Examiners' Report

Principal Examiner Feedback

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

Paper 1: Combined Science (Higher tier) is awarded a total of 60 marks, and it is assessed by a variety of question types, including multiple-choice questions, short answer questions, calculations and extended open-response questions. Candidates should answer all questions in a time period of 1 hour and 10 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) Combined Science qualification assesses practical knowledge and maths skills, the requirements of which are given in the specification. Furthermore, there are 6 mandatory core practicals that candidates must complete prior to the examination, as aspects of working scientifically are also assessed in questions throughout the paper.

Paper 1: Combined Science (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 mitosis, disease communication, the nervous system, the use of stem cells, genetic engineering and the structure and function of sex cells.

Questions designed to assess practical work included writing a plan to determine the optimum temperature of an enzyme including variables and improvements, and the effect of enzyme concentration on rate of reaction, 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

1ai – 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 in 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

1aii – 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 bypassing the brain or an involuntary process was only seen in detailed responses.

1bii – 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 2

2a – 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.

2bi – This item required two ways that communicable diseases are different from non-communicable diseases. Candidates need to avoid giving the same idea twice and just give the reverse argument, for example, communicable diseases cannot be inherited and non-communicable diseases 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.

2bii – It was clear that candidates of all abilities 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 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.

2biii – 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.

2c - 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 from destroying the TB pathogen. Instead, many candidates just repeat the stem of the question that they would be more susceptible to TB.

Question 3

3aii – The responses to this item showed that some candidates can identify processes that occur during the cell cycle but are not clear on what happens at each stage. A number of incorrect responses identified processes that occur during interphase such as DNA replication or aligning on the equator from metaphase. Candidates who gave a process that occurs 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.

3aiii – 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.

3b – 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.

3c – 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 was seen for the risks but only higher ability candidates obtained two marks for this aspect.

Question 4

4ai – 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 several incorrect readings from the graph of 1.25x. Some incorrect answers had no workings which prevent any marks from being awarded as no workings mark can be awarded.

4aii – Many candidates scored full marks for this item by correctly identifying that cancer develops because of uncontrolled cell division leading to the formation of a tumour. Very few responses identified mutations in the DNA as a starting point.

4bi – 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. Several candidates referred to not removing too much blood or only removing the correct amount which is not a safety precaution and was not credited.

4bii – 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 5

5aii – 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.

5aiii – 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.

5aiv – 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.

5vi – 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.

5b – 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.

Question 6

6a – 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. Many candidates mixed the two labels up and were not able to be awarded the marks

6b – This math's 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 fewer errors when unit conversions are required. Some candidates completed the calculation correctly but did not express the answer in standard form.

6c – This extended open-response combined data analysis and math's 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.