GCE AS EXAMINERS' REPORTS

BIOLOGY
AS

SUMMER 2023

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Introduction

Our Principal examiners' reports offer valuable feedback on the recent assessment series. They are written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and detail how candidates have performed.

This report offers an overall summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It goes on to look in detail at each question/section of each component, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.[i]

The information found in this report can provide invaluable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	Eduqas offers an extensive annual programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.eduqas.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 6 months after the examination.	www.wjecservices.co.uk or on the Eduqas subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the overall subject, rather than for each component/unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results and Grade Boundaries (eduqas.co.uk)

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Exam Results Analysis	WJEC Eduqas provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	www.wjecservices.co.uk
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.eduqas.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	www.wjecservices.co.uk or on the Eduqas subject page.
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Subject Officer's Executive Summary

Overall, the standard of candidates' responses to questions was good and was similar to that shown in 2022, with a similar overall mean. They demonstrated a sound ability to process, analyse and interpret data and information. Better candidates were able to express themselves well using appropriate scientific terminology. However, a significant minority of candidates were not able to recall the terminology required for AO1 questions.

This year, across the cohort, there seemed to be more errors made when answering questions testing mathematical skills than on previous series. This also applied to questions testing practical skills. Questions which combined these two skills such as those testing microscope skills were a particular problem.
In addition to this, candidates need to pay particular attention to correct rounding and expressing their answer to the correct number of decimal places or significant figures.

In Component 1 a good understanding of biological molecules, cell division and protein synthesis were shown. However, the understanding of membrane structure and function caused more issues, as did the identification of cell organelles in an unfamiliar micrograph. Answers to the quality of extended response question were mixed with some excellent responses seen but also some which failed to score many marks. Candidates should be encouraged to identify the three parts to the question and ensure they use the information that has been given to them.

In Component 2, the understanding of oxygen dissociation, the process of ventilation and evolutionary relationships were particularly good. As always, candidates find any question assessing plant structure more challenging, especially when it focusses on phloem. The question on digestion also caused some issues. Again, candidates need to be encouraged to use all the information given in the stem of the question in order to be able to gain higher marks in questions such as this.

Areas for improvement	Classroom resources	Brief description of resource
Recall of scientific terminology	Knowledge organisers	A collection of sample knowledge organisers to support the learning of A level Biology.
Practical and microscopy skills	Experiments on film	Videos of every specified practical and questions to strengthen practical skills.
Structure of responses to QER questions	Online exam review	Annotated sample candidate responses which can be used to show good practice.
Knowledge and understanding of plant transport	Blended learning – adaptations for transport in plants	This blended learning resource contains interactive self-study content covering Component 2 - Adaptations for transport in plants.

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COMPONENT 1: BASIC BIOCHEMISTRY AND CELL ORGANISATION

Overview of the Component

This paper covered content from across the component 1 specification including biological molecules, cell division, cell membrane and cell structure.

All assessment objectives (AO1, AO2 and AO3) were covered within the paper. The assessment included questions asked in both practical and theoretical contexts. Maths skills included calculation of a mean, mitotic index, magnification and actual size calculation. Reading data from graphs and use of data in table format to identify a trend.

Comments on individual questions/sections

Q.1 This question assessed mainly AO1. Many candidates were able to identify the role of the ions in living organisms in (a), however care should be taken in wording of answers e.g. used to **strengthen** bones, rather than used in bones.

Comparison of the two proteins in (b)(i) was completed well with many able to identify the secondary structures present and the overall structural level. Less were able to state they were fibrous or globular.

Accounts regarding lysozyme action for induced fit in (iii) were well answered by many. However, some candidates did not continue to say the active site would return to its original shape. Weaker candidates talked of the shape of the active site and substrate 'matching' or being 'perfect' in (iv), rather than on them being complementary to each other.

In (c)(i), most candidates could recall the test for protein and colour change, although some referred to Benedict's solution. Determination of protein concentration using the graph in (ii) was done well. Many responses for (c) (iii) were well answered, although stating that it 'would affect absorption' was not enough to gain the mark. Answers which stated that the chlorophyll would absorb the light gained credit. Not all candidates appreciated that there could be other proteins present in the samples in (iv).

Identification of the sources of error with the standard curve production were mixed for (c) v. Most could say that there were insufficient protein concentrations used and many stated reasons why the line of best fit was invalid. Few candidates referred to range bars or repeats being absent.

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Q.2 Most candidates could say why a stain was necessary in (a)(i) and some good responses gave an example of a stain. Weaker candidates referred to using food colouring or a pigment. The explanation for the use of a stain was often weak. Many candidates mentioned cell structures or organelles or DNA, when the required response was to make chromosomes visible. Part (a)ii was well answered in the main. Many responses referring to the cells being in interphase or had taken up insufficient stain to be visible. Strong responses showed a good understanding of the chromosomes not being visible to being decondensed. Part (a)iii was generally answered well by most. Interphase was identified by the majority of candidates as the longest stage of the cell cycle in (iv). Stronger candidates correctly explained why and gave an estimate of a percentage number of cells in interphase in the image. Weaker candidates did not refer to the image to form their explanation.

The only issue with calculating the mitotic index in (b) was rounding. For part (i) some responses stated that they would do more distances to increase reliability, rather than counting more field of views for each distance. Most could answer correctly for the significance of mitosis as producing genetically identical cells and for growth. Weaker candidates stated, 'repair of cells' or simply 'growth and repair', failing to qualify repair.

Q.3 Many candidates were able to read the graph and axes to access (a)(i). Weaker responses stated that the plateau was where there was no fluorescence. Part (a)ii was answered well in many cases, although fewer candidates referred to the fluorescence not returning to the normal level.

There were errors in the calculation of the magnification in (b)(i), it was unclear how many had arrived at their figures. There were also errors in the conversion from mm to micrometres. Part (b)ii was also mixed in success. Some failed to measure the line correctly, did not convert correctly or failed to give their answer to two significant figures. Many other candidates had no problem with either of these calculations.

For part (c) some candidates could not identify the nucleus or vacuole. These images are readily available via the internet in a labelled form. Candidates should be familiar with electron micrographs of cells and identification of the organelles from them.

Part (d)(i) asked why temperature should be controlled in this experiment. Some candidates responded that it was the independent variable. Few stated that the kinetic energy of the molecules would increase. Calculation of the mean in (ii) posed little problem for many candidates. It was still surprising that several candidates could not calculate a mean from given data. Part (d) iii required some deeper thought about the data presented. Good responses included data statements linked to the trend, going on to explain the effect of this on permeability. Weaker responses referred to the sodium chloride changing the water potential of the solution and affecting osmosis, so gained few marks. Some responses also failed to recognise that absorbance decreased means there was less pigment released. Part (d)iv was answered very thoroughly by many. Although some were confused and stated there would be an increase in fluidity and permeability as a result of the sodium ions presence. Modification of the method in (v) was well answered. Most could suggest a range of temperatures as the independent variable, many giving examples of the temperature which could be used. It was good to see responses suggesting the use of thermostatically controlled water baths.

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Q.4 Identification of the differences between DNA and RNA nucleotides in (a) was well answered with the highest facility factor on the paper. The use of letters T or U was not accepted as candidates should know the names of the bases and write them fully. Part (b)i was not a problem if candidates had read that it was the complementary mRNA that was required and not DNA. Part (b)ii was well answered by many candidates. They showed good learning of the stages of translation, and many achieved maximum marks, including all the marking points in thorough responses. Weaker responses began their account with transcription which was not asked in the question. Most could state translation and describe how mRNA attached to the ribosomes. Wording of responses relating to codon-anticodon interaction could sometimes be clumsy. Candidates would be advised to look at previous mark schemes to refine wording of answers to questions such as this.

Q.5 This was the quality of extended response question and some excellent answers were seen. However, many candidates failed to reach the highest marking band due to lack of detail or errors in part. This question had the lowest facility factor on the paper.

Strong responses included data from the graph and identified the stages of mitosis and meiosis correctly. They went on to link the changes in DNA content with what was happening at those stages e.g., homologous chromosomes or chromatids being separated. These were clear answers and were rewarded with the higher marks.

Weaker responses gave a list of the stages of mitosis/meiosis and no detail of why the DNA content had changed linked to the events of those stages. Some candidates simply stated that meiosis I was the same as mitosis and failed to reach marking points as a result. The graph was there to be used in the responses, those which said simply that the DNA mass increased/decreased had not used the data given. Some candidates gave lists of the letters from the graph and attempted to identify the stages. This was not necessary; many identified them incorrectly. Some responses regarding meiosis could give data from the graph but could not link the drop in DNA content to the processes of anaphase I and II. Candidates' responses to the final section of the question were mixed in quality. Stronger responses included that mitosis produces genetically identical daughter cells, not just identical cells. There were some errors in recall in terms of when crossing over and independent assortment take place in the cell cycle. Good responses referred to the restoration of the diploid number of chromosomes at fertilization.

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COMPONENT 2. BIODIVERSITY AND PHYSIOLOGY OF BODY SYSTEMS.

Overview of the Component

Candidates' performance covered a wide range of achievement. The majority were able to access marks within the mid to higher range. Many had a level of understanding worthy of high marks with only a minority showing a poor grasp of biological principles within this component.

All candidates attempted questions 1 – 5 and 97.7% attempted question 6, the QER assessment which carried 9 marks.

The highest facility factor (FF) was shown by questions 1 and 2 and the lowest by question 4.
All assessment objectives (AO1, AO2 and AO3) were covered within the paper.

Generally, candidates with a broader knowledge base were able to access more AO1 and AO2 answers than those with a poorer understanding of subject matter. Many applied their knowledge successfully to meet AO2 objectives and more able candidates showed they could evaluate information and reach logical conclusions required by AO3 questions.

Most candidates were able to calculate numerical answers correctly. A minority found the precision of plotting or interpretation of graphs problematic.

Difficulties in evaluating some practical problems were more common. Those who read the information given in the stem of the question carefully were more likely to make sensible suggestions.

All four major topic areas for component 2 were represented, namely; the relatedness of organisms through evolution and the adaptations of organisms for gas exchange, transport and nutrition.

Candidates were expected to use their knowledge of the above topics across a variety of organisms throughout the paper.

Comments on individual questions/sections

Q.1 This question had a relatively high facility factor suggesting that candidates could access many of the required answers with reasonable consistency but there were some noteworthy exceptions.

In (a), most candidates could extrapolate at least one feature of all three domains displayed in the format of a Venn diagram. A significant number found it difficult to identify two common features or identify one feature common to just two domains.

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The ability to link primary protein structure to an amino acid sequence was appreciated by most candidates in (b)(i), the majority of whom could explain the significance in terms of species relatedness. Some confused amino acids with bases. Most plotted 'X' at an appropriate point on the graph in (iii). However, for some, the 'plot' was not precise enough due to over thick lines or haphazard crosses, so the exact point was too far removed from the 69% line on the graph.- In (v), too many candidates failed to make a reference to structure (of wings) in their answer and the link to evolutionary origins was often unclear.

In addition to correct use of the equation in (c)(i), answers with decimal places should have been rounded to the nearest whole number. Some candidates did not appreciate that only whole numbers are appropriate for the number of moths. Most answers to (ii) stated at least one possible event that could interfere with estimating population size. References to reproduction (within 24 hrs) were not creditworthy unless specific to caterpillars emerging, as the stem of the question refers to larvae (caterpillars). References to moths 'giving birth' were rejected. For (iii), many valid and sensible suggestions stating at least one controlled variable were accepted. Answers that did not obtain credit often made vague references to temperature or repeated features already stated in the stem of the question.

Candidates were able to use the information given in (iv) to suggest how an increase in moth populations could affect biodiversity. Reference to a depletion of lime trees in isolation was not creditworthy unless clearly related to a consequence for biodiversity.

Q.2 This question had the highest facility factor. Candidates showed a good understanding of oxygen transport despite the unfamiliar comparison of fish species from tropical and polar water temperatures.

Most candidates were able to plot the p50 on the graph in (a)(i). Some showed poor precision, sometimes due to over thick pencil lines.

Oxyhaemoglobin dissociation curves generally followed the correct shape curve in (ii) but some failed to make a line that would be expected to reach the same (or similar) maximum % saturation as mackerel. The link between an increase in respiratory CO_2 and reduced affinity for oxygen was understood in (iii).

Most correct answers to (b)(ii) included the concept of increased surface area: volume and reduced diffusion distance. References to thin capillary walls were not given credit within the context of the question. Fewer candidates appreciated the importance of friction in slowing blood flow.

Providing evidence to evaluate the conclusion in (c)(i) was relatively straightforward but answers needed correct reference to figures from graph 2.4.

Many candidates were able to link increasing oxygen consumption with the need for haemoglobin or a higher heart rate in (ii).

Q.3 A lower facility factor here suggested that candidates were less confident about plant transport, particularly in phloem. There was also more variation in marks across the cohort than in other questions.

Much of part (a) required straightforward knowledge. The experiment described in part (b) is a familiar one.

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Many answers to (a)(i) listed two sinks for sucrose. Reference to 'shoots' was not accepted as the structure or tissue needed to be clear.

(Descriptions of phloem structure in (ii) were sometimes inaccurate. Of those, some suggested there were no organelles in sieve tubes or that they were 'empty' or failed to explain why structural features affected flow rate.

There were many correct descriptions of the effect of sucrose on water potential in sieve tubes in (iii). However, not all described the direction of resulting water flow or the effect on volume.

Many responses recognised that the observations in the stem of question (iv) suggested the use of energy although it was not always clearly stated. There were several irrelevant references to the presence of phosphate in molecules other than ATP. Statements describing cyanide as an inhibitor were only acceptable within the context of respiration specifically.

Candidates were able to calculate rate of transport of phloem correctly from the data provided in (b)(i). Failure to use the correct number of significant figures was the most common error.

Many answers to (ii) suggested collecting 'more data' with no explanation of what that data could be. Alternatively, finding a mean was stated with no explanation of what the mean would represent. Few concluded that some stylets may fail to yield any solution or collecting a larger volume of solution would be an advantage in detecting radioactive CO_2.

Some candidates realised that the exact measured position would be difficult to pin point with several aphids. Often, answers lost focus of the dependent variable which was distance (travelled by radioactive ^{14}C) and not the volume of solution collected.

Q.4 Although this was a shorter question, the lowest facility factor suggested that more candidates found parts of question 4 challenging.

Generally, (a)(i) was not answered well. Few candidates associated a fox with digesting more protein than a rabbit, in order to bring digestion within the context of the diet.

The majority of answers did not distinguish the role of the ileum in absorption or the significance of surface area for the purpose.

There were vague references to 'needing a shorter or longer gut' with no differentiation between structures or functions.

There was a very wide range of answers to (b)(i) with few able to identify the correct magnification of a suitable objective lens. Many assumed that the total magnification of the microscope was required so ×400 was a common error. Magnifications of many thousands were suggested despite the question stating that a light microscope had been used.

Those who had learned the pathway of glucose through epithelial cells gained all three marks in (ii). Some errors included stating incorrect functions of trans-membrane proteins or descriptions of facilitated diffusion and active transport in the wrong place.

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Part (iii) was answered well by many, although answers needed to indicate clearly where water would be travelling to rather than where it was coming from.

Q.5 The facility factor here was lower than most other questions but many candidates were able to gain at least half marks. Application of knowledge of human gas exchange was found to be challenging for some.

Understanding the purpose of an internal gas exchange surface in (a) was generally good although fewer candidates were able to describe the purpose of ventilation.

The action of muscles during inspiration was well explained on the whole in (b)(i). However the role of the pleural membranes was less well understood and did not always relate to the graph. Some candidates described expiration (which was not required) as well as inspiration.

In general, candidates who read the graph correctly in (ii), obtained both marks for the calculation. If not, the most common error was a miscalculation of the number of breaths taken during one minute.

Not all candidates were able to state a correct structure where CO_2 would remain in (iii) and seemed unaware that some air would not be exhaled fully.

Most found (iv) challenging despite being told to use the information in the table. More able candidates recognised that proportions of individual gases in the mixture can differ if the volume of one of the other gases changes.

In (c), many candidates recognised the spaces in the lung tissue of photograph 5.4A were enlarged and linked this to surface area correctly. A significant number of responses failed to refer to alveoli or air spaces.

Few candidates referred to increased tissue thickness or increased diffusion distance but this was an alternative point.

Q.6 The quality of responses was varied and marks spanned the entire range from 0 - 9 with most in the mid range. The mean mark was 5.1, suggesting candidates could draw upon a reasonable knowledge of parasitic adaptations.

It was encouraging to read answers that organised information logically and there were some well written examples that used the information effectively.

Generally, candidates were able to access more marks relating to the survival of the adult in the host stomach. Adaptations of the life cycle that would improve chances of reinfecting a primary host obtained fewer marks on average.

It was clear which candidates had noted key information within the stem of the question.

Some answers lapsed into descriptions of other parasites or included humans as a host. Irrelevant statements may have affected the mark awarded and in some, there was contradiction of the information provided.

A significant number of candidates were unsure what defined a host as primary or secondary.

However, the majority were able to include a reasonable range of relevant information.

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Supporting you

Useful contacts and links

Our friendly subject team are on hand to support you between 8.30am and 5.30pm, Monday to Friday.
Tel: 029 2240 4252
Email: science@eduqas.co.uk
Qualification webpage: AS and A Level Biology | Eduqas

See other useful contacts here: Useful Contacts | Eduqas

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WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk

[i] ***Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.***

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