Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

November 2021

Pearson Edexcel GCSE Biology

(1BI0) Paper 1H

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The Pearson Edexcel GCSE (9-1) Paper 1 Biology (Higher tier) paper is the first of two papers are taken as part of the GCSE (9-1) Biology qualification. This is a linear qualification assessment model whereby candidates must complete the two papers in the same single year of certification.

Paper 1: Biology (Higher tier) is awarded a total of 100 marks, and it is assessed by a variety of question types, including multiple-choice questions, short answer questions, calculations and two extended open-response questions. Candidates should answer all questions in a time period of 1 hour and 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

In addition, the GCSE (9-1) Biology qualification assesses practical knowledge and maths skills, the requirements of which are given in the specification. There are 8 mandatory core practicals that candidates must complete prior to the examination, as aspects of working scientifically are also assessed in questions throughout the paper. However, there was some leniency on the completion of practical work as a result of the pandemic.

Paper 1: Biology (Higher tier) paper contains questions assessing the content from Topics 1 to 5, as identified in the specification. In this examination series, candidates were required to respond to questions that tested their knowledge and understanding of the eye and the brain, the nervous system, disease transmission, mitosis, the use of stem cells, genetic inheritance and genetic engineering, evolution and methods of reproduction, the structure and function of sex cells and aspects of protein synthesis.

Questions designed to assess practical work included mathematical analysis and interpretation on an investigation into the effect of chemicals on bacterial growth, the effect of temperature on enxyme action including variables and improvements, the use of a microscope and osmosis. The maths skills assessment in this paper related to questions requiring unit conversions, magnification, rate calculations as well as the use of significant figures and standard form.

Question 1

1aii – Most candidates identified that the pupil gets smaller. There were a small proportion of candidates who confused the pupil and the iris or who suggested that the iris gets smaller as the pupil contracts. Higher ability candidates referred to the muscles in the eye or linked the change in the pupil to the idea of protecting the retina but restricting the amount of light entering they eye.

1bi – The majority of candidates correctly identified CT or PET scans as a way to detect tumours, or gave the alternative accepted response of X-rays. A small proportion gave responses that might suggest the presence of a tumour such as behaviour changes, but this does not detect the tumour and was not credited.

1bii – This item was well answered by the majority of candidates who referred to the skull as a barrier making the brain hard to access. Many responses included the idea that there was a risk of damage to the brain. The idea that neurones do not repair was only seen in very detailed responses.

Question 2

2ai – This question required a description of how an impulse crosses the synapse between the relay and motor neurone. Candidates who recognised were able to access a good number of marks for the item by identifying the role of neurotransmitters in transmission across the synapse. The idea of the impulse being carried across the gap was seen some responses and not credited. Higher ability candidates who recognised that the impulse in the relay neurone triggered the release of the neurotransmitters were frequently able to score full marks. Candidates didn't recognise the role of a synapse, and gave the route of an impulse through a reflex arc, did not answer the question that had been asked and scored zero for the question

2aii – Most candidates recognised the role of a reflex arc as a protective measure in response to danger and many were able to link two-mark points together and obtain full marks. The idea of by-passing the brain or an involuntary process was only seen in detailed responses.

2bii – This item required a description of how reaction times for the same students could be compared with a different stimulus. Most candidates obtained the first mark for measuring the reaction times of the students in response to red squares with many giving the idea of keeping everything else the same. A lot of responses indicated the idea of using the same students which is given in the question. Higher level responses referred to the idea of controlling other variables and/or calculating a mean by repeating the measurements.

Question 3

3a – Many candidates gave the WHO as the organisation that defines health. The majority gave the abbreviated name which was accepted. Incorrect responses referred to the NHS.

3bi – This item required two ways that communicable disease are different from non-communicable disease. Candidates need to avoid giving the same idea twice and just giving the reverse argument, for example communicable diseases cannot be inherited and non-communicable disease can be inherited. The idea of being spread or passed on was insufficient for the first marking point, it needed to be linked to the idea of being from person to person and weaker responses frequently did not obtain this mark. The term pathogen was not used often but examples of bacteria or viruses were seen.

3bii – It was clear that candidates of all ability now recognise how the spread of a disease can be reduced or prevented, likely influenced to an extent by the current pandemic. Facemasks, isolation of infected people and vaccination were the most commonly seen mechanisms. However, many candidates gave descriptions of different mechanisms and only obtained one mark as they did not explain how that mechanism would prevent or reduce the spread of TB.

3biii – The majority of candidates entered the countries in the first column and the number of people with TB in the second column with the figures entered correctly. Some candidates did not obtain full marks as they omitted suitable headings.

3c - The command word for this item is explain so required candidates to make the link between the effect of AIDS on the body and why this makes someone susceptible to TB. Many candidates obtained the mark for having few white blood cells or the effect of HIV on white blood cells or the immune system. Few candidates went on the explain that this would prevent the body destroying the TB pathogen. Instead many candidates just repeating the stem of the question that they would be more susceptible to TB.

Question 4

4aii – A high proportion of candidates obtained full marks for this question by including at least one specific precaution to prevent the contamination of agar jelly plates alongside the general idea of wearing gloves, washing hands or wearing a mask. Candidates frequently recognised the need to keep the lid on at all possible times or using sterile equipment with some describing passing a loop through a Bunsen flame. The use of an autoclave or working close to a Bunsen was not seen in many responses.

4bi – The majority of candidates were able to substitute the values into the equation to calculate the area of the zone of inhibition. Some candidates used 3.14 for π and other used the π button from the calculator but both were credited. The most frequent mistake seen was to use the diameter and not the radius and some candidates lost the final mark for not giving the answer to 1 decimal place.

4bii – A higher proportion of candidates were able to identify disc B as a control, compared to similar questions on previous papers. Perhaps indicating the practical skills knowledge is improving. Some described the idea that it was to see the effect of just saliva without toothpaste and this was also credited.

4biii – This item required candidates to recognise the limitation of a method and a good attempt was made at this question. Most candidates obtained at least one mark for recognizing that the agar plate still had bacteria on it or that the experiment was not being done on teeth. Higher ability students obtained full marks for giving two reasons, most frequently including the idea that only one species of bacteria had been used or that it only tested one type of toothpaste.

4c – This question was more challenging and some candidates had not read or assimilated the information given to them and made links back to the effectiveness of the toothpaste and not the effect it had on cells. Some candidates also consider that a difference of 1% is significant and are not assessing the data values. Higher ability candidates did recognise that there was little difference in the percentage of healthy cells after 2 hours and that the toothpastes were not harmful.

Question 5

5aii – The responses to this item showed that some candidates can identify process that occur during the cell cycle but are not clear on what happens at each stage. A number of incorrect

responses identified process that occur during interphase such as DNA replication or aligning on the equator from metaphase. Candidates who gave process that occur in prophase included the condensing of DNA and the nuclear membrane or nucleus breaking down. Some candidates confused the cell membrane with the nuclear membrane. High level responses also referred to the spindle fibres forming, indicating a high level of knowledge that could have come by starting an A-level course.

5aiii – There was a lot of misspellings of cytokinesis but many were phonetic and obtained the mark but candidates should ensure they can spell key scientific terms correctly. The most common incorrect response was telophase.

5b – Most candidates scored at least one mark on this item with many scoring both. Candidates are not naming the lenses on microscopes, but many recognise the need for a 40x lens and the need to focus the image. Some gave details on placing the slide on the stage and turning on the light which doesn't answer the question. Turning the wheel was not credited for focusing but the idea that the slide needs to move on the stage was sufficient.

5c – The response to this item required the benefits and risks and candidates who structured their response to show these two aspects clearly scored more marks. The idea that stem cells could become specialized to replace damaged cells was the most frequent response but candidates must be careful to avoid the idea that stem cells can be used to repair damaged cells. A range of the marking points were seen for the risks but only higher ability candidates obtained two marks for this aspect.

Question 6

6ai – Nearly all candidates correctly calculated that 4 units of alcohol is 32 grams of alcohol. The majority were then correctly able to read that the risk was elevated to 1.2x. There were a number of incorrect readings from the graph of 1.25x. Some incorrect answers had no workings which prevent any marks being awarded as no workings mark can be awarded.

6aii – Many candidates scored full marks for this item by correctly identifying that cancer develops as a result of uncontrolled cell division leading to the formation of a tumour. Very few responses identified that mutations in the DNA as a starting point.

6bi – This item asked for safety precautions needed when removing blood from a person. Wearing gloves was a common response. The idea of sterile needle was also given for candidates who scored full marks. A number of candidates referred to not removing too much blood or only removing the correct amount which is not a safety precaution and was not credited.

6bii – This question targets the top range of grades, requiring the interpretation of a family pedigree to explain the genotype of female Z. The homozygous recessive female and homozygous dominant female mean that the only possible genotype is that female Z is heterozygous. Candidates need to beware that heterozygous dominant or heterozygous recessive is not a correct genotype. An incorrect genotype cannot be correctly explained and therefore no credit was given.

Question 7

7ai – Most candidates gave the idea of location in the rock layer as a method to date a fossil, a few identified radiometric dating and some incorrectly gave carbon dating, most likely as this is something they will have covered if studying physics.

7aii – The majority of candidates gained the mark for this question with the idea of similar bone structure. The same structure or body shape was insufficient and not credited as it does not identify the bones or skeleton as the similarity.

7b – This question required a description of selective breeding. The idea of breeding two animals that run fast was nearly always given. Some candidates did not extend the answer to include the idea of selecting the offspring and repeating the process over many generations. Some incorrect responses of genetic engineering were seen.

7c – This was the first extended open response question on the paper and was generally answered well by candidates of a range of ability. The level was awarded based on the detail of advantages and disadvantages and the mark within the band decided on the clarity of the response. Most candidates knew that sexual reproduction caused variation and that a mate was required and the converse for asexual reproduction. Better responses also referred to the time that was needed for the reproductive cycle. Candidates who reached level 3 discussed the implication of genetic variation in the presence of selection pressures for survival of the species and evolution or that it allowed the production of many organisms with the same beneficial characteristics. This question lends itself to a clearly structure, possibly with subheadings and this is something that should be encouraged to ensure that answers are concise and mark yielding.

8aii – Many candidates indicated that the enzymes were working faster for this item. Higher ability candidates went on to indicate that this was closer to the optimum. Very few candidates explained that this meant there was more kinetic energy, more collisions or more enzyme-substrate complexes. Candidates need to recognise that when the command word is explain their responses need to include scientific reasoning.

8aiii – As is often seen, candidates are better able to explain what happens to enzymes at high temperatures than at low temperatures. Most candidates were able to explain that the milk would not clot or clot at a slower rate because the enzyme would be denatured. Times greater than 75 seconds were accepted.

8aiv – This item was generally answered well with most candidates giving the idea that it was used to see if the effect of not adding chymosin or that it was a control. Some responses referred to the idea of accurate, precise or reliable results and candidates must be aware that these words have a specific meaning scientifically.

8vi – Most candidates were able to give at least one improvement to the method with many of them being awarded both marks. The most frequent marks awarded were for smaller intervals between

the temperature and for the indication that this would be around 35°C to 45°C or repeating the test at each temperature. Some candidates gave the idea that a wider range of temperatures could be used and this was not credited.

8b – The details of genetic engineering is a high specification statement and responses indicate that candidates generally have a very good understanding of the topic or that they find it challenging. Most candidates who gained full marks linked the use of restriction enzymes producing sticky ends with ligase to form the recombinant plasmid, few indicated that it would need to be inserted into the bacterial cell. Weaker responses only gained the mark for the idea of inserting a plasmid into a bacteria cell.

9a – To gain full marks on this question candidates were required to identify that structure A contains mitochondria for respiration or to release energy and that the acrosome or enzymes are used to digest the egg cell membrane. Candidates need to avoid stating that energy is produced or created. Some incorrect responses gave the idea that the mitochondria store energy and that structure B was the nucleus.

9b – This maths question on magnification required candidates to measure the width of the egg cell and calculate it's actual width with the answer in millimetres and standard form. Some candidates measured the diameter in centimetres which led to an error in the calculated value as it was not converted to millimetres. It is highly recommended that candidates measure in millimetres as it leads to less errors when unit conversions are required. Some candidates completed the calculation correctly but did not express the answer in standard form.

9c – This extended open response combined data analysis and maths skills with the application of knowledge on osmosis to an investigation. The level of the response was determined by the detail of the data analysis and the mark within the level by the application of knowledge on osmosis and direction of water movement. Candidates must ensure that when asked for calculations this requires manipulation of figures and not just a description that includes figures. Candidates who calculated a mass increase or decrease were able to access level 2 with many able to say which direction the water was moving. A calculation of percentage change in mass allowed access to level 3 and full marks if combined with the details on the movement of water by osmosis.

10a – A high proportion of the candidates found this item challenge and protein synthesis is a higher topic targeting higher ability candidates. This item requires the application of knowledge for alleles to protein synthesis to recognise that alleles have different sequences of DNA which would lead to a different sequence of mRNA and a different order of amino acids in a polypeptide which would fold to form a different structure. Many candidates did not give the idea that alleles have a difference in DNA sequence which is the starting point from the question but some recognised that the sequence of the mRNA and amino acids would be different.

10bii – This question required application of the knowledge on monoclonal antibodies to the information of blood types given within the question stem. Higher ability candidates recognised that the A antigen is different to the B antigen so the antibody would not bind the B antigen. Few candidates linked this to the idea that the shape of an antibody is complementary to the antigen. The question targeted the top grades for the paper.

10ci – Many candidates identified the that the genotype is homozygous for the white allele. Some only quoted one allele which does not represent the genotype.

10cii – This item required candidates to apply their knowledge on codominance to the outcome of a genetic cross on flower colour. If candidates recognised that pink flowers have a heterozygous genotype they were able to complete the Punnett square, interpret it correctly and obtained full marks. Some incorrect responses showed the outcome of a cross of white flowers with red flowers which does not give the same outcome and was not credited.