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Examiners' report

BIOLOGY A

H420

For first teaching in 2015

H420/02 Autumn 2021 series

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

	Reports for the November 2021 series will provide a broad commentary about candidate performance, with the aim for them to be useful future teaching tools. As an exception for this series they will not contain any questions from the question paper nor examples of candidate responses.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

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Paper 2 series overview

The Biological Diversity paper assesses Modules 1, 2, 4 and 6.

Candidates found some of the questions challenging but there was no evidence of candidates having run out of time.

To do well on this paper candidates needed to recall key knowledge and apply it in the context of the question. They also needed to apply their understanding of scientific investigations to the situations covered in the questions. It was important for candidates to read the questions carefully. Candidates also needed to demonstrate effective numerical skills.

There was evidence across the paper that several candidates had 'gaps' in their knowledge. Most consistently few seemed comfortable with classification or discussion of the work of Alfred Russel Wallace.

The proportion of questions requiring mathematical skill remained at around 10%, as in all A Level Biology papers. Most candidates coped well with the maths skills questions, but it is worth reminding candidates to estimate the magnitude of their answer.

Examiners were pleased that candidates indicated when an answer extended onto the additional answer space. However, it was again noted that some centres are unnecessarily supplying additional sheets or answer booklets before candidates had used the additional answer space at the back of the question paper. When candidates' answers need to overrun the provided answer space it is strongly recommended that they use the additional pages at the back where their answer will certainly be seen by examiners.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• read the questions carefully before beginning their answer • paid attention to command words • used any extra information given when constructing their answer • recalled and used precise key terms correctly.	• based their answer on the general idea of the question • overlooked command words • used general rather than precise terms or confused precise terms that have a different meaning.

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Themes in candidate responses

It was evident from many responses that candidates had not absorbed all the information they had been given in the question: in Q18(b)(iii) many candidates cited paternity or forensics despite these options having been removed by the wording of the question; Q21(c) and Q21(d)(ii) were clearly about tissue culture but many answers referred to taking cuttings and, in part (c), many candidates did not appear to notice the references to 'increased numbers' or 'many clones'. Moreover, there were several questions – for example Q16(b)(i), Q16(c) and Q18(a) – where candidates did not gain marks because they did not do what the command word asked them to.

In data evaluation questions, Q19(b)(ii) and Q20(a)(iii), few candidates attempted to consider reasons why the given conclusion might be supported. There was also evidence that candidates, perhaps not surprisingly given the circumstances, had not practised the skill of constructing results tables or using statistics to analyse results.

Classification and the contribution of Alfred Russel Wallace seemed to be poorly understood.

Comments on responses by question type

Multiple choice questions

Candidates found the multiple choice questions more accessible than in most previous sessions and generally did well on Questions 2, 3, 7, 8, 9, 10, 11 and 13.

There were a few questions where candidates struggled with for example in Question 1, many candidates thought fibrous proteins were involved in the rigidity of membranes. In Question 5, many candidates thought antitoxins bind to antigens on the surface of pathogens. In Question 12, many candidates did not appear to appreciate the significance of 'between' (as opposed to 'within') varieties. As ever, many candidates struggled with the concept of levels of biodiversity, even in a multiple choice question such as 15.

Level of response questions

Candidates continued to write concise answers to the Level of Response (LoR) questions and very few used the additional pages available for these. Centres appeared to have acted on advice given in previous reports that the answer to a question worth 6 marks should, on average be only twice as long as the answer to a question worth 3 marks. It is still true that responses that continue at length onto additional pages often struggle to retain enough coherence to achieve the upper mark within a given level.

Q17(d)

Candidates generally found this to be the easier of the two LoR questions on the paper. Most understood, and could describe, some of the principles behind succession: in particular, that plants in the early stages die and are decomposed to help provide soil and nutrients for later stages. Many candidates focused most of their attention on discussing pioneer species with minimal discussion of other stages and this often limited the level awarded. Candidates who understood succession were usually also able to explain the deflected succession in heather moorland. There was some confusion of the terms 'primary' and 'pioneer'.

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Teaching tip

Where it is practical, fieldwork at an appropriate site can help candidates visualise the seral stages of succession.

Q20(c)

The majority of the candidates were able to use the data in the graph correctly and they were able to outline that birds with very small or very large beaks did not survive whereas those with average beak sizes did. Most of the candidates had to explain the process in more detail, by including details about the importance of genetic variation or inheritance of alleles for average beak size. Many candidates successfully referred to the graph within their answers and so were able to access the higher levels. A few candidates did not seem to appreciate the fact that extremely large beak sizes were being selected against as well as extremely small ones. There was a small but significant number of candidates that discussed the data in the graph as if the x-axis represented time, rather than beak size.

Practical questions

Experimental design

Q21(d)(ii)

Most candidates could identify the independent and dependent variables, while others got these the wrong way round. Many also offered two correct control variables but several suggestions implied that the investigation might have been done using different plants, rather than clones or that the clones were cultured in soil.

Presenting results

Q18(b)(i)

Candidates were presented with some raw data in an inappropriate format and were asked to present the data in an appropriate table. Most candidates constructed a table with ruled lines but very few achieved full marks. The numbers that candidates were given were recorded to various, and often too many decimal places. Only a few candidates presented the numbers with consistent decimal places or to an appropriate number of decimal places, given the precision of the raw data. Most responses correctly put 'pH' in the left-hand column but many wrote 'pH' next to every value, rather than in a heading. It was also more common to see 'Average' in the final column heading, rather than the more precise 'Mean'.

	**OCR support**	Practical skills handbook

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Calculations

Q17(a)(i)

Many candidates achieved both marks. Most candidates converted the numbers given in standard form into whole numbers and performed the calculation correctly. Although the question did not instruct candidates to answer in standard form, this was the most appropriate format so full marks were not given if responses were written out in full. A minority of candidates also gave answers to too many significant figures, which was inconsistent with the resolution of the numbers they had been presented with.

Q17(b)(i)

Most candidates did this calculation successfully. Others multiplied 545 by 0.71 and so gave an answer lower than 545, which does not make sense in the context of the question.

Exam tip
Estimate the size of an expected answer and then use this estimate to accept the calculated answer, or to reject it and try again.

Q19(b)(i)

Around half of candidates achieved full marks. Very few scored 1 mark.

Q20(a)(ii)

This was the most challenging calculation question with fewer than half of candidates gaining both marks. Many candidates calculated the *G.fortis* range as a proportion of *G.fuliginosa*, giving their answer as 4.25. Some gave their answer to only one significant figure, or as a percentage, despite the instruction.

Q21(d)(i)

A little over half of candidates got both marks here. The question required the candidates to calculate a percentage change which is a fundamental skill in biology.

	**OCR support**	OCR's AS and A Level Biology A Biology B (Advancing Biology) Maths skills handbook

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Interpreting data

Q19(b)(iii)

Around half of candidates achieved 1 mark in this challenging question about interpreting the results of a statistical test. Most appreciated that a calculated value below the critical value meant the student was incorrect and the null hypothesis ought to be accepted but few could use the idea of probability to discuss this further.

Q20(a)(iii)

This was a challenging question in which candidates were required to apply their knowledge of the expected shape of a disruptive selection graph to some real data about finches. Real data rarely matches the textbook ideal and most candidates struggled to perceive two peaks in the graph they were presented with. It was rare to award more than one mark and those candidates that did achieve the mark tended to do so for challenging the scientists' conclusion and describing the graph as having only one peak. Few candidates attempted to consider reasons why the conclusion might be supported.

Drawing conclusions

Q16(b)(ii)

Fewer than half of candidates correctly identified C as the father but the majority of those that did could explain why the evidence supported that conclusion. Most candidates suggested that A was the father because of a higher number of matches overall, not appreciating the significance of some bands having come from the mother.

Q19(c)

This question was challenging but differentiated well between candidates. Only a minority of candidates gained marks – usually for stating that the allele in question was dominant or that it was carried on the X-chromosome with a supporting statement. Most responses either attempted to describe the results, rather than drawing a conclusion from them, or assumed the allele was recessive and attempted to find evidence to support that assumption.

Structured questions

Q16(b)(i)

This question differentiated well but candidates often did not appear to appreciate the significance of the command word 'outline'. Many candidates wrote so much detail about PCR or electrophoresis that they did not leave room for the other parts of the process.

Q16(c)(i)

Many candidates offered descriptions of what 'non-coding' might mean rather than explaining the reasons why some sections did not code for a polypeptide.

16(d)

Most candidates gained 1 mark for *Escherichia.* Fewer than a fifth were familiar with synthetic biology and less than 10% wrote 'phylogeny' in the final space – many candidates left it blank.

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Q18(a)

Most candidates were clearly familiar with aspects of membrane structure but may merely attempted to describe the structure of membranes rather than explaining why the structure of phospholipid molecules facilitates the formation of membranes.

Q19(a)(ii)

Most candidates could do the genetic cross successfully, but few appreciated that the sex of the individual birds, i.e., male or female, was an important part of the description of the phenotype.

Q19(b)(ii)

Very few candidates could select a critical value from a statistical table.

Q20(d)

Very few candidates seemed aware of Wallace, often linking him to genetics or DNA. This question was often omitted.

Common misconceptions

Fewer of these were obvious on this paper but it was apparent that some candidates thought that DNA contained amino acids.

Key teaching and learning points – comments on improving performance

Command words in questions are important. Many candidates could have gained more marks by giving an answer that matched the command word in the question. For example, Q16(b)(i) asked candidates for an outline but many wrote a detailed description. Question 18(a) asked for an explanation, but many candidates offered a description.

Guidance on using this paper as a mock

Examiners found this paper relatively straightforward to mark using the published mark scheme. Some points to note are as follows:

Q16(b)(i) Marking point 5 needs some word to indicate 'probe' or 'tag'; 'use radioactivity' is not enough.

Q16(b)(ii) It is very difficult for any marks to be given if individual C is not the answer given.

Q16(b)(iii) The first point is '*idea of…*' so almost any reasonable suggestion to do with disease is acceptable.

Q17(b)(ii) Suggestions that hen harriers are eaten by an even larger predator are not credited (the question states that they are the top predator). Answers about competition from a fellow predator are not credited either, unless it is clear in the answer that the competing predator is newly arrived.

Q17(d) In order for a response to achieve Level 3 there must be some discussion of seral stages in addition to the regularly discussed pioneer community.

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Q18(a) The third marking point is awarded only if it is clear in which direction the phospholipid molecules are facing in relation to aqueous solutions (water or cytoplasm).

Q18(b)(i) Do not award the second marking point if 'pH' has been written next to every pH value.

Q19(a)(ii) Many candidates get 3 marks because they don't include the sex as part of the phenotype so the first marking point cannot be given but the final one can.

Q20(a)(i) The minus sign is required for the mark.

Q20(a)(iii) Few candidates get any marks. The most common one to award is marking point 6 for a reasonable description of a single peak being inconsistent with the scientists' conclusion.

Q20(b)(ii) Answers about physical or genetic barriers to reproduction are not credited.

Q20(c) In order to achieve Level 3, a response needs to mention pre-existing genetic variation, differential survival, and inheritance of alleles, and to refer correctly and precisely to the graph.

Q21(d)(ii) Answers that imply that the tissue could be derived from different plants or is being cultured on soil are not credited.

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