AQA
Questions matter

AS

Biology

7401/1 Paper 1

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

This paper proved to be more challenging than last year. Several questions (06.3, 07.3, 07.4 8.3, 8.4, 9.2 and 9.3) caused difficulties for students. These questions assessed students' ability to apply their knowledge and to analyse, interpret and evaluate scientific information. The responses to questions 8.3 and 8.4 assessing practical skills, and to question 7.4 assessing evaluation skills were particularly disappointing. However, some excellent answers were seen from well prepared students. There were also some excellent responses to questions assessing knowledge and understanding, for example when describing the semi-conservative replication of DNA.

As usual, there was considerable variation in the ability of students to answer questions assessing mathematical skills. It was evident in some responses that students had misinterpreted or failed to take note of the command words. Examiners commented that handwriting on occasion was very difficult to read.

.

Question 1

01.1 Over 75% of students correctly labelled both parts of the amino acid for the one mark.

01.2 Despite almost 90% of students obtaining at least one mark, this question proved to be an effective discriminator. Most students correctly stated a peptide bond was formed between the two amino acids, but fewer students could correctly state that a dipeptide would be formed.

01.3 Approximately 70% of students correctly identified serine as the amino acid joined to alanine.

01.4 Two thirds of students were able to obtain at least one mark on this mathematical question on ratios. Many of these students correctly calculated the number of amino acids in a heavy chain using the ratio provided. One method used was to divide 1322 by 3.13 and then multiply this by 2.13. This answer of 900 amino acids scored one mark as it was the number in both heavy chains. Dividing this number by two gave 450 and gained both marks.

Question 2

02.1 The diagram of an ATP molecule does appear in the specification. Despite this, students had difficulty completing **Figure 4** to show the labelled components of this molecule. A wide variety of drawings were seen. The bonds had to correctly come off each side of the pentagon to gain mark point 2. Labelling the components proved a challenge for some students. Ribose rather than pentose was required. Some students incorrectly labelled the base adenine as adenosine. One third of students obtained both marks.

© 2025 AQA

02.2. This question proved to be an effective discriminator. Approximately 22% of students obtained all three marks and approximately 86% at least one mark. Some students do appear to find the role of ATP confusing. The question stated that phosphate is released from ATP, so the correct process of hydrolysis and enzyme ATP hydrolase was expected. Some students incorrectly discussed ATP synthase and the formation of ATP in their answer rather than ATP hydrolysis. To explain how the phosphate is used by cells many students correctly referred to phosphorylation. However, far fewer students explained that phosphorylation makes substances more reactive to obtain mark point 3. An area of misconception was that phosphate makes cells more reactive rather than the substances within them. Some students simply stated that 'ATP is used in respiration' rather than stating its specific role in making glucose more reactive.

02.3 This question proved to be the most effective discriminator on the paper**.** Approximately 25% of students obtained all three marks and two thirds of students at least one mark**.** Many of these students appreciated that co-transport is involved in the uptake of glucose. Good answers correctly outlined the role of sodium ions. Weaker answers just stated that glucose was absorbed by active transport and defined the term rather than explain the co-transport of glucose with sodium ions. There were some excellent answers of this process which gained full marks.

Question 3

03.1 This question assessing knowledge and understanding proved to be the second most effective discriminator on the exam paper. Approximately, a third of students obtained maximum marks and almost 90% of students at least one mark**.** Several excellent answers were given to describe the process of semi-conservative replication of DNA. Some students who had learned and understood the process provided all six marking points (five maximum) on the mark scheme. In the best answers it was made clear that DNA polymerase joins together adjacent DNA nucleotides to form the phosphodiester bonds. Common errors were that DNA helicase hydrolyses rather than breaks hydrogen bonds, and that DNA polymerase forms hydrogen bonds between complementary bases. A few students incorrectly discussed RNA, transcription, or translation rather than focussing on DNA replication.

03.2 Approximately, 50% of students obtained at least one mark for this question and slightly more than 20% both marks. Most of these students obtained mark point 2 for clearly explaining that the DNA band in sample 2 contained 'heavy' and 'light' nitrogen. However, only the best responses obtained mark point 1 for naming or describing semi-conservative replication.

03.3 There was some variety in the positioning and number of the DNA bands in sample 3. Some students drew one band below the level of the band in sample 2. Other students drew two bands, both above the level of the band in sample 2. Approximately 25% of students correctly drew the positions of the two DNA bands in sample 3.

Question 4

© 2025 AQA

04.1 This question was another good discriminator. Approximately 55% of students obtained at least one mark but less than 5% obtained all three marks. Definitions regarding genes and the genetic code often prove difficult for students. A wide variety of very vague answers were given. Better answers referred to the position of a gene on a chromosome or DNA (molecule) when defining the term locus.

The definition of exon was very poorly answered. A common response was 'exons code for polypeptides'. To achieve mark point 2, the principle of a sequence of amino acids was needed. The definition of universal genetic code was better answered. A common answer that did not gain credit was 'the genetic code is the same in all organisms.' The term codon or triplet had to be part of the answer to show full understanding.

04.2 It was pleasing to see that many students could successfully convert the DNA base sequence into an mRNA base sequence and then use **Table 2** to identify the correct amino acid sequence this could code for. Almost 90% of students obtained at least one mark and over two thirds obtained both marks.

04.3 This question was another very good discriminator. Approximately 15% of students obtained all three marks and approximately 75% at least one mark. Deletion and substitution mutations were very familiar to most students. The idea of a frame shift or how a deletion would cause this was often well understood to achieve mark point 1. However, obtaining mark points 2 and 3 proved more challenging. Students had to use the information in **Table 2** and **Table 3** to access these marks. Better responses did explain that the genetic code was degenerate for mark point 3. However, stating that 'DNA is degenerate' was not credited, reference to the 'code is degenerate' was required. Only the best responses achieved mark point 3 for explaining why the specific codon CG_ would always code for arginine.

Question 5

05.1 A wide variety of answers were seen to this question including references to courtship and phylogeny. When students did correctly discuss DNA, mRNA or amino acids they did not always make clear it was the 'sequence' that was important. Similarly, when referring to DNA or mRNA, reference to 'bases' was often omitted. A common incorrect response was 'sequence of DNA' rather than 'sequence of bases in DNA.' Mark point 3 was less frequently awarded as it was important to stipulate that the amino acid sequence was from a polypeptide or protein. Approximately 15% of students obtained two marks and slightly more than a third of students at least one mark.

05.2 A significant number of students failed to gain marks as they did not 'Describe and explain' as stated in the question. Many of these students only described methods of collecting leaves to gain valid results. Better responses did provide a good understanding of the need for random sampling and/or a large sample size in this investigation. However, these were in the minority. Approximately 5% of students obtained both marks and approximately 35% at least one mark.

05.3 Approximately 15% of students obtained both marks for this question and almost two thirds of students at least one mark. It was pleasing that many students could correctly

© 2025 AQA

calculate a percentage uncertainty, i.e. $x \div 86 \times 100$, where x was their uncertainty value. As a result, students could still obtain one mark even if they did not give the correct value of 1 as their uncertainty.

Question 6

06.1 This was an auto-marked question. Approximately 50% of pupils provided the correct answer of 42.5%. This question was a very poor discriminator with the lowest discrimination index on the exam paper.

06.2 Approximately a third of the students drew a tangent on the graph to calculate the correct rate of reaction at 2 seconds. Approximately 80% of students obtained at least one mark. Many of these students obtained a mark for the incorrect answer of 2.5. This answer was achieved by taking a reading of 5 dm^3 from the Y axis and then dividing by 2 seconds from the X axis.

06.3 Many students could link the reduction in gas exchange to the reduction in surface area or diffusion distance. Far fewer students realised that **Figure 7** showed a reduction in the volume of air exhaled, many focussing purely on inhalation. Consequently, less than 10% of students obtained maximum marks and approximately 72% at least one mark. Weaker answers described gas exchange in a person without emphysema, focusing on adaptations to maximise the rate of gas exchange. This was at the expense of explaining how gas exchange would be reduced in a person with emphysema.

06.4 It was pleasing that many students did show a good understating of the data in **Figure 8**. Many correctly described the correlation between smoking and COPD deaths in men and women to gain mark points 1 and 2. For example 'as the percentage of smoking decreased, so did the number of deaths caused by COPD in men' achieved mark point 1. Some students thought that this correlation was negative in men. Weaker answers contained very vague statements with no references to men or women. Consequently, one in four students failed to obtain a mark. Approximately 12% of students gained maximum marks.

Question 7

07.1 Approximately 60% of students correctly named sucrose as the main carbohydrate transported through the phloem. Glucose was a common incorrect answer, but a wide variety of biological molecules were named.

07.2 This question proved to be a very effective discriminator. Each mark point required both a feature of starch and an explanation as to how starch is a good storage molecule. Approximately 25% of students obtained all three marks and approximately 80% at least one mark. Weaker responses often failed to provide full explanations. This was particularly evident for mark point 2. Students stated that starch was compact but did not link this to its coiled, spiral or helical shape.

07.3 Less than 10% of students obtained the mark for this question. Students did not fully realise that the ^{14}C from the $^{14}CO_2$ would be incorporated into the glucose in the leaf during

© 2025 AQA

photosynthesis. This glucose with the ^{14}C would become part of the sucrose and be transported in the phloem. When students did grasp that not all the ^{14}C would be transported down they did not relate this to the sugars. Common answers included, 'some radioactive materials remained in the leaf' or 'some were used in respiration' without any reference to sugars.

07.4 This question proved to be very challenging for students. Less than 1% of students obtained the maximum four marks and less than 5% gained three marks. Just over 50% of students scored zero. Mark points 1 and 2 were most commonly seen. Some students stated that as there was more radioactivity in the phloem than the xylem, the phloem was carrying the sugars. They used this to support the mass flow hypothesis. Some students also made the correct link that as there was radioactivity in the xylem then this would not support the hypothesis.

Question 8

08.1 This question was a straightforward test of AO1 skills. Approximately, 60% of students obtained at least one mark for this question and approximately 20% both marks. Students demonstrated they understood the structure of a cell-surface membrane, many correctly identifying the phospholipid and protein. However, for each marking point they had to also state a correct function for each molecule. Weaker answers just described the properties of the molecule rather than giving its function in the membrane. For example, some students correctly identified molecule **A** as a phospholipid. However, they then described its hydrophobic and hydrophilic properties rather describing its specific function in the cell-surface membrane.

08.2 Identifying control variables is a commonly asked question on Biology AS papers. Many students used very generic terms below AS level standard. 'Amount of water' should be stated as 'volume of water'. However, many students correctly understood that this would affect the dilution of the resulting solution. The second pair of answers was more commonly seen. Many students referred to the size or the shape of the disc rather than being more specific. The mark scheme required answers such as surface area, thickness, volume, mass etc. An explanation not acceptable at AS level is 'to make it a fair test.' Slightly more than a third of students obtained both marks and approximately 75% at least one mark

08.3 This question was a very good discriminator. Approximately 5% of students obtained maximum four marks and approximately 80% at least one mark. Many students were able to describe the relationship between the two variables and the levelling off at $80^{0}C$. Explaining the results proved more difficult. A common misconception was that higher temperatures denatured enzymes slowing down the rate of a reaction. Better responses explained that denaturation of membrane proteins damaged the cell membrane making it more permeable.

08.4 This question was another very effective discriminator. This assessment of practical skills proved challenging for many students. Approximately 10% of students obtained all three marks and approximately 45% at least one mark. Most students had difficulty describing the required procedure. Many of these students provided unnecessary details on preparing a serial dilution or discussed the effects of temperature on the permeability of beetroot. They

© 2025 AQA

often omitted to describe how a colorimeter could be used to construct a calibration curve. Only the best responses described how an accurate measurement could be determined from a calibration curve.

Question 9

09.1 Slightly less than 50% of students provided the correct answer of directional selection. Some of the incorrect answers included, 'mutation', 'survival of the fittest' and 'adaptations.' For a one-mark question, this was a very effective discriminator.

09.2 A very common misconception was that bacteria become 'immune' to penicillin. Students confused immunity with resistance. As a result, descriptions of the immune response were provided in the answers to this question. To achieve full marks students had to specifically refer to the blaZ, penicillin-resistance or beta lactamase allele. Weaker responses often only referred to a 'beneficial allele' or 'advantageous allele' rather than applying this to the context of the question. Furthermore, an increase in allele frequency was poorly expressed e.g. 'the majority of bacteria will have the allele.' This question was one of the most effective discriminators on the exam paper. Approximately 5% of students obtained all three marks and approximately 50% at least one mark.

09.3 This question proved challenging for many students and was a poor discriminator. Less than 2% of students obtained both marks and only 20% at least one mark. The fact that mark point 1 required the idea of 'many' or 'most' made it inaccessible to most students. This required the understanding that the specific type of antibiotic would target a common site found in many different types of bacteria.

09.4 Approximately 26% of students obtained both marks for this calculation and approximately 11% obtained one mark for some correct working.
.

09.5 This question proved challenging as for each mark point a suggestion and explanation were required. Approximately 15% of students obtained both marks and approximately 60% at least one mark. Just stating than patients in hospital have a weakened immune system on its own was not sufficient for mark point 1.

© 2025 AQA

© 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.