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Examiners' Report
June 2019

IAL Biology WBI05 01

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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-release 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 attempt 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 produce detailed answers that do not address the question in the context in which it is set, often gaining little credit.

Question 1 (b) (i)

Many candidates struggled with this question. Although the question asked candidates to find the mean heart rate and the word mean was in bold, many simply calculated a heart rate based on one cycle and did not gain the mark.

Question 1 (b) (ii)

Most candidates found this question straight forward. The most frequent reason for not gaining a mark was failing to address the idea of rate. Candidates did not gain a mark for simply stating that the number of cycles or peaks would increase. They needed to say there would be more peaks in a particular period of time or that the peaks would be closer together.

Question 1 (c)

Many candidates answered this question well. A number of candidates used the term 'signals'; this was not accepted in place of impulses, marking points 1 and 3. Relatively few candidates mentioned the role of the SAN as a pacemaker (MP2).

(c) Describe the role of the sinoatrial node (SAN) in controlling heart rate.

(3)

SAN is the pacemaker of the heart which causes a depolarisation and wave of excitation to spread through the tissue and cause contractions. The SAN is connected to the cardiac centre ~~via~~ by nerves i.e. parasympathetic and sympathetic nerves. When heart rate is to be increased due to various stimuli, The message is sent along the sympathetic nerve which increases the heart rate by increasing the frequency of depolarisation or wave of excitation from SAN controlling heart rate.

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Examiner Comments

In this example, the candidate has described the SAN as the pacemaker (MP2) that initiates a wave of depolarisation (MP3) in the first two lines. The following three lines gain MP1. The candidate did not mention the role of the wave of depolarisation in stimulating contraction of the atria (MP4) or its action on the AVN (MP5).

Question 2 (a)

Candidates generally produced good responses to this question gaining both available marks.

Question 2 (b)

Candidates generally produced good responses to this question gaining both available marks. Suggestions around keyhole surgery causing less damage e.g. less blood loss and less scarring were considered as alternatives so would only gain one mark.

Question 2 (c) (ii)

Many candidates produced good responses to this question. Marking points 1 and 2 were frequently seen. Relatively few candidates produced a good description of how successful outcomes could be measured or of the comparison of 7mm grafts with other sizes. Many simply suggested test a whole range of different sizes that included 7mm. For marking point 4 they needed to focus on comparing 7mm with other diameters.

Question 3 (b)

Many complete responses were seen for which candidates gained full marks. A number of candidates made reference to chemoreceptors rather than thermoreceptors. Marking point 5 required candidates to describe the return of temperature to normal. The mark was not gained for statements about cooling the body down unless it was clearly expressed this cooling down was to the normal or set value.

(b) Describe the role of the hypothalamus in maintaining the internal body temperature during exercise.

(4)

During exercise, temperature receptors in the skin detect the temperature change stimulus (increasing temperature). The temperature receptors in the skin send impulses along sensory neurones to the hypothalamus in the brain. The hypothalamus acts as the CNS. The hypothalamus sends nerve impulses along motor neurones to the sweat glands to increase sweat production, so that sweat will evaporate off the surface of the body causing a cooling effect. The hypothalamus sends nerve impulses to the the blood vessels near the surface of the skin. The smooth muscle in this blood vessel ~~constricts~~ relaxes and the blood vessel will vasodilate in blood vessels near the surface of the skin. Heat in the blood will radiate out of the surface of the skin.

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Examiner Comments

In this response, the candidate gained all four available marks. MP1 - lines 1 and 2, MP2 - lines 3 and 4 and MP3 - lines 5 and 6. The response was also awarded MP4 - in lines 6 to 8 and the last two lines. The idea of increased sweating linked to the cooling effect of sweating and vasodilation to radiation of heat was accepted for increased heat loss.

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Examiner Tip

Aim to provide complete answers that are clear and unambiguous.

Question 3 (c)

This question was straightforward for most candidates and many gained full marks for complete answers.

Question 4 (c) (i)

Many candidates managed to complete this calculation successfully. The main reasons that did not gain both marks were misreading values from the graph and incorrect rounding of the final answer.

(i) Using the trend lines drawn on the graphs, determine the percentage difference in red light intensity required to stimulate 30% germination in batches **A** and **B**.

(2)

$\frac{9 - 2.8}{9.0} \times 100$

68.9%

68.9 %

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Examiner Comments

In this response the candidate has clearly obtained the correct values from the graphs, 9 and 2.8 (MP1), and has completed the calculation correctly (MP2).

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Examiner Tip

Although full marks are awarded for the correct answer to a calculation always show your working. Mistakes in transcribing the calculated answer to the answer line or in the rounding of final answers often cause candidates to lose marks. If there are no workings this could result in the loss of all available marks.

Question 4 (c) (ii)

Many candidates struggled to describe the results presented to them. Some candidates misinterpreted the data and described batches B and C as being exposed to red light **for** 3 and 24 hours, rather than **at** 3 and 24 hours. Very few candidates commented on the effect of far-red light (MP1) or the change in the gradient for either batch B or C (MP4). Some candidates ignored the command word, describe, and tried to explain the results gaining no credit for the explanation.

(ii) Describe the effect of light exposure on the germination of these seeds.

(3)

The increase in light exposure increase the germination.
In the daylight the ~~R~~ phytochrome red, P_R is absorbed and by the plants and is converted to P_{FR} (phytochrome far red)
The presence of P_R stimulates the germination while P_{FR} inhibits the germination.
Increase in redlight intensity has a direct linear, positive coorelation to perentage germination.

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Examiner Comments

In this response the candidate gained one mark (MP2). Unfortunately, the candidate ignored the instruction to describe the results and gave an explanation instead, for which no marks were available.

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Examiner Tip

Pay attention to command words. In particular, describe and explain require very different responses. If you give an explanation when asked for a description you may lose marks.

If you are not sure about your answer, look ahead to the next question. It may be that the next question is asking for an explanation of the data and you then have a better idea of what you need to include or not include in a description of the data.

(ii) Describe the effect of light exposure on the germination of these seeds.

(3)

→ Light exposure had no effect on the germination of Batch C

→ Batch A required a larger red light intensity than batch B to germinate and for both batches, as the light intensity increased in the range in which they germinate, so did the % germination for e.g for Batch B, as the light intensity increased from 2 to 3 a.u, the % germination increased by 12%.

→ Both batch B and batch A had different ranges of light intensity ~~as they~~ in which they germinate

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Examiner Comments

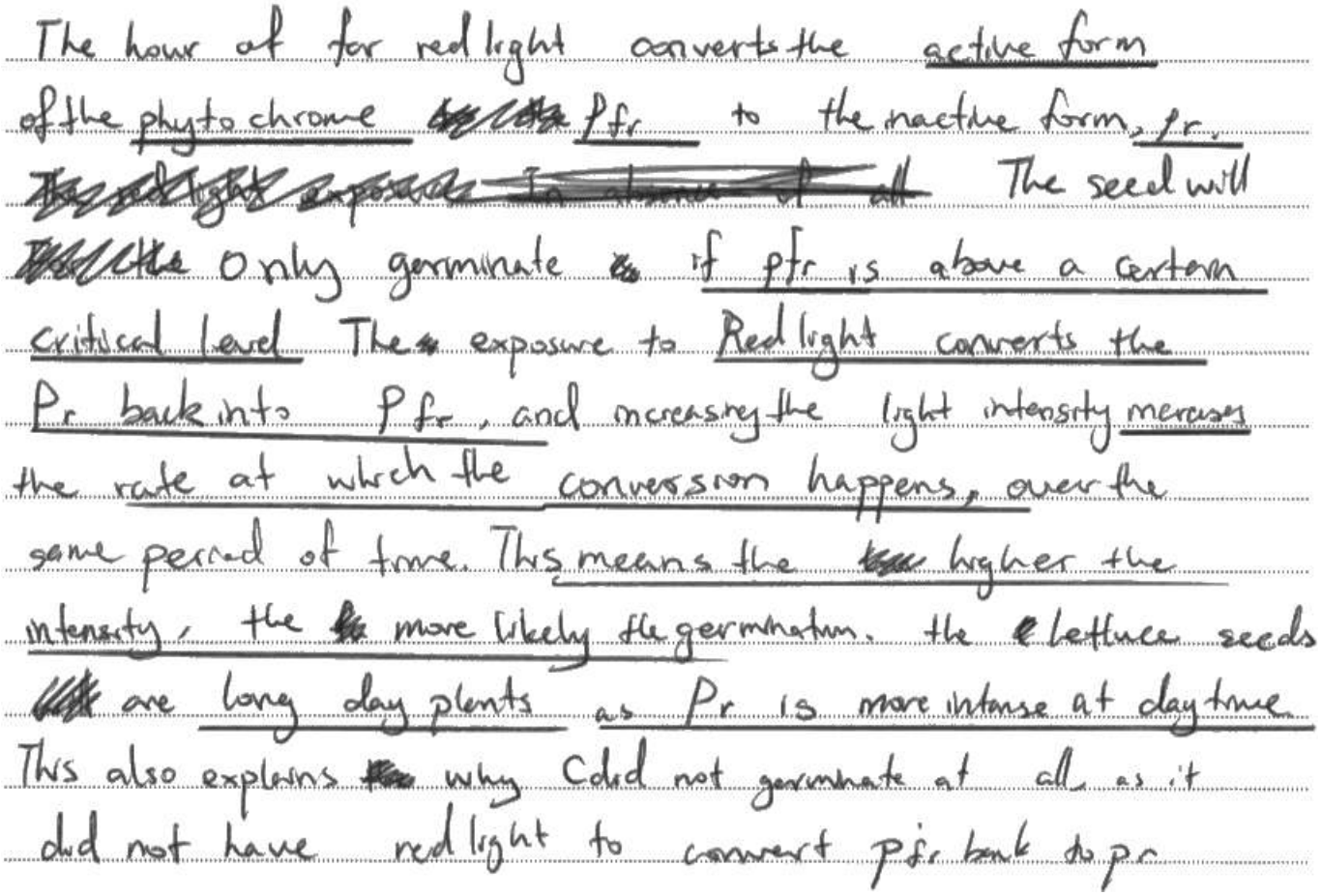
In this response the candidate gained two marks (MP2 and 3) in lines 3 to 7. The first two lines did not gain MP1. For MP1, candidates had to state that far-red light inhibited germination.

Question 4 (c) (iii)

Those candidates that understood the experiment were able to gain full marks demonstrating their understanding of the role of phytochromes in germination. Many candidates who did not apply their knowledge and understanding of phytochromes to the context of this question were still able to access some of the marking points (MP1 and 3).

(iii) Using your knowledge of photoreceptors, suggest an explanation for the results of this experiment.

(4)



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Examiner Comments

In this response the candidate provided a good explanation for the data provided. MP3 - lines 1 and 2, MP4 - lines 4 and 5, MP1 - lines 5 and 6 and MP2- lines 6 and 7.

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Examiner Tip

Always check your answers to make sure you have made all the points you want to. This candidate has underlined each bit of information they think is important. This demonstrates they have checked their answer. You do not need to underline but you should check.

Question 5 (b) (i)

Candidates were provided with some information collected from an investigation of respiration in alligators. Candidates were asked to describe and explain the results. Many candidates produced a good description of the results (MP1, 2 and 3). However, candidates often struggled to provide sensible explanations (MP4 to 8).

*(i) Describe and explain the results of this investigation.

(6)

As the duration of activity increases, the rate of lactate production decreases, showing an overall decrease by 34·3 mmol/kg/min, the rate of ATP production also decreased by 51·41 mmol/kg/min, both showing a negative correlation but a greater decrease by the rate of ATP production. However, as the duration of activity increases, the mass of glycogen used also increases, showing a positive correlation, increasing by 1·5 g/kg. This is because during short periods of exercise, anaerobic respiration takes place, which involves glycolysis taking place in the cytoplasm of the cell where glucose is phosphorylated forming 2 molecules of pyruvate, and 2 molecules of ATP and reduced NAD. The resulted pyruvate is reduced and converted to lactate (increasing lactate production) while reduced NAD is oxidised. As the duration of activity increases, less anaerobic respiration takes place, and less pyruvate is converted to lactate (reducing lactate production). As aerobic respiration takes place, more glycogen is used up as it is broken down to glucose to be used in respiration for respiring muscle cells, more ATP is used.

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Examiner Comments

In this response the candidate has gained 6 marks. MP1, 2 and 3 - in the first 5 lines, MP5 - lines 8 and 9, MP7 - lines 11 and 12 and MP4 - last 2 lines.

Question 5 (b) (ii)

(ii) After stopping exercise the oxygen consumption of the alligator increases.

Explain why the oxygen consumption of an alligator increases after a short period of activity.

(3)

The short period of activity requires anaerobic respiration that produces lactate. This lactate is transported through blood to liver to be oxidised back to pyruvate. So oxygen consumption increases to oxidise lactate and pay oxygen debt.

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Examiner Comments

In this response the candidate gained three marks. MP1 - lines 1 and 2, MP2 - lines 3 to 5 and MP6 - last line. MP2 was allowed for the oxygen being required to oxidise the lactate back to pyruvate. A simple statement that lactate is oxidised would not be sufficient.

(ii) After stopping exercise the oxygen consumption of the alligator increases.

Explain why the oxygen consumption of an alligator increases after a short period of activity.

(3)

Because the muscles stop working and anaerobic respiration is favoured. So this produce lactic acid that drops the ~~blood~~ pH. This is detected by chemoreceptors in carotid arteries and aorta and send impulse to the brain for ~~more~~ needing more O_2.

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Examiner Comments

In this response the candidate gained one mark (MP1).

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Examiner Tip

Candidates can be asked different types of 'explain' questions, 'Explain **how** ...' and 'Explain **why**...' This is an explain why question but the candidate has provided an explain how answer. Make sure you read the question carefully and give the correct 'why' or 'how' answer.

Question 5 (b) (iii)

Candidates were provided with some information collected from an investigation of respiration in alligators. Candidates were asked to describe and explain the results. Many candidates produced a good description of the results (MP1, 2 and 3). However, candidates often struggled to provide sensible explanations (MP4 to 8).

Question 6 (a) (i)

A large number of candidates ignored the reference to 'in this study' in the question. These candidates often gave a good explanation of what is meant by the term the critical window (MP1). However, unless candidates made reference to the development of the ventilation centre or the need of oxygen as the required external stimulus they did not gain a second mark.

6 A study was carried out to investigate the critical window in the development of the ventilation centre in rats.

(a) In this study, groups of newborn rats were exposed to a five-day period of low oxygen concentration, beginning on day 1, day 11 or day 21 after birth.

A control group was also included, in which newborn rats were not exposed to a low oxygen concentration.

The rats were allowed to grow to adulthood. They were then tested for their change in breathing after they were exposed to a low oxygen concentration.

The table below shows the results of this study.

Group	Mean increase in breathing rate / breaths min^{-1}	Mean change in tidal volume / $cm^3\,100\,g^{-1}$
control	27	+0.10
low oxygen concentration for days 1 to 5	24	+0.07
low oxygen concentration for days 11 to 15	11	−0.24
low oxygen concentration for days 21 to 25	29	+0.15

(i) Explain what is meant by the term **critical window** in this study.

(2)

Important time periods during development when ~~where~~ environmental stimuli have great effects on the organism's development

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Examiner Comments

In this response the candidate has ignored the context of the question and has simply given a definition of 'critical window' (MP1).

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Examiner Tip

When appropriate make sure you provide answers in the context of the question.

(i) Explain what is meant by the term **critical window** in this study.

(2)

Critical window is the period of time during which new stimuli are required so that synapses in the brain can form. In this study, low oxygen concentration is the stimuli for critical window.

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Examiner Comments

In this response the candidate has explained what the critical window is (MP1) and has linked development of the exposure to oxygen (MP2).

(i) Explain what is meant by the term **critical window** in this study.

(2)

The critical window in this study is the need of the ventilation centre to be exposed to stimuli ~~so that~~ it during a specific time period so that it can properly develop

ResultsPlus
Examiner Comments

In this response the candidate has explained what the critical window is (MP1) and has linked it to development of the ventilation centre (MP3).

Question 6 (a) (ii)

Many candidates struggled to describe the results of the study. The main observations that can be drawn from the data are that low oxygen concentration at 11 to 15 days reduces the mean increase in breathing rate and causes a negative change in tidal volume (MP1 and 2).It can also be concluded that the 1 – 5 and 21 – 25 day groups were similar to the control group (MP3). Many candidates simply transcribed the table into text or described in detail, often with data manipulation, the small changes between the control and each group. Often candidates failed to emphasise that it was the 11 – 15 day group that exhibited significant changes from the control.

Question 6 (b)

(b) Describe the role of the ventilation centre in controlling the breathing response to a short period of low oxygen concentration in the control rats.

(4)

~~At low oxy~~ O_2 ~~concentration means that the blood's~~ CO_2 ~~concentration is high~~ The low O_2 concentration in the blood is detected by the chemoreceptors in the carotid arteries and aorta. ~~The~~ which send impulses to the ventilation centre ~~via the sensory~~ in the medulla. The ventillation centre sends more impulses via the sympathetic nerve to the ~~breathing rate~~ diaphragm and intercoastal muscles to contract at a faster rate ~~com~~ increasing the breathing rate. ~~T~~ The Impulses are also sent the muscles to contract harder thereby increasing the tidal volume so that more O_2 can be taken in as ventillate rate increase.

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In this response the candidate gained 4 marks. MP2 - lines 1 and 2, MP3 - lines 2 and 3, MP4 - line 4 and MP5 line 5 and 6. MP6 - last four lines For MP4 'more impulses' was accepted as just sufficient for more frequent. Sending impulses by itself would not have been accepted. For MP6 'increasing tidal volume' was accepted for increased depth. So, together with increased rate of breathing MP6 could be awarded.

Question 6 (c)

This question proved to be straightforward with most candidates being able to produce at least one reason to justify the use of rats in the study. Marking points most frequently seen were MP1 and 2.

Question 7 (a)

Candidates often recognised that 'targeting' the neuromuscular system would paralyse or incapacitate the potential prey (MP3). However, relatively few candidates clearly linked this to the idea that nervous communication is rapid (MP2) or explicitly stated that the neuromuscular system controls movement (MP1).

7 The scientific article you have studied is adapted from *Venom: The secrets of nature's deadliest weapon*, R Jenner and E Undheim, The Natural History Museum, 2017.

Use the information from this article and your own knowledge to answer the following questions.

(a) Suggest why targeting the neuromuscular system is the quickest way of deterring or debilitating an adversary or potential prey (paragraph 4).

(2)

The transmission of Nerve impulses is fast which inhibit the muscle contraction of prey in a short period of time. Prey can't move in a short period of time.

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In this response the candidate clearly states that nerve impulses are fast (MP2) and then conveys the idea that prey are quickly unable to move (MP3).

Question 7 (b)

Many candidates suggested that the neurotoxin could act as a neurotransmitter or caused the accumulation of neurotransmitter in the synapse (MP1). Many then went on to describe the consequences in terms of binding to the post-synaptic membrane and generating action potentials (MP2 and 3). Very few candidates made any reference to the role of motor neurones (MP4)

(b) Explain how a neurotoxin could act on a neurone to cause 'uncontrollable muscle contraction' (paragraph 5).

(3)

the neurotoxin can ~~bind to~~ act as an neurotransmitter due to their similar shape, hence be able to bind to specific reception on the post-synaptic membrane and cause the sodium ion channels to keep opening and ~~sodium ions~~ hence keep the post-synaptic neurone depolarised, as the neurotoxins are not neurotransmitters, they cannot be ~~broken~~ broken down by enzymes nor be reuptaken by the reuptake proteins, so the wave of depolarisation in post-synaptic neurone will not be able to stop and the motor neurones will therefore keep receiving signals to contract,

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In this response the candidate gained three marks. MP1 - lines 1 and 2, MP2 - lines 3 and 4 and MP4 last to lines. The phrase 'continuous waves of depolarisation' would be an acceptable alternative for MP3.

Question 7 (c)

Many good responses were seen addressing all marking points. With a large number of candidates gaining two marks for complete answers. Some candidates are still confusing primary structure with a DNA sequence and describe the primary structure as a sequence of bases.

(c) Explain the role of the primary structure in the production of a water soluble venom protein (paragraphs 8 and 9).

(2)

primary structure is the sequence of amino acids in a polypeptide chain. the type of amino acid will determine the type ~~type~~ of folding in the protein. If the protein is globular, has hydrophillic R-groups on the outside it will be water soluble

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In this response the candidate has provided a complete explanation. MP1 - lines 1 and 2, MP2 - lines 3 and 4 and MP3 - lines 5 and 6, are all available.

Question 7 (d)

Based on a core practical this question was accessible to candidates with many good accounts seen. Marking points 1, 2, 3 and 7 were frequently seen. Marking points 4, 5 and 6 were seen much less frequently. Many candidates simply described how an antibiotic property could be demonstrated. To answer the question fully candidates needed to express the idea of testing the antibiotic and haemolymph at different concentrations (MP5) and against different microorganisms (MP4). They also needed to explain how the antibiotic properties could be compared (MP6). Simply stating that the diameter of the clear zone would be measured was not sufficient for MP6. Candidates need to explain how the area of the clear zone relates to antimicrobial activity, e.g. the larger the area of the clear zone the more effective the antibiotic.

*(d) Describe how the antimicrobial properties of scorpion haemolymph could be compared with an antibiotic such as penicillin (paragraph 11).

(5)

First, ~~extract~~ haemolymph from a sedated or dead scorpian and fill a small test tube. Next prepare ~~to~~ 2 nutrient agar plates and pour into 2 ~~petri~~ petri dishes. Sterelise and inoculating loop using a blue bunsen flame and innoculate the petri dishes with a lawn of bacteria. Futhermore, Seal the petri dishes leaving small air spaces. Soak 4 paper disks of equal diameter in haemolymph and 4 identical disks in ~~penicill~~ penicillin. Place the disks equal distance apart on the surface of the agar plate and leave to in and incubator set at 25°C for 48 hours. Measure the diameter of the zones of inhibition using a vernier caliper and calculate the mean zone of inhibition for each substance.

The substance with the greater mean diameter has the greater anti-microbial properties.
Be sure to repeat the experiment for increased reliability. Also ensure gloves are worn at all times and aseptic technique is maintained throughout the experiment.

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In this response the candidate gained 5 marks. MP7 - line 7, MP1 - line 6, MP2 - lines 8 and 9, MP3 - line 12 and MP6 lines 16 to 18. The candidate did not make any reference to using different microorganisms (MP4) or of testing different concentrations of antibiotic (MP5).

Question 7 (e)

This question was straightforward for many candidates with many good answers being seen.

(e) Explain why blocking potassium channels in neurones causes continuous nerve impulses (paragraph 12).

(2)

If pottasium channels blocked, then pottasium ions cannot diffuse out of the cell to regain resting potential and ~~cell~~ neuron will stay depolarized, so action potentials keeps on moving along the axons so nerve impulses keep on occuring.

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In this response the candidate gains both available marks. MP1 - lines 1 to 3, MP2 - lines 4 and 5 and MP3 5 to 7. In the context of this question the phrase 'the neurone stays depolarised' was accepted for MP2. However, in a different context candidates might be expected to make specific reference to the membrane being depolarised.

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Examiner Tip

When describing processes involved in nerve conduction, e.g. depolarisation, it is better to locate the process to the membrane than to the cell. 'The membrane stays depolarised' is a better response than 'the neurone stays depolarised'.

Question 7 (f)

The idea of how a particular trait or phenotype can evolve is familiar to many candidates and a number of complete responses were seen. MP1, 2, 3 and 4 were frequently seen. Very few candidates made any comparison to the German cockroach (MP5). A small but significant number of candidates expressed ideas around evolution poorly. One concerning misconception is that a selective pressure will cause mutations that lead to evolution. For marking point 1 candidates needed to make it clear that mutations take place at random. If candidates linked the occurrence of mutations to the presence of a selective pressure then they did not gain MP1.

(f) Suggest how resistance to the neurotoxin of the African tarantula evolved in the American cockroach but not in the German cockroach (paragraph 14).

(4)

Mutation in the gene sequence occurred, so one amino acid was different, with the different primary structure changing the folding of the protein, so the neurotoxin was no longer able to bind. Selection pressure due to predation by the African Tarantula caused a fall in population, those cockroaches with this beneficial mutation were more likely to survive and reproduce, passing the beneficial allele on, as the neurotoxin does not paralyze insects with the mutation. Frequency of this mutation in American cockroaches therefore increased over time. German cockroaches not exposed to Tarantula, different selection pressure, so this mutation was not as beneficial, and so did not evolve as a result.

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In this response the candidate gains all four available marks. MP1 - line 1, MP3 lines 4 and 5, MP2 - lines 6to 8, MP4 - lines 9 and 10 and MP5 - last three lines.

Question 7 (g)

Candidates recognising that this question was asking about the release of neurotransmitter at synapses generally scored well. Marking points 2 and 3 were frequently seen. Many candidates did not mention calcium ions binding to the neurotransmitter vesicles (MP1).

(g) Explain how alpha-latrotoxin causes the release of neurotransmitters (paragraph 22).

(3)

Alpha-latrotoxin inserts itself into neuronal cell membrane and acts as an ion channel. This allows an influx of calcium ions. Calcium ions bind to vesicles containing neurotransmitters. Vesicles fuse with ~~a membrane of~~ pre-synaptic membrane and release neurotransmitters by exocytosis.

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Examiner Comments

This is a good example which clearly gains all three marking points.

Question 7 (h)

Although candidates are familiar with serotonin from the specification, its role in stimulating pain is novel. It was pleasing to see many good responses to this question, suggesting that candidates had engaged well with the pre-release material. The most frequently seen marking points were MP1 and MP2. Relatively few candidates mentioned sensory neurones or transmission of impulses to the brain (MP3 and MP4).

(h) Suggest how the release of serotonin can cause pain (paragraph 23).

(3)

Serotonin is a neurotransmitter released from presynaptic neurones.
It binds to and activates heat sensitive pain receptor.
This increases pain sensation. More impulses are sent to the brain via sensory neurones.

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This is an example of a good response with the candidate gaining three marks from marking points 1, 2, 3 and 4.

Question 7 (i)

Many candidates correctly suggested using fMRI (MP1). However, a number struggled to suggest how the effect would be shown, e.g. comparing before and after being stung.

(i) Some venoms cause a 'lingering pain' (paragraph 25).

Describe how the effects of one of these venoms on the brain could be observed.

(2)

Using an fMRI, the activity of ~~a~~ every parts of the brain can be monitored. fMRI monitors oxygenation of haemoglobin through BOLD, and the parts of the brain ~~receive~~ which are active and thus appear white on the machine. Thus, parts of the brain ~~causing~~ feeling pain ~~and~~ can be observed on a patient before and after exposure to the venom.

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In this response the candidate gained both marks, MP - line 1 and MP2 - line 6 and 7.

Question 7 (j)

(j) The honeybee sting is painful (paragraph 26).

Animals can learn to recognise the sound of honeybees, and can avoid being stung.

Suggest how this learning could be investigated.

(4)

Allow animals ~~to be~~ that have been stung by bees to listen to bee sounds using speakers. Count the number of animals that run away each time they listen to bees. Repeat the whole process at equal intervals with same volume If number of animals running away increase then animals have learned by conditioning which is linking sound of bees by getting stung.

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In this response the candidate has described animals being stung (MP1) and then observing the response of the animals when they hear the sound of bees (MP3). The candidate then explains how they would demonstrate learning (MP4). It is not clear from the response that the animals being stung hear the bees as they are being stung (MP2).

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 sole description.

Grade Boundaries

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

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