Pearson Edexcel

Examiners' Report
June 2018

GCSE Biology 1BI0 1H

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Introduction

The Pearson Edexcel GCSE (9-1) Paper 1 Biology (Higher tier) paper is the first of two papers taken as part of the new GCSE (9-1) Biology qualification.

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

Paper 1: Biology (Higher tier) is awarded a total of 100 marks and it is assessed by a variety of question types, including, multiple-choice questions, short answer questions, calculations and extended open-response questions. Candidates should answer all questions in a time period of 1 hour and 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

In addition, the new GCSE (9-1) Biology qualification assesses practical knowledge and maths skills; the requirements of which are given in the new specification. Furthermore, there are 8 mandatory core practicals which candidates must complete prior to the examination, as aspects of working scientifically are also assessed in questions throughout the paper.

The Paper 1: Biology (Higher tier) paper contains questions assessing the content from Topics 1 to 5, as identified in the new specification. In this first examination series, candidates were required to respond to questions that tested their knowledge and understanding of the eye, the effect of exercise and diet on weight linked to cardiovascular disease, osmosis, cells and subcellular structures, tissue culture and aseptic techniques, calorimetry, bacterial infection and immunity, stem cells, mitosis, microscopy, evolution evidence based on the pentadactyl limb and gene sequencing, Mendel's genetics, sex-linked inheritance and family pedigree analysis, enzyme activity, including practical work and data analysis, genetic engineering, the human genome project, the effect of antibiotics on bacteria, protein synthesis and the lytic cycle for viruses.

Questions designed to assess practical work included writing a plan for an investigation, safety precautions, including aseptic techniques, using a microscope, controlled variables and the method and analysis of results for the practical testing of the effectiveness of antibiotics on bacteria. The maths skills assessment in this paper related to questions requiring BMI calculations, surface area calculations, percentage increase calculations, probabilities and rate calculations.

Question 1 (a) (ii)

This question asked candidates to give a reason why people who are short-sighted cannot see distant objects clearly. Candidates used many ways to answer this question, many of which were accepted. The light rays meet in front of the retina or that the light is refracted too much demonstrated a good understanding. The idea that light was focused in front of the retina, that the image formed in front of the retina or that the focal distance was in front of the retina were also accepted. Candidates were not awarded marks for insufficient answers about the light rays not meeting on the retina. Other common errors were that the light rays meet behind the retina or that light does not reach the retina.

(ii) Give a reason why people who are short-sighted cannot see distant objects clearly.
(1)

Light in the eye focuses in front of the retina

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Examiner Comments

This is an example of a correct response which was awarded the 1 mark.

This is an example of an incorrect response which was awarded 0 marks.

(ii) Give a reason why people who are short-sighted cannot see distant objects clearly.
(1)

The light is being refracted before the retina.

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Examiner Comments

Light is always refracted before the retina. Therefore, this response did not answer the question.

Question 1 (a) (iii)

This question asked for the type of lens used to correct short-sightedness. Concave or diverging lens were acceptable. The mark was not awarded for the insufficient response of contact lenses or glasses.

(iii) State the type of lens that can be used to correct short-sightedness.

(1)

A contact lens could be used.

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Examiner Comments

This is an example of an insufficient response which was awarded 0 marks.

Question 1 (b)

This question shows one aspect of the qualification that has changed since the omission of coursework. Candidates were asked to devise a plan to test the hypothesis that people with brown eyes are more likely to be short-sighted than people with blue eyes.

The first mark was awarded for the idea of using an equal sample of each eye colour. The second marking point was for the idea of testing people's vision. Simply asking people if they are short sighted was not an acceptable response as it had to relate to the idea of testing.

For the third marking point, the idea of processing the results in such a way that would allow you to draw a conclusion was required. For example, the idea of counting the number of people in each group and comparing the results between the two groups, or that if more people with brown eyes were short-sighted, the hypothesis is correct. Candidates were awarded marks from a range of combinations of the marking points.

(b) A student was given the hypothesis 'People with brown eyes are more likely to be short-sighted than people with blue eyes.'

Devise a plan to test this hypothesis.

(3)

Find an equal amount of ~~each~~ people with each eye colour and have them tested for short sightedness and then repeat the test three times over with the same amount of people but change the people that are tested.

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Examiner Comments

This response was awarded two marks for the equal numbers of people with each eye colour and for testing them for short sightedness.

(b) A student was given the hypothesis 'People with brown eyes are more likely to be short-sighted than people with blue eyes.'

Devise a plan to test this hypothesis.

(3)

Get a group of 50 people, 25 blue eyed and 25 brown eyed. Then ask each person whether they're short-sighted, record the results. Look at the difference in numbers of people who are blue eyed and short-sighted and brown eyed and short-sighted. Compare results to the hypothesis. See if there are more brown eyed people who are short-sighted.

(Total for Question 1 = 6 marks)

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Examiner Comments

This response was awarded two marks for the equal numbers of people and comparing the results. Simply asking people would not give a reliable outcome for the equivalent of an eye test.

This response was awarded the full 3 marks.

(b) A student was given the hypothesis 'People with brown eyes are more likely to be short-sighted than people with blue eyes.'

Devise a plan to test this hypothesis.

(3)

They would have to gather the same amount of blue and brown eyed people. They would then test their eyesight. They would then compare the amount of people with blue eyes that were short-sighted and the amount of people with brown eyes that were short-sighted to get a result.

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Examiner Comments

Make sure you consider the number of marks available for the question so you can consider how much detail you should include in your answer.

Question 2 (a)

In this question, candidates were asked to explain why exercise can cause weight loss. The question offered two marking points; the first marking point was awarded for the idea that exercise requires energy or respiration. The idea of burning calories and an increased metabolism were also acceptable responses.

The second mark was awarded for explaining that exercise reduces fats or that the energy is obtained from fats. 'Sweating' was awarded a mark provided it was linked to the idea of water loss. Overall, the question was answered well, and many candidates scored both marks. However, some candidates did not get the second marking point as they only gave the idea that the energy in food intake was burned, rather that the idea of weight loss because fat already in the body was lost.

2 (a) Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss.

(2)

Because it means they will burn off more calories quicker so won't gain as much fat.

ResultsPlus
Examiner Comments

Burning calories was credited for marking point 1. The idea of not gaining fat was not sufficient for the second mark as it does not indicate losing fat.

2 (a) Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss.

(2)

Excercise can cause weight loss because the person is decreasing the amount of fatty deposits in the body by burning excess fat reducing the risk of cardiovascular disease

ResultsPlus
Examiner Comments

This response was awarded one mark for the idea of burning fat and decreasing fatty deposits. The idea of exercise causing weight loss is given in the question.

2 (a) Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss.

(2)

Fat is the body's way of storing excess food for later. Exercising can cause weight loss because ~~it~~ it requires energy and if you do not eat enough then it will use the energy stored in the fat ~~to~~ so you'll lose weight.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for the idea of using energy that was stored as fat.

Question 2 (b)

This question required candidates to interpret the diagram of a stomach fitted with a gastric band as well as an application of knowledge to an unfamiliar context. Candidates were asked to 'explain' how a gastric band helps a person to lose weight.

This question was allocated 2 marks. Candidates were required to provide two out of a possible three responses to be awarded full marks. For marking point 1, answers which included reference to reducing the volume of the stomach were correct. A mark was not awarded for the incorrect interpretation that it reduces the size of the entry to the stomach.

For marking point 2, answers which referred to the idea of reduced food intake or restricting the amount of food entering the stomach were also correct. However, reference to just the idea of feeling full quicker was not an acceptable response. For the third marking point, answers which included reference to the idea of stored fat being used which would lead to weight loss were also correct. Most candidates scored full marks by combining the idea of a smaller stomach volume and eating less. Fewer candidates recognised that stored fat must be used in order to reduce weight.

(b) Figure 2 shows a gastric band fitted to a stomach.

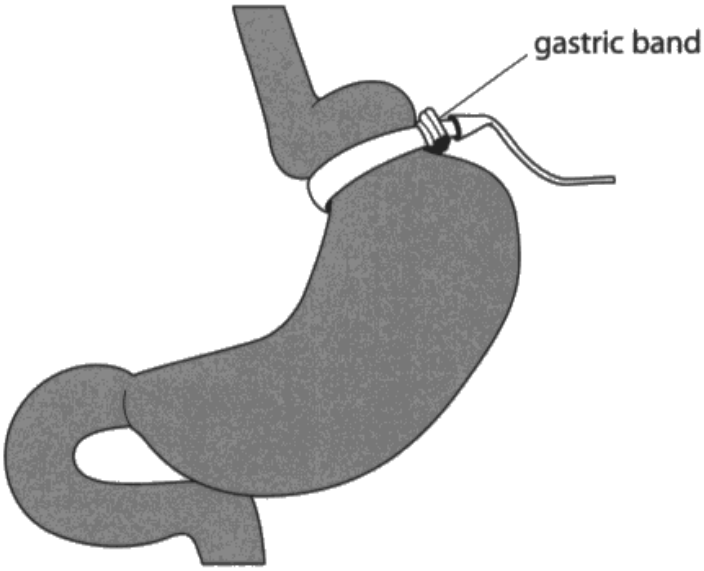

Figure 2

Explain how a gastric band helps a person to lose weight.

(2)

A gastric band reduces the amount of food a person can consume by making the stomach smaller/tighter. This in turn makes the person eat less, so loses weight, due to not as much energy being provided, so the body uses fat.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for reference to a smaller stomach, less food intake and using up fat.

(b) Figure 2 shows a gastric band fitted to a stomach.

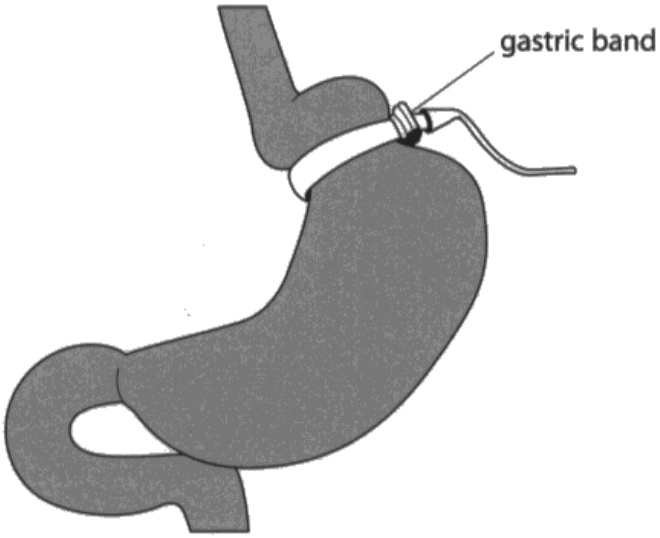

Figure 2

Explain how a gastric band helps a person to lose weight.

(2)

A gastric band ~~to stops~~ reduces the amount of food a person can intake without feeling full, which will stop people eating as much which leads to them losing weight

ResultsPlus
Examiner Comments

This response was awarded one mark for the idea of reducing the intake of food. The candidate has stated this twice but did not expand on the explanation to obtain any further marks.

Question 2 (c) (i)

This question required a standard calculation of BMI with the additional maths skill of using significant figures.

The correct answer, including the correct number of significant figures, scored the maximum of 3 marks, and with no workings shown. However, if the incorrect answer was given candidates were able to obtain some marks by demonstrating evidence of substituting the correct numbers into the equation for marking point 1, and evaluating this equation to the incorrect number of significant figures for 2 marks. Furthermore, 2 marks were awarded for an evaluation without the correct number of significant figures and with no workings shown.

Many candidates were able to gain the maximum 3 marks. The answer of 22 was the most frequent response, which was awarded two marks, as well as 21.9 which shows an error in rounding.

(c) BMI and waist : hip ratio can be used to find out if a person is obese.

Figure 3 shows some data for two males.

male	BMI	waist : hip ratio
A	27.3	0.85
B	?	0.81

Figure 3

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(i) Male B has a mass of 72 kg and a height of 1.81 m.

Calculate the BMI of male B.

Give the answer to 3 significant figures.

(3)

$$\text{BMI} = \frac{72\text{ kg}}{1.81^2}$$

$$= 22.0$$

BMI = 22.0

ResultsPlus
Examiner Comments

This response was awarded the full 3 marks for the correct answer given to three significant figures.

(c) BMI and waist : hip ratio can be used to find out if a person is obese.

Figure 3 shows some data for two males.

male	BMI	waist : hip ratio
A	27.3	0.85
B	?	0.81

Figure 3

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(i) Male B has a mass of 72 kg and a height of 1.81 m.

Calculate the BMI of male B.

Give the answer to 3 significant figures.

(3)

$$\frac{72}{1.81^2} = 21.977$$

BMI = 21.9

ResultsPlus
Examiner Comments

This response was awarded two marks. The candidate has rounded incorrectly but given the answer to three significant figures.

(c) BMI and waist : hip ratio can be used to find out if a person is obese.

Figure 3 shows some data for two males.

male	BMI	waist : hip ratio
A	27.3	0.85
B	?	0.81

Figure 3

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(i) Male B has a mass of 72 kg and a height of 1.81 m.

Calculate the BMI of male B.

Give the answer to 3 significant figures.

(3)

$$\frac{72}{1.81^2} =$$

BMI = 22.2

ResultsPlus
Examiner Comments

This response was awarded one mark for inputting the numbers into the equation. The answer is incorrect and no further workings are shown.

ResultsPlus
Examiner Tip

Show your mathematical workings on all calculations.

Question 2 (c) (ii)

In this question, candidates were required to interpret the data given to conclude that 'male A' is overweight but not abdominally obese for marking point 1. In addition, answers that suggested male A is nearly abdominally obese were accepted. The explanation aspect of this question relates to the fact that male A's weight distribution was not around his abdomen or vital organs. The idea that male A's waist was more evenly distributed or that he has more weight on his hips than waist was creditworthy.

Some candidates demonstrated the misconception that because the data indicated that male A was only 0.05 away from 0.90 waist:hip ratio, male A had a large amount of abdominal fat. This response demonstrated a lack of understanding of waist:hip ratio, which is new to this specification.

(ii) Figure 4 shows the interpretation of BMI values.

BMI range	interpretation
below 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and above	obese

Figure 4

Males with a waist : hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist : hip ratio for male A shows about his weight distribution.

(2)

Male A's BMI of 27.3 shows he is overweight and his waist : hip ratio of 0.85 shows he is not abdominally obese. This shows male A's weight is distributed more evenly across his body and not all at his abdomen.

ResultsPlus
Examiner Comments

This response was awarded two marks for the data interpretation and the justification of the weight being evenly distributed, as well as not all at the abdomen.

(ii) Figure 4 shows the interpretation of BMI values.

BMI range	interpretation
below 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and above	obese

Figure 4

Males with a waist : hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist : hip ratio for male A shows about his weight distribution.

(2)

Male A has an ~~slightly~~ overweight BMI, but his waist:hip ratio is fairly normal. This suggests that most of his weight is found around his hips and is said to be 'pear-shaped'.

ResultsPlus
Examiner Comments

This response was awarded one mark for the justification of weight is on the hips. The interpretation of the waist:hip ratio of 'fairly normal' is not sufficient.

(ii) Figure 4 shows the interpretation of BMI values.

BMI range	interpretation
below 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and above	obese

Figure 4

Males with a waist : hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist : hip ratio for male A shows about his weight distribution.

(2)

Male A's BMI is 27.3 which shows that he is overweight, His Hip to waist ratio is 0.85 which shows that he isn't abdominally obese but nearly is which suggest that his weight is in the abdominall region.

(Total for Question 2 = 9 marks)

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Examiner Comments

This response was awarded one mark for the interpretation of the data, but the candidate has justified it incorrectly.

Question 3 (a) (i)

In this question, the formula for calculating surface area was given and candidates were asked to calculate the surface area of chip B.

Most candidates completed the mathematical calculation successfully and were awarded the full 2 marks for the correct answer, 48 or 48.0.

A common error in this question related to the values XY, XZ and YZ being added together rather than the correct process of multiplying the values. In some cases, candidates calculated the surface area of chip A, which was already given.

3 (a) Figure 5 shows two potato chips.

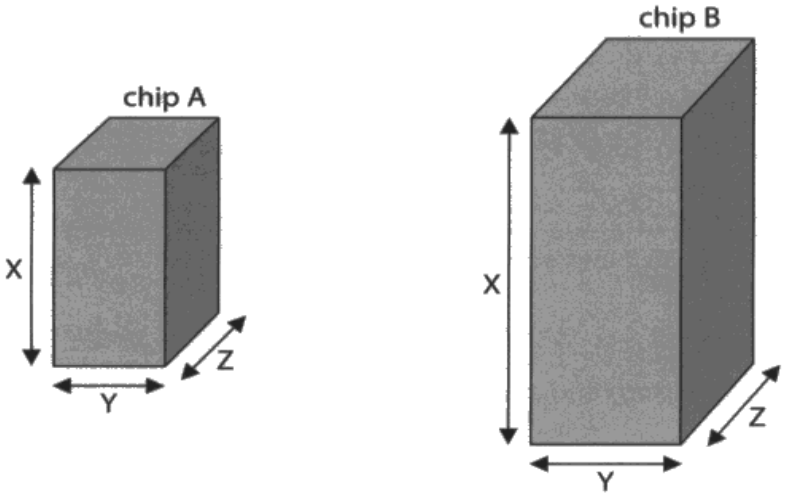


Figure 5

Figure 6 shows some information about each potato chip.

potato chip	length of X in cm	length of Y in cm	length of Z in cm	total surface area of four sides in cm²	total surface area of top and bottom in cm²	total surface area of chip in cm²
A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

(i) Calculate the total surface area of potato chip B using the formula,

Total surface area = 2XY + 2XZ + 2YZ

(2)

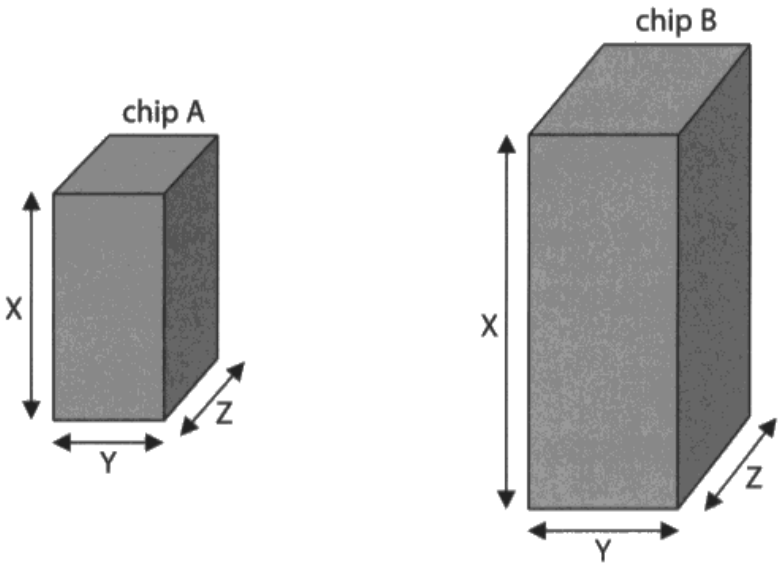
2(5)(2) + 2(5)(2) + 2(2)(2)
20 + 20 + 8

total surface area = 48 cm²

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for showing the numbers substituted into the equation and the correct answer.

3 (a) Figure 5 shows two potato chips.



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A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

(i) Calculate the total surface area of potato chip B using the formula,

Total surface area = 2XY + 2XZ + 2YZ

(2)

$(2 \times 5.0 \times 2.0) + (2 \times 5.0 \times 2.0) + (2 \times 2.0 \times 2.0)$

$= 78$

total surface area = 78 cm²

ResultsPlus
Examiner Comments

This response was awarded one mark for substituting the numbers into the equation, but the answer is incorrect.

3 (a) Figure 5 shows two potato chips.

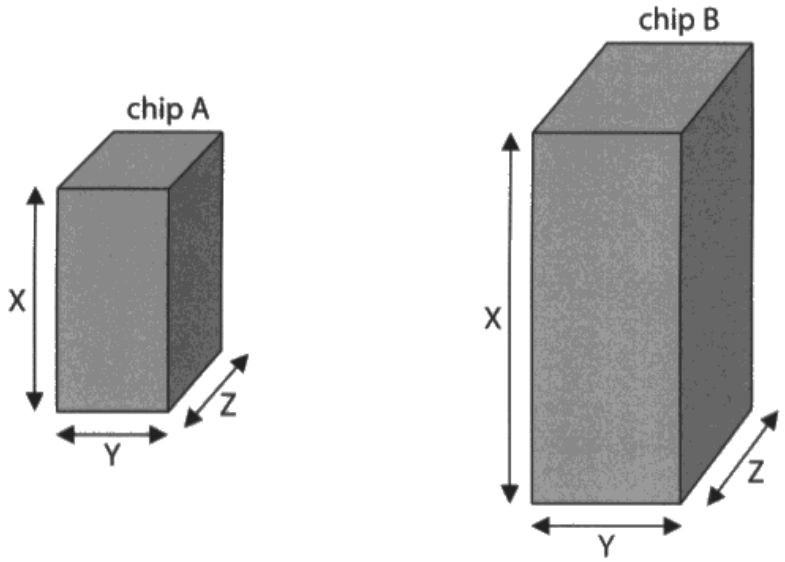

Figure 5

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A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 6

(i) Calculate the total surface area of potato chip B using the formula,

Total surface area = 2XY + 2XZ + 2YZ

x = 5.0
y = 2.0
z = 2.0

(2)

surface area = 2(5+2)+2(5+2)+2(2+2)

14 + 14 + 8 = 36

total surface area = 36 cm²

ResultsPlus
Examiner Comments

This response was not awarded any marks as the substituting into the equation is incorrect. This was one of the main errors seen for those candidates who did not gain credit on this question.

Question 3 (a) (ii)

This question required candidates to provide an explanation as to why potato chip B had a greater increase in mass. For marking point 1, candidates were required to give a comparative idea for chip B, for example, that is was larger, greater or bigger. Suggestions of chip B having a higher solute concentration or lower water potential than chip A were also accepted.

Answers which suggested a larger surface area:volume ratio were incorrect. For marking point 2, candidates needed to refer to the notion that more water was going into potato chip B. Responses which just referred to the idea of water entering by osmosis were not sufficient as the process also occurs in chip A. Therefore, for marking point 2, candidates must indicate more water going into potato chip B.

(ii) The potato chips were placed in distilled water for 20 minutes.

Figure 7 shows the increase in mass of each potato chip.

potato chip	increase in mass in grams
A	0.1
B	0.3

Figure 7

Explain why potato chip B has a greater increase in mass than potato chip A.

(2)

It has a bigger surface area, as a result more water goes in to the potato chip by osmosis. More water in means that the increase in mass is greater.

ResultsPlus
Examiner Comments

This response has been awarded the full 2 marks for reference to a bigger surface area and more water moving into the chip by osmosis for the explanation.

(ii) The potato chips were placed in distilled water for 20 minutes.

Figure 7 shows the increase in mass of each potato chip.

potato chip	increase in mass in grams
A	0.1
B	0.3

Figure 7

Explain why potato chip B has a greater increase in mass than potato chip A.

(2)

The increased surface area increases the chances for osmosis into the chip.

ResultsPlus
Examiner Comments

This response is worthy of one mark for reference to the increased surface area. Osmosis into the chip is not sufficient to explain the mass increase.

Question 3 (a) (iii)

In this question, candidates were required to explain what would happen to the cells of chip A if it was placed in a concentrated salt solution for a total of 3 marks.

For marking point 1, candidates were required to refer to the notion that the cells in chip A would lose water or become plasmolysed. Similarly, reference to chip A getting smaller, shrinking or losing mass were also acceptable responses.

For marking point 2, candidates were required to refer to the notion of water being released by osmosis. The use of the term 'diffusion' by some candidates was ignored.

For marking point 3, candidate responses needed to refer to the solute concentration gradient or the idea of water potential. However, the notion of water concentration was also accepted, as knowledge of water potential itself was not required.

Most candidates were successful in achieving full marks for this question. However, candidates who were awarded 2 marks had often neglected using the term osmosis or were unable to provide a clear explanation as to why the water moved out of chip A.

(iii) Potato chip A is transferred from the distilled water into a concentrated salt solution.

Explain what will happen to the cells in potato chip A.

(3)

The cells in chip A will lose water as osmosis will occur, transferring water from the highly concentrated cells to the lower water concentration in the salt solution. They ~~will~~ may lose turgidity and potentially lose their rigid shape

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Examiner Comments

This response is worthy of two marks for reference to losing water and osmosis. The description of osmosis has an error as the potato cells are not highly concentrated in comparison to the salt solution. The explanation is not accurate enough for the full three marks.

(iii) Potato chip A is transferred from the distilled water into a concentrated salt solution.

Explain what will happen to the cells in potato chip A.

(3)

The cells will decrease in size, as the salt in the salt solution will draw out the water from them, meaning they contain less water, and so will become smaller.

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Examiner Comments

This response was awarded 1 mark for the idea of the water being drawn out of them, or decrease in size. The answer does not explain the change to the cells using scientific knowledge of osmosis.

(iii) Potato chip A is transferred from the distilled water into a concentrated salt solution.

Explain what will happen to the cells in potato chip A.

(3)

potato chip A will lose mass as the water molecules in the cells of potato chip A will go from the high concentration of water to the low concentration of water in the salt solution through the partially permeable membrane of the potato skin, this is osmosis.

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Examiner Comments

This response was awarded the full 3 marks for stating what will happen to the cells in chip A and explaining it using scientific knowledge on osmosis.

Question 3 (b)

In this question, candidates were required to provide an explanation for the difference in sub-cellular structures between the cells of a potato and the cells in the leaf of the potato plant. Most candidates successfully obtained two marks for this question.

To be awarded the full 2 marks, candidates were required to link the idea that chloroplasts are found in the leaf because photosynthesis occurs, or that they were absent in the potato because it did not photosynthesise. In some responses, candidates described the idea of stomata or root hair cells, which are not sub-cellular structures and, therefore, an incorrect response.

(b) The potatoes of a potato plant develop underground.

Explain **one** difference in the sub-cellular structures in a cell in the potato and those in a cell in the leaf of the potato plant.

(2)

The leaves contain ~~ea~~ chloroplasts with Chlorophyll for photosynthesis, whereas the potato cells don't : they're underground

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Examiner Comments

This response was awarded the full 2 marks for stating the difference between the cells in the leaf of the potato plant and the cells of the potato, and for giving the link to photosynthesis.

(b) The potatoes of a potato plant develop underground.

Explain **one** difference in the sub-cellular structures in a cell in the potato and those in a cell in the leaf of the potato plant.

(2)

The potato ~~plants~~ cells do not contain chlorophyll because they are not exposed to light and therefore do not photosynthesise.

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Examiner Comments

This response was awarded the full 2 marks as chlorophyll is accepted in the additional guidance and the link to photosynthesis is stated.

Question 4 (a) (i)

In this question, candidates were required to name the process that occurs as cells in plantlets develop into root cells.

The mark was given for the use of the term 'differentiation' or 'specialisation' and many candidates were able to name the correct process. Some candidates gave tissue culture as the answer, which referred to the method in Figure 8 in the question. Mitosis was also seen but not worthy of credit.

Question 4 (a) (ii)

This question required candidates to describe the advantages of producing plants by the method shown in the diagram.

Marking point 1 was awarded for the idea that many plants could be produced, many plants from one parent or a higher yield of that plant. The idea of 'quicker' needed to be clarified with the notion that sexual reproduction takes longer and the idea of waiting for seeds was acceptable.

Marking point 3 was awarded for the idea of genetically identical and the term clones was used frequently. This was frequently linked to the idea that the offspring would have the desired characteristics of the parent plant. Marks were also awarded for the idea of producing rare or endangered plants and for the idea of obtaining plants difficult to grow from seed.

The idea of being able to use ideal conditions or that they can be grown all year round is not specific to this method and references to costs were ignored. The most common responses were the idea of producing many plants, that they were clones or that they had the desired characteristics. Candidates of higher ability often scored the full 2 marks for this question with those of a lower ability more often scoring 1 mark.

(ii) Describe the advantages of producing plants by the method shown in Figure 8.

(2)

One advantage is that it is quick and easy process so wont take much time.
Another advantage is if the mother plant had desired characteristics, so will the ~~offsp~~ daughter plant.

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the idea of having the desired characteristics. 'Quick and easy' is not clarified so is not worthy of the second mark.

(ii) Describe the advantages of producing plants by the method shown in Figure 8.

(2)

~~Because~~ they can be grown all year round in little space, in little time. Also plants that are near extinction can be grown and plants that are hard to grow from seed (like orchids) can be grown

ResultsPlus
Examiner Comments

This response is worthy of the full 2 marks for the less commonly seen responses of growing rare plants and those that are hard to grow from seed.

Question 4 (a) (iii)

In this question, candidates were required to explain why an autoclave was used to prepare the agar growth medium.

The first mark was awarded for the idea of the use of the term sterilise. Marking point 2 was awarded for the idea of destroying bacteria, pathogens, fungi, microorganisms, or that there was no contamination. The idea of preventing microorganisms getting into the agar was ignored. The final mark was awarded for the idea that microorganisms would compete with the plants or use the nutrients from the agar. Candidates who demonstrated knowledge of an autoclave frequently scored well on this question, but it was clear from some responses when candidates did not understand the science.

(iii) An autoclave is used to prepare the agar growth medium used in Step 2.

Explain why the agar growth medium is autoclaved.

(2)

It will kill any bacteria living in the growth medium. This means that the plantlets are at less of a risk of developing disease.

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the idea of killing any bacteria living in the growth medium. Less risk of developing disease is vague and was not credited.

(iii) An autoclave is used to prepare the agar growth medium used in Step 2.

Explain why the agar growth medium is autoclaved.

(2)

So that there is no contamination of bactoria or organisms that may affect the growth of the plant. The autoclave kills the organisms and sterilises the agar growth medium.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks. The candidate has used key words including contamination and sterilisation to produce a good level response.

Question 4 (a) (iv)

This question asked for a reason why the leaves of one plantlet would be of a different colour. The plants are growing in identical conditions so environmental factors were not sufficient. The marks were given for mutation or affected by disease. The idea that a different allele would arise due to mutation was accepted alongside different genotype and genetic variation.

(iv) One of the plantlets had different coloured leaves.

Give **one** reason why this plantlet had different coloured leaves.

(1)

The plantlet leaf may have inherited a different ~~another~~ allele which would change the phendype of the leave and given it a different colar.

ResultsPlus
Examiner Comments

This response was awarded the mark for the idea of inheriting a different allele.

Question 4 (b) (i)

This is a practical question requiring candidates to describe the test to identify starch, which is related to one of the core practicals. The first mark was awarded for identifying the use of iodine solution, although iodine on its own was accepted. The second mark was awarded for the expected positive result. This mark was awarded for reference to blue-black or the idea of a darkening of the colour of the iodine solution, for example, light to a dark brown, as this is what is observed in the core practical investigating the effect of pH on the enzyme amylase. This question was answered well by candidates of all ability.

(b) Crop plants provide a source of energy in the form of carbohydrates such as starch and sugars.

(i) Describe the test to identify starch.

(2)

Iodine can be added to the substance and if starch is present it will go from an orange-brown colour to blue-black.

ResultsPlus
Examiner Comments

This response is worthy of the full 2 marks for the correct reagent and the result.

ResultsPlus
Examiner Tip

Learn the reagents used in food tests and the negative and positive results.

(b) Crop plants provide a source of energy in the form of carbohydrates such as starch and sugars.

(i) Describe the test to identify starch.

(2)

Iodine solution will turn from brown to brick red if starch is present. If starch is not present the iodine solution will stay brown.

ResultsPlus
Examiner Comments

This response was awarded 1 mark for reference to the reagent. The candidate has given the positive result for reducing sugars.

Question 4 (b) (ii)

This question asked for an explanation as to why a calorimeter has a lid. Marking point 1 was awarded for the idea of reducing energy loss, keeps the heat in, preventing energy escaping or heat escaping. Preventing evaporation or water loss was also awarded the mark, and 2 marks were given if this was linked to the idea of a constant volume of water. The lid ensured the results are accurate, ensuring the validity of results was also accepted. A 'fair test' was not creditworthy. More candidates were able to score one mark for the idea of preventing heat loss but fewer went on to complete their explanation for the full 2 marks.

(ii) The amount of energy in the sugars extracted from crop plants can be measured using the calorimeter shown in Figure 9.

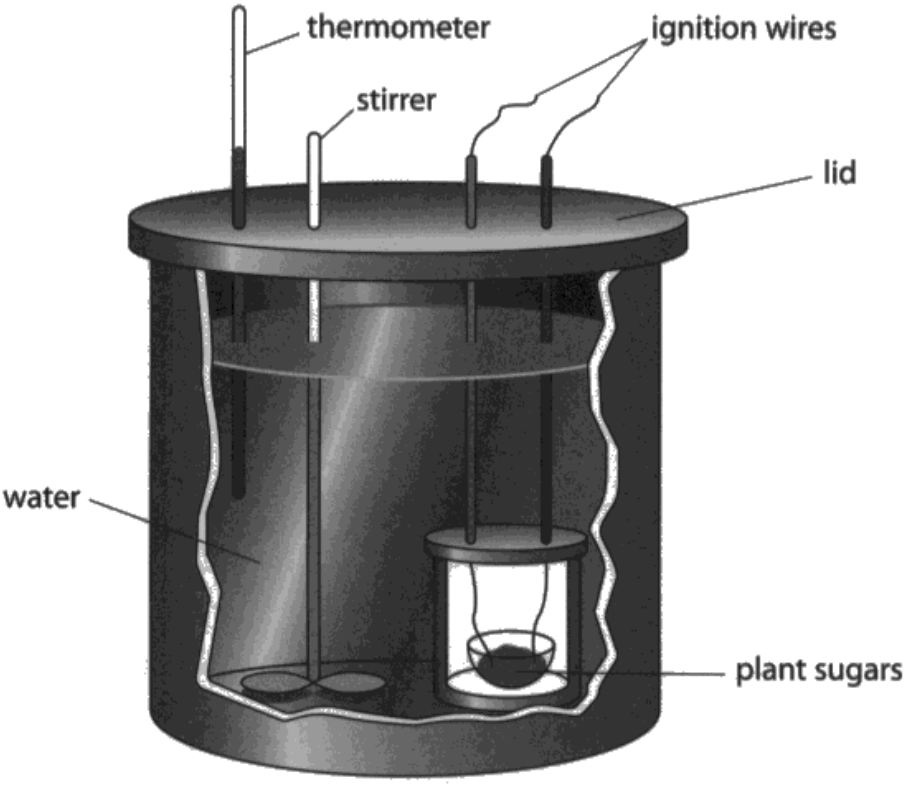

Figure 9

Explain why the calorimeter has a lid.

(2)

This is so that no water can evaporate and so that the temperature (insulate) will stay the same and the process won't be interrupted.

ResultsPlus
Examiner Comments

In this response, the idea of the role of a lid in preventing water evaporating was awarded a mark.

(ii) The amount of energy in the sugars extracted from crop plants can be measured using the calorimeter shown in Figure 9.

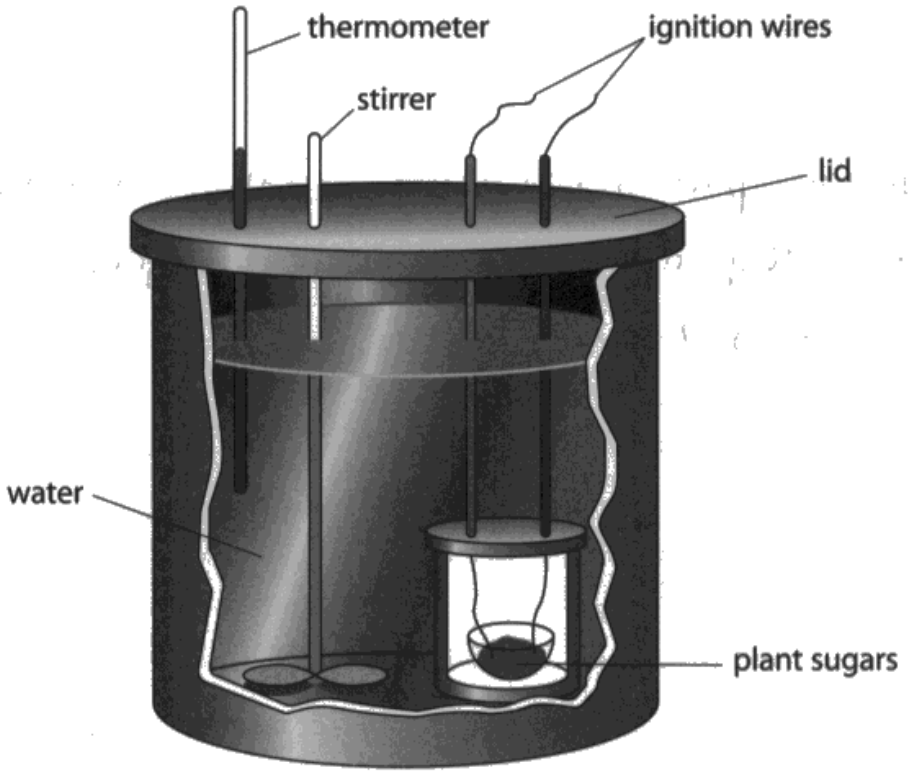

Figure 9

Explain why the calorimeter has a lid.

(2)

To ensure that none of the heat is lost when the sugars are burnt because they need the exact measurement of how much energy was used & if heat escapes then the amount of energy in the sugars won't be correct.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for the idea of ensuring that heat is not lost, which was acceptable, and that the amount of energy in the sugar would not be correct. This is the reverse argument for the accurate result.

Question 4 (b) (iii)

This question required candidates to give a reason for stirring the water in the calorimeter. Candidates had to give the idea of the temperature throughout the water being constant, or that the heat was evenly distributed. Some incorrect answers stated that the temperature of the water stays constant throughout the investigation. Energy as an alternative to heat was accepted. Simply keeping the water moving in isolation was not credited.

(iii) State why it is important to stir the water in the calorimeter.

(1)

To make sure all the water is evenly heated.

ResultsPlus
Examiner Comments

This response was worthy of the mark for the idea of heating the water evenly.

(iii) State why it is important to stir the water in the calorimeter.

(1)

to keep the temperature constant

ResultsPlus
Examiner Comments

This response was awarded 0 marks for the idea that the temperature does not stay constant.

ResultsPlus
Examiner Tip

Ensure that your choice of words are accurate for what you are trying to say.

Question 5 (a) (i)

This question related to the working scientifically aspect of the specification assessing practical skills. The question provided information that the bacteria '*Streptococcus*' causes sore throats and skin infections. Candidates were asked to give two precautions a doctor should take when treating an infected patient.

Full marks were awarded for two relevant responses related to washing hands, wearing gloves or protective clothing (including the idea of covering wounds), wearing a surgical mask, sterilising equipment or being immunised. The question required candidates to specify safety precautions specifically related to protecting a doctor, therefore, treating an infected patient in an isolated room was ignored. Similarly, wearing goggles was not specifically relevant to this situation and, therefore, not an acceptable response. Candidates of all abilities were able to answer this question successfully. The most common responses seen were for wearing gloves and a face mask.

5 *Streptococcus* bacteria can cause a sore throat or skin infection.

An illness called scarlet fever can also develop during an infection with this bacterium.

(a) (i) Give **two** precautions a doctor should take when treating a patient who is infected with *Streptococcus*.

(2)

They should avoid contact ~~op~~ between themselves and the patient, also they should be cautious of when the person is coughing as pathogens can be aurbourne. So maybe wear gloves and a mask over their nose and mouth.

ResultsPlus
Examiner Comments

This response was worthy of the full two marks for the idea of avoiding direct contact or wearing gloves and also wearing a face mask.

5 *Streptococcus* bacteria can cause a sore throat or skin infection.

An illness called scarlet fever can also develop during an infection with this bacterium.

(a) (i) Give **two** precautions a doctor should take when treating a patient who is infected with *Streptococcus*.

(2)

Streptococcus bacteria can become airborne and is communicable so a doctor should wear a face mask and work under aseptic conditions to reduce involvement of other bacteria.

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the suggestion of wearing a face mask. No explanation is needed for questions using the command work 'state' or 'give'.

Question 5 (a) (ii)

In this question, candidates were assessed on the mathematical skill of calculating a percentage change in mass.

The first marking point was awarded for calculating the difference of 3113 and full marks were given for the correct answer. Incorrect responses were usually for calculating the percentage of 2830 from 5943. Candidates who scored one mark calculated the difference but divided by the final number and not the starting number. There was an error carried forward for one mark for calculating the percentage change from the incorrect answer to the difference between 5943 and 2830, providing that candidates had shown the mathematical workings so that the point of error could be identified. This question challenged candidates but those of higher ability were able to obtain full marks.

(ii) From September 2013 to March 2014 there were 2 830 cases of scarlet fever in the UK.

From September 2014 to March 2015 there were 5 943 cases of scarlet fever.

Calculate the percentage increase of the number of cases of scarlet fever between the periods September 2014 to March 2015 and September 2013 to March 2014.

(2)

$$\text{percentage change} = \frac{\text{final} - \text{initial}}{\text{initial}} \times 100$$

$$= \frac{5943 - 2830}{2830} \times 100$$

$$= 110$$

110 %

ResultsPlus
Examiner Comments

This response is worthy of the full 2 marks for the correct answer. The candidate has clearly shown the mathematical workings which reduces the chance of errors.

ResultsPlus
Examiner Tip

Always set out your mathematical workings in a clear and logical way.

(ii) From September 2013 to March 2014 there were 2 830 cases of scarlet fever in the UK.

From September 2014 to March 2015 there were 5 943 cases of scarlet fever.

Calculate the percentage increase of the number of cases of scarlet fever between the periods September 2014 to March 2015 and September 2013 to March 2014.

(2)

$$\frac{5943 - 2830}{2830} \times 100$$

3 %

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the correct mathematical workings shown. The candidate has produced the incorrect answer.

ResultsPlus
Examiner Tip

Always show your mathematical workings so that you can obtain marks even if you make a mistake in the calculation.

Question 5 (c)

Generally, candidates answered this question very well frequently scoring the maximum of 3 marks.

Candidates were asked to explain how an adult develops immunity to the toxin produced by bacteria. For marking point 1, marks were awarded for the idea that that the toxin enters the body, or that the adult caught scarlet fever as a child or previously. For marking point 2, reference had to be made to an immune response and not just the idea that they became immune, as this was given in the question. The production of lymphocytes was also an acceptable response for marking point 3. Reference to both B and T lymphocytes were awarded a mark, but white blood cells was not credited, neither were memory cells for memory lymphocytes.

(c) Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the *Streptococcus* bacteria produce during infection.

Explain how an adult develops immunity to the toxin.

(3)

Because they may have had the fever before or had a vaccination for the fever (inactive pathogen for the disease is injected in to the patient) but either way this means that they have memory lymphocytes ~~&~~ that were produced when the pathogen (or inactive pathogen) entered the body initially. So when the pathogen enters the body now the memory lymphocytes can quickly produce the specific antibodies to attack the antigens on the bacteria, so the immune response is a lot faster

(Total for Question 5 = 9 marks)

ResultsPlus
Examiner Comments

This response is worthy of the full 3 marks as the candidate has addressed all of the possible marking points available.

ResultsPlus
Examiner Tip

Ensure you accurately use the correct scientific terminology.

(c) Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the *Streptococcus* bacteria produce during infection.

Explain how an adult develops immunity to the toxin.

(3)

when an adult gets infected by this fever, the person's immune system fights to get rid of the bactena. When the white blood cells killed the bactena, they'll remember exactly what toxins the bactena made so next time the bactena thies to infect the person, white blood cells will know exactly what to do and fight and get rid of the fever straight away and that is how an adult develops immunity.

ResultsPlus
Examiner Comments

This response is worthy of one mark. The candidate has not used the accurate scientific terminology in the response. The idea of white blood cells is not specific enough, there is no mention of antibodies and developing immunity is repeating the information in the question.

Question 6 (a)

This question required candidates to apply scientific knowledge, which is an important skill. Candidates were asked to describe the benefits of being able to re-programme adult cells in order that they become cells with the properties of embryonic stem cells.

Candidates of higher ability scored well on this item. In some cases, candidates only described the benefits of embryonic stem cells and did not apply their scientific knowledge and consider the context of the question.

The first marking point was awarded for the knowledge that embryonic stem cells can differentiate into any cell type. The notion of many different cell types was an acceptable response, but no marks were award for just the idea that cells can differentiate.

The second marking point was awarded for the idea that embryonic stem cells would not need to be used or that embryos did not need to be killed. However, reference to solely unclarified ethical issues were not awarded a mark.

The third marking point was awarded to the notion that there was less chance of rejection, which was not a common response by candidates. The fourth marking point was awarded for the uses of embryonic stem cells, such as treating currently incurable conditions or named conditions. Cell transplants or replacing faulty cells was also an acceptable response. However, repairing faulty cells was not credited but repairing damaged tissue was an acceptable response.

6 (a) In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research.

(3)

One benefit of this is that adult stem cells will therefore be able to differenciate into any sort of cell like embrgonic ones can. This means that they can be used for the same adult who needs more cells such as red blood cells if they are low (for example have blood cancer) This means they won't suffer rejection as it is their own cells. Another benefit is that there will be no need to use embryonic stem cells which means embroys went be made just for the use of creating cells, as many see this un-ethical and ~~[illegible]~~. unhumaine.

ResultsPlus
Examiner Comments

This is a high-quality response and was awarded the full 3 marks. The candidate has applied their knowledge to the context of the question, including ideas on less chance of rejection and not needing to use embryonic stem cells.

6 (a) In 2012, two scientists were awarded the Nobel prize for their research on stem cells.

They showed that adult cells could be reprogrammed to become cells with the properties of embryonic stem cells.

Describe the possible benefits of this research.

(3)

As adult stem cells have a limited number of cell that they can differentiate into where as with embryonic cells they can differentiate into any cells. Embryonic cells are used to replace and repair damaged cells to treat diseases such as Parkinson's and treat some types of blindness

ResultsPlus
Examiner Comments

This is an example of a common response. The candidate has not fully considered the context of the question and just given the role of embryonic stem cells.

Question 6 (b) (iii)

This question required candidates to provide two relevant points of information to be awarded the full 2 marks. However, candidates were generally awarded 1 mark for this question by stating that DNA is replicated during interphase. More able candidates were able to give acceptable answers for marking point 2 related to the production of cell organelles or named cell organelles. Responses related to marking point 3 to the idea of metabolic activities taking place or cell growth was less frequently mentioned by candidates. Frequent incorrect responses included that the nuclear membrane dissolved.

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase.

(2)

During interphase the chromosomes make identicle ~~copp~~ copies of each other in the nucleus. The cell also prepares for division by ~~ge~~ making more mitochondria, for respiration and energy.

ResultsPlus
Examiner Comments

This response is worthy of 2 marks. Chromosomes making copies was accepted and the candidate also mentioned making more mitochondria which is a named cell organelle.

(iii) Interphase is part of the cell cycle.

Describe what happens during interphase.

(2)

The cell carries out it's normal functions, such as anaerobic respiration. They also double the number of sub-cellular structures in order to prepare for mitosis.

ResultsPlus
Examiner Comments

This response was awarded 2 marks. Anaerobic respiration is a named chemical process and doubling the number of sub-cellular structures is worthy of a mark.

Question 6 (c)

This question required candidates to use their practical skills and knowledge obtained from completing the core practical on microscopy to explain how a magnification of x400 could be obtained. To be awarded the full 2 marks, candidates needed to name both lenses and a combination of lenses that would total x400 given, provided the eye piece was equal to or lower than the objective lens. Candidates awarded 1 mark did not name the lenses or referred to the objective lens as the magnification lens. Some candidates simply described how to focus an image on the microscope, repeating the Year 10 progress assessment question and answer.

(c) Figure 12 shows a root tip with cells in different stages of mitosis.

The image was magnified 400×.

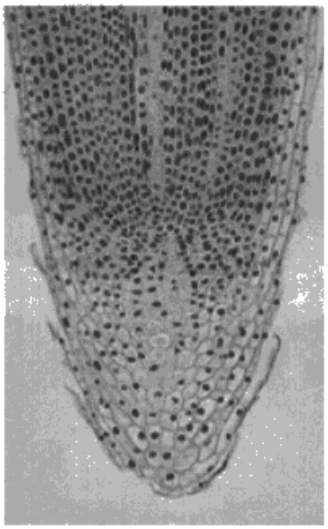

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Figure 12

Explain how a magnification of 400× can be obtained using the lenses on a light microscope.

(2)

a magnification of 400x can be obtained by ~~a~~ using an objective lens of 40x and eyepiece lens of 10x.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for having both lenses named and the correct combination of magnifications.

(c) Figure 12 shows a root tip with cells in different stages of mitosis.

The image was magnified 400×.

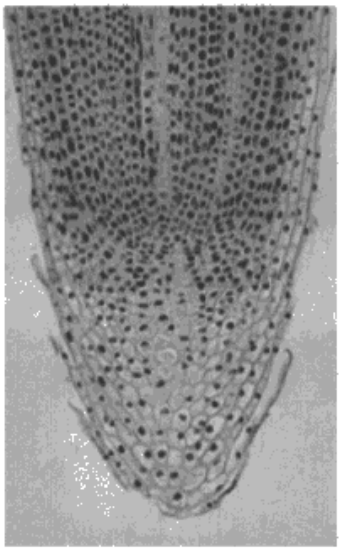

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Figure 12

Explain how a magnification of 400× can be obtained using the lenses on a light microscope.

(2)

You can put a magnification of 10x and 40x on together as 40 times 10 gives 400

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the idea that a 10x and 40x lens produces a magnification of 400x.

ResultsPlus
Examiner Tip

Using past papers is a good revision strategy but make sure you read the new question carefully as it will not always be asking for the same answer.

Question 7 (a) (i)

Candidates were asked to describe the reasons why the anatomy of the pentadactyl limb of the cat and the bat suggests that they come from a common ancestor.

Many candidates scored the first marking point by stating that the limbs had the same structure of bones. Five digits was the most common example of a bone structure seen. The second marking point was less frequently given with many candidates just repeating the question, stating that it showed they had evolved from a common ancestor and not extending this to say that the common ancestor must have had a pentadactyl limb. The idea that the limb structure is unlikely to have arisen more than once during evolution was rarely seen.

7 (a) Figure 13 shows the pentadactyl limb of a bat and a cat.

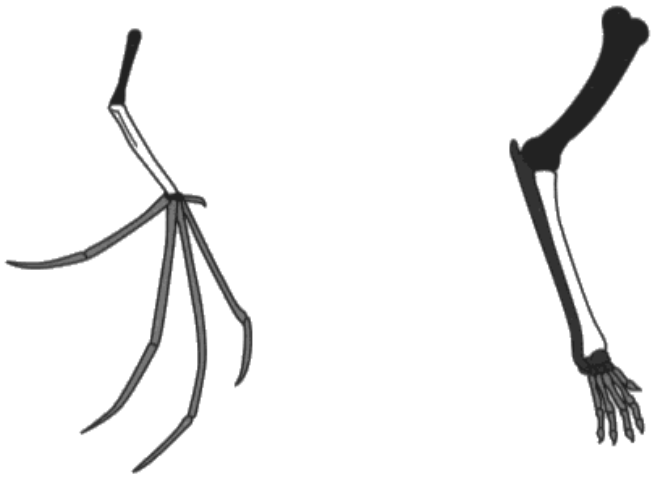


Figure 13

(i) Describe the reasons why the anatomy of the pentadactyl limb suggests that bats and cats evolved from a common ancestor.

(2)

Because the cat and bat both have five digits on their limb this proves that they have both evolved from a common ancestor due to their similar structures.

ResultsPlus
Examiner Comments

This response was awarded 1 mark for describing the similar structures.

7 (a) Figure 13 shows the pentadactyl limb of a bat and a cat.

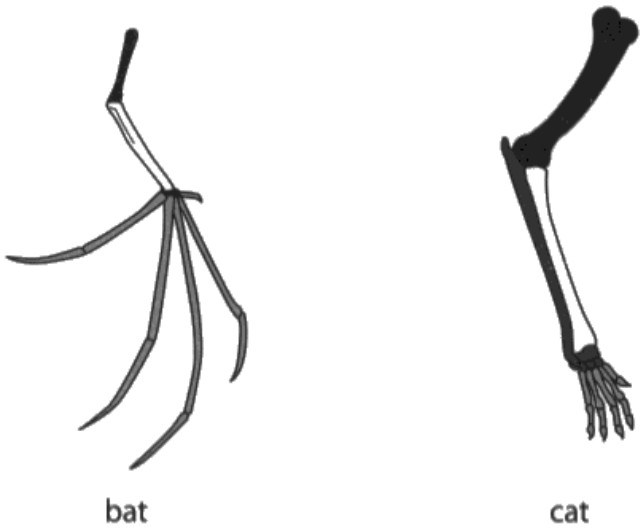


Figure 13

(i) Describe the reasons why the anatomy of the pentadactyl limb suggests that bats and cats evolved from a common ancestor.

(2)

Because both the cat and the bat have the pentadactyl limb, a limb with 5 digits, it shows that they ~~came~~ evolved from a common ancestor with a pentadactyl limb, but evolved to use it for different purposes.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for describing the similar structures and that the common ancestor would also have had a pentadactyl limb.

Question 7 (a) (ii)

This question addressed content that is new to the specification. It asked for a description of how sequencing genes from different organisms provides evidence for evolution. Marking point 1 required candidates to give the idea of comparing sequences or examining the sequences to find similarities or differences, not just for sequencing genes as that is given in the question

The idea of similarities or differences in the DNA was not an acceptable answer as responses had to refer to genes, alleles or sequences for marking point 1. The second marking point extends the response to describe how closely related organisms share similar sequences and differences in DNA sequences can show evolution.

(ii) Genetic analysis also provides evidence for evolution. of natural selection

Scientists can sequence genes from different organisms.

Describe how this type of genetic analysis provides evidence for evolution.

(2)

The gene sequence from different organisms can be compared to determine how closely related they are. It can show how two different organisms from diffent species have similar gene sequences and are quite closely related and have therefore developed from a common ancestor, providing evidence for evolution

ResultsPlus
Examiner Comments

This response is worthy of 2 marks for comparing the gene sequences from different organisms and for the idea that those with similar gene sequences are quite closely related.

Question 7 (b) (ii)

This question challenged candidates of higher ability. Candidates were asked to explain how Mendel showed that some inherited traits are not expressed in organisms by using the example of pea plants that produced round or wrinkled seeds. This question required candidates to interpret the information given in the question.

A mark was awarded for recognising that the first offspring were heterozygous or carriers. When these plants are crossed 25%, or 1/4, of the offspring are wrinkled seeds, which was awarded a mark. This is because the offspring are homozygous or have two alleles for wrinkled seeds, which was a third possible mark. The most frequent mark given was for recognising that wrinkled is recessive and round is dominant. Combinations of letters were awarded marks if they were in the correct context and Punnett squares could be used, provided they were labelled.

(ii) Mendel crossed pea plants that produced round seeds with pea plants that produced wrinkled seeds.

All the offspring produced round seeds.

He then crossed these offspring with each other.

Some pea plants in the next generation produced round seeds and the others produced wrinkled seeds.

Explain how this showed that some inherited traits are not expressed in an organism.

(3)

It shows that some traits are dominant and some are recessive as ~~some~~ when he cross bred the first two pea plants they produced all round seeds showing this was dominant over wrinkled seeds. though when he brea them again the trait for wrinkled seeds reappeared showing it was recessive

ResultsPlus
Examiner Comments

This is an example of a response which repeats a lot of information given in the question. It was awarded 1 mark.

ResultsPlus
Examiner Tip

When answering questions on genetics, use the correct scientific terminology.

(ii) Mendel crossed pea plants that produced round seeds with pea plants that produced wrinkled seeds.

All the offspring produced round seeds.

He then crossed these offspring with each other.

Some pea plants in the next generation produced round seeds and the others produced wrinkled seeds.

Explain how this showed that some inherited traits are not expressed in an organism.

(3)

The wrinkled seeds alleles are recessive, round seeds alleles are dominant. This means that the wrinkled seeds need two ~~genes~~ ~~both~~ alleles for it to be expressed, but the round seeds only need one. This means that all the ~~st~~ offspring of the initial homozygous plants will express the dominant round seeds, but they are heterozygous and so ¼ of their offspring will recieve two recessive wrinkled seed alleles and so express the phenotype of wrinkled seeds.
This is because sexual reproduction takes one hereditary unit per parent.

ResultsPlus
Examiner Comments

This response is worthy of the full 3 marks. The candidate has used key scientific terminology including alleles, homozygous, recessive, heterozygous and has also included some probability with 1/4 of the offspring receiving two recessive alleles.

Question 7 (c)

This question required candidates to interpret a family tree for the sex-linked condition Duchenne muscular dystrophy. Sex-linked inheritance and family trees are difficult concepts and the question challenged many candidates.

The first mark was for stating that person Z was an unaffected male. Further marks were awarded for explaining that he has one copy of the dominant allele, that the allele is on the X chromosome, or giving his correct genotype with an explanation, and that he needs the dominant allele to have an unaffected daughter as she is the only child that confirms his phenotype.

Many candidates interpreted the family tree for an autosomal recessive condition which was not creditworthy. An incorrect phenotype cannot be explained using the information from the question, so no marks were awarded if the phenotype was incorrect. The most frequent mark given was for the phenotype, and candidates that were able to explain the phenotype frequently obtained both explanation marks.

(c) Duchenne muscular dystrophy is a recessive sex-linked genetic disorder. This disorder causes muscle weakness.

Figure 14 shows the inheritance of Duchenne muscular dystrophy in a family.

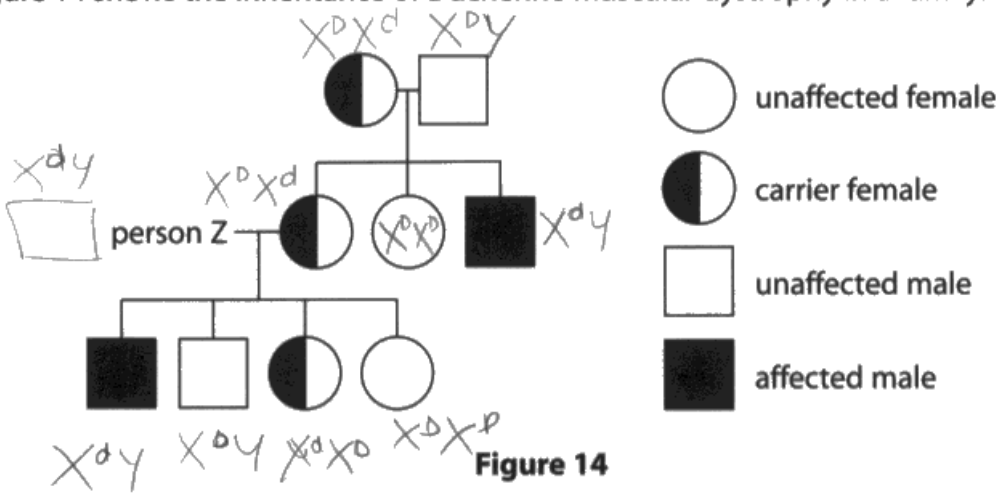


Figure 14

State and explain the phenotype of person Z.

(3)

Person Z must be a ~~heterozygous~~ male with the genotype ~~X^dY~~ X^DY which means he doesn't have the disorder. I know this because he has an unaffected daughter with genotype X^DX^D so he must have passed on the dominant allele to her on his X chromosome.

ResultsPlus
Examiner Comments

This response is worthy of the full 3 marks for giving the phenotype of the male who does not have the disorder and that he has the dominant allele. The candidate has also mention that the male has the genotype and has used the idea that he has an unaffected daughter.

Question 8 (a) (ii)

With practical knowledge now being assessed as part of the new specification, this question required candidates to explain why a variable needed to be controlled for the investigation. The question required candidates to read carefully and interpret the information about the investigation that was probably unfamiliar.

This question was awarded 2 marks; the first mark was awarded for recognising that the mass of the potato disc is a variable or stating what would happen if the mass was not controlled. The second mark was awarded for explaining that it allows the results to be compared, or that it means the amount of catalase is the same in each reaction. The idea that it makes the results valid was accepted but the idea of reliable or a fair test was not credited.

(ii) The potato discs all had the same mass.

Explain why the student used potato discs with the same mass.

(2)

~~By increasing the mass it increases the amount of enzymes stored in the potatoe.~~

The same mass allows the student to have the same amount of enzymes in each potatoe disc. So that an equal amount of enzymes can break down the substrate.

ResultsPlus
Examiner Comments

This response was awarded 1 mark for the idea of the same amount of enzyme, but the candidate has not linked this to the idea of a controlled variable for a second mark.

(ii) The potato discs all had the same mass.

Explain why the student used potato discs with the same mass.

(2)

By using potato discs with the same mass, the student could get a clearer set of ~~on~~ results.

ResultsPlus
Examiner Comments

In this response, no marks were awarded for stating that the results would be clearer or more reliable, or that the test would be fairer. Stating that the potato discs all have the same mass is repeating the information from the question. Therefore, this response was awarded 0 marks.

(ii) The potato discs all had the same mass.

Explain why the student used potato discs with the same mass.

(2)

The potato disc ~~was the~~ is a controlled variable, so to make it a fair test, the potato disc had to be same mass otherwise time taken for the ~~con~~ different concentrated solution would differ - and the results cannot be compared on the desirable dependant variable.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for explaining that the mass is a controlled variable which allows the results to be compared. The candidate also expressed the idea that different mass discs would take different times to rise.

Question 8 (a) (iii)

This question required candidates to recognise two other controlled variables for the investigation. Responses which identified hydrogen peroxide as a controlled variable had to include the volume or mass of hydrogen peroxide and not just the amount. Some incorrect responses stated variables that had already been controlled, or for giving the independent or dependent variable. The most frequently correct responses were temperature and pH. Although pH does change with concentration in this investigation it was accepted as it is beyond the candidates' knowledge.

(iii) State **two** other factors that need to be kept the same to improve this investigation.
(2)

The volume of hydrogen peroxide solution must remain the same as well as the surface area of the potato disc as it affects the rate of reaction.

ResultsPlus
Examiner Comments

This response clearly stated the volume of hydrogen peroxide and the surface area of the potato disc for two factors that need to be controlled and was awarded the full 2 marks.

(iii) State **two** other factors that need to be kept the same to improve this investigation.
(2)

The total surface area of the potato chip.

The ammount of hydrogen peroxide solution ~~the~~ in the test tube.

ResultsPlus
Examiner Comments

In this response, reference to the amount was not accurate enough, it needed to be volume or mass. This response was awarded 1 mark for reference to the surface area of the potato chip.

(iii) State **two** other factors that need to be kept the same to improve this investigation.

(2)

the amount of time waiting for the potato to rise.

the amount of hydrogen peroxide in the test tube.

ResultsPlus
Examiner Comments

This response shows confusion with the concept of controlled variables. The amount of time for the potato to rise is related to the concentration of hydrogen peroxide. Therefore, the response was awarded 0 marks.

Question 8 (b) (i)

This question uses the command words, 'state' and 'explain'. Therefore, to be awarded the full 4 marks, candidates were required to provide a valid conclusion of the results of the investigation given, and explain the outcome using scientific knowledge and understanding.

Most candidates were awarded 1 mark for the conclusion. Many candidates were able to describe the data that justified the conclusion but were often unable to explain it. Responses that scored well on this question were those that gave scientific knowledge and understanding related to the idea that by increasing the amount of substrate, increases the chance of collisions, so more enzyme substrate-complexes are formed, and oxygen is released faster.

Just the idea of a negative correlation was ignored, unless the correlation was explained. The idea of the enzyme and substrate combining, or meeting was acceptable for an explanation of collisions.

However, in responses where the conclusion was deemed incorrect, the linked explanation could not be correct, therefore, no marks were awarded.

(b) Figure 16 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s^{-1})
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(i) State and explain a conclusion based on these results.

(4)

A conclusion for these results is that the higher the concentration of hydrogen peroxide solution the quicker it was for the potato disc to rise and the rate increased by a large amount (0.011). This is because more oxygen bubbles were produced quicker and therefore pushed the potato disk up.

ResultsPlus
Examiner Comments

This response was awarded 2 marks for stating the conclusion that the higher the concentration of hydrogen peroxide the quicker it was for the potato disc to rise, and for a partial explanation of more oxygen bubbles being produced quicker.

(b) Figure 16 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s^{-1})
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(i) State and explain a conclusion based on these results.

(4)

The higher the concentration, the faster the time taken for the disc to rise + the faster the rate of reaction. The reason for this is that, the higher the concentration of a substance, the more substrates are present, meaning more frequent collisions. Because of this, reactions are faster + the quicker the reactions, the quicker the gas bubbles are released, causing the potato to rise, meaning ~~they~~ it rises quicker.

ResultsPlus
Examiner Comments

This response was awarded the full 4 marks for stating a valid conclusion and for explaining it using scientific knowledge on enzyme action and the effect of concentration on the rate of enzyme controlled reactions.

(b) Figure 16 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s^{-1})
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 16

(i) State and explain a conclusion based on these results.

(4)

- the lower the concentration, the slower the rate of reaction as at 5% it took 325 seconds to rise.
- the higher the hydrogen peroxide concentration, the faster the rate of reaction as at 20%, it took 72 seconds
- this shows a trend that the higher the concentration the faster the rate of reaction.

ResultsPlus
Examiner Comments

This response was awarded 1 mark for stating a conclusion. The candidate has quoted data but has given no explanation about how concentration affects the rate of enzyme controlled reactions.

Question 8 (b) (ii)

Most candidates answered this question well, and were awarded the full 2 marks, by recognising that the result needed to be expressed to three decimal places. However, 1 mark was awarded even if the answer had not been expressed to three decimal places where the mathematical workings were correct.

(ii) The student repeated the investigation with a 25% hydrogen peroxide solution and recorded a time of 75 seconds.

Calculate the rate of reaction for the 25% hydrogen peroxide solution.

(2)

$75^{-1} = 1/75 = 0.1\dot{3}$

0.13 s^{-1}

ResultsPlus
Examiner Comments

This response was awarded 0 marks as the answer is incorrect and not expressed to the number of decimal places as the other data in the table.

(ii) The student repeated the investigation with a 25% hydrogen peroxide solution and recorded a time of 75 seconds.

Calculate the rate of reaction for the 25% hydrogen peroxide solution.

(2)

$\frac{1}{75} = 0.01\dot{3}$

0.013 s^{-1}

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks for the correct answer to three decimal places.

Question 8 (b) (iii)

The application of scientific knowledge to experimental data is an important skill. This question asked candidates to give the reason why a further increase in concentration of hydrogen peroxide did not lead to an increase in rate of reaction. It required candidates to recognise that the substrate concentration is no longer limiting the rate of reaction, or that there is now another factor limiting the rate of reaction. The idea that all the active sites were occupied or that the enzyme was saturated was also acceptable. The idea that the enzyme has started to denature was only accepted if linked to a change in pH, the hydrogen ion concentration or acidity.

(iii) The student decided that the rate for the 25% hydrogen peroxide solution was not anomalous.

Give the reason why the result was not anomalous.

(1)

The concentration is now becoming no longer the limiting factor as increasing it has not much effect on the rate due to more enzyme needed to react with the substrate.

(Total for Question 8 – 12 marks)

ResultsPlus
Examiner Comments

This response states that the concentration is no longer the limiting factor and the candidate has identified that more enzyme would be needed. The response was awarded 1 mark.

(iii) The student decided that the rate for the 25% hydrogen peroxide solution was not anomalous.

Give the reason why the result was not anomalous.

(1)

Because he could of missed timed it, so it would of been a human error.

ResultsPlus
Examiner Comments

In this response, the idea of human error was not credited as it is not a reason why the result was not anomalous.

Question 9 (a) (i)

Candidates of all abilities demonstrated a good level of knowledge for this question.

Candidates were required to explain how a gene is inserted into a plasmid, including the use of restriction enzymes to produce sticky ends and ligase. Phonetically correct spellings, such as 'ligase' were accepted but 'lipase' was rejected. The idea of matching sticky ends was accepted for complementary. No marks were awarded for responses which did not include these details, for example, enzymes cut the DNA was not creditworthy.

9 (a) Yeast cells can be genetically modified to produce a painkiller.

This painkiller is usually obtained from opium poppies.

One method for genetically modifying a yeast cell uses a plasmid containing the desired gene.

(i) Explain how a gene can be inserted into a plasmid.

(2)

The ~~p~~ gene is cut out using a restricting enzyme that creates sticky ends, the plasmid is also cut open using a different restricting enzyme but ~~the~~ matching sticky ends are left, ligase then joins the two together.

ResultsPlus
Examiner Comments

This response is worthy of the maximum 2 marks. The candidate did not get the mark for restricting enzymes but did give the idea of matching sticky ends and ligase being used.

9 (a) Yeast cells can be genetically modified to produce a painkiller.

This painkiller is usually obtained from opium poppies.

One method for genetically modifying a yeast cell uses a plasmid containing the desired gene.

(i) Explain how a gene can be inserted into a plasmid.

(2)

The gene can be obtained using an enzyme, ~~This can then be used to insert into the plasmid~~ that can cut the dna leaving sticky end. these can then be joined using ligase and inserted into the plasmid using a vector.

ResultsPlus
Examiner Comments

This response shows a lack of detail. There is no reference to restriction enzymes and the candidate has not described the sticky ends as complementary or matching. There is no indication that the gene is being inserted into a plasmid.

Question 9 (a) (ii)

Issues surrounding genetic engineering were examined in this question which required candidates to apply their knowledge to the specific context of identifying the possible benefits and risks of producing painkillers from genetically modified yeast cells. Candidates were not awarded marks for vague statements about genetic engineering being unethical as specific details were required in the response.

In some responses, candidates demonstrated limited knowledge of this topic by stating that painkillers were genetically modified, that the yeast was ingested or that we do not know the impact of the painkillers on humans. For example, answers such as the yeast could have a negative effect on humans were ignored.

The idea that it was easier to produce painkillers from genetically modified yeast cells was insufficient as the response needed to relate to the ease of extraction for marking point 3. In addition, the idea of reduced biodiversity and cross pollination is not an acceptable response, but the possibility of risks of the GM yeast entering the environment was credited. Furthermore, issues surrounding cost are unsubstantiated and, therefore, were not credited.

Candidates were award marks for a more commonly expressed idea that an increased yield could be obtained in a shorter amount of time. The risks element to this question required more detail. Less able candidates often struggled to explain the risk element in a cohesive way. Moreover, marks were more commonly awarded for an explanation of the benefits rather than risks.

(ii) Discuss the possible benefits and risks of producing painkillers from genetically modified yeast cells rather than extracting the painkillers from poppies.

(3)

less poppies will be destroyed, and yeast can be made / grow all year round whereas poppies are only seasonal.
However nobody knows the risks of using genetic modification as it is still too young to understand the effects and many people dont agree with it due to religion

ResultsPlus
Examiner Comments

This response was awarded 1 mark for the benefit of being able to grow yeast all year round. The reference to genetic modification being too young to understand the effects is too vague for credit.

(ii) Discuss the possible benefits and risks of producing painkillers from genetically modified yeast cells rather than extracting the painkillers from poppies.

(3)

The modified yeast cell allows the ~~gene~~ painkillers to be produced quickly as yeast reproduces quicker and easier. This allows for an increased yield of the painkillers. However the genetic modification may cause wild yeast cell to become contaminated with the gene.

ResultsPlus
Examiner Comments

This response has given two benefits and one risk. The candidate has given the idea of an increased yield produced quicker. The reference to 'easier' is unclarified and was not awarded a mark. The candidate has also given the risk of cross contamination of other yeast cells with the gene. This response was awarded the full 3 marks.

Question 9 (b) (ii)

This extended open-response question covered three aspects: (i) the effect of changes in DNA sequence, (ii) the impact of the ability to sequence a genome on the individual and, (iii) the impact of the knowledge on medical treatments. The idea of influencing medical treatment is given in the question and therefore is not credited.

A mark was awarded in the Level 1 mark band for stating some valid content from one of the three areas.

To be awarded a mark from the Level 2 mark band, responses needed to demonstrate a good description of one of the three areas, or a combination of two of the areas. Marks were more commonly awarded from this mark band for details on sequencing the genome to diagnose possible diseases and the idea of personalising medicines.

To be awarded a mark from the Level 3 mark band, responses needed to contain content from all three areas. The top range of the Level 3 mark band was awarded to responses that were sufficiently structured and coherent, in line with the descriptors given in the mark scheme.

In some responses, there was evidence of a misconception of the idea that scientists could alter the sequence of the genes to impact the individual. More able candidates produced rounded responses, addressing all three areas and included more detail on the effect of mutations, which was not required but demonstrated comprehensive synoptic knowledge of the topic.

*(ii) In 2003, the first complete human genome was sequenced.

The genomes of different people have small changes in the sequence of the DNA bases.

Describe how these changes in DNA sequence can affect the individuals and how sequencing a person's genome could influence their medical treatments.

(6)

> If you know certain genes that cause certain illnesses you can test people for the gene to see if they are prone to getting the disease.
> The downside to this is that people who tested positive for a gene that causes a serious illness could always have anxieties about getting ill and might be pressured into not having children. They could also be discriminated against by employers or life insurance companies.
> If someone did test positive for an illness that could be prevented, they might be given medicine that will prevent them from ever getting ill

ResultsPlus
Examiner Comments

This is an example of a Level 2 response. The candidate has given a detailed description of the impact of sequencing on the individual which would be worth a Level 2 alone but has also talk about the impact on medical treatment. There is not sufficient reference to the indicative content from DNA sequencing to achieve a Level 3. The response is logical and coherent so is awarded 4 marks.

*(ii) In 2003, the first complete human genome was sequenced.

The genomes of different people have small changes in the sequence of the DNA bases.

Describe how these changes in DNA sequence can affect the individuals and how sequencing a person's genome could influence their medical treatments.

(6)

The changes in a DNA sequence can effect traits and characteristics that could be passed on as you reproduce. Changes in the DNA can also cause un-expected mutations. It can also ~~made~~ make medicine from the doctor less efficient and could create more chances of infection. This is due to a new sequence that alters how your body reacts to certain medication.

ResultsPlus
Examiner Comments

This is an example of a Level 1 response worthy of two marks. The candidate has made reference to the indicative content from DNA sequences but nothing further. The idea that medication could be less efficient and create chances of infection is not correct. The response is sufficiently coherent for 2 marks to be given from the level descriptors.

*(ii) In 2003, the first complete human genome was sequenced.

The genomes of different people have small changes in the sequence of the DNA bases.

Describe how these changes in DNA sequence can affect the individuals and how sequencing a person's genome could influence their medical treatments.

(6)

Changes in the DNA sequence can ~~affect~~ sometimes affect the individuals phenotype. ~~Small~~ Mutations in the DNA can affect the ~~protein~~ order of amino acids and the protein which is transcribed which may contribute to having an affect on the persons displayable ~~characteristics~~ characteristics. ~~By sequencing a person~~ It can also make a person more susceptible to a certain disease. By sequencing a persons genome doctors can asses ~~whether~~ which genes they have that could make them more likely to develop a certain disease, as they ~~know~~ know what genes cause which diseases. This can result in that person getting diagnosed with the disease earlier which can lead to early medical treatments for the disease. They can also be prescribed medicine which can prevent the disease from forming. Also the increased screening for the disease can increase the ~~lik~~ ~~likelihood~~ likelihood that the treatments are succesful. However it may lead to discrimination from ~~or~~ insurance companies as they know if they are likely to develop a disease in the future. * The mutation can change the bases leading to a change in the gene

~~* The mutation can change the bases~~

(Total for Question 9 = 12 marks)

ResultsPlus
Examiner Comments

This response is worthy of Level 3. The mutations written above the question would have been credited, although it is already given in the answer. The candidate has referred to the indicative content from DNA sequences, the impact on the individual and the impact on medical treatment. The answer is coherent and is awarded the full 6 marks.

*(ii) In 2003, the first complete human genome was sequenced.

The genomes of different people have small changes in the sequence of the DNA bases.

Describe how these changes in DNA sequence can affect the individuals and how sequencing a person's genome could influence their medical treatments.

(6)

Sequencing a persons genome could let scientists take out certain diseases which may be past down from parents. It would also allow to give desired characteristics or phenotypes like ~~hig~~ height etc, allowing doctors to elimate a disease on a large scale, if there are no carriers there cannot be the disease. ~~meaning~~ ~~without~~ This would allow docters to ~~prescribe~~ prasribe a change in Someones DNA sequence which would elimanate the trait or characteristic for offspring.

ResultsPlus
Examiner Comments

This response is not worthy of credit as the candidate has misunderstood the question.

Question 10 (a) (i)

This question required knowledge of the core practical from Topic 5 so that candidates could apply it to the context of the question. Candidates were required to describe how a scientist could determine the effectiveness of myxopyronin on two species of bacteria.

Generally, the question was answered well by most candidates. Marking point 1 was based on the required method and marking point 2 was about how the results would be obtained to make the judgement about which antibiotic was the most effective. The idea of spreading one species on one half of the plate and the other on the other half was accepted, although a time period for the incubation was not required. Some candidates stated that the bacteria were grown before the discs were added which was not credited. Descriptions of a zone of inhibition were accepted.

10 A scientist was planning to compare the effectiveness of the antibiotic myxopyronin on two different species of bacteria.

Figure 18 shows the equipment the scientist can use.

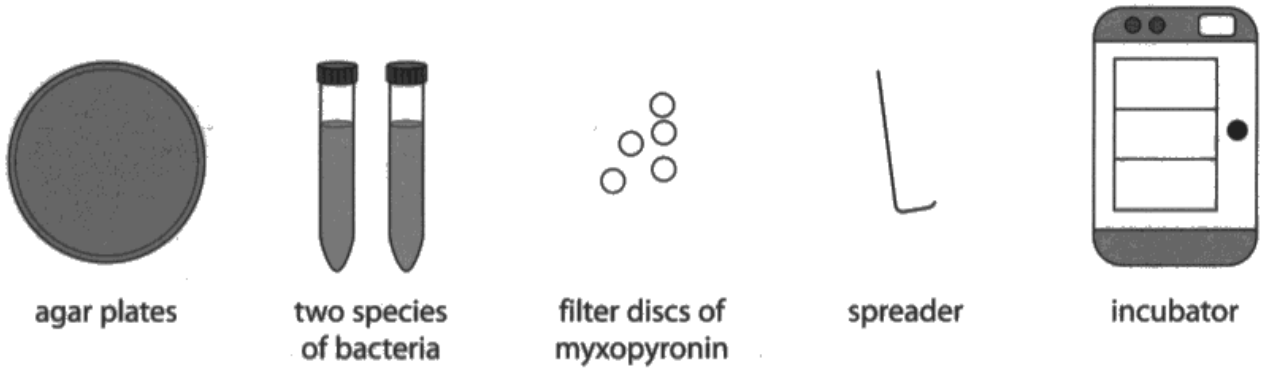


Figure 18

(a) (i) Describe how the scientist could determine the effectiveness of myxopyronin on the two species of bacteria.

(2)

by adding the bacteria to ~~the~~ two agar plates & using a spreader to evenly distribute it, then by adding the disks of myxopyronin to the different bacteria and using an incubator to keep the bacteria at optimum breeding temperature for a set ~~of~~ amount of time. Whichever has the least bacteria surrounding the filter disk is the most effective.

ResultsPlus
Examiner Comments

This response was awarded the full 2 marks; 1 for the method and 1 for the results. The least bacteria surrounding the filter disc being the most effective was sufficient.

10 A scientist was planning to compare the effectiveness of the antibiotic myxopyronin on two different species of bacteria.

Figure 18 shows the equipment the scientist can use.

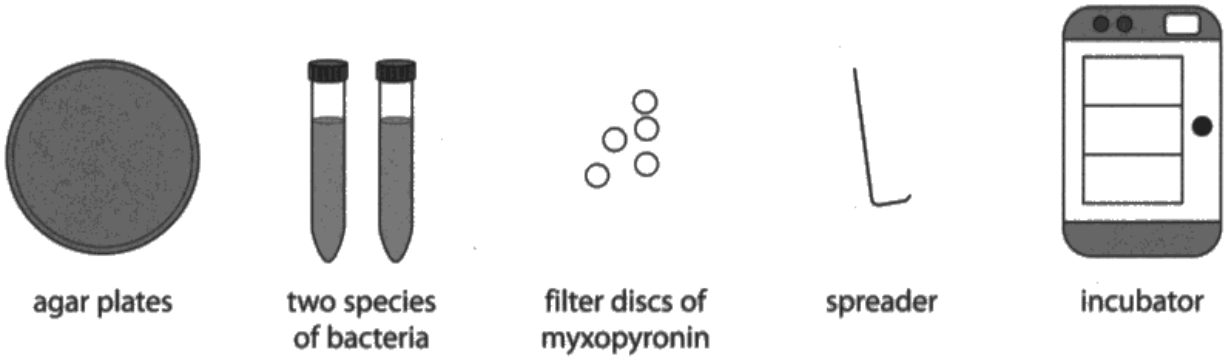


Figure 18

(a) (i) Describe how the scientist could determine the effectiveness of myxopyronin on the two species of bacteria.

(2)

By working out the inhibition zone. The larger the inhibition zone, the more effective myxopyronin will be, the smaller the inhibition zone, the less effective. You can work out the area $= \pi r^2$

ResultsPlus
Examiner Comments

This response is worthy of 1 mark for the expected results.

ResultsPlus
Examiner Tip

Read the question carefully as this response is only worth one mark for describing the results and not giving details of how the scientist would obtain the results.

Question 10 (a) (ii)

The detailed knowledge required to obtain full marks on this question challenged candidates.

Protein synthesis is a difficult concept and lower ability candidates were frequently limited to 2 marks for the idea of destroying the bacteria but not affecting the human cells. Myxopyronin inhibits bacterial RNA polymerase is given in the question so details were required on its role to access further marks. Myxopyronin preventing bacteria spreading or that it just inhibits the bacteria was not sufficient as candidates needed the idea that the antibiotics destroy bacteria, prevent them growing or reproducing. The reverse arguments for making mRNA during transcription which is used to make proteins were accepted.

(ii) Myxopyronin inhibits bacterial RNA polymerase.

Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans.

(4)

~~Myxopy~~ Myxopyronin effectively kills bacteria without harming the human and therefore it can be used to treat bacterial infections in humans because it is successful at killing the pathogen causing the infection in the body.

ResultsPlus
Examiner Comments

This response is worthy of two marks for reference to killing bacteria without harming humans.

ResultsPlus
Examiner Tip

Try to match the number of facts you include in your answer to the number of marks available.

(ii) Myxopyronin inhibits bacterial RNA polymerase.

Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans.

(4)

RNA polymerase is an enzyme used in transcription for protein synthesis, which a bacterial cell would need for growth. If it inhibits RNA polymerase, mRNA cannot be replicated from the complementary unzipped DNA, meaning that proteins cannot be formed from amino acids brought by tRNA to the ribosome, and therefore the bacteria cannot grow and reproduce. This prevents a dangerous infection ~~and~~ as there is no increase in the bacterial population.

ResultsPlus
Examiner Comments

This response is worthy of the full 4 marks. The candidate has referred to the role of RNA polymerase in transcription, so the mRNA cannot be made, proteins cannot be made and that this prevents the bacteria reproducing.

(ii) Myxopyronin inhibits bacterial RNA polymerase.

Explain why the antibiotic myxopyronin can be used to treat bacterial infections in humans.

(4)

Bacterial RNA polymerase ~~als~~ allows the bacteria to form a strand of mRNA during transcription so it can be translated to make proteins. If myxopyronin inhibits bacterial RNA polymerase transcription cannot happen so no proteins can be translated killing the bacteria. ~~The~~ However, the antibiotic does not affect human RNA polymerase so the cells produce proteins as normal leaving them unaffected.

ResultsPlus
Examiner Comments

In this response, the candidate has demonstrated excellent knowledge about protein synthesis and has specifically applied it to the context of the question obtaining the full 4 marks.

Question 10 (b)

This extended open-response question was answered well by most candidates although it was clear when candidates did not know about the lytic cycle and some responses referred to bacteria not viruses. A Level 3 response required details on both the lytic cycle and how a virus could spread through a population.

For spread through the population, responses needed to refer to more than just spreading to other host cells as a method for spread to another host was required, for example, body fluids and sneezing. Omitting this information prevented some candidates accessing Level 3 as they had not fully answered the question.

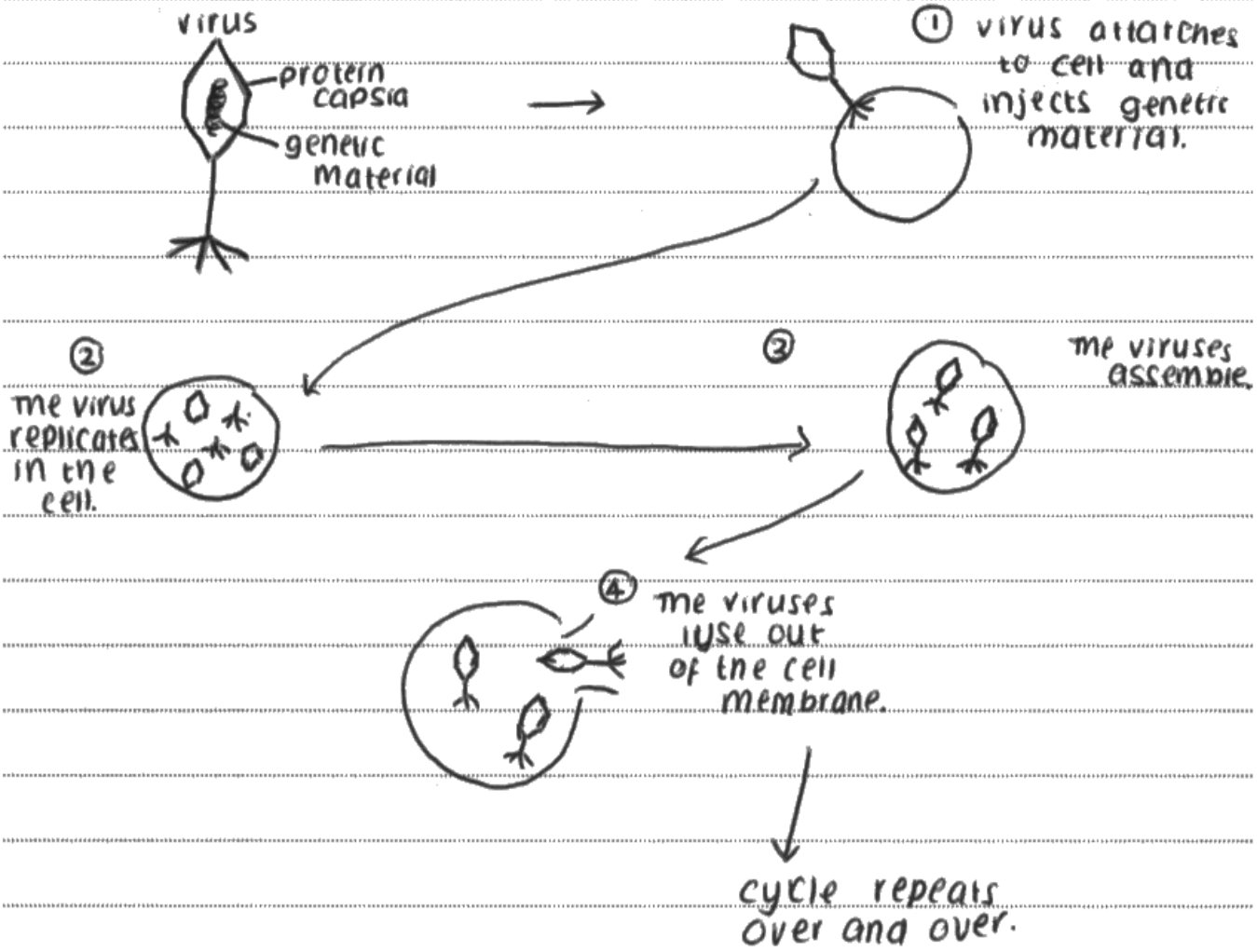
Level 2 was awarded for a good description of the lytic cycle, or some content on the lytic cycle, and spread through a population. For Level 1, candidates needed to refer to some content on the lytic cycle or how viruses are spread through a population. Responses that were logically ordered in terms of the life cycle process were awarded the top of the band in line with the descriptors in the mark scheme.

*(b) Infections can also be caused by viruses.

Describe the lytic pathway of a virus and how this causes the spread of infection through a population.

(6)

In the lytic cycle, a virus attaches to a cell and injects its genetic material. The ~~genetic material~~ virus ~~them~~ then replicates in the cell, creating many virus organisms. The viruses then assemble and lyse out of the cell membrane to go and infect other cells.



ResultsPlus
Examiner Comments

This is an example of a Level 2 response which is coherent and logical and was awarded 4 marks. The candidate has not addressed the idea of spreading through a population and so could not achieve a Level 3 mark.

ResultsPlus
Examiner Tip

A diagram can help you answer a question, just make sure you label it.

*(b) Infections can also be caused by viruses.

Describe the lytic pathway of a virus and how this causes the spread of infection through a population.

(6)

Viruses can be passed from person to person through coughing, sneezing and physical contact. This will cause the infection of a population. The virus travels around the body.

ResultsPlus
Examiner Comments

This is an example of a Level 1 response describing how viruses are spread through the population. It does not include details of the lytic cycle.

*(b) Infections can also be caused by viruses.

Describe the lytic pathway of a virus and how this causes the spread of infection through a population.

(6)

Viruses are not living and thus do not have the components needed to reproduce by themselves. For this reason, a virus injects its genetic material into a host cell and uses ~~its~~ the host cell's proteins and enzymes to create its viral components. The virus forms and this process is repeated until the cell lyses, or splits open, to release lots of viruses. This virus then goes on~~t~~ to do the same to other cells, multiplying in number. Viruses are then found in bodily fluid, such as the blood, which can be spread between people if ~~they are~~ an infected bodily fluid gets into you. This can happen if drug users share needles, or through sexual contact in some cases, like AIDS, or even a mother breastfeeding her child.

ResultsPlus
Examiner Comments

This is an example of a Level 3 response awarded the full 6 marks as it gives a detailed description of the lytic cycle for a virus and the mechanism by which it is spread through a population.

Paper Summary

Overall Performance

Most candidates were able to access both the extended writing responses well demonstrating good knowledge on the effect of analysis of gene mutations on individuals and the influence on their medical treatments in the first question, and key information on the lytic cycle of viruses for the second extended response question.

Many candidates were able to demonstrate a good level of knowledge in the early questions, including the eye, diet and exercise, tissue culture and calorimetry. Osmosis challenged some candidates who were able to interpret the data given in the question but did not apply their knowledge of the process sufficiently well when explaining the results.

The level of knowledge shown about immunity was very good for most candidates but the application of their knowledge on stem cells to a context was more challenging. Higher ability candidates had some good knowledge on the pentadactyl limb and genetic analysis and many candidates were able to obtain some marks on these questions by interpreting information given in the question.

The genetic questions were particularly challenging. Most candidates did not use genetic terms correctly when interpreting one of Mendel's experiments. The combination of sex-linked inheritance and family pedigrees allowed higher ability students to demonstrate their understanding of the topic helping them to increase their marks on the paper, but many candidates were unable to interpret the information they were given.

Candidates of all abilities showed some good knowledge on genetic engineering, but only more able candidates were fully able to discuss the benefits and risks of the process when it was applied to a context. The applied question of protein synthesis challenged candidates of a lower ability but enabled those of higher ability to demonstrate their knowledge of this difficult concept.

The assessment of practical work in the new qualification has replaced the controlled assessment component of the previous specification. Candidates of all abilities were able to answer questions using their practical skills knowledge, including questions on safety precautions and the identification of controlled variables. However, candidates need to ensure they use scientific terms, including volume and mass, accurately. Most candidates were able to recall methods, including the food test for starch and the microbiology practical to test the effectiveness of an antibiotic. They also made good attempts at writing a method to test a hypothesis. Explaining why a variable needed to be controlled was more challenging, especially as it was not in the context of a core practical.

Candidates of all abilities were able to access the more straightforward maths questions, including calculating a rate, BMI and the surface area of a rectangle. Candidates found the calculation of a percentage increase more challenging and weaker candidates did not use probabilities in their answers to the challenging genetics questions.

Candidates of all abilities were able to analyse data to give a conclusion to the enzyme investigation, but only more able candidates were able to explain the conclusion using scientific ideas. Candidates need to check whether they are to 'describe' or 'explain' interpretations of data as this also applied to the question of waist:hip ratio and BMI.

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

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Use all the information given in the question to help construct the answer but avoid repeating the information which has already been given, and giving a vague response which will not gain credit
- Consider the context of the question to ensure 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 awarded.
- Ensure that they can interpret family pedigrees for both the sex of the individuals and use genetic terms in their answers.
- Use scientific terminology accurately where possible in responses.
- Always show the mathematical workings when doing calculations as a mark can be awarded for errors carried forward.
- Think about the structure of the answer to the extended open-response questions before starting to write. This is to ensure that the answer shows clarity of writing, while remembering that accurate spelling and grammar in these questions is also important.

Grade Boundaries

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

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

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