GCSE

BIOLOGY

8461/1H: Paper 1 Higher
Report on the Examination

8461
June 2019

Version: 1.0

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General Comments

In the second year of the new specification for GCSE Biology, most students coped well with the demands of the paper. There was little evidence to suggest that students were unable to complete all questions within the allotted time.

On occasions, some students wrote excessively and should be reminded that the answer space provided has been specifically designed to fit the responses of most students. Several students used additional pages for just one or two words; with the environment in mind, schools and colleges could advise students to only use additional pages when absolutely necessary. In addition, when a student completes a graph on an additional page, it is essential that graph paper is used, as plotting marks cannot be awarded when a grid is not evident. The addition of a scale is also very difficult to award a mark for, unless the student carefully draws this. Even with additional graph paper, the student should lay out the dimensions of their graph in the same way as in the original question. To avoid the need for additional paper in graph drawing questions, students should be advised to use a pencil so that corrections can be made easily.

Some student's handwriting was particularly difficult to read and the use of poorly phrased sentences and imprecise language lead to a lack of clarity in some responses. Students should be encouraged to read back over longer written responses to check for errors and ensure that their meaning is clear. There were incidences of students not reading the question carefully enough or in calculations, not checking all of the instructions had been followed after completing their answer.

The mathematical skills tested in this paper were widely understood by most students, however, a significant number were unable to read values from a graph accurately, or plot an even scale and axis. Many students failed to achieve a mark when asked to draw a line of best fit, and therefore, students should be exposed to a variety of graph drawing experiences that involve both curves and straight lines of best fit. Some students are unable to round numbers accurately.

From the Required Practical Activities (RPAs) covered in this paper, it is clear that a significant proportion of students do not understand the methods involved in testing foods. It is vital that students have the opportunity to carry out all RPAs throughout their GCSE course.

The cell drawing question identified the need for students to practise this skill more frequently, as most student's drawings did not closely resemble the figure provided. Also labelling skills need honing as many labels ended before the cell itself or did not touch the labelled structure.

In extended response questions, many students failed to link their ideas logically, and often limited themselves to the lowest level descriptor as a result. At this level, too many students continue to refer to the production of energy in respiration, often negating marks that otherwise would have been achieved. Several students failed to appreciate the requirements of the 'evaluate' question, missing out a clear judgement and good comparative statements. Many students also struggled to articulate their ideas in a different context, for example, with reference to osmosis, as assessed this year and last.

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 Nearly all students answered this question correctly; however, the term 'powerhouse' of the cell was not creditworthy, but occasionally seen.

01.2 Most students were able to name either a red blood cell or bacterial/prokaryotic cell as containing no nucleus. Xylem cell was rarely seen, however, eukaryotic cells and plant cells were common incorrect answers. Occasionally, students failed to qualify the type of blood cell they were referring to and hence, did not achieve the mark.

01.3 This question was designed to assess students' scientific drawing skills, as outlined in RPA 1. Very few students drew a cell of a similar shape to the one in Figure 1, instead drawing simple round or oval cells.

Many students were able to correctly identify two sub-cellular structures within their drawn cell, however, students should ensure that label lines touch the structure they are labelling. Some students incorrectly drew a thick outer line surrounding the cell, which was interpreted as a cell wall.

01.4 Nearly all students achieved this mark. Phonetic spellings were acceptable; however, some student's spellings were too ambiguous to achieve the mark.

01.5 The majority of students were able to correctly measure the distance between point X and Y, within the allowable tolerance. Most students were able to accurately convert cm to mm and substitute their values correctly into the equation to gain a correct answer of $\times$ 400.

Two marks were often achieved by students who had forgotten to convert their measurement to mm or who had converted incorrectly. A few students multiplied their value in cm by various factors of 10 in an (incorrect) attempt to convert to mm.

01.6 This question was generally well answered, with most students making correct reference to magnification and resolution. Some students attempted to describe each term with limited success, as references to *bigger* or *zoom* were not creditworthy. Some students were able name some subcellular structures that could be seen with an electron microscope, but did not go on to say that these structures are smaller than those that can be viewed with a light microscope.

Question 2 (standard demand)

02.1 82% of students correctly identified a protist as causing malaria.

02.2 79% of all students gained the mark in this question; however, several students simply quoted values from the table without comparing them. A few students only referred to the number of people using nets, with no reference to the related incidence of malaria.

02.3 71% of students gained this mark.

02.4 90% of students used the trend correctly to predict the answer.

02.5 This question proved difficult for many students, with 62% answering correctly. Many students simply stated methods to reduce malaria, such as vaccinations, without qualifying that these measures had been in some way improved, developed or more readily used/available in their answer. Another common answer was that more mosquitos were being killed with no further qualification. The most common correct answers seen were 'improved health care' or 'more access to drugs to treat malaria'.

02.6 Many students were able to gain full marks in this extended response question and a mark of zero was rare. 0.2% of students failed to attempt the question. This question differentiated between students very well.

A Level 2 response required detailed information on both a body defence and an immune defence. Some students limited themselves to Level 1 by writing only about the immune system and therefore, it is vital that students read the question carefully to ensure that they achieve maximum marks.

Most students made a correct reference to the role of stomach acid and to the skin acting as a barrier for the body defences section of their answer. Few students correctly understood where mucus is produced in the body and many confused the role of cilia, often referring to villi instead. Several students referred to sneezing and vomiting, and ear wax or nasal hairs trapping microorganisms themselves, none of which were creditworthy.

Many responses about the immune system were detailed and students were generally able to write confidently about this aspect of the question, despite a small number of students confusing antibodies and antigens.

Question 3 (standard demand)

03.1 The vast majority of students gained both marks in this question, however, an error on the left-hand side of the equation often led to an error on the right, and therefore, no marks being awarded.

The most common answers gaining only one mark (for the right-hand side) were where students wrote light in place of carbon dioxide or water on the left-hand side. The question asked students to write a word equation and it is important for students to follow instructions carefully. If students do write a formulae, they must be reminded of the conventions to use as many write CO^2 instead of CO_2, which is not creditworthy.

03.2 79% of students were able to correctly identify the independent variable in the investigation.

03.3 Many students struggled to identify two ways of improving the method to make the results more valid. Many identified that repeating the investigation would help, but did not go on to talk about calculating a mean or eliminating anomalies.

It was often clear which students had a detailed understanding of this RPA, as those that had were able to give detailed descriptions of how to control the temperature or carbon dioxide concentration. A minority of pupils confused this practical with calculating the rate of transpiration using a potometer.

03.4 90% of all students were able to correctly calculate the mean.

03.5 Having drawn an appropriate scale, most students plotted the points accurately. However, a significant number of students plotted the data for the volume of oxygen, despite being clued in by being asked for value X in the previous question and being asked to plot it on the graph.

By far the biggest error was in deciding upon the scale for the x-axis. Many students used an uneven scale, simply using the power output values given in the table. In this question, many were unable to draw an accurate curve of best fit. The most common errors seen were drawing a point to point line with straight lines or drawing a 'feathery' curve.

Some plotted points were drawn too finely and were then obscured by the student's curve of best fit. Other points were plotted using large, thick crosses which made it difficult for accuracy to be achieved within half a small square. Students must be reminded that they initially should draw graphs in pencil, so that if errors are made, they can be corrected.

Several students used additional paper after making an error, however, they drew their graph on lined paper and hence, no plotting marks could be awarded. Students must be reminded to request graph paper in such circumstances.

03.6 Most students were able to read the value from their graph correctly; however, errors were frequently made, such as students reading 1.8 as 2.8 or as 0.8. Students who didn't use a ruler often quoted an incorrect value. Those who had plotted the data incorrectly in question 03.5 were able to access this mark by calculating the value directly from the data in the table. Many students who had given an uneven or difficult scale in question 03.5 then read their value for 75 W inaccurately.

03.7 95% of students identified the correct graph in this question.

Question 4 (standard & standard/high demand)

04.1 37% of students answered this question correctly. Many students did get confused about the difference between the guard cells and stomata, often referring to them as one and the same. References to guard cells being **in** stomata were common, as were references to the guard cells themselves closing or opening.

As the question referred to how water loss is controlled, students who referenced only the closing of the guard cells did not achieve the mark.

04.2 Generally, this question was answered well by most students and differentiated between students well. However, many students gave unnecessary information at the start of their answer, writing in detail about how water enters the roots from the soil and about the process of osmosis. Many confused the processes of osmosis and active transport here, despite this information not being relevant to the question.

Most students achieved marking points 1 and 2, however, some students confused xylem with phloem and transpiration with translocation. A number of students gave very detailed descriptions of transpiration pull and the structure of the xylem vessels.

04.3 28% of students achieved the mark for this question. Many students who did not achieve the mark appeared to fail to read the information carefully enough, giving responses about differing conditions surrounding each plant despite the fact that the question told students the plants were kept in the same room. Often, vague responses referring to plants being better adapted were given, but with no reference as to how. Those students, who stated that plant A was bigger, failed to achieve the mark as no reference to leaf size or number was given.

04.4 The first two mark points of this calculation question were accessed well by most students. A majority of students forgot to convert their answer to 2 significant figures; students are encouraged to re-read calculation questions once they have completed their answer to ensure that all instructions have been followed.

Some students failed to read accurately from the graph (to within half a small square) and therefore were often limited to one mark (or zero if their readings were very inaccurate).

04.5 This question was generally well answered by students. A minority failed to give comparative answers, and some were confused by the concept of humidity.

Question 5 (standard, standard/high & high demand)

05.1 11% of students gave a response in line with the Level 2 descriptor. Many students were unable to logically link their ideas about increased backflow of blood to the effect on exercise. This, and a reference to respiration, was required for Level 2. Students who struggled to gain any credit in this question simply stated the function of the valves within the heart.

Many students realised that a faulty valve would allow backflow of blood, and a high proportion of those continued on to say that this would lead to problems with overall blood circulation. Slightly better responses explained that this would lead to a lack of oxygen to the cells/tissues, and so aerobic respiration would be limited, or anaerobic respiration would occur. The majority of students, if they reached this point, went no further. Very few students then completed the account to relate these points to exercise, and how muscles were less able to function.

Whilst some students were able to make reference to decreased respiration, very few described the type of respiration they were referring to (aerobic or anaerobic) or how this decrease affected exercise. The students who did refer to anaerobic respiration were more likely to achieve Level 2 than those referring to aerobic respiration, as many often went on to refer to muscle fatigue. Many came close with a reference to lactic acid but failed to link

this to its effect on muscles. References to fatigue in general were commonly seen, but this was not specific enough to be creditworthy at this level.

A significant misunderstanding which manifested itself regularly in various parts of the paper and is repeated every year is that respiration 'produces', 'makes' or 'generates' energy. Students should be advised during their studies that this is not only unacceptable but is scientically impossible. A further common misconception seen was that a leaking heart valve would lead to the mixing of oxygenated and deoxygenated blood, rather than a backflow of (some) blood.

05.2 The success rate for correct calculations in this question was high, and many students drew the correct conclusion from their result.

A considerable number of students however, failed to read the question correctly and gave the wrong figures, quoting the percentages of those alive after 5 years or those developing blood clots. Common errors included students failing to manipulate the data, and simply quoting raw figures, leading of course, to the wrong conclusion, that biological valves are better.

Students should be encouraged to check their calculations for rounding errors, as these occurred frequently.

05.3 87% of students were able to identify platelets as the blood components that start the clotting process, however, the spelling of the terms was often incorrect.

05.4 It was clear where students had clearly identified the word 'evaluate' in the stem of the question as their responses showed good use of comparative statements.

Weaker responses indicated that students had failed to read the question carefully enough ir did not understand the word evaluate. A large number of these responses didn't include comparisons and were just facts about one type of valve. In some cases where comparisons were given, the wording of the sentence made it unclear as to which type of valve was being referred to and students should therefore be encouraged to read back over their responses to check for clarity, if they have time.

Many students included the calculations they had carried out in question 05.2 to support their comparisons. Some students attempted to work out further percentages using figures from the table that were already given as percentages. Students who failed to notice that the data for death from heart related problems had not been converted to a percentage invariably used the higher number of deaths after mechanical valve replacement as a negative factor. There were also a lot of responses that included incorrectly calculated figures which led to incorrect conclusions. Many students simply misquoted the figures given to them or gave the comparisons in favour of the wrong type of valve.

The biggest hurdle that prevented students scoring well on this question was the instruction to use their own knowledge. Without reference to any scientific detail not included in the table, the student's answer was limited to Level 1 (maximum two marks). The majority of students gave many comparisons of the information supplied to them but were still restricted to the lowest level. A Level 3 answer required a judgement, either stated or implied, supported by comparisons of the data and own knowledge.

The most commonly seen own knowledge referred to was the idea of rejection. This was accepted for pig valves even though in reality, they are treated so that they are not rejected. As the source is living tissue, it was accepted that many students would assume the pig valves contain antigens that the recipient's body will react to. Just the mention of rejection was enough to elevate a student's answer into Level 2 but was considered weak own knowledge unless supported by some more detail, such as the use of immunosuppressant drugs. Some students got the idea of rejection the wrong way round, stating that the mechanical valves would be more likely to be rejected, which was not credited.

Some students were able to link the risk of blood clots in the brain with strokes or heart attacks, and the need for anti-clotting drugs, although some talked about the need for the medication without giving a reason why.

Only a minority of students mentioned the ethical or religious issues surrounding the use of pig tissue and very few mentioned the hardening of the valves or the fact that mechanical valves can sometimes be heard working.

Very few students included any of the indicative content listed about both valves. In fact, rather than realising that both valves are readily available, several students referred to the need to wait for a donor, with the implication that the valves were coming from human donors rather than pigs. This idea was not credited.

Other ideas not deemed creditworthy were those of cost or infections due to surgery. Both of these could apply to either type of valve so were not credited as a comparison.

The presentation of many student responses caused issues, as many wrote a long introduction to their answer, which was unnecessary, and this caused them to run out of space and continue their answers all over the page. Whilst most students should not need to use additional answer space, students should be reminded to use an additional answer booklet, rather than trying to squeeze answers in the margin or at the bottom of the page. Many answers showed students' lack of awareness of how to tackle an extended writing answer - some of them answered very briefly with one or two simple statements and others were written in general terms without reference to the data provided.

Question 6 (standard, standard/high & high demand)

06.1 86% of students achieved this mark.

06.2 74% of all students correctly identified Benedict's reagent. The most common incorrect answers were iodine solution (where students then went on to describe the test for starch in question 06.3) and Biuret reagent.

06.3 A significant number of students scored poorly on this question, with 24% achieving full marks. Most students did not achieve marking point 1 as they did not state the need to add Benedict's and **heat**. Adding Benedict's and putting it in a water bath was not sufficient, as students needed to specify that the water bath is hot (not warm), or above 65 °C.

Most students who correctly identified Benedict's solution in question 06.2 achieved marking point 2.

The vast majority of students correctly identified the colour change, even linking the various colour changes to the concentration of glucose. This was better answered than the first part of the question. In a few cases, students incorrectly referred to the wrong colour changes such as 'pink, purple or lilac'.

06.4 Many students found this question difficult, and were unable to make the link between excess glucose in the blood and osmosis. Common misconceptions were that people with diabetes would have more glucose in their cells and so will respire more to get rid of it. This would produce water, which would be lost from cells and excreted out in urine/by the kidneys or as sweat.

For students who did manage to identify that the question was related to osmosis, many did not achieve marking point 1 because of incorrect statements relating to water or solute concentration. Students continue, year on year, to state that osmosis is the movement of water from an area of high concentration to low concentration. Because of the lack of reference to water concentration, we assume the concentration to which they refer is the solute concentration and therefore, this answer is incorrect. References to water moving down the concentration gradient are also, therefore, incorrect. Use of the words hypertonic and hypotonic was not common and when used, the words were often used incorrectly.

06.5 Very few students achieved full marks on this question, and the most common mark achieved was one. Three out of the five available marks were set at high demand of this question that differerntaited between students well.

For marking point 1, many students knew that the small intestine had a large surface area and some described folds, projections or villi. Some gave extra information about microvilli, but not always correctly. A few students struggled with specific vocabulary, referring to cilia or alveoli instead of villi.

Many of the marking points in this question were often described by students in general terms that were not specific enough. For example, some omitted to specify that it was the villi or folds/projections that were responsible for the large surface area, or that it was the villi/capillaries that had walls that were one cell thick. Many made reference to the intestine itself being one cell thick.

Whilst many students understood that mitochondria were needed for active transport, again, most stated either that there were mitochondria present in the cells (rather than there being lots or more than usual) or that the mitochondria were just found in the small intestine, rather than inside the cells. Some students mixed and matched their answers from the first and second parts of the required response and many referred to 'it' or 'they' which made their sentences unclear in places.

Many students did not achieve marking point 2 as they either did not refer to 'walls' or else responded incorrectly with walls of the small intestine. Those who answered correctly usually referred to the walls of the villi rather than those of the capillaries. A few students referenced the villus membrane instead of the wall and a few students incorrectly described the cell walls of the intestine. Many students made correct references to a shorter diffusion distance although some just mentioned a shorter distance to travel without reference to diffusion or absorption.

Marking point 3 was the least attempted marking point. Most of the students who did attempt this point related the length of the small intestine to an increased surface area leading to more diffusion, rather than an increasing time for absorption.

In general, for marking point 4, students were able to link a good/ ich blood supply or large network of capillaries to the maintenance of a concentration gradient. However, many students referred to a constant blood supply or linked a good blood supply to quicker/easier/more absorption which wasn't enough to gain the mark.

In marking point 5, very few students mentioned cells. Some referred to villi or the small intestine having lots of mitochondria. In both cases, most students went on to give accurate detail, linking many mitochondria to respiration or energy release for ATP. However, this did not gain them the mark. Again, the general misconception regarding the production of energy prevented many students gaining a mark here.

Students should be reminded of the need to check the context of the question they are answering – several responses about the small intestine being well ventilated and containing cilia were seen here.

Question 7 (standard/high & high demand)

07.1 Most students struggled to express themselves clearly in this question and it was clear that many students simply did not understand the concept of a double circulatory system. As a result only 26% gained credit here. Many failed to reference the idea of there being two separate pathways coming from each side of the heart. Whilst some students realised there were two pathways, many stated simply that they came from the heart, therefore describing a single circulatory system.

07.2 This item was answered well with 81% gaining the mark. Those that failed to achieve the mark, even though they appeared to know where the ventricle was, did so because:

- of inaccuracy in drawing their label line
- using a circle which extended over the valves and into the atria
- using an X which was overly large and whose centre was placed outside of the ventricle.

Students should be encouraged to be precise in their labelling of diagrams as careless annotations often led to marks not being awarded.

07.3 25% of all students gained a mark and a further 4% gained two marks. Both marking points in this question were linked and whilst many students were able to articulate the idea of less oxygen somehow being transported around the body, very few were able to link this to oxygenated and deoxygenated blood mixing together, therefore gaining zero marks.

On occasions where students achieved marking point 1, this was rarely followed by marking point 2. A common response was that less oxygen was being transported, without stating its destination of the body/cells or equivalent.

Many students were under the impression that oxygenated and deoxygenated blood simply cannot mix and therefore, the heart has to wait for the oxygenated blood to be pumped before it can pump the deoxygenated blood.

07.4 Very few students accessed marks beyond the first two marking points. Many students seemed to understand the simple concept that a low level of oxygen in the water would result in less oxygen in the axolotl, causing problems, but few went on to explain this with any scientific detail.

Very few students referred to the concentration gradient to explain why less oxygen diffused in. Of those that did attempt to explain this point, those who explained the idea of a negative concentration gradient were more likely to get the mark for marking points 1 and 2.

Most students realised that less oxygen would be taken into the gills of the axolotl but many did not gain the mark for marking point 2 because they referred to 'absorbed' instead of 'diffused' or were vague about where the oxygen was going (into the axolotl, rather than its blood or gills).

Many students continue to confuse the processes of osmosis, diffusion and active transport, with many stating that oxygen moves in by osmosis or active transport. It was quite common for students to say that 'no' oxygen was being taken up or that 'no' respiration was occurring and again, students need to be directed to think about the context of the question.

Few students were awarded marks for marking point 3 because they did not link energy to respiration. Of those that did, quite a few stated that 'respiration produces energy' and some even stated that 'respiration produces glucose which releases energy'. Some wrote about anaerobic respiration but because they did not mention energy, they did not gain a mark. However, they went on to explain that this led to the production of lactic acid, which was toxic to the axolotl and so achieved a mark for marking point 4. This mark was also awarded to quite a few students who went down the aerobic route, with the most common responses being 'there was not enough energy for movement' or 'not enough energy for keeping warm'.

There was quite a lot of irrelevant information given by students when answering this question. Many referred to the single ventricle or the circulatory system being inefficient and gave detail about this. Others described gills in detail and explained about respiratory surfaces.

07.5 57% of students were able to correctly name a stem cell.

07.6 Most students gained this mark; and despite the two answers on the left hand side of the mark scheme being those given in the specification, a wide variety of alternative acceptable answers were given.

Cancer, diabetes and cystic fibrosis were commonly used as responses and whilst many of these conditions cannot yet be successfully treated using regenerated tissue, as the question asked students to name a condition that **could** be treated, these answers were acceptable.

Of those that failed to score on this question, a large proportion cited growing a human limb as a potential condition that could be treated.

07.7 31% of students provided acceptable answers to this question. However, some students needed to be more specific with their answers – 'it is small' being a common response that needed further clarification as to why being small made it suitable for use in a laboratory. Lots of students referred to the fact that the axolotl has a double circulatory system, highlighting that they had not read the question carefully enough.

07.8 Students found this question more difficult than question 07.7, with many giving the answer 'it's not a human', which was not quite enough at this level. Many students stated that the tissues and cell structures of an axolotl are different to a human's tissues or cells, highlighting a lack of understanding in this area.

Most students who accessed the mark in this question correctly stated that humans do not have gills.

Question 8 (standard, standard/high & high demand)

08.1 The majority of students accessed marking point 1 by using the term biological catalyst. Some students failed to state that an enzyme is found in living things, instead describing a catalyst they had come across in their chemistry lessons. Many students simply stated that enzymes are chemicals that help to break down food, highlighting a lack of depth of knowledge about other uses of enzymes in the body. Several students also failed to realise that enzymes build molecules up as well as break them down. Very few students accessed marking point 2 accurately.

08.2 42% of students achieved both marks in this question. Mouth, stomach and liver were the most common incorrect answers seen and several students quoted intestines without qualification.

08.3 Most students were able to access marking point 1 and many marking point 2. While most read the instruction not to reference hormones, a few described the effects of insulin on blood glucose and did not gain credit. And several students wasted time by describing this before going on to gain credit on relevant marking points.

For marking point 1, many good examples were given of named enzymes failing to be produced, or not being able to access the intestine because of a blockage caused by the tumour.

Of those who failed to achieve any marks, the most common misconception was that there would be an increase in the enzymes produced as there would be more cells in the tumour to make them. The consequence of this would actually be that too many 'nutrients' are in the intestine and cannot all be absorbed at once. Many also referenced the uncontrolled division of the cancer cells as the direct cause of the weight loss, due to their increased use of the products of digestion before it had even been absorbed.

For marking point 2, the need for enzymes to digest food was clearly well understood but many did not gain marks due to a lack of precision with terminology, referring to 'nutrients' or 'large molecules' rather than to food/protein/fat/carbohydrate not being broken down.

For marking point 3, most students did not make any mention of absorption, referring simply to less of the soluble products being in the blood and many did not name any of them,

continuing instead to refer to nutrients/carbohydrate/protein/fat. At this point, many simply focussed on the undigested food being egested as the reason for weight loss.

Very few students accessed marking point 4.

Other common misconceptions were that a loss of appetite occurs due to pain caused by eating and that the pancreas produces bile.

08.4 This question was well answered by most of the students who attempted it, although there were a few students who did not attempt it at all. Most of the students answering scored two marks, gaining marking points 1 and 3, however, a lack of accuracy occasionally meant that student did not access marking point 1 as they referred simply to the cancer, rather than the cancer cells. Very few students accessed marking point 2.

08.5 This question was quite well answered by a lot of students, with 45% achieving full marks. 38% of students scored one mark and there were quite a few students who did not attempt the question.

Some students failed to score marking point 1 because they did not mention enzyme B, only inferring that enzyme A was inhibited. Quite a few students mixed up which enzyme was present and which was inhibited.

For marking point 2, most students scored the first bullet point. Some students did not gain this mark as they did not include the idea of the cell division being uncontrollable. A few students said that the enzymes were dividing uncontrollably, and several wrote about enzymes being alive or growing rapidly.

08.6 Although the answer spaces were labelled for students to structure their responses, many students ignored these, and put their response in either section. Students should put their answers under the correct headings when required to do so.

Whilst the concept of a placebo was generally well understood, students struggled to express their understanding clearly. Many students described what a placebo was, rather than why it was used and many thought that the use of a placebo would prevent the patients from lying. Several students simply stated that use of a placebo would eliminate the placebo effect, which gained no marks.

References to a psychological (variously spelled and described) effect were common, and unqualified 'mental effects' were occasionally seen. Many students correctly described the placebo as being used to make a comparison (with the drug being tested) or as a control. Quite a few students did not gain credit for describing its use as a control ‘variable’.

Many students realised that a double blind trial was a means of preventing bias. Many used this term and a number of students correctly described the ways doctors might be biased.

08.7 92% of students achieved this mark on the drug trial process.

08.8 The majority of students who attempted this question were able to access one mark (usually marking point 2) by stating that the monoclonal antibody would be specific to, or would only target the cancer cells. Lots of students referred to the monoclonal antibody itself destroying or stopping the cancer cells from dividing without making a link to the drug.

Although the question clearly asks how monoclonal antibodies work to *treat* pancreatic cancer, many students explained how monoclonal antibodies are made, so there was a lot of irrelevant information about hybridomas, which gained no credit.

A few students referenced pathogens rather than cancer, and how the monoclonal antibodies kill the pathogens.

Only a few students knew that radioactive substances, (often given as radioactivity), toxins or drugs were attached to monoclonal antibodies, and not all of those understood that it was this, and not the monoclonal antibodies themselves that killed the cancer cells. Amongst those who understood the concept, poor expression meant that ‘cancer’, rather than ‘cancer cells’ was commonly given. Insufficient descriptions such as ‘treating cancer’ or ‘fighting cancer’ were common.

The second pathway was seen frequently, often in conjunction with the first pathway, but was not as well understood or explained. The idea that monoclonal antibodies block the signals that tell cells to divide was seen infrequently. Ideas of the body's own immune system being helped to kill cancer cells was seen slightly more frequently but was poorly expressed.

Several students suggested that monoclonal antibodies were attacking or attaching to enzymes A and B and some referred to dyes being attached to monoclonal antibodies to help surgeons localise the cancer, with no further detail on how to treat it.

A common misconception was that the binding of the monoclonal antibody alone to the cancer cell would inhibit its division or bring about its destruction. Some students even thought that, once bound, the monoclonal antibody would itself engulf the cancer cell.

A number of students erroneously thought that the monoclonal antibody once injected into the patient, would itself divide and increase in number.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

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