
GCSE

Science A / Biology

BL1HP

Report on the Examination

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General

Again there are some students who will have studied this unit for at least one year, and possibly up to three years, who will have gained grades below their ability as they had been entered for the inappropriate tier. A significant proportion of students gained fewer than 10 marks on this tier. At the other end of the scale there were also many very good students, scoring over 50 marks on a paper designed to stretch better students.

Students should continually be reminded of the need to read the information provided in questions carefully and to answer the question they are asked, rather than one they think may have been asked. The use of past papers is helpful to students revising for their examination, but they should be reminded that future questions are unlikely to be exactly the same as those in the past and therefore learning specific answers to past questions is counter-productive. Better that they should practice spotting what questions are demanding of them.

Once more students made it difficult for examiners to award marks by writing outside the boxes on the paper edges, thus losing answers as papers are trimmed for scanning purposes, by such poor writing that it is illegible, or by writing in such a faint colour that scanning does not show up their responses. Students should be advised to equip themselves with a black pen that delivers a dark ink colour. Where a student's writing is of such a poor standard that it might compromise marking, centres may provide scribes so that a student's knowledge and understanding of biology can be properly assessed.

Students should also be reminded that the answer spaces provided on the paper should be more than adequate to provide a full answer, so there should be no need to extend answers onto additional pages. Furthermore, scanning allows for a further line or so to be written beyond the printed lines.

Question 1 (Standard demand)

- (a) Only a little under half of the students correctly identified 'leprosy' in this question. This was spelled in a wide variety of ways; however provided the answer was recognisable and approximately phonetically correct, the mark was awarded. Although thalidomide is being trialled for treatment of a number of other diseases, it is only being used to treat one or two others, as shown in the mark scheme, thus vague suggestions of 'cancer' were ignored. It was surprising that so many students displayed weak knowledge here, with suggestions of 'morning sickness'.
- (b)(i) This question required students to analyse the information in the table and add together the shortest times from each trial stage. Examiners did not expect that this would prove to be so difficult for so many students, with little more than a third arriving at the correct answer.
- (b)(ii) This was a little more difficult than the previous part, as students needed to establish both the smallest and largest total of volunteers. However answers which either quoted both of these values or resulted from calculating the difference in the total values were accepted. The most common error was to quote '4980', the difference between the lowest and highest numbers for the three clinical phases.
- (c) The most common answers referred to efficacy, normally phrased in terms of 'to see if they work'. References to determining the correct dose were also common, whilst suggestions of the need to check for toxicity were relatively rare. Weaker responses often suggested checking that the drug does not 'harm' people, that it might be 'dangerous' or to check for

'safety'; these suggestions were considered to be too vague and were insufficient to gain the mark. Those students who had not carefully read the stem of the question often suggested the need to check for 'side effects' such as allergies, which were again ignored, if other correct answers were given.

- (d)(i)** The majority of students could offer at least one suggestion, most commonly in terms of ease of availability or accessibility of legal, non-prescribed drugs. Far fewer were aware that the (much) greater number of people taking these drugs would make them much more likely to affect health. Weaker students often failed to recognise the importance of the reference to 'the population' in the question and focussed on individuals perhaps taking overdoses, which would also be true of illegal drugs. Examiners were surprised at the number of students who seemed to believe that legal, non-prescribed drugs had not been tested and as such were 'dangerous to take'. Answers that were based on the cost of the two types of drug were ignored.
- (d)(ii)** The large majority of students recognised that some drugs would be difficult to give up because of 'addiction' or 'dependency'. Others offered the equally acceptable suggestion that 'withdrawal symptoms' would result if the person attempted to stop taking the drug. Very few students suggested examples of withdrawal symptoms. However 'craving' was considered to be insufficient.

Question 2 (Standard demand)

- (a)** A high proportion of students realised that process X is 'photosynthesis'. Many incorrect responses referred again to 'respiration', as presumably students maintain the misconception that respiration in plants (and algae) is different to that in other organisms, in that it 'uses carbon dioxide'.
- (b)(i)** The most common errors derived from students misreading the scale; for example reading that 'respiration by animals' accounted for 70 (billion tonnes of carbon). As a result, little more than half the students were able to arrive at the correct figure of '140' for their answer.
- (b)(ii)** Despite the scale and the rest of the question being described in terms of 'carbon', the examiners accepted answers in terms of 'carbon dioxide'. It was surprising, particularly considering the publicity given to the fact, that so many students arrived at exactly the opposite description to the one shown by the bar chart, ie that 'there is more carbon being removed from the atmosphere than is being added'. Some students demonstrated their overall misunderstanding by referring only to the number of processes on the two sides of the chart, whilst others quoted incorrect values or calculations (although errors in part (b)(i) carried forward were not penalised).

Question 3 (Standard demand)

- (a)(i)** A number of students appeared unaware that investigations of this type would, of necessity, be carried out outdoors and as such, it would be impossible to control the 'temperature' or 'light (intensity)'; however such suggestions were ignored if another correct answer was given. By far the most common error was to suggest the vague 'amount of weed killer', rather than 'amount/volume of weed killer *solution*', students perhaps not realising that the former could equally refer to the independent variable. Other correct

answers referred to the same 'area' or the same 'time interval'. Some students, who had presumably not looked at the table of results, suggested 'number of daisies/weeds' which was clearly incorrect in this field investigation; perhaps these students were identifying a further variable that might have also been controlled, rather than one which the gardener did control in the investigation.

- (a)(ii)** On the whole, this part was answered well, with most students realising that 'more daisies were growing after the application of the weed killer' than before its application. The alternative route to the mark, that this result (as in the case of any anomalous result) 'does not fit the pattern' shown by the other results, was also commonly given. Those students who failed to gain the mark frequently appeared to have looked only at the third column of the table, suggesting that the result for the use of 20 units of weed killer was the same as that for 0 units, in that 8 daisies were growing after the two week period.
- (a)(iii)** Although the majority of students gained the mark here, the necessity of a 'control' or means of 'comparison' was not as well known as might have been expected. Others realised that this is a means of 'validating the results', although very few expressed this using the correct term, preferring to go along the lines of 'checking that it was the weed killer (rather than some other factor) which was killing the weeds'. A number of students identified 'control' but then showed their confusion by adding 'variable' and as a result gained no mark as this is a very different component of the investigation.
- (a)(iv)** Many students recognised that a concentration of 80 (arbitrary units of weed killer) had also killed all the daisies and gained the mark, although some of these disqualified their answer by stating that this concentration had 'killed the same number of daisies'. An alternative route to gaining this mark was to describe a possible design flaw in the investigation which might lead to a lack of certainty about the conclusion. The most common of these was to refer to the gardener's failure to repeat the investigation. Relatively few students suggested that 100 (arbitrary units of weed killer) might also kill other (wanted) garden plants. Of those students who did not gain the mark, here, the most common response showed evidence of poor reading of the question, usually confirming that 100 units of weed killer was the best concentration to use as it 'killed all the daisies'..
- (b)** There were many excellent answers, gaining all six marks, in spite of the fact that the context was plant biology, one not necessarily favoured by students. The large majority of answers were awarded at least four marks. Some students however, failed to read the question carefully. The word 'environmental' reminded them of a question on a previous year's paper and they decided to discuss adaptations to hot and cold or dry habitats instead. Some simply saw 'affect' and 'growth' and chose only to discuss how 'environmental factors affect the 'rate' of growth rather than to include their effects on its 'direction'. Statements such as 'increased light intensity causes the shoot to grow more' failed to gain credit. Suitable environmental factors included light, gravity and water. References to the specific named tropisms were not necessary but were clearly acceptable as alternatives here. Some students referred to 'nutrients', 'carbon dioxide concentration', 'temperature' and even 'wildlife' or plant roots 'growing around stones' but these were considered to be inappropriate. Students should also be reminded that 'sun' is too general a term and that 'light' is always the word that examiners will be looking for in answers. Similarly, 'ground' or 'earth' are both insufficient for 'gravity' and 'plant' is not equivalent to 'shoot'. The effects on direction of growth included shoots 'growing upwards' or 'towards light' and growing 'against the force of gravity' and of roots 'growing downwards' or 'towards gravity'

or water'. It was not necessary to discuss 'positive' or 'negative' tropisms, although a number of students did. Some idea of the specific direction of growth was required. Answers such as 'it causes the plant to bend in a certain direction' or 'to grow the right way' or 'to grow longer / taller' were insufficient. Similarly, 'shoot' and 'root' needed to be specified here, as in the question. Students often use 'plant' as a synonym for 'shoot' but answers such as 'the plant grows towards light' could only gain credit for the named factor and not for the response.

The role of plant hormones in responses was generally well understood. The majority of students referred to auxins in answers but some plucked the wrong plant term from their memories giving, for example, 'stomata' or 'xylem' instead. Many appreciated the fact that unequal growth rates were caused by unequal distribution of hormone in the plant. References linking the correct pattern of distribution to the precise response were unnecessary and beyond the knowledge expected for this unit. Some students, struggled with the concept of auxins. They sometimes thought that auxins could be 'killed', 'grew', 'strengthened the stem' or were 'absorbed from the sun'.

The Quality of Written Communication element of this question rarely caused any problem for students. For the most part, 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.

Question 4 (Standard and High demand)

- (a) It was expected that students would be able to draw on their learning that pathogens are 'microorganisms that cause infectious diseases'. The examiners accepted specific types of microorganism, such as 'bacteria' or 'viruses' or the more general 'microbe' as alternatives to 'microorganism'. Similarly, either 'causing infection', 'causing disease', or 'causing illness' were acceptable, although it was considered that 'causing sickness', making you 'unwell' or being 'harmful' were too vague. Those students who did not gain this mark often stopped at describing pathogens as merely 'microorganisms', without further qualification or displayed weak understanding, suggesting that the microorganism was itself the disease.
- (b) Many students were able to describe at least one way of reducing the number of bacteria which become resistant to antibiotics, although few went on to give a complete answer. Correct and common ideas included 'reducing the use of antibiotics' and the need to 'complete the course'. A further mark could be gained by suggesting the circumstances in which antibiotic use could be reduced, such as 'for minor infections' although relatively few displayed deeper understanding by explaining that antibiotics should not be used to treat viral infections. There was some confusion about the use of vaccination, with some students suggesting this would be an alternative to giving antibiotics to patients or that doctors should 'wash their hands' between patients, whilst others suggested that giving more or stronger antibiotics would suffice.
- (c)(i) The distractor, 25 °C, was chosen more frequently than the equally incorrect 100 °C, with only a little under half of students offering the correct answer, this difference was undoubtedly due to the knowledge that the former is the maximum temperature that should be used in schools.
- (c)(ii) Students who showed some understanding but were not awarded the mark often failed to give a comparative answer that microorganisms grow 'faster', rather than simply 'fast'. Others were keen that industry should save money by reducing energy costs. Those

students who referred to enzyme action, including denaturation at 100 °C were not credited as they had not considered that the question referred specifically to growing bacteria.

Question 5 (Standard and High demand)

In this question, it was expected that students would be able to draw on their understanding of adaptations of organisms and apply ideas from their learning to the specific unfamiliar situation.

- (a) A significant proportion of students suggested that a store of oxygen within the air bladders would allow the bladder wrack to respire to a greater extent than the saw wrack and thus grow faster. These students had not appreciated that respiration uses biomass rather than produces it and thus greater respiration would in fact result in less material being available for growth. Those who recognised that photosynthesis is necessary to add biomass often did well here, realising that the air bladders would aid flotation, so the wrack would have greater access to sunlight and thus photosynthesise more. Those students who understood this but did not gain all three marks often stopped short, omitting the last part of this story or failing to give a comparative answer, to match the comparative in the question. It was concerning to examiners how many students wrote about 'oxygen being used for photosynthesis', and even if this point was made comparatively, the mark for photosynthesis was not awarded due to the incorrect biology that had been used. An alternative route to gain one of the marks was that the bladders would contain carbon dioxide and this was given by a significant minority of students.
- (b) Gaining both marks on this question was, to a certain degree, a question of stating what might seem obvious, rather than needing any special insight into the peculiar lifestyle of the angler fish. Only a minority of students felt it was worth mentioning that there would be no light at over 1000 m and it was for this reason that the lure would be advantageous. Where marks were awarded it was usually to do with spotting predators or prey. Very few realised that the lure would be useful to attract mates for reproduction. Many students, upon suggesting that a lure would be useful to attract prey, presumably felt that it was self-evident that the prey would then be eaten and so did not bother to state the fact and thus did not gain the second mark. Similarly, upon proposing that the lure would (improbably) enable the angler fish to see its predators, then failed to mention 'and therefore escape from them'. A few students arrived at more novel suggestions, that the lure would 'provide light for algae to photosynthesise' and so 'provide food for the angler fish'. Another suggestion was that the bacteria in the lure 'could be used to infect prey so that they became ill making them easier to catch and eat'.

Question 6 (Standard and High demand)

- (a) This question was an opportunity for students to critically analyse the methodology of a nationally carried out scientific study. Sufficient information was provided for students to gain at least two marks fairly easily. One issue that led to the vast majority of students failing to gain all three marks, was the very common tendency to identify one reason and then use up the next six or seven lines repeating and elaborating on this, and never getting round to suggesting a second let alone a third reason. Even a brief study of the information in the table should have allowed students to recognise that 'blackbirds were seen in more gardens' than were house sparrows. Some quoted the values from the table and often

went on to calculate the difference in percentage, but this still only amounted to one reason, when three reasons had been asked for. Unfortunately some students did not read or quote the table headings carefully enough and misinterpreted this as percentage / number of birds which were seen, rather than percentage of gardens they were seen in. A second limitation in the investigation was the short duration of the observations, a point which many students identified, although again this was elaborated upon as students referred not only to the one hour duration, but also the single day and the one month, again all of which were one idea. A third mark might have been gained in a number of ways, in this case the most common was the idea that only gardens were used for the survey, whereas the birds might have lived elsewhere.

However several misconceptions were also evident, one that six hundred thousand observations was insufficient, in comparison with national population of approximately 60 million. These students had omitted the idea that not every individual in the population has a garden of their own, furthermore had limited understanding of what proportion of the population a survey might cover or that 600 000 is in fact a very large sample. Others thought that specific areas, often Wales or Scotland, would be excluded from the survey.

- (b)(i)** This was a difficult calculation targeted at the upper end of the candidature. With this in mind, the quarter of students who arrived at '60.3' had completed the demanding thought processes and carried out the correct mathematical computation. Incorrect answers often got no further than '80%', the change in percentage; and as this could be read from the bar chart, it was clearly not a calculation. The other common answer was 46.5, the difference between the change in percentage, 80%, and the 33.5% of gardens goldfinches were seen in, in 2011.
- (b)(ii)** This question required students to draw upon their understanding of what might affect the size of a population. However, the most obvious answers, that there might be 'fewer predators' or 'more food' were not common. Students often stopped at the idea of 'more were born' without offering suggestions as to why this might have come about. It was also evident that many students had failed to read the vital information that the 2012 survey was carried out in the same way as the 2011 survey', given in the question. Thus suggestions that the survey was done in a different season or that different migration patterns might have an impact on the figures were not creditworthy. Similarly that the survey was completed by 'more people' was also irrelevant as figures were given as percentages rather than as raw data. Students often displayed poor understanding of the time scale involved in evolution, suggesting that in the twelve month period, the goldfinches had evolved longer / stronger beaks for feeding.
- However, it was pleasing to note that almost all answers were in comparative terms. It should be noted that students are not expected to know the specific feeding habits of any organism so, although improbable, suggestions such as 'there would be fewer wrens eating the goldfinches' were accepted in terms of understanding the principle of there being fewer predators.

Question 7 (Standard and High demand)

- (a)** This question asked about receptors in the skin, rather than receptors in general. Thus students who qualified the first point with inappropriate stimuli, such as 'light' or 'sound', were not credited with the mark. Furthermore it should be noted that the skin does not detect 'temperature', but rather 'changes in temperature', although in a list of otherwise correct stimuli, this inaccuracy was ignored. Anthropomorphic answers had the receptors

'feeling', 'thinking' and 'deciding' whilst others suggested that the receptors were themselves effectors in bringing about the response. In terms of the second marking point, although many described the role of receptors in sending 'impulses' or the barely acceptable 'signals', many others reverted to the inadequate 'messages', additionally these impulses were often sent directly 'to muscles', rather than 'the brain / spinal cord' or 'via sensory neurones'.

- (b)(i)** Many students had learned this part of the specification well and the format of the question allowed them to gain four marks in a fairly straightforward way. The question identified that 'there are two types of effector', thus answers that identified a specific muscle or gland were not awarded the marks in the first column. Many thought that hormones or specific examples of hormones were effectors and that glands were responses. There were many instances of 'neurone', 'synapse' or 'spinal cord' in the effector column with equally wrong matching words in the response column. The response column often contained examples of simple reflex actions. The mark scheme was applied strictly: thus specific examples of effectors were ignored unless preceded by the correct general term. The 'relaxation' of muscles was ignored, whilst 'expansion' of muscles negated any other words written in that part of the table.

Many students were unable to offer any suggestions whatsoever and left the table blank. Perhaps a little more attention to the mark allocation here might have prompted some of these to at least have a go at answers, rather than give up so many marks without effort.

- (b)(ii)** A significant proportion of students could offer no more than the need to avoid body temperature becoming too high or too low, thus doing little more than restating the question. Better answers, perhaps from students who had studied other units, referred to the possible 'denaturation of enzymes', although a considerable number of these lost the mark by describing denaturation as a result of 'low temperatures', whilst others appeared to believe that enzymes work at only one specific temperature.

Question 8 (Standard and High demand)

- (a)** Whilst the term 'gene' is likely to be commonly heard and used by students, relatively few were able to define it well. A common misunderstanding was that a gene is a whole 'strand of DNA', is 'on DNA' or is a whole 'chromosome', rather than being only 'part of the DNA / chromosome'. Other students got the scale in reverse order, suggesting that 'genes contain chromosomes'. For the second marking point many students simply gave examples of characteristics, implying that genes only 'control eye / hair colour', or suggested that it is genes that 'make us unique' or make us 'look like our parents'. The question, having been phrased in general terms, required a general answer that genes 'control characteristics / features', but not 'what we look like'.
- (b)** It was evident that many students had not carefully revised the part of the specification concerning adult cell cloning and thus had difficulty in comparing this process with the iPS method described in the question. However, even for these, a little thought and possibly guesswork might have yielded some (or even all) of the marks, as they could have picked out specific parts of the process described and suggested that they were 'the same as' or 'different to' adult cell cloning. However, for those who had a good knowledge of the process of adult cell cloning, no marks could be awarded if all their answer consisted of was a description of this process, rather than an attempt to make comparisons between the two. Examiners were pleased that most students made a good attempt to identify when

they were describing similarities and when they were describing differences. The use of link words such as 'however', 'whereas' and 'also' were common ways of showing this. The most common misunderstandings concerned the belief that the embryo in adult cell cloning is formed as a result of fertilisation. Students often stated that 'in both, fertilisation occurs outside the body'. Some seemed very uncertain about the role of the egg cell in adult cell cloning. They seemed to think that the nucleus from the skin cell is put into an egg cell and then fertilised.

A common mistake was to state that the two processes are similar because they both involve egg and sperm cells. Another quite common response was that in cloning, the egg is fertilised with the nucleus of the skin cell.

There were more attempts to describe similarities between the processes, rather than differences, however full marks were available providing at least one similarity / difference was given.

As in previous longer prose questions, students often extended their responses onto additional sheets, sometimes having left the lines on page 17 blank. Students should again be reminded to plan responses to such questions carefully to avoid wasting valuable time.

- (c) Many students recognised the need to retain biodiversity or maintain food chains and thus gained the mark here. Others correctly suggested the possibility that the drill might be economically useful in the future, usually referring to the potential of extracting useful drugs or cures for diseases. Weaker students got no further than suggesting that this would 'prevent extinction', which, along with the idea of the aesthetic value of drills, was not credited.

Question 9 (Standard and High demand)

- (a) Although the essence of this question is quite straightforward and involves a term that students must be very familiar with, considerable misconceptions and gaps in knowledge exist. Many students appeared to believe that 'balance' means that there should be equal amounts of each nutrient in the diet, ie the same mass of vitamins as of carbohydrates, rather than referring to balancing the intake with the body's needs. It should also be noted that the various nutrients might be in the correct proportion but if these proportions did not deliver the correct amounts, then the diet would not be balanced. Students who quoted the names of the nutrient groups, rather than using a general term, needed to identify at least four of the groups. There was a clear misunderstanding on the part of many students as to what a nutrient group consists of, with suggestions of 'dairy' and 'fruit and vegetables', sometimes alongside one or two of the nutrient groups expected, along with frequent references to the 'eat-well plate'.
Relatively few students referred to 'energy' in their answers and it was not common for students to demonstrate understanding of the need to match intake to an individual's needs, such that a balanced diet for one person might not be a balanced diet for another.
- (b)(i) The majority of students correctly identified 'ovaries'. A wide variety of alternative suggestions was given, with the most common being the 'pituitary gland'; some of these suggestions had no link whatsoever to the reproductive system.
- (b)(ii) Students were keen to demonstrate the whole breadth of their knowledge, often giving three roles of oestrogen in the female reproductive system. Students might have been alerted by the one mark allocation and only two lines being available that one role would have been sufficient.

- (b)(iii)** There were two alternative ways of answering this question, either by referring to the action of anabolic steroids or in birth control. For the former, examiners were looking for the specific action of the steroid, rather than the vague ‘enhancing performance’ and for the latter students needed to make it clear what form of birth control the steroid was involved in, the contraceptive pill. A few alternative answers involving the use of steroids in specific medical treatments were also allowed.
- (c)** Responses of a large proportion of students to this question lacked depth. At this stage in the paper, students might expect that they would need to do more than simply quote the general effect of increasing dietary cholesterol. However this, a ‘decrease’ in production by the liver, was worth one mark if no other mark was gained and indeed for most of the students who gained any credit here, this was the mark given. Examiners were looking for the very obvious change in rate of decrease in production of cholesterol by the liver for the first mark followed by an indication of the mass of dietary cholesterol at which this happened, ‘900 (mg per day)’, for the second mark. Many students chose to ignore the focus of the question regarding the effect of dietary cholesterol and instead described the effect of increasing blood cholesterol concentration on the production by the liver. This of course, gained no credit, although those students who followed the story through, going from dietary cholesterol to blood cholesterol and its consequential effect on liver production were credited. Some students described a decrease of cholesterol production but then simply quoted values from two random points within the graph, often choosing the wrong scale to read values from. Those who did manage to gain the first mark often failed to get any further because they again chose the wrong scale to read values from. As a result only around ten per cent of students gained both marks. A very few students chose to correctly quote all three significant points from the graph and were awarded both marks.
- (d)(i)** It was evident that many students simply did not read this question carefully enough. The question asked students to name a part of a cell, so it was surprising that so many named all sorts of bodily organs or chemicals and that so many could not offer a single suggestion, leaving the answer line empty. In this unit students are only expected to know three parts of cells, nucleus, cytoplasm and cell membrane and are only expected to know any detail about the function of one of these, the nucleus. Students are expected to know that ‘genes’ control characteristics, one of which might be the chemicals cells produce, furthermore that these genes are parts of ‘chromosomes’ and that these are found in the ‘nucleus’; so any one of these three answers would have gained the mark. Although the ‘ribosomes’ (not part of this unit) are involved in protein, and therefore enzyme, synthesis, they do not *control* enzyme production, merely acting as a structure on which protein is assembled, however this answer was considered to be just acceptable.
- (d)(ii)** Given the information they had worked through in the question, along with the information that statins lower the concentration of cholesterol in the blood, good students might be expected to make a reasonable suggestion as to how statins achieve this. Consequently, good students, on the whole could offer sensible suggestions of the drug ‘reducing the production of cholesterol by the liver’ or of ‘reducing reductase production’. Some alternative reasonable suggestions were accepted as shown in the mark scheme. Disappointingly many students got no further than repeating the stem of the question that statins ‘reduce blood cholesterol’ or quoting their knowledge that statins ‘lower the risk of heart and circulatory disease’ without getting to the question as to how this might be achieved.

Mark Ranges and Award of Grades

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