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Examiners' report

BIOLOGY A

H420

For first teaching in 2015

H420/03 Autumn 2020 series

Version 1

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 Autumn 2020 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 answers.

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 3 series overview

H420/03 is one of the three examination units for GCE Biology A. This component assesses content from across all areas of Biology, and links together the different areas, within different contexts, some practical, some familiar and some novel. To do well on this paper, candidates need to be comfortable applying their knowledge and understanding to unfamiliar contexts and be familiar with a range of practical techniques. They must also be able to analyse, interpret and evaluate ideas and evidence to be able to reach conclusions and develop and refine practical design and procedures. This, together with the fact it relies on learning and applying knowledge from two years of work, has proved a difficult test for some candidates. However, all questions were accessible to candidates, and there seemed to be no time issues with completing the examination. The examination produced a good spread of marks and most candidates attempted all the questions.

Examiners were pleased to see that many candidates used the additional answer spaces provided in the paper, rather than continuing their answers outside the provided lines, and this is something we would encourage all centres to advise their candidates to do.

Centres are advised to encourage candidates to spend a little time reading the question and ensuring their response is relevant and answers the question. Even if the science is correct, if it does not answer the question then it will not be given marks.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• Have well developed mathematical skills enabling them to perform calculations • Produce clear and concise responses for Level of Response questions • Have a good practical knowledge, with the ability to understand and apply the information given to the questions being asked • Could interpret information given in diagrams and tables and use it to answer related questions	• Found it difficult to apply what they had learnt to unfamiliar situations, scoring most of their marks on questions involving recall and understanding • Produced responses which lacked depth, particularly to practical based questions • Produced responses which were often peripheral to what had been asked, sometimes simply repeating information provided • Found it difficult to answer mathematical based calculations • Found it difficult to use images supplied in the question paper to answer related questions

Comments on responses by question type

Level of response questions

Both Level of Response questions produced a full range of marks, with many candidates scoring well on both questions. In **1(c)**, candidates tended to describe the role of the pituitary gland and ADH, but many struggled to write relevant points about the role of the nervous system. Few candidates wrote about the role of aldosterone, despite it being flagged in the question stem. Common misunderstandings included the production site of aldosterone (many mentioned the pituitary gland instead of the adrenal gland) and confusion over how water potentials change in the blood, collecting duct and tissue fluid. Some candidates wrote general points about the nervous system (e.g. details of action potentials, reflex arcs etc.) that were not relevant to the question.

The second Level of Response, question **3(a)(i)**, was by and large answered better than **1(c)**. Most candidates produced adequate descriptions of the results shown in both tables and many were able to relate the availability of light to the ability to photosynthesise and produce materials for growth. Some candidates confused the primary purpose of photosynthesis with the production of ATP rather than carbohydrates. Most candidates understood the terms 'phototropism' and 'geotropism' and could apply these terms when explaining the results in Table 3.2.

Other

The candidates during this session tended to score better on AO1 questions – demonstrating knowledge and understanding (e.g. in **2(a)**, **3(c)(i)**, **5(d)**) than AO2 – applying knowledge and understanding (e.g. in **2(c)**, **4(c)(iv)**) or AO3 – analysing, interpreting and evaluating scientific information, ideas and evidence (e.g.in **1(b)(iii)**, **1(d)(i)**)

Question 1

Many candidates appeared to be unfamiliar with the requirements for a good biological drawing required for question **1(a)**. Drawings often had sketchy or incomplete lines rather than clear continuous lines and the inclusion of features not visible in Fig 1.1, such as the ureter and blood vessels. Labelling errors were frequent, with tissues misidentified and label lines drawn free hand or with arrow heads.

Many candidates could not interpret the photomicrograph in Fig 1.2, and so could not describe the function of structure A as increasing surface area for reabsorption for question **1(b)(ii).** Most candidates understood the role of the distal convoluted tubule in water or ion reabsorption for **1(b)(i)** and correctly identified lumen B as having the highest concentration of urea due to water being reabsorbed from an earlier part of the tubule for **1(b)(iii)**.

A surprisingly large number of candidates did not identify diuretic Y as being the most effective at reducing blood pressure due to reducing the blood volume the most. Most candidates correctly identified diuretic X as being the most suitable for use by a person with diabetes, although some candidates incorrectly stated that this diuretic raised blood glucose the least, this was not given credit.

i	**OCR support**	Support for drawing skills can be found in the Biological drawing skills handbook: https://www.ocr.org.uk/Images/251799-biology-drawing-skills-handbook.pdf

	AfL	Showing students images of photomicrographs from which they need to identify structures and describe what they see may help them to answer similar questions in the future.

Question 2

Many candidates scored well on question **2(b)** by realising that the hole in the septum wall would allow deoxygenated and oxygenated blood to mix leading to less oxygenated blood being pumped to the cells. Fewer candidates mentioned that some oxygenated blood would be delivered to the lungs or that deoxygenated blood would pass into the left ventricle.

In question **2(c)** very few candidates linked the information in the question stem with the idea that creatine kinase is an intracellular enzyme found in the blood due to damage to the heart muscle.

A number of candidates did not gain credit for **2(d)** as they did not link clones being genetically identical to the idea that this means genetics has no effect on the results of the experiment and acts as a control variable

	Misconception	A common misconception was that the enzyme had brought on the heart attack by causing the heart to produce large amounts of ATP for muscle contraction and overexert itself.

Question 3

Most candidates suggested the t-test for **3(a)(ii)** but far fewer could justify the choice of test for **3(a)(iii)** (omitting the idea of comparing means). Candidates were good at using the tabulated data in **3(a)(iv)** and linking this to the rejection of a null hypothesis. However, a significant number of candidates could not work out the correct number of degrees of freedom to use in the table.

Surprisingly, few candidates were able to suggest the correct formulae of the ions for **3(b).**

In **3(d)**, most candidates correctly used the information in the diagrams of Fig 3.2 to help them answer the question, gaining full marks.

	OCR support	Support with maths calculations and statistics can be found in the Mathematical skills handbook: https://www.ocr.org.uk/Images/294471-biology-mathematical-skills-handbook.pdf As well as the Mathematical skills statistics booklet: https://www.ocr.org.uk/Images/338621-mathematical-skills-statistics-booklet.doc And the Maths for biology section on the OCR website: https://www.ocr.org.uk/subjects/science/maths-for-biology/index.aspx?id=biology-a-h020-h420-from-2015

Question 4

Most candidates gave appropriate suggestions for the functions of proteins A and C, based on the information given in Table 4.1, and could recognise that antibiotic A22 could cause problems in humans by binding to actin in muscles.

Likewise, many candidates used the data in Table 4.2 to evaluate the advantages and disadvantages of the two antibiotics, gaining both marks. However, some candidates lost marks by not being precise in their responses, for instance by saying oritavancin cures fewer bacterial infections without naming the specific infection *Streptococcus,* or by saying it has fewer side effects without naming the side effects.

Many candidates correctly identified X and Y in **4(c)(i)** but few could name Z correctly.

Few candidates knew why antibiotic genes are used in plasmids for **4(c)(ii)**. Many candidates referred to the gene providing bacteria with protection from antibiotics without stating why this was done in this case.

Many candidates struggled to gain both marks for the two- step calculation in **4(c)(iii)**, although many gained a mark for working out one of the steps correctly.

Candidates often understood the technique of PCR, but could not apply this technique to compare growth rates of *E.coli* in different tissues for **4(c)(iv)**. Those that suggested taking DNA samples from both tissues and using PCR to compare the amounts of DNA produced after a fixed number of cycles gained credit here.

Question 5

Most candidates recognised the need to use stratified sampling in **5(a)** and correctly described how the number of samples in each sector needed to be proportional to the area being measured. Some candidates omitted to include a calculation as was required by the question, or to name the sampling technique and so did not gain full marks.

The calculations for **5(b)(i)** were generally well understood, the most common errors being failing to give the population sizes to the nearest whole number.

Many candidates correctly concluded that the Chapman estimate was lower than the Lincoln estimate for one mark for **5(b)(ii)**. However, few gained the second mark which required candidates to think in terms of the proportional difference between the estimates, rather than in absolute numerical terms.

An impressive number of candidates understood the difference between preservation and conservation for **5(c)**, and most scored one mark, but some struggled to word their answers clearly and relate them to the information provided.

i	**OCR support**	Support with Module 1.1 Practical skills can be found in the Practical activities support guide: https://www.ocr.org.uk/Images/597719-practical-activities-support-guide.pdf

Question 6

In question **6(a)(i)** Candidates generally struggled to score marks. They wrote around the marking points without describing the key ideas (e.g. they didn't mention the placenta, they didn't convey the idea of oxygen transferring between the two forms of haemoglobin, they stated oxygen is needed for fetal growth but did not mention respiration).

Few candidates were able to plot the graph to the required accuracy for **6(a)(ii)**. Many took the instruction to 'sketch' the curve as meaning that precision was not required, and so drew curves of a similar shape to those of adult and fetal haemoglobin already shown, ignoring the details of the curve set out in the question stem.

In **6(c)**, many candidates seemed to understand the concept of excretion, but struggled to translate this into an explanation of this specific example, and so did not gain full marks.

Key teaching and learning points – comments on improving performance

Candidates often struggled at applying their knowledge to new situations. For example applying PCR to survey the amount of *E.coli* in tissue.

Candidates struggled when using images supplied to them. For example in the drawing of the kidney and the identification of microvilli in the micrograph of a kidney tubule.

Candidates found carrying out multiple step calculations difficult.

Candidates found drawing a line on a graph when given a written description difficult.

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