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Examiners' Report
June 2016

IAL Biology WBI05 01

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June 2016

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Introduction

The paper showed that candidates were able to demonstrate their knowledge and understanding of the relevant sections of the specification. All questions were attempted by most candidates, including those at the end of the paper, which shows that the time allotted was sufficient.

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.

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 but some candidates do seem to read key words and then start to write, failing to appreciate the actual question being asked. It was pleasing to note that many candidates were able to apply their knowledge to the unfamiliar scenarios that were presented. Overall, the level of knowledge and understanding demonstrated was very satisfying.

Question 1 (b) (i)

This question examined understanding of the nervous control of heart rate during exercise. Credit was given to answers that described the role of chemoreceptors in the aortic or carotid bodies in detecting changes in the carbon dioxide level in the blood. Thermoreceptors in the hypothalamus or skin, and stretch receptors in the atria or skeletal muscles, were also credited. Correct reference to the medulla, the sympathetic nervous system and the SAN also gained credit. Many answers showed excellent understanding and scored full marks.

(b) Nervous and hormonal control can increase the heart rate during exercise.

(i) Describe how the heart rate can be increased by nervous control during exercise.

(4)

- When the heart rate starts to slow down, impul- [redacted] ses are passed down the sympathetic nerve which increases the [redacted] heart rate back to normal.
- [redacted] After exercising when the heart rate needs to return to normal, impulses are passed down the para-sympathetic nerve which decrease the heart rate, bringing it back to normal.

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Examiner Comments

This answer fails to include all but one of the marking points. The only acceptable mark was for reference to the sympathetic nervous system.

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Examiner Tip

Candidates should look at the number of marks available in a question and try to include at least that number of different ideas in their answer.

1/4

(b) Nervous and hormonal control can increase the heart rate during exercise.

(i) Describe how the heart rate can be increased by nervous control during exercise.

(4)

At the beginning of ~~an~~ exercise, the atria fill up with blood, and the stretch receptors in the ~~artea~~ atria walls get stimulated. This sends an impulse to cardiovascular control centre in the medulla oblongata, which then sends an impulse to the SAN via the ~~the~~ sympathetic nerve to stimulate the SAN. The heart rate ~~gets~~ increases.

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Examiner Comments

This answer has five of the available marking points. The only idea missing is that of a change in the levels of carbon dioxide.

stretch receptors

atria

cardiovascular centre

SAN

sympathetic nerve

4/4

ResultsPlus
Examiner Tip

Try to include as many ideas as possible in your answer. Four marks were available in this question and this answer includes five acceptable marking points so scored a maximum of 4.

Question 1 (b) (ii)

This question asked candidates to give one similarity and one difference between hormonal and nervous control of heart rate. Most candidates were able to give one difference such as hormonal being slower to take effect, or longer lasting. Credit was only given if the answer showed the idea of a comparative comment. As such, stating that hormonal lasts a long time was insufficient. Those who wrote that hormonal is chemical but nervous is electrical, or that hormonal uses blood but nervous uses neurones also gained credit for these comparative descriptions. The most common similarity seen was that they affect the SAN.

(ii) Give **one** similarity and **one** difference between hormonal and nervous control of the heart rate.

(2)

They both could increase or decrease the heart rate by affecting firing of SAN.
Hormonal response is slower than nervous control.

ResultsPlus
Examiner Comments

This answer gained both marks for providing an acceptable similarity - both increase heart rate / both affect the SAN, and providing an acceptable comparative comment about a difference - hormonal is slower. Also, both responses were linked to the heart.

2/2

ResultsPlus
Examiner Tip

When asked to provide a difference make sure your answer is comparative.

(ii) Give **one** similarity and **one** difference between hormonal and nervous control of the heart rate.

(2)

Difference is hormonal control of heart is long lasting but nervous control of heart is short (lived)

ResultsPlus
Examiner Comments

This answer only discusses the difference between hormonal and nervous control and fails to make reference to any similarity.

1/2

ResultsPlus
Examiner Tip

Read questions carefully and do not rush to put pen to paper.

Question 2 (a)

There were many excellent answers that described habituation as a reduced response to a repeated stimulus. Credit was also given to the idea that habituation is a form of learning. Candidates lost credit for lack of detail by stating habituation occurs when organisms get used to a stimulus, or adapt to a stimulus.

(a) Explain what is meant by the term **habituation**.

(2)

~~The~~ When the same stimuli is given continuously to an animal it stops reacting to it after a certain time. this is known as ~~habituation~~. habit habitation.

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Examiner Comments

This candidate gains both marks by stating that the stimulus is 'continuous' which equates to repeated, and that the animal 'stops reacting' which equates to a reduced response.

2/2

ResultsPlus
Examiner Tip

Note that the examiners can give credit to answers that do not use exactly the same wording in the mark scheme as long as the wording is equivalent.

(a) Explain what is meant by the term **habituation**.

(2)

Habituation is a form of learning where there is a loss of response due to repeated stimulus over a period of time. Habituation occurs as the calcium ion channels become less responsive. due to repeated unimportant stimulus.

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Examiner Comments

This answer has all three of the marking points in the mark scheme but only a maximum of 2 can be credited.

form of learning

loss of response

repeated (stimulus)

2/2

ResultsPlus
Examiner Tip

Giving a number of ideas beyond the number of marks available will increase the chance of gaining maximum marks.

Question 2 (b) (i)

This question required candidates to devise an investigation to assess habituation by birds in the presence of a scarecrow. The examiners rewarded those who appreciated that the number of birds in a field with a scarecrow should be counted at various time intervals (trials) during a period of time. If habituation occurs then the number of birds seen in the field should increase. Credit was also given for the idea of repeating the investigation for reliability and for the control of one acceptable biotic or abiotic variable. Candidates who devised investigations comparing a field with and without a scarecrow were able to gain all the marking points as were those who devised laboratory based investigations.

(b) (i) Describe an investigation to determine whether habituation by the birds occurs in the presence of a scarecrow.

(5)

10

In an open field, place ~~the~~ scarecrows in a straight line at the same distance apart. All scarecrows must be of the same height and build (mass). Set up a video camera. Count the number of birds that visit the field on day 1. Leave the ~~scarecrows~~ scarecrows in the field for a week and count the number of birds visiting the field everyday for 7 days. Repeat the entire experiment in 3 other fields, and calculate the mean number of birds visiting the field on each day. Make sure that all scarecrows are of the same height and made of the same material and that all the fields have the same type of crop and make sure all the fields are of the same area, eg: 50m x 50m.

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Examiner Comments

This answer gained the maximum mark for the following ideas:

use of a scarecrow

counting birds that visit the field

counting done every day for 7 days

repeating the investigation in 3 other fields

same type of crop in each field

5/5

(b) (i) Describe an investigation to determine whether habituation by the birds occurs in the presence of a scarecrow.

(5)

y Place scarecrows in a field.

y then measure the time it takes for the birds to arrive on the field and leave the field.

y

ResultsPlus
Examiner Comments

This answer gained 2 marks for reference to the following:

use of a scarecrow

measuring the time it takes for the birds to arrive/leave the field

2/5

ResultsPlus
Examiner Tip

In questions that ask about how to devise investigations think about the main principles such as how to set up the independent variable, how to measure the dependent variable, how to control other variables and how to ensure the data collected will be valid.

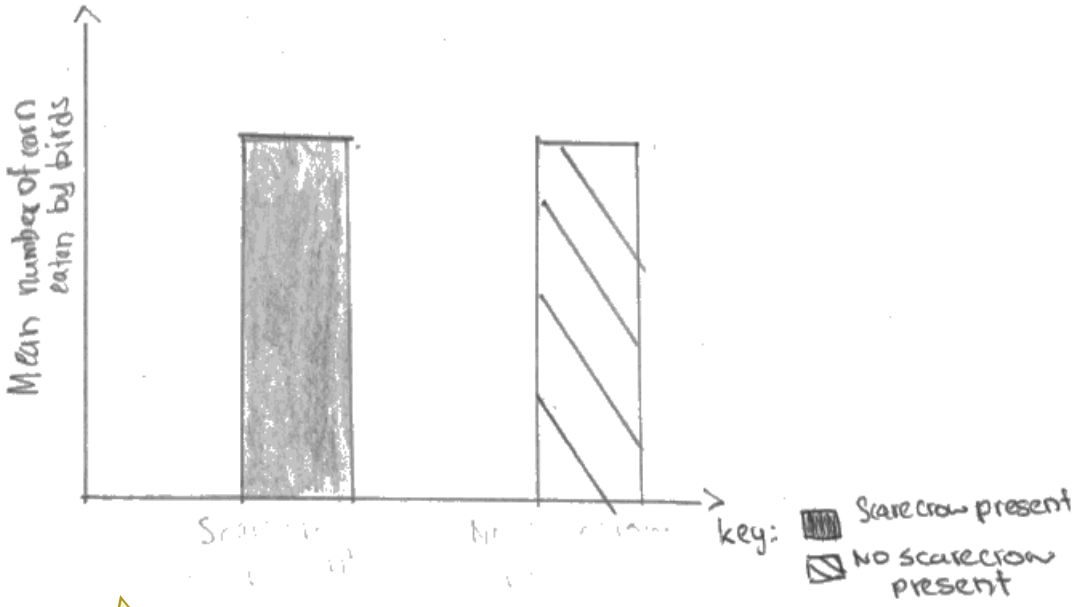
Question 2 (b) (ii)

This question asked candidates to sketch a graph to show the data obtained if habituation occurred. The examiners gave credit to graphs that labelled the x axis to give some indication of trials and labelled the y axis to show how the dependent variable could be measured. Credit was then given for showing an appropriate slope. So, for example, the number of birds counted in the field on a daily basis should show an upward slope, but the number of birds flying away from the field on a daily basis should show a downward slope.

Credit was given for bars or points with no lines as long as the trend matched the labels on each axis.

(ii) In the space below, draw a sketch graph to show the data obtained if habituation by the birds occurs.

(2)



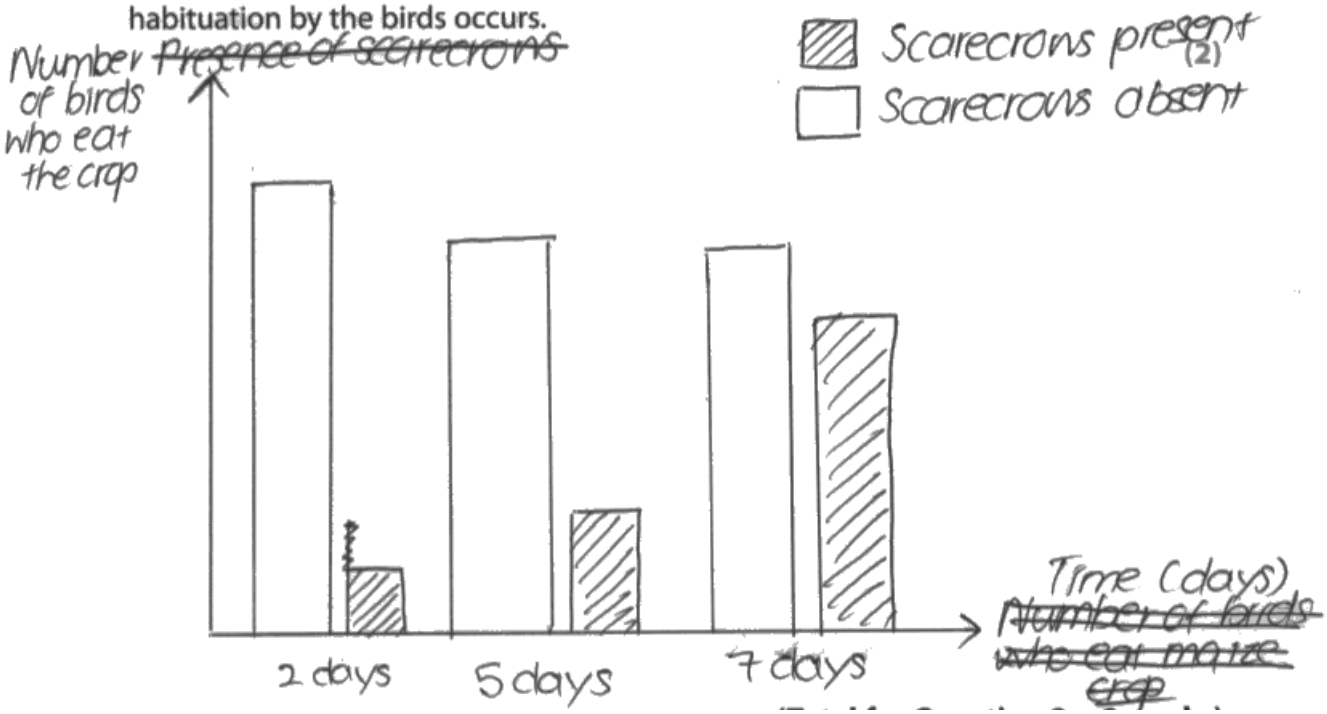
ResultsPlus
Examiner Comments

This sketch does not have an acceptable label for the x axis so gained zero.

0/2

(ii) In the space below, draw a sketch graph to show the data obtained if habituation by the birds occurs.

(2)



ResultsPlus
Examiner Comments

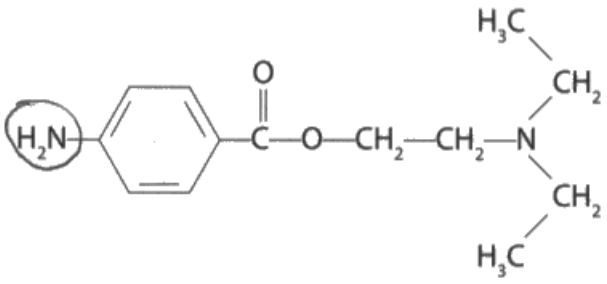
This sketch has acceptable labels for each axis and the trend shown by the bars with a scarecrow present is upward which is what would be expected.

2/2

Question 3 (a) (i)

This question asked candidates to draw a circle around the amine group in the structure of the anaesthetic drug. Credit was given only if the amine group alone was circled. Students who hedged their bets and drew a circle around the amine group and another part of the molecule lost credit.

(a) The diagram below shows the structure of an anaesthetic drug.



(i) Draw a circle around the part of this drug that is an amine group.

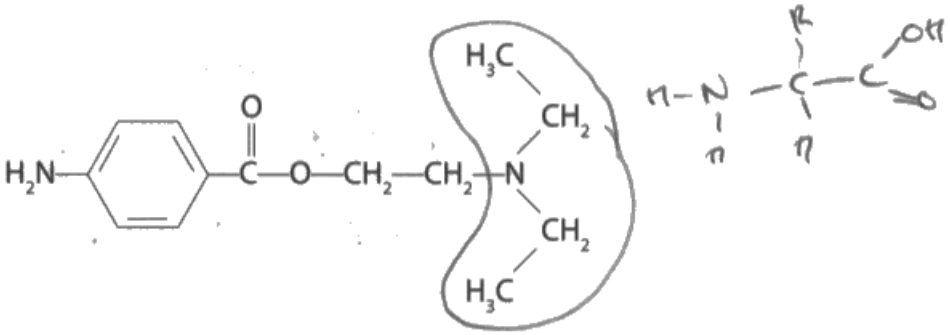
(1)

ResultsPlus
Examiner Comments

This answer is correct.

1/1

(a) The diagram below shows the structure of an anaesthetic drug.



(i) Draw a circle around the part of this drug that is an amine group.

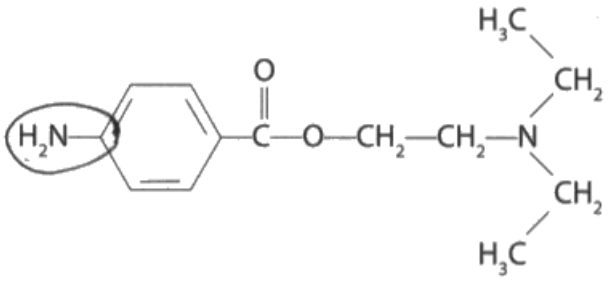
(1)

ResultsPlus
Examiner Comments

This answer is incorrect as the amine group is not circled.

0/1

(a) The diagram below shows the structure of an anaesthetic drug.



(i) Draw a circle around the part of this drug that is an amine group.

(1)

ResultsPlus
Examiner Comments

This answer is incorrect as the circle also includes a carbon from the adjacent part of the molecule.

0/1

ResultsPlus
Examiner Tip

Take care to read instructions carefully.

Question 3 (a) (ii)

This question asked candidates to explain how the anaesthetic drug prevents a patient feeling pain. The stem of the question informed candidates that the drug works by binding to channel proteins in the axon. The examiners credited students who were able to recall that these channel proteins were sodium ion channels and that the binding to these channels prevented the influx of sodium ions. As a result, there would be less depolarisation of the axon and fewer action potentials would be generated leading to fewer impulses to the brain. Many candidates discussed events at a synapse rather than at an axon.

(ii) This anaesthetic drug works by binding to channel proteins in the axons of neurones. These neurones normally transmit impulses that the brain interprets as pain. no depolarisation

Explain how this anaesthetic drug prevents the patient feeling pain.

(4)

The drug will bind to the sodium channel gates in the membrane of neurone thus Na^+ ions won't diffuse into the neurone so the action potential of +40mv wont be reached so there will be no depolarisation of the neuron. So no action potential triggered. ~~The potassium gate~~ so The Na+K pump will keep on pumping 3 Na^+ out and 2 K^+ in neurone and so K^+ will diffuse out more than Na^+ entering so the neurone will remain in resting potential.

ResultsPlus
Examiner Comments

This answer gained full marks for reference to:
sodium channels (the term ion was not required for Mp1)
sodium ions won't diffuse into the neurone
action potential won't be reached
no depolarisation
4/4

(ii) This anaesthetic drug works by binding to channel proteins in the axons of neurones. These neurones normally transmit impulses that the brain interprets as pain.

Explain how this anaesthetic drug prevents the patient feeling pain.

(4)

By binding to the channel/protein in the ~~axons~~ axons, Na^+ & K^+ diffusion across the membrane is halted, hence the depolarisation of the ~~ne~~ axon doesn't occur, as a result a wave of depolarisation isn't produced and the impulse isn't sent to the part of the brain that interprets pain.

ResultsPlus
Examiner Comments

This answer lacks the precise detail needed to gain marks. Reference to channel proteins alone is insufficient to gain Mp1. Also, the direction of movement of the sodium ions is not clear enough to gain Mp2.

Marks were awarded for no depolarisation of the membrane and the impulse not being sent to the brain.

2/2

ResultsPlus
Examiner Tip

Repeating terms in the stem of the question will not gain credit and be precise about the direction of molecular movement.

Question 3 (a) (iii)

It was hoped that candidates would state that vasoconstriction is a narrowing of small arteries and that the reduced blood flow allows the anaesthetic drug to remain in situ and provide pain relief for longer. However, credit was given if candidates linked reduced blood flow to reduced loss of blood. Many candidates lost Mp1 if they named capillaries or veins as the blood vessels involved in vasoconstriction.

(iii) The injection for pain relief contains the anaesthetic drug and a chemical that causes vasoconstriction.

Suggest the advantage of including a chemical that causes vasoconstriction.

(2)

Narrow the blood capillaries ~~that~~ under the epidermis.

Reduce heat loss.

ResultsPlus
Examiner Comments

This answer was given no credit as the narrowing of capillaries is discussed and heat loss is mentioned.

0/2

ResultsPlus
Examiner Tip

When discussing vasoconstriction be precise when naming the type of blood vessel affected.

(iii) The injection for pain relief contains the anaesthetic drug and a chemical that causes vasoconstriction.

Suggest the advantage of including a chemical that causes vasoconstriction.

(2)

vasoconsmiction is when ~~causes~~ the lumen of blood vessels is made narrower. This increases blood pressure and reduces blood flow near the skin ~~so~~ (a sense organ) so less O_2 will be supplied to receptor / sense organs such as the skin which won't be able to detect pain.

ResultsPlus
Examiner Comments

This answer gains 1 mark for making a correct reference to narrowing of blood vessels but the discussion about lack of oxygen to receptors is not worthy of credit.

1/2

Question 3 (b)

This question expected candidates to suggest how an anaesthetic drug could reduce pain by binding to calcium ion channels. Marks were available for mentioning that the drug blocks the calcium ion channels so fewer calcium ions could enter the presynaptic knob. This results in fewer vesicles fusing with the presynaptic membrane. The lack of neurotransmitter being released and binding to receptors in the postsynaptic membrane would mean less depolarisation of this membrane leading to less action potentials and impulses to the brain. Many candidates described the events that take place at a synapse and then were able to gain credit by stating that these events would not happen if the drug was present. Those who merely described the events that take place at a synapse lost credit.

(b) A different anaesthetic drug works by binding to calcium ion channels when an impulse arrives at a synapse.

Suggest how this anaesthetic drug reduces pain.

(4)

The calcium ion channels in the pre-synaptic membrane don't open therefore vesicles containing the ~~neur~~ neurotransmitter for pain do not move towards and fuse with the presynaptic membrane and the ~~neurotrans~~ neurotransmitter is not released into the synaptic cleft by exocytosis so the neurotransmitter does not diffuse across the cleft and does not bind to receptors on the post synaptic membrane so Sodium ion channels do not open on the post synaptic membrane and the impulse does not travel to the CNS therefore the patient would feel ~~pain~~ as much pain.

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Examiner Comments

This candidate scored full marks by making reference to:
calcium ion channels don't open
vesicles do not move and fuse with presynaptic membrane
neurotransmitter not released
neurotransmitter does not bind to receptors in postsynaptic membrane
impulse does not travel
4/4

(b) A different anaesthetic drug works by binding to calcium ion channels when an impulse arrives at a synapse.

Suggest how this anaesthetic drug reduces pain.

(4)

if the drug binds to calcium channels then the pre synaptic knob is impermeable to calcium ions. As a result, the neurotransmitters will not be released into the synaptic cleft via exocytosis in vesicles, and so they will not cause the permeability of the post synaptic knob to sodium ions to increase. Therefor ~~ta~~ there is no depolarisation, so no ~~impulse~~ impulse to the pain area of the brain.

ResultsPlus
Examiner Comments

This answer gains a decent score but lacks the quality of language needed to gain the maximum. Credit was given for:

calcium channels being impermeable

neurotransmitters not released

no depolarisation

This candidate fails to state clearly that fewer calcium ions enter the presynaptic knob as a result of the impermeability: vesicles not fusing with the presynaptic membrane and reduced binding of neurotransmitter to receptors on the postsynaptic membrane.

3/4

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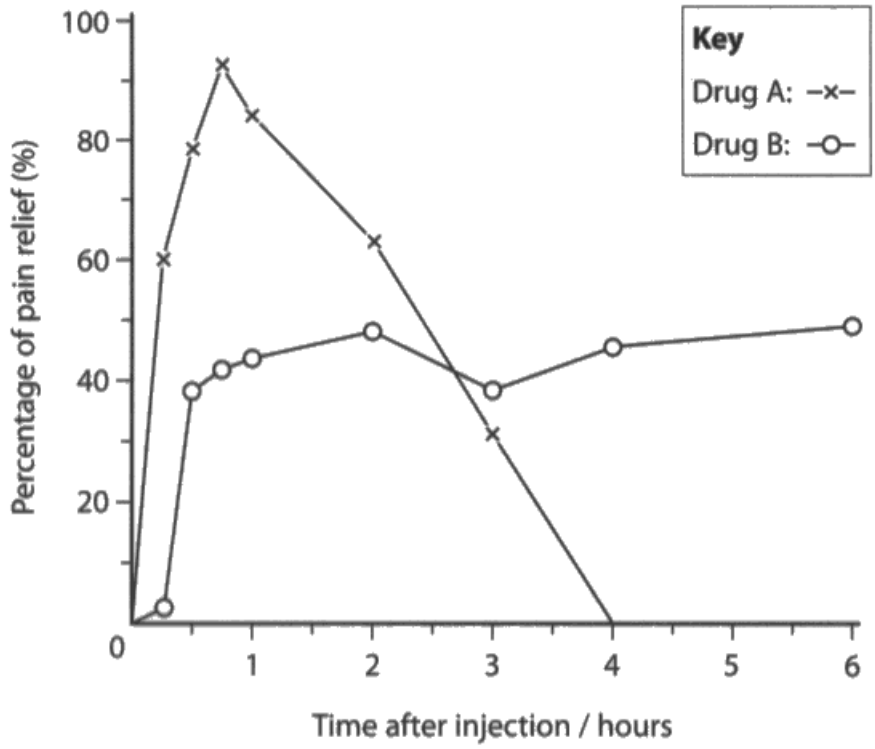
Examiner Tip

Examiners are not allowed to deduce on your behalf if the quality of expression is poor. You must make your points clear to the examiners so they are left in no doubt.

Question 3 (c)

This question rewarded those candidates who appreciated that drug A provided faster and more pain relief, but for a shorter period of time. Therefore, any treatment that required these features should involve drug A. Candidates who failed to provide comparative ideas failed to gain credit as did those who merely quoted the data.

(c) The graph below shows the pain relief provided by two different anaesthetic drugs, A and B.



Suggest how a dentist could use this data when deciding which anaesthetic drug to use.

(3)

- The rate at which the percentage of pain relief increases is greater for Drug A than for Drug B.
- Drug A has a higher peak of percentage pain relief of 92% ~~at 1 hour~~ than Drug B.
- After 3 ~~days~~ hours, Drug A has a lower percentage of pain relief than Drug B (pain relief in Drug B lasts longer than for Drug A)
- The peak percentage of pain relief is ~~reached~~ faster by Drug A than by Drug B.

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Examiner Comments

This answer gained full marks by stating that;

the rate of pain relief is greater for drug A

drug A has a higher pain relief

pain relief in drug B lasts longer

3/3

ResultsPlus
Examiner Tip

When asked to use data, look at the total number of marks available and include at least that number of ideas in your answer. Also, when asked about two items (drugs in ths case) make sure your answer indicates comparative words such as higher or longer. Stating that drug A provides high pain relief would not have gained credit.

Question 4 (a) (i)

This question rewarded students who understood that the data suggests that there is no brain damage because the pupil diameter of the unconscious patient decreased in a similar way to that of the conscious patient. Many students failed to appreciate that the slight difference is not significant and claimed that brain damage had occurred.

4 A pupilometer is a device used to measure the pupil diameter in the eye.

Doctors use a pupilometer to assess brain damage in unconscious patients who have had accidents.

(a) The table below shows the pupil diameter, during one second, when bright light was shone into the eye of an unconscious patient and a conscious patient.

Time / s	Pupil diameter / mm	
	Unconscious patient	Conscious patient
0.0	4.40	4.40
0.2	4.21	4.20
0.4	3.84	3.82
0.6	3.46	3.45
0.8	3.22	3.20
1.0	3.00	2.99

(i) Explain the conclusion doctors should make about possible brain damage of this unconscious patient.

(2)

The patient has damaged his ~~parietal~~ occipital lobe as he is unable to contract the pupil as the bright light was shone.

ResultsPlus
Examiner Comments

This candidate scored poorly as the biology is incorrect as is the interpretation of the data. It is clear that the pupil diameter is decreasing but this answer suggests that this is not the case.

0/2

ResultsPlus
Examiner Tip

Read data carefully before starting to answer a question.

4 A pupilometer is a device used to measure the pupil diameter in the eye.

Doctors use a pupilometer to assess brain damage in unconscious patients who have had accidents.

(a) The table below shows the pupil diameter, during one second, when bright light was shone into the eye of an unconscious patient and a conscious patient.

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0.6	3.46	3.45
0.8	3.22	3.20
1.0	3.00	2.99

(i) Explain the conclusion doctors should make about possible brain damage of this unconscious patient.

(2)

If the pupil diameter decreases with a unconscious patient like the conscious patient within the 1 second ~~as~~ when bright light is shone This indicates that the visual cortex of the brain is not damaged and also (optic centre) which is the occipital lobe is not damaged.

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Examiner Comments

This is an excellent answer gaining full marks.

2/2

ResultsPlus
Examiner Tip

Try to use A level terminology and ideas in your answer rather than general descriptions.

Question 4 (b)

This question expected candidates to explain how bright light is detected by the retina to allow nerve impulses to be sent to the brain. Therefore, credit was given for making reference to the conversion of rhodopsin into retinal and opsin in photoreceptors, causing sodium on channels to close resulting in hyperpolarisation, the reduced release of neurotransmitter, the depolarisation of bipolar cells and an impulse travelling to the brain along a sensory neurone in the optic nerve. There were many excellent answers demonstrating good knowledge and understanding. This was also a QWC question with the emphasis on spelling. The examiners noted that the spelling of key words was impressive.

***(b) Explain how bright light shone into the eye is detected by cells in the retina leading to nerve impulses being sent to the brain.**

(5)

Light falls on retina, where rods and cones (photoreceptors) are present. Other cells are also present. In the rods, ~~ret~~ rhodopsin breaks down to opsin and retinal. Cis-retinal ~~to~~ converts to transretinal. So the ~~so~~ Na^+ ion channels (in the outer membrane (of cell)) of ~~the~~ the rods close, and no Na^+ ions diffuse in. But the Na^+ ion pumps (in inner membrane) continuously ~~continuously~~ pumps out Na^+ ions by active transport using ATP, so the rods get ~~dep~~ hyperpolarised. So no vesicles fuse to neurone membrane and release glutamate (neurotransmitter) so bipolar neurone not depolarised. But cones release as well as other cells excitatory neurotransmitters that depolarise the bipolar neurone by binding to receptors. So action potential is produced as Na^+ ion channels open up. ~~Thes~~ Neurotransmitters released from bipolar neurones bind to sensory neurones, causing depolarisation and action potential or ~~response~~ impulse, which gets sent to the brain. ~~Impulse~~ The ~~the~~ stimulus detected is depolarises other cells of the ~~eye~~ retina, which further depolarise bipolar and sensory neurones.

(Total for Question 4 = 8 marks)

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Examiner Comments

This answer gains full marks for the following:

reference to rods/cones

rhodopsin breakdown to opsin and retinal

sodium ions close and no sodium ions diffuse in

reference to hyperpolarised

no glutamate release

reference to depolarisation of the bipolar cell

The reference to action potential / impulse cannot be credited as there is no link with sensory neurone / optic nerve

5/5

*(b) Explain how bright light shone into the eye is detected by cells in the retina leading to nerve impulses being sent to the brain.

(5)

The increase in light intensity is detected by photoreceptors (eg:- cone) in the retina. These send impulses to the midbrain along the optic nerve. The optic nerve then sends impulses to the ~~circular~~ radial muscles in the iris along ~~Pupil~~ parasympathetic nerves (extensor). causing the radial muscles to relax. Circular muscles (antagonistic pair) contracts. (flexor). # ∴ the pupil constrict. (diameter decreases).

Radial & & circular muscles are antagonistic pairs. They have opposite effects.

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Examiner Comments

This is a poor answer that scores 2 marks for mentioning;
photoreceptors
impulses along the optic nerve
The information about the pupil reflex is irrelevant.
2/5

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Examiner Tip

Inclusion of irrelevant information will gain no credit and use up valuable time.

Question 5 (a)

This calculation expected candidates to give the correct time of 1.85 and the correct units in seconds. It was pleasing to note that the vast majority of the candidates gained both marks.

A cheetah runs at 27 m s^{-1} in an attempt to catch its prey.

(a) Calculate the time it would take a cheetah to run 50 m at a speed of 27 m s^{-1}.
Show your working.

(2)

$v = \frac{d}{t}$

$t = \frac{d}{v} = \frac{50\ m}{27\ ms^{-1}}$

$= 1.85\ s$

Answer 1.85 s

ResultsPlus
Examiner Comments

This answer gained full marks.

2/2

A cheetah runs at 27 m s^{-1} in an attempt to catch its prey.

(a) Calculate the time it would take a cheetah to run 50 m at a speed of 27 m s^{-1}.
Show your working.

(2)

$\text{speed} = \frac{\text{distance}}{\text{time}}$

$27\ ms^{-1} = \frac{50}{x}$

$x = 1350\ s.$

$\frac{1350}{60} = 22.5\ min$

Answer 22.5 minutes

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Examiner Comments

This answer gained no marks as both the time and the units are incorrect.

0/2

A cheetah runs at 27 m s^{-1} in an attempt to catch its prey.

(a) Calculate the time it would take a cheetah to run 50 m at a speed of 27 m s^{-1}.
Show your working.

(2)

Time = Distance / Speed = 50 m / 27 ms^{-1} = 1.85 m/s^{-1}

Answer 1.85 m/s^{-1}

ResultsPlus
Examiner Comments

This answer gained credit for the correct time but no credit for the units.

1/2

ResultsPlus
Examiner Tip

In simple calculations, when the units are not provided, think carefully about the units that should be used.

Question 5 (c) (i)

This question asked candidates to suggest a null hypothesis linked to the data provided. Most struggled to provide an acceptable response.

(i) Suggest the null hypothesis the scientists were testing.

(1)

There is no significant difference in percentage of muscle fibres of slow twitch and fast twitch fibres of the wild and captive cheetah.

ResultsPlus
Examiner Comments

This answer gained the mark for making it clear that there is no significant difference in the proportion of fast and slow twitch fibres in wild and captive cheetahs.

1/1

ResultsPlus
Examiner Tip

Remember that a null hypothesis should make reference to no significant difference.

Question 5 (c) (ii)

This question asked students to use the data in the table to suggest a conclusion that can be drawn about the effect of captivity on the composition of muscle. The question tested the understanding that overlapping standard deviations suggest that there is no difference between comparative values. This concept was not appreciated by most students with many believing that captivity increased the proportion of slow twitch fibres and decreased the proportion of fast twitch fibres. Other terms that describe the overlap such as range or error bars were also accepted.

(ii) Using the data in Table 2, suggest a conclusion that can be drawn about the effect of captivity on the composition of muscle.

Give a reason for your answer.

(2)

Keeping cheetahs in captivity increases the percentage of slow twitch fibres and reduces the percentage of fast twitch fibres in cheetahs. Comparing percentage of muscle fibres in vastus lateralis of wild and captive cheetahs, captive cheetahs have 3.1% more slow twitch fibres and less fast twitch fibres. The conclusion drawn may not be valid as error bars overlap.

ResultsPlus
Examiner Comments

This answer understands that the 'error bars' overlap but fails to link this to there being no significant difference.

1/2

(ii) Using the data in Table 2, suggest a conclusion that can be drawn about the effect of captivity on the composition of muscle.

Give a reason for your answer.

(2)

In vastus lateralis of wild cheetah, ~~the~~ the % of slow twitch fibre and fast twitch % are respectively 18.9% — 12.1% and 86.5% — 82.5%. Whereas the % in vastus lateralis of captive cheetah is 21.6% — 15.6% slow twitch and 85.6% — 77.2%. There is a increase increase in slow twitch muscles and decrease in fast twitch in captive cheetah. This can be due to inactivity ~~of~~ as they don't need to hunt. ~~so ...~~

ResultsPlus
Examiner Comments

This answer simply quotes the numbers in the data and then offers nothing creditable.

0/2

ResultsPlus
Examiner Tip

In data analysis questions, simply quoting numbers from the data is unlikely to gain credit.

(ii) Using the data in Table 2, suggest a conclusion that can be drawn about the effect of captivity on the composition of muscle.

Give a reason for your answer.

(2)

when cheetahs in captivity they have a ~~lower~~ higher percentage of slow twitch muscle fibres in the vastus lateralis muscle compared to in the wild and the cheetahs in the wild have a higher % of fast twitch than cheetahs in captive.

The range bars between the data of wild and captive for vastus lateralis overlap so there is no significant diffence in the % of muscle fibres.

ResultsPlus
Examiner Comments

This answer gains full marks for reference to:

range bars overlap

no significant difference

The work that has been crossed out has been replaced, so the replaced work is marked.

2/2

(ii) Using the data in Table 2, suggest a conclusion that can be drawn about the effect of captivity on the composition of muscle.

Give a reason for your answer.

(2)

There is no significant difference in the data as the standard deviation overlaps in the data for the percentage of muscle fibres ~~in~~ (slow/fast) in the vastus lateralis muscle in cheetahs in wild and captivity.

ResultsPlus
Examiner Comments

This is an excellent answer gaining both marks.

2/2

Question 5 (d)

This question asked candidates to explain why the muscle composition of a cheetah causes it to stop running within 50 m. The data in the table helped most candidates to focus on the features of fast twitch muscle fibres. There were many good answers that made it clear that, compared to slow twitch fibres, fast twitch fibres have fewer capillaries, less myoglobin, less oxygen supply, more anaerobic respiration, fewer mitochondria, less ATP production and more lactate production. Weaker answers only made reference to anaerobic respiration and lactate production.

(d) Explain why the muscle composition of a cheetah causes it to stop running if it fails to catch its prey within 50 m.

(5)

The muscles of the cheetah are mainly composed of fast-twitch fibres which enable it to undergo a very rapid response towards its prey. Fast twitch muscles contain low numbers of mitochondria and low levels of myoglobin, thus restricting aerobic respiration and relying only on anaerobic respiration. Products of anaerobic respiration include lactic acid. When lactic acid (or lactate) builds up in the muscle it causes fatigue as it binds to pain receptor that produce the feeling of fatigue in an effort to protect the muscles and enzymes within from damage by the low pH of lactic acid. Thus due to this high anaerobic activity of the cheetah's muscles, running beyond 50 m will be dangerous and ineffective.

ResultsPlus
Examiner Comments

This answer gained full marks for reference to:
mainly composed of fast twitch fibres
low number of mitochondria
low levels of myoglobin
restricting aerobic respiration / only anaerobic respiration
lactic acid / low pH
5/5

(d) Explain why the muscle composition of a cheetah causes it to stop running if it fails to catch its prey within 50 m.

(5)

Cheetahs have fast twitch fibres that are used for short bursts of energy as they ~~produce~~ contract quickly but tire out even quicker. This fast contraction ~~ee~~ uses anerobic respiration to generate ATP. A result of using anerobic respiration is the production of lactic acid. This lactic acid lowers the pH of the blood and affects enzyme activity. Meaning the enzymes required to make ATP are inactive. This makes the muscles of the cheetah tire out and cannot run any faster / further.

ResultsPlus
Examiner Comments

This answer gains 2 marks for mentioning anaerobic respiration and the production of lactic acid. The reference to fast twitch fibres was not credited as there is no indication of a comparison, such as 'more' fast twitch fibres.

2/5

ResultsPlus
Examiner Tip

Look at the number of marks available and include at least that number of ideas in your answer, always appreciating that the examiners expect knowledge and understanding that equates to A level standard.

(d) Explain why the muscle composition of a cheetah causes it to stop running if it fails to catch its prey within 50 m.

(5)

Cheetahs have more fast twitch fibres than slow twitch fibres. Fast twitch muscle fibres provide quick bursts of energy in a very short time. These fibres have underdeveloped blood supply ~~and~~ but have lots of creatine phosphate which can be synthesised to ATP fast. These fibres aren't suitable for endurance and long distance running. So if the cheetah fails to catch its prey within 50m the ~~mu~~ fast twitch muscle fibres start respiring anaerobically and ~~lactact~~ lactic acid (lactate) builds up in the muscles. This ~~mu~~ substance is toxic and could cause fatigue and cramps.

ResultsPlus

Examiner Comments

This answer makes reference to more fast twitch fibres, anaerobic respiration and lactic acid production. Stating that there is an undeveloped blood supply is not detailed enough.

3/5

Question 6 (b)

This question required a tick or a cross in each box to match the method of scanning with each statement. Candidates did well with the use of X-rays and observing the brain in action, but struggled with providing images of soft tissue without contrast medium. Candidates who used a hybrid tick/cross lost credit as did candidates who only used ticks or crosses leaving other boxes blank.

(b) The brain can be scanned for medical diagnosis.

The table below lists statements about three different methods of scanning that provide information for use in medical diagnosis.

In the table below, place a tick (✓) in the box if the statement applies to the method of scanning or a cross (✗) in the box if the statement does not apply to the method of scanning.

(2)

Statement	Method of scanning		
	MRI	CT	fMRI
Uses X-rays	✗	✓	✗
Allows observation of the brain in action	✗	✗	✓
Provides images of soft tissue without contrast medium	✗	✓	✗

ResultsPlus
Examiner Comments

This answer gains 1 mark for correctly filling in the boxes for the top two rows.

1/2

(b) The brain can be scanned for medical diagnosis.

The table below lists statements about three different methods of scanning that provide information for use in medical diagnosis.

In the table below, place a tick (✓) in the box if the statement applies to the method of scanning or a cross (✕) in the box if the statement does not apply to the method of scanning.

(2)

Statement	Method of scanning		
	MRI	CT	fMRI
Uses X-rays		✓	
Allows observation of the brain in action			✓
Provides images of soft tissue without contrast medium	✓		

ResultsPlus
Examiner Comments

This candidate could not be awarded any marks as boxes have been left blank. Examiners are not allowed to interpret what the blank boxes might mean.

0/2

ResultsPlus
Examiner Tip

Read instructions carefully and make sure you do what is asked.

(b) The brain can be scanned for medical diagnosis.

The table below lists statements about three different methods of scanning that provide information for use in medical diagnosis.

In the table below, place a tick (✓) in the box if the statement applies to the method of scanning or a cross (✗) in the box if the statement does not apply to the method of scanning.

(2)

Statement	Method of scanning		
	MRI	CT	fMRI
Uses X-rays	✗	✓	✗
Allows observation of the brain in action	✗	✗	✓
Provides images of soft tissue without contrast medium	✓	✓	✓

ResultsPlus
Examiner Comments

This answer shows how the table should be completed to gain both marks.

2/2

Question 6 (c)

This question asked candidates to describe how cells could be genetically modified to produce drugs that can be used to treat patients with brain chemical imbalances. The examiners rewarded candidates who noted that the gene involved is the one that makes the drug and that restriction and ligase enzymes are involved as are vectors such as plasmids. Many lost credit by not linking the gene to the manufacture of the drug.

(c) New drugs are needed to treat patients with imbalances in some brain chemicals.

Describe how cells could be genetically modified to produce these new drugs.

(3)

First the gene which is needed for the drug is taken out by using restriction enzymes. Then with the use of a vector such as a virus or plasmids the gene is inserted into the cells and with the use of ligase the gene is added to the DNA.

ResultsPlus
Examiner Comments

This answer gained full marks for reference to:

gene for drug

restriction enzyme / ligase

vector

virus / plasmids

3/3

(c) New drugs are needed to treat patients with imbalances in some brain chemicals.

Describe how cells could be genetically modified to produce these new drugs.

(3)

First the gene which is needed for the drug is taken out by using restriction enzymes. Then with the use of a vector such as a virus or plasmids the gene is inserted into the cells and with the use of ligase the gene is added to the DNA.

ResultsPlus
Examiner Comments

This answer only makes reference to restriction enzymes. The DNA mentioned is not linked to making the drug so is not credited. Also, there is no reference to a named vector.

1/3

ResultsPlus
Examiner Tip

Simple recall questions require A level knowledge and understanding and enough valid points to gain maximum marks.

Question 7 (a)

Most candidates were able to describe the relationship between age and the development of CHD as a correlation. Weaker answers described how CHD develops.

7 The scientific article you have studied is adapted from the book called *Biology of Disease*, published by Taylor and Francis in 2007.

(a) The article suggests that there is a relationship between ageing and the development of coronary heart disease (paragraph 1).

Describe how this relationship could be regarded as a correlation.

(1)

As the age of humans increased the development of coronary heart disease increases as well. So the change in one factor is mirrored by a change in another related factor. In this case

ResultsPlus
Examiner Comments

This answer gains the mark for making it clear that as humans age the development of CHD increases.

1/1

7 The scientific article you have studied is adapted from the book called *Biology of Disease*, published by Taylor and Francis in 2007.

(a) The article suggests that there is a relationship between ageing and the development of coronary heart disease (paragraph 1).

Describe how this relationship could be regarded as a correlation.

(1)

because there is other factors that are linked to coronary heart disease e.g. Smoking.

ResultsPlus
Examiner Comments

This candidate has misread the question and is mentioning a factor linked to the development of CHD.

0/1

ResultsPlus
Examiner Tip

Read questions carefully.

Question 7 (b)

This question tested understanding of why a loss in the elasticity of the lungs would reduce gas exchange. The examiners rewarded candidates who appreciated that exhalation or inhalation would be impeded and this would affect the concentration gradient of oxygen or carbon dioxide.

(b) Suggest why a decrease in the elasticity of the lungs of older people will reduce gas exchange (paragraph 6).

Surface area of the lungs that can get to is smaller. (2)

The change in volume of the lungs is smaller.

~~O2 concentration~~ Concentration gradient of O_2 is reduced.

Less O_2 can be inhaled and less CO_2 can be exhaled, as the pressure difference between lungs and the atmosphere is smaller.

ResultsPlus
Examiner Comments

Though not expressed clearly, this answer makes reference to a reduction in the concentration gradient and the idea that inhalation and exhalation are reduced.

2/2

(b) Suggest why a decrease in the elasticity of the lungs of older people will reduce gas exchange (paragraph 6).

(2)

As the elasticity of lungs decreases the lungs will expand less in inhalation. So that less air will enter the lungs in one inhalation So that steep concentration gradients can not be maintained for effient gas exchange.

ResultsPlus
Examiner Comments

Both ideas are evident in this answer:

lungs expand less in inhalation

steep concentration gradient not maintained

2/2

(b) Suggest why a decrease in the elasticity of the lungs of older people will reduce gas exchange (paragraph 6).

(2)

Decrease in elasticity of lungs mean that the alveoli are less effecient at gas exchange.

ResultsPlus
Examiner Comments

This answer lacks the detail required to gain marks. No attempt has been made to offer an explanation and the latter part of the answer reiterates the stem of the question.

ResultsPlus
Examiner Tip

The command word 'suggest' requires a biological reason in any answer.

Question 7 (c)

This question asked candidates to explain how a sarcomere is able to contract. Credit was given to answers that described the release of calcium ions from sarcoplasmic reticulum that then bind to troponin resulting in tropomyosin being moved to expose myosin binding sites. Credit was also given to answers that showed that myosin binds to actin, that ADP and Pi release allows the myosin head to move and that ATP is used to detach the myosin head. Reference to sliding filament theory was also credited. There were many excellent answers gaining high scores. Most mistakes involved confusing troponin and tropomyosin and confusing the role of ATP.

*(c) The article suggests that a loss of individual muscle fibres results in a decreased capacity for work (paragraph 5).

To perform work, the sarcomeres of a muscle fibre must be able to contract.

Explain how a sarcomere is able to contract.

(6)

A Sarcomere is made up of actin and myosin filaments. When a nerve impulse arrives at a neuromuscular junction, neurotransmitters are released. Ca^{2+} ions are released from the sarcoplasmic reticulum into the sarcoplasm and binds to troponin on actin causing it to move. This causes the tropomyosin to shift its position exposing the myosin binding sites. Myosin heads (on myosin) bind to the myosin binding sites releasing ADP and $P_{(i)}$. Myosin head moves and nods forward causing the actin to slide over the myosin towards the H band. The Z-discs are pulled closer to each other. The sarcomere is now contracted. ATP attaches to myosin head allowing it to detach from myosin binding sites and the myosin head returns to its upright position. ATPase hydrolyse the reaction between ATP ⟶ ADP and $P_{(i)}$. If Ca^{2+} are present another cycle of contraction occurs.

ResultsPlus

Examiner Comments

This answer is an example of an excellent response where full marks were credited. Correct ideas were:

calcium ions released from sarcoplasmic reticulum

binding to troponin

tropomyosin shifting position

exposing myosin binding sites

release of ADP and Pi results in myosin head nodding forward

ATP causing myosin head to detach

6/6

*(c) The article suggests that a loss of individual muscle fibres results in a decreased capacity for work (paragraph 5).

To perform work, the sarcomeres of a muscle fibre must be able to contract.

Explain how a sarcomere is able to contract.

(6)

The Sarcomere is a functional muscle unit composed of ~~myo~~ myosin and actin, the actin is binded on Z lines. The H line which is composed of myosin, ~~which~~ is found in the middle of the sarcomere Shrinks when the muscle contracts. The Z line move closer to each other while myosin remains the same size. The Sarcomere is able to contract due to the ATP given to it.

ResultsPlus
Examiner Comments

This is a poor answer that provides a poor description of the structure of a sarcomere but does not address the demand of the question.

0/6

ResultsPlus
Examiner Tip

Read questions carefully and answer what is asked, not what you would like to be asked.

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*(c) The article suggests that a loss of individual muscle fibres results in a decreased capacity for work (paragraph 5).

To perform work, the sarcomeres of a muscle fibre must be able to contract.

Explain how a sarcomere is able to contract.

(6)

- Sarcomeres contain actin and myosin which are proteins responsible of muscle contraction.
- Myosin has two polypeptide chains with a globular head to which ADP and phosphate is attached.
- Actin has actin monomers bound together with tropomyosin and troponin.
- Calcium ions get attached to these troponin molecules making an active site for the myosin heads to attach.
- The globular myosin heads attach to these actin monomers, these are then pulled and contraction in the muscles take place.

ResultsPlus
Examiner Comments

This candidate wastes time by writing about the structure of actin and myosin and only mentions two valid points - calcium ions attach to troponin and myosin attaches to actin.

2/6

Question 7 (d)

Candidates were rewarded for naming a blood component needed for wound healing that would be in reduced supply in older people with atherosclerosis. About 40% of candidates were successful. Simply stating that blood flow would be reduced was insufficient. Weaker answers gave detail on the causes of atherosclerosis.

(d) Suggest **one** reason why atherosclerosis could be responsible for increased wound healing times in older people (paragraph 9).

(1)

(due to plaque)
reduced volume of blood in the arteries results in lower blood flow ∴ the clotting process is slower as well as it takes longer for any molecules required for healing to arrive at the wound, due to the reduced blood flow rate.

ResultsPlus
Examiner Comments

This answer gained no credit because less blood flow was not accepted and the molecules required were not named.

0/1

ResultsPlus
Examiner Tip

Give relevant detail in your answer and avoid general ideas.

(d) Suggest **one** reason why atherosclerosis could be responsible for increased wound healing times in older people (paragraph 9).

to subplasm reticulum

(1)

Eg Narrowing of the wider of the artery so less blood containing oxygen flows near to the skin surface. (Ischaemia)

ResultsPlus
Examiner Comments

This answer was credited because it is clear that less oxygen is supplied.

1/1

(d) Suggest **one** reason why atherosclerosis could be responsible for increased wound healing times in older people (paragraph 9).

(1)

Less blood flows into the damaged area due to narrowing of arteries so fewer platelets and clotting factors are present at the damaged area increasing the wound healing time.

ResultsPlus
Examiner Comments

This answer was credited for naming platelets / clotting factors.

1/1

Question 7 (e)

This question expected candidates to appreciate that a decline in the function of T lymphocytes would reduce the numbers of T helper cells and T killer cells, that less cytokines would be released, fewer memory cells, B effector cells and plasma cells would be made and that fewer antibodies would be released. Credit was given if the lack of T killer cells was linked to less destruction of infected cells. Many candidates wrote about the function of T lymphocytes without addressing the question. Fortunately, many then made it clear that the events described would not happen with a decline in T lymphocyte function.

(e) Explain the consequences of 'a decline in the function of T lymphocytes' with age (paragraph 10).

(3)

If the number of T helper cells reduces, less cytokines will be released. Therefore, fewer B cells will be activated and so fewer B effector cells will differentiate into plasma cells. Therefore fewer antibodies will be released and the humoral response is suppressed. Also if T killer cell activity reduces fewer infected body cells will be killed so the cell mediated response is suppressed. The secondary immune response is also suppressed as

ResultsPlus
Examiner Comments

This is a well written answer that gained full marks for reference to:

number of T helper cells reduces

fewer B effector cells / plasma cells

fewer antibodies

fewer infected body cells

The only marking point not present is reference to less cytokine release.

3/3

(e) Explain the consequences of 'a decline in the function of T lymphocytes' with age (paragraph 10).

(3)

The specific immune response to an injection will decrease as there would be less functioning T-cells which would bind to ~~receptors~~ antigens of antigen presenting cells. Less cytokines released which means less clonal expansion resulting in less production of T killer cells involved in the destruction of a pathogen this would also affect the Humoral response.

ResultsPlus
Examiner Comments

This answer gained 2 marks for:

less cytokines released

less production of T killer cells

2/3

(e) Explain the consequences of 'a decline in the function of T lymphocytes' with age (paragraph 10).

(3)

T lymphotes make T killer cells and T helper cells ~~which~~ and even memory cells which help destroy pathogens or harmful microorganisms ~~which may~~ if there are no T lymphocytes, ~~the~~ or them of them then the immune system will not be able to fight against the disease and so the patient of old age will suffer for long.

ResultsPlus
Examiner Comments

This candidate has some idea about immunity but fails to address the question. Stating that there are no T lymphocytes gains no credit and examiners are not allowed to deduce on behalf of the candidate that this means there are fewer T killer and T helper cells and fewer memory cells.

0/3

ResultsPlus
Examiner Tip

Make sure your answers contain explicit detail rather than implicit ideas.

Question 7 (f)

This question expected candidates to explain how random errors in transcription can result in the production of an abnormal protein. Credit was given for answers that made it clear that a change in the sequence of bases would produce an altered mRNA, which would produce a changed primary structure with R groups in different positions so the disulphide, ionic or hydrogen bonding would create a changed tertiary structure. Few candidates gained all 4 marks.

(f) The error-catastrophe theory suggests that random errors in transcription result in the production of abnormal proteins (paragraph 19).

Explain how random errors in transcription can result in the production of an abnormal protein.

(4)

Random errors during transcription cause mutation and the base sequence of mRNA changes. So, during translation, faulty protein is synthesi abnormal polypeptide is formed. So, primary structure of protein changes. Hydrogen bond formed in different R-group. So, secondary structure of the protein changes. Different di-sulphide bridges causes it final 3D structure of protein to be changed. So, an abnormal protein is formed.

ResultsPlus
Examiner Comments

This is an example of an excellent response that gained all 4 marks for:

reference to a change in base sequence (DNA or mRNA was accepted)

reference to mRNA

primary structure of protein changes

reference to hydrogen bonds / disulphide bridges

3D structure changed

The only marking point not mentioned is a change in the position of the R groups.

4/4

(f) The error-catastrophe theory suggests that random errors in transcription result in the production of abnormal proteins (paragraph 19).

Explain how random errors in transcription can result in the production of an abnormal protein.

(4)

Missense mutation can occur in the gene. Substitution of a base can result in a codon that codes for ~~am~~ another amino acid instead of desired one. R-groups between the amino acids ~~are~~ change. The tertiary structure of the protein is altered. It may not be able to function. In non-sense mutation, substitution of a base may cause the codon to code for stop codon. Protein synthesis ~~is in~~ during translation is preemcaturely halted. Polypeptide chain shortens (shortens). It may not be affective

ResultsPlus
Examiner Comments

This answer gains two marks for

description of a mutation as substitution

tertiary structure is altered

Coding for another amino acid is insufficient - the change in sequence is required.

R groups are mentioned but there is no reference to a change in position.

2/4

(f) The error-catastrophe theory suggests that random errors in transcription result in the production of abnormal proteins (paragraph 19).

Explain how random errors in transcription can result in the production of an abnormal protein.

(4)

Random errors in transcription due to mutati will not produce the same m-RNA from th gene. The mutated gene will be form a different m-RNA. During translation protein produced will be differen as amino acid sequence is differer

ResultsPlus
Examiner Comments

This answer gains two marks for:

reference to mRNA

amino acid sequence is different

2/4

ResultsPlus
Examiner Tip

A 4 mark question will require at least 4 distinct ideas and you should try to include more than four ideas to maximise your score.

Question 7 (g)

This question demanded that candidates look at the relevant paragraphs in the passage to select the correct information in order to carry out the calculation. Most were able to calculate that 6 500 000 are at risk of developing Alzheimer's disease, but only the better answers used the fact that 10% of these are familial, which gives an answer of 650 000.

(g) The population in the United Kingdom is 65 million.

Calculate the **maximum** number of people who develop Alzheimer's disease between the ages of 65 and 80 as a result of genetic inheritance (paragraphs 34 to 36).

Show your working.

Total number of people between 65 and 80 suffering from Alzheimer's disease = $\frac{10}{100} \times 65,000,000$ = 6,500,000 people. (2)

number of people between 65 and 80 suffering from AD due to genetic inheritance = 0·1 × 6,500,000 = 650,000 // Answer 650,000 //

ResultsPlus
Examiner Comments

This candidate shows how the correct answer is worked through.

ResultsPlus
Examiner Tip

When a question asks you to refer to a range of paragraphs it is essential to read them all.

Question 7 (h)

This question asked candidates to suggest how a brain imaging technique could be used to diagnose the loss of function in the part of the brain responsible for feeling emotions. Credit was given for naming one of three imaging techniques (PET, fMRI and CT) with a brief reason, and then naming the part of the brain involved with feeling of emotion. Many candidates gained credit for the imaging technique but only the better answers named the part of the brain.

(g) The population in the United Kingdom is 65 million.

Calculate the **maximum** number of people who develop Alzheimer's disease between the ages of 65 and 80 as a result of genetic inheritance (paragraphs 34 to 36).

Show your working.

Total number of people between 65 and 80 suffering from Alzheimer's disease = $\frac{10}{100} \times 65,000,000$ = 6,500,000 people. (2)

number of people between 65 and 80 suffering from AD due to genetic inheritance = 0·1 × 6,500,000 = 650,000

Answer 650,000

ResultsPlus
Examiner Comments

This answer gained both marks for:
PET linked to flow of blood
cerebral hemisphere / frontal lobe
2/2

Question 7 (i)

This question required candidates to understand that inhibition of acetylcholine degradation allows the neurotransmitter to remain in the synaptic cleft where it can continue to bind to receptors in the postsynaptic membrane. This membrane is then depolarised and an action potential occurs. Weaker answers were about dopamine.

The question challenged candidates with many gaining no marks and only a few gaining all three marks available. Many wrote that the acetylcholine would be reabsorbed so reducing depolarisation of the postsynaptic membrane.

(i) Suggest how drugs that inhibit the degradation of acetylcholine can alleviate the symptoms of Alzheimer's disease (AD) (paragraph 40).

(3)

When the degradation of acetylcholine is inhibited there will be more acetylcholine in the synaptic cleft between neurones so as acetylcholine is not broken down and also there is more acetylcholine bond to post-synaptic membrane so the post-synaptic membrane is kept on being depolarised and therefore there is continous action potential generated in post-synaptic neurons thus more impulses sent to brain and thus alleviate depression and etc...

ResultsPlus
Examiner Comments

This is a good answer gaining full marks for reference to:

more acetylcholine in the synaptic cleft

postsynaptic membrane is depolarised

action potential generated / more impulses

Acetylcholine binding to the postsynaptic membrane was not credited as there is no reference to receptors.

3/3

(i) Suggest how drugs that inhibit the degradation of acetylcholine can alleviate the symptoms of Alzheimer's disease (AD) (paragraph 40).

(3)

As ~~neurotransm~~ degradation of acetylcholine is inhibited it can act as neurotransmitters again reducing the loss of acetylcholine thus ~~slows~~ alleviates the symptoms of AD for a while as long as acetylcholine is still present in the synapses.

ResultsPlus
Examiner Comments

This answer gains 1 mark for the idea of acetylcholine remaining in the synapse but no other detail is provided.

1/3

ResultsPlus
Examiner Tip

One idea will gain one mark, no more.

Question 7 (j)

This question asked candidates to suggest additional detail about an investigation in the article needed to improve confidence in the validity of the conclusion. The examiners rewarded those students who appreciated that there is no information about sample size, control of sample selection, control of food in the diet or control of abiotic factors that could affect lifespan. The question was well answered with many gaining at least one mark. Those who wrote about replication gained no credit because it is clear in the article that this was not done.

(j) The article describes an investigation about the effect of calorie restriction on the development of age-related diseases (paragraph 41).

The results of the investigation suggest that calorie restriction allows rats to live longer.

The description of the design of the investigation lacks the detail needed to have confidence in the validity of this conclusion.

Suggest the additional detail needed to have confidence in the validity of this conclusion.

(2)

- the age of the rats used (they should all be of the same age)
- the gender of rats should be the same
- The rats should weigh approximately the same.
- All conditions such as temperature should be kept constant throughout the study

ResultsPlus
Examiner Comments

This answer gained both marks for reference to:

age / gender / weight

temperature

2/2

ResultsPlus
Examiner Tip

In questions like this it is unlikely that more than one mark will be available for the same idea, which in this case is control of the sample selection.

Question 7 (k)

It was pleasing to note that most candidates attempted this last question in the paper. Candidates were asked to explain why a high calorie diet lacking vitamin E is likely to promote ageing. Candidates were asked to refer to several paragraphs and the examiners rewarded those who appreciated that a high calorie diet means more nutrients/glucose would be available to mitochondria and that as a consequence of the electron transport chain more free radicals are produced. Credit was then given for appreciating that vitamin E removes these radicals so a lack of vitamin E means there are more of them available to damage cell membranes.

(k) Explain why a high calorie diet lacking vitamin E is likely to promote ageing (paragraphs 16, 17 and 44).

(4)

Vitamin E acts as a free radical scavenger and, by virtue of its lipid solubility, may help prevent damage biological membranes. A high calorie diet may increase free radical-mediated damage as the increased availability of nutrients to mitochondria increases the production of the superoxide radical.

ResultsPlus
Examiner Comments

This is a good answer that gains 3 marks for reference to:
vitamin E prevents damage to membranes
increased nutrients to mitochondria
increased production of superoxide radical
3/4

(k) Explain why a high calorie diet lacking vitamin E is likely to promote ageing (paragraphs 16, 17 and 44).

(4)

High calorie diet increase free-radical mediated damage. Vitamin E acts as a free radical trap. The lipid solubility of vitamin E helps prevent damage to biological membranes. Since a high calorie diet has an increased amount of nutrients to mitochondria increase the prodution of the superoxide radical. A diet lacking in vitamin E does not trap the free radicals and damage is caused to biological membranes which promotes ageing.

ResultsPlus
Examiner Comments

This answer was credited with full marks for:
vitamin E is a free radical trap (converse)
vitamin E prevents damage to membranes
increased nutrients to mitochondria
increased production of superoxide radical
4/4

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Look carefully at the number of marks allocated to a question and try to write that number of ideas, or more, to maximise performance.
- Use precise, scientific terminology that reflects A level study.
- Appreciate that repeating the stem of a question or sentences from the pre-release article 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 starting to write.
- 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

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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