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Examiners' Report

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Introduction

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. There were very few blank spaces indicating that students found the questions accessible.

Some students attempt to "set the scene" before beginning their actual response, often merely repeating the words in the actual question. Irrelevant writing wastes time and gains no credit.

Incorrect interpretation of the wording of some questions was less evident this year as was difficulty in applying candidates' knowledge to unfamiliar scenarios that were presented. Overall, the level of knowledge demonstrated was very satisfying.

Question 1 (b)

This simple question discriminated very well. The best candidates recalled that the radial muscles would contract whilst the circular muscles would relax to increase the diameter of the pupil. A common error was to confuse the muscles in the by eye making reference to the ciliary muscles rather than the circular muscles. Another common error was the belief that the radial muscles would be relaxed and the circular muscles would be contracted.

Question 2 (a)

This question examined the ability of candidates to describe how to investigate the rate of respiration in rats. The question discriminated very well. There were many excellent answers that appreciated the need to control the main abiotic variable – temperature, and to control the biotic variable by using the same species, age, and mass of rat. To gain credit for the independent variable candidates had to make reference to the use of many male and female rats. Many expressed how to measure the dependent variable by stating that the change in the volume/height of the coloured liquid needed to be measured after a certain time and that the rate could then be calculated by dividing the volume or height by time. Marks were also available for naming a suitable carbon dioxide absorbent and for explaining that the syringe would be used to reset the level of the coloured water in order to take repeat measurements. Sadly, some candidates seemed unaware of what a respirometer could be used for and these candidates scored poorly.

Question 2 (b)

There were many correct responses that explained that there would be no movement of the coloured liquid if the carbon dioxide absorbent failed to work because there would be no change in volume as the volume of oxygen consumed would be balanced by the volume of carbon dioxide produced. Credit was lost if it was implied or stated that there would be less movement of the coloured liquid.

Question 3 (b) (i)

Although a variety of different names were used to answer this question, it was pleasing to note how many candidates were able to identify the correct structure of the brain from an MRI scan.

Question 3 (b) (ii)

This question asked candidates to suggest the advantages of MRI scanning compared to CT scanning. There were some excellent answers that explained that more detail is possible with MRI scanning because it has better resolution. The fact that MRI scanning is safer and can be used more often because it does not use X-rays was also credited. The idea that MRI scans improve the ability to locate a tumour was mentioned by many candidates but was not credited. If candidates discussed fMRI scanning they were allowed to gain credit for all the available marking points but not for any other descriptions of fMRI.

Question 3 (c)

This question was challenging with many candidates discussing the role of dopamine in binding to the receptor molecules in the postsynaptic membrane, or discussing enzyme inhibition. The examiners credited answers that explained that caffeine would bind to reuptake proteins in the presynaptic membrane.

Question 3 (d) (i)

It was pleasing to note that the use of double blind trials is known by many candidates.

Question 3 (d) (ii)

The comparison demanded in this question required a statement that the SSRI treatment was the best. Credit was also given if this statement was supported by a comparative manipulation of the numbers that had to be chosen from the SSRI and the St John's wort or the placebo. Many candidates seem not to understand what needs to be done when manipulating numbers and in many answers candidates merely repeated the numbers in the table. Credit was also available for a correct comparison between the St John's wort data and the placebo data. Many candidates could deduce that SSRI was the best treatment and the other two marking points were less evident.

Question 3 (d) (iii)

It was pleasing to note that the way in which the trial should be designed in order to produce data that can increase confidence was well understood. The examiners credited ideas about sample size and sample selection, and credit was also given to those who appreciated that the trial should be extended beyond eight weeks in order to find out if the trends continued.

Question 4 (a) (i)

This question challenged students to use their mathematical skills to calculate the cardiac output at rest for the marathon runner using information in the table. The correct answers credited were 4.608, 4.6 and 4.61. For candidates who failed to calculate the correct answer, one mark was available if 4608 or 36 x 128 could be seen in the working. For this reason candidates should always be encouraged to show their working.

Question 4 (a) (ii)

This question challenged students to explain how the information in the table supports the idea that training improves performance. Many candidates merely stated the values for the heart rate and stroke volume but provided no link to the biological consequences. The examiners rewarded candidates who linked increased stroke volume to the fact that this would increase the delivery of blood which helps to promote aerobic respiration and reduce the need for anaerobic respiration. A few candidates also appreciated that a lower resting heart rate allowed for greater potential before reaching the maximum heart rate.

Question 4 (a) (iii)

There were many excellent accounts making it clear that increased oxygen and glucose supply would increase the rate of oxidative phosphorylation. Many appreciated the role of oxygen as the final electron acceptor in the electron transport chain, thus forming water. There were also many accounts that made reference to the role of reduced coenzymes, chemiosmosis and the phosphorylation of ADP. Candidates are encouraged to read questions carefully as this would help them avoid spending time writing about irrelevant topics such as glycolysis and Krebs cycle.

Question 4 (b)

The information in the graph was challenging for candidates. Many failed to refer to the high risk and low risk groups and many gave very detailed descriptions of how the graphs changed by quoting values from the graph but not describing the observed patterns in their own words. Many thought that the low risk group showed a correlation and few referred to possible causal relationships. Only a handful gave other factors that may affect diabetes. Where candidates considered the data carefully, they typically recognised the effect on high risk individuals and referred to negative correlation and gained at least two marks. Many gave very imprecise, vague answers.

Question 5 (a)

Many candidates appreciated that the cell body is in the middle of the axon but there were some who struggled to express their answers with clarity.

Question 5 (b)

Most candidates were able to recognise that conduction velocity increases with increasing axon diameter. Many also appreciated that the conduction velocity was the same at 1μm. Many quoted data rather than carrying out calculations when manipulating data, and units were missing from an alarmingly large number of responses.

Question 5 (c)

This question discriminated well. Schwann cells are known by many as is the role of myelin as an insulator. Many described the action potential at the nodes but often then stated that it jumped from node to node rather than the impulse. Pleasingly, a large number of candidates were familiar with the term 'saltatory conduction' and understood it. Weaker candidates often described the effect of increasing diameter of axons or gave vague suggestions as to how myelin speeds up impulses. The idea that local currents occur over a longer distance was seldom seen.

Question 5 (d)

Most candidates appreciated that the acetylcholine was not broken down but fewer went on to suggest how it then would bind to receptors in the post-synaptic membrane and cause continuous impulses. Some candidates suggested that the effect would be at the presynaptic membrane stating that it cannot be reabsorbed so cannot be re-released so impulses would be reduced. Some also thought that there would be fewer impulses because sarin blocked receptors.

Question 6 (a) (ii)

This question was challenging and discriminated very well. There was significant confusion about the relationship between environmental cues and the interconversion of P_R and P_{FR}, and which form caused flowering. There were many answers that discussed photosynthesis or phototropism. Strangely, few candidates used the term 'phytochrome'.

Question 7 (a) (i)

Many candidates found this question quite difficult. Few were specific in describing breathlessness being caused by lack of oxygen in the blood, with most simply stating 'in the body or in the lungs'. Where candidates did gain credit, it was typically for reference to reduced diffusion and reduced surface area. Many answers simply gave a list of lung diseases and stated that they reduced gas exchange.

Question 7 (a) (ii)

Most answers made reference to difficulty in inhalation as opposed to the difficulty in exhalation that would arise from loss of elasticity.

Question 7 (a) (iii)

Candidates generally found this question demanding. Many thought that the presence of more inhaled oxygen would increase the ventilation rate. Those who appreciated that it would decrease the ventilation rate struggled to link this idea with chemoreception of the oxygen levels in the blood and simply stated that there would be more oxygen in the lungs.

Question 7 (b)

This seemingly straightforward calculation troubled candidates. Many did obtain the correct answer of 3 million, but the number 12 million was often seen.

Question 7 (c)

Stronger candidates often gained full marks with a thorough understanding of nature and nurture linked to correct examples. However, many candidates failed to refer to the terms nature and nurture or to link them to examples, and many transposed the meaning of the terms.

Question 7 (d) (i)

The examiners rewarded those students who appreciated that the alleles would have a different base sequence. This appreciation was seldom seen.

Question 7 (d) (ii)

This question tested candidate ability to derive the correct parental genotypes using the passage. Most were able to succeed with this task but then failed to give the correct probability of 75%. The most common error was to give 25% as the probability.

Question 7 (e)

This question discriminated well. Stronger candidates gave excellent accounts with full scientific vocabulary. There was massive confusion evident over the technique, with some writing about cloning and others about gene therapy. Many failed to refer to genes, DNA or alleles, or did not suggest the A1AT allele. The majority failed to use a fertilised egg. Many suggested the use of body cells or unfertilised eggs. Some even suggested insertion into the lungs of the sheep (presumably confusing this with cystic fibrosis gene therapy). Very few candidates referred to the use of a promoter gene. Poor expression was evident in many answers.

Question 7 (f)

Most candidates gained at least one mark here with many gaining both. Only the weakest failed to appreciate that the FEV would be lower.

Question 7 (g)

Most candidates appreciated that the muscles in the airways were the site of action and that the drugs in the bronchodilators would make the muscles relax so that the airways would open.

Question 7 (h)

Some candidates recognised that theophylline is only used once it has been established that bronchodilators are ineffective because the drug has undesirable side effects. Most candidates simply made reference to the side effects or a description of the side effects.

Question 7 (i)

It was pleasing to note that most candidates attempted this question which suggests that they were able to get to the end of the paper in the time allotted. That said, many answers tended not to reflect the standard required at A level. For example, the phrase 'vaccination helps to produce antibodies with a much faster response which helps to fight infection' did not gain credit as it lacks the terminology and depth of understanding deemed worthy at A level. The best answers used terms that were expected, and therefore credited, such as attenuated bacteria, antigen presenting cells, activated T helper and T killer cells, cytokines, B effector cells, plasma cells producing antibody and memory cells. 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.

Paper Summary

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

- Look at the number of marks allocated to each question and try to make sure that answers at least equate in terms of the number of ideas presented

- Use precise, scientific terminology that reflects A level study

- Appreciate that repeating the stem of a question or sentences from the passage is unlikely to be rewarded

- Be relevant with longer prose answers. This will help avoid wasting time which could be of value with the more difficult analytical questions

- Read the stem of a question carefully before committing to paper

- Recognise that in data interpretation questions there are often marks available for manipulation of numbers to support a written statement

- In calculation questions, show your working, to avoid losing all the marks for a simple mathematical error

Grade Boundaries

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