



GCSE

Science A / Biology

BL1HP

Report on the Examination

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General

The quality of handwriting of some students continues to decline to the point that on occasion the answers that students had written were impossible to read. Schools are reminded again that the use of scribes is permitted and this would help these students to demonstrate their biological knowledge and skills effectively. Students are instructed to write in black ink, so that the responses scan clearly for online marking. In situations where decimal points are required in an answer, students should be encouraged to make sure the point is clearly visible, as faint dots on the paper may not be seen.

Students should be reminded of the advice on the front cover of the paper, to 'show clearly how you work out your answer'. In question 6(a) correct methodology, despite an incorrect answer, would have gained a mark.

It is always important that students should read the information provided in the question, rather than simply being intent on filling the answer lines. This information often gives vital guidance to students to help them utilise their knowledge and understanding effectively.

Question 1 (Standard demand)

- (a)(i)** The vast majority of students correctly identified that alcohol and nicotine are both legal and recreational.
- (a)(ii)** Again, a very high proportion of students gave a correct reason why it is difficult to stop smoking. Most of these referred to 'addiction' with fewer quoting 'dependence', 'withdrawal symptoms' or 'reliance'. There was only occasional reference to examples of withdrawal symptoms, without students having already gained the mark. Some students referred to the fact that these drugs 'alter the chemistry of the body' but as this is true of all drugs, it was insufficient to gain the mark, as was the idea of 'craving'.
- (b)(i)** It was clear that some students had omitted the Science at Work content of the specification from their revision and thus many struggled in this part and in part (b)(ii). Many students believed that independence in this context meant that the company was not linked to the government or the NHS, rather than not being linked to the drug manufacturing company. A weaker, yet still creditworthy, response was that the independent company would 'work alone' or simply 'not be linked to any other company'. It should be noted that although 'not biased' was allowed here, this would preclude the same answer gaining the mark in part (b)(ii) – although those students who did refer to the independent company being unbiased usually went on in part (b)(ii) to explain what this meant and so gained that mark too.
- (b)(ii)** Although many students were able to identify the idea of 'avoiding bias' as the reason for the independence of the testing company, there were many guesses including 'safety', 'testing skills' and even 'proper care of rats'. Several students wished to avoid 'sharp practice' in its various manifestations, including the need for the drug company to protect itself from litigation if the tests 'went wrong'. Mention of trustworthiness and truthfulness were acceptable alternatives to the avoidance of bias and appeared quite often.

- (b)(iii)** This part was not well answered, with many students failing to grasp the focus of the research described. In many cases students merely repeated the information in the stem of the question, that the new drug would reduce the feeling of pleasure from smoking or help people stop smoking. What was needed was for students to recognise that the drug might also reduce the pleasure from alcohol and so help people stop drinking. It was by no means uncommon for those who answered in the right general direction to suggest that the drug would prevent addiction, although it was the effect of this that examiners were looking for.
- (c)(i)** The data for this question was derived from a national survey of alcohol consumption amongst 11 to 15-year-old students and was reported in at least one widely-read national newspaper.

In this part of the question the students were asked to describe the differences between the types of alcoholic drinks consumed by boys and girls.

Two marks were available. The bar chart showed the percentage of boys/girls who had consumed particular alcoholic drinks; however, the examiners also allowed answers in terms of the amount of the different types drunk. The first marking point was awarded for stating that a higher percentage of boys drank beer or lager or cider (than girls). However, stating that boys consumed more beer or lager or cider was also acceptable. The second marking point was for stating that a higher percentage of girls drank wine or spirits or alcopops (than boys). Many students gained full marks but some lost marks by quoting incorrect figures from the bar chart. Others lost marks by stating that boys or girls *preferred* a particular drink or saying that a particular drink was *more popular*. Another common error was stating that boys or girls *tended* to consume a particular drink, with no reference to 'more'.

- (c)(ii)** Students were asked to comment on the validity of the statement, 'All boys drink alcohol'. This question was generally well answered. Many referred to the fact that 'only 100 boys were interviewed' and some students went on to say that such a small sample may not be representative. Others gained the mark by stating that the survey was 'only done on 15 year olds' or 'only carried out in the UK'. A further common acceptable response was that none of the bars went up to 100% or that the highest bar was 88% so this showed that perhaps not all boys drank alcohol. Some expressed this idea by saying that there was no bar on the bar chart showing boys who didn't drink alcohol. A common incorrect response was stating that girls overall drank more alcohol than boys but this was not relevant to the statement.

Question 2 (Standard demand)

Students were generally confident in answering this question and many excellent answers, worthy of all six marks were seen. A few, however, misunderstood the context. The mention of 'ions' seemed to trigger ideas about homeostasis which were ignored. Lengthy discussions of the need to control water content, temperature and blood sugar levels in the body as well as ion levels gained no credit.

Some students were unclear about the meaning of 'component'. Credit was given to the mention of carbohydrates (but not 'carbs'), proteins, fats and vitamins as well as to fibre and water even though these last two went beyond requirements of the specification. More general aspects of diet such as fruit, vegetables and dairy products or the 'healthy food plate' on their own, however, were not considered sufficient matches for 'components'. Some students also mistakenly thought that

'nutrients' belonged to a separate component category whilst others considered 'exercise' to be one. A significant number missed the part of the question which asked for a description of components other than mineral ions and included unnecessary detail about eg iron or, more often, calcium in their answers.

At least one clear link between a component and why it was needed in the diet was necessary for students to attain Level 2. Students sometimes wrote in terms that were too general for full credit to be awarded, reflecting, perhaps, the all too frequent media reports on dietary and health issues. Comments such as 'to keep us strong / healthy / fit', 'to help our cells work better / properly' or 'to cleanse / detox our body' were insufficient.

Specific misconceptions included 'fats contain glucose / sugar', components 'produce energy', 'fibre provides energy', 'fibre digests food' and vitamins equate to mineral ions eg 'vitamins give us iron'.

Credit was also given to answers that included a discussion of the right balance of different foods or energy intake to meet individual needs. Some students, however, still mistakenly believe that a balanced diet refers to one with equal quantities of the various components.

The Quality of Written Communication element of this question occasionally caused problems for students. Although most students appeared to have made particular efforts with punctuation and paragraphing along with organising their answers adequately, to at least match the level of biological knowledge expressed there were some who wrote in note form or gave their answers as bullet points without punctuation.

Question 3 (Standard demand)

- (a) The majority of students who gained this mark did so for the use of the term 'accuracy'. Some of the other terms from the scientific vocabulary, such as 'precise', were ignored. Those who referred to the sensor giving 'valid' results lost any credit they may otherwise have gained.
- (b)(i) Those students who recognised that microorganisms of some kind were involved in the process of decay often went on to gain all three marks, by explaining that the respiration of the microorganisms would produce carbon dioxide. Those students who did not make this link frequently gained just one mark, for suggesting that the decay process releases carbon dioxide. Despite the information in the question a number of students suggested that the grass itself was responsible for the production of carbon dioxide or that carbon dioxide was somehow stored within the grass from when it was alive and was now released
- (b)(ii) To gain this mark, students needed to recognise that all the grass had been decomposed or that the microorganisms had died or lacked sufficient oxygen to respire. As anaerobic respiration does not form part of this unit the examiners were willing to ignore the fact that fermentation would occur, producing carbon dioxide, in the absence of oxygen.

Question 4 (Standard and High demand)

- (a) In this question students were asked to give general functions of a receptor and an effector, along with giving a specific example of each. A good proportion of students were able to describe the role of a receptor in detecting stimuli, and give an example of one, with the most common example being 'light receptors' or the 'eye', itself. A number gave a general

body part such as 'hand' or 'finger' rather than 'skin'. Few students were awarded the first mark for the idea of converting the stimulus into an impulse.

Fewer students could give a generic description of the role of the effector with many giving a specific description of, for example, a muscle and thus missing out on the third marking point. Some however, were able to pick up this third mark by describing the action of both a muscle and a gland. A sizable minority gave as an example the response, such as pulling the hand away from a hot surface, rather than the effector carrying out the response. Students often used the term 'react' in relation to both the receptor and the effector, but this was not accepted in either case.

- (b)(i)** Most students gained both marks here, correctly identifying that a synapse is a junction or gap between two neurones. Those who did not gain the marks often referred to 'nerves', although 'nerve cells' was accepted, or suggested that the neurones join or connect to one another. A number of students went on to describe how information passes across a synapse and as this was not what had been asked for it was ignored.
- (b)(ii)** The first marking point, that information crosses the synapse as a 'chemical', was well known, with some students referring to 'neurotransmitters' which was also accepted. The second mark, which needed more detail, was awarded less often, as students omitted reference to where the chemical came from or what happened in the next neurone when the chemical arrived there. Many students appeared to believe that the synapse itself releases the chemical or that the chemical simply travels across the gap. Those students who failed to gain any credit here showed considerable confusion, often describing chemical information passing along neurones and being converted to electrical impulses to cross the synapse.
- (c)(i)** Given the information that reflexes from sense organs in the head are co-ordinated in the brain, it was surprising that so many students suggested that reflexes from 'eyes', 'ears' and 'tongue' would be co-ordinated by the spinal cord; perhaps in their rush to ensure they completed the exam, these students had omitted to read the information provided to help them. Furthermore answers such as 'fingers' or 'hand' were excluded as these are not sense organs.
- (c)(ii)** Most students realised that they had to divide distance by time to arrive at the answer. This realisation could have been achieved by reference to the units for speed, given in the last column of Table 1 or by using the example for the brain as guidance. A few students wrote down the correct sum, ' $80 \div 50$ ', but then failed to complete it correctly. Weaker students calculated the mean of 80 and 50. Simple rate calculations are a mathematical requirement of this specification.
- (c)(iii)** This was a demanding question and relatively few students rose to the challenge. In order to gain the marks students needed to synthesise several pieces of information, both from their knowledge bank and from that provided. The fact that there are no relay neurones in the brain left many students believing that information arrived at the brain in a sensory neurone and somehow found its way to a motor neurone by chance or because the brain 'knows what to do with it'. Many contradicted the information and explained why reflexes co-ordinated by the brain would be slower than those co-ordinated by the spinal cord. With fewer neurones, there will be fewer synapses in a reflex co-ordinated by the brain and as chemical transmission is slower than an electrical impulse, the reflex as a whole will be faster via the brain. Many of the students who did not gain marks here discussed the length

of the route for the reflex arc, missing the vital idea that the values were about speed, rather than time.

Question 5 (Standard and High demand)

- (a) Despite the question asking about bones in the feet, a high number of students referred to ankle bones. There were also many weak descriptions showing confusion between feet and toes, with many students suggesting that modern horses have just one foot, rather than one toe per foot. Students should have found this question fairly straightforward, as they only had to spot two differences between the feet of *Eohippus* and *Equus*; however they often complicated their answers by attempting to explain the differences as well. Students who gained marks simply referred to the most obvious differences such as the bones becoming longer / thicker / fewer (either in total or in the number of toes) or that fewer bones touch the ground.
- (b)(i) The majority of students used the information they were given to help them answer the question and many students gained both marking points, giving clear explanations involving 'increased surface area' and how this would help to 'stop them sinking in the mud' or enabling them to 'run faster'. However, many students ignored the information they were given and offered explanations involving 'swimming', having 'spare toes if one broke', 'heat loss', 'flexibility' and even 'tree climbing' to allow them to reach leaves higher up. There was much confusion between the role of predators and prey and which one does the chasing; a large number of students lost the second marking point because of this when they mentioned prey chasing the horses. A lot of students gave confused answers in which they either simply described the bone arrangement or they described how the *Eohippus* would have to get used to the harder drier ground by using this foot bone arrangement.
- (b)(ii) Students often applied generic answers they had learned from questions in previous papers but failed to gain all four marks as specific reference to the example in the question was required for the second mark. Despite this, the ideas of 'mutation', 'survival to reproduce' and the 'passing on of genes' was sufficient to gain three of the four marks. Weaker students missed vital details or simply described one horse ancestor 'turning into' another. 'Characteristics' was often substituted for genes, and students often forgot to include reference to either survival or reproduction. The idea of mutation or variation in the population was only described by better students, who often went on to gain at least three of the marks available. Once again there was much confusion between the roles of predators and prey.

Question 6 (Standard and High demand)

- (a) A little under a quarter of students gained both marks for this calculation. It was clear that standard form had confused some students, although many who gained only one mark had failed to round the calculated figure correctly, offering '0.6', rather than '0.67', '0.7' or '0.6 recurring'. An alternative route to gaining the one mark was to show the division sum required and some of those who did this multiplied their answer by 100 twice, to arrive at 67%.
- (b)(i) A significant number of students interpreted the first sentence as meaning that mosquito larvae eat fish, which was clearly incorrect. Others suggested that fish could not eat larvae

as fish live in water while larvae live on land or in the air, although the habitat of larvae had not been given. Consequently few students gained both marks here. Those who did recognise the flaw in the first sentence of the article often stopped after pointing out that food chains must start with plants or producers or that the larvae are not producers, and did not go on to explain the vital role of producers in the food chain as carrying out photosynthesis or making food.

- (b)(ii)** Students often failed to use all the information in the question and consequently missed out on potential marks. Many took the short term view that the release of mosquitoes would increase food for birds or bats or allow greater crop production, whilst others suggested that these male mosquitoes would provide no threat as they do not bite humans so cannot pass on the malaria microorganism. What examiners were looking for was the awareness that scientists must be carrying out the release for some reason and that could only be the reduction of the numbers of mosquitoes in the long term, and the consequences of this on other wildlife. There was also a common misconception that because the gene was transferred from a bacterium that somehow the GM mosquitoes would infect people with the bacterium and cause disease in this way. There was a surprising amount of concern that mosquitoes may be made extinct as a result of the release. Some wrote that all the GM mosquitoes would be genetically identical and therefore could all be wiped out by a disease. Many students repeated statements from the stem of the question eg 'adult mosquitoes provide food for birds and bats' without adding any value and so did not gain credit. Consequently relatively few students scored more than two marks for this part.
- (b)(iii)** Where students wrote about genetic modification, this question was generally answered well. Unfortunately many students wrote about a different technique altogether, most commonly adult cell cloning. Students were often unclear about where the gene was being cut from (the bacteria) or did not get the idea of 'cutting out' across well enough. The third marking point was also often not given because students did not make it clear where the gene was being transferred to. Weaker students were unclear as to whether the gene was being transferred from a mosquito to a bacterium or vice versa, or described the injection of complete bacteria into the mosquito.

Question 7 (Standard and high demand)

- (a)(i)** The most common error was to refer to energy losses in a food chain, such as 'heat' or 'movement', which were ignored. The most commonly given acceptable responses referred to 'respiration' and 'waste' of one kind or another, although if expanded in terms of types of waste, this could have gained two marks. It should be noted that colloquial terms are not acceptable, so references to 'poo' gained no credit. At this level students should know and use the correct biological terms.
- (a)(ii)** This part was not well answered, as many students did not use the information provided. That numbers were 'estimates' was picked up by most of the students who gained this mark, with many not realising that sighting two thrushes in six hours was unlikely to be a realistic figure for the population. Most students centred their responses on ideas that snails 'move slowly' so do not use up much biomass (or energy) in doing so or that 'most of the snail is eaten' with little waste. Neither of these ideas was creditworthy.

(b)(i) Students responded to why a scatter graph is appropriate for this data with a number of incorrect statements, such as there being 'lots of data', the data being 'continuous' or 'to draw a line of best fit'.

Some students did correctly refer to a scatter graph showing 'correlation' or 'trends' in the data. Only a very small minority correctly stated that 'there are two dependent variables'.

(b)(ii) In this question, students were only being asked to describe the patterns shown in Figure 7. However many responses referred only to one of the variables, shell colour or stripes, rather than both. It appeared that some students had not read the information well enough and believed that only the two types of snails shown in Figure 6 exist and described one of these, thus gaining only the one mark.

(b)(iii) Many students correctly referred to the idea of the snails being 'camouflaged' or 'less likely to be seen by predators'. Once again there was some confusion between predators and prey, with students suggesting that the snails 'prey could not see them' or that they were 'camouflaged from their prey'. However, there were also many incorrect responses, such as 'don't get enough sunlight', 'less light to fade the shells' and 'the dark shells can absorb the light / heat to keep the snails warm'.

(c)(i) It was evident from the large number of references to 'lichens' and 'sulfur dioxide' that many students had little idea that lichens are not animals. Hence, relatively few students gained this mark where they had to name both an animal indicator and the environmental factor it indicated. Those who did at least name animals named all sorts of species and all manner of environmental factors. Invertebrate animals (or an appropriately named one) as indicators of dissolved oxygen content in water, was required, although the much weaker 'water pollution' was accepted.

(c)(ii) Students needed to provide the name of an appropriate device to measure the environmental factor they had named in part (c)(i). In this case the device named had to match the factor, so an oxygen meter would not have gained a mark if 'sulfur dioxide' had been given as the environmental factor. Surprisingly some students who had suggested 'temperature' as the environmental factor in (c)(i) were unable to suggest a way of measuring this.

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