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Examiners' Report
June 2022

GCE Biology A (Salters-Nuffield) 9BN0 03

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Introduction

The 9BN0/03 Biology paper focused on the general and practical application of the Pearson Edexcel GCE Biology Specification A. Aspects of all topic areas were considered and the paper included a series of question items linked to a pre-release scientific article. The paper included questions that targeted the conceptual and theoretical understanding of experimental methods, including mathematical analysis of experimental data.

The summer 2022 paper offered a wide diversity of question styles that gave candidates many opportunities to display their knowledge and understanding of material from across the specification. It was pleasing to see candidates offering a range of encouraging responses that showed good understanding of the material and much thanks should go to those who have taught them, as well as to the candidates themselves.

Whilst there were many clear and unambiguous responses, there were some candidates who could not be awarded marks due to the quality of their expression.

Successful candidates:

- demonstrated a familiarity with practical work and could devise investigations based on procedures they had carried out themselves
- had studied the pre-released scientific article and read up on the aspects of biology within the article that they had encountered in their A-level Biology course
- answered questions in the context set, showing that they had read the question
- had learnt how to interpret the newly introduced command words – such as 'determine', 'devise' and 'evaluate'
- provided specific, relevant details to their answers
- attempted every question
- worked through calculations in a logical sequence, showing their working;
- demonstrated the ability to convert units and orders of magnitude.

Less successful candidates:

- re-wrote information from the question, using up time and space
- did not answer questions in context, missing both the command word and the context
- did not understand how to interpret the command words and therefore misinterpreted questions
- left out vital details or wrote vague answers lacking relevant facts
- did not attempt some questions – some answer spaces were left blank
- made errors in calculations and did not provide clearly laid out workings
- did not write clearly or legibly
- wrote answers with poor grammatical construction that lost marks where the meaning was unclear.

Implications for future teaching, learning and exam preparation – ensure that students carry out all of the core practicals. It is important that they are involved in planning the procedures where there are variables that can be controlled or considered as well as in the evaluation of the results. Statistical analysis of data collected will allow students to become familiar with the reasons for selecting and using particular tests and how the results can be interpreted. The pre-released scientific article must be studied well in advance of the examination.

Question 1 (a)(i)

Many candidates were able to explain what a p value of 0.05 means. However, some candidates struggled with this question often confusing p values with critical values.

(i) Describe two conclusions that can be drawn from the results of this investigation.

(2)

angle direction of light influences mean angular curvature of coleoptiles

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Examiner Comments

The candidate's statement is correct. However, it does not answer the question and gains no marks.

ResultsPlus
Examiner Tip

Read the question carefully and check the answer you provide answers the question asked.

Question 1 (a)(ii)

Many candidates were able to explain what a p value of 0.05 means. However, some candidates gave statement such as 'there is a 5% chance of accepting the null hypothesis' (MP1) or even just 'the null hypothesis can be rejected' (no MP).

(ii) The results of this investigation were analysed using the Student's t-test.

A p value of 0.05 was used to interpret the results of the t-test.

Explain what a p value of 0.05 means.

(2)

There is a 5% probability that the results of the t-test are due to chance.

ResultsPlus
Examiner Comments

This is a good response that gained both marks.

(ii) The results of this investigation were analysed using the Student's t-test.

A p value of 0.05 was used to interpret the results of the t-test.

Explain what a p value of 0.05 means.

(2)

Probability of 5% that there is significance between length of coleoptile tip shaved and mean angle of curvature of coleoptiles.

ResultsPlus
Examiner Comments

This response gained one mark, MP1. The candidate has recognised that 0.05 represents 5% chance or probability. However, the candidate does not link this to the probability of the results occurring by chance.

Question 1 (b)(i)

This question was straightforward for most candidates with most suggesting temperature. The most common non-scoring suggestions were 'light' or 'sunlight'. These were considered too vague. Wave length or intensity of light would have gained the mark.

Question 1 (b)(ii)

The calculation was straight forward for many candidates. Candidates were given a graph with plotted points and lines of best fit. They were then asked to calculate a difference in rates using the graph data. This was straightforward for most candidates. However, some ignored the lines of best fit and used various plotted points. Some allowance for this was made in the mark scheme.

(ii) Calculate the difference in the rates of change in cell length from 30 to 60 minutes, in the presence of IAA and in the absence of IAA.

(2)

IAA = $\frac{900 - 800}{30}$ = 3·33 µm min^{-1}

3·33 − 0·2 = 3·13

NO IAA = $\frac{806 - 800}{30}$ = 0·2

Answer 3·13 µm min^{-1}

ResultsPlus Examiner Comments

This response gained both marks for a correct final answer with appropriate units.

Correct numerical answers without units only gained one mark.

ResultsPlus Examiner Tip

If you are given a line of best fit on a graph and asked to carry out a calculation of a slope (for the rates in this question) then use the lines of best fit.

Look at the answer line for units. If there are no units on the answer line, then if appropriate, you should provide units with your answer.

Question 1 (c)

This question proved challenging to candidates. Many ignored the question and simply produced a textbook answer on the role of IAA in phototropism. These candidates often failed to gain many marks.

(c) Explain how the evidence from these investigations indicates that plant hormones are involved in the phototropic response of oat coleoptiles.

(3)

IAA is a plant hormone that stimulates plant growth and cell elongation. In the graph, the cells soaked in a bugger with IAA had a large increase in cell length (from 800μm to 895μm) compared to those soaked in bugger alone (increasing cell length no more than 20μm). This shows plant hormones are involved in phototropic responses. IAA is also released from the tips and distributed along the shaded region as coleoplile will grow towards the light, seen by the shaded (10mm) one have less than 5° of curvature.

(Total for Question 1 = 10 marks)



This response gained all three available marks. MP1 – first line. MP2 – lines 2 to 5, and MP3 – last 5 lines.

(c) Explain how the evidence from these investigations indicates that plant hormones are involved in the phototropic response of oat coleoptiles.

(3)

IAA is reactant to light and causes shoots to grow towards the light by moving away from it and growing the far side quicker which makes the plant bend. This is positive geotropism. Evidence also shows that IAA increases growth of cells as the cells soaked in IAA grew longer and faster than those in just buffer solution.

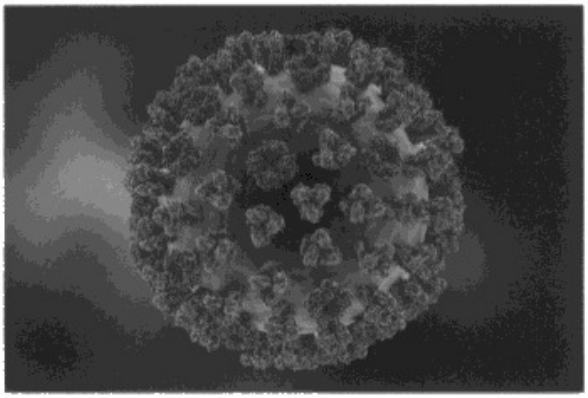
ResultsPlus
Examiner Comments

This response gained one mark, MP2 – lines 5 and 6.

Question 2 (a)

Most candidates gained both marks (MP1 and 2). Many candidates tried to provide details, but these were often incorrect or muddled. Some candidates did not seem to understand what antibiotics were or the difference between bacteria and viruses.

2 The diagram shows an RNA virus that causes influenza.



(Source: © Kateryna Kon/Shutterstock)

(a) Influenza cannot be treated with antibiotics.

Explain why antibiotics cannot be used to treat influenza.

(2)

Influenza is a virus and has viral properties antibiotics only kill or inhibit the growth of bacteria. Influenza which is a viral infection cannot be treated with antibiotics as antibiotics only ~~treat~~ for destroy or inhibit bacteria and not viruses.

ResultsPlus
Examiner Comments

For this response, MP1 was awarded in line 1 and MP2 in lines 2 and 3. It is worth noting that, by itself, the statement 'antibiotics only kill or inhibit the growth of bacteria' is not enough for both MP1 and 2.

Question 2 (b)

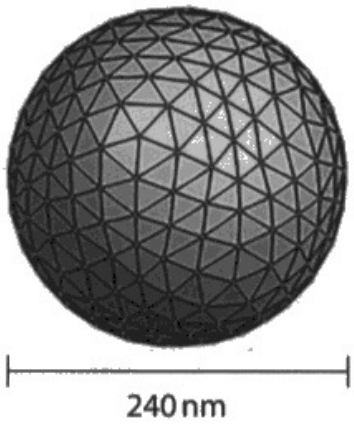
The calculation was straight forward for many candidates. Candidates were asked to calculate how many spike proteins could be packed on the surface of a sphere (virus surface). The final answer needed to be a whole number. Two values were accepted as the final correct answer. Because of the different values of pi candidates might use the approximation, 3.14, their calculator value or the fraction 11/7.

Working marks were available if the final answer was incorrect. But to gain a mark for working candidates work does need to be laid out in a way that makes it straightforward for an examiner to follow. Some candidates left the pi symbol in their workings or final answer and did not gain all available marks.

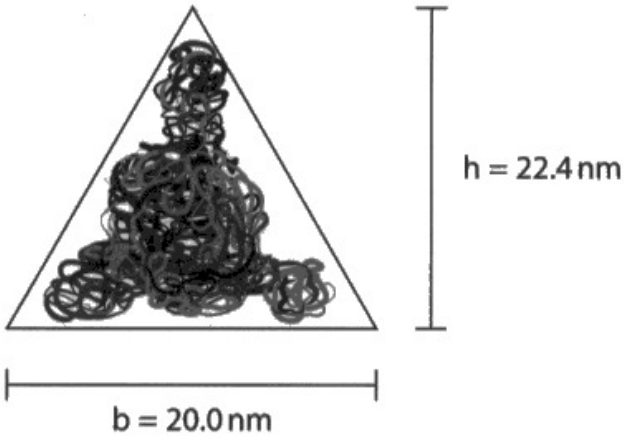
(b) The surface of this virus capsid is covered with 'spike' proteins.

The diameter of the capsid of this virus is 240 nm.

Diagram of the surface of the virus showing each spike protein as a triangle



The diagram shows the area occupied by one spike protein



Calculate the maximum number of spike proteins that can be packed on the surface of one virus particle.

The formula for calculating the surface area of a sphere is $4\pi r^2$

The formula for calculating the area of a triangle is $\frac{h \times b}{2}$

(3)

$SA = 4\pi r^2$

$4 \times \pi \times 120^2$

57600π

$180955.7368\ nm^3$

$A = \frac{22.4 \times 20}{2}$

$= 224 nm^2$

Answer 123

$\frac{224}{57600\pi}$ $1.23787178 \times 10^{-3}$

ResultsPlus
Examiner Comments

This response gained two marks for the working (MP1 and 2).

ResultsPlus
Examiner Tip

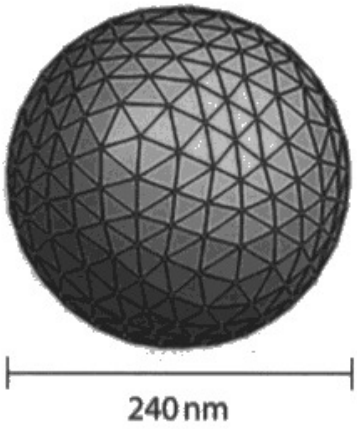
Notice how this candidate has clearly laid out their working. This means it is possible for the examiner to see and award the working marks.

Try to develop the habit of clearly laying out your working for calculations.

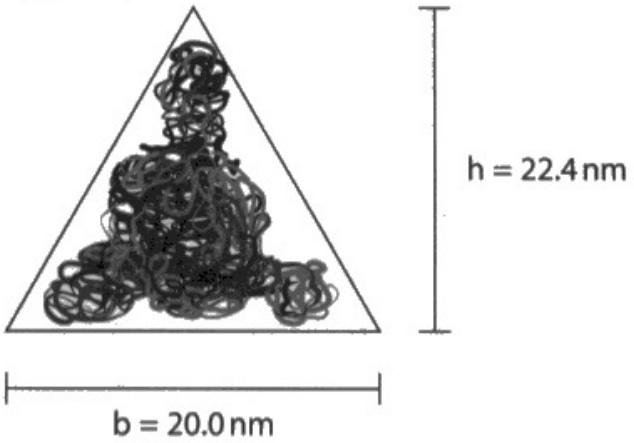
(b) The surface of this virus capsid is covered with 'spike' proteins.

The diameter of the capsid of this virus is 240 nm. πD

Diagram of the surface of the virus showing each spike protein as a triangle



The diagram shows the area occupied by one spike protein



Calculate the maximum number of spike proteins that can be packed on the surface of one virus particle.

The formula for calculating the surface area of a sphere is $4\pi r^2$

The formula for calculating the area of a triangle is $\frac{h \times b}{2}$

(3)

area of sphere = $4\pi r^2$

$= 4\pi(120^2)$

$= 4\pi(14400)$

$= 4(45238.9342)$

$= 180,955.7369$ nm

area of triangle = $\frac{h \times b}{2}$

$= \frac{(22.4 \times 20.0)}{2}$

$= 224$

$\frac{\text{area of triangle}}{\text{area of sphere}}$ $\frac{240}{2} = 120$

$\frac{224}{180,955.7369}$

$= 807.838112$

$= 807$

Answer 807

ResultsPlus
Examiner Comments

This response produced the correct answer for all three marks.

Question 2 (c)

Many candidates gave good descriptions of a suitable procedure and gained 2 or 3 marks. The main reason for not gaining marks was a lack of important detail. Several candidates describe collecting saliva samples and amplifying saliva samples, both without mention of the viral RNA. This type of response did not gain MP1 or 2. Since the question is about an RNA virus and many candidates may have been following the coronavirus story and be aware that RNA can be amplified in a one step process RT-PCR we allowed amplification of RNA by PCR for MP2. Few candidates described producing fragments of amplified material (MP3) and most struggled to provide a description of how the results would show how closely related the strains were (MP5).

(c) Changes in the RNA of influenza produce new strains of the virus with an altered spike protein.

Devise a procedure to determine the similarity of the strains of influenza in saliva samples collected from different people.

(4)

~~[illegible]~~ influenza RNA (using restriction nucleases)

- Isolate ~~RNA~~ sample from the saliva of each person, ensuring they have all had similar diets in the past 24 hours.
- Use PCR to replicate ~~RNA~~ RNA so a sufficient amount is obtained and RNA is bound to flourescent markers.
- Place RNA samples from different people in the wells at one end of a gel electroforecis gel, along with an RNA ladder
- apply a current across the gel and ~~then~~ wait for fragments of RNA to separate
- use southern blotting technique to transfer fragments + visualise
- compare similarities in fragments from different people, the more fragments shared, the more similar the strains

ResultsPlus
Examiner Comments

This was a good response that gained all four available marks. MP1 – line 1, MP2 lines 3 and 4, MP4 – line 6 and MP5 last two lines.

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Examiner Tip

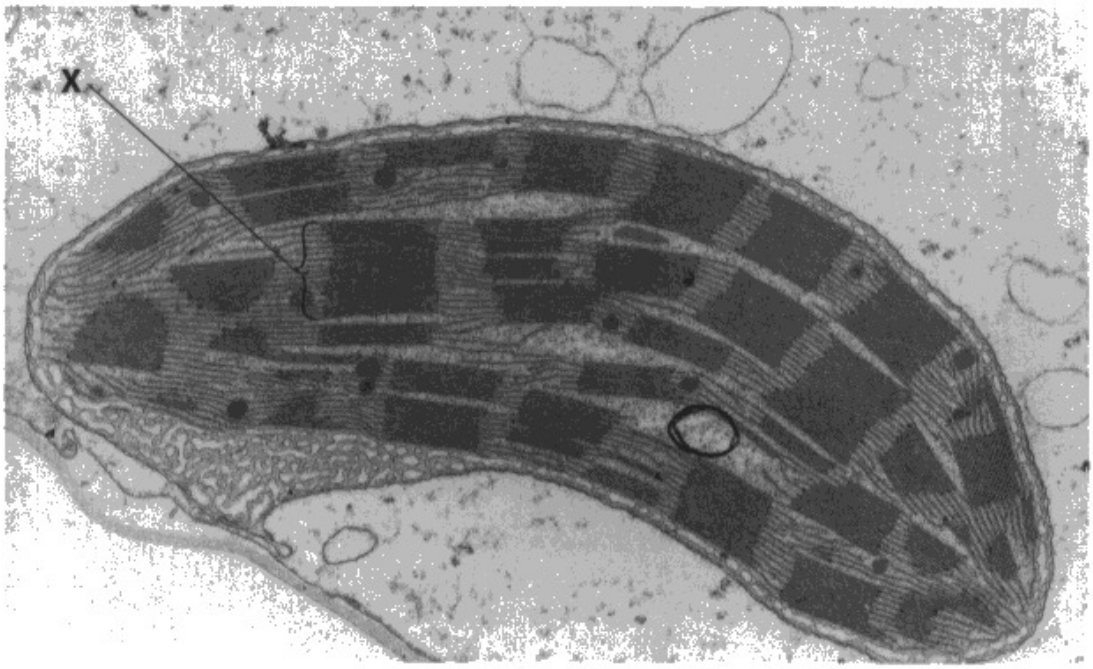
Read through your answer. Ask yourself, have I missed anything out? This candidate describes how fragments are separated and used but forgot to say how they are produced. They may have realised this if they had read through their answer.

Question 3 (a)(i)

Many candidates did not correctly label the stroma. A label line to a correct location annotated site of carbon fixation was allowed. Some candidates did not use label line and instead tried to annotate directly onto the photograph. Several candidates mistook the chloroplast for a cell and some labelled structures outside the chloroplast.

3 Eukaryotic cells contain membrane-bound organelles.

(a) The photograph, obtained using an electron microscope, shows an organelle.



(Source: © Science History Images/Alamy Stock Photo)

(i) Label a part of this organelle where carbon fixation occurs.

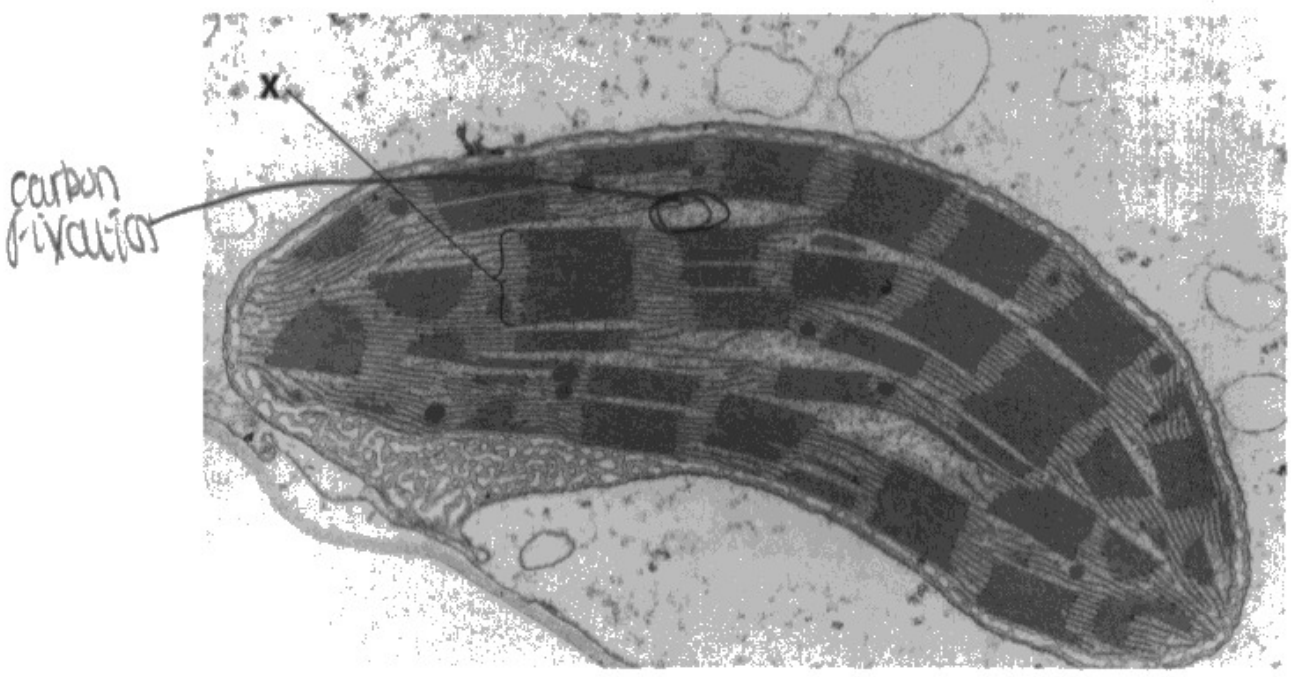
(1)

ResultsPlus
Examiner Comments

Drawing a circle is not enough. Candidates needed to state what is being identified.

3 Eukaryotic cells contain membrane-bound organelles.

(a) The photograph, obtained using an electron microscope, shows an organelle.



(Source: © Science History Images/Alamy Stock Photo)

(i) Label a part of this organelle where carbon fixation occurs.

(1)

ResultsPlus
Examiner Comments

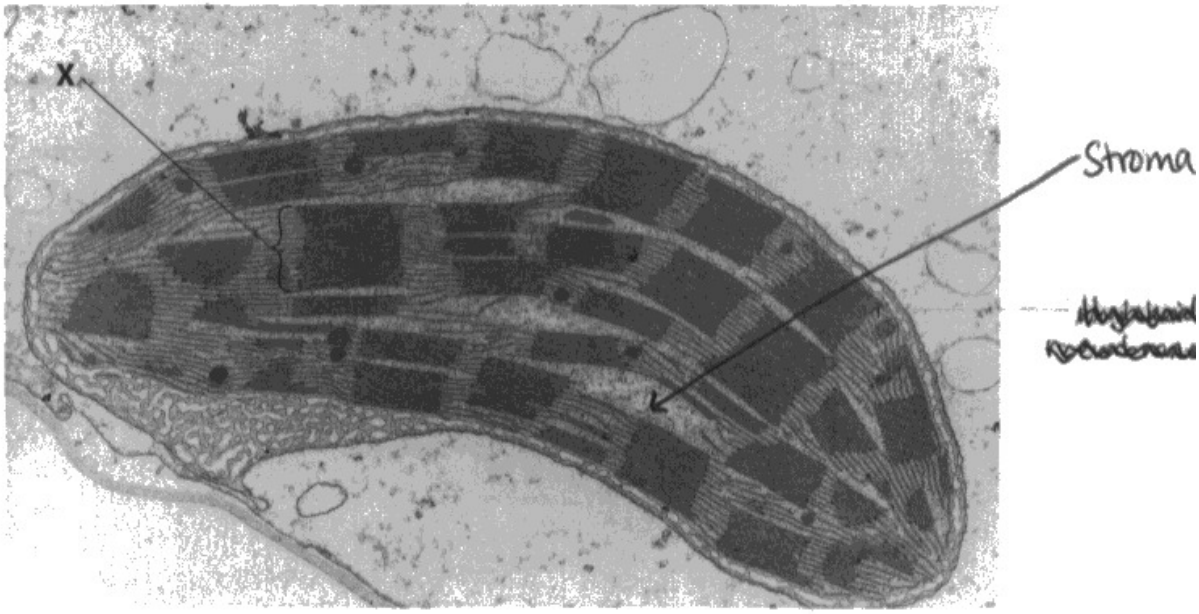
Carbon fixation was accepted for the label if the label line went to an appropriate location.

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Examiner Tip

Good practice is not to cross label lines over each other. For this response there was little ambiguity, and the mark could be awarded. But if you cross lines over each other there is the risk of confusion and then marks would not be awarded.

3 Eukaryotic cells contain membrane-bound organelles.

(a) The photograph, obtained using an electron microscope, shows an organelle.



(Source: © Science History Images/Alamy Stock Photo)

(i) Label a part of this organelle where carbon fixation occurs.

(1)

ResultsPlus
Examiner Comments

Clear label line to correct location and with the preferred label gains the mark.

Question 3 (a)(ii)

Most candidates found this question straightforward. However, many gave thylakoid as the answer. On this occasion thylakoid was accepted, but strictly speaking the structure is a granum (or possibly a stack of thylakoids).

(ii) Give the name of the component labelled X.

(1)

Granum, stack of thylakoids.

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Examiner Comments

Either of these suggestions were accepted for one mark.

Question 3 (a)(iii)

This was a straightforward question. Candidates who recognised the structure as being a granum generally went on to gain two or sometimes three marks. Some candidates did express the idea that a large surface allows as much light as possible to be absorbed (MP3). It was not sufficient to simply state its role in absorbing light.

(iii) Describe how the structure of a membrane in the part labelled X is related to its function.

(3)

The membrane has a large surface area to allow for more to move in and out of the cell. The membrane is thin to allow ~~diffusion~~ mass diffusion of water in and out of the cell easily, for ~~hydrolysis~~ photolysis.

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Examiner Comments

This response gained one mark (MP1) for the idea of a large surface area. However, the rest of the response did not gain any additional credit.

(iii) Describe how the structure of a membrane in the part labelled X is related to its function.

(3)

The Granum is a stack of thylacoids with a large surface to absorb as much light as possible. The thylacoid membrane contains lots of ATP synthase for ATP synthesis and chlorophyll. The chlorophyll contains photosystems that and electron transport protein that allow electron to move along and lose energy for chemiosmosis. This allows photosynthesis, the light dependent stage, to take place.

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Examiner Comments

This is an example of a good response that gained a maximum of three available marks. All four marking points are present, MP1 – just enough in first two lines, MP3 line 2, MP4 – lines 3 and 4 and MP2 – line 4.

Question 3 (a)(iv)

This question was accessible to most candidates and they provided a complete description. A few confused RuBP and RUBISCO and some gave incorrect numbers. For MP2 it had to be CO_2 or carbon from CO_2 and not just carbon that is combining with RuBP.

(iv) Describe how GP is produced by carbon fixation in this organelle.

(2)

Carbon is fixed by a 5C molecule RuBP which is catalysed by RUBISCO This makes the 6C compound very unstable so it immediately splits into 2 3C molecules called GP.

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Examiner Comments

This response gained both available marks. MP1 – line 2 and MP3 – line 3 to the end. It would not have been awarded MP2 as the candidate refers to carbon being fixed. For MP2 it needed to be clear that carbon dioxide or carbon from carbon dioxide was combining with RuBP.

(iv) Describe how GP is produced by carbon fixation in this organelle.

(2)

GP is produced when RUBP is split into a 3-carbon compound 2x3C (GP) RUBP is a weak 6 carbon compound and releases CO_2 into the atmosphere. Red NAD then becomes oxidised and GP adds a H^+ ion, this reaction is catalysed by RUBISCO.

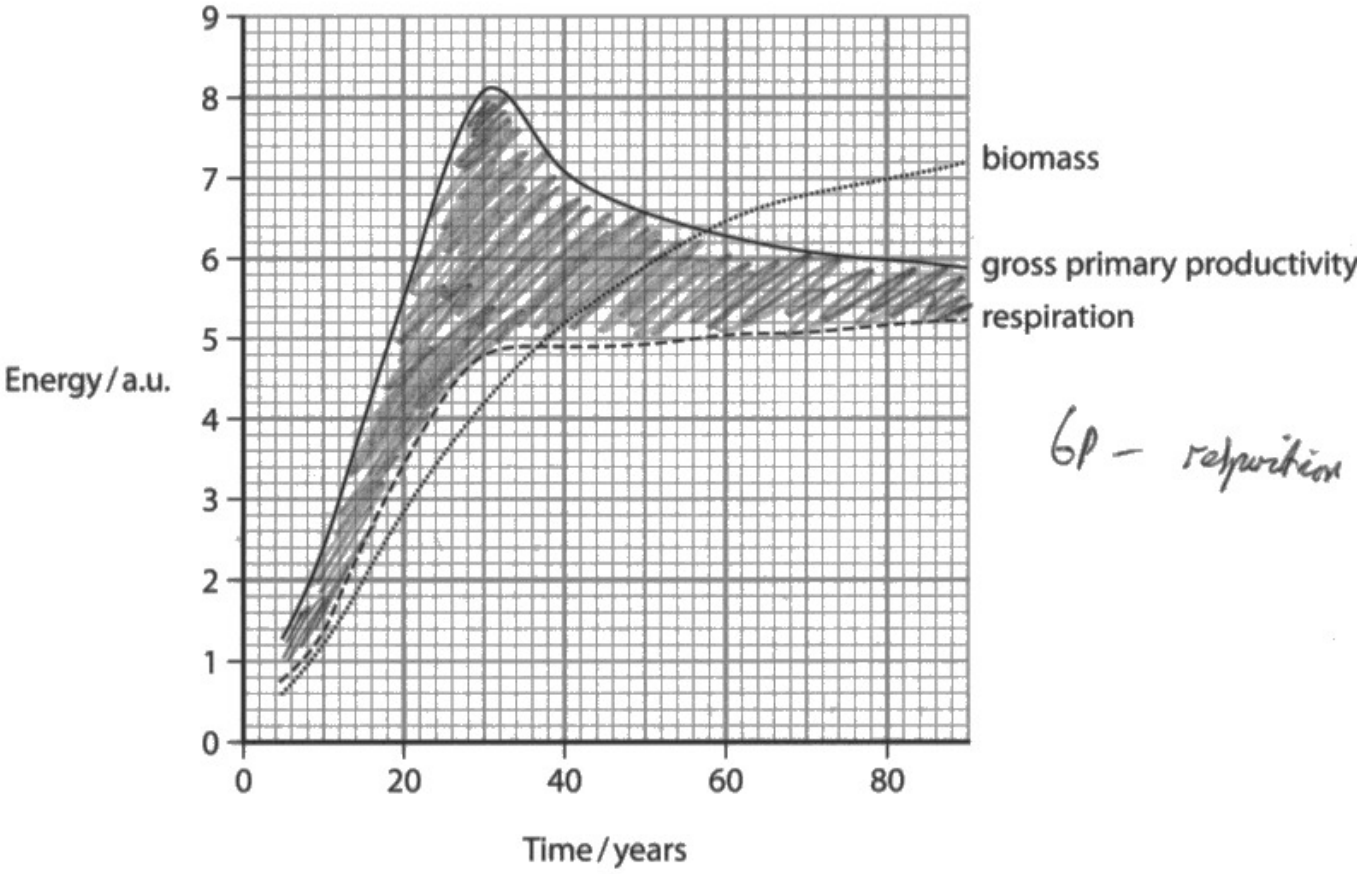
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Examiner Comments

Much of this response is muddled with incorrect biology. However, this was ignored and the final statement 'catalysed by RUBISCO' was allowed for MP1.

Question 3 (b)(i)

A pleasing number of candidates provided the correct answer.

(b) The graph shows the changes in biomass, gross primary productivity and the energy used in respiration during succession from grassland to mature forest.



6p – respiration

(i) Add shading to the graph to show the area that represents net primary productivity.

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Examiner Comments

Correct response gains the mark.

Question 3 (b)(ii)

Many candidates tried to describe different stages in succession rather than answer the question which was about the consequence of succession. Relatively few candidates described the relevant general trends (MP1 and 2). More made the general points about increased photosynthesis taking in more CO2 (additional guidance MP3) and the overall result would be a reduction in CO2 in the atmosphere

(ii) Describe what is meant by the term succession.

(2)

the changes in the communities of an ecosystem with time. It could be that a new community is forming on new land or a community is forming after a natural disaster

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Examiner Comments

This response clearly expresses the idea of changes in communities taking place over time and gains both marks.

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Examiner Tip

Make sure you have a good understanding of biological terms and can use them appropriately. In this answer the candidate correctly used the term community. Many other responses were seen in which candidates used the terms organisms or populations. These responses did not gain MP1.

Question 3 (b)(iii)

Many candidates produced answers that focussed on the initial stages of succession rather than answer the question which was about the consequence of succession. Relatively few candidates described the relevant general trends (MP1 and 2). More made the general points about increased photosynthesis taking in more CO_2 (additional guidance MP3) and that the overall result would be a reduction in CO_2 in the atmosphere.

(iii) Deduce the effect of succession on the level of carbon dioxide in the atmosphere.

(3)

- As succession increases/occurs, the levels of atmospheric CO_2 decreases
- This is because more CO_2 is incorporated (fixed) into organic molecules via photosynthesis as there's an increase in plants and biomass
- This occurs more rapidly and to a greater extent in a mature forest than a grassland as trees are much larger and so can absorb and take in more CO_2 than they release via respiration which levels off. **(Total for Question 3 = 13 marks)**

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Examiner Comments

In this response the candidate clearly states a correct conclusion (MP4) and then goes on to support the conclusion using evidence from the graphs. MP3 – lines 3 to 5. MP1 – last four words.

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Examiner Tip

The 'Deduce' command words requires you to reach a conclusion based on the information provided. Check your answer, have you provided a conclusion, and did you use the evidence provided to reach that conclusion?

(iii) Deduce the effect of succession on the level of carbon dioxide in the atmosphere.

(3)

by Sucession occuring it helps to reduce carbon dioxide in atmosphere, with pioneer species like lichen and moss can develop soil and allow trees to root and grow, which absorb carbon dioxide in the atmosphere, ~~ect~~

ResultsPlus
Examiner Comments

In this response the candidate gives a valid conclusion (MP4 – first two lines). However, the candidate did not then go on and use the information provided to support the conclusion.

Question 4 (a)

This calculation proved difficult for many candidates. Several candidates did not realise that there were two steps to the calculation and only gained one mark for completing an initial step. Many lost a mark by not giving their final answer to three significant figures.

The mass of extract obtained from 5 g of powdered leaf, using each solvent, was measured.

Solvent used	Mean mass of extract ± SD / µg
A	501.3 ± 3.5
B	721.3 ± 1.5
C	245.6 ± 4.0

(a) The mass of dried and powdered lantana leaves is 10.5% of the mass of fresh leaves.

Calculate the mass of fresh leaves needed to produce 1 mg of extract using solvent A.

Give your answer to three significant figures.

501.3 µg from 5g Powder (2)

Assuming mean mass = ~~50.1~~

$\frac{5}{10.5} \times 100 = 47.619047$ g used to make 501.3 µg

$\frac{1000}{501.3} = 1.994...$ $47.619... \times 1.994 = 94.991$

95.0 g

ResultsPlus Examiner Comments

This example gained both marks for the correct calculation with the final answer correctly rounded and presented to three significant figures.

(a) The mass of dried and powdered lantana leaves is 10.5% of the mass of fresh leaves.

Calculate the mass of fresh leaves needed to produce 1 mg of extract using solvent A.

Give your answer to three significant figures.

(2)

$\left(\frac{1000}{501.3} \times 5\right) \div 0.105 = 94.99111833$

94.99(4sf) g

ResultsPlus Examiner Comments

This candidate carried out the calculation correctly but then ignored the instruction to give an answer to three significant places. This response only gained one mark.

ResultsPlus Examiner Tip

With calculation questions make sure you read the question carefully and that you follow instructions regarding the number of significant figures or decimal places to use.

Question 4 (b)(i)

Many candidates did not fully answer the question. The question asks about the effect of different solvents on effectiveness of the extracts against the two bacteria. Many candidates simply described the effects against bacteria and did not compare the effect on the different bacteria. It was common for candidates to give answers in terms of solvent A or solvent B, or letters A and B. rather than extracts prepared using solvent A etc. On this occasion the mark scheme was relaxed to allow these candidates to gain credit.

(b) The antimicrobial properties of the extracts produced using these solvents are shown in the table.

Solvent used to prepare extract	Dry mass of extract / µg	Bacteria tested	
		Klebsiella pneumoniae (Gram negative)	*Micrococcus luteus* (Gram positive)
		Mean diameter of the zone of inhibition / mm	
A	5.0	8.3	7.1
	10.0	10.5	7.0
B	5.0	14.5	12.2
	10.0	18.1	18.0

(i) Deduce the effect of using different solvents on the effectiveness of the extracts against these two bacteria.

(2)

increase in mass of extract leads to increase in zone of inhibition

Solvent B more effective because they have larger zone of inhibition than A eg: 61.1%.

↑ effective betwe ML gram positive at 10g or both A and B

both solvent more effective against gram negative → larger zone of inhibition.

ResultsPlus
Examiner Comments

This response gained both marks. MP1 – lines 3 and 4 and then MP2 – two lines off-set to the left.

Question 4 (b)(ii)

Based on core practical 9 this question proved relatively straightforward to most candidates. However, many went into considerable detail regarding aspects such as aseptic technique but did not link their answer to the data in the table. To gain MP4 candidates needed to describe measuring diameters and not just zones of inhibition. For MP2 it would have been nice to see candidates telling us how they would add 5µg and 10 µg of extract – dissolve in water at a known concentration and then add to wells / discs of paper.

(ii) Devise a method that could be used to collect the data in the table.

(4)

~~1 using agar in a petri dish, place both bacteria over the top in both~~

1 prepare 2 petri dishes that both contain agar.

2 label both petri dishes 1 for each bacteria.

3 place bacteria on top of agar

4 Then soak small paper discs into the extract mixtures.

5 Evenly spread apart, place the discs into the petri dish.

6 Allow the same amount of time for both bacteria to grow.

7 once they have been incubated measure the area around the dish that hasnt grown bacteria - this is your zone of inhibition.

8 Repeat the experiment

* All of the procedure should take place under a bunsen burner (sterile conditions) to avoid contamination that will affect results.

(Total for Question 4 = 8 marks)

ResultsPlus
Examiner Comments

This response gained two marks. MP1 – first three lines and MP2 lines 4 to 7.

ResultsPlus
Examiner Tip

'Devise a method ..' type questions will usually be linked to a table or graph that has been given to you in the question. To gain full marks you will need to describe how the results in the graph / table could be obtained. The table in the question recorded the mean diameters of the zones of inhibition. There are different ways of measuring zones of inhibition so to gain MP4 candidates needed to say they would measure the diameters.

(ii) Devise a method that could be used to collect the data in the table.

(4)

Use aseptic technique such as flaming bottle necks and inoculating loops, disinfecting surfaces and working in the updraft area of a bunsen burner flame. Use a known concentration and volume of each solvent and each extract. Prepare on 2 agar plates by using an inoculating loop to spread the two different bacterias on seperate plates to create lawn plate. Use paper discs ~~of~~ soaked in the extracts (use paper discs of a known absorbancy) and place them firmly down onto each agar plate. Close the lid using tape (but do not shut completely) and incubate for 24 hrs at 25°c. Measure the diameter of the zone of inhibition for each extract and compare effectiveness against the two bacera.

(Total for Question 4 = 8 marks)

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Examiner Comments

This is a good response that gained all four available marks. MP1 – lines 5 and 6, MP2 – lines 7 to 9, MP3 – lines 10 and 11 and MP4 – lines 11 and 12.

Question 5 (a)

Most candidates were able to provide a good explanation of the importance of habituation and gained both marks. Some did not refer to learning to ignore non-threatening stimuli and only gained the second mark.

Question 5 (b)(i)

This question asks for variables associated with the stimulus. In general terms these are the frequency, duration and strength of the stimulus. This is an important aspect of habituation and is something that candidates should have considered in Core practical 18. Candidates reading the question carefully gave answers that were relevant and gained one or two marks. Many candidates ignore the reference to stimulus and gave a range of other variables and did not gain any credit.

(i) State two variables associated with the light-off stimulus that need to be controlled in this experiment.

(2)

Light source.
The Number of fruit flies
Time

ResultsPlus
Examiner Comments

This response did not gain any marks. This is because 'temperature' is not a relevant aspect of the stimulus and 'time' by itself is too vague.

(i) State two variables associated with the light-off stimulus that need to be controlled in this experiment.

(2)

the light must be turned off for the same amount of time each time
the overall light intensity must be the same each time

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Examiner Comments

This response gained both marks. MP2 – first two lines and MP3 – last line.

Question 5 (b)(ii)

Many candidates recognised that habituation was less extensive in flies with reduced synapsin. A smaller number recognised it took longer to reach the maximum habituation possible. Few candidates recognised that the 'Determine' command word requires them to use the data provide. Preferably, by manipulating the data to support their answer.

(ii) Determine the effect of reduced synapsin on the habituation of fruit flies in this experiment.

(3)

reduced synapsin flies became habituated slower (13% difference at 10) became less habituated overall (16% difference at 100) response decreased slower and did not decrease by as much

decrea reduced synapsin reduces habituation

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Examiner Comments

This response gained all three available marks. MP1 – first two lines, MP2 – line 3 and MP3 – line three. The data manipulation mark was given for the 16% difference at 100 as this supports the idea of less habituation. The '13% difference at 10' does not support the idea of slower habituation and would not have gained MP3.

ResultsPlus
Examiner Tip

With determine command word you are required to use the data provided to support your answer. Check that the data you select does support your answer.

(ii) Determine the effect of reduced synapsin on the habituation of fruit flies in this experiment.

(3)

reduced synapsin causes a higher mean % of maximum jump response. they didn't learn that the lights turning off was causing them no harm, so there wasn't as effective habituation taking place as the control.

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Examiner Comments

This response gained one mark. MP1 – first two lines or line five.

ResultsPlus
Examiner Tip

Make sure you are familiar with the command words used in questions. To gain full marks for a 'Determine' question you must use the data provided to support your answer.

Question 5 (b)(iii)

Many candidates were able to provide a good answer to this question. However, many marks were lost by candidates who did not provide sufficient detail for example, in MP1 it needed to be clear that vesicles were fusing with membrane in the pre-synaptic knob. So a description such as 'more vesicles bind to the synaptic membrane' would not gain MP1.

(iii) Explain how reduced expression of synapsin could produce these results.

(3)

Reduced synapsin leads to more vesicles fusing with the pre-synaptic membrane to release more neurotransminer to the synapse. More neurotransminer will bind to receptors on the post synaptic membrane and cause depolarisation and an action potential. This leads to a jump response which is why there is a higher response with reduced synapsin.

ResultsPlus
Examiner Comments

This response gained a maximum of three marks. All four marking points were evident in the response, MP1 and 2 – first three lines, MP3 – line five and MP4 – last two lines.

Question 5 (c)

Candidates often gained MP1 for a suitable description of genome sequencing. Marking point two proved to be more elusive with candidates struggling to explain how they would use the sequences they obtained to identify relevant genes. A disappointing number of candidates suggested that people with and without ASD have different genes or even different numbers of genes.

(c) Scientists are using fruit fly habituation to investigate the role of genes associated with human autism spectrum disorders (ASD).

Before they can do this, the scientists first identify genes linked to human ASD.

Describe how genes linked to human ASD could be identified.

(2)

This allows the fruit fly to produce a response to the stimuli

Scientists can look at genetic profiles of different individuals with ASD and those without using gel electrophoresis. These genetic profiles can be compared to see similarities between the genes. If a gene is only present in the DNA of those with ASD, that gene is likely linked to ASD.

ResultsPlus
Examiner Comments

This response gained MP1 – first two lines.

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Examiner Tip

Take care when using scientific words. In this response the candidate refers to different genes (last three lines) being present in people with ASD and people without ASD. The candidate may mean different alleles, but examiners can't guess and it is possible the candidate really thinks these groups of people have different genes.

(c) Scientists are using fruit fly habituation to investigate the role of genes associated with human autism spectrum disorders (ASD).

Before they can do this, the scientists first identify genes linked to human ASD.

Describe how genes linked to human ASD could be identified.

(2)

By sequencing the genome of people with autism and without autism, and identifying differences in the base sequences of DNA between those with and without Autism, as well as similarities in the base sequences of people with autism.

ResultsPlus
Examiner Comments

This is an example of a good response that gained both available marks.

Question 6 (a)

This was a straightforward magnification calculation that most students completed correctly. Some candidates gave their answer as a recurring number. Since they are calculating a size they should round to an appropriate number of decimal places and not give the final answer as a recurring value.

Question 6 (b)

This question proved to be more challenging than anticipated. The concept was quite simple, starch can be broken down to glucose which can then be used to synthesis glycogen. Many candidates did not answer the question. A common incorrect answer was to provide a comparison or description of the structures of starch and glycogen.

(b) The main food source for adult red flour beetles is starch.

Red flour beetles lay eggs that contain all the nutrients required for the development of the embryo.

The main food source in the eggs is glycogen.

Describe how starch can be used to make glycogen.

(3)

- Starch consists of Amylose and Amylopectin
Whn are polymers of Alpha glucose bonded
together via glycosidic bonds
- Via hydrolysis, to break down starch to
form glycogen
Glycogen is branched, Good energy Storage
and Compact, easily hydrolysed for quick energy release
- Glycogen Stored in liver as energy Storage

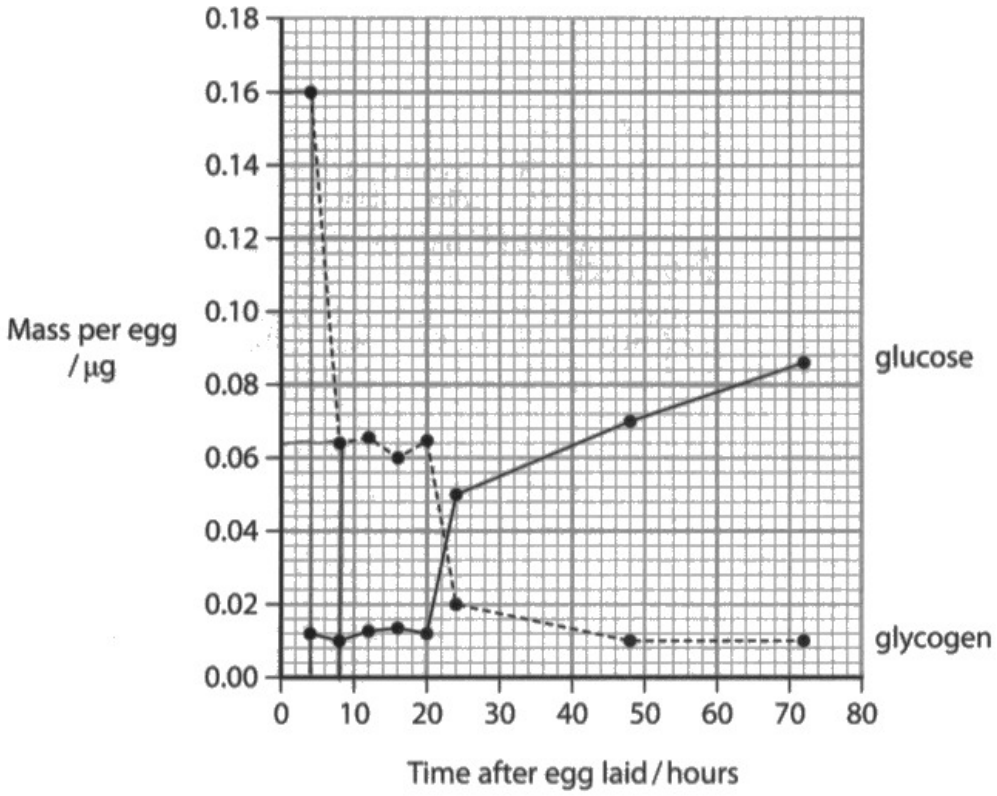
ResultsPlus
Examiner Comments

In this response the candidate has given lots of information about starch and glycogen but does not address the question and gains no marks.

Question 6 (c)(i)

Another straightforward calculation that most candidates completed correctly. Some candidates struggled to read values from the graph.

(c) The graph shows the changes in mass of glucose and glycogen in the eggs of the red flour beetle during embryo development.



(i) Calculate the percentage of glycogen used from 4 to 8 hours after the eggs were laid.

(2)

$\frac{0.16 - 0.064}{0.16} \times 100 = 60\%$

60 %

ResultsPlus
Examiner Comments

A clearly laid out calculation providing the correct answer that gained both marks.

Question 6 (c)(ii)

Many candidates demonstrated a good understanding of how a respirometer could be used and scored well on this question. Many did not gain MP1 because they elected to use the time period 20 to 24 hours. Since the switch could occur at any point between 20 and 24 to demonstrate a change the experiment would need to be carried out from a time starting before 20 hours and finishing after 24 hours.

(ii) A student suggested that between 20 and 24 hours the cells in the developing embryo switched from anaerobic to aerobic respiration.

Describe how a respirometer could be used to test this suggestion.

(3)

- Place embryo in test tube with lid and KOH in bottom to take CO_2 away
Hook bung to respirometer and time after 20 hrs reached the respirometer should stop start moving, as CO_2 taken up Pressure decrease respriometer shifts towards bung (the liquid coloured)
If so the meter shouldn't move until ~~ee~~ 20 hrs for aerobic respiration to take place
- Due to anaerobic doesn't use O_2 so no change in pressure

(Total for Question 6 = 9 marks)

- But aerobic does $O_2 + C_6H_{12}O_6 \rightarrow CO_2 + H_2O$
CO_2 taken up by KOH so overall decrease pressure so respirometer colour liquid shifts towards tube
- Make sure to time to see it occurs between 20 - 24 hrs

ResultsPlus
Examiner Comments

This response gained all three available marks. MP2 line 2, MP3 – line 5 and 6 and MP4 – lines 5 to 9.

The candidate has tried to select suitable times to observe the change. They imply looking before 20 hours (line 7) and after 24 hours (last line). If the idea of observing before 20 hours and after 24 hours had been more clearly expressed this mark would have been easier to award.

Question 7

The level-based question in this paper was more straight forward than recent examples. Compared to previous series the stimulus material was less demanding, and the area of knowledge being assessed more familiar to students. Even so, there was evidence that some candidates did not read the question carefully. The question asks about structure, function and location. To get to level 3 candidates needed to address all three aspects and demonstrating sustained linkage to amino acid side chains in at least two of these aspects.

Discuss the importance of the amino acid side chain to the structure, function and location of proteins.

(9)

Amino side chains are very important to the structure, function and location of proteins. The wrong amino side chain may mean the protein folds incorrectly and cannot function.

Proline makes the polypeptide chain more rigid, which is important for strong, fibrous proteins such as cellulose, murein and keratin. Murein must be strong to ensure the cell wall is stable, otherwise the cell may die. Keratin is important to maintain a strong barrier in the skin, preventing many bacteria and viruses from entering.

The order of the amino side chains in the polypeptide chain determines where bonds form and how the chain coils and folds to form its final 3D shape. The correct amino side chains are required to form the correct 3D shape of the protein. 41% of proteins are enzymes, and the wrong 3D shape in an enzyme means the active site isn't complementary shaped

to the substrate, preventing an enzyme substrate complex from forming. ~~For example, a mutation in the polypeptide chain of potassium hydroxide enzyme may mean it won't~~

The amino side chains in polypeptide chains of receptors are also very important, as the 3D shape must be complementary to a neurotransmitter (post-synaptic receptors) or ~~cell~~ antigens (CD4 receptors). As well as CD4 receptors, the importance of the structure of antibodies produced is ~~the~~ great, as they must be identical to the original immunoglobins to bind to the correct pathogens.

The amino side chains also determine whether a protein is hydrophobic or hydrophilic, which is very important. Phospholipids must have hydrophilic heads and hydrophobic tails in order to form a surface membrane correctly. The hydrophilic centre of many channel proteins allows hydrophilic molecules to ~~enter~~ pass through the membrane. ~~Glycoproteins molecules such~~ Hormones and enzymes must be hydrophilic in order to be transported in the bloodstream or cytoplasm.

As a result, amino acid side chains are very important.

ResultsPlus
Examiner Comments

This was an example of a good level 3 response. The candidate has demonstrated comprehensive knowledge and understanding supported by sustained linkage across all the aspects of the question, structure, function and location.

Discuss the importance of the amino acid side chain to the structure, function and location of proteins.

(9)

The variable R group of an amino acid is very important as it determines the nature of the amino acid and its function. Each different amino acid its R group will determines how it bonds in its tertiary structure and ~~weak~~ whether it will have disulphide bridges, hydrogen bonds and ionic bonds. If this side chain changes, the tertiary structure will change due to different bonding and this will alter the function of the protein. for example, if glycine had a CH_3 group instead of ~~an~~ just a single Hydrogen or any other mutation, it would no longer be able to coil as tightly and ∴ effect the function of the molecule as it will no longer be compact and in the case of starch, may not be able to store energy effectively. Also, a change in R group could determine if the amino acid is ~~soluble~~ polar or non polar so if there is a change, it may not be able to work effectively as it cannot carry out its particular function ∴ it may

be or may not be soluble. A change in the amino acid chain can also cause a change in an enzymes shape ∴ reactions won't be able to occur as the enzyme is denatured which will effect the body as its normal processes cannot occur. Overall, the amino acid side chain is very important as a change could effect tertiary structure due to bonding, can effect enzymes working, effects proteins functions and where they can go in the body and also can lead to lack of energy.

ResultsPlus
Examiner Comments

This is an example of a level 1 response. The candidate has made limited comments on one aspect of the question (protein structure). There are references to other aspects like function and location but, these are not supported in any way by linkage to the role of amino acid side chains.

* Proteins Primary Structure is the sequence of amino acids on a polypeptide chain. The amino acids have different side. In the gysene the side chains allows variety of polypeptide chains held together by polypeptide chain and ~~the~~ gives protein their tertiary structure. which is the folding of the alphahelix and ~~beet~~ beta pleated sheet held together by hydrogen, disulphide and ionic bonds. ~~Some~~ And this importants enzymes are globular proteins with tertiary structure. They are soluble and spherical. And this important this function as for it to complete its function and catalyst chemical reaction enzymes have an active which has aspecific shape which allows substrate bind to it and form a ~~side~~ enzyme-substrate complex. So its important in ~~of~~ function. They are nonpolar

The Protein - The side chains form a peptide bond with nitrogen in amino group as the amino group is slightly positive and carboxyl group slightly negative when these bond together and held by H bonds it gives a protein its rigid structure. These can be alpha helix and beta pleated sheets and fold to give tertiary or quaternary structure. A fibrous protein has a rigid structure interactions to be long straight chain and hard and rigid and collagen is an example of this as it provides the body with protection on the skin surface and in the arteries. The cysteine side chain is chemically reactive. Will allow proteins to function chemically examples of proteins like this carrier and transport proteins which bind to small non polar molecules and carry them across the cell across by passive transport and change shape for them then revert back to original. The ~~scarce~~ amino acid side chain determines the protein formed during Translation of mRNA to produce protein. ~~These~~ This



This is an example of a good level 2 response. The candidate has made some links between amino acid side chains and the structure, function and location of proteins. However, the linkage to amino acid side chains was judged not to be sufficiently extensive for the response to reach level 3.

Question 8 (a)

(a) Explain why natural selection took place in Darwin's Galapagos finches (paragraph 3).

(3)

Each island had different environment ~~food~~ and the type of ~~food~~ seed shape available acted as a selection pressure. The finches all had genetic variation due to random mutations which resulted in one that led to a particular beak shape, one that best fit the local seed. These birds gained more energy, were more likely to survive and reproduce and so this adaptive feature increased the allele frequency in the gene pool whilst those with poorer adapted beaks died off

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Examiner Comments

This response gained three marks. MP2 in the first two lines, MP3 – line 3 and 4 and MP4 – last four lines.

Although in the first line they imply that different populations of finches live on different islands they do not say enough to be awarded MP1.

8 The scientific article you have studied is adapted from *Scientific American*.

Use the information from the scientific article and your own knowledge to answer the following questions.

(a) Explain why natural selection took place in Darwin's Galapagos finches (paragraph 3).

(3)

The reason is because finches who had the best adapted beaks to eat specific type of seed survived than those who were less adapted. Those better adapted will make offspring as the advantageous alleles with adapted beak shape. Passed on those less adapted could not properly eat seeds due to their beak shape and those died and those beak characteristics died out. Offspring of better adapted evolved so they can properly eat the seeds.

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Examiner Comments

In this response the candidate has not addressed the question 'Explain why natural selection took place ..'. The response gained one mark (MP4). There was no mention of isolation of populations (MP1), different selection pressures (MP2) or presence of different mutations (MP3).

Question 8 (b)

Many candidates found this question accessible. However, they frequently gave responses in terms of inflammation and ignored the role of the immune response.

(b) Explain how inflammation and the immune response can cause damage to tissues (paragraph 4).

(3)

- Inflammation is caused by the release of the protein histamine
- Histamine increases the permeability of capillaries and membranes and causes vasodilation of arterioles
- Which causes swelling and an increased blood flow to the site of damage. Also causes white blood cells and other cytophagytes to arrive at the site of damage.
- Which changes the conditions of the surrounding area and can allow a cancerous mutation to gain the competitive edge.

ResultsPlus
Examiner Comments

This response gained three marks. MP1 – first line, MP2 – lines two to four and MP3 – lines five and six.

ResultsPlus
Examiner Tip

Take time to read questions carefully. This was a typical response in which the candidate has addressed the role of inflammation but ignored the role of the immune response.

Question 8 (c)

This was a very straightforward question. Most candidates suggested an appropriate scanning method (MP1) and then went on to suggest carrying out regular scans or scans before and after treatment (MP2). Several candidates did not give any indication of appropriate repeat scanning and did not gain MP2.

(c) Describe how tumour shrinkage could be observed (paragraph 6).

(2)

Tumour shrinkage could be observed through magnetic resonance imaging. This produces an image of the body which can be used to detect tumors.

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Examiner Comments

This is an example of a response that only gained MP1 for naming an appropriate scanning method. There was no mention of repeating the scanning, before and after treatment, so MP2 could not be awarded.

Question 8 (d)

The question asks candidates how ageing, smoking and radiation cause mutations. Many candidates repeated back the question 'smoking or chemicals in smoke cause mutations'. This type of comment did not gain any credit. Several candidates explained that smoking and or radiation caused damage to DNA and that this damage resulted in changes in DNA base sequences (MP1 and 2). Relatively few candidates address how ageing can contribute to the accumulation of mutations. Those that did, mostly described the idea of increased age resulting in increased exposure to carcinogens (allowed for MP3).

Although the question asks 'how these things cause mutations' many candidates provided answers based on potential epigenetic changes. Although epigenetic changes are not themselves mutations they may indirectly result in mutations. A description of an epigenetic change was therefore allowed as an alternative to MP2.

(d) "Why is aging, smoking or radiation exposure associated with cancer?" (paragraph 8).

Explain why "These things cause mutations".

(3)

Smoking contains carcinogens which can damage the DNA leading to mutations. Radiation also damages DNA and skin proteins leading to a change in base of DNA (mutation). As we age we have become exposed to more ~~mutation~~ radiation Smoking and carcinogens so our DNA is more prone to damage and mutations as mutations accumulate in cells.

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Examiner Comments

This response gained three marks. MP1 – line 1 or line 2, MP2 – line 3, and MP3 – line 4 and 5.

For this question, 'leading to a change in base of DNA' was accepted as being equivalent to 'changing the DNA base sequence' for marking point 2.

(d) "Why is aging, smoking or radiation exposure associated with cancer?" (paragraph 8).

Explain why "These things cause mutations".

(3)

aging, smoking / radiation cause damage to the DNA - causing mutations - smoking the carcinogens cause damage to DNA bases - causing mutations - radiation can break off DNA - meaning DNA is transcribed wrong leading to non functional genes / proteins.

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Examiner Comments

This was a typical response that gained one mark. The candidate has linked exposure to smoking and radiation to damage to DNA (MP1).

Question 8 (e)

The question asks why a cancer cell needs to use the resources of surrounding tissues. Many candidates gained a mark for correctly stating that cancer cells are growing or dividing (MP1). Relatively few then went on to explain that they would therefore need oxygen or glucose to respire (MP2) or explain the need for another resource (MP3). A number of candidates gave responses similar to 'so they can outcompete the surrounding tissue' and did not gain any marks.

(e) Explain why a cancer cell needs to 'use the resources of the tissue immediately around it' (paragraph 12).

(2)

a cancerous cell will divide rapidly to reproduce this causes a competition for space. Moreover cancerous cells need resources & such as glucose and oxygen for respiration, this means that the healthy cells will recieve less

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Examiner Comments

This is an example of a good response that gained two marks (MP1 and 2).

(e) Explain why a cancer cell needs to 'use the resources of the tissue immediately around it' (paragraph 12).

(2)

In order to respire the cancer cell needs to use the glucose around it and the host's blood supply ~~that~~ which carries the nutrients.

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Examiner Comments

This response gained MP2 only.

Question 8 (f)

This question asked candidates how a cancer causing mutation might increase the rate of division in stem cells. Many candidates found it challenging to produce a response that gained any credit. Statements equating to rewriting the question as this one 'mutations can cause an increase in the rate of cell division' were frequently seen and did not gain any credit.

Some candidates did produce reasonably complete responses that gained all three available marks. Often for marking points 1, 3 and 4.

(f) Explain how 'a cancer-causing mutation' could increase the rate of division in stem cells (paragraph 14).

(3)

The mutation in the p53 gene causes the tumour suppressor protein not to be produced so the cell cycle is not regulated, increasing the rate of division as it is uncontrolled. A mutation in an oncogene, causes the constant stimulation of stem cell to divide so there is a shorter G phase and mitosis occurs more frequently.

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Examiner Comments

This is an example of a good response. The candidate gains MP1 – first line, MP3 – lines 1 and 2 and MP4 – line 3. They get MP3 again on line 4 and MP4 again on line 5.

(f) Explain how 'a cancer-causing mutation' could increase the rate of division in stem cells (paragraph 14).

(3)

cancer causing mutations increase the rate of divisions uncontrollably ∴ if this mutation was introduced to stem cells it could cause the stem cells to divide rapidly and uncontrollably ∴ increasing the rate of division.

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Examiner Comments

This candidate gained one mark (MP4) for the idea of uncontrolled cell division.

Question 8 (g)

Candidates were asked to describe how 'a key player in the immune system' differed from a stem cell. Many candidates found this question straightforward. MP1 was frequently seen, and many candidates described the difference in limitation on cell division (MP3) and gave examples of 'key players' and their function (MP2 and 3). Relatively few candidates expressed the idea of differential gene expression having taken place in 'key players' (MP5).

(g) Describe how a cell that is 'a key player in the body's immune system' differs from a stem cell (paragraph 14).

(4)

'a key player in the body's immune system' is an already differentiated cell such as a phagocyte or a B-lymphocyte. A stem cell ~~can~~ still is still yet to be differentiated. ~~Th~~ In the bone marrow, a stem cell is multipotent. This is where the cell can differentiate into a select few different cells but not all of them.

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Examiner Comments

For this response the candidate gained MP1 – first five lines and MP2 – line 3.

(g) Describe how a cell that is 'a key player in the body's immune system' differs from a stem cell (paragraph 14).

(4)

Stem cells are undifferentiated cells that are able to grow and divide into a specialised cell.
cells in the immune system such as T-cells are specialised for a function, having specific genes turned on and off in order to control gene expression and give the cell qualities that play a key role in the primary immune response. For example while stem cells have all genes being potentially active, T-cells will have some genes off and others on for the synthesis of proteins producing the CD4 receptors, for example.
As well as plasma cells being specialised for antibody production.

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Examiner Comments

This is an example of a good response. MP1 – lines one to five, MP2 and 3 last few lines, MP5 – lines five to eight.

Question 8 (h)

It was originally expected that answers to this question would revolve around the main example given in the article like 'pesticide resistance'. However, many candidates produced responses in terms of tumour treatment or antibiotic resistance. The mark scheme was therefore adapted to accommodate any sensible model of competitive release.

(h) Describe how the effects of 'competitive release' could be demonstrated (paragraphs 18 and 19).

(4)

In two equally sized fields, plant the same amount of the same crop. Release insects into the fields, wait until a stable population has formed. In one field, spray a large dose of insecticide, on the other, only spray enough to lower the population. Again wait until a stable pop. Record insect numbers in each field using quadrats. Then, wait again until stable populations have formed. Repeat with the insecticide. Again, record population numbers. Repeat this process up to 5 times. The end result should show a higher number of insects in the field with the high dose of insecticide as they have grown resistant however the field with only the small amount of insecticide should have fewer insects as they have remained sensitive to the insecticide.

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Examiner Comments

This is an example of a good response. The model system selected is pesticide resistance. They describe the selection of a suitable study site (MP1 – first two lines), then they describe using a high concentration and a minimal concentration of pesticide (MP2 – lines three and four), before describing a method of sampling (MP3 – lines four and five), the idea of repeating over time (MP4 lines six and seven) and finish by telling us how competitive release would be demonstrated (MP5 – last four lines).

(h) Describe how the effects of competitive release could be demonstrated (paragraphs 18 and 19).

(4)

• Competative release could be demonstrated using bacterial cells
• two groups of baceria of the same species could be used
• both groups could be give bacterio-cidal antibiotics but at different doses
• # this can be repeated over a prolonged period of time and it should be recorded how long the bacteria populations could be kept under a specific value.
• This would ~~the~~ could then show changes of the numbers of resistant individuals in the popalation.

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Examiner Comments

In this response the candidate has chosen to use antibiotic resistance as the model system. They identify use of two cultures (MP1 line 3) and then describe a method of demonstrating competitive release (MP5 – lines ten to twelve). The use of 'different doses' was not enough for MP2 and the candidate did not give a suitable sampling method (MP3) or describe repeat sampling (MP4).

Question 8 (i)

Many good responses were seen to this question. Marks were most frequently lost because of lack of detail. For example, many candidates referred to mutations, but did not link them to a change in the target recognised by the host and did not get MP1. Few candidates gave good descriptions of specific examples of resistance mechanisms (MP3). Several candidates gave descriptions of antibiotic resistance which were not relevant to this question.

Question 8 (j)

This question was answered well by many candidates.

(j) Discuss the ethical issues relating to the use of mice in experiments such as those described in the article (paragraph 25).

(4)

Some Animals, such as mice have rights, this means since they are not able to consent they should not be used. Also mices may experience pain and suffering which is unethical. However, since this is cancer which is becoming more prevalent, in this case, the b benefits outweigh the harm as we are using the information for medical research. However, mice and humans are very different, so just because there is a certain reacer internal reaction with a mice, it does not necessary mean there will be the same reaction for humans.

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Examiner Comments

In this response the candidate gained MP3 – line 1, MP5 – line two, MP1 – line five and MP4 – lines six and seven.

Paper Summary

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

- be prepared to apply what you have learnt from core practicals to answer questions in the exam
- read all the information provided – especially where the stimulus material is unfamiliar
- learn the command words and the types of answers expected
- read the whole question, identify the command word and the context
- set out calculations carefully – show each stage of your working, in case a mistake is made at the final step
- attempt every question – time permitting, read the stem of the question carefully as there is often helpful information in there that might help
- add specific, precise details – do not expect the examiners to fill in the gaps for you
- use bullet points if it helps you organise your answers to questions – but make sure the statements contain details and are not too brief.

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