Questions matter

GCSE

Biology

8461/2H

Report on the examination

Version: 1.0
June 2025

© 2025 AQA

Further copies of this report are available from aqa.org.uk

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

General comments

The demand of this year's questions compared favourably with those of previous years, with the mean mark increasing slightly from 2024.

It is important that students understand the requirements of the command words used in question papers to give them confidence in their approach to each question. Across the paper, students' ineffective articulation or lack of scientific detail meant that credit could not be awarded particularly for higher demand questions.

Illegible or very small handwriting continues to be an issue for many students - and centres should work with the students to support them in overcoming this. Students are reminded to use a black pen for writing to ensure answers are clear when scanned in for marking.

Mathematical skills across the paper were generally comparable with previous years, particularly when calculating a percentage and drawing and interpreting a Punnett square diagram. Many students become muddled and make conversion errors in calculations.

From the Required Practical Activities assessed in this paper it is clear when students have been given sufficient opportunities to not just complete them, but to interpret any data collected and consider the validity of the methods used. Students that have not been given these opportunities are at a significant disadvantage, and this is often evident in their performance.

Students are reminded that any chemical formula used should be in the correct format e.g. CO_2. Credit will not be given for incorrect formulae such as CO^2, CO2 or Co_2.

Levels of demand

Questions are set at three levels of demand for this paper:

- standard demand questions are designed to broadly target grades 4–5
- standard/high demand questions are designed to broadly target grades 6–7
- high demand questions are designed to broadly target grades 8–9.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (Standard demand)

01.1

This question required students to apply their knowledge of fossil formation to the specific example of an ichthyosaur fossil.

© 2025 AQA

Only two steps in the fossilisation process were required to score full marks, so misunderstanding or omission of one step, was not critical. Almost a third of students achieved both marks.

Many students showed good knowledge of the first step in fossil formation, often referring to sediment, or an appropriate synonym; however, some also referred to the dead animal being buried in 'rock' or in 'rocks' which disqualified this idea. Whether this burying occurred before or after decay was not important in the award of the mark.

Although many students were aware that the dead ichthyosaur had decayed, they were often imprecise in terms of what had decayed. Many described the whole 'body' or the 'tissues' decaying, which implied that both soft and hard material decays. Some were able to recover this point with statements such as 'the body decays, leaving the bones behind'. Very few students referred to the soft tissues being eaten (by detritivores).
Students were commonly well versed in the idea of mineralisation of bones.
There were some excellent answers showing that students had revised this topic well, often giving all three points on the mark scheme in clear and concise detail.

01.2
Students were provided with the length of the fossil image and the relevant magnification factor and were required to calculate the real length of the fossil.
The majority of students completed this calculation well with a pleasing 80% gaining all 3 available marks. The most common error was in converting millimetres to metres, where a conversion factor of 100 was not uncommon. Some students completed the conversion in two steps, first converting to centimetres, then to millimetres, perhaps showing a lack of confidence in their maths, at the start of the paper.
A not uncommon error was for students to use the magnification equation, with the two values as numerator and denominator. It was rare then, for students to attempt to convert their answer to metres.

01.3
Students were required to recall the classification hierarchy, completing a partial classification using given terms.
This was very well attempted with nearly 90% of students gaining both marks. It was clear that many students had remembered the sequence by using a mnemonic, often written alongside the question. However, less successful students occasionally confused population for phylum, presumably due to the same initial letter.

01.4
Students were required to suggest causes for the extinction of ichthyosaurs, and over 80% of students gained at least one of the available marks.
Although this should not be an unfamiliar question to students who have practised from previous examination papers, the context of the information provided meant that some general answers were insufficient. The information in the question was that ichthyosaurs lived in the sea, consequently 'drought' was not credited. Similarly, the information provided stated that ichthyosaurs were in competition with other predators for food, thus a 'lack of food' was ignored, as was the presence of 'predators'. For this last idea, a mark could only be awarded if any predators were described as being 'new'.

© 2025 AQA

The question was well answered, common correct responses included reference to 'disease', 'natural disasters' and 'habitat loss', although all of the possible answers were seen frequently.

Question 2 (Standard demand)

02.1
Students were given a method for an investigation into numbers of daisy plants growing in a field at different distances from the tree. Three quarters of students knew that the steps were repeated to remove all the water, or to ensure all the water had evaporated. Common incorrect answers seen included 'to improve accuracy', 'to identify anomalies' and 'to remove excess water'.

02.2
Students were given data from an investigation into the number of daisy plants growing at different distances from a tree. They were asked to calculate a percentage and give their answer to the nearest whole number. This calculation was attempted by over 95% of students, with a pleasing 80% being awarded the full 3 marks. Of the students that did not gain all 3 marks, those that showed their working out were able to gain one or two marks. Students should be encouraged to always show their working out for calculations.

02.3
A pleasing number of students were able to describe the effect of distance from the tree on the percentage of water in the soil – with almost 90% gaining credit. Students that simply stated 'it increased' did not gain credit as reference to both the distance and the percentage of water were required for the mark.

02.4
Students were asked to consider changes to the investigation that would increase the validity of the student's conclusion. Bullet point 1 was most commonly seen, although students stating simply to 'repeat it' without further qualification could not be given credit at this level of demand. Around 75% of students gained at least one mark for this question.

02.5
Around a quarter of students were able to suggest three abiotic factors that might have caused more daisy plants to grow further from the tree, with a further half of students gaining two of the available three marks. The full range of possible correct responses outlined on the mark scheme were seen, with light being the most common. A few students negated a correct abiotic factor by suggesting the tree (biotic) was the cause – for example 'shade from the tree'.
Vague answers such as 'soil' or 'weather' did not gain credit, and despite being told in the question not to refer to water, a small number of students referred to rainfall, humidity or drought which again could not be credited.

Question 3 (Standard demand)

03.1
Almost 60% of students were able to correctly define geotropism. Of those students who did

© 2025 AQA

not achieve both available marks most were clear that a tropism affected the growth of the plant but were unclear of the link between geotropism and gravity, with references to geographical features being a common incorrect response.

03.2

This extended response question required students to plan an investigation, with some examples of equipment suggested. It was clear that many students had carried out the required practical on tropisms assessed in this question. Around 50% of students reached Level 3, with the majority of those gaining full marks. Those that did, successfully described investigating at least 2 light regimes as well as measuring/observing results and giving several control variables.

Some students that did not gain full marks did so for predicting the results, rather than describing how to take final measurements and/or observations in the investigation. The vast majority of students scored some marks due to being able to list control variables. Some students thought placing seedings on a windowsill would give them all-round light and therefore provide a comparison with the seedings placed in the box with a slit.

Just over 15% of students were limited to Level 1 mostly due to being unable to provide a comparison between the effects of unilateral light and all-round/no light.

03.3

This was a well answered question by the majority of students with 90% being able to name the hormone auxin. Where incorrect responses were seen, it was usually for naming a different plant hormone – such as gibberellin.

03.4

Almost 90% of students knew that an uneven distribution of the hormone controlled the plant's responses to the direction of light.

03.5

This question required students to explain how a plant's response to light aided survival. Many students used up much of the available space describing how unilateral light influenced the uneven distribution of auxin, resulting in uneven growth of the stem. This was not required, as the question asked how this response was advantageous to the plant. These students then often omitted more than passing reference to the focus of the question, perhaps stopping at the idea that this allowed the plant to receive light. Many students seemed unaware that even if the leaves are directed away from the light source, they will still be able to absorb light. What was required in responses was that by facing the light source, leaves could absorb *more* light, allowing *more* photosynthesis resulting in *more* glucose being produced. Those students who did not incorporate the idea of 'more' into their answers could gain one mark for linking two of the critical processes of light absorption, photosynthesis and glucose production.

Most students could make a connection between plants absorbing light, allowing photosynthesis to happen (and producing glucose) – allowing students to gain the compensation mark - as they neglected to mention these processes would be increased or maximised by the response to light. A quarter of students gained 2 marks, usually for stating that more light was absorbed and linked this to increased photosynthesis. Mark point 3 was least commonly seen.

© 2025 AQA

Question 4 (Standard/high demand)

04.1
Almost all students attempted this question, with just over 80% of gaining the mark. ADH and FSH were the most common creditworthy answers seen. Common incorrect answers, although seen relatively rarely, included adrenaline, thyroxine, and progesterone.

04.2
Only a third of students gained credit in this question. Whilst many students were able to begin their answer to this question, a number did not give sufficient detail at this level of demand to gain the mark. Stronger responses often covered several marking points in one succinct sentence e.g. 'The hGH would be digested by protease into amino acids within the stomach and so would not be absorbed into the blood', whilst those that were less successful did not refer to either what would break down the hGH, or where this breakdown would occur.
A significant proportion of students cited the stomach acid as breaking down the protein, with many going on to refer to denaturation of enzymes. A number also referred incorrectly to the hGH 'dissolving', rather than being digested.
Some students misunderstood the question and wrote about the hormone taking longer to get into the blood stream if taken orally, rather than focussing on the hormone being digested as a protein. Other less successful responses correctly recognised that the hormone would be digested but implied that the products of this digestion would work in the same way as the undigested hormone when later absorbed into the bloodstream. The idea of lack of absorption because the hormone was 'too big' was also seen relatively frequently.

04.3
This question differentiated well, with the full range of marks awarded. While a quarter of students scored no marks, a third of students were able to gain 3 or 4 marks. High level responses often went beyond the scope of the specification, using terminology such as recombinant DNA, restriction enzymes / endonucleases and DNA ligase in the correct contexts. 'Sticky ends' also featured frequently with some good descriptions of how these were used within the process. Some students confused 'ligase' with 'lipase' which meant that they were unable to earn credit for mark point 4.
A very small minority of students answered the question in relation to production of insulin rather than hGH, but a number of responses detailed parts of the process of adult cell cloning, rather than genetic engineering.
Some students found explaining the process of genetic engineering difficult and used only the information provided in the question. Reference to plasmids as vectors for mark point 3 and the sweeping statement 'using enzymes and plasmids' were not creditworthy without further qualification as this information was given to them in the question.
Less successful responses often confused the role of the hormone and the enzymes in the process, with the enzyme occasionally being inserted into the plasmid, or the hGH hormone itself (rather than the gene) being cut out, or placed into the plasmid/bacteria.

04.4
50% of students scored no marks on this question. Students are reminded that when answering 'compare' style questions they should make it absolutely clear to what they are referring when writing in the converse and to be mindful when using the word 'it'. In the

© 2025 AQA

context of this question, 'it' referred to the hormone produced by genetic engineering as this was the subject of the question and therefore, an answer of 'it might spread infection' is incorrect. There was a significant number of responses where marks could not be awarded due to this lack of clarity.
Bullet points 2, 3 and 4 were the most commonly awarded, although for bullet point 4, a lack of qualification relating to the disease being passed on or spreading to humans (rather than the disease just being present in urine) meant this bullet point could not be awarded.
A number of uncreditworthy responses referred to the difficulties in physically collecting the urine from the animal, as well as ideas that the recombinant hormone is simply 'cheaper', 'easier', 'safer' or 'quicker'. A significant proportion of students described recombinant production in purely hygienic terms (e.g. 'cleaner' or 'more sanitary') without recognising it is easier to purify.
Only a very small number of students were able to access bullet point 6, often due to a lack of precision with their wording; many students did state that it was a 'specific human hormone' but often neglected to go on to relate this to effectiveness.

Question 5 (Standard, Standard/high and High demand)

05.1
This question required students to give two uses of the peat removed from peat bogs. Over 50% of students gained one mark, with a pleasing 25% gaining both marks available.
'Combustion' and 'fuel' were the most common answers seen, with only 1% of students not attempting the question. The most common incorrect answer given was 'fertiliser', or a description of the role of fertiliser.

05.2
Only 40% of student gained the mark for correctly defining biodiversity. Those that fell short of the mark generally did so for not using the term 'species' in their answer. Some students referred to 'the species of plants and animals' which did not include all other species such as prokaryotes and so could not gain credit.

05.3
This was a levelled response question which was marked holistically.
Students were required to give a detailed explanation of how the destruction of peat bogs could affect biodiversity both in the local area **and** globally. Just over a third of students only gave a one-sided explanation of either the global or the local effects and consequently were restricted to Level 1.
Just over 10% of students gained credit in Level 3. Such answers included details of global and local effects of peat bog destruction, alongside clear explanations of the impact on biodiversity.
Around 40% of students gained credit in Level 2, falling short of Level 3 often due to having less effective explanations for local effects, while still giving clear explanations of the impact of global effects. While many students mentioned local habitat destruction, or lack of food – this was rarely linked with death/extinction of *species* – but instead referred to death/extinction of animals/plants/wildlife which was not sufficient for credit. Most answers, however, gave detailed descriptions of carbon dioxide release either directly, or by combustion and/or decay of peat – linked with the consequences of this on global warming, climate change and habitat destruction.

© 2025 AQA

Students are strongly encouraged to engage in regular practice with this question type during their studies and revision, paying particular attention to formulating a balanced response that addresses the entirety of the question's scope.

Question 6 (Standard, Standard/high and High demand)

06.1
Over 70% of students identified the correct cell division that represented mitosis.

06.2
Over half of students identified cells A and C as being genetically identical.

06.3
Just over 85% of students gained the marking point here, knowing that cell J had 23 chromosomes. The most common incorrect response was '23 *pairs*'.

06.4
Students appeared to struggle with the high demand of this question, with only around 15% of students gaining the mark. Knowledge of the *stages* of meiosis is not required for this specification – as such the exact point that the reduction in chromosome numbers happens is not needed, hence, it was reasonable for students to give an answer of 5 or 6 depending on their interpretation.
The most common correct answer was '6', and there was a range of incorrect responses, with '4' being the most common. Some responses gave a list of letters without a number which did not answer the question.

06.5
Students struggled to clearly explain why offspring produced using runners are genetically identical. While many students correctly identified mitosis as being involved for mark point 1, simply stating that offspring were 'clones' was not sufficient without mentioning mitosis. 30% of students gained 1 mark – overwhelmingly for mark point 1. Mark point 2 was rarely awarded due to ineffective articulation at this level of demand. Even answers containing pertinent details often struggled to fully meet the mark scheme requirements. Additionally, many students focused on describing asexual reproduction, with answers such as 'only one parent is required' or 'no gamete fusion,' rather than explaining **why** the offspring were genetically identical. Some described mitosis as producing two genetically identical cells, but this was insufficient to explain why the whole plant was genetically identical.
Despite detailed attempts by most students, only 1% of students gained both available marks.

06.6
Only 10% of students managed to gain any marks in this question. Again, features of sexual reproduction were given, with little additional detail explaining why the offspring produced using flowers, fruits and seeds are not genetical identical. To earn mark point 1, students needed to explicitly link meiosis with the production of gametes, a connection rarely seen in responses that typically mentioned one without the other. Mark point 2 proved highly demanding due to its strict detail requirements. Many good attempts were seen but

© 2025 AQA

unfortunately lacked the precision needed at this level of demand. A very common error was the suggestion that meiosis actually produced the flowers, fruits and seeds which is incorrect.

06.7
One fifth of students were able to describe at least one advantage of asexual reproduction to the survival of the strawberry plants. For bullet point 1, a direct comparison to sexual reproduction had to be made, but many responses did not use this comparative language. However, if awarded bullet point 1 was by far the most common correct response seen.
For bullet points 2 through to 6, a clear link to a survival advantage was required. Many responses stated that 'less energy was needed', or 'only one parent needed' but then did not link it to the appropriate survival advantage and as such could not be awarded credit.

06.8
This question was set at very high demand with only a quarter of students gaining at least 1 mark. Bullet point 1 was the most common advantage of sexual reproduction given – articulated in many ways to match the variety of options on the mark scheme. Responses such as, 'genetic variation will decrease the chance of a disease killing all the plants' was most commonly awarded – which equated to 'genetic variation gives selective advantage' gaining one mark. Several good answers were seen but sadly students had only referred to 'variation' and not 'genetic variation' and so could not be credited. In addition, some responses correctly stated that 'seed dispersal would lead to less competition' but then didn't qualify this with any of the required examples from the mark scheme and as such were not credited.

Question 7 (Standard/high and High demand)

07.1
Almost three quarters of students could identify the median result in Table 3.

07.2
Many students made a good attempt at calculating student B's reaction time, and .only made incorrect attempts to convert seconds to milliseconds.
75% of students scored at least 3 marks. Students were mostly able to substitute values into the equation and work this out correctly to gain mark points 1 and 2 quite easily.
Errors were seen when some used their median value from Question **07.1** rather than the mean from Table 3 when substituting into the equation. Students are reminded to read the question detail carefully. There was a significant number of students who were unable to convert numbers from one unit to another by the necessary factor. As part of their studies, students should regularly practise calculations involving prefixes and powers of ten for orders of magnitude.

07.3
Just under 20% of students were able to describe two ways the investigation could be improved, with a further 40% gaining one of the two marks available. It was clear that many students had completed the investigation, but as in previous years still found it a challenge to articulate their ideas clearly. For bullet point 2 in particular, students gave vague statements such as 'drop from same height' or 'start with ruler between the finger and thumb' which were not credited. A significant number of students incorrectly suggested adding another

© 2025 AQA

independent variable would improve the investigation, such as giving caffeine or alcohol or introducing a distraction.

07.4
This question was widely attempted, with about half of the students achieving 3 or 4 marks. Students generally identified the eye's function as a receptor and gave the correct sequence of impulse transmission via neurones. A notable error, however, incorrectly placing the receptor in the skin. The optic nerve's role and its connection to the brain were rarely mentioned. However, it was pleasing that many students successfully identified the role of chemicals, often specifying neurotransmitters, in synaptic transmission. For mark point 6, a significant number of responses did not gain the mark due to not giving a location for the specific muscle involved in the response. Similarly, some students mentioned the location of the muscle but did not state that it contracts.

Question 8 (Standard/high and High demand)

08.1
A third of students gained both available marks for this question. Many students were able to correctly identify HH as the genotype. The alternative correct response of 'homozygous dominant' was also used by some students. A significant number gave incorrect answers of H, Hh and hh, whilst a few simply wrote heterozygous or homozygous. It was also clear that a significant number of students did not know what 'genotype' meant and wrote answers such as black or Himalayan. Some students used different letters to the required HH and did not include a key to indicate what their letters represented, so could receive no credit.
Some students were able to write very clear explanations for their selection of the HH genotype that matched one the three alternatives on the mark scheme. Some students wrote answers that successfully explained their answer of HH using a reverse logic.

08.2
A pleasing 40% of students were able to successfully draw a fully annotated Punnett square diagram and use it to give the probability of offspring being white – achieving full marks.
Many students were able to use the correct gametes for both parents, gaining mark point 1.
Students demonstrated good skills in deriving offspring genotypes in their Punnett squares even when their selected parental genotypes were incorrect and so gained mark point 2.
The commonest error for this question was the omission to clearly identify the phenotypes for each of the given offspring genotypes for mark point 3. The terms 'homozygous' and 'heterozygous' were used frequently to describe each phenotype, so did not gain credit.
Many students were able to give the correct probability from their Punnett square for mark point 4 to be awarded. Those students who chose incorrect parental genotypes of Hh and hh often subsequently gave 50% as their probability from correctly derived offspring, so could gain credit. A small number of students who ended up with HH, HH, Hh and Hh as their four offspring genotypes thought that the Hh genotypes were white.

08.3
Only 1% of students achieved full marks for this question, with 60% gaining no marks or not attempting the question. Many had an idea of how protein synthesis works but there was much confusion evident, for example amino acids coding for a gene or a protein, rather than the base triplet coding for an amino acid. The first mark point was not achieved by the vast

© 2025 AQA

majority of students, with some referencing codons or bases but few referred to a triplet or 3 bases. Many students then incorrectly stated that 'a different amino acid or protein was *made*', rather than 'a different amino acid was coded for'.
The final two marking points were most commonly seen among the 15% of students that scored 2 marks in this question. Several students were familiar with and could explain the idea of the active site changing shape and the consequences of that change in that the substrate would no longer fit to it.

08.4
Nearly 60% of students could give a partial explanation as to why the fur was white in the first four weeks of life – gaining at least 1 mark. Responses needed to specifically refer to either the temperature of the nest or the mother's body temperature – rather than the body temperature of the young rabbit.
Many students were able to explain the idea of the tyrosinase/enzyme not working above 35 °C, but a significant number went on to state that the enzyme was denatured which therefore precluded them from the second marking point.

08.5
Three quarters of students were able to score at least 1 mark in this question, with less than 5% of those gaining all 3 available marks. Some students correctly mentioned the outside environment being colder, but many referred to the young rabbit's body temperature falling, rather than just its extremities. A considerable number of students incorrectly stated that the body temperature of the young rabbits was between 15°C and 25°C. Correct ideas for mark point 2 were rarely awarded.
Many students were able to correctly state that the tyrosinase was now active for mark point 3. Some students showed confusion between tyrosine and tyrosinase here – missing out on mark point 3 if they did so.

08.6
Over 70% of students gained at least one mark for their partial explanation of the advantage of producing melanin when exposed to bright sunlight. Most students were able to correctly explain that UV radiation causes skin cancer (or just cancer) with the vast majority achieving this mark point. The idea of UV radiation causes mutation or DNA damage (which then led to cancer) was much less commonly seen.

Question 9 (Standard, Standard/high and High demand)

09.1
This question required students to provide two conclusions about the percentage of people with Type 2 diabetes, from data provided in the form of a bar chart. Two thirds of students scored 2 marks on this question.
Referring to 'diabetes' was sufficient for credit to be awarded, although 'it' was insufficiently clear without some qualification. Any student referring to Type 1 diabetes could not gain credit, but this was extremely rare.
Most students gained at least one mark, with nearly all describing the effect of age on the prevalence of Type 2 diabetes. This could be phrased in terms of an overall trend or a

© 2025 AQA

description of one or other end of the age range. Some students referred to both ends of the age range as their two conclusions but could only be awarded one mark.

Descriptions of the effect of body weight on the prevalence of diabetes proved to be a little more problematic, with some suggesting that 'overweight people' have the highest percentage of diabetes; unfortunately, these students had not used the key sufficiently well, as 'overweight' was the middle category of body weight. Hence, students who described one or other end of the body weight scale were most successful, with answers such as 'diabetes is more common in obese people'.

Some students were confused by the information and wrote about the effect of age on body weight, 'people get more obese as they get older', which was not supported by the information and gained no credit. Other students attempted to describe both trends in one statement, often not clearly describing either trend.

09.2

Two thirds of students correctly identified the mean percentage of Hb-G after 12 weeks as being 7.65%

09.3

Around a third of students did not gain any marks in this extended response question. For credit, students were required to analyse information about two clinical studies on diabetes treatments. Students were expected to evaluate both the methods used and the effectiveness of the treatments in detail to be awarded a mark in Level 3 – achieved by just 20% of students.

The high demand of this question meant that a single statement for each of the usefulness of the drugs and the methods used was insufficient to access the lower mark in Level 1.

Many students did attempt to compare the usefulness of the drugs, with answers such as 'both drugs lower Hb-G levels', which even if seen in reference to the two drugs in statements well apart in the response, were still credited. Furthermore, a correct comparison of the relative impact of the two drugs in lowering Hb-G levels could gain credit for both drugs lowering Hb-G levels and for drug A having a greater effectiveness in this respect. However, many students referred only to the drugs 'changing Hb-G levels' or even for 'drug A changing Hb-G levels more than drug B' and could not gain credit for either of these statements.

In terms of comparing the methods used in the investigations, many students simply restated the methods or suggested alternative methods, such as 'investigation 1 should have used a placebo' which was not a clear comparison of the methods and gained no credit.

Some students were confused by the numbers of patients involved in Investigation 2, believing that only 1 patient had taken the drug, and 630 patients had been given the placebo.

Students should practise questions of this type in their studies and revision, as the command word 'evaluate' was not well understood in many cases. This requires students to make comparisons; in this case of the two investigations.

© 2025 AQA

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

© 2025 AQA and its licensors. All rights reserved.