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Examiners' Report
June 2025

GCSE Combined Science 1SC0 1BH

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Introduction

The Pearson Edexcel GCSE (9-1) Paper 1 Combined Science Biology (Higher tier) paper is the first of six papers taken as part of the GCSE (9-1) Combined Science qualification. This is the eighth assessment of the GCSE (9-1) which takes place in May each year. The Combined Science specification and the qualification both follow a linear assessment model whereby candidates must complete the six papers, worth 60 marks each, in the same single year of certification. Paper 1: Combined Science (Higher tier) 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 15 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. There are two such questions in this paper. In addition, the GCSE (9-1) Combined Science qualification assesses practical knowledge and mathematical skills; the requirements of which are given in the 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. Paper 1: Combined Science (Higher tier) contains questions assessing the content from Topics 1 to 5, as identified in the specification.

In this examination series, in questions that overlapped with the Foundation Tier, candidates were required to respond to questions that tested their knowledge and understanding of communicable and non-communicable diseases linked to waist to hip ratio, mitosis, the movement of substances including osmosis and diffusion. Questions on the higher paper only assessed knowledge and understanding human evolution and extinction, the three-domain classification system, cholera linked to the immune response, testing reaction times linked to factors affecting the speed of transmission in neurones and the inheritance of a dominant genetic disorder. The extended open response question required candidates to apply their knowledge on the stages needed to extract DNA from strawberries and the structure of DNA. As such this question addressed practical knowledge. Other questions designed to assess practical skills included an understanding of the design of an investigation to test reaction times, as well as the identification of relevant controlled variables and the reasons why these need to be controlled. The maths skills assessed in this paper related a calculation of waist to hip ratio, significant figures, a calculation of the volume of a cube, a magnification calculation and the use of percentages to interpret genetic cross outcomes from Punnett squares.

There are now many past papers with mark schemes and examiner's reports available as well as practical support booklets for this qualification and it is clear that these resources are being utilised as part of the revision process. The use of scientific terminology in responses continues to improve, not just in higher ability candidates. Improvements were seen in responses to questions on the immune response, osmosis, magnification calculations and the analysis of data from a graph. Most candidates were able to access the extended writing response. The responses to practical questions on reaction times showed a good level of understanding but candidates are still not scoring well when asked to suggest improvements to investigations. The question relating to extinction illustrated that candidates are occasionally answering questions they expect to be asked based on previous questions and not the current question posed with many giving answers related to evolution and not extinction. Within this topic candidates successfully described changes that have occurred during human evolution and the uses of stone tools. The question on

eukaryotes and prokaryotes linked to the three-domain system proved challenging for candidates to gain full marks with many limiting their knowledge to the presence or absence of a nucleus. Candidates demonstrated a good understanding of the inheritance of dominant genetic conditions in the four-mark question on the paper.

There was an improvement in the level of detail given in answers to practical questions linked to planning an investigation. It is clear that many candidates had completed the practical to extract DNA from cells and had tested reaction times using a ruler. In general, maths questions showed a good level of understanding, although some candidates did not give answers to the correct order of magnitude when calculating the magnification used and some candidates did not give the waist to hip ratio to the number of significant figures requested in the question.

Question 1(a)

This question required the identification of two ways in which the spread of tuberculosis could be reduced or prevented. Most candidates gained the marks for the idea of covering the mouth or wearing a mask and isolating infected individuals. Vaccination and the idea of washing hands were less common responses and antibiotics was rarely given. The question was well answered by most candidates. Some candidates only gained one mark for two very similar ideas like covering the mouth and wearing a face mask which were the same marking point. Responses that referred to the idea of social distancing were credited but not just the term 'lockdown'. Using PPE was not credited unless they answer referred to specific ideas related to tuberculosis.

1 (a) Tuberculosis is a disease that is spread through airborne droplets.

Give **two** ways of reducing or preventing the spread of tuberculosis.

(2)

1 Quarentine, if you are infected.

2 Don't go too close to people.

ResultsPlus Examiner Comments

Quarantine and do not mix in large groups are the same mark point so this was awarded 1 mark. Always be careful not to repeat a point in questions such as these.

1 (a) Tuberculosis is a disease that is spread through airborne droplets.

Give **two** ways of reducing or preventing the spread of tuberculosis.

(2)

1 wearing a mask to reduce/stop droplets

2 don't share ~~utensils~~ protect/ covers mouth when coughing

ResultsPlus Examiner Comments

This response is awarded 1 mark. Wearing a mask is a mark point but cover mouth is the same mark point so cannot be awarded twice.

1 (a) Tuberculosis is a disease that is spread through airborne droplets.

Give **two** ways of reducing or preventing the spread of tuberculosis.

(2)

1 Cover mouth when coughing &

2 Stay atleast 2m away from others to prevent it from ~~reaching~~ spreading person to person

ResultsPlus
Examiner Comments

Both marks can be awarded here as there are two separate mark points, cover mouth or wear a mask is one mark point. Staying apart from others is the same mark point as stay inside or do not mix in groups, etc.

Question 1(b)i

Candidates could gain the mark for this question by stating that liver disease is non-communicable because it cannot be spread from person to person or that it was not caused by a pathogen. The idea of it being caused by alcohol consumption was also accepted.

(b) Obesity is a risk factor for some non-communicable diseases.

(i) State why liver disease is a non-communicable disease.

(1)

As it is obtained from lifestyle choices

ResultsPlus
Examiner Comments

This answer was too vague to be credited, overuse of alcohol or too many fatty foods would have been awarded a mark.

(b) Obesity is a risk factor for some non-communicable diseases.

(i) State why liver disease is a non-communicable disease.

(1)

This is due to the disease not being able to spread ~~through contact~~ to another person or organism

ResultsPlus
Examiner Comments

Not being able to spread to another person is enough for the mark. Note we would not accept just 'cannot be spread', there must be some element of between people, organisms, individuals, to gain the mark.

Question 1(b)ii

For this question candidates were given the equation to calculate the waist to hip ratio and asked to give the answer to 2 decimal places. Most candidates successfully calculated the correct answer but not all of them correctly gave the answer to 2 decimal places.

(ii) The waist-to-hip ratio can be used to show if excess weight is a health risk.

An adult has a waist measurement of 80 cm and a hip measurement of 90 cm.

Calculate the waist-to-hip ratio for this adult, using the equation:

$$\text{waist-to-hip ratio} = \frac{\text{waist measurement}}{\text{hip measurement}}$$

Give your answer to **two** decimal places.

(2)

waist-to-hip ratio 0.89

ResultsPlus Examiner Comments

This answer was awarded 2 marks as the correct answer was calculated on the answer line. Note although this gained full marks it is not advisable not to show the working because if the answer was incorrect we could give no credit for the method if this was not shown.

(ii) The waist-to-hip ratio can be used to show if excess weight is a health risk.

An adult has a waist measurement of 80 cm and a hip measurement of 90 cm.

Calculate the waist-to-hip ratio for this adult, using the equation:

$$\text{waist-to-hip ratio} = \frac{\text{waist measurement}}{\text{hip measurement}}$$

Give your answer to **two** decimal places.

(2)

waist to hip = $\frac{80}{90}$

waist-to-hip ratio 0.8cm

ResultsPlus
Examiner Comments

This candidate has completed the correct calculation shown in the working; however they have incorrectly rounded the answer. We did award 1 mark for 0.8 to any number of decimal places for 1 mark.

ResultsPlus
Examiner Tip

Make sure you read the full question. In this question the answer was asked for to 2 decimal places. Make sure you follow these instructions as they will be credited with the mark.

Question 1(b)iii

This question required candidates to interpret the data in figure 2. The first mark was for identifying that a waist-to-hip ratio of 0.75 equates to a low health risk. The second marking point was for justified this interpretation. The mark was given for the idea that 0.75 is less than 0.8 or that this showed that the excess mass or fat was not around the waist or vital organs. Some candidates confused waist-to-hip ratio with BMI and some responses referred to health complications as a result of low body mass despite no information relating to mass being given in the question.

(iii) Figure 1 shows the health risk of some waist-to-hip ratios.

health risk	waist-to-hip ratios	
	males	females
low	0.95 or less	0.80 or less
medium	0.96 to 1.0	0.81 to 0.85
high	1.1 or more	0.86 or more

Figure 1

Explain the health risk for a female with a waist-to-hip ratio of 0.75.

(2)

Excercise ~~& nutrition~~ should be moderated due to the high difference, and a higher good intake is recommended.

ResultsPlus
Examiner Comments

This response has not taken into account the data in the table but has given a general response. This is not creditworthy.

ResultsPlus
Examiner Tip

Always include quoted data in responses when it is given as this is almost always creditworthy.

(iii) Figure 1 shows the health risk of some waist-to-hip ratios.

health risk	waist-to-hip ratios	
	males	females
low	0.95 or less	0.80 or less
medium	0.96 to 1.0	0.81 to 0.85
high	1.1 or more	0.86 or more

Figure 1

Explain the health risk for a female with a waist-to-hip ratio of 0.75.

(2)

· har low health risk because her waist - to - hip ratio is less than 0.8

ResultsPlus Examiner Comments

This candidate is awarded 2 marks for the idea that the risk to health is low and because the waist hip ratio is less than 0.8. Note the less than 0.8 is important as it shows correct interpretation of data from the table.

(iii) Figure 1 shows the health risk of some waist-to-hip ratios.

health risk	waist-to-hip ratios	
	males	females
low	0.95 or less	0.80 or less
medium	0.96 to 1.0	0.81 to 0.85
high	1.1 or more	0.86 or more

0.75

Figure 1

Explain the health risk for a female with a waist-to-hip ratio of 0.75.

(2)

There is a much lower health risk for females with a waist to hip ratio of 0.75 This is because there isn't ~~any~~ ~~excess~~ much weight or fat there to cause problems

ResultsPlus
Examiner Comments

This candidate has scored one mark. We are accepting there is a much lower health risk against the first marking point but they have not gone on to explain in detail where that fat is distributed. They have just said there isn't much fat or weight there to cause problems. This is not enough. We are looking for the idea of the fat being carried around the organs or around the waist or the idea that the waist:hip ratio is lower than 0.80.

Question 1(c)

Most candidates scored highly on this question recognising that cells produced by mitosis had the properties of being genetically identical or diploid. The idea that two cells were produced or that they were body cells was credited. Descriptions of diploid were also accepted. No credit was given to the uses of these cells in growth, repair or asexual reproduction. Candidates lost marks where they gave contradictory answers to one of the marking points such as haploid cells or genetically different cells.

(c) Cancer occurs when cell division by mitosis is uncontrolled.

Describe the properties of cells produced by mitosis.

(2)

Mitosis produces two ~~identa~~ identicle diploid daughter cells from one cycle of mitosis

ResultsPlus
Examiner Comments

This candidate has scored two marks. The first for two cells, the second for diploid. They state identical cells. This is not enough for a mark as the cells must be genetically identical, as genetically is emboldened on the mark scheme.

(c) Cancer occurs when cell division by mitosis is uncontrolled.

Describe the properties of cells produced by mitosis.

(2)

The Properties of cells Produced by mitosis are that they have a nucleus and the cells have 23 chromosomes each as together they would have 46. The cells are identical daughter cells, so they have the same properties.

ResultsPlus
Examiner Comments

This candidate has not been awarded any marks. They say the cells have 23 chromosomes which is incorrect and if they were human cells the diploid number would be 46. They also state the cells are identical which is not enough, it must be genetically identical as genetically is emboldened on the mark scheme. We would accept 46 chromosomes against the second mark point and we would also accept 23 pairs of chromosomes.

(c) Cancer occurs when cell division by mitosis is uncontrolled.

Describe the properties of cells produced by mitosis.

(2)

The cells produced are 2 daughter cells (Haploid)
Mitosis cells are used for growth, repair and asexual reproduction

ResultsPlus
Examiner Comments

This candidate has been awarded 1 mark for two daughter cells. They have stated haploid which is a reject against diploid but does not affect the other marking points. We are not awarding any marks for what cells produced by mitosis do such as growth and repair or asexual reproduction, as the question asks for the properties of the cells.

ResultsPlus
Examiner Tip

Never try to put down two options such as haploid and diploid in cases such as this as we do not choose the correct answer when one is correct and one is incorrect. It is better to choose one of the options if you are unsure.

Question 2(a)

Candidates scored well on this question explaining that the mass of the potato would increase due to osmosis. Marks were awarded for defining the process of osmosis as well as the idea that water moved into or was absorbed by the potato. Candidates were limited to two marks when they incorrectly stated that the mass of the potato would decrease. Answers to this question indicated that candidates had used previous papers during revision and more candidates are defining key terms within their explanations.

2 (a) Figure 2 shows a beaker containing a potato cylinder in distilled water.

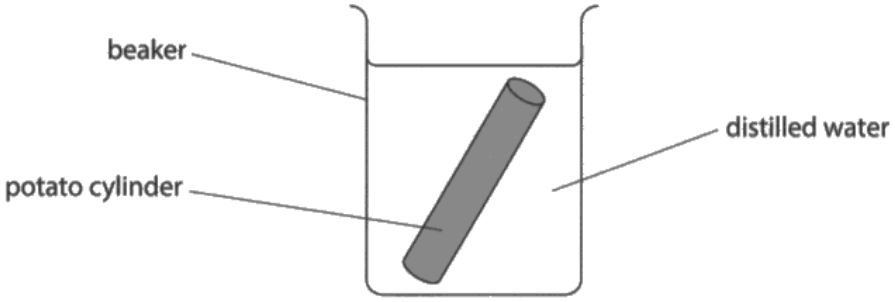

Figure 2

Explain why the mass of this potato cylinder will change when it is placed in distilled water.

(3)

The mass of the potato cylinder will change when it is placed in distilled water because the particles will travel into the potato cylinder as the concentration is low by osmosis.

ResultsPlus
Examiner Comments

This response is awarded 1 mark. This question is about what happens to the potato cylinder when placed in distilled water. There is no mark for 'the mass will change,' however We need the idea that the mass will increase when placed into distilled water because water moves into the potato and we will accept the potato absorbs water for marking point 2. This response has given particles rather than water as the answer so the second mark cannot be awarded.

2 (a) Figure 2 shows a beaker containing a potato cylinder in distilled water.

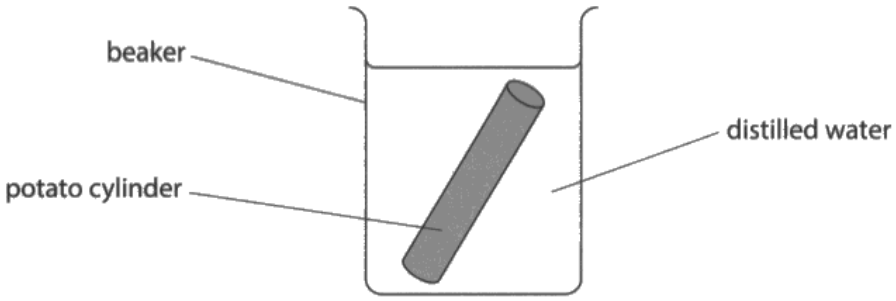

Figure 2

Explain why the mass of this potato cylinder will change when it is placed in distilled water.

(3)

The distilled water is pure water, & do to it's low concentration of any solutes, such as sugar or salt, has a higher concentration of water. Through osmosis, the diffusion of water from high concentration to low concentration through a semi-permeable membrane, water will enter the potato cylinders cell, causing it to gain mass.

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Examiner Comments

This response is awarded 3 marks for osmosis, for water going from high concentration to low concentration and for semi-permeable membrane. We would also accept partially permeable membrane. They could also be awarded a mark for the mass increasing and for water entering the potato cylinder.

Question 2(b)i

Most candidates scored full marks on this question, correctly calculating the volume of cube C. Most candidates calculated this by using 33. Some candidates used the surface area to volume ratio to obtain the correct answer, by dividing 54 by 2. The most common incorrect answer was 18 where candidates had calculated 54 divided by 3.

(b) A scientist investigated the rate of diffusion using three agar cubes of different sizes.

Each cube contained a pH indicator that changed from pink to colourless when placed in acid.

The cubes were placed in a beaker containing an acid.

Figure 3 shows some information about each cube.

cube	length of each side of cube in cm	surface area in cm^2	volume in cm^3	surface area to volume ratio	time taken for the cube to become colourless in seconds
A	1.0	6	1	6:1	170
B	2.0	24	8	3:1	260
C	3.0	54	?	2:1	500

Figure 3

(i) Calculate the volume of cube C.

(2)

$D = \frac{M}{V}$

$V = m/d$

$54/3 = 18$

18 ..... cm^3

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Examiner Comments

This was not awarded any marks as the calculation, although correct for their numbers, was incorrect for calculating volume.

(b) A scientist investigated the rate of diffusion using three agar cubes of different sizes.

Each cube contained a pH indicator that changed from pink to colourless when placed in acid.

The cubes were placed in a beaker containing an acid.

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A	1.0	6	1	6:1	170
B	2.0	24	8	3:1	260
C	3.0	54	?	2:1	500

Figure 3

(i) Calculate the volume of cube C.

3 : 1
24 : 8
54 : ? − 27
2 : 1

(2)

27 ..... cm^3

40 seconds ←

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Examiner Comments

The marks awarded for this question are firstly the idea of 3 x 3 x 3 or 3 cubed. We would also accept 54/2 which is shown in the additional guidance column. This response has shown some working but they have put 27 on the answer line. This is the correct answer so can be awarded 2 marks. We award full marks for the correct answer with no working.

Question 2(b)ii

This question required candidates to explain the difference in the time taken for cubes A and B to become colourless. Most candidates scored well by recognising that cube A was quicker because it was smaller or that it had a large surface area to volume ratio. The reverse argument was also accepted. No marks were awarded for quoting times from the table or calculated differences without an indication of which was quicker or slower. References to surface area in isolation were ignored. No credit was given to the idea of a faster rate of diffusion, as the linked explanation related to diffusion distance and not rate.

(ii) **Explain the difference in the times taken for cubes A and B to become colourless.**

(2)

The lower amount of surface area in cube B caused it to have a longer duration to become colourless compared to cube A.

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Examiner Comments

This response shows the reverse argument that cube B is taking a longer time to become colourless which is the first mark point. There is no mark for differences in surface area for it must either be volume, size or surface area to volume ratio

(ii) Explain the difference in the times taken for cubes A and B to become colourless.

(2)

330s quicker

Cube A become colourless ^due to having a ~~lower~~ ~~to~~ higher ~~to~~ surface to volume ratio which means a higher rate of osmosis compard to cube b ~~to~~ taking 500 seconds

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Examiner Comments

This candidate has written cube A became colourless 330 seconds quicker, which is the first mark point. We ignored references to time. They are also awarded the second mark point for cube A having a higher surface to volume ratio.

(ii) Explain the difference in the times taken for cubes A and B to become colourless.

(2)

Cube A takes 170 seconds whereas cube B takes 260 seconds so there is a difference of 90 seconds.

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Examiner Comments

No marks were awarded for just quoting figures. They must give a comparative such as either faster or slower. In this case the candidate has quoted numbers and stated there is a difference so no marks can be awarded.

Question 3(a)i

The mark for this question was obtained by most candidates by correctly calculating that *Homo habilis* had lived on Earth for 900,000 years. Some candidates incorrectly calculated the time period as 1.1 million years.

Question 3(a)ii

Candidates were asked for one way in which *Homo habilis* would have used tools. The most common responses included hunting or as weapons. The idea that the tool was a sharp stone or a sharpened stone was not credited. The idea that they were made into tools such as arrowheads or hand axes was credited. Although rarely seen the idea that the tools could be used to date fossils was credited.

(ii) Fossil evidence suggests that *Homo habilis* used tools.

State **one** use of these tools.

(1)

Sharpened rock

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Examiner Comments

A sharpened rock is how they make the tools rather than what they were used for, so this was not credited.

(ii) Fossil evidence suggests that *Homo habilis* used tools.

State **one** use of these tools.

(1)

hunting prey

ResultsPlus
Examiner Comments

This was one of the most common responses for the mark - the idea of hunting or killing animals.

(ii) Fossil evidence suggests that *Homo habilis* used tools.

State **one** use of these tools.

(1)

Chop down trees

ResultsPlus
Examiner Comments

Although this is not directly on the mark scheme this comes under the additional guidance of any other reasonable use of tools for 1 mark.

Question 3(a)iii

Many candidates gained full marks for this question by indicating that Lucy's skull size was smaller and that she had longer arms or shorter legs. The idea that she was shorter or walked less upright was also credited. The idea that *Homo habilis* walked on two feet or was bipedal was insufficient as this applies to Lucy as well. Responses that just indicated that Lucy was more ape-like were ignored. Some candidates thought that Lucy lived more recently than Homo habilis, so most of these responses did not gain any marks.

(iii) Scientists use fossil discoveries to suggest the structure of the whole body.

Lucy is a fossil of the species *Australopithecus afarensis*.

Describe how the body structure suggested for *Australopithecus afarensis* is different from the body structure suggested for *Homo habilis*.

(2)

Lucy had longer arms to swing from tree to tree and had a large big toe. to grip on better where as homo habilis was more in proportion and its toes where all around the same size like ours (homo saplers) are.

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Examiner Comments

This response was awarded 2 marks. Longer arms is a mark point. Please note longer limbs is not acceptable as this could be arms or legs. A large big toe is in the additional guidance for an extra mark.

(iii) Scientists use fossil discoveries to suggest the structure of the whole body.

Lucy is a fossil of the species *Australopithecus afarensis*.

Describe how the body structure suggested for *Australopithecus afarensis* is different from the body structure suggested for *Homo habilis*.

(2)

her skull size would have been larger. And Her arm length would have been slightly shorter.
And perhaps evidence of walking on two legs

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Examiner Comments

This response was not awarded any marks. Her skull size would be larger is incorrect as we assume the context of the question is Lucy. The same applies to shorter arms which is also incorrect for Lucy.

Question 3(a)iv

This question discriminated across the ability of candidates sitting the paper. Marks were awarded for a selection pressure, change in the environment or named selection pressures which link to the idea the *Australopithecus afarensis* did not have advantageous adaptations or could adapt, which led to them being out-competed. Responses that described the process of evolution were not credited as this does not explain extinction. Candidates must ensure that they answer the question which has been asked and not what they are expecting based on previous question papers.

(iv) Explain what could have caused the extinction of *Australopithecus afarensis*. (3)

Aus eralopithecus afarensis

The extinction of ~~Lucy~~ would be due to ~~evi~~ evolution changes ~~which~~ to Homo Habilis would have a higher survival rate, increased intelligence. Furthermore changes in environment could reduce the population of ~~Lucy's~~ australopithecus afarensis

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Examiner Comments

This response was awarded 1 mark for the idea that there was a change in the environment that had an effect; however, unfortunately, there was no further creditable content.

(iv) Explain what could have caused the extinction of *Australopithecus afarensis.*

(3)

Their could have been a disease that wiped them out as they carry the same genes. So therefore will all be killed as their wasn't a variation in the genes, they had not adapted so were killed when a disease infected them as they couldn't fight it off.

This response is worth 2 marks with the first mark for disease which is an example of a selection pressure and the second mark for the idea of them being unable to adapt to the change.

Question 3(b)

Most candidates gained one mark on this question for the idea that prokaryotes have no nucleus or the reverse argument. More detailed responses did go on to state that eukaryotes have membrane bound organelles or mitochondria. Alternatively, good responses included the idea that genetics was involved in the proposal of the three-domain classification system. Very few candidates linked all of these ideas together to gain full marks.

(b) Figure 4 shows how the three-domain classification system was developed.

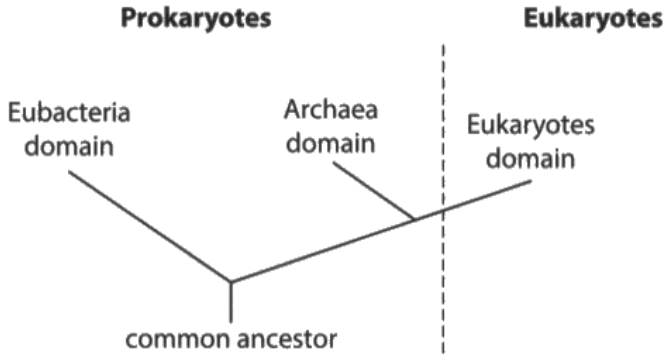

Figure 4

Describe the differences between prokaryotes and eukaryotes and why the three domain classification system was introduced.

(3)

prokaryotes - no nucleus

Eukaryotes - have nucleus, more complicated cell structure.

introduced so the scientists could gain more understanding of each domain and see how they all linked through genetics

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Examiner Comments

This candidate was awarded 2 marks. Most candidates were able to state that prokaryotes have no nucleus which is the first mark point and they then went on to state that the domain theory was developed based on genetic analysis for a second mark point.

(b) Figure 4 shows how the three-domain classification system was developed.

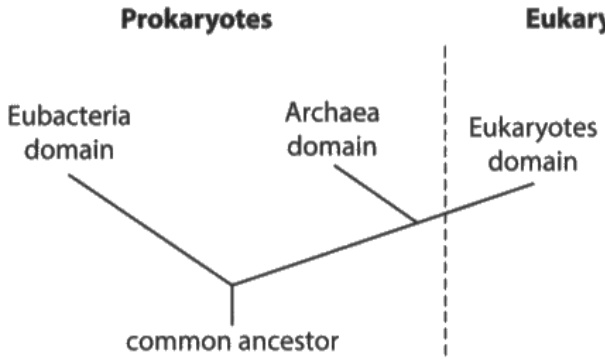


Figure 4

Describe the differences between prokaryotes and eukaryotes and why the three domain classification system was introduced.

(3)

Prokaryotes had more domains and eukaryotes has less. The three domain classification system was introduced to connect and find differences within prokaryotes and eukaryotes

ResultsPlus
Examiner Comments

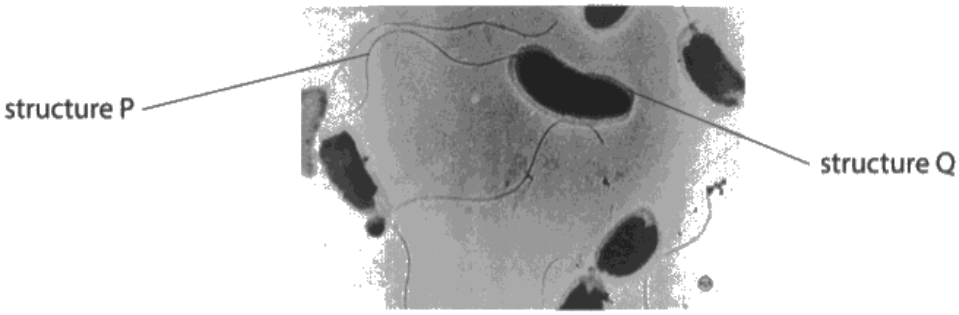
This response was not credited with any marks as there are no direct comparisons of prokaryotes and eukaryotes and no knowledge of why the domain theory was developed.

Question 4(a)i

This question asked candidates to give the function of two structures identifiable from the diagram. Candidates lost marks when they gave the names of the structures instead of the functions. If they gave both we credited the function. For structure Q the function of the cell wall capsule or cell membrane were accepted. The most common responses were that P was for movement and Q was for protection or maintaining structure.

4 (a) The pathogen *Vibrio cholerae* causes the disease cholera.

Figure 5 shows *Vibrio cholerae* bacteria.



(Source: Corbis)

Figure 5

(i) Complete the table to show the function of structure P and structure Q.

(2)

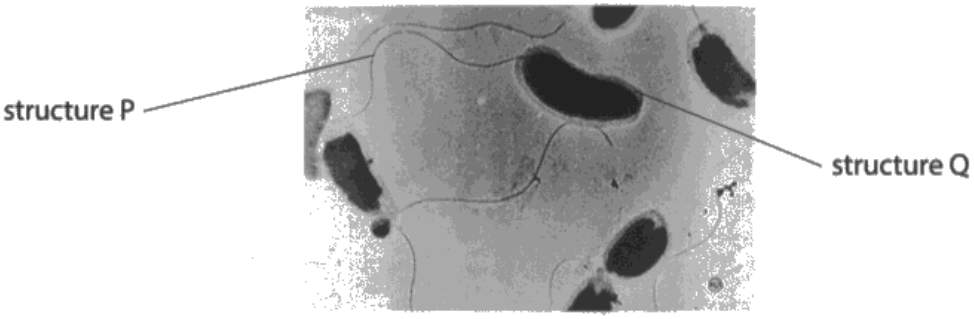
structure	function
P	Flagella
Q	Cell wall

ResultsPlus
Examiner Comments

This is an example of the candidate misreading the question and giving the structure rather than the function. In this case no marks can be awarded.

4 (a) The pathogen *Vibrio cholerae* causes the disease cholera.

Figure 5 shows *Vibrio cholerae* bacteria.



(Source: Corbis)

Figure 5

(i) Complete the table to show the function of structure P and structure Q.

(2)

structure	function
P	Flagella allows the cell to move
Q	Cell wall protects the cell

ResultsPlus
Examiner Comments

In this case we can ignore the named structure and mark the functions as correct with P allowing the cell to move and Q providing protection, so 2 marks can be awarded.

Question 4(a)ii

Many candidates scored well on this magnification calculation. The calculation required a unit conversion followed by the determination of the magnification power used. The most common incorrect responses scored one mark for an incorrect unit conversion that led to an answer with an error to any power of 10.

(ii) On the original image, the length of one bacterial cell is 12 mm.

The actual length of this bacterial cell is 2.0 μm.

Calculate the magnification.

(2)

$\frac{12}{2} \times 1000$

magnification = 6000

ResultsPlus
Examiner Comments

This is the correct calculation and the correct answer on the answer line for 2 marks.

(ii) On the original image, the length of one bacterial cell is 12 mm.

The actual length of this bacterial cell is 2.0 µm.

Calculate the magnification.

(2)

12 ÷ 0.2 = 60

magnification = 60

ResultsPlus
Examiner Comments

This candidate has given the correct calculation but the incorrect conversion but can still be awarded 1 mark.

Question 4(a)iii

The symptoms for cholera that were accepted included diarrhoea, nausea, vomiting, dehydration or stomach pain. Tolerance was applied to spellings, particularly for the word diarrhoea. General symptoms of infection such as fever or headache were ignored as these apply to many illnesses and we wanted those things specific to cholera.

(iii) State **one** symptom of the disease caused by *Vibrio cholerae*.

(1)

dehydration

ResultsPlus
Examiner Comments

Dehydration was acceptable as this would occur due to the diarrhoea and vomiting. 1 mark awarded.

(iii) State **one** symptom of the disease caused by *Vibrio cholerae*.

(1)

Nausea

ResultsPlus
Examiner Comments

Nausea was acceptable for the idea of vomiting. 1 mark awarded.

Question 4(a)iv

Most candidates gained the mark for recognising that *Vibrio cholera* is transmitted through water. Body fluids or contact were not credited.

(iv) State how the disease caused by *Vibrio cholerae* is transmitted.

(1)

water born disease

ResultsPlus
Examiner Comments

1 mark awarded for water borne disease. Any idea of it being passed in water or food was acceptable.

Question 4(b)

Many candidates gained full marks on this question for lymphocytes produce antibodies against the pathogen's antigens. Fewer responses than previously seen confused antigens and antibodies. The idea that antibodies kill pathogens was not credited. High level responses went on to give the idea that pathogens clumped together by the antibodies were destroyed by phagocytes or during phagocytosis.

(b) Describe the specific immune response when a pathogen infects the body.

(3)

The body would Produce lymphocytes due to detecting the foreign antigen. Furthermore these lymphocytes Produce antibodies which attach to the pathogen and ~~Pour kill~~ destroy it. Furthermore some lymphocytes are left to act as memory lymphocytes which ~~have to~~ Produce specific antibodies if the same Pathogen infect in the future.

ResultsPlus
Examiner Comments

This response was awarded 3 marks. The idea that lymphocytes were produced which produce antibodies is 2 marks. The idea that the antigens were foreign or on the pathogen was also a mark. Memory lymphocytes were the same mark point as lymphocytes.

ResultsPlus
Examiner Tip

Try not to confuse antigens and antibodies. Remember antigens are on pathogens.

(b) Describe the specific immune response when a pathogen infects the body.

(3)

white blood cells get attacked by pathogen. Thai Antigens attack the antibodies (pathogen) and create lymphocytes. when pathogen ~~enters again~~ infects again, respance is faster due to memory lymphocytes.

ResultsPlus
Examiner Comments

No marks are awarded for white blood cells as we require lymphocytes or memory lymphocytes. The response states antigens attack the antibodies (pathogen) and create lymphocytes. This is all in the incorrect context so is not creditworthy. They do go on to say correctly that if it infects again the response is faster due to memory lymphocytes, which is correct for 1 mark.

Question 5(a)i

This question asked candidates how they would determine a median value. The mark was awarded for the idea that it was the middle value or that if all the values were put in order it would be the third one as five tests were completed. Just the idea that it was a third value was insufficient for the mark that the third test may not be the median value. If they put the numbers in order and took the middle value that was acceptable. Candidates who did not score on this question generally stated how a mean would be calculated.

5 (a) Reaction time can be tested by dropping a ruler and measuring the distance it travels before it is caught.

Figure 6 shows how the test works.

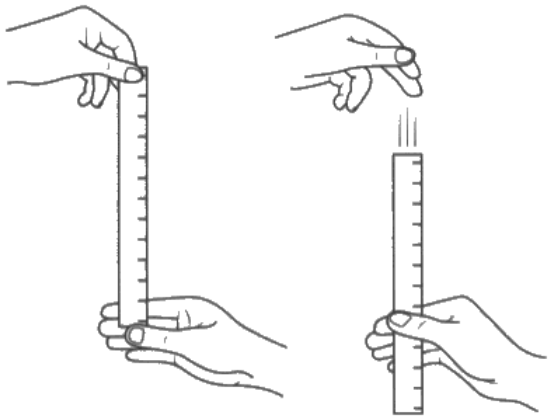


Figure 6

This method was used to test the reaction times of three students.

Each student completed the test five times and the distances were recorded.

(i) State how the median distance for each student could be determined from the results.

(1)

The results can be put in order from highest to lowest

ResultsPlus
Examiner Comments

Although this is the start point for calculating the median they did not then take the middle value so a mark cannot be awarded.

5 (a) Reaction time can be tested by dropping a ruler and measuring the distance it travels before it is caught.

Figure 6 shows how the test works.

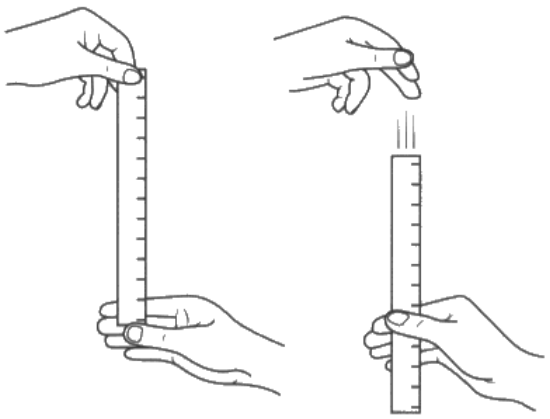


Figure 6

This method was used to test the reaction times of three students.

Each student completed the test five times and the distances were recorded.

(i) State how the median distance for each student could be determined from the results.

(1)

Put the results in ascending order then find the middle

ResultsPlus
Examiner Comments

This is a correct method of calculating the mean and a mark can be awarded.

Question 5(a)ii

This question required candidates to identify one variable that would need to be controlled and to explain why this was necessary. Most candidates gave the idea of the starting point or height of the ruler or where the catching hand started. Few candidates made the link that variables are controlled to ensure validity or comparability of data. Controlling variables does not ensure reliability or accuracy. A common misconception was that the weight of the ruler or the length of the ruler would affect how far or how fast the ruler would drop.

(ii) State and explain **one** variable that needs to be controlled in this investigation.

(2)

heiant ruler dropped from as if it was dropped from diffirent neights there would bean unfare advantage to people who had it dropped closer as they higher its dropped the more time to react.

ResultsPlus
Examiner Comments

This was awarded 1 mark for the height from which the ruler was dropped. The second mark must relate to comparability or validity to gain the mark.

(ii) State and explain **one** variable that needs to be controlled in this investigation.

(2)

make sure that none of the students are on any medication that might effect their reaction time.

ResultsPlus
Examiner Comments

This was an alternative to the height of the ruler and was acceptable for 1 mark.

(ii) State and explain **one** variable that needs to be controlled in this investigation.

(2)

The Measurements on the ruler could be a control variable in this experiment as a consistent measurement tool would contribute to a fair test.

ResultsPlus
Examiner Comments

This was a common response. The measurements on a standard ruler do not change so this is not awarded. We also do not credit using the same ruler or same size/mass ruler as this would not have an effect. 0 marks awarded.

Question 5(a)iii

Candidates who scored well on this question identified that student A had the fastest reaction time because they had the smallest mean distance or that the ruler fell the shortest distances. Many candidates identified that the distance it really fell decreased with repetition but they did not always explain why this occurred and only obtained one mark. Candidates should try to use data in mathematical analysis when it is available in the question.

Question 5(a)iv

This question required the candidate to devise a plan and scored more highly than data plan questions in previous series. Most candidates gained a mark for getting two students each to consume a different drink or for the same student consuming both drinks with a time interval in between. More detailed responses referred to the use of a control and that multiple students could be used or that the mean could be calculated. When a variable was controlled the most common responses were the same volume of drink or the time in the interval between drinking and taking a test.

(iv) **A student wanted to investigate the effect of two different drinks containing caffeine on reaction time using this method.**

Devise a plan the student could use.

(3)

The student should use 2 different people. First, he should measure the reaction time of both students without any stimulants. He should repeat this and take an average/mean. Then, one ~~student~~ person should be given a drink with caffeine and the other ~~student~~ person should be given a different drink with caffeine. He should then repeat the tests after the people have drunk the stimulant and waited a little. He should record the results after having taken a stimulant and should repeat and take an average. He can then compare the effects of both drinks by comparing reaction time before and after stimulant. He can subtract the reaction time after drinking the stimulant by the reaction time before taking the stimulant to find the change in reaction ~~time~~ time.

ResultsPlus
Examiner Comments

This response gets the first mark point for giving 1 person a caffeine drink and giving the other person a different caffeine drink. The second can be awarded for testing before and after drinking. The third mark point cannot be awarded as the way the answer is phrased they are not controlling other drugs. The last mark point can be awarded for repeating and calculating a mean.

Question 5(b)i

The only correct answer for this was the cell body. There was some confusion with responses including axons and even the myelin sheath.

Question 5(b)ii

Candidates were required to use figure 12 to comment on how the diameter of a neurone affects the speed of electrical impulses. Most candidates successfully identified that increasing the diameter increased the speed and many identified that the increase in speed was greater for myelinated neurones. Higher level responses successfully manipulated the data from the graph or indicated that the increase in speed for the myelinated neurones was linear.

(ii) Figure 9 shows how the diameter of neurones affects the speed of electrical impulses.

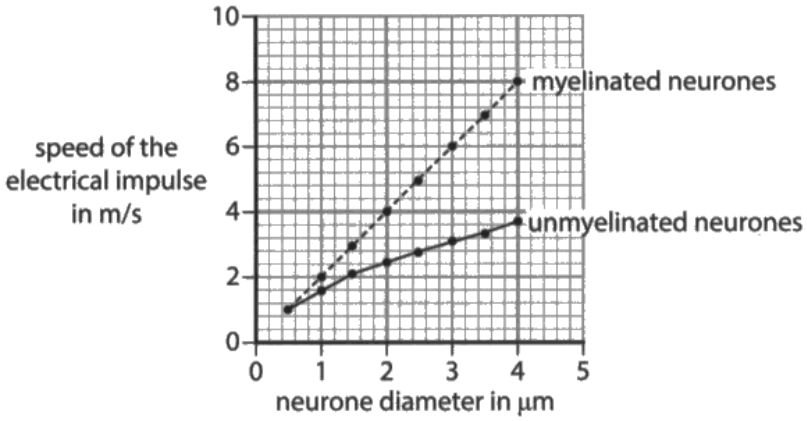


Figure 9

Comment on how the diameter of a neurone affects the speed of the electrical impulses.

(3)

myelinated neurones - as the neurone diameter in µm increases the speed of the electrical impulses in M/S increases - As well as unmyelinated neurones.

But myelinated neurones increase from 1m/s to 8 m/s in the same ~~time~~ diameter (4µm) as unmyelinated neurones; that only go from 1 m/s to around 4.8 m/s

ResultsPlus
Examiner Comments

This response is awarded 2 marks, as axon diameter increases speed of the impulse for the first mark point. The second mark is for the comparison of trends from the myelinated to the non-myelinated axons showing the myelinated axons have greater speeds.

ResultsPlus
Examiner Tip

When quoting from graphical data always use the axes information and quote from the x axis then the y axis. In this case as neurone diameter increases speed the electrical impulse also increases.

Question 6(a)ii

Detailed responses to this question were limited. Many candidates only identified that the build-up of mucus would reduce the diameter of the airway or affect gas exchange. Higher level responses did refer to ciliated epithelial cells and how cilia would not be able to move the mucus which would trap pathogens or increase the chance of infection.

Question 6(b)

The majority of candidates successfully completed the Punnett square for this question. Marks were not awarded if the letters used were not the same or if a sex-linked Punnett square was given. The explanation marks were awarded for identifying the 50% chance of offspring being unaffected or affected. Higher level responses linked this to the correct science in terms of the alleles inherited. A minority of responses illustrated the misconception that there are carriers of dominant genetic diseases.

Question 6(c)

This extended open response question was answered well by the majority of candidates. The detail given for the extraction of DNA from strawberries enabled most candidates to access at least level 2. Some candidates were then limited by a lack of information about the structure of DNA, possibly because they did not address this bullet point or that they just linked it to the idea that the structure of DNA is a double helix. High level responses were awarded full marks for sufficient detail on the reasons for the extraction stages and full details on the structure of DNA including hydrogen bonds between complementary base pairs. Candidates must ensure that they address all aspects of the question when answering extended open responses to allow them to access the higher levels.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure they answer the actual question in the paper. Written responses to a number of questions indicated that candidates used past papers as part of their revision process, which is commendable, but care must be taken to ensure that candidates answer the actual question in the paper, as although the knowledge may be similar the question is rarely identical.
- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given and the quantity of additional information given should reflect the number of marks awarded for the question.
- Read the information given in the introduction to the question but avoid repeating it in the answer as it will not gain credit. Candidates should also read mathematical questions carefully to note whether an answer is required in a specific format, such as number of significant figures. They should ensure they consistently apply rules for rounding up numerical answers.
- Ensure that when describing data from graphs and tables they identify the trends shown and use data in written responses, using mathematical analysis so as mean calculation is possible. A mathematical manipulation of the data is nearly always likely to be creditworthy. Candidates need to ensure readings from percentile charts are accurate.
- Make sure that key scientific terms from the specification are understood including diploid, prokaryotes, eukaryotes, allele and chromosome. When completing Punnett squares for inheritance, ensure that the same letter is used for the alleles.
- Always show the mathematical working when doing calculations as a mark can be awarded for errors carried forward.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks awarded.
- Consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.

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