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# Examiners' Report
# June 2015

# IAL Biology WBI05 01

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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 attempted 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 (c) (i)*

This question challenged students to suggest how sodium ions leave the axon. There were many excellent answers that appreciated the role of active transport and the pumping of ions through carrier proteins. It was pleasing to note that few candidates referred to sodium passing through carrier proteins.

## *Question 1 (c) (ii)*

This question asked candidates to explain the effect that a metabolic poison would have on the rate at which sodium ions leave an axon. The examiners rewarded answers that made it clear that the rate would fall because the poison would reduce the production of ATP needed to work the sodium pump. There were many excellent answers but many candidates fell short of the total of 3 marks because they failed to include the three main ideas. Candidates are encouraged to look at the totals for each question before starting their answers and to make an attempt to think what might be required to help them gain maximum marks.

## *Question 2 (a) (iii)*

The correct answer of medulla oblongata was achieved by 73.9% of candidates. Examiners also accepted the term medulla alone. The cardiovascular centre was less frequently seen, but was also credited.

## *Question 2 (b)*

This question required candidates to recall how thermoregulation is controlled in mammals. Candidates are encouraged to write in erudite detail and to ensure that their answers reflect A level standard. Many candidates lost credit because their answers lacked worthy terminology and detail.

## Question 3 (a)

This question challenged candidates to describe the events that take place at a synapse that enable the transmission of an impulse. This was a QWC question with the emphasis on a logical sequence of events being described. The diagram clearly assisted students and many answers demonstrated a high level of understanding. 44.2% of candidates gained full marks. Candidates need to be precise in their writing, so an answer that mentions calcium ions moving into the membrane is not as credit worthy as an answer stating that the calcium ions pass through the membrane or that they enter the presynaptic knob. Similarly, candidates are encouraged to name the channels involved as calcium ion channels rather than calcium channels.

## Question 3 (b)

This question challenged candidates to suggest how cocaine can lead to a person having an increased sense of pleasure. The examiners credited answers that made it clear that the cocaine molecules would bind to the re-uptake channel proteins in the presynaptic membrane. This would result in an accumulation of dopamine in the synaptic cleft which would bind to receptors in the postsynaptic membrane, causing depolarisation and the initiation of action potentials in the post synaptic neurone. Lack of precise terminology was apparent in many answers.

(3)

As dopamine is prevented from being taken back up the presynaptic neurone, it stays diffused in the synaptic cleft, which results in a higher concentration of dopamine in the synaptic cleft over time, leading to an increase in the magnitude of the effect of dopamine (pleasure)

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**Examiner Comments**

This candidate fails to give a reason why dopamine is prevented from being taken back into the presynaptic neurone and also fails to give a reason why the person would have an increased sense of pleasure.

The only idea worthy of credit is that the dopamine remains in the synaptic cleft.

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**Examiner Tip**

Look carefully at the number of marks available and make sure answers contain the required number of ideas and that terminology used is worthy of A level.

## *Question 4 (a) (i)*

This calculation discriminated well with the better candidates correctly giving 33.8 as the answer. Other acceptable responses were 33.83 and 34.

## *Question 4 (a) (ii)*

The examiners credited answers that made it clear that the 20 to 29 age range had the most reliable data as it had been obtained from a larger sample size. References to standard deviation were ignored.

## *Question 4 (a) (iii)*

24.5% of candidates appreciated that the standard deviation represents the spread of data about the mean and that the size of the standard deviation has an effect on reliability, confidence in the mean and statistical comparability between the means of samples. Descriptions of the word 'spread' were also accepted. 45.1% of candidates gained one mark by expressing one of these ideas.

## *Question 4 (b) (i)*

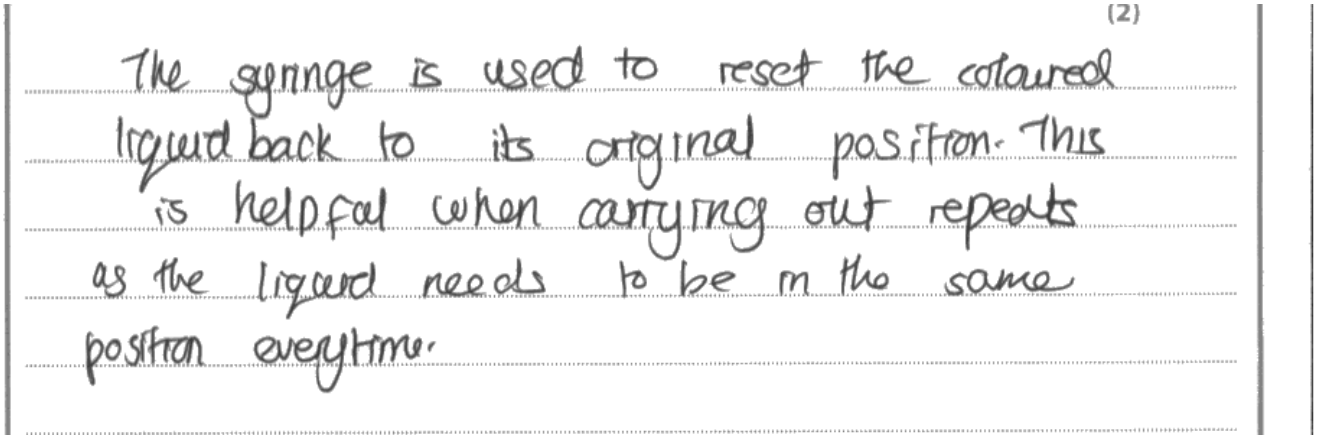
Only the most able candidates were aware that atropine would prevent acetylcholine binding to receptors but most candidates recalled that the pupil dilation was due to the inability of circular muscles to contract whilst radial muscle could contract.

## *Question 4 (b) (ii)*

The examiners credited answers that explained that there is a need to test drugs for efficacy, safety and dosage. References to ethical considerations were ignored, as were references to animals having similar nervous systems and organs. Only 9.2% of candidates failed to score at least one mark.

## *Question 5 (a) (ii)*

This question tested student understanding of apparatus they should be familiar with. Most students recalled that the syringe is used to reset the coloured oil, but only the better students explained that this enabled repeat readings to be made. Candidates who explained that the syringe could also be used to help measure the volume of oxygen consumption were also credited. 42.2% of candidates failed to score.



(2)

The syringe is used to reset the coloured liquid back to its original position. This is helpful when carrying out repeats as the liquid needs to be in the same position everytime.

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**Examiner Comments**

This answer gains full marks because the candidate has stated that the coloured oil is moved to reset so that repeats can be made.

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**Examiner Tip**

The word 'explain' means that a reason is expected. In this case the reason is to obtain repeated measurements. Candidates who only state that the coloured oil is moved would only gain one mark.

(2)

It is used to reset the level of the coloured oil so that the investigation can be repeated.

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**Examiner Comments**

Another good example of an answer that gains full marks.

(2)

The syringe is used to adjust the level of coloured oil in the U-tube. If the plunger is pushed pressure on that side increases and liquid moves down. If the plunger is ~~pushed~~ pulled out the pressure decreases and oil moves up. Before beginning the experiment, the oil level on both sides are made equal by using the syringe.

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**Examiner Comments**

This answer fails to give a reason and only gains one mark for the idea of moving the coloured oil.

## *Question 5 (b) (i)*

The examiners gave both marks for the answer 15 °C. Those who chose a temperature for a water bath not listed in the table still had a chance of gaining one mark if the number 6.75 appeared in their working.

(2)

~~Temperature of water bath =~~ Mean oxygen consumption = $\frac{4.5\text{cm}^3 \times 2.0\text{g} \times 20\text{hr}}{2.0\text{g} \times 60\text{hr}}$

$= 6.75\text{cm}^3\text{g}^{-1}\text{hr}^{-1}$

Answer ..... °C

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**Examiner Comments**

This answer fails to give the temperature of the water bath but does show the number 6.75 in the working.

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**Examiner Tip**

Always show working as a mark is available even if the answer is missing or incorrect.

(i) During this investigation, the student found that 2.0 g of maggots consumed 4.5 $\text{cm}^3$ of oxygen in 20 minutes.

Use this information to calculate the temperature of the water bath most likely to produce this result. Show your working.

(2)

$\frac{4.5}{2} = 2.25\text{ cm}^3/\text{g}$

2.25 — 20

x — 60

$x = 6.75\text{ cm}^3\text{g}^{-1}\text{hr}^{-1}$.

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**Examiner Comments**

The answer is incorrect but the number 6.75 appears in the working so one mark is achieved.

## *Question 5 (b) (ii)*

To gain the mark, candidates had to make it clear that not only should smaller temperature intervals be chosen but also that they should be between the range 25 °C to 35 °C.

(1)

It could be repeated but with more values for temp ie increments of only 2 degrees

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**Examiner Comments**

This answer refers to smaller intervals but fails to give the range in which the smaller intervals should be used.

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**Examiner Tip**

Give as much detail as possible in answers. Though the idea of smaller intervals is sensible, the more able candidates will appreciate that it is equally sensible to have smaller intervals within a restricted range.

(1)

Repeat the experiment by use a different range eg from 25°C to 35°C and instead of every 5°C do repeats redo the experiment for every two degrees from 25°C to 35°C

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**Examiner Comments**

This candidate has the idea of smaller intervals and the idea of restricted range, so gains the mark.

## *Question 5 (c)*

A pleasing number of candidates were aware that ATPase is involved in chemiosmosis and that denaturation of this enzyme would reduce ATP production by affecting proton transport. Less able candidates gained one mark for appreciating that high temperatures would denature enzymes.

## *Question 6 (a)*

This question examined data relating to the habituation of sea slugs from water that differed in turbulence. Recognition that habituation had occurred gained credit. To gain more marks candidates were expected to make reference to the fact that there was a learning curve for both sea slugs and that the curve for the sea slugs from calm water was steeper and above that for the sea slugs from rough water. Credit was also available for the use of data that conformed to a restricted list of acceptable descriptions. Candidates are encouraged to look at graphical data and attempt to express the patterns therein in an erudite way. Many simply describe every point in a graph showing no real understanding.

## *Question 6 (b)*

The examiners rewarded candidates who understood the underlying biological explanation for the data in the graph. As such, they credited answers that made it clear that the sea slugs from rough water were already habituated to the stimulus of being squirted, which they tend to ignore as it is perceived as harmless. This behaviour allowed these sea slugs to benefit by saving energy for other purposes and allowing them to benefit from greater gas exchange.

## *Question 6 (c)*

This question examined candidates' understanding of how fMRI scanning works to help scientists observe brain activity as habituation occurs. Many candidates showed an excellent understanding of the procedure' but only the more able candidates linked the changes seen during fMRI scanning to the changes in brain activity leading up to habituation.

## *Question 7 (a)*

In this question, students were rewarded for appreciating that beta blockers would reduce heart rate and that this would impair the performance of an endurance athlete because less oxygen or glucose would be transported. Many candidates wrote about the effects of adrenaline before making reference to the effect of beta blockers. Candidates need to be encouraged to answer the question asked rather than waste their time writing irrelevant content.

## *Question 7 (b)*

This question hinged on candidates appreciating that in the passage it is made clear that steroid injections would weaken ligaments. The examiners credited answers that explained the consequence of this weakening. Marks were given to candidates who recalled that ligaments join bone to bone and that a weakening of this relationship would affect joint stability.

## *Question 7 (c)*

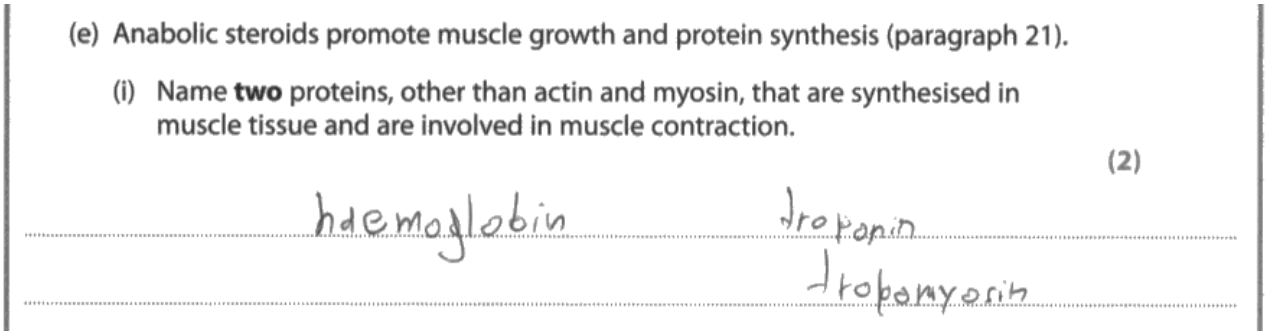
Candidates were rewarded for appreciating that diuretics dilute urine which makes it more difficult to detect banned drugs, and also that they help athletes lose weight which would enable them to compete in lower weight categories in many sports. Again, candidates are encouraged to answer the question asked directly – many gave excellent irrelevant accounts of the role of ADH.

## *Question 7 (d)*

This question tested understanding of the term autologous as used in the passage. Many candidates appreciated that it is important to avoid the risk of an immune response leading to rejection and the risk of disease transmission.

## *Question 7 (e) (i)*

This was a relatively simple question but many candidates struggled to recall troponin, tropomyosin or ATPase as significant proteins involved in muscle contraction. Candidates who give a list of terms need to be aware that the examiners mark the first two in the list.



(e) Anabolic steroids promote muscle growth and protein synthesis (paragraph 21).

(i) Name **two** proteins, other than actin and myosin, that are synthesised in muscle tissue and are involved in muscle contraction.

(2)

haemoglobin troponin

tropomyosin

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**Examiner Comments**

This candidate wrote a list of terms. The examiners were told to mark the first two in any list, so this candidate only gained one mark.

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**Examiner Tip**

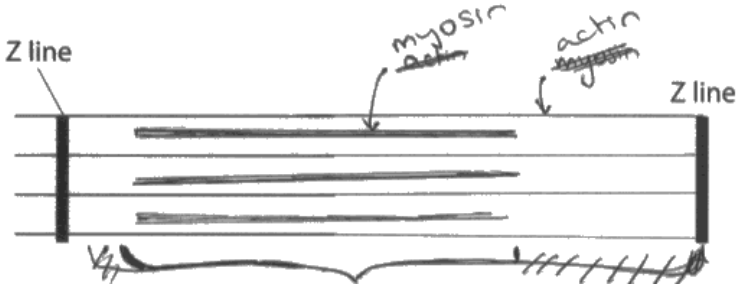
When a question asks for two names, in this case two relevant proteins, restrict your answer to two names and do not give a long list.

## *Question 7 (e) (ii)*

Again, this relatively straightforward question posed problems for some candidates. Credit was given for a correct completion of the drawing and for correctly labelling myosin and actin.

(ii) The diagram below shows part of a sarcomere.

Complete the diagram by drawing and labelling where actin and myosin are found. (2)

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**Examiner Comments**

This candidate produced an incorrect drawing but the labelling of actin and myosin is acceptable.

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**Examiner Tip**

Take care with even the most straightforward of questions. Try to think where the two marks might be allocated. This question uses the terms 'drawing' and 'labelling' which is a clue to where the marks will be allocated.

## Question 7 (f)

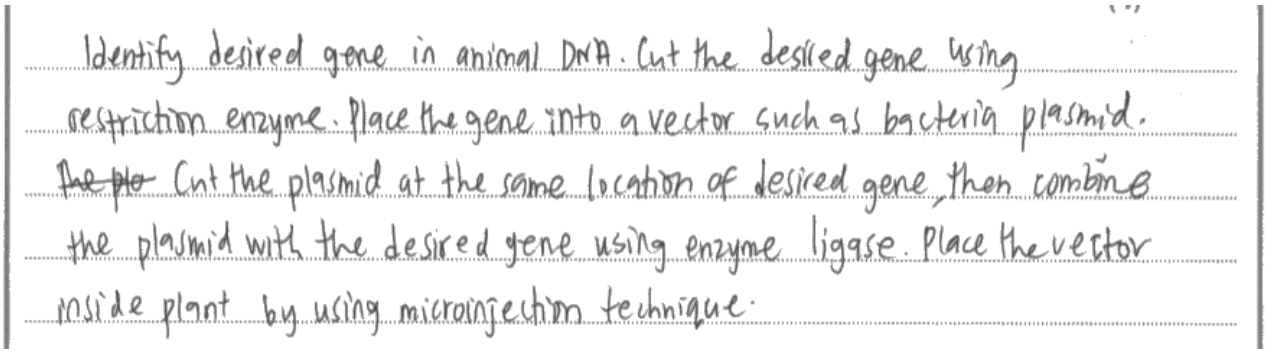
Many candidates, 61.1%, appreciated that an endogenous substance is one that is produced within the body.

## Question 7 (g)

The more able candidates appreciated that endurance athletes need a greater proportion of slow twitch fibres as they have more myoglobin, mitochondria and capillaries. These structural features allow slow twitch fibres to respire aerobically so lactate production is limited and less fatigue occurs. Many candidates failed to write a coherent, lucid answer, often mixing concepts about both twitch fibres in their account which made it difficult for examiners to decipher their argument.

## Question 7 (h)

Many candidates were able to describe the process of genetic modification of plants to enable them to produce human proteins.


Identify desired gene in animal DNA. Cut the desired gene using restriction enzyme. Place the gene into a vector such as bacteria plasmid. ~~The plo~~ Cut the plasmid at the same location of desired gene, then combine the plasmid with the desired gene using enzyme ligase. Place the vector inside plant by using microinjection technique.

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**Examiner Comments**

This answer gained full marks.

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**Examiner Tip**

In answers that require extended prose it is not always necessary to write at length. Often the best answers are succinct and to the point. Candidates are encouraged to think before they start writing. This will help them to produce answers that flow and avoid repetition.

## *Question 7 (i)*

This question expected candidates to appreciate that blood doping and EPO increase the viscosity of the blood increasing the risk of heart attacks and strokes. There were many excellent answers demonstrating sound knowledge and understanding.

## *Question 7 (j)*

Many appreciated that EPO levels and red blood cell concentration can vary between people because of their genetic inheritance. They also appreciated that there are legal methods such as oxygen tents or altitude training that can also affect the red blood cell concentration.

## *Question 7 (k)*

Candidates showed good understanding of the process of gel electrophoresis. 41.1% gained full marks. However, they need to appreciate that DNA fragments are placed in the agar wells, not genes.

## 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:

- 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. One of the QWC questions expected candidates to spell biological terms correctly, so candidates need to be made aware of the importance of this skill.
- Appreciate that repeating the stem of a question or sentences from the passage is unlikely to be rewarded.
- Be relevant and succinct with longer prose answers. This will help avoid wasting time which could be of value with the more difficult analytical questions. One of the QWC questions required writing in a logical sequence, so candidates would benefit from practice in this skill.
- 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

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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