

**Biology B**

**Gateway Science Suite**

General Certificate of Secondary Education **J263**

**OCR Report to Centres**

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**June 2012**

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

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## General Certificate of Secondary Education

### Biology B (Gateway) (J263)

#### OCR REPORT TO CENTRES

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## Overview

These new specification papers have offered different types and levels of challenge to those of the legacy specification. In this sitting, only the Unit 1 assessments were available (B731-01 foundation and B731-02 higher). There has been a noticeable shift in questioning techniques that Ofqual had insisted on and these were evident for centres to see in these papers.

The reports on the individual papers, along with their mark schemes will help guide candidates and centres toward the desired expectations for success. Also, prompting in longer questions with bullet points, which has proved very successful in the past, was not allowed in the setting of these papers. This led to answers that were often less focussed than we have been used to in the past. Some candidates highlighted the key information and points on the question paper. This level of thought often gave answers that were more focussed and successful.

Centres should remind candidates that scripts are scanned as black and white images, so the use of coloured pens or faint pencil is not recommended. Furthermore, if candidates' answers do not fit in the designated area, a sensible approach used by many candidates is to indicate part of the answer is elsewhere on the page. An arrow is often all that is needed to highlight this. This will then direct the marker to open up the whole page and mark accordingly. If no such indication is there then the answer may be missed.

The Principal Examiners' reports which follow indicate good advice for teachers and candidates alike. Heads of science are advised to use them with their colleagues so that in classroom situations they can routinely and purposefully advise their students.

## **B731/01 Modules B1, B2, B3 (Foundation Tier)**

### **General Comments:**

- In general the paper was balanced and accessible to all candidates. Very few candidates failed to complete the paper.
- Most candidates were able to answer the examination paper with very few "No Responses" being given. The paper produced a wide range of marks.
- Overall candidates found this paper challenging and marks ranging from low teens to mid-forties were seen. It was rare to see any marks in the fifties.
- There were some questions where some candidates gave responses that did not answer the question posed, but higher scoring candidates' responses, showed a clear understanding of what was expected.
- The majority of candidates were able to recall that many sperm die during fertilisation. They could also identify what trophic level an organism was in. Only the most able candidates were able to describe features that determine a species.
- The calculations on percentages on the paper were answered well by all abilities.

### **Comments on Individual Questions:**

#### **Q1**

- (a)(i) The majority of candidates had the optic nerve correct; the most common wrong answer being retina. Over half of candidates had the iris correctly labelled, but quite a few wrote lens.
- (a)(ii) A whole variety of answers were given. Most candidates got the top box, but fewer had 'focus before the retina'. Many candidates ticked 'focus before the lens'.
- (b)(i) This question was generally answered well. Most candidates had a mark for 'nucleus' and then 'in the DNA' was the next most common answer. Some candidates gave one point, i.e. DNA or nucleus.
- (b)(ii) Many candidates got very confused and tried to explain why it was a family tree. Some candidates were also writing about Kevin being married to another person who has nanophthalmos and did not really understand how the structure worked. A number of candidates concentrated on the fact that some of the children had nanophthalmos and others did not, but did not make it clear that the parents did not have the disorder. More than half of candidates scored at least one mark.

**Q2**

- (a) Many candidates quoted what was written on the axis and did not interpret what the graph results were showing. They also wrote a lot about healthy and unhealthy diets, without clearly making the link between fat and heart disease. When asked to explain how the data would be interpreted, candidates started explaining how they would draw extra graphs and tables and would try and use the information to teach people how to be healthy, etc. There was also a lot of repetition, giving the same trend over and over again. Those candidates, who mentioned cholesterol, often did not include the trend, so ended up on Level 2 instead. Most Level 1 marks were awarded for limited analysis of the data and most Level 2 marks were awarded for the trend of more fat in the diet leads to more deaths from heart disease.
- (b) A wide variety of responses were given and a number of candidates were ticking two or more boxes.

**Q3**

- (a)(i) Marks were mostly gained for 'automatic', although many contradicted this by then writing about messages being sent to the brain. The vast majority had this wrong because they kept stating 'a reflex action is the time it takes you to respond .....'.
  - (a)(ii) Many candidates had LSD or magic mushrooms, but around half of the candidates were stating heroin, cocaine or ecstasy.
  - (a)(iii) The majority of candidates stated 'it contains nicotine', but then wrote 'which is addictive or highly addictive', without the comparison. No candidates wrote 'has more withdrawal effects'.
- (b)(i) A number of candidates had this correct, but a few had 7500, 75, 7.5, 750000.
- (b)(ii) Not many candidates had part (i) correct and then part (ii) wrong. A few candidates also got this mark as an error carried forward (ecf), but a few left it completely blank.
- (b)(iii) The majority of candidates had heroin, but a few concentrated on 'has the smallest dose needed to have an effect'. They were also writing about 'only needing a small amount to kill you', without making any comparison. Only a few wrote about the therapeutic ratio.
- (b)(iv) Candidates needed to write about the different effects on rats as opposed to humans and some were not specific enough. However, the majority of candidates had the cruelty idea.

**Q4**

- (a) Most candidates had 4, but other incorrect answers were 8, then 7, then 3.
- (b) Many candidates wrote about the sparrows having **no** food, so lost their mark. Only a minority of candidates recognised the effect of the sparrow hawks on the sparrow population.
- (c)(i) Most candidates had highest mean, or the highest yield idea, but a lot then contradicted this by stating the highest yield in **all** fields.

- (c)(ii) Responses to this question were generally weak. Most candidates were unable to work out the range. However, some candidates did get one mark for the resistably range being one. A few had just written the name without the calculation and had missed the idea of 'showing' how they got the answer, which was in the stem of the question.
- (c)(iii) Very few candidates had the sparrow hawk idea and many wrote about resistably not working or gave the same ideas as in the previous question. Some, who were on the correct lines, wrote that they needed to test for longer or repeat it more times, without applying their answer specifically to the question.

## Q5

- (a) This was generally a well scoring question, with lots of ideas given. Most candidates were either Level 1 or Level 2, predominantly Level 2. Candidates did not gain credit for calling the cheetah, prey, and for lack of detail in the explanation, e.g. 'the gazelle has eyes on the side of its head to see the predator'.
- (b) This question was generally answered well. Many candidates correctly calculated the percentage; however, some were giving the 60% value.
- (c)(i) Most candidates had the idea that the cheetah was going down in number, but thought they would get the extra mark for then giving values. Other candidates did not gain credit for stating that the prey decreased, so the cheetah had **no** food. Quite a few candidates mentioned a decrease due to hunting for fur, etc.
- (c)(ii) This question was answered well by nearly all candidates. Where no credit was gained, the answer referred to just 'they will continue to decrease'.

## Q6

- (a) A small percentage of candidates got this correct. Most were constructing their answers around *Swima bombiviridis* being newly discovered organisms and missed the point.
- (b) Many candidates had species, but far fewer had genus. There was wide selection of other boxes ticked.
- (c) This question was not answered well. Most candidates used the ovals as a light source and others wrote that they helped them to escape from predators, which repeated information in the stem of the question. The most common correct answer was to distract or scare the predator, occasionally there was an answer referring to it attracting prey.
- (d) Very few candidates had this correct. Most had the idea that there would be more ovals in the future, but did not apply this and link it to ideas about better survival.

## Q7

- (a)(i) Most candidates had 60, a few had 58 and some had 124. There were lots of answers stating it was the most frequent number.
- (a)(ii) Most candidates got the mark for stating it was the same/60 or for 9 and 10 minutes; not many had the levels off at 60, idea. Quite a few candidates put the resting heart rate idea here instead of in (b)(ii).

- (b)(i) About 50% of candidates had answers somewhere between 5 and 7. Some put 9 minutes, and a few put 10. Some candidates were giving a pulse rate instead of time.
- (b)(ii) Many responses were 'returning to normal rate', and 'resting/rate' was also used a lot.
- (c) Many candidates incorrectly stated 'less blood was needed'. The most common correct idea was that of 'less oxygen'; a number of candidates also got the 'muscle' mark, but some stated 'to the body' and this was insufficient.

### Q8

- (a)(i) Quite a few candidates were confused with tissue culture techniques. Many wrote 'take a piece of the plant' and many wrote about taking a cutting of the roots. For the second part, many candidates wrote 'plant it in a pot' and did not mention a suitable growth medium. Soil and rooting powder/hormone came up in equal proportions, but candidates did not usually get both together, generally stating 'dip it in root powder and plant it in a pot'. There were some candidates who were, incorrectly, describing an idea about cutting back, where the plant is cut down ready to re-grow again next year.
- (a)(ii) Responses to this question were very weak. Most were stating that it would kill the original plant, or the new plant would be much weaker and less healthy. Candidates were also stating that it would take longer to grow, would take more effort and cost and that they would be the same, without any link to genes. Correct responses were split between the lack of variation and disease killing them all. No one wrote about the limited number of cuttings compared to seed number.
- (b) Very few candidates had this correct, and for most who scored, it was for the idea of storage of water. All sorts of responses came up from 'keeping the nucleus safe', to 'absorbing materials for photosynthesis', to 'holding the genetic material'.
- (c) The most popular correct response was, plants growing continuously and humans not. Many candidates were giving half an answer, when the question clearly asked them to explain the differences between each, so some were stating plants grow continuously, without explaining how that differs to human growth. Few candidates scored two marks here.

### Q9

- (a) Often candidates left this blank, but responses included acrosome, enzymes, and sperm body, with very few giving the correct response.
- (b) Many candidates got this mark with the idea that many sperm die or do not make it to the egg.
- (c) Most candidates had the idea of fish/eggs being eaten and that it increased the chance of survival, although few were awarded two marks.
- (d) This question was generally answered well; the majority got 46, but there were a few 23 pairs.

**Q10**

Although targeted at standard grade, there were very few candidates who managed to access any marks at all. The ones that did score, often got three marks for a Level 2 response, as they mentioned different proteins, but did not really have any other understanding to back it up.

## B731/02 Modules B1, B2, B3 (Higher Tier)

### General Comments

In general, candidates made a good attempt at the paper, attempting most, if not all of the questions, and also usually writing at an appropriate length. However, it is also true that they found it harder than did candidates for last summer's B631/02. Although the paper did produce a normal distribution of marks, this did not extend to the top of the available mark range, which was usually the case with the legacy specification papers.

In calculations, candidates should be made aware of the importance of showing their working. There did however, seem to be fewer cases than last session, of incorrect rounding in calculations. The quality of candidates' spelling, punctuation and grammar was generally good overall. However, centres should be aware that there was anecdotal evidence from markers that, although these were in the minority, there did appear to be an increase in the number of candidates producing almost illegible writing. Candidates should be made aware that in questions asking for a comparison, comparative answers must be given. So, for example, in Q3(c)(ii) there was a mark for stating that heroin was the most dangerous drug because it had the smallest lethal dose, but not for stating that it had a small lethal dose.

### Comments on Individual Questions

#### Q1

- (a)(i) About a third of candidates gained at least one mark, and only a few gained both. A common error was to give answers that were too general, e.g. that the lens is the wrong shape or that light is not focussed on the retina. These comments would equally apply to long-sight and so were not credited.
- (a)(ii) Just over half the candidates correctly stated that short-sight is corrected using concave lenses. The most common error was predictably 'convex', and the proportion gaining the mark may indicate that many candidates were guessing between concave and convex lens.
- (b)(i) Although many candidates had some idea of what an allele is, i.e. that it is some type of gene, many were not awarded the mark because of the imprecision of their answers. For example, 'alleles are different types of a gene' gained the mark, but 'alleles are different types of genes' did not; around a quarter of candidates gained the mark.
- (b)(ii) Although some candidates incorrectly stated that you could tell that nanophthalmos is caused by a recessive allele because a minority of people have it, or that you can tell because Jane does not have it, most candidates appreciated that it is because the parents, Seema and John, do not have the condition, while some of their children do. Nearly half the candidates gained full marks.
- (b)(iii) Although two thirds of candidates got at least one mark for working out the probability of the child having the disorder as 50%, only about half gave a fully correct genetic diagram. Some showed diploid gametes, but the most common error was to start with the wrong parental genotypes, e.g. Nn and Nn, or Nn and NN.

## Q2

To gain full marks, candidates had to fully answer the question by giving more than one valid criticism, as well as provide an explanation of Keys' conclusion in terms of cholesterol reducing the oxygen (or glucose) supply to the heart (muscle). Some candidates gave valid criticisms such as only a small number of countries were used in the study, or that the data showed all types of fat, yet Keys made a conclusion involving just saturated fat. No credit was given for the commonly given criticism that other factors, such as smoking, affect heart disease, as this on its own does not discredit the results. Only a very small minority gave an explanation of the depth required for full marks, indeed only a minority explained that the blood flow to the heart (muscle) is reduced by cholesterol build-up. The majority gave a relatively low level scientific explanation simply in terms of fat in the diet reducing blood flow or leading to the build-up of cholesterol. Just over half the candidates gained marks, but the vast majority of these only gained two.

## Q3

- (a)(i) Most candidates gained at least one mark, usually for the idea that some drugs are more harmful than others. However, many also gained the second marking point for explaining that possession or use of different class drugs, leads to different penalties.
- (a)(ii) Nearly three quarters of candidates gained the most common correct answers which were LSD or magic mushrooms. Common incorrect responses included heroin, cocaine and ecstasy.
- (a)(iii) Although over a third of candidates gave a correct description of vasodilation as the widening of blood vessels, many lost the mark by stating that vessels move closer to the skin surface. Given that this misunderstanding is repeatedly commented on in examiners' reports, it is disappointing that it still persists. Some candidates thought vasodilation also means other homeostatic mechanisms involved in temperature regulation, such as sweating.
- (b) Less than a third of candidates could explain the action of cannabis in terms of its effect on neurotransmitters at synapses. Most made vague statements about just slowing down or stopping impulses.
- (c)(i) Most candidates gained at least one mark, with about half gaining two, for correctly calculating the therapeutic ratio as 5000.
- (c)(ii) A majority gained at least a mark, though only a few went on to gain both. There was no mark for identifying heroin as the most dangerous – the marks were for the explanations. As already explained in the general comments, answers had to be comparative.

## Q4

- (a) About half the candidates gave a fully correct description of what is meant by the term 'species', gaining two marks, while the rest tended to gain no marks for simply stating that different species were different 'types'.
- (b) Around two thirds of candidates correctly chose both genus and species. About a third chose one correct answer.

- (c) Candidates found the context difficult. The expected answers included the ideas that the worms might use the glowing green structures to distract predators or could use them as bait to attract food. Only about a third gained a mark and virtually none gained two. The most common unacceptable answer was that the worms might use the structures as torches to find their way around.
- (d) Although not many scored three, otherwise the question discriminated reasonably well with roughly a third of candidates gaining each of zero, one or two marks. Weaker answers described how the green oval structures developed, but only better ones answered in terms of isolation leading to independent evolution and the formation of a new species. Candidates who gave generic answers about the role of isolation, but didn't link it to this specific example gained a maximum of two.

#### Q5

- (a) Although most candidates wrote at length, relatively few gained more than two marks. (Around half gained two marks in total.) Although candidates did write about how lowering the frill could help prevent the lizard overheating, few explained this in terms of reduced surface area, and even fewer in terms of a reduced surface area to volume ratio. The latter was necessary to access full marks. Some candidates were confused about the role of the frill stating that it was extended to warm up, but then also extended to lose heat. This was only accepted if it was made clear that the lizard did this in a cool place. Generic descriptions about ways to avoid overheating that could equally well apply to other animals, such as moving to a cooler place, gained a maximum of two marks. The suggestion of using the frill as a sun shade gained no marks.
- (b) Two thirds of candidates scored, but this was usually one or two marks; few gained three. The most common acceptable answers referred to the low survival chances of the released iguanas, for example because of the continuing presence of predators. Some also pointed out that breeding from a small number of adults could lead to a reduction in genetic variation.

#### Q6

- (a) Only a very small minority of candidates correctly explained biomass in terms of dry mass. A common misconception was that a pyramid shows the biomass of individual organisms; another was that it shows the biomass of 'all the organisms'.
- (b)(i) About two thirds of candidates correctly identified the process inside the body that releases heat as respiration. No credit was given for answers such as movement.
- (b)(ii) Nearly three quarters of candidates correctly calculated the energy lost as 0.89kJ.
- (b)(iii) Less than half the candidates correctly calculated the percentage of energy transferred to growth as 7.96%. The most common error involved dividing 3.14 by 0.25 instead of the other way round.
- (b)(iv) To gain full marks, candidates had to explain that, because energy is lost from the food chain at each stage, there isn't enough energy to support another trophic level. Although relatively few candidates gained both marks, most gained at least one. No credit was given to the idea that sparrowhawks are so fierce that no other animal can eat them. No credit was given either to the idea that there is no energy left by the time you get to the top level.

**Q7**

- (a)(i) Most candidates correctly identified the start of adolescence in girls as being between 9 and 10 years.
- (a)(ii) Very few appreciated that the fastest growth rate for boys was between 0 and 1 year. Most incorrectly chose adolescence.
- (a)(iii) Two thirds of candidates correctly identified an age between 13 and 14 as being when there was the greatest difference in the growth rates of girls and boys, although less than half of these could explain correctly why they had chosen that age.
- (b)(i) Most candidates correctly named mitosis.
- (b)(ii) Many candidates found it difficult to distinguish between DNA replication and cell division, for example by writing about DNA, but drawing stages of mitosis. Although less than a third gained full marks for describing DNA unzipping and new strands forming by complementary base pairing, only a half failed to gain any marks. Some candidates wrote about protein synthesis.

**Q8**

- (a) Just less than half the candidates gained any credit, with four being the most common mark amongst those who did gain marks. To gain up to four marks a link had to be made between changes to DNA and consequent changes to proteins. To gain six marks, a link had to be made to changes to enzymes thereby changing cell processes. Those who did not gain any marks generally reworded the question by basically repeating the statement that cancer is caused by changes to DNA.
- (b) The three quarters of candidates who gained a mark generally did so for the idea that the information gained from the survivors may help to treat or cure cancer. Very few gained a second mark.

**Q9**

- (a) This was a very discriminating question with roughly a quarter of candidates getting each of the marks available from zero to three. The best answers clearly explained that extra oxygen was needed to remove the lactic acid that had built up during the race due to anaerobic respiration. Weaker answers thought that anaerobic respiration was still taking place after the race. There was some confusion in weaker answers between breathing and respiration, with a few candidates explaining that respiration produces oxygen.
- (b) Although a majority of candidates gained marks, only a small minority gained all three. Often candidates explained that as some blood bypassed the lungs there was less oxygen in the blood, however, few then went on to link this to reduced respiration, or reduced energy release, in muscles. Some candidates thought that there would be **no** oxygen getting into the blood.

**Q10**

- (a) A third of candidates gained each of zero, one or two marks. Although many did describe the insertion of a nucleus into a cell, some did not make it clear which egg or which cell was involved and so could not be awarded the mark. Many also went on to get the second point about providing an electric shock, however, a noticeable number also lost a mark by referring to fertilisation; even some of those who otherwise would have gained full marks then wrote that the egg cell was fertilised, showing that they really did not understand the process after all.
- (b) Around a quarter of candidates appreciated that body cells can not grow into embryos because they have lost the ability to differentiate.

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