Examiners' Report

Summer 2013

GCE Biology (6BI05) Paper 01R
ENERGY, EXERCISE & COORD.

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General Points

Candidates were able to demonstrate their knowledge and understanding by tackling the wide range of questions offered in this paper. It was clear that the vast majority of candidates had studied the pre-release article and were able to relate their reading to the questions asked in a meaningful way.

Incorrect interpretation of the wording of some questions continues to be somewhat evident, as does the difficulty in applying candidates' knowledge to unfamiliar scenarios presented. However, overall, the level of knowledge demonstrated was very satisfying.

Question 1(a)
This was a straightforward multi-choice question with which the majority of candidates had no problems.

Question 1b(i)
Most candidates demonstrated a clear general knowledge of the mechanisms involved within a rod cell when stimulated by light. Less commonly seen were references to light intensity required or to absorption of light (rather than light 'hitting' a rod cell which was often seen).

Question 1b(ii)
Although there were some excellent answers seen, many students lost marks by concentrating on the optic neurone itself rather than the rod and bipolar cells. It was also clear that some students did not realise that glutamate is an inhibitory neurotransmitter. Overall, one mark was the most common score achieved.

Question 2(a)
It was unfortunate that some candidates concentrated on describing how the MRI image is obtained, rather than how the MRI scans themselves could be used. Those students who interpreted the question correctly invariably attained the maximum 2 marks.

Question 2(b)(i)
The vast majority of candidates had no difficulty in identifying two suitable variables. The two most common variables were age and gender.

Question 2(b)(ii)
This question also produced some excellent responses demonstrating that the mechanism of fMRI was well understood. The only common omission was that the scan is produced in real time. About a third of candidates gained all three marks.

Question 2(b)(iii)
The majority of students demonstrated a good knowledge of the functions of the cerebral hemispheres. The only common error was to suggest that the cerebral hemispheres are responsible for coordination of movement.

Question 3(a)
The full mark range was seen in this item, with the mean being about 1.7 Those candidates who concentrated on how enzymes work in this metabolic process i.e. speeding up the reactions, lowering the activation energy etc did very well in this question. However, others gave long descriptions of the use of enzymes in ATP production which was not creditworthy. It was not required that the candidates should know all the enzymes involved, but rather just that a different enzyme was involved at each stage and what, in general this achieves.

Question 3(b)(i)
Many candidates demonstrated an excellent knowledge of the electron transport chain. However there were, as in previous papers, some who talked about NAD or H^+ ions travelling along the chain rather than electrons. Some also referred to energy being 'lost' rather than released.

Question 3(b)(ii).
Most candidates had a reasonable level of knowledge about the process here, although the term 'electrochemical' gradient was less frequently seen than would have been expected. Most appreciated that ATP was formed although less candidates described energy being released by the movement of the H^+ ions.

Question 3(c)
This multi-choice question considered the movement of a coloured liquid in a respirometer under three different situations. Whilst the majority of candidates demonstrated encouraging understanding of this practical, the numbers gaining the marks ranged from about 90% for the first situation to about 60% for the third situation.

Question 4(a)(i)
Most candidates achieved the full 2 marks here.

Question 4(a)(ii)
Again, the action of calcium ions on troponin was well understood by most candidates.

Question 4(a)(iii)
The majority of candidates were able to correctly state the position of the SAN within the heart. However, a number failed to identify which one of the two atria.

4(b)(i) and (ii)
Most candidates achieved the mark for part (i) but (ii) appeared to present more of a challenge. Whilst some candidates gave very good answers, referring to the validity and range of data, others gave very general comments e.g. not knowing the sample size making the assessment of validity impossible. This sort of question requires comment on the data given in the graph.

Question 5(a) (i) and (ii)
A pleasing majority of candidates correctly offered the name of structure P from the motor neurone diagram as well as the direction of impulse travel.

Question 5(b)(i)
Most candidates achieved marking points 1 and 3 with fewer mentioning the non linear nature of the correlation.

Question 5(b)(ii)
The majority of candidates had no problem with this calculation question. The only point to stress here is that both marks can be lost if a small error is made in the final answer and the working is not shown.

Question 5(c)
There were some excellent answers, with candidates clearly demonstrating an ability to apply their knowledge to the question asked, achieving full marks. However this question presented a challenge to others. Some, unfortunately, did not appear to read the question carefully enough simply describing the normal sequence of events without eugenol, thereby losing several marks. Others went into great detail about sodium and calcium ions without actually answering the question. The mean score for this 6 mark question item was just over 3 marks.

Question 6(a)(i)
As might be expected, only a minority of candidates failed to achieve the mark for this question about the purpose of the control.

Question 6(a)(ii)
It was very pleasing to see that most candidates demonstrated a good knowledge of the mechanisms involved. The main errors were in talking vaguely about 'growth' rather than height or length, or referring to cells

expanding rather than lengthening. The full mark range was seen for this 5 mark item with the mean being about 3 marks.

Question 6(b)
Many candidates clearly had a good knowledge about IAA and transcription factors and the mechanisms involved, with a pleasing number gaining full marks. However, others showed very limited knowledge about transcription factors with some ignoring them altogether and going straight to production of mRNA and then translation.

Question 7(a)
The vast majority of candidates achieved the full 2 marks for this question.

Question 7(b)
Again, most candidates had clearly understood the terms used in the article and therefore achieved the full 2 marks.

Question 7(c)(i)
Although many candidates achieved the mark here, a number simply said 'cold blooded' which was insufficient and others seemed to struggle to give an unambiguous response to the question.

Question 7(c)(ii)
This question proved to be a challenge to many candidates, the mean being one mark out of two. The main error that candidates made was in giving simplistic answers rather than talking about how mechanisms of heat transfer and exchange contribute to the poikilothermic response to changing temperature. The second part of the question was very poorly answered.

Question 7(d)
The full two marks were achieved by many candidates, with good knowledge of the use of restriction enzymes to 'cut' genes particularly evident. The main errors were in failing to mention that the vector contained the cancer containing gene or failing to give a valid method for its introduction into the mouse cells.

Question 7(e)
This question was very well answered by many candidates who demonstrated a very good knowledge about the function of myelination easily achieving 4 or 5 marks (out of 5). The stats seem to show that 27% gained 4 marks and 26% 5 marks. The main spelling mistakes were 'Schwann' and 'myelination' Very few talked about clusters of sodium-gates channels or their function at the nodes of Ranvier.

Question 7(f)
Few mentioned that less oxygen would be absorbed at the lungs, and many referred to less blood 'going' to the brain rather than less being pumped to the brain.
Fewer candidates still talked about the effect on the concentration gradient for oxygen at the brain, the diffusion of oxygen, or the continual respiration in brain tissue causing fast depletion of oxygen.

Question 7(g)
Whilst about 70% of candidates correctly used the information to identify a hormone and its function, a number incorrectly suggested that gonadotrophin-releasing hormone suppressed release of gonadotrophin. The role of gonadotrophin itself appeared to be well understood.

Question 7(h)
Many candidates achieved 1 mark here for suggesting that there were less mitochondria, but rather fewer achieved the second mark due mainly to failing to describe the consequence i.e. less energy for the flagellum. It was notable just how many candidates talked about the function of mitochondria and how energy fuels the movement of the flagellum, but did not then go on to say what the likely result would be of a change in the mid-section of the sperm. Others talked vaguely about the sperm swimming without mentioning the flagellum at all.

Question 7(i)
There were a range of marks achieved here. The main errors were in talking about fat being converted into glucose for energy which is incorrect, and in giving vague comments about fat keeping the mole rats warm. Very few mentioned the release of metabolic water via oxidation.

Question 7(j)
Some excellent answers to this question were seen. However, many candidates lost marks by not referring to the genetic aspect of outbreeding. About 0.9 was the mean score (out of two) for this question item.

Question 7(k)
This question presented a challenge to many candidates with a majority giving imprecise answers which were not creditworthy. A sizeable number of candidates simply said that the DNA was identified, or that genes were identified without mentioning the non coding sequences.

Question 7(l)
Although many candidates gave excellent answers to this question, a sizeable number lost marks simply by not being sufficiently precise. For example, statements like 'mole rats do not get cancer' were common with no reference to the p16 gene etc. A further common example would be

those who mentioned that mole rat incisors grow through the lip but did not mention the important point that this occurs without damaging the skin.

Paper Summary
The paper gave candidates the opportunity to demonstrate their knowledge and understanding; their ability to apply this knowledge to unfamiliar scenarios; and their ability to draw together links between different areas of the specification.

In order to avoid common pitfalls in future papers it would be helpful to:

- Ensure that the question asked is fully understood when formulating a response
- Use precise, scientific language rather than giving general statements
- Avoid simply repeating the question
- In calculation questions, show your working, to avoid losing all the marks for a simple mathematical error.
- When asked to comment on data, use the data given rather than giving general statements.