

# Examiners' Report

## June 2018

### GCSE Science 1SC0 1BF

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# Introduction

The Pearson Edexcel Combined Science, Paper 1: Biology (Foundation tier) is one of six assessments taken as part of the new GCSE (9-1) Combined Science qualification.

This is the first assessment of the new GCSE (9-1) Combined Science specification and the qualification follows a linear assessment model whereby candidates must complete all the six assessments in the same single year of certification.

The Paper 1: Biology (Foundation tier) assessment consists of 60 marks assessed by a variety of question types, including multiple choice questions, short answer questions, calculations and extended open-response questions. Candidates should answer all questions in a time period of 1 hour and 10 minutes. The extended open-response questions are identified by an asterisk (\*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

In addition, the new GCSE (9-1) Combined Science qualification assesses practical knowledge and maths skills; the requirements of which are given in the new specification. Furthermore, for the Biology qualification, there are 6 mandatory core practicals which candidates must complete prior to the examination as aspects of working scientifically are also assessed in questions throughout the paper.

The Paper 1: Biology (Foundation 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 pathogens and disease, DNA, enzymes, microscopy, mitosis, obesity and the risk of developing cardiovascular disease, osmosis and selective breeding.

Questions designed to assess practical work included writing a plan for an investigation, using a microscope, controlled variables and safety precautions. The maths skills assessment in this paper related to questions requiring completion of a graph, BMI calculations, surface area calculations and a ratio.

## Question 1 (a)

This question asked candidates to draw one straight line from each of two types of pathogen to a disease caused by those pathogens. Many candidates were able to complete the question successfully. However, candidates who drew two lines from one or both of the pathogens did not gain credit.

## Question 1 (c)

This question required some straightforward data interpretation. Candidates were asked to explain why the data suggests that a patient has a bacterial infection. The first mark was given for stating that Patient Z has a higher white blood cell count. Responses, such as 'more white blood cells' were accepted. The second marking point was awarded for explaining that white blood cells kill bacteria/produce antibodies. A common acceptable response was that white blood cells fight infection. However, 'killing' infection was not credited.

This response has been awarded the full 2 marks for stating that there are more white blood cells, and by continuing to say that these are for fighting off infection. The quality of written English is poor but the biology criteria is clearly met so full credit has been given.

(c) Figure 1 shows the number of white blood cells in blood samples from three patients.

	Patient X	Patient Y	Patient Z
Number of white blood cells per $\mu\text{l}$	8 500	5 700	12 500

Figure 1

Explain why the data suggests that Patient Z has a bacterial infection.

(2)

Because he has many more white blood cells, meaning his body has made more to fight off infection.



This is an 'explain' question so any statement made needs to be qualified in order to be awarded the second marking point.

(c) Figure 1 shows the number of white blood cells in blood samples from three patients.

	Patient X	Patient Y	Patient Z
Number of white blood cells per $\mu\text{l}$	8 500	5 700	12 500

**Figure 1**

Explain why the data suggests that Patient Z has a bacterial infection.

(2)

Because patient z has more white blood cells than the other patients. Also, the less white blood cells you have, the less it is that you will get a bacterial infection.



In this response, the candidate was awarded 1 mark for the reference to 'more white blood cells'. However, the suggestion of more white blood cells to infections was incorrect as the question states that the patient already has an infection.



Re-read the question and ask yourself, "have I answered the question?"

In this response, the candidate has given no creditable answers to the question.

(c) Figure 1 shows the number of white blood cells in blood samples from three patients.

	Patient X	Patient Y	Patient Z
Number of white blood cells per $\mu\text{l}$	8 500	5 700	12 500

**Figure 1**

Explain why the data suggests that Patient Z has a bacterial infection.

(2)

Patient Z has a bacterial infection because  
it contains lots of lysozymes and because  
pathogens have entered the body with  
antigens.



Candidates are advised to read the question carefully. This is an 'explain' question and candidates must ensure that their first statement refers directly to the data given.

## Question 1 (d)

This question looked at the working scientifically aspect of the qualification, assessing practical skills.

Candidates were told that HIV is diagnosed by blood tests. They were asked to state two safety precautions that need to be taken when handling blood samples. Creditworthy responses for marking point 1 were seen most frequently, such as wearing gloves or wearing goggles. Good responses covering the other marking points were seen much less frequently.

References to using and disposing of needles were not credited because the question was not about taking blood samples. This was an accessible question and many candidates scored at least 1 mark.

(d) HIV is diagnosed by blood tests.

State **two** safety precautions that need to be taken when handling blood samples.

- (2)
- 1 That you dont have any open wounds so wear gloves
  - 2 keep it cold



In this response, wearing gloves was credited for marking point 1. This was not an 'explain' question so the reason given for wearing gloves was good, but not creditable.

The reference to 'keep it cold' was sufficient for crediting for marking point 3.

(d) HIV is diagnosed by blood tests.

State **two** safety precautions that need to be taken when handling blood samples.

(2)

1. make sure you are covered / nobody is exposed.

2. you don't contaminate somebody else's by mixing 2 samples.



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Examiner Comments

In this response, the first answer was too vague and incorrect to be credited a mark. The second answer was a common response given by many candidates. However the suggestion of not mixing samples, which may be a good procedural point, does not answer the question. Therefore, no marks were awarded for this response.

## Question 2 (a) (iii)

In this question, candidates were asked to state the type of bond that joins bases together in DNA molecules.

Many candidates found this question challenging and named a range of bonds, such as covalent or ionic, rather than giving the correct response of weak hydrogen bond. However, reference to just 'hydrogen' was deemed to be creditable within the construct of the question.

## Question 2 (b)

This is a practical question asking candidates to describe how cells can be broken down to release DNA.

Candidates with first-hand experience of extracting DNA from fruit or other sources were able to score the full 2 marks for conveying the basic idea of crushing fruit and for mixing cells with a salt/detergent solution. Using ethanol was also an acceptable alternative response for marking point 2.

## Question 2 (c)

In this question, candidates were required to state two benefits that the human genome project could have for medicine. This question challenged candidates across the ability range. The most common creditworthy responses seen were for the second marking point, such as treating genetic disorders or developing new medicines.

This response was awarded the full 2 marks. The first part of this response was awarded 1 mark for meeting the criteria for 'personalised medicines'. The second part meets the criteria for 'genetic counselling'.

(c) In 2003, scientists finished sequencing the 3 billion base pairs in the human genome.

State **two** benefits that the Human Genome Project could have for medicine.

- (2)
1. tailored medicines can be made for people to suit ~~there~~ their needs
2. people can be pre warned if they are more ~~likely~~ likely to get a certain cancer



**ResultsPlus**  
Examiner Comments

This candidate has prepared well for this exam considering consequences of the science covered regarding the Human Genome Project in the specification. When preparing such topics, have a system, for example, a table with columns of name, what it is and uses. A fourth column of 'other points' may also be useful.

### Question 3 (a)

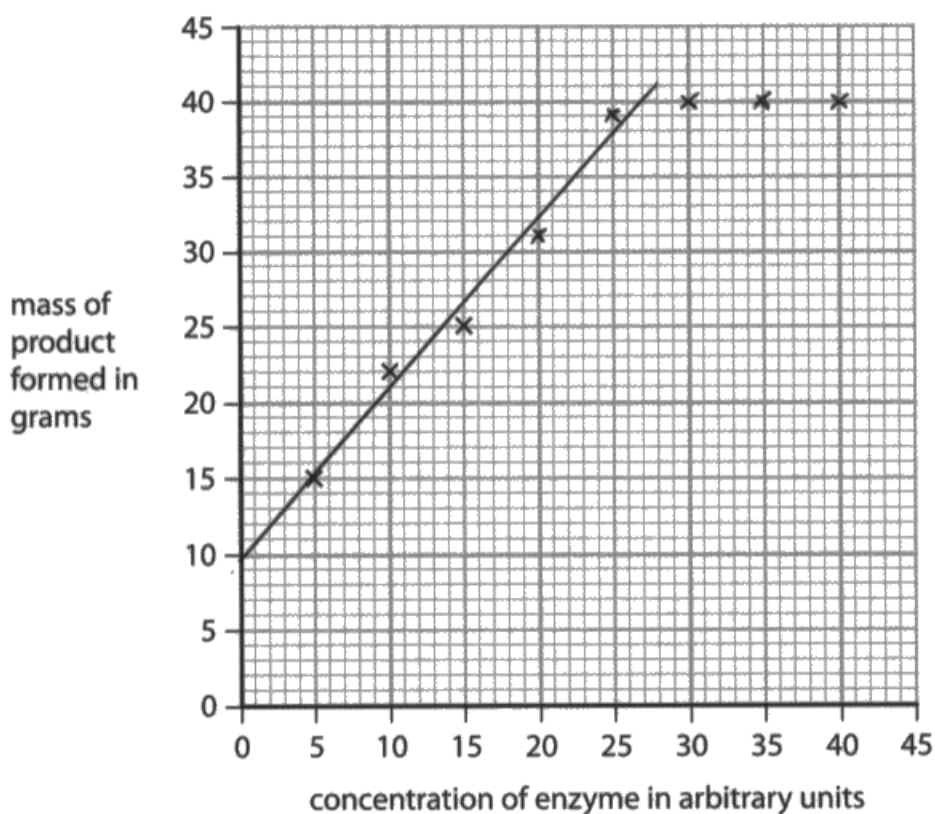
This question required candidates to plot five points on a graph and then draw a line to show the trend in the data.

Whilst the majority of candidates were successful in achieving the first marking point of plotting the five points, many candidates did not go on to draw a line, which precluded them from gaining marking point 2. A line showing a steady increase, then levelling off at 30 arbitrary units was required. Dot-to-dot lines were accepted.

- (a) Complete the graph by plotting the points and drawing a line to show the trend in the data.

The first three points have been plotted for you.

(2)





To gain marking point 1, all the five points had to be plotted to within half a small square. In this response, the concentration of the enzymes for 32 is plotted as 31, and 38 is plotted as 39, so no credit was given for marking point 1.

For marking point 2, the line had to increase and then level off with a generous allowance around the leveling off region. In this response, no levelling off is included and, therefore, no credit was given for marking point 2. Therefore, no marks were awarded for this response.



Plotting points on graphs have to be very accurate. Use a sharp pencil and make sure you understand the scales used on the axes.

### Question 3 (b)

The first marking point was awarded for a straightforward statement that the mass of product increases as enzyme concentration increases.

Many candidates were successful at achieving marking point 1 but did not gain further marks by neglecting to describe that the mass of product stays the same or levels off from 30 arbitrary units.

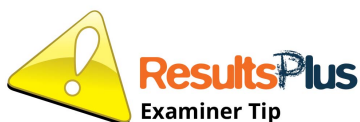
(b) Describe the effect that enzyme concentration has on the mass of product formed.

(2)

The concentration of enzyme goes up then the mass of product goes up so it will keep breaking down the product.



In this response, the candidate is awarded the first marking point but fails to extend their response to describe what the levelling off means in terms of mass of product formed to be awarded the second marking point.



When describing a trend on a graph where the line is more complicated than a straight line, make sure that you have described all parts of the line.

### Question 3 (c)

The mathematical skill of calculating a ratio was examined in this question.

Candidates across the ability range found this question challenging, but when successful, they usually gained both marks for giving the correct ratio of 1:3. Incorrect substitution (15:5) leading to an answer of 3:1 scored one mark for an error carried forward.

- (c) The ratio of enzyme concentration to the mass of product formed, using an enzyme concentration of 40 arbitrary units, is 1:1.

Calculate the ratio of enzyme concentration to product formed when the enzyme concentration is 5 arbitrary units.

(2)

5:15

÷5

1:3

ratio 1:3



In this response, the candidate is awarded the full 2 marks for the correct answer written on the answer line.

### Question 3 (d) (ii)

In this question, candidates were asked to explain why a temperature of 80°C was not used in the investigation with pepsin.

Many candidates were able to state successfully that the enzyme would denature at 80°C and so gained a mark for marking point 2. Some candidates were then able to explain that the enzyme or its active site would change shape, thus gaining a mark for the third marking point. A common response for the fourth marking point was that no reaction would take place, or that the substrate would no longer fit into the active site.

Marking point 1 was gained less frequently, mainly because comments about the optimum temperature were vague.

(ii) Explain why a temperature of 80°C was not used in this investigation.

(3)

The temperature 80°C is too high for the enzyme to handle and the concentration of the enzyme would be inconclusive.



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Examiner Comments

In this response, the candidate has given a vague statement and was awarded no marks.



**ResultsPlus**  
Examiner Tip

This is an 'explain' question and so needs a specific answer, preferably with key words. In this case, the question is about enzymes so key words could include 'optimum' and 'denatured'.

(ii) Explain why a temperature of 80°C was not used in this investigation.

(3)

The optimum temperature for an enzyme within the human body is 37°C. If the temperature was to increase to 80°C, the enzyme would denature, meaning the substrate wouldn't be complementary, thus the enzyme wouldn't be able to catalyse the reaction. This is called the lock and key theory.



This is an example of an excellent response where the candidate has included scientific terminology in the correct context and has been credited with all three available marks.

## Question 4 (a)

This question required knowledge of how to use a microscope effectively and to explain ways of improving a procedure. This question is based on a core practical.

There were several acceptable ways of improving the method, such as using a stain, adjusting the focus of the microscope and increasing the magnification. Whilst many candidates could give at least one way of improving the method, they were less successful at explaining the suggested improvement and sometimes just rephrased or repeated the stem of the question.

Candidates that suggested using an electron microscope did not gain credit as the question asked how this particular method, which was using a light microscope, could be improved.

### 4 (a) A student cut a piece of onion and placed it on a microscope slide.

The student then placed this slide on the stage of a light microscope and looked through the eyepiece.

No cells could be seen in the piece of onion.

Explain **two** ways this method could be improved to see details of the onion cells.

(4)

1. place the slide on the stage and change objective lens so it the smallest then using the coarse adjustment knob make the slide the stage so it just under the objective length and the make down the stage until you almost see a focused image.
2. He could also use the fine adjustment knob to make the image sharper and more in focus.  
Another method he can use is increase the magnification to a greater amount so that he could see the cell.  
Finally, another method that could be use is to make a thin slice so that light could pass through and you could apply a stain if the onion is transparent so that its easier to see.



This response shows a clear understanding of two ways to improve the method. Each way has a creditworthy reason to support it and so the full 4 marks were awarded.



An 'explain' question will usually require a statement followed by a reasoned justification to extend the statement. Note how this candidate has done so. Use this structure as a basis for your answers to this type of 'explain' question.

## Question 4 (b) (iii)

For this question, candidates had to describe two genetic similarities of new cells produced by a plant cell dividing by mitosis.

The majority of candidates found this question challenging, but some were able to gain a mark from marking point 1 by stating that the new cells would have the same genes, chromosomes, DNA or alleles. The fact that the new cells would be genetically identical to cell Q was also accepted. Marking point 2 was seen infrequently, although some candidates clearly understood the relevant science and gave precise answers.

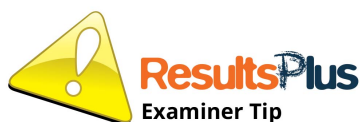
(iii) Describe **two** genetic similarities of the new cells that would be produced by cell Q in Figure 4.

(2)

- 1 The new cells would have same number of ~~DNA~~ Chromosomes
- 2 The new cells would have the same DNA as old ones.



This response was awarded the full 2 marks as the candidate has mentioned that the new cells will have the same number of chromosomes. The statement that, 'the cells would have the same DNA' was accepted for the criteria of 'genetically identical'.



State your answers simply and concisely making sure that you put your ideas down clearly.

(iii) Describe **two** genetic similarities of the new cells that would be produced by cell Q in Figure 4.

- 1 ~~Both~~ The DNA will be the same type of helix in both cells. (2)
- 2 Both cells DNA will have the same type of bases.



**ResultsPlus**  
Examiner Comments

This candidate has answered the question with the correct characteristics of DNA. However, no marks were awarded as the candidate stated that all DNA has the same helix and the same four bases, which did not meet with the marking criteria.



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Examiner Tip

When writing a response to a specific question ask yourself, "is what I am writing true for all examples or is my answer specific to this question?"

## Question 4 (b) (iv)

Candidates found this question very accessible and demonstrated good knowledge of relevant safety precautions when heating hydrochloric acid.

Comments on general laboratory safety, such as tying hair back, standing up or putting bags under benches were not creditworthy.

(iv) The cells in Figure 4 were heated in hydrochloric acid.

State **two** safety precautions that should be taken when heating hydrochloric acid.

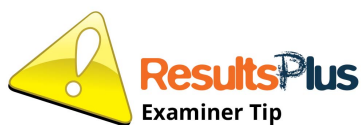
(2)

1 Safety goggles must be worn.

2 Flammable objects (blazers) should be removed.



This response was awarded 1 mark for reference to wearing safety goggles. Blazers should be removed was not credited as it is considered to come under the heading of a general laboratory rules for all practical sessions.



Make sure that your safety precautions are specific to the practical investigation in the question.

(iv) The cells in Figure 4 were heated in hydrochloric acid.

State **two** safety precautions that should be taken when heating hydrochloric acid. (2)

1. Make sure the acid does not reach near boiling point.
2. Make sure safety glasses are on.



This response was awarded the full 2 marks. The first response was accepted for marking point 3 and the second response was taken as 'glasses' not 'gasses' by using the context, that is to say, the word 'safety' and also comparing the letters to others in the response.



Take care with your writing. Look at the second answer. Does it say 'glasses' or 'gasses'? It is very close but just enough to take as glasses so the mark is awarded.

## Question 4 (c)

This question asked candidates to explain one advantage of using an electron microscope to observe plant cells.

The second marking point of each 'advantage/explain' criteria was only awarded if the first marking point (advantage) was awarded. Therefore, candidates that gave two advantages but explained neither of them were only awarded 1 mark.

Acceptable responses included, a higher resolution so more detail can be seen, or higher magnification so more detail can be seen. Less precise responses, such as better magnification, did not gain credit, but references to being able to see subcellular structures was awarded the second marking point.

(c) Explain **one** advantage of using an electron microscope to observe plant cells.

(2)

electron microscope has better resolution than  
light microscopes because they are more expensive  
so you can see the makeup of the cell better.



In this response, 1 mark is awarded for reference to a 'better resolution', but just falls short of the second mark as 'see the make up of the cells better' is not specific enough for credit.



Good use of the word 'resolution' but the last part needs to be more specific for credit. For example, 'so you can see more detail inside the cell, such as ribosomes', is a more specific response.

(c) Explain **one** advantage of using an electron microscope to observe plant cells.

(2)

it can have a higher magnification than a normal microscope and can see a lot more closer and see more detail.



This response refers to higher magnification for the first mark and just crosses the agreed criteria for awarding a second mark by referring to 'seeing more detail'.

## Question 5 (a) (ii)

This question asked candidates to give a reason why cirrhosis is a non-communicable disease.

Candidates found this question very accessible and a common creditworthy response was that cirrhosis cannot be passed on or cannot be spread. Correct responses seen less frequently were that cirrhosis is not caused by pathogens or that it is not contagious.

(ii) Give **one** reason why cirrhosis is described as a non-communicable disease.

(1)

because you can't spread /  
give the disease to another  
person.



This is an example of a standard, basic response that answered the question and was awarded the one mark.

(ii) Give **one** reason why cirrhosis is described as a non-communicable disease.

(1)

It is a non-communicable disease as it is caused by and contracted from ~~alcohol~~ alcohol abuse



**ResultsPlus**  
Examiner Comments

It was a common error to relate cirrhosis of the liver correctly with cirrhosis, but this response did not answer the question and was awarded no marks.



**ResultsPlus**  
Examiner Tip

Make sure you read the question carefully and check that you have answered the question rather than just write down what you have been taught about a topic. Underlining the key words in the question can help you to focus your mind on what is required to gain credit.

## Question 5 (b)

In this question, candidates were asked to explain why exercise can cause weight loss.

The first marking point was awarded for the idea that exercise requires energy. The idea of exercise burning calories was a common answer, which was given credit.

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.

Generally, this question was answered well, and many candidates were awarded at least one mark. However, some candidates did not achieve marking point 2 as they only gave the idea that the energy in food intake was burned, rather than the idea of weight loss because fat already in the body was being lost.

(b) 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)

The fat will start decreasing, so less fat they are able to breath more easy and exercise uses a lot of energy, so fat is also lost.



This response states that exercise uses energy and that this causes a decrease in fat. Therefore, it was awarded the full 2 marks.



Try to answer the questions succinctly. It helps the examiner to identify where they can award marks.

## Question 5 (c)

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

Marking point 1 was awarded for reference to reducing the volume of the stomach. It was not awarded for the incorrect interpretation that the size of the entry to the stomach is reduced.

Marking point 2 was for the idea of reduced food intake or restricting the amount of food entering the stomach; the basic idea of feeling full quicker was insufficient.

Most candidates were awarded the full 2 marks by combining the idea of a smaller stomach volume and eating less. For marking point 3, few candidates recognised that stored fat must be used to cause weight loss.

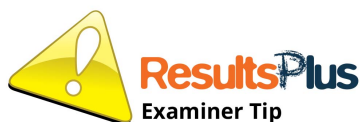
Explain how a gastric band helps a person to lose weight.

(2)

Gastric band helps a person to ~~loss~~ lose weight  
as the band placed around the ~~stomach~~  
Stomach to make ~~the~~ it smaller so people  
cant consume a lot of food therefore not  
putting much weight on.



This response demonstrates a commonly seen, standard answer covering both marking points.



With a question that is not familiar to you, it probably means that you have to apply your knowledge to a new situation. Don't panic, but describe what you see in the diagram or in the data and then use your knowledge related to the topic to answer the question.

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

(2)

a gastric band helps a person to lose weight because the band is there to not let anymore fat in and when you sweat you burn alot of calories.



In this response, the candidate has been too specific and is awarded no marks.



Re-read your work and ask yourself if it is reasonable and does it answer the question.

## Question 5 (d) (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 marking point 2. Furthermore, 2 marks were awarded for an evaluation without the correct number of significant figures and with no workings shown. The answers of 21.977, 21.9 and 22 were seen most frequently and were awarded 2 marks. Of these, the most frequent response given was 21.9, which shows an error in rounding.

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

Figure 6 shows some data for two males.

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

Figure 6

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)

$$\frac{72}{(1.81)^2} = 21.97735112$$

$$\text{BMI} = 22.0$$



This is an example of a good clear answer that gets the three marks as the candidate has calculated the BMI correctly and expressed the answer to three significant figures.

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

Figure 6 shows some data for two males.

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

**Figure 6**

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)

$$72 \div 1.81 = 39.795.$$

$$\text{BMI} = 39.795$$



Many candidates missed out squaring the height (1.81m), thereby making it impossible to gain any of the three marks available.



Take care to include all parts of the equation when you substitute numbers into a formula.

## Question 5 (d) (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 was accepted. The explanation aspect for 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.

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)

This says that male A is overweight because his BMI is 27.3 and overweight is 25.0 - 29.9 - This shows he is in the middle of these numbers.



It was very common to see this answer which correctly states that male A is overweight. Unfortunately, this response was awarded no marks as the question asks to comment on BMI and waist:hip ratio. Marking point 1 requires both details for credit to be awarded.



If a question asks for comments on two factors, make sure that you answer both of them. One way to do this is to tick off the parts in the question as you work through the question.

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)

In the interpretation 0.85 is nearly abdominally obese and (waist:hip) and 27.3 is overweight (BMI) but this could just mean that the man A is muscular because muscle weighs more than fat. This shows these two interpretations are wrong.



**ResultsPlus**  
Examiner Comments

This response was awarded the full 2 marks as the candidate interprets the data for both BMI and waist:hip ratio and gives the alternative explanation that the mass could be in muscle tissue.



**ResultsPlus**  
Examiner Tip

As for all 'explain' questions, make sure you give a reason to support your first statement(s).

## Question 6 (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. Many 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.

It was disappointing to see that some candidates had calculated the surface areas of the sides correctly and then added them up incorrectly.

Figure 9 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 cm <sup>2</sup>	total surface area of top and bottom in cm <sup>2</sup>	total surface area of chip in cm <sup>2</sup>
A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

Figure 9

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

$$\text{Total surface area} = 2XY + 2XZ + 2YZ$$

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

(2)

$$\text{total surface area} = \dots\dots\dots 48 \dots\dots\dots \text{cm}^2$$



A neatly presented answer showing correct substitution and correct answer for 2 marks.



In maths questions where a formula is given, as in this case, always start off with substituting the data you have into the equation.

Figure 9 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 cm <sup>2</sup>	total surface area of top and bottom in cm <sup>2</sup>	total surface area of chip in cm <sup>2</sup>
A	3.0	1.5	1.5	18.0	4.5	22.5
B	5.0	2.0	2.0	?	?	?

**Figure 9**

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

$$\text{Total surface area} = 2XY + 2XZ + 2YZ$$

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

$$= 42$$

(2)

total surface area = ..... **42** cm<sup>2</sup>



This is an example of a common error with this question. The candidate has substituted the data into the equation correctly for one mark but then calculated the answer incorrectly, stating the total surface area as 42 instead of 48, thereby not gaining credit for the second marking point.



Show all your mathematical workings. In this question, write each part of the equation out underneath the substituted values, then add them up.

## Question 6 (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 it had a larger surface area. Just stating that the chip was larger was also an acceptable answer. Suggestions of chip B having a higher solute concentration or lower water potential than chip A were also accepted. Many candidates were able to state this successfully.

Answers which suggested a larger surface area:volume ratio were not accepted. For marking point 2, which was less successfully answered, candidates needed to make reference to the notion that more water was going into potato chip B. Responses which indicated that chip B soaked up more water were accepted. Responses which just referred to the idea of water entering by osmosis were not accepted as the process also occurs in chip A.

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

Figure 10 shows the increase in mass of each potato chip.

potato chip	increase in mass in grams
A	0.1
B	0.3

Figure 10

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

(2)

Because the total surface area of potato B is bigger than the A's one therefore it had more place to absorb more water and increase its mass potato B



This is an example of a good answer gaining both marks for stating that the surface area is bigger in chip B and that this means that more water is absorbed.



The clue for looking at surface area of the two chips is that this follows on from Q6ai, where the surface area of chip B was calculated. For the second marking point the word 'more' must be included for the amount of water absorbed as the data shows that both have increased, and the question asks to explain why there is a greater increase in mass for chip B.

## Question 6 (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 specific knowledge of water potential itself, but it was not required. Candidates who used this concept were usually successful in obtaining full 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 water will leave the cells and the mass will decrease.



This is an example of a very basic response stating that water will leave the cells/lose mass (same marking point), for 1 mark.



This is a 3 mark question. Always check the number of marks available and if you have made less points than there are available, try to extend your answer to address subsequent 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~~ The mass of the cells will decrease. This is because there is a less concentration of water in the salt solution as there is in the cell so the water will move by osmosis out of the cell.



A pleasing, succinct answer that addresses all three marking points.

## Question 6 (b)

This extended open-response question challenged candidates across the ability range. Candidates were asked to explain how two different varieties of potato plants could be selectively bred to produce new plants with characteristics of both.

There were three aspects to the question; the desirable characteristics of variety A and variety B, procedures for obtaining new plants and dealing with the outcomes of continuing to crossbreed the offspring from varieties A and B.

A response was awarded Level 1 for stating some valid content from one of the three areas. Repeating information from the stem of the question did not gain credit.

For Level 2, the response needed to include a good description of two areas from the indicative content. For Level 3, the response was required to give an explanation of selectively breeding potato plants A and B, covering all three areas of indicative content. Responses that were sufficiently structured and coherent gained the top mark at a particular level.

Whilst some candidates had clear ideas about selective breeding and could state a definition of the process, others confused the procedure with genetic engineering. Other candidates tried to breed the genes, traits or cells with some peculiar ways of crossbreeding potatoes, for example, planting the potato varieties next door to each other so their roots could swap characteristics. These misunderstandings in the procedural processes only allowed credit for the first area of indicative content.

Very few responses covered points from all three areas of indicative content.

**New varieties of potato plant can be produced by selective breeding.**

**Explain how selective breeding of the two varieties of potato plants can produce new potato plants that are all faster growing and produce many, large potatoes.**

(6)

variety A has a good trait of large potatoes and variety B has two good traits of many potatoes and they're a fast growing plant. Taking the good traits of these plants and putting them together would create a more beneficial plant. The farmer can do this by reproducing the plants until all of the three most beneficial traits are in one plant so that that plant is then able to be produced more.



This is an example of an answer that was awarded Level 1 gaining 2 marks. If the candidate could have explained that the plants were crossed rather than just stating reproducing them, then Level 2 could have been awarded.



In a question where you are asked to 'explain how', try to describe the techniques used in as much detail as you can using scientific terminology where possible.

New varieties of potato plant can be produced by selective breeding.

Explain how selective breeding of the two varieties of potato plants can produce new potato plants that are all faster growing and produce many, large potatoes.

(6)

In selective breeding you can pick the plants that have the characteristics that you want. In this example you would breed the two plants together and some of their offspring would have the desired characteristics. You then take the offspring with the characteristics you want so in this case offspring that are fast growing with many large potatoes and selectively breed them with another plant that has them characteristics because then their offspring are more likely to have the desired characteristics. You keep breeding offspring with the desired characteristics so you are more likely to get more plants that are what you want. Selective breeding takes the genes from the plants that have the characteristics you want and

(Total for Question 6 = 13 marks)

breeds them with more ~~plants~~ characteristics you want so there is a more likely chance of getting the desired characteristics because the offspring will have the genes that are needed for the characteristics.

**TOTAL FOR PAPER = 60 MARKS**



A good response covering enough detail to meet the criteria for Level 3 with supported lines of reasoning allowing 6 marks to be awarded.

# Paper Summary

## Overall Performance

Many candidates were able to demonstrate a good level of knowledge in the questions related to pathogens.

In Question 3, many candidates demonstrated their skills in completing the graph and interpreting the data.

However, the questions related to osmosis challenged candidates across the ability range; many were able to interpret the data given in the question but could not then go on to apply their knowledge of osmosis sufficiently well to explain the results.

Most candidates were able to access the extended open-response question, but with varying degrees of success. In the extended open-response question candidates often demonstrated a clear understanding of selective breeding, but applying their knowledge to an unfamiliar context often proved to be very challenging.

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 must ensure that they use scientific terms accurately, including volume and mass.

Many candidates were able to recall methods, including the test for starch. Candidates were less successful at writing methods, such as in the question investigating fertilisers, but many were familiar with appropriate safety precautions for a procedure.

Candidates of all abilities were able to access the more standard maths questions, including calculating BMI and the surface area of a cuboid. However, candidates found the calculation of a ratio much more challenging.

Candidates 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 should read the question carefully to ensure they understand whether they have been asked to 'describe' or 'explain' interpretations of data, such as in the question on enzymes and the question on BMI and waist:hip ratios.

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 an answer whilst avoiding the repetition of information which has already been given, and giving vague response which will not gain credit.
- Consider the context of the question to ensure candidates 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.
- 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>



