



General Certificate of Secondary Education

Science A 4405 / Biology 4401

BL1HP Unit Biology 1

Report on the Examination

2012 examination – January series

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Science A / Biology
Higher Tier BL1HP**General**

In this first examination of the new specification examiners were pleased that the majority of students appeared to be well prepared for the new specification. However, there are still some areas where skills need to be developed. This is most notable firstly, in questions requiring evaluation skills and secondly, in answers to questions which require explanations which can now only gain full marks if a full and complete answer is given. Furthermore, the introduction of the assessment of Quality of Written Communication (QWC) adds a further element of difficulty to the paper. These, and other examples, will be referred to where appropriate in this report, but Schools / colleges should pay particular attention to the report on question 6(b).

Examiners continue to be concerned that a small minority of students are inappropriately entered for Higher Tier papers. These students clearly lack many of the skills required for a demanding paper where their powers of reasoning and deduction as well as their in-depth knowledge of the specification will be tested.

As explained more fully in the report for the Foundation Tier, students need to be sure of the type of answers required by different command words such as “explain” and “evaluate”, to notice important clues and instructions in the stem of a question and to indicate clearly if they have continued an answer outside of the designated area.

Question 1 (Standard Demand)

- (a) (i) Although most students demonstrated at least some knowledge of the term ‘sexual reproduction’, many were unable to provide a meaningful definition, resulting in less than half gaining this mark. The basis of most answers was that this involved two of something, either ‘parents’ or ‘gametes’ or ‘sexes’ or even ‘species’. However a large number of these went no further than mere involvement, thus ‘this involves a mother and a father’ and ‘a sperm and an egg are used’. Even students who appreciated that gametes needed to be more than just present often failed to stress the importance of ‘fusion’ and terms such as ‘mix’, ‘come together’ and ‘meet up’ were frequently seen. Some responses were simply descriptions of the outcome of sexual reproduction (as opposed to asexual reproduction), for example ‘it’s when the offspring get genes from both parents’ and ‘it gives rise to variation’ and as such failed to gain the mark. A significant number of students assumed intercourse to be the same as reproduction. More than a few responses were based on the difference between animals and plants and the idea that ‘animals carry out sexual reproduction whereas plants carry out asexual reproduction’.
- (a) (ii) Students fared better in this part, perhaps being more cued in by the information about the zorse. Those who failed to gain the mark usually paraphrased the question with answers such as ‘the zebra and the horse both pass on characteristics’ or described the picture ‘it gets stripes from the zebra and white skin from the horse’. One significant misconception identified by examiners was of students’ misunderstanding of the term ‘characteristics’, treating this as a synonym for ‘genes’ and thus gaining no mark. What was expected was a reference to genes (or an equivalent term) and that these were acquired from both parents. The mark for this latter idea could only be gained if the first idea was included, so those who only rewrote the question could not gain this mark.
- (b) Many students appeared to be well prepared for the QWC question and there was a notable improvement in neatness of writing (not assessed), care with spelling and punctuation, when compared with the rest of the paper. Those students who made the
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effort should be congratulated for this but it is obviously a chore to many who revert to poor quality written English in the rest of the paper. There were frequent misspellings of even the most basic words such as ‘embryo’, ‘nucleus’ and ‘uterus’. It was intended that the diagram should provide visible clues for students to guide their description. Most took these on board and made a worthy attempt. However, those who got no further than describing just what was in the diagram (‘skin cell from a zorse’; ‘egg cell from a horse’; ‘remove nucleus from egg cell’) gained only two of the six marks. In order to award higher marks, examiners were looking for added detail, expressed appropriately, from the process, such as the fusion of the nucleus of the skin cell with the empty egg cell, the use of an electric shock (not just a ‘shock’ as described by some) to trigger the growth of the cell into an embryo and the subsequent implantation of the embryo into the uterus. These were all creditworthy ideas, but each only prompted by the diagram. Common errors, omissions and misconceptions included the ‘placing of the whole skin cell into the empty egg’, as students weak knowledge was compounded by their poor observation skills of the diagram showing the arrow from the skin cell nucleus; that the embryo should be put anywhere ‘in the surrogate mother’ including the ‘ovaries’. The formation of the embryo was very often described as taking place after being placed in the uterus and sometimes the electric shock was applied after the formation of the embryo and sometimes after implantation!

Students should be reminded that the use of the words such as ‘it’ and ‘they’ are often ambiguous and that they should take particular care to avoid their use, where possible, as phrases such as ‘it is put into it’ have no real meaning. It must be stressed that irrespective of the quality of the biological detail provided in an answer, examiners may not award full marks for answers that lack ‘almost faultless spelling, punctuation and grammar’, as described in the preamble to the mark scheme.

Question 2 (*Standard Demand*)

- (a) There are two key instructions, ‘compare’ and ‘use data from the graph’. Whilst the majority of students attempted to comply with both of these, many made vital errors that prevented them gaining at least one of the marks. Thus those who failed to notice that the numbers were in thousands, thought that the figures were ‘per thousand’ or gave irrelevant information from before 1968 often did not gain credit whilst those who believed that *both* vaccines were given after 1988 generally gave confused accounts as to their effectiveness. Some students chose to describe the impact of the MMR vaccine on mumps and rubella describing the MMR as being ‘more effective because it treated more diseases’. The examiners accepted a wide range of number references for the effect of both vaccines, from the immediate effect over one year or one ‘cycle’ to the total effect over the ‘lifetime’ of the vaccine and many students made good attempts to give appropriate values. However, references to rate of reduction were not accepted as, for example the rate of reduction of cases from both vaccines changes each year as a best fit line (if one can be drawn from data with large peaks and troughs) is a curve.
- (b) A high proportion of students correctly identified ‘mumps’ and ‘rubella / German measles’, although there were the usual errors including ‘meningitis’ and ‘rabies’. An unexpectedly high number of students made no attempt at this question.
- (c) It was clear that some students had been taught well beyond the requirements of the specification, as answers included references to different types of white blood cell, antibody-antigen interactions and how ‘memory’ works. At the other end of the scale, some students showed quite surprising omissions, with no mention of either white blood cells or antibodies in their answers. Descriptions of the body ‘fighting off’ measles were not uncommon amongst weaker students. The last mark was often missed as students poor expression or weak knowledge let them down, thus ‘the body knows how to fight it off’, ‘white blood cells stay in the body so they’re ready next time’ or ‘white blood cells kill

it quickly' gained no credit as it was the rapid *production* of the antibodies upon re-infection that was required.

Question 3 (*Standard Demand*)

- (a) (i) Most students understood the requirement of a 3-layered structure here. A few, however, failed to gain any marks at all, giving a food chain only or attempting (sometimes very well!) to draw the organisms involved instead. Apart from this, two common errors were seen in answers, both of which arose from students focusing only on the numbers of organisms. These students sometimes failed to appreciate that the question asked for a pyramid of biomass. So although 3-layered structures were drawn, the band widths reflected numbers only. Other students realised the need for a triangular shaped structure so placed aphids, with the largest number, at the bottom and the single bean plant at the top. Such answers gained one mark for the correct shaped pyramid but nothing for the labelled bands. Other students saw the necessity to maintain food chain order in their diagrams and gave 'middle-heavy' pyramids instead, again gaining only one mark, this time for the layers in the correct order. Despite these errors, a pleasing number of students achieved full marks in this question.
- (a) (ii) Few students achieved both marks. Weak answers simply stated that the bean plant was 'bigger'. Some tried to add scientific value to these responses by using phrases such as 'larger surface area' or 'more dense' but still failed to gain credit. Others tried to be more inventive by suggesting that bean plants contain 'more water' or that they need a higher biomass for reasons such as: 'to support the insects without getting squashed' or 'to prevent the animals from starving'. Other students chose to ignore 'biomass' in the question and answer in terms of energy losses instead. This led to a shift in focus to e.g. 'respiration', 'movement' and 'temperature control' (even though inappropriate for insects!) and these were not credited. Students who mentioned losses of waste or excretion, however, did gain credit. Some specified urine and faeces and picked up both marks but very few mentioned carbon dioxide. Several answers referred, correctly, to not all of the bean plant or aphids being eaten, although a few students seemed to think that it was because both had bones!
- (b) Although the carbon cycle is not usually a popular topic, many students managed to gain at least two marks here. The idea that the bean plant would decay was commonly mentioned and this was often linked with microorganisms or detritivores. Good students appreciated that these organisms respire and then release carbon dioxide. Some students felt they had to include every possible detail of the carbon cycle in their answers and wrote far more than was necessary. There were some notable misconceptions in responses, however, such as the belief that when plants decompose the carbon simply disintegrates into the soil and that it is then available for other plants to absorb. Another was to assume that plants take up and retain gaseous carbon dioxide so that when they die the carbon dioxide simply escaped again into the atmosphere, rather like air from a burst balloon. Some students seemed intent on confusing not only biomass but also carbon with 'energy'; others thought that carbon returned to the atmosphere via sweat or excreta. Overall, however, some very pleasing answers were seen in response to this question.

Question 4 (*Standard / High Demand*)

- (a) (i) Students should aim to be much more specific in their responses to direct questions. There were a number of very vague answers often using the word 'something' either 'something that does something' or a 'chemical which does
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something'. Many included the word 'chemical' but failed to include what this chemical did, even at the simplest level with the idea of the chemical being a 'message'. Relatively few students referred to the idea that a hormone affects a 'target organ'. Evidently some students had compared nervous communication with hormonal communication, in their revision, and gave these comparisons in their answers here. Those that included relevant descriptions of a hormone were, of course, credited, however weaker ones such as 'hormones travel at the speed of blood' were not.

- (a) (ii) A high proportion of students correctly named an appropriate gland, or simply gave 'glands'. Those glands named in the specification were of course commonly given and the examiners accepted all other endocrine glands. Of concern was the poor spelling of 'pituitary' with some attempts being barely recognisable and it is fortunate that on this occasion hormonal communication was not the subject of the QWC question.
- (a) (iii) A good proportion of students correctly gave 'blood' or 'bloodstream', however 'nerves' and 'synapses' were by no means uncommon, whilst others hedged their bets with 'blood and nerves'. Students should be made aware that answers that include both a right and wrong answer for a single marking point will never be awarded the mark, irrespective of the order they write the answers or the use of brackets or fainter / smaller writing.
- (b) Many students showed excellent knowledge and had clearly prepared themselves well for this question. These students often gave all the marking ideas available and would have scored many more marks had they been available. Those students who bullet-pointed their responses ensured that they referred to all three hormones. Other students fared worse with half-learned facts that were sometimes scatter-gunned at the hormones, thus whilst they might have correctly given a function of one of the hormones in one sentence, they immediately lost that mark for attributing a wrong function to the same hormone in the next sentence. Once more, students would be better served by having some understanding of the mechanics of mark schemes, in that contradictions cost marks and it is no use hedging bets with multiple attempts. For a question with a three mark tariff asking about three hormones, it should be evident that there is one mark for each hormone and so only one role for each is required.

Question 5 (*High Demand*)

- (a) Examiners were surprised that just over half of students gave the correct answer 'mutation', with 'adaptation' or 'selection' being fairly common suggestions.
- (b) Many students had clearly learned a standard answer to this question, however they failed to relate this to the particular context given and so missed out on at least one of the marks. Whilst most were aware that both reproduction and genes were important somewhere in the story, what was often omitted was the idea that reproduction allows the relevant genes to be passed on to the offspring. Very few students referred to the important point about only the mutant males being able to hatch and, if they did, even fewer continued the explanation and whilst the link between survival and reproduction was often correctly made, some considered that the mutation made them breed faster. There was evidence of some confusion about how genes work, with suggestions such as 'the stronger gene survives'. Further confusion about living things in general was not uncommon with answers often referring to the butterfly 'having babies'. A few students took entirely the wrong track and homed in on the reference to bacteria in the question and thus described the effect of white blood cells and antibody production which would have served them well if repeated in question 2(c).

Question 6 (High Demand)

- (a) (i) A high proportion of students were able to give one of the alternatives available; in most cases this involved animals of some kind, with ‘cells’ and ‘tissues’ being rather less common. The most common reason for students failing to score the mark here was for not answering the question, misreading it as ‘why is the drug tested’, giving answers that would have been better in part (a)(ii).
- (a) (ii) Many students appeared to be well-versed in the reasons for trialling drugs, with the majority scoring at least two of the three marks. Nearly all were aware of the possible toxicity of a drug, often expressing this in terms of ‘side-effects’. Reference to ‘efficacy’, expressed in a wide variety of ways was also common. However, ideas about establishing dosage were less frequent, although those who did so expressed this clearly, and reference to possible ‘interaction with other drugs’ was seldom seen.
- (b) The question was purposely open to interpretation, so that students could gain credit for a variety of approaches, comparing statins with cholesterol blockers or comparing statins (and / or cholesterol blockers) with no treatment. In previous specifications, students have been able to gain marks in “evaluation” questions for simply extracting ideas directly from the information provided and assigning it to either ‘advantages’ or ‘disadvantages’. This is no longer the case and as such is exemplified in the specimen papers on the AQA website. In questions such as this students must now “*add value*” to the information provided. Thus both sides of any point must be made for the mark to be gained. For example ‘statins cause death’, although a rather extreme extrapolation of the information, is inadequate as it only involves copying from the information provided. In order to gain the mark for this idea, students also needed to make the point that ‘(on the evidence provided) cholesterol blockers do not cause death’. Hence a very large proportion of students got no further than paraphrasing the information and gained few, if any, marks and a mark above three out of the six available was a very rare achievement. Very few students referred to ideas about the uses of the two types of treatment in different situations; statins for people with high cholesterol linked to inheritance and / or cholesterol blockers for people with dietary cholesterol problems. On the whole this question part was the most poorly answered on the paper. However, it is expected that future students will improve their skills in tackling evaluation style questions as they gain experience from these early papers.

Question 7 (High Demand)

- (a) Most students knew the names of the three neurones; a greater problem was applying the names to the correct structures. The most common error was to transpose ‘sensory’ with ‘motor’ and thus gain only one of the three marks available for C as the relay neurone.
- (b) Students struggled with this question, with ‘pressure’ being the most common acceptable response. Vague references to the indirect stimulus, ‘kick’ or ‘knock’ on the knee / leg were not accepted but if this was linked to the precise position ‘P’ the mark was given. A wide range of unexpected answers, including ‘heat’, reference to ‘sharp pins’ and even ‘bright light’ was given, as students presumably recalled other stimuli, they had studied.
- (c) Most students referred to a ‘chemical’ crossing the synapse, with a few going further than is required with ‘neurotransmitter’. Perhaps prompted by part (a), some described the chemical as ‘passing from one neurone to another’ or moving ‘between neurones’. Better students were able to add further detail, referring to the chemical ‘diffusing’ across the synapse, although only rarely was it clear that the chemical is a means of ‘transmitting information’ across the synapse. However, there were some excellent

answers here and it was quite clear to examiners that many students had made a concerted effort to learn the events at a synapse.

Question 8 (*High Demand*)

This question tested students' analytical skills and their ability to express ideas clearly. Many responded well and gave good answers throughout the question, however many others got lost "en route" as they were unable to link information from different parts of the question into clear ideas.

- (a) Most students identified 'Scotland' however; the reasons for this choice were generally far from clear, with most seeming to have chosen it as having the largest *total* area of woodland. Unfortunately, this only gained the first mark as the question required a reference to *proportion* of area suitable for squirrels. Furthermore reference only to a (rough) figure for the proportion of Scotland that was suitable was not sufficient to gain the second mark, as examiners required a reference to the figures for both England and Wales as well.
- (b) (i) Most students appeared to recognise that there is a link between squirrel type and type of woodland but were unable to articulate their ideas coherently. In the main, students left examiners to fill in the gaps, which of course, they do not do. Students referred either to the different squirrel types or to the different woodland types in England and Scotland, but often did not go on to join these two observations into one complete statement. There was evidence that students had interpreted the map of squirrel distribution in terms of absolute numbers of squirrels.
- (b) (ii) Relatively few students realised that they had to revisit the whole map and data table, rather than refer again to Scotland and England. Thus many merely pointed out that 'England has some red squirrels' or that 'Scotland has grey squirrels too', thus suggesting an anomaly. Those students who realised that Wales was the key to this question generally gained the mark here, identifying that the distribution of squirrels in Wales matches that of England whilst the distribution of tree types is different. As in (b)(i) students often lost marks for poor expression, referring to 'lots of' rather than 'more' or 'not many' rather than 'less / fewer'.
- (c) Most students made a good attempt to use the data provided. The arrangement of the information in a table made comparisons easier and most students attempted to use the information in this way. However, what let many students down was the imprecise way the information was used. Thus 'grey squirrels reproduce more' might include the necessary comparison but lacks the additional '*per year*', as over their lifetime red squirrels will have more young than grey. Similarly it is not the survival of squirrels per se that was expressed in the table, but the survival rate *of their young*. Students who missed these vital components were not awarded the marks. Most students did recognise the importance of '*parapox virus*', rather than just 'virus' in their answers. Only a few realised that having a greater range of food available would be an advantage to the survivability of grey squirrels.

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