were able to score at least one mark.

- 4 Scientists think that chickens were domesticated from red junglefowl thousands of years ago.

Figure 6 shows some information about these birds.



| information | red junglefowl | domesticated chicken |
|------------------------------|---|--|
| photograph |  <p>(Source: © Jamil Bin Mat Isa/ Shutterstock)</p> |  <p>(Source: © Tsekhmister/ Shutterstock)</p> |
| mass of adult in kg | 0.75 to 1.2 | 2.5 to 3.0 |
| number of eggs laid per year | 10 to 15 | 250 to 300 |

Figure 6

- (a) Describe how selective breeding has produced chickens that lay large numbers of eggs.

(3)

Selective breeding is where you breed two animals to make another one. Selective breeding has produced chickens that lay large number of eggs so there is more eggs and produce.



The candidate has given a generic definition of selective breeding, without providing any specific detail in the context of the question. The stem of the question has been copied in the second sentence. There are no creditable points in this answer.



Always check that you have answered the question that has been set and try to avoid repeating the question in your answer. Look at the number of marks available for the question so you can include that number of points in your answer.

- 4 Scientists think that chickens were domesticated from red junglefowl thousands of years ago.

Figure 6 shows some information about these birds.

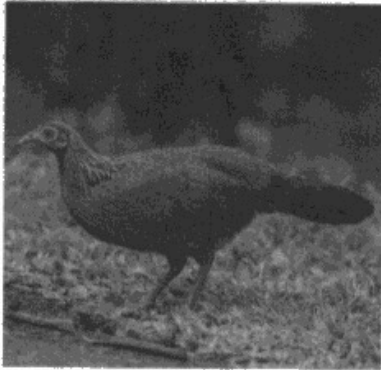
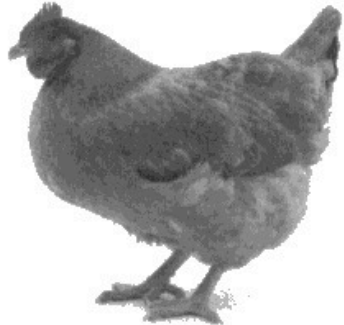
| information | red junglefowl | domesticated chicken |
|------------------------------|---|--|
| photograph |  <p>(Source: © Jamil Bin Mat Isa/ Shutterstock)</p> |  <p>(Source: © Tsekhmister/ Shutterstock)</p> |
| mass of adult in kg | 0.75 to 1.2 | 2.5 to 3.0 |
| number of eggs laid per year | 10 to 15 | 250 to 300 |

Figure 6

- (a) Describe how selective breeding has produced chickens that lay large numbers of eggs.

(3)

Over time, as humans have purposefully bred chickens ~~that~~ that ~~to~~ lay ~~less~~ more eggs ~~more~~ together, they now have a larger population. As human demand has increased, we use selective breeding by purposefully choosing ~~chickens~~ to breed chickens with a higher egg count.



This answer scores two marks. There is a clear indication that chickens that lay more eggs have been bred. In fact, these points have been made twice in this response. No credit was given for comments such as 'select the best chickens'.

- 4 Scientists think that chickens were domesticated from red junglefowl thousands of years ago.

Figure 6 shows some information about these birds.


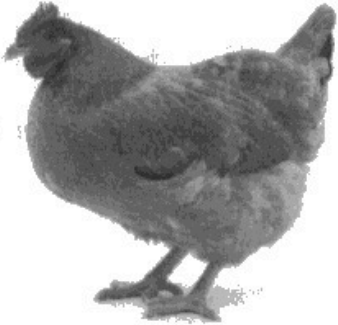
| information | red junglefowl | domesticated chicken |
|------------------------------|---|--|
| photograph |  <p>(Source: © Jamil Bin Mat Isa/ Shutterstock)</p> |  <p>(Source: © Tsekhmister/ Shutterstock)</p> |
| mass of adult in kg | 0.75 to 1.2 | 2.5 to 3.0 |
| number of eggs laid per year | 10 to 15 | 250 to 300 |

Figure 6

- (a) Describe how selective breeding has produced chickens that lay large numbers of eggs.

(3)
 Selective breeders have chosen the ~~best~~ ^{chickens} that lay the most eggs and bred them together and then waited for the offspring to lay eggs and have selected the one who layed the most to breed on and on so that they can produce more eggs.



This is a well-structured answer that scores all three marks. The candidate understands the principles of selective breeding and has applied their knowledge to the question. Selecting chickens with the highest egg production, breeding them and selecting birds with the best traits from the offspring score the marks. 'Breed on and on' could also be awarded a mark for repeating (selection and breeding) over many generations.

Question 4 (b)(ii)

The majority of candidates understood that gametes are haploid and gave 39 as their answer.

Question 4 (c)

This question required candidates to complete a table comparing the production of body cells and gametes. The question was completed well and a large proportion of candidates scored all three marks. Most candidates could give meiosis as the type of cell division that produces gametes, but spellings varied considerably. However, phonetic spellings of meiosis were credited. When giving the number of daughter cells produced by each type of cell division, some candidates confused matters by using the number of chromosomes from Q04(b).

(c) Complete the table to compare the production of body cells and gametes.

One box has been completed for you.

(3)

| type of cell produced | type of cell division | number of daughter cells produced |
|-----------------------|-----------------------|-----------------------------------|
| body cell | mitosis | |
| gamete | metasis | |



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Examiner Comments

This response scores zero marks. The word written for the type of cell division that produces gametes cannot be accepted as a phonetic spelling of meiosis because it includes the letter 't'. There has been no attempt to complete the boxes for the number of daughter cells produced.



ResultsPlus
Examiner Tip

Make sure that you learn how to spell important biological terms and know what they mean. Flash cards are a useful way of revising scientific vocabulary.

(c) Complete the table to compare the production of body cells and gametes.

One box has been completed for you.

(3)

| type of cell produced | type of cell division | number of daughter cells produced |
|-----------------------|-----------------------|-----------------------------------|
| body cell | mitosis | two |
| gamete | meiosis | four |



All three boxes have been completed correctly, so this answers scores three marks. The number of daughter cells produced can be written in figures or words.

Question 4 (d)

This question asked candidates to describe the function of stem cells and proved to be very challenging for a large proportion of candidates. Many knew that stem cells are undifferentiated, although this was not a creditworthy point. A mark was awarded most frequently for describing the ability of stem cells to differentiate or become specialised. Sometimes specific examples of specialised cells were given. The ability of stem cells to divide or make new cells was described less frequently, although references stem cells being used for growth or to replace damaged cells were not uncommon.

(d) Some animal cells are stem cells.

Describe the function of stem cells.

(2)

- repairs / replaces damaged cells
- helps with growth of the animal cells.
- It's an unspecialised cell, doesn't need have a specific function.



ResultsPlus
Examiner Comments

This response gains one mark for the reference to replacing damaged cells. The point about growth is the same point on the mark scheme. On its own, 'repairs damaged cells' would not be creditworthy. The fact that stem cells are undifferentiated is factually correct, but does not score a mark because it does not describe a function.



ResultsPlus
Examiner Tip

Listing a series of points can be a good idea because it helps to give a logical structure when answering some types of question.

(d) Some animal cells are stem cells.

Describe the function of stem cells.

(2)

Stem cells are a special type of cell that can either become red blood cells, white blood cells or nerve cell



ResultsPlus
Examiner Comments

This response scores one mark for the clear idea that stem cells can become specialised (become red blood cells, white blood cells, nerve cells).

(d) Some animal cells are stem cells.

Describe the function of stem cells.

(2)

Stem cells (both embryonic and adult) are used to differentiate into different types of cells to help people that have damaged cells, so these differentiated stem cells replace the damaged ones and are able to ~~function~~ function as the cell.

(Total for Question 4 = 10 marks)



ResultsPlus
Examiner Comments

This candidate has a good understanding of stem cells and their function. The ability to differentiate and to replace damaged cells are the creditable points here, scoring both marks available for the question.

Question 5 (a)(i)

Q05 required candidates to be familiar with calorimetry to measure the energy content of food.

In Q05(a)(i) a large proportion of candidates could give a function of the lid of the calorimeter shown in Figure 7, ie to prevent heat loss or to prevent the evaporation of water. Candidates who were unfamiliar with calorimetry experiments gave answers such as the lid prevents the entry of bacteria or unwanted substances. These responses did not gain credit.

- 5 The calorimeter shown in Figure 7 can be used to investigate the energy content of food.

Heat energy is released when a small sample of food is burnt, causing the water temperature to increase.

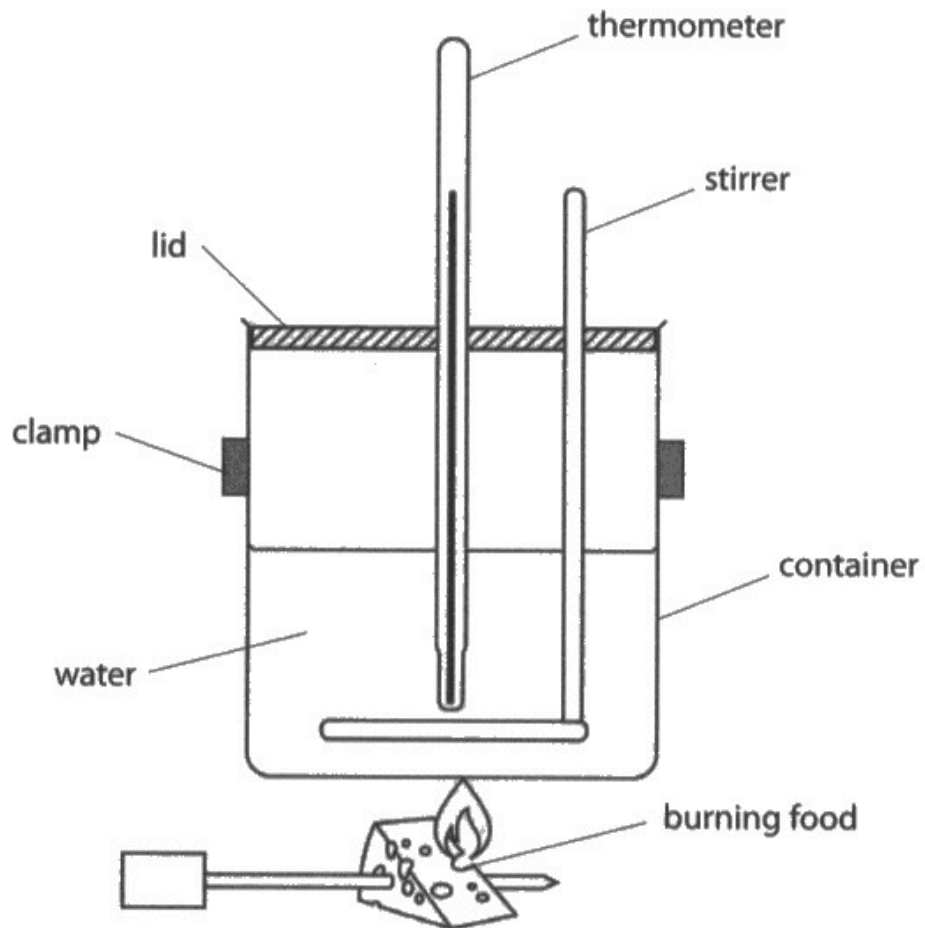


Figure 7

- (a) (i) Give **one** function of the lid.

(1)

The lid stops heat from escaping the calorimeter.



This answer scored the mark. Preventing heat loss or stopping the evaporation of water were the most common answers that gained credit.



Questions based on practical work are a common feature of Biology examination papers. Make sure that you are familiar with the core practicals and other specification points that are linked to practical work.

Question 5 (a)(ii)

It was pleasing to note that most candidates scored at least one mark on this item. Marks were available for a reference to using a thermometer, measuring the initial temperature and final temperature and subtracting the initial temperature from the final temperature.

- (ii) Describe how the increase in the temperature of the water could be measured.

(2)

By having a thermometer. reading the scale of [°]Celsius degrees, how much temperature increased.



This response gains one mark for the use of a thermometer. The candidate has not described measuring the initial temperature and the final temperature.

- (ii) Describe how the increase in the temperature of the water could be measured.

(2)

The temperature ^{increase} ↑ can be measured by taking a reading from the thermometer at the start of the test and at the end of the test. Then do Final temperature - Starting temperature to find the difference.



This is a good response that gains full marks. The use of a thermometer has been mentioned. 'Taking a reading from the thermometer at the start of the test and at the end of the test' can be interpreted as measuring initial and final temperature. The equation given in the last sentence is another creditworthy point.

Question 5 (b)(i)

This was a very accessible calculation question, with an overwhelming majority of candidates scoring both marks.

(b) A student used this calorimeter to investigate the energy content of a food.

The results are shown in Figure 8.

| temperature change in °C | mass of water in g |
|--------------------------|--------------------|
| 30 | 50 |

Figure 8

(i) Calculate the energy content of the food.

Use the equation

$$\text{energy in joules (J)} = \text{mass of water} \times 4.2 \times \text{temperature change}$$

(2)

energy content = 6.3 J



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Examiner Comments

This answer scores zero marks. The candidate has not shown any working and the final answer is incorrect.



ResultsPlus
Examiner Tip

Even if you are confident with maths questions, always show your working. If you make an error with the final stage of a calculation, you can still gain marks for the working you have shown.

(b) A student used this calorimeter to investigate the energy content of a food.

The results are shown in Figure 8.

| temperature change in °C | mass of water in g |
|--------------------------|--------------------|
| 30 | 50 |

Figure 8

(i) Calculate the energy content of the food.

Use the equation

energy in joules (J) = mass of water \times 4.2 \times temperature change

$$50 \times 4.2 \times 30 = 10500$$

(2)

energy content = 10500 J



ResultsPlus
Examiner Comments

This response scores one mark for substituting into the equation correctly. The final answer is incorrect.

Question 5 (b)(ii)

Evaluating methods is a common feature of biology questions that are based on practical investigations. Most candidates attempted this question, but it was disappointing that a large proportion were unable to give at least one way of improving the investigation described. Marks were awarded most frequently for suggesting using the same mass of food or the same volume of water. A mark was also available for stating that the investigation could be repeated with each food. References to keeping the distance of the burning food from the calorimeter the same or ensuring the food is burnt completely were far less common. This perhaps suggests that a reasonable proportion of candidates had no firsthand experience of this practical and thus the key issues that teachers stress when explaining methods. Previous Examiner Reports have highlighted the use of the term 'amount' by candidates instead of specifically referring to quantities such as mass and volume. It is pleasing to report that some improvements have been noted.

(ii) The student repeated the investigation using a different food.

The results are shown in Figure 9.

| temperature change in °C | mass of water in g | energy content in J |
|--------------------------|--------------------|---------------------|
| 64 | 25 | 6720 |

Figure 9

State **two** ways the student could improve the investigation so that the energy content of the two different foods can be compared.

(2)

1. Different change in ~~the~~ temperature
2. Different mass of water



This response scores zero marks. Temperature change is the dependent variable and is not a relevant answer. The mass of water should be kept the same if the energy content of two foods is going to be compared.

(ii) The student repeated the investigation using a different food.

The results are shown in Figure 9.

| temperature change in °C | mass of water in g | energy content in J |
|--------------------------|--------------------|---------------------|
| 64 | 25 | 6720 |

Figure 9

State **two** ways the student could improve the investigation so that the energy content of the two different foods can be compared.

- ~~Measure the mass of the~~ ^{Use the same mass of water in} ~~both tests~~ ⁽²⁾
- ~~Take multiple tests on the cheese and the different food to check for outliers~~



ResultsPlus
Examiner Comments

This is a good answer that scores both marks. The candidate's second point is a good description of repeating with each food.

Question 5 (c)

This was an accessible question, with a large proportion of candidates scoring both marks for the explanation that avocado contains more fat, so it has a higher energy value. Responses that referred to apple having less fat and therefore less energy also scored both marks. Candidates who struggled to score marks often just quoted values from the table and did not give an explanation as the question asked.

(c) Figure 10 shows some facts about two foods.

| food | carbohydrate in g | fat in g | energy in kJ |
|------------------|-------------------|----------|--------------|
| 100 g of apple | 14.0 | 0.2 | 220 |
| 100 g of avocado | 9.0 | 15.0 | 669 |

Figure 10

Explain the difference in the energy values of these two foods.

(2)

The apples had less fat than the avocados did
but had more carbohydrates



ResultsPlus
Examiner Comments

This response scores one mark. The candidate has identified that apple contain less fat than avocado, but has not gone on to explain how this results in a difference in the energy values of the two foods.

(c) Figure 10 shows some facts about two foods.

| food | carbohydrate in g | fat in g | energy in kJ |
|------------------|-------------------|----------|--------------|
| 100 g of apple | 14.0 | 0.2 | 220 |
| 100 g of avocado | 9.0 | 15.0 | 669 |

Figure 10

Explain the difference in the energy values of these two foods.

(2)
the avocado has more fat leading to a higher amount of energy due to fat being an energy store



ResultsPlus
Examiner Comments

This is a concise answer that scores both marks. The candidate has identified that avocado has more fat (per 100 g) and therefore has a higher energy value.

Question 6 (a)(i)

The stem of the question stated that the common cold is caused by a virus. To gain the mark for this question candidates had to give one reason why antibiotics are not used to treat the common cold. A large proportion of candidates scored the mark for stating that antibiotics do not kill viruses, or antibiotics only kill bacteria. Antibiotics are only used to treat bacterial infections and the common cold is not caused by bacteria, were other creditworthy responses.

6 (a) The common cold is caused by a virus.

(i) Give **one** reason why antibiotics are not used to treat the common cold. (1)

Because the common cold isn't caused
by a pathogen



ResultsPlus
Examiner Comments

This response scores zero marks. The candidate has not recognised that a virus is a pathogen. A comment about antibiotics not killing viruses would have scored the mark.

6 (a) The common cold is caused by a virus.

(i) Give **one** reason why antibiotics are not used to treat the common cold. (1)

~~Antibiotics~~ is used to kill bacterial infections only, further more, virus cannot
be killed with antibiotics



ResultsPlus
Examiner Comments

Viruses cannot be killed with antibiotics scores the mark. The references to antibiotics killing bacterial infections is ignored, but a comment such as 'antibiotics are only used to treat bacterial infections' would be given credit.

Question 6 (b)

This was a challenging question, with blank spaces seen on many occasions. However, the inclusion of an annotated diagram was designed to provide the scaffolding for candidates to access the question and to develop a coherent response. Candidates were asked to use an annotated diagram to explain how antibiotic-resistant bacteria have evolved. Those candidates who made reference to the diagram usually scored some marks. The two points credited most frequently were 'the antibiotic kills the non-resistant bacteria and the resistant bacteria survive' and 'the resistant bacteria reproduce'. A smaller number of candidates appreciated that only antibiotic-resistant bacteria would be left and that the antibiotic would no longer be effective against them. Only a very small number of candidates stated that some bacteria have a mutation (that makes them resistant), or referred to survival of the fittest and beneficial alleles being passed on. A large number of candidates wrote about bacteria being immune to antibiotics and these responses did not gain credit.

(b) Figure 11 shows the effect of adding an antibiotic to a culture of bacteria.

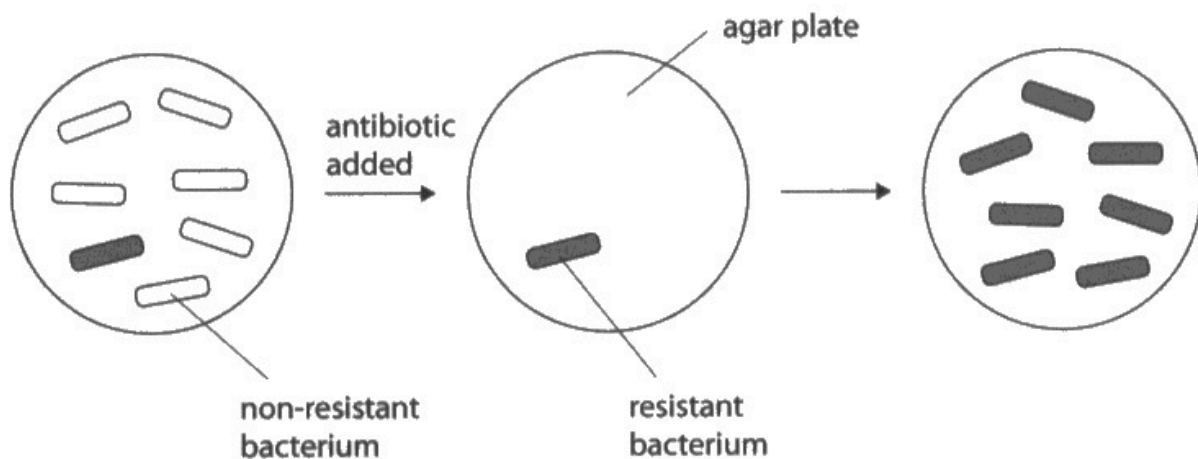


Figure 11

Explain how antibiotic-resistant bacteria have evolved.

Use information from Figure 11 in your answer.

(4)

antibiotic resistant bacteria evolved because the antibiotic was added once, clearing the non-resistant bacteria but not clearing the resistant bacterium and letting it expand and evolve. antibiotic-resistant bacteria forms when the bacteria become immune to the antibiotic.



This answer scores zero marks. 'Clearing the non-resistant bacteria' is insufficient for the antibiotic kills the non-resistant bacteria. The idea that bacteria become immune to the antibiotic is not creditworthy.



Always try to use precise scientific language in your answers, such as antibiotics kill bacteria instead of antibiotics 'clear bacteria' or 'antibiotics get rid of bacteria'. You should also refer to bacteria becoming resistant to antibiotics rather than becoming immune to antibiotics.

(b) Figure 11 shows the effect of adding an antibiotic to a culture of bacteria.

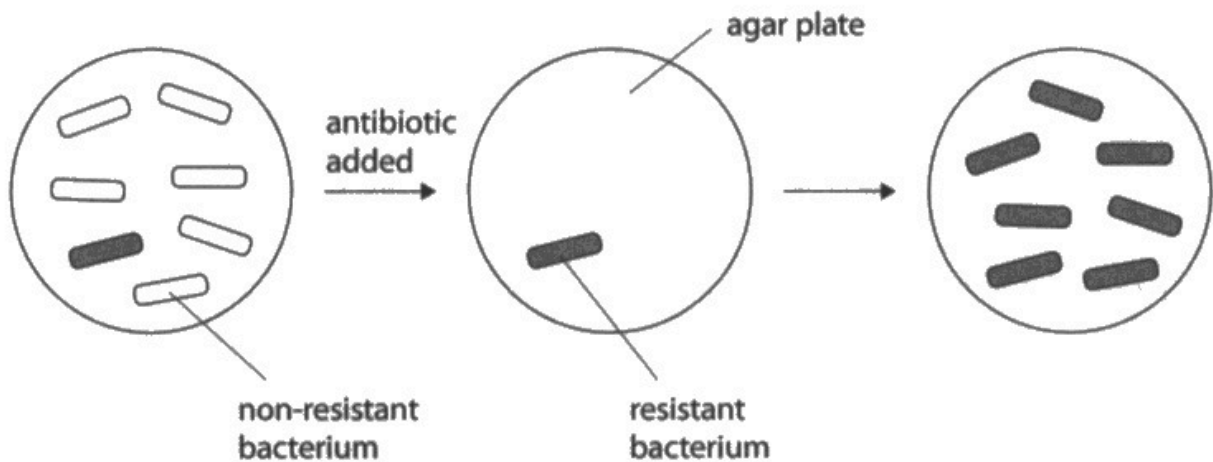


Figure 11

Explain how antibiotic-resistant bacteria have evolved.

Use information from Figure 11 in your answer.

(4)

Due to asexual reproduction the resistant bacteria has reproduced to make clones of itself to take over the host quicker these clones will also use asexual reproduction to create more clones and spread



This response scores one mark for explaining that the resistant bacteria reproduce. There are no other relevant points in the answer.

(b) Figure 11 shows the effect of adding an antibiotic to a culture of bacteria.

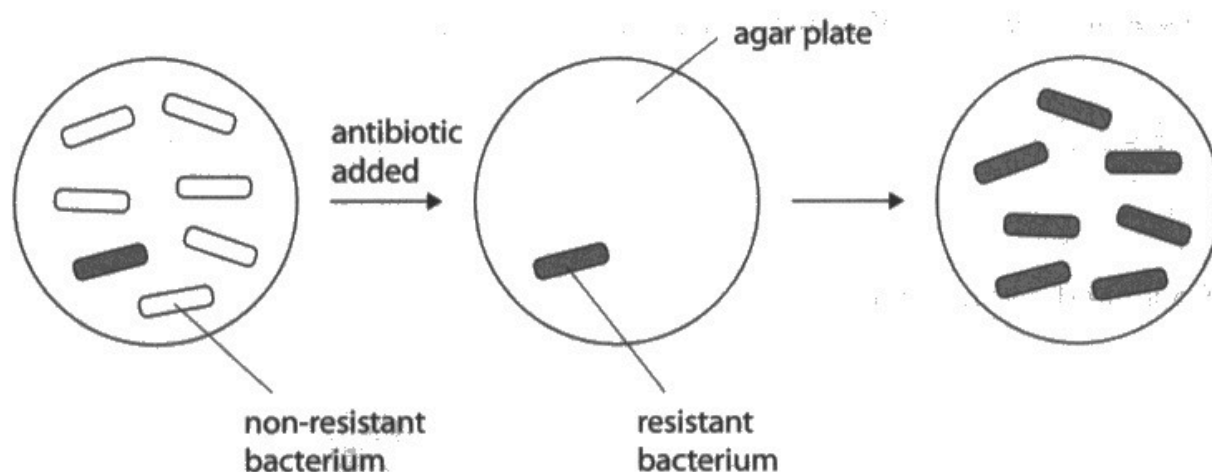


Figure 11

Explain how antibiotic-resistant bacteria have evolved.

Use information from Figure 11 in your answer.

(4)

Bacteria evolves as when antibiotic is added not all 100% of bacteria is removed, therefore some remains and learns to be resistant to the anti-biotics. This antibiotic-resistant bacteria then multiplies, so all bacteria is now resistant to that anti-biotic. As seen in figure 11, not all removed, 1 is resistant so it multiplies and now they are all resistant.



This response gains two marks. The candidate has referred to the antibiotic-resistant bacteria multiplying and the fact that all the bacteria become resistant to the antibiotic.

(b) Figure 11 shows the effect of adding an antibiotic to a culture of bacteria.

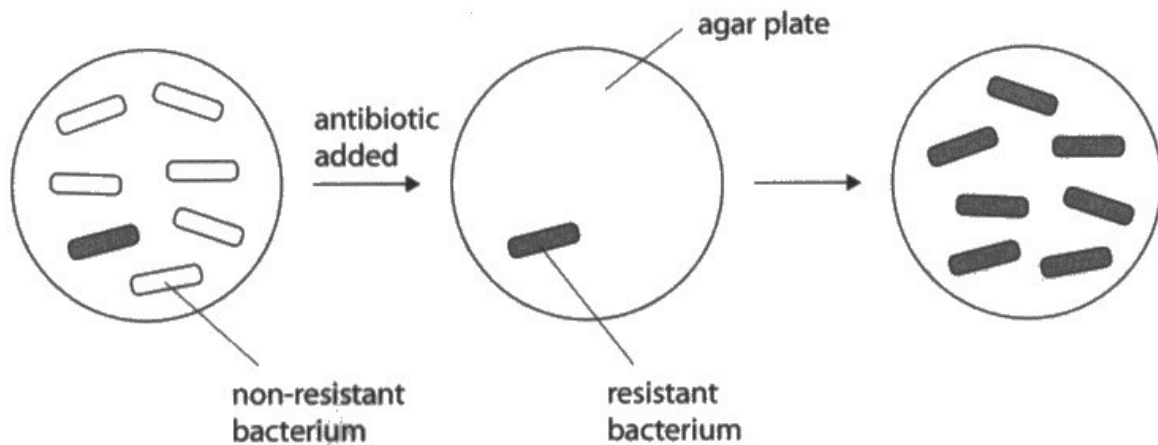


Figure 11

Explain how antibiotic-resistant bacteria have evolved.

Use information from Figure 11 in your answer.

(4)

Antibiotic - resistant bacteria has mutated to overcome antibiotics by recognition. For example, in figure 11 when an antibiotic is added to a culture of non - resistant bacteria it will kill them. However, the resistant bacterium will evidently multiply and adapt to the antibiotic that has been given so that it is not easily destroyed.



There are three creditworthy points in this response: the fact that the antibiotic-resistant bacteria have a mutation, non-resistant bacteria being killed by the antibiotic and the resistant bacteria multiplying.

(b) Figure 11 shows the effect of adding an antibiotic to a culture of bacteria.

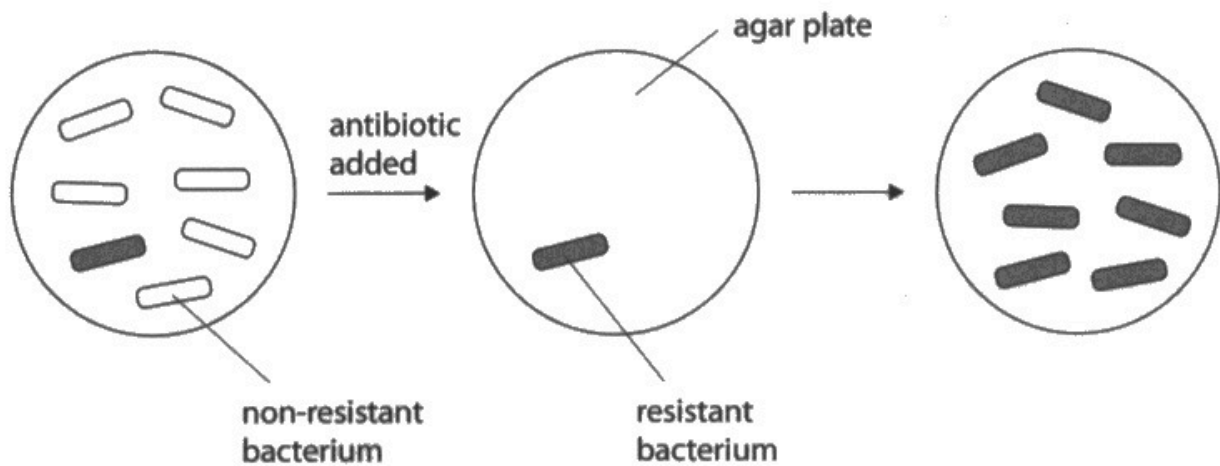


Figure 11

Explain how antibiotic-resistant bacteria have evolved.

Use information from Figure 11 in your answer.

(4)

Antibiotic-resistant bacteria has evolved by someone having a bacterial infection and needs antibiotics, they take the antibiotic however one of the bacteria had a random, advantageous mutation where it is resistant to the antibiotic. Because all the other bacteria is killed by the antibiotic the competition is killed so by survival of the fittest the mutated bacteria survives and multiplies by ~~the~~ mitosis and gives the same mutated genetics to its offspring who also survives the antibiotics and repeat



This is a detailed answer that scores full marks. The creditworthy points are: bacteria having an advantageous mutation, other bacteria (non-resistant) being killed by the antibiotic, competition being reduced and multiplication of the bacteria with the mutation. 'Gives the mutated genetics to its offspring' is insufficient to gain the mark for passing on beneficial alleles.

Question 6 (c)

This was an accessible question about evidence for human evolution. The majority of candidates scored the mark. Fossils was the most common creditworthy answer, but bones, skulls, pentadactyl limbs and cave paintings were also acceptable responses.

(c) One source of evidence for human evolution is from stone tools.

Give **one** other source of evidence for human evolution.

(1)

our bone structure compared to
~~to~~ those over time.



ResultsPlus
Examiner Comments

This response gains the mark. 'Bone structure' would be sufficient, but the reference to comparing over time makes this a better quality answer.

Question 6 (d)(i)

The majority of candidates scored at least one mark for this question. Candidates had to refer to photographs of two stone tools and explain how these tools provide evidence for human evolution. Descriptions of differences between the tools were often detailed and a large proportion of candidates scored two marks. Fewer candidates scored all three marks, usually because they rarely explained that humans had developed greater skill (in order to craft more refined tools).

(d) Figure 12 shows two stone tools.



(Source: © John Kepchar/Shutterstock)

tool A
approximately
4 000 years old



(Source: © Eduardo Estellez/
Shutterstock)

tool B
approximately
100 000 years old

Figure 12

(i) Explain how these tools provide evidence for human evolution.

(3)

These tools provide evidence for human evolution as they can confirm how humans used to hunt for food. They suggest a long time ago we were like animals as we had to go hunt and kill animals for food which differs from now as we can go to a shop to get food or the butchers to get meat.



This answer does not gain any credit. The candidate has not referred to the general features of the tools shown in the photographs.



Always use the information provided in a question. In this case you could identify some differences between the tools shown in the photographs and link this to their age and how humans have evolved. A straightforward comparison of the tools and what they might be used for would score a mark.

(d) Figure 12 shows two stone tools.



(Source: © John Kepchar/Shutterstock)

tool A
approximately
4 000 years old



(Source: © Eduardo Estellez/Shutterstock)

tool B
approximately
100 000 years old

Figure 12

(i) Explain how these tools provide evidence for human evolution.

(3)

Shows that humans became smarter overtime because tool A is better than tool B. Therefore showing that brain size increased, more sophisticated than tool B. Showing that brain sizes increased,



ResultsPlus
Examiner Comments

This answer scored two marks. The candidate has recognised that tool A is more sophisticated than tool B and that 'humans became smarter' (accepted for more intelligent). A reference to greater skill would have scored the third mark.

Question 6 (d)(ii)

This question asked candidates to describe two methods scientists use to date stone tools. It was surprising to note that many candidates were unable to give a creditworthy answer. Depth in a rock layer was the most common response seen for one mark. The relatively small proportion of candidates scoring both marks described making comparisons with other finds, or comparing the way the tools had been made. Few candidates described dating the surrounding rocks. There were many references to carbon dating, but this was not credited unless there was a link to organic material found with the stone tools.

(ii) Describe **two** methods that scientists use to date stone tools.

(2)

1 carbon dating

2 Rock formation



Carbon dating does not gain a mark unless there is a link to the carbon in organic material found with tools. 'Rock formation' is too vague to be given credit. There must be a reference to the depth of the tools in rocks to score the mark.

(ii) Describe **two** methods that scientists use to date stone tools.

(2)

- 1 Compare them to stones already dated
(see which is most worked / more sophisticated)
- 2 Depending on where what layer of the ground they are found in. Stones found in deeper levels underground will be older than those found in higher up levels underground which will be younger.

(Total for Question 6 = 12 marks)



ResultsPlus
Examiner Comments

This is a good response that scores both marks. There is a description of comparing the stone tools to those already dated and some detail about the depth that tools are found in the ground.

Question 7 (a)(i)

This question asked for one difference between normal body cells and cancer cells. Candidates who were familiar with this specification point frequently gave the answer that cancer cells divide uncontrollably. Cancer cells multiply rapidly was also a creditable answer, as was cancer cells have mutations.

7 Tissue culture can be used to grow cells.

(a) (i) State **one** difference between normal body cells and cancer cells.

Cancer cells uncontrollably keep dividing over again but normal body cells are controlled ⁽¹⁾



ResultsPlus
Examiner Comments

This answer gains the mark for 'cancer cells uncontrollably keep dividing'.

Question 7 (a)(ii)

Many candidates found this applied question very challenging, with only a minority of them scoring the mark. However, some good answers were seen, with candidates writing that cells in tissue culture may respond differently to cells in the body. Other creditable answers included 'the drug may not work the same' (in the body) and 'the drug might produce different results'.

(ii) Cancer cells can be grown in tissue culture.

Give **one** disadvantage of testing drugs on these cancer cells.

(1)

Cancer cell wont give the same results as a normal body cell.



This is a good answer. The candidate has understood the question and has given a very clear response to score the mark.

Question 7 (b)(i)

It was not expected that candidates would have firsthand experience of preparing sterile growth medium, but relatively few knew that an autoclave is used to do so. Only a very small proportion of candidates scored the mark for this item. Other acceptable responses including use gamma rays and use UV radiation. Common answers that did not gain credit include 'heat the growth medium' and 'flame the growth medium'.

(i) State **one** way the growth medium can be sterilised.

(1)

hold near a bunsen burner when cells
are placed onto it



This response scored zero marks. The candidate is perhaps demonstrating an awareness of aseptic techniques, but holding near a Bunsen burner would not sterilise the growth medium.

(i) State **one** way the growth medium can be sterilised.

(1)

aseptic techniques such as an autoclave.



The reference to aseptic technique can be ignored, but 'an autoclave' gains the mark.

Question 7 (b)(ii)

Most candidates were familiar with the general reasons for sterilising equipment or materials, but their ability to express ideas clearly using simple scientific terms often let them down. Thus, explaining one reason why the growth medium should be sterilised tended to just be along the lines of 'to get rid of bacteria or pathogens'. Such responses were not credited; the idea of killing bacteria (or pathogens) or preventing contamination / preventing the growth of unwanted organisms was required. However, the majority of candidates scored at least one mark. Those who gained a second mark usually did so for the idea that the plantlets wouldn't be killed (by pathogens) or that they would grow disease-free.

(ii) Explain **one** reason why the growth medium must be sterilised.

(2)

To kill all pathogens so that they don't interfere with the results.



ResultsPlus
Examiner Comments

'To kill all pathogens' scores one mark. There is no clear explanation of why this is important; the reference to not interfering with the results is insufficient.



ResultsPlus
Examiner Tip

If the command word in the question is 'explain', always try to think of a reason why something has happened or why an action must be taken. Remember to use the word 'because' in your answer.

(ii) Explain **one** reason why the growth medium must be sterilised.

(2)

To kill any ^{microorganisms} ~~pathogen~~ because they'll be a competition for food and other resources needed for the plant cells to grow.



ResultsPlus
Examiner Comments

This is a good response showing a clear understanding of the importance of sterilising the growth medium. The reference to killing microorganisms scores the first point on the mark scheme and the explanation of reducing competition scores a second mark.

Question 7 (b)(iii)

This question asked for one advantage of using tissue culture to conserve rare plants. A large proportion of candidates could not suggest a creditworthy answer. The most common response that gained the mark was 'so the plants don't become extinct'. Few candidates stated that only a small quantity of plant tissue is needed for the process.

(iii) Suggest **one** advantage of using tissue culture to conserve rare plants.

(1)

~~You can grow~~ Through tissue culture you can grow plants any
time of the year, therefore it's far more efficient and safer so we
can conserve rare plants at a much faster rate



This answer showed an awareness of tissue culture and conserving plants. A mark was awarded for 'growing plants at any time of year'. This was linked to a point on the mark scheme about controlling environmental factors.

Question 7 (c)

This was an accessible six mark question about physical barriers in plants giving protection from attack by pests and pathogens. Accessibility was no doubt helped by the diagrams given and relatively few blank answer spaces were seen. Weaker responses referred to the stem of the question too often and just mentioned 'to protect from pests and pathogens'. A large proportion of candidates were able to describe three different physical barriers in sufficient detail to access Level 3. It was pleasing to note that many candidates could recall the names of unlabelled structures in the diagrams and were able to articulate their understanding of how the different barriers protect plants from attack by pests and pathogens.

Describe how physical barriers protect plants from attack by pests and pathogens.

Use information from Figure 14 in your answer.

(6)

Plants are prevented from being attacked from pests and pathogens as there is barriers put up to protect the plants a tree has got lots of barriers the bark, living tissue and then there is the wood. If you grow your plants in a green house you can put a spray of pests and pathogens killers on the plant to stop the plants from being attacked.



ResultsPlus
Examiner Comments

This is a Level 1 answer that scores one mark for the reference to bark in trees. There is no additional detail to support a mark at the top of this level.



ResultsPlus
Examiner Tip

Try to make full use of photographs and diagrams in questions. In this case, giving a simple description of the features you can see in all the different plant structures would gain more credit than by just referring to bark in trees.

Describe how physical barriers protect plants from attack by pests and pathogens.

Use information from Figure 14 in your answer.

(6)

Physical barriers mean firstly the pests or pathogens have to either either find another way into harm to target organism or break in. But plant with defences like thorns means to animals can't eat them without being cut, deterring them. Or some organisms have extremely hard shells so pathogens can't crack the shell and get in and pests won't be able to attack the shell protected organism.



ResultsPlus
Examiner Comments

This is a Level 1 response scoring two marks. The reference to thorns being a deterrent so animals will not eat plants is sufficient to award a mark at the top of Level 1. No additional barriers are described, so Level 2 cannot be accessed.

Describe how physical barriers protect plants from attack by pests and pathogens.

Use information from Figure 14 in your answer.

(6)

PHYSICAL BARRIERS, such as bark and thorns, protect plants from attack by pests and pathogens by preventing them from getting inside and attacking the plants cells. Some ~~these~~ physical barriers like bark are more efficient as they can block pathogens and pests as there is physically no way to get through. Other barriers can be less effective (like thorns) against pathogens as they can get ~~through~~ past them. ^{however} thorns are more dangerous and therefore more effective against pests.



This is a Level 2 answer scoring four marks. The candidate has described two physical barriers and has given some detail about how these barriers protect plants from attack by pests and pathogens.

Describe how physical barriers protect plants from attack by pests and pathogens.

Use information from Figure 14 in your answer.

(6)

- In a plant cell the cell wall ~~and~~ strengthens the cell and the cell membrane controls what comes into and out of the cell this prevents pests and pathogens from entering
- In the plant stem it is strengthened and has spikes on the outside to deter/prevent pests from attaching/destroying it
- In a ~~the~~ woody stem the living tissue and wood is protected by the bark and creates layers to prevent attacks
- In a plant leaf it has many layers to prevent the living tissue from being attacked and ~~stop~~ ^{prevents this} Total for Question 7 = 12 marks
- in all of these in figure 14 they all have physical barriers to prevent attacks from pests and pathogens.



ResultsPlus
Examiner Comments

The description includes several physical barriers, making this a Level 3 response. There is some detail about how these physical barriers protect plants from attack by pests and pathogens, so a mark at the top of the level can be awarded (six marks). Without the additional detail this answer would only be awarded a mark at the bottom of Level 3.

Question 8 (a)

Q08 was linked to Topic 1 specification points on enzyme action.

In this question, candidates had to plot three points on a graph, then draw a line of best fit. The majority of candidates were able to plot the points very accurately, but were less successful with the line of best fit. The most appropriate line drawn through these points to show the effect of temperature on the rate of reaction was a curved line. Although it was pleasing to see few candidates joining points with straight lines, it was disappointing to note that many candidates were unfamiliar with the typical graphs associated with different factors affecting enzyme action.

- 8 A student investigated the effect of temperature on the rate of reaction of the enzyme pepsin.

Figure 15 shows the data collected.

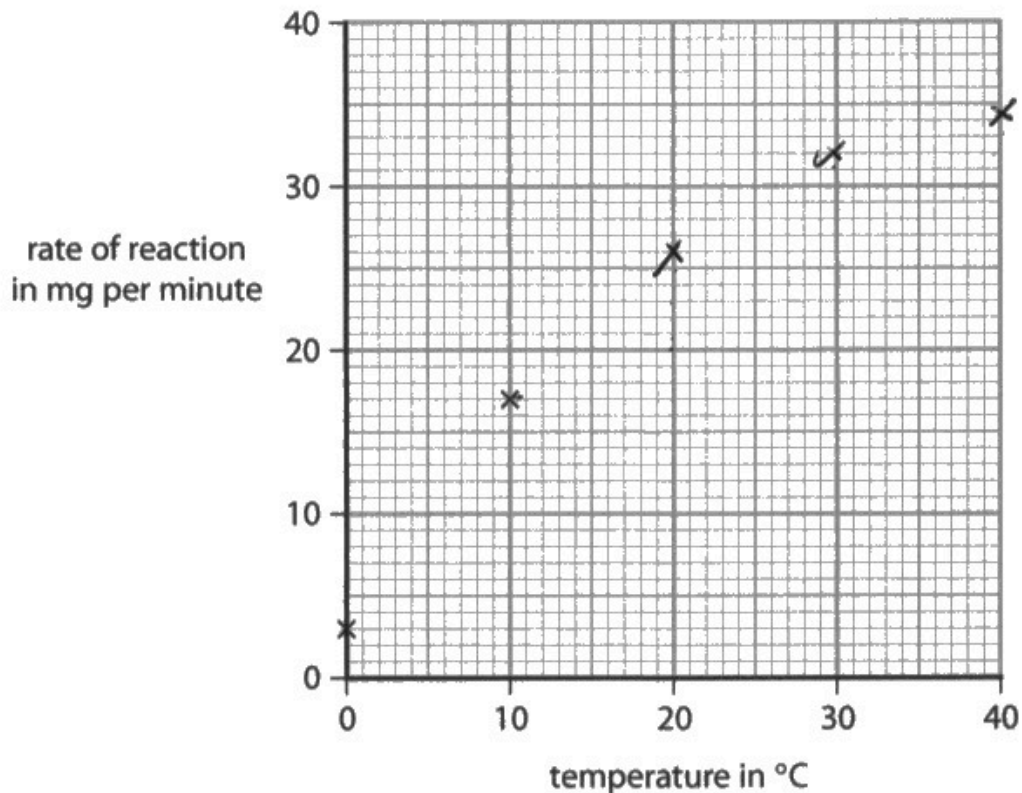
| temperature in °C | rate of reaction in mg per minute |
|-------------------|-----------------------------------|
| 0 | 3.0 |
| 10 | 17.0 |
| 20 | 26.0 |
| 30 | 32.0 |
| 40 | 34.0 |

Figure 15

- (a) Complete the graph by plotting the results shown in Figure 15 and drawing a line of best fit.

The first two points have been plotted for you.

(2)





This answer scores one mark for plotting the points accurately. There has been no attempt to draw a line of best fit.



Remember to check that you have completed all parts of the question. In this case you need to plot three points on the graph, then draw a line of best fit.

- 8 A student investigated the effect of temperature on the rate of reaction of the enzyme pepsin.

Figure 15 shows the data collected.

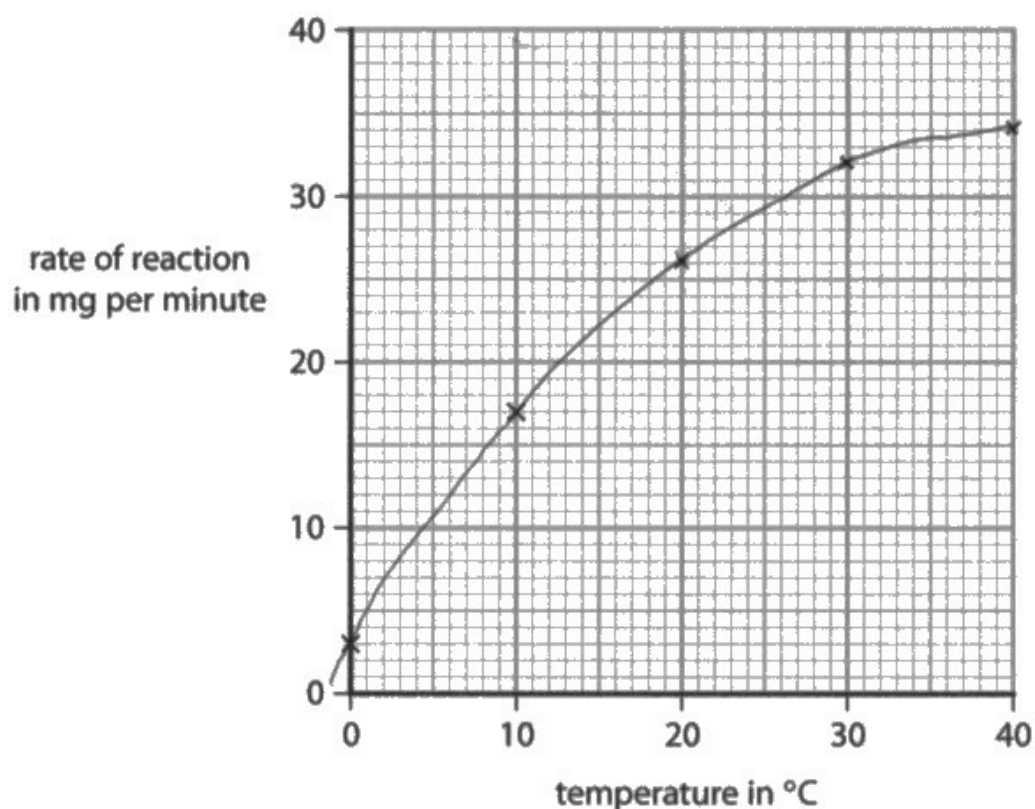
| temperature in °C | rate of reaction in mg per minute |
|-------------------|-----------------------------------|
| 0 | 3.0 |
| 10 | 17.0 |
| 20 | 26.0 |
| 30 | 32.0 |
| 40 | 34.0 |

Figure 15

- (a) Complete the graph by plotting the results shown in Figure 15 and drawing a line of best fit.

The first two points have been plotted for you.

(2)





This a good response that gains both marks. The fact that the line of best fit slightly extends to the left of the y axis is ignored.



When you are asked to draw a line of best fit through a series of points, always think about what the data is showing. You can then decide if it is more appropriate to draw a straight line or a curved line. In this case the rate of reaction of an enzyme is being affected by temperature. We would not expect this reaction to continue increasing at the same rate, so a curved line is appropriate.

Question 8 (b)(ii)

This was a very accessible question, with most candidates scoring at least two marks and many developing their answers sufficiently well to gain all three marks. It was pleasing to note that most candidates followed the instruction in the question to use data from the graph to support their answers. A large proportion were able to identify the optimum pH for pepsin activity and referred to pH ranges when describing the trend. A very small proportion of candidates described the trend shown by the graph for the enzyme trypsin. In addition, instead of answering this question that uses the command word 'describe', some candidates wrote about denaturation. This would have been appropriate if the command word had been 'explain'.

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

Use data from the graph to support your answer.

(3)

Pepsins optimum pH is 2 but any where after that the enzymes denature or don't work to their maximum energy



ResultsPlus
Examiner Comments

This response scores one mark for identifying the optimum pH. References to denaturation can be ignored because this is not an 'explain' question.



ResultsPlus
Examiner Tip

Always think about the command word used in the question. In this question the command word is 'describe' so write about what you can see in the graph and use data to support your answer. Writing about denaturation will not gain you extra marks because the command word is not 'explain'.

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

Use data from the graph to support your answer.

(3)

The enzyme pepsin has an optimum pH of 2, as seen in figure 16. If pepsin is placed in a solution of a pH more than 2, it will begin to denature quickly as seen by the exponential decrease of pepsin's enzyme activity at a pH above 2.



This answer scores two marks. There are references to the optimum pH of pepsin and a decrease in pepsin activity above pH 2. An additional comment about the increase in pepsin activity would have gained a third mark.

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

Use data from the graph to support your answer.

(3)

Pepsin starts to activate at pH 0.2, the activity then increases until the pH reaches the optimum at pH 2. After this point the pepsin reacts slower as the pH gets higher and the activity fully stops at pH 3.6



This is a concise answer that scores all three marks. References to activity increasing from pH 0.2 scores two marks. Identifying the optimum pH gains a third mark. Together, the comments 'reacts slower (after the optimum pH)' and 'the activity fully stops at pH 3.6' would also score a mark.

Question 8 (b)(iii)

This was a very straightforward question, although a small proportion of candidates stated the optimum pH for pepsin instead of trypsin.

Question 8 (b)(iv)

In this question candidates had to explain why there is no trypsin activity at pH 5. The question proved to be very challenging, with many responses being insufficient to be awarded credit. Some candidates scored one mark for just stating that pH 5 is too acidic or too low. Many candidates perhaps did not appreciate that this is a three mark question. However, a small number of good explanations were seen and these included details of how the structure and subsequent action of the enzyme trypsin would be affected at pH 5.

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

(3)

there is no activity at pH 5 because the enzyme pepsin has just reached its optimum temperature and is now slowing down and getting ready being replaced with pepsin.



ResultsPlus
Examiner Comments

This response scores zero marks. The enzyme pepsin has been confused with trypsin and temperature has been confused with pH.



ResultsPlus
Examiner Tip

This is an 'explain' question, so you need to start by making an observation, eg the pH is too low. Then you can apply your knowledge of the effect of changes in pH on enzymes. A good answer would include why the low pH will affect the activity of trypsin, such as a reference to denaturation.

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

(3)

There is no trypsin activity because trypsin works best at a point just after neutral more towards the alkali side. When at a too low pH like 5 the trypsin doesn't work because the enzymes just denature or the active site is deformed.



This is a good response that gains all three marks. 'Too low a pH' scores one mark, 'enzymes just denature' scores a second mark and 'the active site is deformed' a third mark.

Question 8 (b)(v)

It was disappointing to note that most candidates seemed to be unfamiliar with controlling the temperature of an enzyme-catalysed reaction. Only a small proportion gave the expected response of 'use a water bath'. However, 'use a thermometer' was a very common answer that did not gain credit.

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

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

(1)

Keep the tests in a fridge or room with air conditioning



ResultsPlus
Examiner Comments

This response scored one mark. There is no reference to a water bath, but the candidate understands something about temperature control. The temperature inside a refrigerator is low, but that temperature is being controlled. Similarly, the temperature in a room with air conditioning is being controlled.



ResultsPlus
Examiner Tip

Remember that thermometers are used to **measure** temperature, but not to control temperature.

Question 9 (a)(ii)

The majority of candidates scored the mark available for this question. Most creditworthy answers referred to malaria being spread by mosquitoes. Responses using the term vector were seen much less frequently.

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

(1)

Through the protist, mosquitos which carry infected blood and give it to other people when the mosquito drinks their blood.



ResultsPlus
Examiner Comments

This response includes two creditworthy points: the reference to mosquitoes and the transfer of the pathogen through blood.

Question 9 (b)

The majority of candidates could interpret the data in the table to score one mark for noting that the number of measles cases reported had gone down since 1985. Although it was not a requirement of the question, some candidates calculated the decrease in the number of cases of measles reported. A much smaller proportion of candidates scored both marks by explaining that the decrease was due to people being immunised against measles. Responses that referred to cures, or medicines for measles being found, were not credited.

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

Figure 17 shows the number of measles cases reported in England and Wales from 1985 to 2015.

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

Figure 17

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

(2)

People have taken a lot of antibiotics
So ~~there~~ their body could survive which
means the biologists have done
a research to find the correct antibiotic
that kills this type of bacterium



ResultsPlus
Examiner Comments

There is no reference to the data, so this answer scores zero marks.



ResultsPlus
Examiner Tip

If the question includes some data, you should refer to that data in your answer. In this question you need to think about the change in the number of measles cases, so writing about the data is essential.

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

Figure 17 shows the number of measles cases reported in England and Wales from 1985 to 2015.

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

Figure 17

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

(2)

*the number of measles cases cases are going down, this could be because
of better access to measles vaccinations.*



This is a concise answer that scores both marks. The change in the number of measles cases has been identified and a reason for this (vaccinations) has been given.

Question 9 (c)

The response of the immune system to an infection by pathogens was not well understood. Many candidates referred to the immune system attacking or fighting off pathogens, but such responses were not awarded any marks; the idea of white blood cells destroying or killing pathogens was required. A mark was awarded most frequently for stating that antibodies are produced, although some confusion between antibodies and antigens was seen. Some candidates described chemical defences, but these responses were not creditworthy.

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

- 1 it will release white blood cells to fight off the pathogen
- 2 it will cause the body to heat up to attempt to kill the infection
- (2)



This answer scores one mark for 'it will cause the body to heat up'. The idea of white blood cells fighting off a pathogen is insufficient; to gain the first point on the mark scheme there must be a comment about white blood cells killing or destroying pathogens. Phagocytosis or white blood cells engulfing pathogens also scored this mark.



The immune system is a difficult topic. Try to learn the basic facts about the immune system by making flash cards or mind maps.

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

(6 marks)

- release memory lymphocytes on the ⁽²⁾ ~~end~~,
1 increase number of ~~bright~~ white cells
releases
2 increase the temperature of the body



ResultsPlus
Examiner Comments

This answer shows that the candidate has some knowledge and understanding of the immune system. The reference to memory lymphocytes scores one mark. The additional points described (increase in the number of white cells and an increase in temperature) could each gain one mark; these answers are both against the same point on the mark scheme.

Question 9 (d)(i)

Q09(d)(i) was an applied question about non-communicable diseases. Although many candidates clearly knew what a non-communicable disease is, they were often unable to articulate their ideas in a sufficiently clear way to score the mark here. A simple answer such as (beriberi) is not spread from person to person would be enough.

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

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

(1)

because it cannot be spread to
other people.



ResultsPlus
Examiner Comments

The idea that beriberi cannot be spread to other people was sufficient to score the mark.

Question 9 (d)(ii)

Despite being given a partially labelled diagram, many candidates struggled to describe the path taken by electrical impulses in a reflex arc. A large proportion of candidates named neurone X (sensory neurone) correctly, but the names of neurones Y and Z were often either unnamed, or their names were the wrong way round. Instead of restricting themselves to describing the basic pathway hinted at in the diagram, many candidates confused matters by adding a link to the brain in their descriptions, or they went into detail about the structure of neurones. Even a fairly simple description of the pathway, without naming any of neurones X, Y or Z would have resulted in a mark at the bottom of Level 2. The additional point of detail needed to score a mark at the top of Level 2 or Level 3 was often lacking in responses. A reference to synapses was the most common additional detail seen.

*(ii) Beriberi can affect reflexes.

Figure 18 shows a reflex arc.

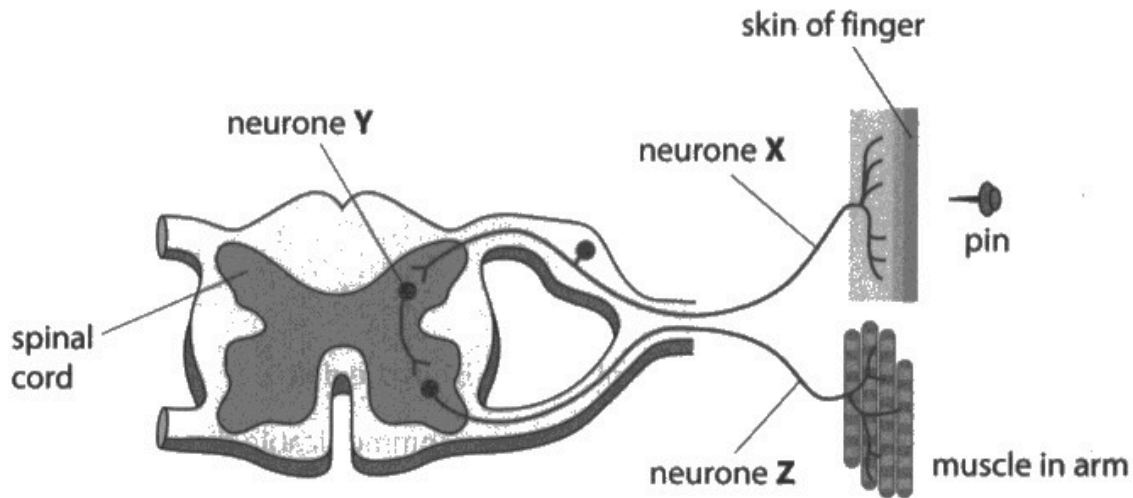


Figure 18

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

Electrical impulses travel very efficiently as well as quickly through neurone X to neurone Y.

This electrical impulse travels through the finger into the hand and eventually through the arm muscles which will cause a reflex.

It will travel pass all
of your veins and other
organs pastⁿ your body & not
touching any intⁿ or muscle
of the arm which attracts
the electrical impulse.

Everything ~~in~~ else in your
body does not attract these
impulses ~~which leaves~~ & which
leaves no danger.



ResultsPlus
Examiner Comments

This response refers to part of the pathway taken by electrical impulses (X to Y) and scores a mark at the bottom of Level 1. An additional point of detail is needed to score a mark at the top of the level, such as a reference to the spinal cord.

*(ii) Beriberi can affect reflexes.

Figure 18 shows a reflex arc.

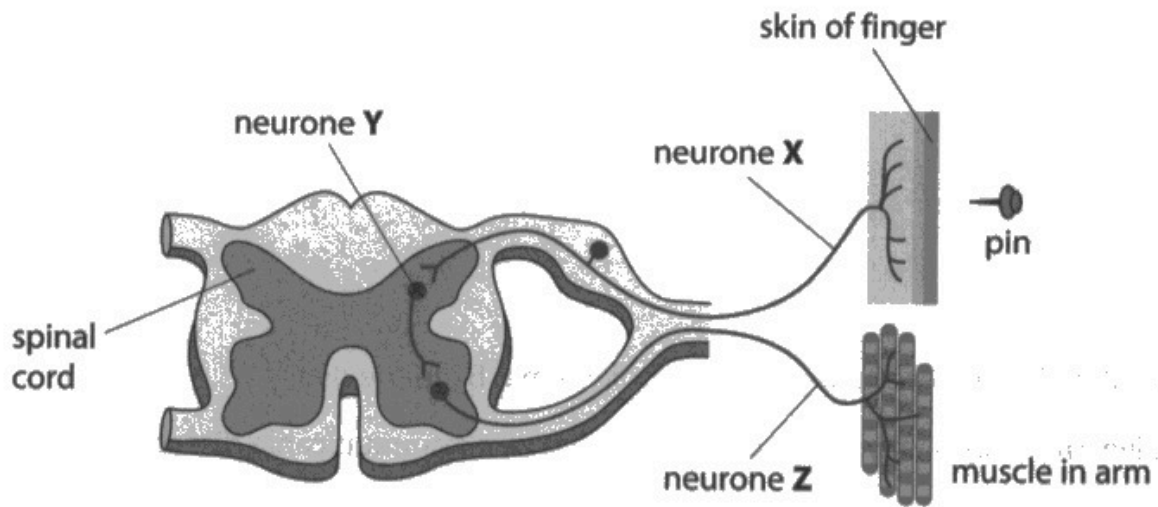


Figure 18

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

The prick of the pin alerts the relay neurone, the synapse then the motor neurone then there is an electrical impulse, then the reflex.



In this response the candidate has referred to part of the path taken by electrical impulses (relay neurone to motor neurone) and a synapse between these two neurones. A mark at the top of Level 1 can be awarded. A more complete description of the path taken by electrical impulses would have resulted in a higher mark, because the names of neurones Y and Z have been given.



Always make full use of the information provided in the question. Here, just referring to two neurones does not describe the full path taken by electrical impulses from the skin to muscles. Think carefully about what you can see in a diagram before you begin to write about it.

*(ii) Beriberi can affect reflexes.

Figure 18 shows a reflex arc.

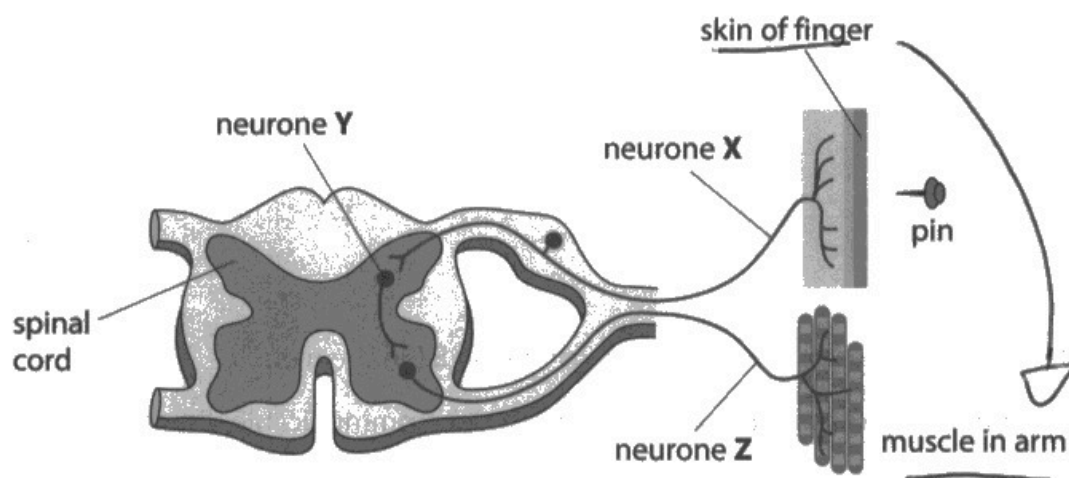


Figure 18

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

The path taken by electrical impulses from the skin to the muscles in the arm is where the electrical impulses in the skin travel through neurone X around the spinal cord through neurone Z and into the muscle in the arm. When the skin will be pricked by a pin the electrical impulses which travel in the muscles in the arm through the reflex arc. The journey starts by the prick of the skin on the finger into neurone

X, it then travels through neuron X and enters the spinal cord. From the spinal cord, the electric impulses then get sent through neuron Y which will then get transferred over to neuron Z. From neuron Z the electric impulses finish their journey and end up in the muscles in the arm.



ResultsPlus
Examiner Comments

This answer scores a mark at the bottom of Level 2. There is a clear description of the path X to Y to Z on the second page of the candidate's response. None of the neurones have been named, nor is there an additional point of detail, so the response gains three marks, not four.

*(ii) Beriberi can affect reflexes.

Figure 18 shows a reflex arc.

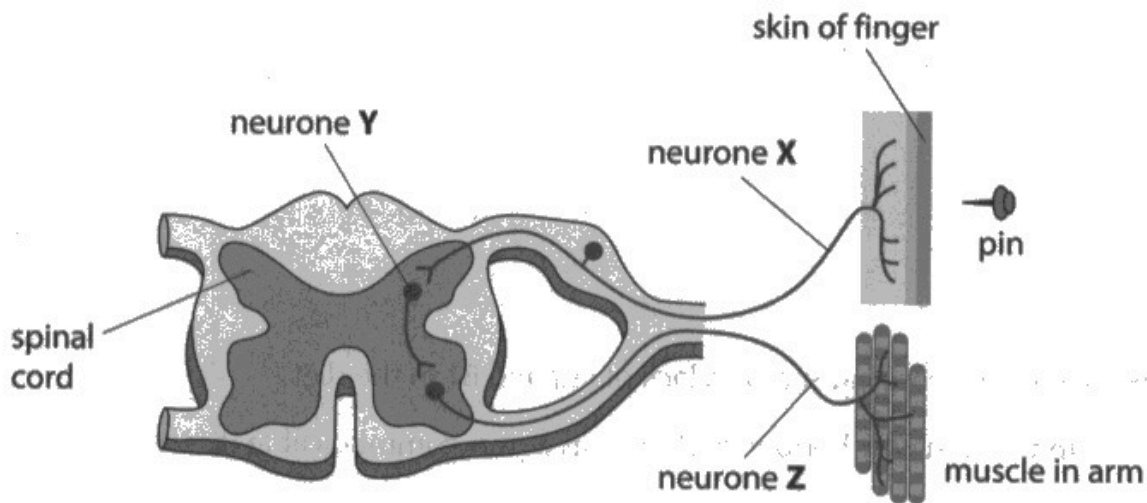


Figure 18

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

The pin is detected by Neuron x (pain receptor) and sends an impulse to Neuron Y through a synapse. The signal then travels to the brain, to which the brain subconsciously sends a signal to move away (to neuron Z) which causes you to jolt backwards when pricked by a pin.

↑
motor neurons



This response can be awarded a mark at the top of Level 2. The path taken by electrical impulses has been described and one neurone has been named. There is also an additional point of detail – synapses – so four marks scored. If a second neurone had been named, then this would be a Level 3 answer.

*(ii) Beriberi can affect reflexes.

Figure 18 shows a reflex arc.

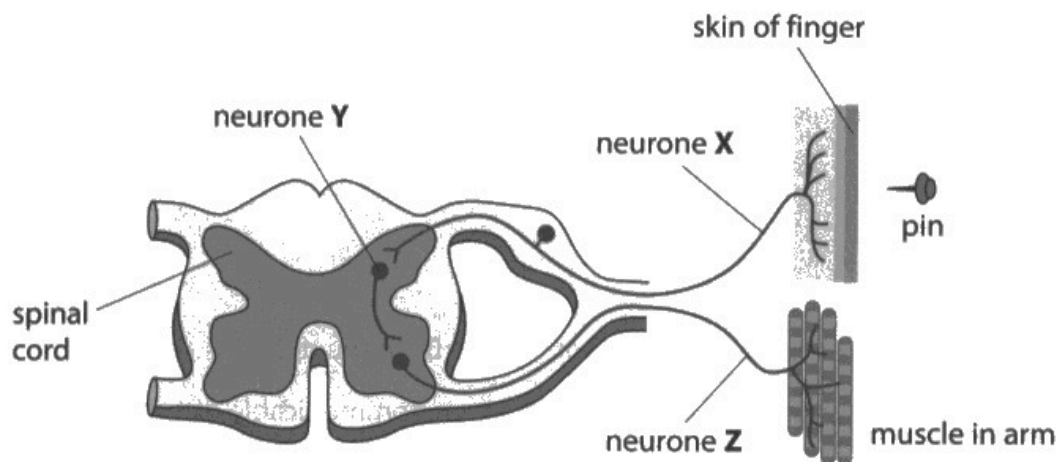


Figure 18

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones X, Y and Z in your answer.

(6)

When the pin pricks the skin it triggers the sensory neurone which causes an electrical impulse to go through it. It then reaches the axon terminals and the electrical impulse is sent over the synapse and received at the motor relay neurones axon terminals and this electrical impulse is then sent to the motor neurone which takes the electrical impulse to your muscle which causes a reaction to the ~~pin being pushed~~ skin being pricked by

the pin



ResultsPlus
Examiner Comments

The candidate has named the neurones involved in the path taken by electrical impulses in the reflex arc. There is a reference to synapses and axon terminals. The detail in the response is sufficient to score a mark at the top of Level 3, ie six marks. If only one neurone had been named and only one additional point of detail given, eg synapses, then the answer would score five marks.

Question 10 (a)(ii)

Q10 was based on the work of Gregor Mendel and inheritance.

Q10(a)(ii) was answered extremely well, with most candidates scoring both marks because they could use the ratio given.

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

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

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

Handwritten student work:

$$3:1$$
$$3+1=4$$
$$160 \div 4 = 40$$

| | |
|----|----|
| 40 | 40 |
| 40 | 40 |

$$\frac{40}{100} = 3:1$$

(2)

Number of pea plants with purple flowers = 40



ResultsPlus
Examiner Comments

This answer only scored one mark because the candidate did not take the extra step to subtract 40 from 160.

Question 10 (a)(iii)

In this question candidates had to complete a Punnett square and show a percentage. A surprisingly large number of candidates were unable to identify the genotype for a plant with white flowers and simply used the same genotype as given in the question. This may be a result of not reading the question carefully. However, a mark could be awarded for completing the Punnett square correctly using the gametes given by the candidate. In general, Punnett square completion was of a high standard. Some candidates chose to use different letters to represent the alleles and did not gain credit for completing the Punnett square.

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

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

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

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

(3)

| | | | |
|----------------|---|---------------|----|
| | | white flowers | |
| | | B | b |
| purple flowers | A | AB | Ab |
| | a | aB | ab |

Percentage of pea plants that produce white flowers = 25 %



ResultsPlus
Examiner Comments

This response scores zero marks. The candidate has used different letters for the genotype (B and b), meaning no marks are awarded for completing the Punnett square. The incorrect percentage is on the answer line, so this mark is not awarded either.



ResultsPlus
Examiner Tip

Only use the letters suggested by the question to represent different genotypes.

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

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

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

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

(3)

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

Percentage of pea plants that produce white flowers = 25 %



ResultsPlus
Examiner Comments

The genotype for white flowers is incorrect, but the offspring shown in the Punnett square are correct for the gametes shown. The percentage of pea plants that produce white flowers (25%) is also correct for the offspring shown. Overall, this response scores two marks.

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

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

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

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

(3)

| | | | |
|----------------|---|---------------|----|
| | | white flowers | |
| | | a | a |
| purple flowers | A | Aa | Aa |
| | a | aa | aa |

Percentage of pea plants that produce white flowers = 50 %



ResultsPlus
Examiner Comments

The Punnett square has been completed correctly and the percentage is correct, so this answer scores full marks.

Question 10 (b)

This question asked for two advantages of using asexual reproduction to produce flowering plants. Although most candidates attempted the question, many were unclear about specific advantages of asexual reproduction. The points awarded marks most frequently were that only one parent plant is needed and that plants are produced faster. Relatively few candidates scored marks for referring to genetically identical offspring or that the flowering plants produced will have the same characteristics (such as flower colour).

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

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

(2)

- 1 ~~does not need~~ only requires one parent
- 2 produces identical offspring



ResultsPlus
Examiner Comments

The candidate's first point scores one mark. If the second point had mentioned genetically identical offspring, then a second mark would have been awarded.



ResultsPlus
Examiner Tip

Check that you know the main advantages and disadvantages of asexual reproduction. You should also know these facts for sexual reproduction.

Question 10 (c)(ii)

This question asked candidates to describe how the complementary bases are linked in a DNA molecule. It was very surprising to note that the majority of candidates could not recall basic facts about base pairing. There were many references to a double helix structure or the structure of the DNA strands, but these did not gain any credit; a description of how the bases are linked was required. The most common answers scoring one mark included a reference to at least one base pair, eg A with T. Candidates who were clearly familiar with DNA structure often succinctly stated weak hydrogen bonds, thus scoring both marks.

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

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

(2)

they are linked by a double helix structure.



ResultsPlus
Examiner Comments

The fact that DNA has a double helix structure is not relevant to this question, so zero marks scored. There needs to be a description of how the complementary bases are linked within that structure.



ResultsPlus
Examiner Tip

Make sure that you read all questions carefully throughout the paper. This question is asking you about how complementary bases are linked in a DNA molecule. Writing about a double helix structure does not specifically answer the question.

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

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

(2)

they are 4 complementary bases in 2 pairs, base C is linked with base G and base A is linked with base T, bases hold together by weak hydrogen bonds.



ResultsPlus
Examiner Comments

This is a very good answer that scores full marks. All three points on the mark scheme are included in this response.

Paper Summary

Based on their performance on this paper, candidates should:

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Use all of the information given in the question to help them construct their answer but avoid repeating the information which has already been given and giving vague responses which will not gain credit.
- Consider the context of the question to ensure that they apply their scientific knowledge to the situation they are being asked about.
- Develop their practical skills knowledge to ensure they understand the difference between the factors being investigated and controlled variables.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks available.
- Use scientific terminology accurately, where possible, in responses.
- Always show their working when doing calculations, as a mark can be awarded for errors carried forward in this case.
- Think about the structure of the answer before starting to write, especially when tackling the extended questions, to ensure that the answer shows clarity of writing and that it flows, while also remembering that accurate spelling and grammar in these questions is important.

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>

