Examiners' Report
Principal Examiner Feedback

Summer 2017

Pearson Edexcel GCSE
In Biology (5BI2H) Paper 01

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Paper Introduction

The paper assessed 24 of the 2011 B2 specification statements. The six questions were ramped so complexity increased across each question as well as across the paper. The three topics within the specification: the building blocks of life, organisms and energy and common systems were covered reasonably equally with specific topics including: blood cell function, adult and embryonic stem cells, blood vessels of the heart, concentration gradients, exercise and cardiac output, anaerobic respiration and the effects of lactic acid, bacterial cell structure, functional foods, transpiration and stomata, absorption of mineral ions by roots, water transport through a plant, the human genome project, transcription, mutations related to the lock and key theory of enzymes, the digestive system, amylase, the function of bile and structures of the small intestine. The standard of answers was thought to be slightly lower than previous years with higher numbers of candidates struggling to access and apply their knowledge to answering questions, with some just rephrasing the stem of the question as their answer and many struggling to answer the more open-ended questions concisely and with the degree of specificity required for credit, although it was pleasing to see some excellent, coherent answers using germane scientific terminology accurately. Mathematical skills included data analysis and simple calculations. It was pleasing to see some key items discriminating well across the available marks. There was an emphasis, as in previous years, on applying knowledge which allowed candidates to match the 'A' grade descriptors. Too many candidates could still not develop their responses into a logical specific set of points that answered the question. There also was a notable increase in the number of candidates who misread the question producing stock answers related to the topic instead of addressing the construct of the question. There was an improvement in candidates' responses in answering items where the command word was explain although, as in previous years, there was confusion shown in candidates' responses with the requirements of the command word describe, with many extending an initial creditable 'describe' point with an explanation, shown for example in responses to item 2ci. The number of unanswered items was in line with previous years.

The mean mark for the paper was down slightly compared to the 2016 paper, although certain questions like the two 6 markers discriminated better with roughly equal percentages of candidates being assigned to each of the four levels. Responses from higher grade candidates showed accurate, detailed answers with a good understanding of both scientific concepts and facts. Middle grade candidates could identify the basic structures and concepts required but as mentioned above, could not develop their answers to, for example, explain the consequences of the initial points made. Numbers of candidates using extra paper or writing long responses that resulted in part of their answer being 'out of clip' were better than in previous years and it was noticed that a large number of 'out of clip' responses were due to candidates giving long introductions, often restating the stem of the question to lead into the points they were trying to make. It was disappointing to see so many responses where candidates could not

access questions where other candidates scored well, asking the question as to whether they had been entered for the correct tier.

Overall it was pleasing to see excellent answers on most questions covering the required depth and detail outlined in the specification and very disappointing to see candidates not accessing some questions that should have been relatively straightforward for example, 4a. The ability to extract and analyse salient data was in line with previous years although a significant number of candidates made a very simple error in calculating the time taken for bacteria to divide to reach the stated mass of 80g. A complete range of ability was demonstrated by candidates.

5BI2H_01_Q01a

This item required candidates to compare numbers of blood cells stated in standard form. It was pleasing to see that the vast majority, 98% of candidates correctly gained the one mark available.

5BI2H_01_Q01bi

This question discriminated well with 54% of the candidates scoring both marks available. Those candidates that scored one mark often stated that white blood cells 'fight' the bacteria but then said that they would therefore reduce in number which is a logical, if incorrect statement. The quarter of candidates that gained no marks either vaguely stated that numbers of blood cells would change or were very wrong stating, for examples that red blood cells would be eaten by the bacteria and so the numbers would go down.

Examiner Tip

Work through the specification points that state 'recall .....' and ensure that you **learn** the basic points as taught in lessons and shown by appropriate texts and websites.

5BI2H_01_Q01biii

It was pleasing to see the majority of candidates gaining both marks available here, with many using scientific terminology correctly and able to name a range of dissolved substances transported by plasma with glucose, insulin, and antibodies being common responses although some focused on waste products quoting urea and carbon dioxide. Other candidates gained there second mark by stating that red or white blood cells or platelets were transported around the body in the plasma. Candidates who only gained one mark often did so by referring to the plasma transporting substances around the body which was considered too vague for credit.

Examiner Tip

Make flash cards and have a friend test you so that you learn the facts and functions of structures detailed in the specification. Make sure that your answer is detailed, coherent and logical and then check that you have answered the question.

5BI2H_01_Q01ci

Candidates had to state one similarity between adult and embryonic stem cells to gain the mark available. Over one third of candidates managed to gain the mark. Many candidates lost marks by giving simplistic answers, for example that both were cells or that both become red blood cells. Although not common, it was clear from some answers that some candidates did not know what these types of cells were with references to the stem cells growing into embryos and plant stems.

Examiner Tip

For one mark questions ensure that you answer the question, but keep your response to the point.

5BI2H_01_Q01cii

The second part of 1c required candidates to state a difference between embryonic and adult stem cells to gain the mark available. This was slightly lower scoring than 1ci as some candidates confused the two types of stem cells writing the differences the wrong way round or just stated what one type of stem cell could do. Although not seen as often as expected from previous examinations, the terms totipotent and unipotent were used by candidates almost entirely correctly gaining credit. Most candidates that gained the mark, did so by describing that embryonic cells can develop into all types of body cell, whilst adult stem cells only develop into one type or a few types. Many candidates lost marks by saying cells rather than types of cells.

Examiner Tip

Where a question asks for a similarity, or a difference, make sure that you make reference to both in your response. Read your answer and ask if it answers the question and is what you have written clear? If it isn't, add detail to make it creditable.

5BI2H_01_Q02bi

This item was poorly answered with candidates being asked to apply their knowledge about blood flow and cellular respiration to explain why the diffusion gradient between blood and cells is maintained. This, thereby, discriminated well between higher grade and lower grade candidates. Candidates found it easier to explain that respiration in cells kept the concentration of oxygen low in cells with the difficulty seeming to be how to express that blood flow keeps replacing the blood in capillaries with oxygenated blood. Many candidates did not access the question and simply defined diffusion.

Examiner Tip

In questions where you are asked to apply your knowledge to a different situation, underline the key phrases / words including the command word. Here the most important part of the question is 'maintained'.

5BI2H_01_Q02bii

The majority of candidates scored the mark available for completing the aerobic respiration equation. Common errors include writing water as a reactant and energy and energy and lactic acid as products.

Examiner Tip

When preparing for examinations by using previous papers, think on how details required by the specifications can be used in different ways.

5BI2H_01_Q02ci

85% of candidates could successfully write that as the running speed increased, cardiac output also increased through interpreting a line graph. The way that this was written by many suggests that they had been trained well by their teachers. It was, however,, disappointing that only 11% of candidates could develop this to say that the rate of increase reduces form 12 or 16 km per hour. Some candidates recognised the decrease in the rate of increase but lost the second mark as they stated that the cardiac output decreased. A relatively small number of candidates gained the second mark by manipulating relevant data extracted from the graph.

Examiner Tip

When using data from graphs or tables credit usually requires the candidate to manipulate the figures. For example, here, the candidate could simply

calculate the increase from 0 to 4 km per hour and for 20 to 24 km per hour for the second mark to be awarded.

5BI2H_01_Q02cii

This area of the specification is understood well, which allowed 22.1% of candidates to gain 1 mark, with 64.5% gaining both marks available by applying their knowledge to answer why the runner in the question gets a muscle cramp when running over 24km per hour.

5BI2H_01_Q03bi

Candidates responded to this item in a similar way to item 2ci with the majority of candidates (65%) achieving 1 mark here with a slightly better 25% getting both marks available by extending their answers to give more detail when comparing the two prebiotics in the foods listed in the table. The second mark was not awarded mainly again for candidates to simply copying data from the table instead of manipulating it.

5BI2H_01_Q03bii

Over half the candidates correctly added the mass of prebiotic A to B and then stated that onions were likely to give the greatest increase in beneficial bacteria in the intestines. A common error was to just look at prebiotic A with some candidates stating, with no evidence, that prebiotic A was stronger or more powerful.

5BI2H_01_Q03biii

It was pleasing to see the majority of candidates setting there working out logically with the 10g doubling until the mass was 80g and then counting the gaps between to correctly arrive at 3 hours. Some candidates only gained one mark by setting the doubling out correctly but then including the 10g in their calculation arriving at 4 hours. A significant minority of candidates lost the marks by increasing from 10g to 20g, to 40g and then to 60g before 80g losing their way in doubling the bacteria. Candidates who scored no marks frequently just took two or three of the figures quoted and multiplied them, divided one by the other, or a combination of both.

Examiner Tip

In a question where a progression is outlined, draw the progression out to help focus your mind on the problem set. When given figures in a question do not just divide one by the other in the hope that it will answer the question. Read the question carefully use the key points to work out what you need to do with the data.

5BI2H_01_Q03c

It was disappointing that over half of the candidates could not even suggest using two groups of people to investigate claims on the health benefits of probiotic yoghurts for one mark. A simple answer such as give the probiotic yoghurt to one group of people and yoghurt without probiotics to another would have been awarded 2 of the 3 marks available. Approximately the same percentage of candidates gained the one, two or three marks available which helped discriminate the different standards of higher candidates well. There were some excellent answers seen with matching groups and double blind placebo testing with reasonable ways to measure any increase in health clearly stated. It is possible that teachers need to spend some time on analysing what is required to answer these types of questions successfully.

5BI2H_01_Q04a

This item required candidates to design an investigation into transpiration in different light intensities using celery stems in red dye. The basic set up of the apparatus was given to the candidates. The item gave excellent discrimination with the largest percentage of candidates getting 1 mark and roughly equal percentages obtaining 2 or 3 marks. Those that were credited with one mark struggled to develop their response beyond saying how they could vary light intensity. Some excellent answers were seen where methods of measuring the distance the dye had travelled up the stem accurately and how other salient factors could be controlled. The quarter of candidates who did not score on this items failed to even say put some of the celery sticks in the dye in a dark room and some in a well-lit room, which was disappointing. Many of these talked about transpiration or predicting the results instead of addressing the question of how to investigate it under the different light intensities. A significant minority clearly did not know what transpiration was and wrote about photosynthesis or transcription/ translation.

Examiner Tip

In designing investigation items, read the question after you have written your response and ask yourself 'have I answered the question?' Then ask yourself 'is my response specific enough to tell others what to do and how to do it?' It is good to write some basic ideas like you would need to control the temperature but to ensure that credit is given the answer should state how the temperature can be controlled and a suitable temperature for the investigation.

5BI2H_01_Q04bi

It was very disappointing that the majority of candidates could not access this question although those that did showed an excellent understanding of

how guard cells control the amount of water lost through transpiration which was beyond what was required to gain the marks available. Most students saw that the rate of transpiration decreased after 25 degrees Celsius with a few just describing this but the majority being triggered into writing a response about enzymes being denatured often relating the enzymes to photosynthesis or protein synthesis. It has been suggested that candidates have been taught that if a question has a factor increasing and then decreasing as temperature increases, trot out the enzymes are denatured response. Around half of the candidates who wrote creditable responses scored just one mark by either stating that stomata close or that the plant was responding because it had already lost too much water so was trying to reduce water loss.

Examiner Tip

When presented with a trend in a graph or a table, look at the axes labels / table headings and relate these to the biology behind the question so that you can target your response to answer the task set.

5BI2H_01_Q04c

Just under half the candidates scored on this item that required them to explain how mineral ions are absorbed by the root hair cells. There are some minerals that can be absorbed by diffusion and a few candidates were credited with 'by diffusion' if they stated the circumstances. A few wrote about calcium ions being in a higher concentration in chalky solid and some wrote about when large quantities of fertiliser are added then again concentrations of ions can be higher in the soil than the roots although these were few and far between those that gained marks stated by active transport and then developed this by describing active transport and / or stating that the process required energy.

5BI2H_01_Q04d

This item required candidates to explain how water moves from the root hair to the stem. Too many candidates did not read the question correctly and wrote about water being absorbed by the root hairs although some of these did continue their answer and gain a mark by referring to water entering the xylem to then move up the stem. Other candidates referred to incorrect processes including active transport and a few saying by photosynthesis. Again, excellent responses were seen explaining osmosis with reference to concentrations in different cells with some explaining how the concentration gradient was maintained.

Examiner Tip

When asked to explain how a more general biological process occurs, ensure that you describe the steps involved logically as well as use biological principles to explain why it happens.

5BI2H_01_Q05ai

This item required candidates to read a figure from the graph showing the number of base pairs sequenced each year during the human genome project. Whilst 40% correctly stated an acceptable, it was disappointing that many candidates read the scale by such a large uncreditable margin with figures from 2000 to ones larger than the maximum 2200 shown on the graph. Some candidates stated 550 (million) which was the number of base pairs sequenced by the start of 2000 and there was a larger than average number of blank responses possibly suggesting that some candidates had missed the question.

5BI2H_01_Q05aii

It was surprising that candidates had difficulty in accessing this item that required them to say why the rate of sequencing bases in DNA during the HGP increased. The basic answers of more scientists / countries became involved and methods or equipment was improved were commonly seen in candidates who scored the available mark. Those that did not score either gave vague answers e.g. more money was used, stated that, for examples, because eighteen countries were involved without referring that this was increased with an surprising number stating that as the world population had grown, there were more base sequences in the world than at the start showing a poor understanding of the basic tenants of the HGP.

5BI2H_01_Q05aiii

The majority of candidates scored at least one of the two available marks on this item with many excellent answers seen. Common responses that received credit included the relatively simple statement that the HGP has given us a better understanding of genetic disorders, references to knowing the location of 'faulty' alleles (although often stated as faulty gene) on the chromosomes, developing treatments for genetic conditions, improving gene therapy and the developing of personalised medicines. Candidates had more difficulty in expressing their ideas in a creditable manner when trying to write about marking point 4, the increased ability to predict the risks of developing a genetic condition with responses that were, for once, too specific e.g. the HGP has allowed us to know at exactly what age you will develop cancer. A significant number of candidates who were credited for hitting marking point 4 did so because they developed their first comment into discussing genetic screening and genetic counselling.

5BI2H_01_Q05b

This six mark question assessed the quality of written communication as well as the candidates' knowledge of transcription. It was pleasing to see that candidates found this question accessible with practically no blank responses seen. Candidates who did not score any marks often confused transcription with translation or referred to a completely different process including photosynthesis, transpiration, and respiration. Common misconceptions, that mRNA entered the nucleus to copy the DNA was regularly seen along with the roles of tRNA, DNA and mRNA being confused. Roughly one quarter of the candidates were judged to be in each of level 2 or 3 based on their coverage of the indicative content. Both covering the basic sequence of transcription but with level 3 responses being more detailed, specifically, by making an accurate reference to uracil. Many of the level 3 answers seen contained as much detail as one could expect from a GCSE candidate.

Examiner Tip

Stick to answering the question being asked. If the question is about transcription as in this case, do not waste time and effort in writing about other processes. Use a method to learn processes that have specific steps by a method suitable to you. For example the steps could be written out in a flow chart or as a set of revision cards.

5BI2H_01_Q05c

This item was an excellent discriminator with the majority of the candidates gaining just 1 mark and roughly a third extending their response to gain the second mark as well. Excellent responses were seen explaining what a mutation is, how transcription and translation express the mutation in an altered protein / enzyme and how this can change the shape of the active site making it less likely that an enzyme substrate complex will form. The item discriminated well as candidates who were not so certain on the biology involved often confused the amino acids in the enzyme with the amino acids that are the substrates during the latter stages of transcription thus gaining only one or no marks.

Examiner Tip

Make sure that your answer to items where the command words are 'explain how' include a description of what happens that relate specifically to the focus of the question. It often helps to refer to parts of the question in your answer.

5BI2H_01_Q06aii

Well over half of the candidates gained marks on this item which again acted as a good discriminator. Higher grade candidates gave succinct clear answers that covered the main points as outlined in the mark scheme. Candidates who gained lower grades often gained one mark by stating that amylase acted on carbohydrates / starch but then confused the action of amylase by stating that the products were amino acids and / or fatty acids and glycerol. Candidates who gained no credit often confused amylase with bile or gave multiple answers that disqualified any correct points included, for example some wrote that amylase acted on foods to produce sugars and amino acids.

Examiner Tip

Learn the basic definitions and biology involved in areas of the specification where the statement outline definite facts as these are often used as the basis of examination questions.

5BI2H_01_Q06b

Item 6b required candidates to explain the consequences of having the gall bladder removed and was accessed well by most candidates with the majority of candidates gaining 1, 2 or 3 marks, with roughly equal percentages gaining one or two marks and slightly less gaining the maximum of three marks. It was disappointing that some candidates confused the gall bladder with the bladder, although those that did so often went on to describe the consequences of having the bladder removed adequately. Candidates who scored one or two marks often incorrectly stated that the gall bladder produced bile or confused the action of bile with enzymes.

Examiner Tip

Learn the basic facts required by the specification statements and then when asked to apply them you can do so reasonably thus gaining consequential marks. Take time to consider consequences of changes to situations outlined in the specifications as part of your revision as these will often be part of the harder questions that will be used to discriminate between the C/D and A/B candidates. Practice this kind of question in your revision - if you cannot answer them, then you need to go back and learn the underlying biological principles required by the specification in greater detail.

5BI2H_01_Q06c

The final item was the other six marker that required candidates to explain how structures in the small intestine allowed absorption of digested foods effectively. This question again discriminated well with the majority of candidates gaining 1, 2 or 3 marks, however, here more candidates were awarded level three than two, which was more than those who gained level 1. The standard was markedly different with those achieving level 1 able to state a structure or state that the small intestine had a large surface area, those achieving level 2 mainly being able to develop their response to describe one or more of germane structures related to increasing absorption, and those with level 3 giving logical descriptions of the structure names explaining how this helped increase absorption. It was disappointing that just over one fifth of candidates could not name or describe even a simple structure in the small intestine. It was pleasing to see that there were very few blank responses and the quality of written communication was higher than in previous years with just 0.3% being awarded the lower of the two marks at each level.

Examiner Tip

Practice as many past examination questions as possible as part of your preparations ensuring that you know the type of responses required to answer the questions asked. When answering a question that requires an effect of something, ensure that you describe the structure and then go on to say how this helps the structure to function in the way implied by the way the question is written.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Ensure that they read the question carefully so that their response is targeted to the question being asked. Do not just regurgitate stock answers as more often than not they are required to apply knowledge to a different situation to that which was taught.
- Have a clear understanding of the requirement in answering 'describe' questions.
- Put their answers clearly with correct terminology.
- Do not give alternative ideas as more often than not they disqualify creditable responses.
- Develop responses so that consequences of initial points are covered in items where more than 2 points are available.
- Be specific as many vague answers seen showed that candidates had a basic understanding of the concepts being tested but were unable to express their ideas specifically enough to be awarded marks.

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