



GCSE Examiners' Report

Biology
GCSE
Summer 2024

Introduction

Our Principal examiners' report provides valuable feedback on the recent assessment series. It has been written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and details how candidates have performed in each unit.

This report opens with a 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 then looks in detail at each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.¹

The information found in this report provides valuable 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	WJEC offers an extensive 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.wjec.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 12 months after the examination.	Portal by WJEC or on the WJEC 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 subject, rather than for each unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results, Grade Boundaries and PRS (wjec.co.uk)

¹ 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.

Exam Results Analysis	WJEC provides information to examination centres via the WJEC Portal. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	Portal by WJEC
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.wjec.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.	Portal by WJEC or on the WJEC subject page.
Become an examiner with WJEC.	We are always looking to recruit new examiners or moderators. These opportunities can provide you with valuable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner WJEC

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Executive Summary

The separate science GCSEs remain very popular with centres. The majority of the cohorts sit the higher tier. Some very able candidates sit these qualifications. The easing of the foundation tier papers which has occurred for a number of series continued to have an effect on the means and it is pleasing to see the majority of candidates attempting most of the paper. It is particularly noticeable in the performance in the first few questions. The performance on the higher tier papers was encouraging too. However, it was noted that some candidates entered for higher tier would have benefitted from sitting the foundation tier paper.

There were many examples of candidates not reading the questions carefully and / or taking note of information and instructions. There were also many who did not attempt question parts without answer lines even though the instructions for the question were in bold.

Recall of knowledge (AO1 questions) continues to be an issue for many candidates. Mathematical skills of candidates were generally good. Some incorrect substitutions were seen and this highlighted that units hadn't been considered or converted properly. Incorrect rounding was often seen. Candidates should be encouraged to show their workings, if incorrect answers are given they may be able to attain some method marks. Only the very able were able to answer questions based on ratios and percentage changes. Candidates should take note of the way the answer should be expressed. This needlessly cost many candidates a number of marks.

The literacy skills of the candidates highlighted a number of issues, frequent spelling, punctuation and grammar errors were seen. Many candidates struggled to communicate clearly and effectively e.g. incorrect terminology, vague responses. The presentation of responses often caused problems to examiners. When candidates were asked to give a qualitative response and to include data, often they didn't include the data. QER questions continue to cause issues for many of the reasons listed above, namely the recall of knowledge and the literacy skills of candidates. Scaffolding in these questions does increase the attempt rate.

Performance in the practical unit was very good, the mean between all the sciences was comparable. The areas for development are very similar to those listed above – qualitative responses were not clear, issues with units and incorrect rounding. Candidates are familiar with the key practical terms but it is the application to a situation they tend to struggle with. Performance in practical questions on the theory written papers was not as good at times as in the Unit 3 assessment. Interestingly if these questions had appeared in the practical task it is likely they would have coped with them well, e.g. variables, anomaly, repeatability etc. It is the transfer of skills which is the issue. However, interacting with graphs in a practical context was well done along with multiple choice answers.

Areas for improvement	Classroom resources	Brief description of resource
Improving Recall and AO1 skills	Knowledge organisers	A collection of sample knowledge organisers to support the learning of GCSE Biology.
Improving responses to different command words	Exam walk through	These resources offer practical hints and tips on

<p>and using information given in the stem of the question</p>		<p>how to effectively approach questions in the examination paper. Available for all units, the PTs with audio help and audio script in the notes will walk candidates through mock examination papers, helping them revise and practise useful exam techniques.</p>
<p>Improve knowledge of topic areas</p>	<p>Blended learning</p>	<p>The blended learning resources contains interactive self-study content covering all topics. Candidates may find this useful either as a recap or in flipped learning</p>

BIOLOGY

GCSE

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UNIT 1: FOUNDATION TIER

Overview of the Unit

This year's paper covered a range of topics from the biology specification including the heart and blood vessels, the alveolus and gas exchange, bioaccumulation, the carbon cycle, enzymes and food chains. The paper also included practical based questions such as the energy in food practical and an enzyme practical, as well as an example of a practical in a less familiar context in the overlap question. It was pleasing that most candidates attempted the majority of the paper.

Candidates were most successful in the first few questions where the answers were low demand and included exercises such as Cloze comprehension style word selection from a limited list of options, labelling diagrams choosing from a list of options or a True/False exercise. Candidates were supported with the direct recall AO1 questions with these types of prompts. Candidates were attempting to answer longer answer questions including the 3 mark question and the QER. Candidates were most successful at AO2 questions where they could use material provided in the question to help with their answers. Candidates were still able to gain credit across the entire paper, including the overlap questions, although the questions towards the end of the paper discriminated the performance of the candidates.

Candidates' maths skills were evident, and most were successful at low demand maths skills such as simple calculations and working out a mean but found substituting into a given equation more challenging. Some practical skills were evident such as identifying anomalous results and identifying independent and dependent variables, however identifying control variables was not so well answered.

Comments on individual questions/sections

- Q.1** Almost all candidates attempted most of this question. Most candidates were able to complete the missing labels on the diagram of the heart. Candidates struggled with identifying the function of the blood vessels both in part (b) and part (d). The most common mistake in part (d) was for candidates to use the term pulmonary for the arteries that provided the heart with its own blood supply. Candidates were able to choose the correct function of the valves.
- Q.2** Candidates generally found this question difficult, especially part (a) (labelling the alveolus) and part (b)(ii) (describing the adaptations of the alveolus for gas exchange). Most candidates attempted the gas exchange parts of the question. In part (b)(i) most candidates understood that respiration releases energy in cells. The other two parts of the question were not quite so well understood.
- Q.3** This question contained some simple calculations which the candidates were very successful at answering. Candidates were also able to successfully describe the health problems of consuming too much fat. Candidates were much less successful at part (d)(iii), with very few able to correctly suggest that heat energy is lost to the surroundings.

- Q.4** Candidates were successful at using the information given in the text to answer questions in parts (a)(i) and (a)(ii). Candidates were also quite successful at the calculation in part (b)(i). However, candidates were less successful at explaining the process of bioaccumulation for the reason for the deaths of the organisms at the top of the food chain.
- Q.5** A high proportion of candidates attempted the QER question which was pleasing. Pupils were most successful at identifying photosynthesis as the process of plants absorbing carbon dioxide, and many identified that the process of burning releasing carbon dioxide. Some were able to describe the process of feeding as transferring carbon from plant to animal, but often stated 'carbon dioxide' was transferred. Very few candidates included decomposition in their answers and hardly any referred to bacteria or fungi.
- Q.6** Candidates were quite successful at knowing the function of protease and lipase, and were able to use the results of the experiment to identify the optimum temperature of the enzyme. However, knowledge of enzymes denaturing at higher temperatures was poor and (b)(ii) was not well answered, although most attempted this 3 mark question. Candidates were not very successful at suggesting variables that should have been controlled in part (d), suggesting that practical skills are lacking.
- Q.7** Candidates were very successful at identifying the producer from the pyramid of numbers with most candidates getting this part correct. The most common mistakes on this question were candidates not using arrows in the food chain and identifying the producer 'grass' as the source of energy as opposed to the Sun. Candidates were aware of reasons why not all energy is passed on to the next stage of the food chain with the most common correct answers being used in respiration or lost in excretion. Candidates were able to attempt to draw the pyramid of biomass, the most common mistake here was candidates changing the order of the bars to grass, fleas, zebra, lion in order to make it pyramid shaped.
- Q.8** Foundation candidates struggled to identify the nutrients found in fertiliser and (a) was very poorly answered. Candidates were much more successful at practical maths skills on this question and were able to identify anomalous results and calculate means well. However, they found the practical skill of identifying inaccuracies and suggesting improvements very difficult.

BIOLOGY
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UNIT 1 HIGHER TIER

Overview of the Unit

This year's paper covered a wide range of topics from the biology specification and was of a similar standard and level of accessibility as the previous year's paper. The questions were a mix of familiar topics and practical work set in applied or contemporary contexts. All supporting images and graphs required to answer the questions were clearly identified. Presentation of work by many candidates posed a challenge to examiners, with the standard of handwriting and expression making it difficult to tease out any creditworthy responses.

Candidates performed well in the following topics/skills:

- food chains and food webs showing the transfer of energy between organisms and pyramids of numbers and biomass Q.1
- calculating means and identifying anomalous results, 2ci+ii
- evaluating scientific investigations, 2d
- calculation of magnification, 5aii+iii
- recognising controlled variables, 8biv

Some candidates found the following topics/skill challenging:

- correct use of scientific terminology, 2d, 3bii, 3c, 7d
- providing detailed knowledge in their answers, 3bii, 3cii
- eutrophication, 4c
- drawing a conclusion, 5b
- role of the stomata, 5bii
- identifying trends from a graph, 7a
- protein structure, 8a
- understanding command words, specifically describe and explain, 8bi+iii

Areas for improvement include:

- opportunities to practice mathematical skills in applied contexts, 3bi
- providing comparative responses, 3c, 6cii
- opportunities to address misconceptions during learning, 3c, 5bii, 6b
- evaluation of scientific investigations, data or surveys, 7d
- understanding the purpose of control experiments, Q.9

Comments on individual questions/sections

- Q.1** This question overall did not pose too much of a challenge for the higher tier candidates. However, it was surprising to see more than half the candidates failing to represent the food chain shown in the food pyramid correctly.
- Q.2** Most candidates were able to state at least one plant nutrient in part (a). Common errors seen were the stating of nitrogen and phosphorus instead of nitrates and phosphates.

Higher tier candidates managed to hold their own throughout most of this question.

Good responses were seen in part (d) demonstrating creative thinking and linking ideas from other topics, e.g. concepts of bias and random sampling from ecological sampling were applied when suggesting reasons for inaccuracies and suggestions for improvement.

A small number of candidates were limited by their ability to express themselves in writing. This was an issue seen throughout the whole paper. For example, in part (d) when trying to provide a suggestion for improvement, some candidates gave, “look at a wider range of tomatoes”. Look at is far too vague the candidate should be focussing on what they are going to do with the tomatoes, i.e., ‘measuring’ or ‘choosing’ or ‘picking’. Also, what do they mean by a wider ‘range’? This demonstrated a lack of understanding of technical terms.

Q.3 In part (a), some candidates lost marks because the arrow was not touching a cell. This was most common error apart from not being able to recognise the correct cells from the image.

In part (b)(i), many candidates who failed to get 3 marks calculated the total volume of plasma, but then did not know what to do with this value. A smaller number of candidates did not know how to write their answer to two significant figures. It is recommended that regular practice of mathematical skills in applied contexts should be used to familiarise candidates with the application of maths in biology.

Part (b)(ii) was the second most challenging item of this question. “Carry nutrients/waste” was a typical generic response showing a lack of detailed recall, or a lack of appreciation of the detail required at higher tier. It could also indicate a lack of understanding of terminology, for example candidates not recognising that nutrients and minerals hold different meanings.

In part (c), most candidates did well to gain at least one mark. The mark that was most often gained was to link the component of blood, such as red blood cells, with its function. Many candidates stated that, ‘red blood cells or haemoglobin was low,’ but failed to make the comparison with other patients or the normal by either use of the superlative, e.g. lowest {concentration/number} or a comparison, e.g. lower than {other patients/normal}. Some candidates explained, “Patient A has a lower count of red blood cells than the average.” This exemplified many responses throughout the paper where candidates used terms interchangeably, without regard to meaning. In this case, range and average have different meanings. Also, the table has a clear column heading – ‘normal range’. An excellent example of a response was, “Table 3.2 shows patient A has the lowest concentration of haemoglobin and red blood cells which carry oxygen in the blood around the body.” This candidate gained all three marking points for a maximum of two marks.

Part (c)(ii) proved to be the most challenging item of this question. In this item, candidates were asked to explain why patient **B** is most at risk of disease. Many used a comparison with the range, as they had done in part (c)(i), which was not valid here as there were two patients below the normal range for white blood cells. There was also the same issue of comparative responses discussed in item (c)(i). Candidates need to understand that if a question asks for a comparison, then a comparative response is required. They need to be taught to recognise question stems that require a comparative response. Interrogation of data could be used as a useful tool to help develop these skills. Many candidates also explained that white blood cells, “fight infections.” This answer lacked any detailed scientific knowledge to gain credit.

Q.4 Most candidates were able to recall the correct scientific term in part (a).

Use of **Table 4.3** to identify oxygen concentrations at two locations did not prove a challenge for most candidates. The most common error was concluding that the oxygen concentration at location A was moderate or moderate to high.

Eutrophication in various contexts has been a common question item over the years and it continues to challenge most candidates. It is a complex topic that draws together many synoptic strands within the year 10 content. As such, when presenting eutrophication in contemporary contexts it is worth using pedagogical techniques that allow learners to address and correct their misconceptions rather than approaching the topic as a flow chart that requires direct recall. The most common misconception that persists is that oxygen levels decrease due to lack of photosynthesis because the water plants are dying. Many candidates explained that bacteria or microbes feed on dead plants. This description would need to be qualified in the context of decomposition to gain credit.

Q.5 Part (a)(i) proved to be the most challenging item of this question. The surface view of a leaf appeared unfamiliar to many students and as such they were unable to label either cell type.

Calculation of magnification is a skill that has continued to improve. The number of candidates providing answers to part (a)(ii) in cm was very small. Most candidates were able to gain both marks in part (a)(iii). If a candidate calculated the magnification correctly, they were awarded full marks. However, if they did not calculate the magnification correctly, examiners looked for evidence of other maths skills such as unit conversion, e.g., “24mm x1000 = 24µm”. If units were missing, the conversion mark was not awarded. It is worth noting that it is the answer written on the line that is considered the final answer provided by a candidate.

In part (b), a common response that gained no marks was, “they open at 06:00 and close at 19:50.” These candidates did not realise that a conclusion required more than a description of the data in the graph, i.e., what is the significance of these times?

A common misconception seen in part (b)(ii) was that stomata open and close to control or reduce gas exchange. A misconception that continues to be seen is that stomata prevent water loss, but as the data in the graph shows, the stomata have not closed completely, therefore there would still be some water loss. A reduction in water loss would have been an acceptable response.

Q.6 Most candidates did well on part (a) in recalling the products of both aerobic and anaerobic respiration.

A misconception occasionally seen in part (b) was references to energy being produced. Energy is an abstract concept for candidates; however, they need to understand why ‘producing ATP’ is an acceptable response, but ‘producing energy’ is not.

Part (c)(i) proved challenging for most candidates. The item tested their ability to interpret an unfamiliar graph and apply an understanding of ATP as an immediate source of energy. This question was an excellent discriminator with only the most able candidates using the key provided with the graph to support their answers, e.g.,

“There is no ATP from anaerobic/aerobic respiration at the start of exercise.” Even though in part (c)(ii) candidates were instructed to use data from **Table 6.2**, some still referred to **Graph 6.1** in their answer. Biology questions specifically refer to any images, tables or graphs required to use when answering a question. Also, if the candidates are instructed to use data from a table or graph, then it is expected that their answer will contain data from the referred source. In this case a comparative use of data such as, “Aerobic respiration produces 38 molecules whilst anaerobic respiration produces 2 molecules of ATP per molecule of glucose,” was looked for.

Q.7 Most candidates were able to identify at least one trend from the graph. The most common trend identified was that “the mean age of death’ for both men and women was increasing.” Common errors seen were candidates referring to average life span or people living longer. When describing trends candidates need to use the labels provided in the axes of the graph. References to life span and people living longer were considered neutral and gained no credit or penalty. There was a tendency as well for candidates to quote data, but not interpreting the trend within that data, e.g. “The mean age of death for women ranged from 79 -82, whereas males 73-77.” Many candidates made a comparison between mean age of death of males and females, e.g., “mean age of death of females is higher than males.” This answer gained no marks because it is a snapshot rather than a change over time. If the candidate had written, “mean age of death of females is always higher than males,” they would have gained a mark.

In part (c)(i), many candidates did not link increased fruit and veg consumption with an increased intake of vitamins and minerals and their associated health. Some suggested that fruit and vegetables contained vitamins and vegetables and gained no marks because they had not addressed the question of how the **change** in consumption of fruit and veg benefited health.

An evaluation should identify relevant evidence and provide a judgment. When asked to evaluate in an exam, the evidence required will always be in the stem of the question. In part (d), Some candidates lost one mark even though they identified the relevant evidence, because they did not make a judgment. Incorrect understanding of scientific terminology was sometimes seen, e.g., the term ‘reliable’ was used to make a judgement. The only acceptable use of reliable would be in the context of improving a mean, e.g. repeat readings makes the mean more reliable.

Q.8 Part (a)(ii) proved to be the most challenging item of the whole paper with only a small number of candidates gaining a mark here. A common answer given to part (b)(i) was, “The intensity of light has decreased after iodine was added.” This response exemplifies a misunderstanding of key command words by candidates. They provided a description of the change in light intensity rather than explaining why it was decreasing. They also noted that iodine was added without explaining the effect of the iodine on the colour of the solution. Many candidates are taught to start an explanation with a description, and these often do provide a good start and end point to an explanation. The start point in this case was adding iodine and the finish was a decrease in light intensity. The challenge to the candidate was to link these two together in a coherent explanation, e.g., “The iodine would have turned blue/black if starch was present so would have decreased the amount of light passing through.”

In (b)(iii), The most common mark point awarded was the recognition that carbohydrase was added at 10 minutes. The mark point least awarded was starch being broken down into glucose. Many stated that starch was broken down but failed to add the further detail regarding glucose. All three of the mark points were awarded independently of each other. This item also had the same issues around candidates providing descriptions rather than explanations as previously discussed in (b)(ii). Most candidates managed to state at least one correct controlled variable in part (b)(iv).

The most common errors were as follows.

- Use of amount or how much rather than volume
- Distance of light – this was too vague. Referring to the diagram and stem you can see that it was the distance of the light from the sensor that was controlled.

The intensity of light in this investigation was the independent variable, however if candidates stated “the intensity of the light from the lamp” as a controlled variable, it was accepted as an expression of keeping the light intensity emitted by the lamp constant.

Part (b)(v) had the second lowest attempt rate of the whole paper. This suggests that candidates skimmed the question because there was no answer line and did not realise that they needed to annotate **Graph 8.3**. This is a problem also seen in the Biology Unit 2 paper this year where candidates did not attempt to label a diagram of the eye.

Q.9 This year the QER question was based on a classic osmosis demonstration which may have been unfamiliar to some candidates. The mean response was in the lower end of the middle band. The question had a higher facility factor than the previous year’s QER. To gain a higher band mark, candidates needed to include indicative content H or I, the points relating to the purpose of a control experiment. As most candidates found this concept challenging, the number of responses seen in the top band were low. Most candidates approached the question by describing the movement of water directly from the petri dish to the concentrated sugar solution. What many candidates found difficult was expressing the difference in water concentration or solute potential between two different areas, e.g., “the concentration in the distilled water was higher than in the potato”. This type of response was commonly seen. One of the best responses seen was, “The concentration of water in the distilled water is higher than the concentration of water in the potato. The concentration of water in the potato was higher than the concentration of water in the concentrated sugar solution. Therefore, water moved by osmosis from the distilled water through the partially permeable membranes of the potato cells to the concentrated sugar solution. This caused the level of the liquid to rise. Potato B was a control experiment used to show that it was the presence of the sugar solution that caused the movement of water.”

BIOLOGY

GCSE

Summer 2024

UNIT 2 FOUNDATION TIER

Overview of the Unit

This year's paper covered a range of topics from the biology specification including the structure of bacteria and viruses, stem cells, adaptation and classification, control of blood glucose and diabetes, natural selection, genetic engineering, inheritance and the nervous system. The paper also included practical based questions including a reaction time practical. It was pleasing that most candidates attempted the majority of the paper.

Candidates were most successful in the first few questions where the answers were low demand and included exercises such as Cloze comprehension style word selection from a limited list of options, or a True/False exercise. Candidates struggled with AO1 direct recall responses such as the definition of intraspecific competition or mutation. Candidates were more successful in these questions where support was given in the form of stimulus material such as images or options from which candidates could choose their response. Candidates were more successful at AO2 and AO3 questions where they could use information in graphs for their response and in questions that asked them to 'suggest' and answer. Candidates' knowledge of adaptation and classification was particularly strong, but the topics of stem cells and the nervous system were weak. Candidates were still able to gain credit across the entire paper, including the overlap questions, although the questions towards the end of the paper discriminated the performance of the candidates.

Candidates' maths skills were evident, and most were successful at maths skills such as calculating a mean and most were able to substitute into a given equation to calculate a percentage change. Candidates' practical skills were also good, especially describing a trend and graph skills such as reading from the graph, extrapolating from a graph and drawing bar charts. However, identifying control variables was not so well answered.

Comments on individual questions/sections

- Q.1** No areas to highlight
- Q.2** Candidates were quite successful at choosing the correct definition of a stem cell, although were less successful at naming the two types of stem cell despite the stimulus material provided in the form of an image.
- Q.3** This question was generally very well answered. Candidates' knowledge of classification was good, and most were able to use the table to identify the species most closely related and knew the meaning of the term vertebrate. Candidates' knowledge of adaptations was also very good, and they were able to use information given on an unfamiliar organism and successfully identify adaptations. Candidates were less successful at recalling the meaning of the term intraspecific competition.

- Q.4** Candidates were extremely successful at describing a trend from a graph with almost every candidate gaining this mark. Candidates' maths skills were also evident, and many were successful at reading from the graph, calculating a difference and also substituting into an equation to work out a percentage change.
- Q.5** This question was generally well answered. Candidates were especially successful in parts (a) and (b), completing tables and bar charts. Candidates struggled to recall the definition of a mutation but were more successful at the 'suggest' questions in part (c).
- Q.6** A high proportion of candidates attempted the QER question which was pleasing. Candidates were able to use the stimulus material provided to describe the process of genetic engineering, but candidates were generally less successful in recalling an advantage and disadvantage for genetically modified crops.
- Q.7** Foundation candidates were quite successful at completing the Punnett square in part (b)(i), however many lost a mark by stating the expected ratio as 2 : 2 and not expressing the answer in its simplest form, i.e., 1:1. In part (b)(iii), foundation candidates struggled to express themselves and lost marks due to incorrect use of terminology. Candidates sometimes referred to the Y chromosome being dominant, which was treated as neutral despite being incorrect.
- Q.8** Foundation candidates were not very successful at part (a) on this question, indicating knowledge of the nervous system was lacking. 'Eye' was accepted as an alternative to retina as very few foundation candidates were stating retina as the receptor. It was hoped that candidates would know that information is carried by the optic nerve from the eye to the CNS. However, this response was very rare with most foundation candidates who got the mark referring just to a 'nerve'. Candidates were much more successful at interpreting the results of the practical and were especially successful at calculating the mean. Candidates were successful in stating how the students could increase their confidence in their results in part (b)(iv).

BIOLOGY
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UNIT 2 HIGHER TIER

Overview of the Unit

This year's paper covered a wide range of topics from the biology specification. The questions were a mix of familiar topics set in applied or contemporary contexts with plenty of opportunities to examine candidates' scientific investigation skills. All supporting images and graphs required to answer questions were clearly identified.

The later questions in the paper discriminated well in the performance of candidates.

Candidates performed well in the following topics/skills:

- using Punnett squares to explain sex determination, 1bi.
- recall of knowledge, 3b, 4a, 7a, 7c, 8b,8d.
- understanding and application of ideas surrounding classification, 4b, 10b
- understanding of ethical issues involved in animal experimentation, 7b
- use of percentages to calculate values, 8a
- evaluating hypotheses, 2bii

Some candidates found the following topics/skills challenging

- expressing ratios in their simplest form, 1bi.
- understanding and application of scientific terminology or command words, 1biii, 3b, 5bi.
- providing detailed knowledge in answers, 2bii, 3d.
- controlled variables, 2biii
- labelling diagrams, 3a

Areas for improvement include:

- calculation of percentage change, 9a
- the requirement for a comparative response, 4ciii, 5bi, 10cii
- better use and application of correct scientific terminology
- understanding the purpose of control experiments, 5c

Comments on individual questions/sections

Q.1 Higher tier candidates had no problem with completing the Punnett square in part (b)(i), however many lost a mark by stating the expected ratio as 2 : 2 and not expressing the answer in its simplest form, i.e., 1:1.

In part (b)(iii), candidates lost marks due to incorrect use of terminology. Many referred to the allele or gamete instead of chromosome. Candidates need to learn the meaning of biological terminology as well as opportunities to apply their use when explaining. Some candidates only referred to the letters X and Y without explaining that they represented chromosomes.

The use of the terms dominant or recessive allele were seen quite often. This was treated as a neutral response and not penalised, even though it was plainly incorrect. Occasionally, use of homozygous and heterozygous were also seen.

Q.2 In part (a)(i), 'eyes' was accepted as an alternate answer for receptor, even though it was expected for the Biology Separate qualification that candidates should be able to provide retina as a correct response. 'Retina' was not commonly stated as the receptor.

Because part (a)(ii), was a common tier question, examiners did not hold out for correct sequencing when marking candidates' responses. Correct sequencing is a higher tier only requirement. What was looked for in responses was a clear expression that the 'nerves/neurones' carry an 'electrical signal' or 'electrical impulse'.

It was hoped that candidates would realise that information is carried by the optic nerve from the eye to the CNS. However, this response was rare with most candidates who got the mark referring to either 'nerve/neurone' or 'sensory nerve/neurone'.

The candidates were asked to evaluate a hypothesis in item (b)(ii). Some good responses were seen by higher tier candidates in giving evidence to support the hypothesis, e.g. "The mean reaction time is quicker for the students which is 394 ms whereas teachers are 438 ms". Here the candidate has used data from the table provided as well as interpreting the data. If the candidate has simply quoted data, e.g. "students are 394 ms and teachers are 438 ms", this would not have been enough as there is no interpretation of data. A common error seen was when candidates did not refer to the **mean** reaction time, e.g., "students got faster times than the teachers", this is incorrect as not all the students times were faster than the teachers. Some responses were also too vague, e.g., "One teacher had a faster reaction time than the others." In this example, who are the "others" referred to in the answer?

Item (b)(iii) was the most challenging part of question 2. The candidates were asked to state **one** variable that should have been controlled. A common response seen was, "The ages of the students and teachers." However, **Table 2.2** shows that the age of the students is all the same (15) and therefore does not require controlling. This answer is an example where a wrong response cancelled a correct response.

Most candidates got the mark for (b)(iv) by either referring to repeating, increasing the sample size or providing examples of reproducibility.

Q.3 Many candidates had left **Image 3.1A** unlabelled in Part (a). This item had the lowest attempt % for the whole paper. There is a tendency for some candidates to skim through papers and miss items without answer lines. It is worth encouraging candidates to cross each item number off as they go through paper to make sure they have not missed anything. Of those candidates that did answer this part, the most common error was either the arrow not touching the sclera or the arrow going too far through the sclera and touching the choroid.

Part (b) is a familiar question that did not trouble most candidates. However, occasionally components of the reflex arc were listed, e.g. motor neurone, effector. This suggests that some candidates did not understand the meaning of the term properties.

For part (d), an application of knowledge of the structure and function of the eye was required. This item is another example of where candidates lost marks due to lack of detail in their responses. E.g., "The diameter of the pupil will decrease when there is bright light which decreases the risk of the light damaging the eye, as less is getting in."

The second marking point was lost as it is expected that Biology Separate candidates should recognise that it is the retina is the structure in the eye that would have been damaged.

- Q.4** Part (a) was recall of knowledge and most candidates managed to recall both missing Kingdoms.

To gain the mark in part (c)(iii), candidates needed to compare the population density of the different districts to make a correct judgment. Better responses used the superlative when comparing, e.g. “Bhoktola, because it had the highest population density.” Other good responses made a direct comparison, e.g. “Bhoktola, because it had a higher population density compared to the other districts.” Some candidates used data, e.g. “Bhoktola, as it had 3.29 number/km²”, without any additional interpretation and therefore gained no marks. A common response was, “Bhoktola, as there is a high population density.” As there was no comparison with other districts, the candidates did not gain a mark.

- Q.5** In part (b)(i), candidates were asked to describe one difference in the growth of roots shown in two different images. If candidates are asked to “Describe one difference ...”, then it is expected that they’re answer is a comparative. Many candidates failed to do this. Some candidates do not understand the difference between the command words ‘describe’ and ‘explain’. Many candidates tried to explain the reason for the difference in root growth here and therefore gained no marks.

An understanding of control experiments has proved challenging to candidates over time. In part (c), some candidates managed to recognise the experiment with the seed grown on Earth as a control experiment. Many candidates referred to control or controlled variables or experiments. This demonstrates that candidates still have trouble understanding the meaning of some scientific terminology. Not many candidates gained the second mark here, suggesting the importance of a control experiment. Most provided a foundation level response, e.g., “to show the difference”, or “to compare”, and did not develop their answer further. Providing meaningful experiences of control experiments across all the sciences whilst developing practical scientific skills could be a way of improving candidates understanding of control experiments.

- Q.6** The use and limitations of a model to illustrate the effect of camouflage colouring in predator prey relationships is a specification statement, and examples of this type of model have appeared in previous past papers. Candidates who had encountered this type of modelling during their learning seemed to do well in this question. Part (c) proved to be one of the most challenging items on the whole paper, with very few candidates identifying two limitations. The most common limitation provided suggested that unlike prey, spaghetti pieces could not move.

- Q.7** Most candidates gained at least one mark in part (a). The most common cells identified in **Image 7** were Cells **B**, the myeloma or tumour cells.

Most candidates were able to provide an ethical advantage of using lab grown cells, e.g., “no mice are harmed” or “the mouse is unable to give consent.” A few candidates had responses like, “There is no destruction of a potential life”, suggesting a superficial understanding of ethical issues. This type of casual response is also often seen in the context of ethical issues linked to use of embryonic stem cells.

In part (c), most candidates understood the terms 'double-blind' and placebo'. A small number of responses referred to the placebo effect rather than a placebo drug as directed in the stem of the question.

- Q.8** Most candidates managed to gain both marks for the calculation in (a). There were numerous definitions proffered for the term stem cell in part (b) and most candidates managed to gain at least one mark for part of the correct definition.

Most candidates managed to identify the type of cell division that occurs when cells are grown in the laboratory in (b)(ii), however the most common error seen was to state that the daughter cells produced were "identical" rather than "genetically identical".

In part (c), the candidates were asked to suggest one way in which the scientific community could increase their confidence in the results observed. The information provided on page 18 demonstrated that the results were based on a trial involving one individual. Candidates who gained a mark on this item had obviously returned to the question stem before answering that the scientists should, "increase sample size". Many candidates unfortunately responded with, "Do more tests", and gained no marks. When evaluating scientific processes, candidates need look carefully at the context of the question before responding.

- Q.9** Once again, as in previous years, a percentage change calculation proved beyond most candidates in part (a). The most common error was to divide 10.4, the water intake on the day of the marathon, with 2.70, the water intake in the 24 hours before the marathon. Use of real-world data as well as past papers can be a good way to practice calculating percentage changes.

Part (b) was the QER question. The indicative content seen the least was reference to negative feedback or osmoregulation. Quite often indicative content E was missed when candidates were not detailed enough and referred to water in the body rather than in blood. Candidates sometimes referred to an incorrect part of the brain for indicative content B. However, this was overlooked during marking because detailed knowledge of the brain is not required for GCSE, and references to incorrect parts of the brain monitoring water levels were treated as neutral. A few candidates gave details of the kidney and osmoregulation beyond that required for GCSE level, e.g., referring to increasing permeability of the distal convoluted tubules. Occasionally this did lead to candidates losing marks by incorrectly stating, e.g. "tubule becomes less permeable to water therefore more water is reabsorbed." This illustrates the delicate balance between challenging candidates with knowledge beyond GCSE level and their ability to apply it correctly.

- Q.10** Part (a) proved to be a good discriminator, with some excellent responses gaining all four marks. The first mark point for 'antigens' was the one most missed by candidates. The role of the lymphocyte in producing antibodies was often overcomplicated with candidates losing marks for incorrect interpretations of the science, e.g. "The vaccine contains dead or weakened forms of the bacteria that release antigens which are recognised by lymphocytes which alert T-lymphocytes which produce antibodies to destroy the antigens and bacteria." For this example, the candidate loses the antibody mark on the principle of an incorrect response cancelling a correct response. The immune response is a challenging topic for candidates and teachers should bear in mind the level of understanding required for GCSE should balance the requirement to challenge and push higher attaining candidates.

Some candidates were unsure of the role of antigens in the immune response. Typical responses seen were, “The vaccine is detected as a foreign object The antigens recognise the foreign body”.

For (b), a comparison of trends was required. Some candidates seem not to understand the concept of a trend being a change over time and provided responses that just compared females and males, e.g., “the number of males diagnosed with gonorrhoea is greater than females.” This typical response is only a snapshot and does not reflect a change over time. Candidates also tended to write extended sentences that made it difficult for examiners to tease out any credit from the responses provided.

Part (c)(ii) proved a challenge to many. Once again, this question required a comparative response. Many candidates did not provide a comparison suggesting, e.g., “Gonorrhoea is symptomless in up to 50% of women.” This response is meaningless without reference to the data for males. An example of a good response was, “More women than men are unaware that they have it as in 50% of cases its symptomless and in men its only 10% of cases”
It was encouraging to see that most candidates in part (d) knew how to prevent the spread of an STI.

BIOLOGY

GCSE

Summer 2024

UNIT 3 PRACTICAL ASSESSMENT

Overview of the Unit

In this unit candidates are assessed on their practical skills including, forming hypotheses, recognising and preventing hazards and risks, recording and presenting data, understanding the variables that are involved in experiments, evaluating the success of the experiment and planning improvements.

The performance of candidates across all the tasks was pleasing with good evidence that candidates are familiar with practical work and the analysis of practical results. The tasks all proved to be accessible for most candidates who usually attempted all sections. Hypotheses were usually well done. Risk assessments were not well done. Candidates were usually able to record their results logically although units were often incorrect and correct rounding was an issue for many candidates. Many produced suitable graphs although many did not produce linear scales or suitable lines of best fit. Key terms such as repeatability and reproducibility were well-known, but many candidates were not clear in their responses and consequently lost marks in explanations.

Comments on individual questions/sections

Most candidates were able to make a sensible hypothesis in each of the 9 tasks, which linked the independent and dependent variables. The exception to this was the exothermic reactions experiment, where many candidates simply stated that the temperature would rise when zinc was added and did not link temperature and time.

In producing risk assessments, the most successful candidates linked the risk with a particular action in the method, such as spilling chemicals onto skin whilst pouring, and were able to suggest a sensible control measure for that risk. Less successful candidates often did not link the risk to an action, for example stating simply that water can burn you with no reference to either the action of pouring or the affected body part. It is still common to see reference to chemicals splashing into eyes which earns no credit. It was also very common for candidates to create a risk for experiments where there were no significant risks.

Section A - Tables of results

Most candidates produced well organised tables of results and recorded all their data. It was pleasing to see that most candidates included units in the table headings and not in the body of the table. Incorrect units such as C° or use of incorrect abbreviations of units (e.g. secs for s / seconds) was commonly seen, especially in the sweating tubes practical. In that task many candidates struggled to organise their table of results sensibly. In the exothermic reactions task, candidates were instructed to record the time every 30 seconds for 3 minutes. It was common to see the time recorded incorrectly with candidates recording 1.3 minutes for a time of 1 minute 30 seconds. Handwriting was an issue for many candidates, and particularly the legibility of numbers. In the cake cases experiment, candidates were required to determine the mean from 3 numbers. Almost all candidates knew how to calculate the mean, but errors in rounding their final answer meant that this mark was withheld.

Section B – Variables

Each of the 9 tasks included a section on variables. Candidates were usually able to identify the independent and dependent variables, and most were able to state the range of these variables when required. Many of the tasks explored how certain variables were controlled, and in common with previous series this was not well answered, with no clear indication of the apparatus used or the required measurement of that variable.

Section B – Graphs

The most successful candidates obtained most of the available marks in this section. However, a significant number of candidates made common errors that have been seen in past series. The choice of non-linear scales, particularly in the cake cases task, was commonly seen with many candidates scaling their x -axis in reverse. Many candidates also lost the scale mark as they failed to record a value at the origin. Where candidates chose sensible scales, plotting was usually accurate with errors mainly seen in plotting where multiples of values such as 0.15 were used. Lines of best fit continued to be problematic as many candidates simply joined the first and last point with no consideration of the spread of data above and below the line. Joining point-to-point is only usually acceptable in Biology tasks but this was seen commonly in all tasks.

Description of the results was often quite limited. Whilst the majority of candidates were able to describe a relationship between the independent and dependent variables in the graph, a description of the shape of the graph, where it was required for the second mark, was poor. A significant number of candidates do not understand “directly proportional” correctly.

In the exothermic practical, candidates would link the temperature increase to time but not follow this with a description of the subsequent decrease or levelling off.

Section B - Calculations

Across all the tasks, where candidates were asked to use equations, calculations were answered well by most candidates; these included calculations of speeds, heat energy released and uncertainty. Some candidates did confuse units particularly in the cup case speed calculation where m/s was used for cm/s calculations and vice versa.

Section B – Explanation of results

Linking practical results to underlying theory proved again to be challenging for many candidates. In the exothermic reaction task, many candidates failed to clearly link their results to the reaction pathway. Similarly, in the cake cases task, only the most successful candidates recognised that the speed should have been consistent and could sensibly comment on their results.

Section B – Use of practical terminology

It was evident that most candidates understood practical terminology such as repeatability, reproducibility and precision and understand what an anomalous result is. The most successful candidates were able to evaluate repeatability and use data to justify their responses. However, many candidates, whilst clearly understanding the meaning of the terminology, gave answers to questions that were too vague for credit, with responses such as all the results are similar, rather than focusing on the similarity of repeats. Poorer responses were characterised by a lack of reference to the data collected or presented.

Section B – Improvements

Many candidates were able to suggest suitable improvements, for example using a lid for insulation in the exothermic reaction experiment or video recording the drop in the cake cases experiment. Where candidates were less successful, they often used vague descriptions of improvements with no suggestion of how these would be used. There seemed to be a lack of knowledge or experience of higher precision instruments such as a burette or graduated pipette from many candidates in some centres.

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