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In Biology (WBI05)
Paper 01 Energy, Exercise and Coordination

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Introduction

Students were able to demonstrate their knowledge and understanding by tackling the wide range of questions offered in this paper. It was clear that some students had studied the pre-released article and were able to relate their reading to the questions asked in a meaningful way. However, many students appear to have struggled with aspects of the paper and, in particular, with the scientific article.

Some students attempted to “set the scene” before beginning their actual response, often merely repeating the words in the actual question. This wastes valuable time and gains no credit.

Incorrect interpretation of the wording of some questions was apparent in several questions and many students appeared to struggle to apply their knowledge to the unfamiliar scenarios that were presented. In some cases, students produced detailed answers that do not address the question in the context in which it is set, often losing valuable marks.

Multiple Choice

The multiple-choice questions proved accessible to candidates and were all frequently answered correctly.

Question 1

(b) This question asked candidates to explain how fMRI could be used. Very few candidates considered how the fMRI data could be collected and simply described the presence of light areas in the brain. To gain MP1 candidates needed to make it clear that the subject was being asked to think about hitting a ball. The most frequently observed marking point was MP3. Many candidates were able to recall that fMRI involved oxy and deoxyhaemoglobin but did not link these to the interaction with radio waves, MP4.

Question 2

(b)

It was pleasing to see many candidates describe the ideas of fMRI detecting increased blood flow as a result of radio waves interacting with deoxyhaemoglobin (MP3 and 4). However, often candidates failed to take account of the practical issues associated with using fMRI. As a result, they frequently suggested playing squash in an fMR; and did not gain MP1 or 2.

(c)(i)

Many candidates found this question straightforward and gained both available marks. It was pleasing to see many candidates beginning their description with a description of the general trend before describing the two distinct sections of the graph.

(c)(ii)

The question was answered well by many candidates. Candidates recognised that there would be a switch towards increased anaerobic respiration and that this would result in the production of lactic acid which that would result in a decrease in blood pH (MP4 and 5). A simple statement that anaerobic respiration occurs is not sufficient for MP4. Relatively few candidates tried to explain the first part of the graph (MP1, 2 and 3).

Advice to candidates – when asked to explain a set of results try to identify and explain general trends and distinct regions shown by the data. In this graph there are two distinct regions, the initial plateau and then the decrease in pH, that both need explaining to gain full marks.

Question 3

(a) (i)

inter membrane rather than inner membrane or matrix.

(a)(ii)

This question proved to be discriminating. Many candidates correctly identified oxygen and water. Fewer, identified reduced NAD and NAD and fewer still hydrogen ions. Some candidates incorrectly suggested reduced NADP and NADP for the first two boxes

Advice to candidates - It might help you avoid confusing NAD and NADP if you remember P for **p**lants or **p**hotosynthesis.

(b)

Many candidates demonstrated a good understanding of oxidative phosphorylation and scored well on this question. Some candidates did not focus on oxidative phosphorylation including details of glycolysis and Krebs cycle in their responses. Although they often went on to provide a high scoring answer they will have spent time on the question providing details that were not required. Some candidates did not use the term chemiosmosis and did not gain MP1. A significant number of candidates either made statements such as ‘.... phosphorylation of ATP’ which is incorrect and should be ‘.... phosphorylation of ADP’. However, to gain marking point 5 candidates needed to describe the combination of ADP and inorganic phosphate to form ATP to gain the mark.

Question 4

(a)

The majority of candidates were able to correctly identify the three labelled structures as, muscle, ligament and tendon. However, many candidates struggled to explain how the properties of these structures contribute to movement of bones about a joint.

(b)(i)

This calculation proved to be challenging to majority of many candidates. However, it was pleasing to see many candidates are now clearly laying out their calculations which often allows the award of the intermediate marks if candidates make a mistake towards the end of the calculation.

(b)(ii)

Many candidates linked the size of tear to the risk of developing osteoarthritis (MP3). Unfortunately a significant number did not link this to the different types of damage observed (MP1 and 2).

(b)(iii)

Many candidates did not think about the information provided and the context of the question. Instead these candidates produced generic statements about sample size, age of patients etc. These generic statements did not gain the mark.

Question 5

(a)(i)

This calculation was completed successfully by many candidates. Some candidates ignored the instruction to calculate the change in response to exercise. Instead many of these candidates calculated the change from exercise to resting (50%) which did not gain any marks.

(a)(ii)

Many candidates correctly identified two appropriate variables to control. The list of acceptable variables reflects the type of study. This study looked at changes in blood flow caused by exercise. Acceptable variables were mostly to do with the exercise undertaken (MP1 and 2) and conditions during the investigation (MP4 and 5). The fitness of the participants was also allowed (MP3). Factors such as gender and age were ignored. Reference to diet was not accepted as an alternative to food consumed during the study.

Advice to candidates. When asked to suggest appropriate variables think carefully about the context of the question and suggest factors closely linked to the investigation described.

(b)

Candidates recognising that the main changes were an increased flow to muscles and skin and who provided an explanation for these changes generally scored well. Some candidates simply described the observed changes and did not score many marks. To gain marking point 5 it needed to be clear that exercise caused an **increase** in heat production and not just respiration or muscles produce heat. Very few candidates made reference to increased cardiac output (MP1) which is disappointing considering this is an important aspect of unit 5.

(c)

A number of excellent responses were seen with candidates producing complete answers that gained the maximum available marks. However, many candidates struggled with this question. The most common reason for not gaining marks was the omission of important detail. For marking point 1 it needed to be cardiac muscle or tissue and not the SAN that is myogenic. For marking point 2 it needed to be the cardiovascular centre and not just the medulla. Many candidates describe impulses rather than waves of depolarisation throughout their responses. This was penalised for marking point 4. However, incorrect use of impulses was allowed elsewhere in the candidates response e.g. marking point 7 and 8.

Question 6

(b)(i)

Few candidates realised that the combination of number of drops and different concentrations resulted in an increasing dose of phenylephrine. However, many candidates gained a mark for describing the increase in pupil diameter caused by increased concentration or increased number of drops of phenylephrine. Although this was not the answer sought, it was allowed. Few candidates went on to describe the effect of phenylephrine dose on the duration of response or the speed of response (MP2 and 3). A disappointing number of candidates made no attempt to understand what the graphs showed and by simply quoting values from the graphs gained no marks.

(b)(ii)

Candidates reading the question carefully realised that the phenylephrine acts on muscle fibres and generally gained two or three marks. However, many candidates gave detailed explanations based on the activation of neurones and often failed to gain any marks.

Advice to candidates: always read questions carefully and after reading the question check you understand what you are being asked to do.

Question 7

(a)

Many candidates were familiar with habituation and were able to suggest how habituation might be demonstrated (MP3 and 4). A disappointing number of candidates suggested tapping the vial but made no reference to controlling the frequency or force of tap (MP 1 and 2).

(b)

Many candidates demonstrated an understanding of what stem cells are but did not provide sufficient detail to gain marks. To gain MP2 candidates needed to specify that iPSC's could be differentiated into neurones or nerve cells. Many candidates suggested that iPSC's could be used as treatment rather than be used to test treatments (MP3). Very few candidates made reference to obtaining iPSC's from individuals with Parkinson's disease (MP1).

(c)

Many candidates found this question accessible. However, to gain marking point 3 candidates needed to make reference to 'proteins with active sites with the same shape'. Simply saying 'proteins having similar active sites' was not sufficient.

(d)

Many candidates found this question challenging. However, a number of candidates produced complete responses that gained all three available marks. Marking points 1, 2 and 3 were most frequently seen. Many candidates made vague reference to 'loss of coordination' or 'the symptoms of Parkinson's disease' rather than loss of motor control and did not gain MP4.

(e)

This question was very straightforward and many candidates gave complete descriptions gaining both available marks.

(f)

For this question, very few candidates were able to produce answers that gained marks. When a mark was awarded, it was usually for marking point 3.

(g)

This question proved accessible to candidates with many gaining all five available marks. Few candidates made reference to chloride channels (MP4) and the inner membrane becoming more negative (MP5). For marking point 2 candidates needed to make reference to the post-synaptic membrane. Post-synaptic neurone or post-synaptic knob were not accepted.

(h)

Many candidates did not appear to understand the term 'gene expression' and did not answer the question asked. Instead, they gave incorrect answers about alternative splicing and the production of more than one protein from a single gene.

(i)

This question proved to be challenging. A number of candidates recognised that to answer the question they needed to describe inheritance of recessive and dominant traits (MP1 and 3). However, very few then managed to link this to the transcription or expression of a gene (MP2 and 4).

(j)

Many candidates recognised that non-dysjunction involved the failure of a pair of chromosomes to separate (MP1). A number of candidates ignored the context of the question and suggested the non-dysjunction occurred in mitosis. It was also common to see reference to anaphase but without any indication that this was in either meiosis or mitosis.

(k)

A number of candidates were able to answer this question well. However many candidates simply suggested genetically engineering *Drosophila* (MP2) or testing drugs on them (MP4) failing to link the two ideas or describe identification of relevant genes (MP1).

Paper Summary

The paper gave students 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:

- Look closely at the number of marks allocated to each question and equate this to the number of ideas or points presented.
- Use precise, scientific terminology of an A level standard.
- Read the stem of the question closely before committing an answer to paper.
- Understand that simply repeating the stem is unlikely to gain any credit.
- Show workings in calculation questions to avoid losing marks.
- Show how data has been manipulated where required instead of simply quoting figures from a graph or table.
- Use time management sensibly.
- Have a greater appreciation of the scientific method, in particular the design of experiments.
- Understand that the command word explain expects students to offer biological rationale in their response and not solely description.
- Try to provide answers that are tailored to the biological context in which the question is set.

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