GradeMax

Pearson

Mark Scheme (Results)

January 2026

Pearson Edexcel International Advanced Level In Biology
WBI15/01

GradeMax

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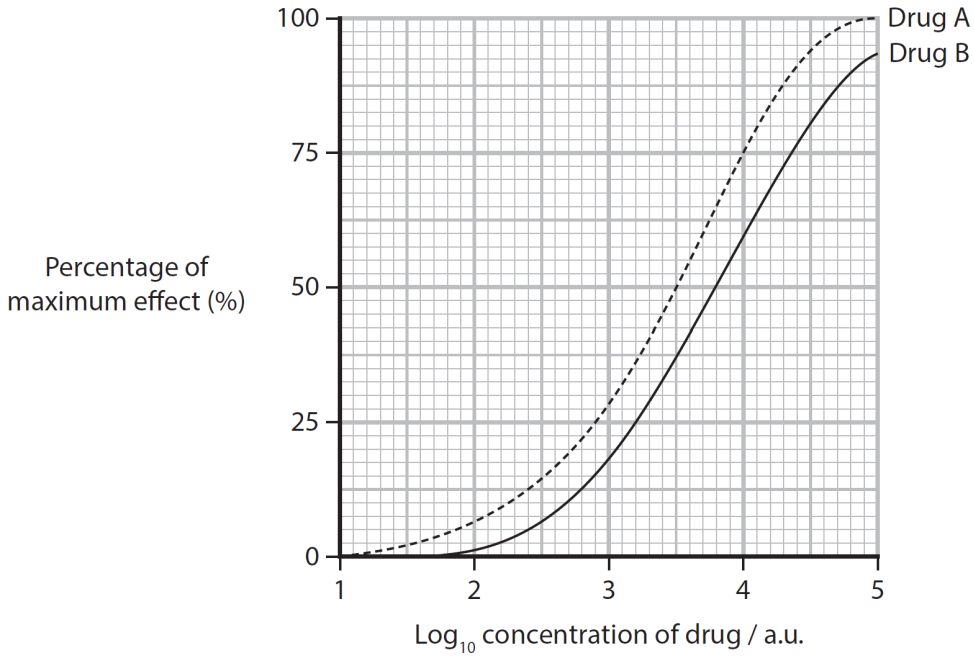
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th rowspan="2">Statement about the action of some drugs</th><th colspan="4">Type of drug</th></tr>
<tr><th>both nicotine and CV</th><th>nicotine only</th><th>CV only</th><th>neither nicotine nor CV</th></tr>
<tr><td>Binds to acetylcholine receptors</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>Stimulates nerve impulses</td><td></td><td>X</td><td></td><td></td></tr>
</table>
</td><td></td><td>(2)</td></tr>
</table>

Question number	Answer	Additional guidance	Mark
1(b)(i)	An answer that makes reference to the following points: • so that all the data will fit on one graph (1) • as large range of concentration of drugs / a wide range of doses are plotted (1) • Visualise the rate of change / determine any trends easier (1)	**Allow** to fit all the data on the x-axis / otherwise the scale will be too large **Allow** convert numbers to more manageable/plottable numbers **Ignore** quoted numbers **Ignore** easier comparison	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	• correct values read from graph and converted to antilogs (1) • correct answer from values subtracted (1)  	Values: 3.5 and 3.8 Antilogs: 3162.2777 and 6309.5734 Difference = 3147.2958 / 3147 / 3147.3 Accept 3147.29 or 3147.3 **Correct answer with no workings gains 2 marks.** **1 mark for 3.8-3.5 = 0.3** **1 mark for antilog 0.0357 = 1.086**	**(2)**

Question number	Answer	Additional guidance	Mark
2(a)(i)	An answer that makes reference to the following points: • carbon dioxide ÷ oxygen (1) • <u>volume</u> (carbon dioxide) **produced** and <u>volume</u> (oxygen) **used** (1)	**Ignore amount** **Accept** moles instead of volume **Ignore** number of molecules / oxygen available **Accept** RQ = vol of carbon dioxide released / vol of oxygen used for **2 marks**	**(2)**

Question number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation that makes reference to the following points: • because carbon dioxide is produced in the {Krebs cycle / link reaction} (1) • and oxygen is needed {as a final electron acceptor / as final proton acceptor / in oxidative phosphorylation} (1)	**If no other marks given accept for 1 mark** if there is no oxygen you cannot use the equation as it is vol. CO_2 / vol O_2	**(2)**

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr>
<td>2(b)(i)</td>
<td>An answer that makes reference to the following points:

• as the proportion of {carbohydrate decreases / lipid increases} the RQ decreases (1)

• calculation to support the relationship (1)

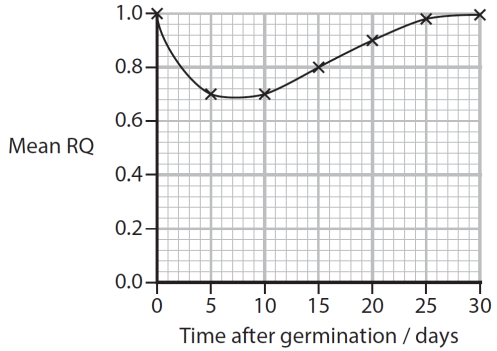
<table>
<tr><th>Proportion of carbohydrate</th><th>Proportion of lipid</th><th>RQ</th></tr>
<tr><td>1.0</td><td>0.0</td><td>1.00</td></tr>
<tr><td>0.8</td><td>0.2</td><td>0.88</td></tr>
<tr><td>0.6</td><td>0.4</td><td>0.80</td></tr>
<tr><td>0.4</td><td>0.6</td><td>0.76</td></tr>
<tr><td>0.2</td><td>0.8</td><td>0.73</td></tr>
<tr><td>0.0</td><td>1.0</td><td>0.70</td></tr>
</table>
</td>
<td>Accept converse
Accept positive/negative correlation

e.g. simple subtraction to illustrate increase and/or decrease between stated values of carbohydrate / lipid

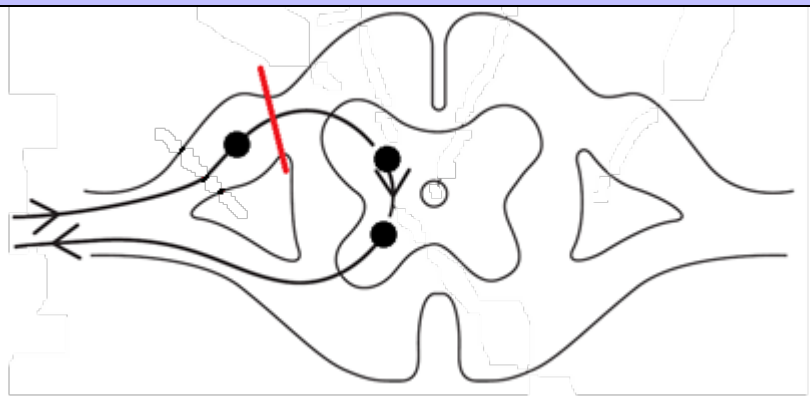
Drop from 1.0 to 0.0 in carbohydrate results in a drop in RQ of 0.3.

Drop of 0.4 in carbohydrate proportion between 1.0 carbs to 0.6 carbs results in a 0.2 decrease in RQ.

Increase of 0.4 in lipids between 0 lipids to 0.4 lipids there is a decrease RQ by 0.2.</td>
<td>(2)</td>
</tr>
</table>

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that makes reference to three of the following points: • at germination (the respiratory substrate) is carbohydrate (1) • {during days 0 to 5 / as days increase to day 5}, proportion of {carbohydrate used decreases / lipid used increases} (1) • between 5 and 10 days after germination, lipid (is the respiratory substrate) (1) • after day 10 the proportion of {carbohydrate increases / lipid decreases} (1)  	**Ignore** descriptions of data / RQ **Don't piece together** **Accept** at day 0 / first / the end / day 30 / after 25 days (the respiratory substrate) is carbohydrate **Accept** 0 and any value between 5-10 days **Accept** any values between 5-10 days **Accept** after 7 days the proportion of {carbohydrate increases / lipid decreases} **If no other marks awarded** **Accept** as days increase carbohydrate used decreases then increases / lipid used increases then decreases **1 mark**	**(3)**

Question number	Answer	Mark
3(a)(i)	**The only correct answer is B** ***A*** *is incorrect because J is a motor neurone, K is a sensory neurone and L is the relay neurone* ***C*** *is incorrect because J is a motor neurone, K is a sensory neurone and L is the relay neurone* ***D*** *is incorrect because J is a motor neurone, K is a sensory neurone and L is the relay neurone*	**(1)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An answer that makes reference to the following points: • {one cell body / two cell bodies} positioned correctly (1) • all cell bodies positioned correctly (1)	 **Accept** sensory neurone cell body circle anywhere to the left of the red line **Accept** fill in or blank circles or other clearly indicated shapes **Do not accept** circles that do not show a gap between the neurones	**(2)**

Question number	Answer	Mark
3(a)(iii)	**The only correct answer is B** ***A*** *is incorrect because it is white matter* ***C*** *is incorrect because R is the spinal canal* ***D*** *is incorrect because S is not part of the spinal cord*	**(1)**

Question number	Answer	Mark
3(b)(i)	**The only correct answer is A** ***B*** *is incorrect because it is the calcium ion channels that open* ***C*** *is incorrect because it is the calcium ion channels that open* ***D*** *is incorrect because it is the calcium ion channels that open*	**(1)**

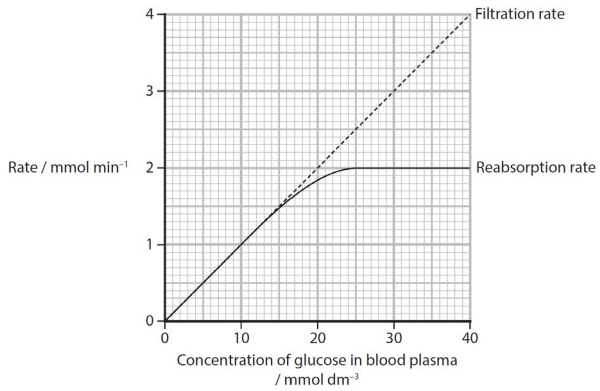
Question number	Answer	Mark
3(b)(ii)	**The only correct answer is B** ***A*** *is incorrect because guanine is a nitrogenous base* ***C*** *is incorrect because galactose is a sugar* ***D*** *is incorrect because guanine is a nitrogenous base and galactose is a sugar*	**(1)**

Question number	Answer	Additional guidance	Mark
3(c)	An explanation that makes reference to four of the following points: • (when the neurotransmitter binds to receptors it) triggers a (few) sodium ion channels open (1) • sodium ions move into the neurone depolarising the membrane **slightly** (1) • this causes **more** sodium ion channels to open (in same part of neurone (1) • so the membrane becomes (further) depolarised / an influx of sodium ions (1) • and this (cycle) continues until an action potential is produced (1)	**Ignore** potassium ions **Ignore** sodium unqualified – penalise once only **Accept** changes the membrane potential **slightly** **Accept** and this (cycle) continues until threshold is reached **Accept** a description of building up to an action potential	**(4)**

Question number	Answer	Additional guidance	Mark
4(a)(i)	• **5.6**	**Ignore** 'x' on the answer line	**(1)**

Question number	Answer	Mark
4(a)(ii)	**The only correct answer is C** ***A*** *is incorrect because filtration occurs in Bowman's capsule (L) and reabsorption occurs in the PCT (K)* ***B*** *is incorrect because filtration occurs in Bowman's capsule (L) and reabsorption occurs in the PCT (K)* ***D*** *is incorrect because filtration occurs in Bowman's capsule (L) and reabsorption occurs in the PCT (K)*	**(1)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	• 600 (%)	3.5 – 0.5 = 3 3 ÷ 0.5 = 6 × 100 = 600	**(1)**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	A description that makes reference to the following points: (b) The graph shows how the rates of filtration and reabsorption of glucose in mammalian nephrons vary with the concentration of glucose in the blood plasma.  • as concentration of glucose increases the filtration rate increases (1) • as concentration of glucose increases to {23 / 24 / 25} the reabsorption rate increases (1) • from a concentration of glucose of {13 / 14 / 15} to {23 / 24 / 25} the rate of reabsorption slows down (1) • as concentration of glucose increases above {23 / 24 / 25} the reabsorption rate remains constant (1)	**Accept** concentration of glucose written once for all marking points **Ignore** answers in context of rate / mmol min^{-1} **Accept** converse **Accept** positive correlation / directly proportional **Accept** {plateaus / remains the same / levels off} as equivalent to remains constant	**(3)**

Question number	Answer	Additional guidance	Mark
4(b)(iii)	• filtration **rate** is faster than reabsorption **rate** / reabsorption **rate** was at a maximum / reabsorption **rate** levels off / reabsorption **rate** is not fast enough (1)	**Accept** converse	**(1)**

Question number	Answer	Additional guidance	Mark
5(a)(i)	• {repetition of a / prolonged / non-threatening} stimulus results in a {decreased response / decreased polarisation / changed behaviour} (1)	**Ignore** references to save energy / further stimuli **Accept** where an organisms stops responding to a {repeated / prolonged / non-threatening} stimulus	**(1)**

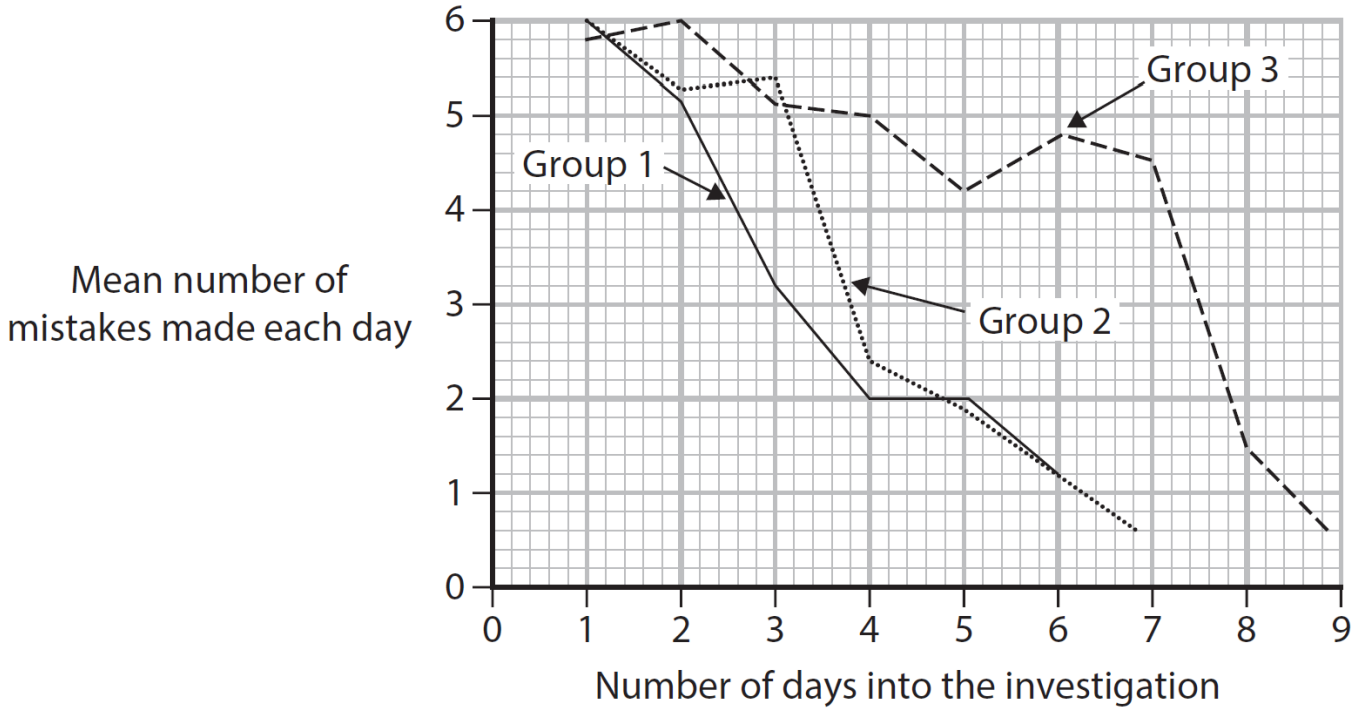
Question number	Answer	Additional guidance	Mark
5(a)(ii)	• any **two** appropriate reasons	**Examples** elk will be {killed by the cars / injured by cars / hit by cars} elk more likely to be hunted / killed people will be hurt in a car crash people could be bitten by elk food being given to elk could harm them elk lose ability to find food zoonotic transmission other reasonable suggestions	**(1)**

Question number	Answer	Additional guidance	Mark
5(b)(i)	• three correct values read from graph (1) • correct ratio (1)	2, 2.4, 5 1 : 1.2 : 2.5 **OR** 0.4 : 0.48 : 1 Correct answer with no workings scores **2 marks**	**(2)**

Question number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation that makes reference to three of the following points: • group 1: (mean) **number of mistakes** decrease as rats {learnt how to get to the food / wanted to get to the food / could smell the food} (1) • group 1: **learnt** faster as they {wanted to reach the food / could smell the food} (1) • group 3: {**slow decrease / fluctuating**} in the number of mistakes in the first 6 days (as no food is rewarded) (1) • group 3: {**faster / steeper / significantly**} decrease in number of mistakes after day 6 due {the presence of food / the rats being able to smell the food} (1)	**Ignore** references to group 2 **Accept** reward instead of food **Accept** Group 1 had the lowest (mean) number of mistakes (than Group 3) each day as rewarded by food **Ignore** steepest decrease **Accept** faster learning after day 6 due to {the presence of food / the rats being able to smell the food}	**(3)**

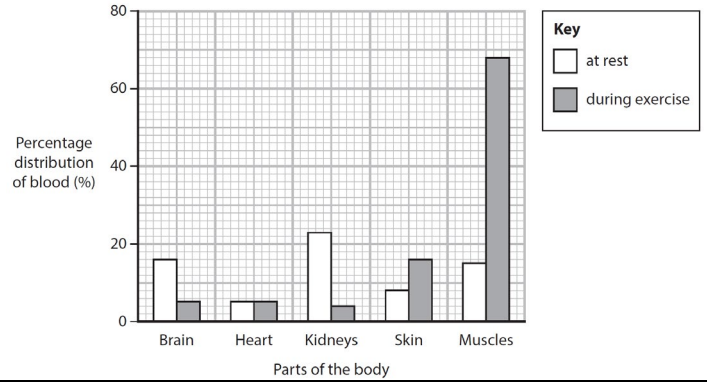
Group of rats	Investigation set-up
1	A food reward placed at the end of the maze each day of the investigation
2	A food reward placed at the end of the maze from day 3 onwards
3	A food reward placed at the end of the maze from day 6 onwards

The graph shows the results of this investigation.



Question number	Answer	Mark
6(a)	**The only correct answer is C** ***A*** *is incorrect because cardiac output is the product of heart rate and stroke volume* ***B*** *is incorrect because cardiac output is the product of heart rate and stroke volume* ***D*** *is incorrect because cardiac output is the product of heart rate and stroke volume*	**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	• 3.4		**(1)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that makes reference to four of the following points: • increase in blood (flow) to skin by vasodilation (1) • for thermoregulation (1) • (in exercise) as heat (energy) produced during {muscle contraction / respiration in muscles} (1) • decrease in blood (flow) to kidney as blood is {increased in/redistributed to} skin (1) • decrease in blood (flow) to kidney as blood is {increased in/redistributed to} muscles (1)	**Accept** dilation of arterioles equivalent to vasodilation **Accept** help cool the body down / heat loss from skin / heat loss by radiation / to increase sweating **Accept** {heat (energy) released / body temperature increases} as equivalent to heat (energy) produced **Piece together mp 4 and 5**	**(4)**
			

Question number	Answer	Additional guidance	Mark
6(c)	A description that makes reference to two of the following points: • cardiac cycle is {faster / shorter} (1) • atrial systole is shorter (1) • force (of contraction) is greater during ventricular systole (1)	**Ignore** references to heart rate / PQRS waves / cardiac output **Accept** greater stroke volume during ventricular systole **Ignore** more contraction of ventricles unqualified	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)	A description that makes reference to three of the following points: • (light absorbed by) rhodopsin (1) • which splits into opsin and (trans) retinal (1) • (opsin) causes sodium ion channels to be {blocked / closed} (1) • more sodium ions pumped out of the rod cells than diffuse in (1)	**Accept** positive ions	**(3)**

Question number	Answer
*7(b)	**Basic knowledge (B):** • P_R converts to P_{FR} in red light / wavelength 660nm • P_{FR} converts to P_R in far red light / wavelength 730nm • P_{FR} converts **slowly** into P_R in the dark • P_{FR} is the active form that stimulates germination / P_R inhibits germination • P_{FR} concentration is greater than P_R for germination to occur **Explaining group data (E):** **Group 1:** • red light converts P_R into P_{FR} / red light increase P_{FR} • P_{FR} causes germination **Group 2:** • P_{FR} slowly converted back into P_R in darkness / slowly decreases P_{FR} / increases P_R • no P_{FR} so no germination / P_R inhibits germination **Group 3:** • red light converts P_R into P_{FR} / red light increase P_{FR} • darkness not long enough to convert P_{FR} back into P_R so germination occurs **Group 4:** • red light converts P_R into P_{FR} / red light increase P_{FR} / far red light converts P_{FR} (back) into P_R / far red increase P_R / darkness converts remaining P_{FR} (back) to P_R / darkness increases P_R • results in less P_{FR} (than P_R) so no germination/ not enough P_{FR} so no germination / more P_R (than P_{FR}) inhibits germination **Group 5:** • far red light will convert P_{FR} into P_R /far red increase P_R / red light will convert P_R (back) into P_{FR} / red light increase P_{FR} • darkness not long enough to convert P_{FR} back into P_R so germination occurs **Additional knowledge (A):** • P_{FR} initiates the transcription of genes involved in germination / activates transcription factors for genes involved in germination • P_{FR} causes activation of amylase gene • amylase breaks down the starch into maltose/glucose • used in respiration / for cell division / for protein synthesis • **Accept other relevant information** • **DO NOT ACCEPT P_{FR} acts as a transcription factor** **(6)**

			Additional guidance
Level 0	0	No awardable content	
Level 1	1-2	Demonstrates isolated elements of biological knowledge and understanding to the given context with generalised comments made. Vague statements related to consequences are made with limited linkage to a range of scientific ideas, processes, techniques and procedures. The discussion will contain basic information with some attempt made to link knowledge and understanding to the given context.	Simple descriptions of data 1 mark = two pieces of information described 2 marks = three pieces of information described
Level 2	3-4	Demonstrates adequate knowledge and understanding by selecting and applying some relevant biological facts / concepts. Consequences are discussed which are occasionally supported through linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows some linkages and lines of scientific reasoning with some structure.	Simple discussion of data 3 marks = two pieces of information about one group (E) OR one explanation from two groups (E) 4 marks = two explanations from two groups (E)
Level 3	5-6	Demonstrates comprehensive knowledge and understanding by selecting and applying relevant biological facts / concepts. Consequences are discussed which supported throughout by sustained linkage to a range of scientific ideas, processes, techniques and procedures. The discussion shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	Extended discussion of data 5 marks = two explanations from two groups (E) plus one additional explanation linked to why germination occurs 6 marks = two explanations from two groups (E) plus two additional explanations linked to why germination occurs

Question number	Answer	Mark
8(a)	**The only correct answer is A** ***B*** *is incorrect because only statement 1 is correct as slow twitch muscle have more mitochondria than fast twitch* ***C*** *is incorrect because only statement 1 is correct as slow twitch muscle do not fatigue as easily* ***D*** *is incorrect because only statement 1 is correct as slow twitch muscle have more mitochondria and therefore do not fatigue easily*	**(1)**

Question number	Answer	Additional guidance	Mark
8(b)	An explanation that makes reference to three of the following points: • (because more capillaries will result) in **more** {oxygen / glucose} (to the muscle cells) (1) • glucose will provide the respiratory substrate (1) • oxygen will result in aerobic respiration (1) • therefore {more / increase / a lot of} ATP (for muscle contraction) (1) • increased removal of carbon dioxide (1)	**Accept** faster diffusion of {oxygen / glucose} **Accept** glucose needed for glycolysis **Accept** less likely to become anaerobic / reduce build-up of lactic acid **Accept** energy equivalent for ATP	**(3)**

Question number	Answer	Additional guidance	Mark
8(c)(i)	An explanation that makes reference to the following points: • so that there will be no (overall / net) movement of water into and out of the (muscle) cells (1) • so that the cells do not {burst / shrivel up / change size} (1) • so that only the {ATP / glucose} affects the length of the fibres (1)	**Accept** fibres equivalent for cells **Accept** no (overall / net) osmosis	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)(ii)	• water and ions / saline (solution) (1)	**Do not allow** glucose / ATP / sodium / calcium / minerals **Accept** Sodium ions / Na+ / Ca^{2+} / calcium ions / salt solution / any named ion solution	**(1)**

Question number	Answer	Additional guidance	Mark
8(c)(iii)	• mean of three fibres calculated (1) • percentage decrease calculated (1)	25mm, 27mm, 24mmm 25+27+24 = 25.3mm / 2.53cm Answer between 23-27mm Mean 23 = 23.3% **(30-25.3) / 30 = 15.7%** Mean 27 = 10% **Accept** range 10 – 23.3 % **Correct answer with no working out receives 2 marks** **Ignore** minus signs **Do not accept more than 2 decimal places**	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)(iv)	An explanation that makes reference to three of the following points: • ATP binds to myosin head (1) • causing a shape change (in the myosin) (1) • so myosin {detaches from the actin / returns to original position / reposition the myosin head / breaks cross bridges} (1) • so that the myosin head can bind to the {actin / myosin binding sites} again (1)	**Ignore** references to tropomyosin and troponin	**(3)**

Question number	Answer	Additional guidance	Mark
8(c)(v)	An answer that makes reference to two of the following points: • glucose supplied a respiratory substrate to produce ATP (1) • but time taken for ATP to be produced (1) • less ATP produced (from respiration of glucose) than provided in ATP solution (1)	**Accept** glucose is used in respiration to produce ATP **Accept** slower to produce ATP **Accept** less ATP produced from anaerobic respiration	**(2)**

Question number	Answer	Additional guidance	Mark
9(a)	An explanation that makes reference to two of the following points: • food production requires land which {destroys habitats / deforestation removes trees which removed CO_2 / decreases biodiversity} (1) • food production requires burning of fossil fuels which release greenhouse gases (1) • food production requires water (for irrigation) which could divert water away from {wildlife / humans} (1) • food production may {use / produce} chemicals which could {poison wildlife / accumulate in food chain} (1)	**Accept** food production requires land which {causes deforestation / soil erosion / other name destruction of habitat} **Accept** other named causes of greenhouse gases / named greenhouse gases Eg farming machinery / factories / methane from cows **Accept** waste products as equivalent for chemicals	**(2)**

Question number	Answer	Additional guidance	Mark
9(b)	An explanation that makes reference to two the following points: • plants have to be grown to feed the animals (1) • less energy is lost from the food chain (1) • animal farming produces methane which {is a greenhouse gas / causes global warming} (1) • plants {have a lower carbon footprint / are carbon neutral / photosynthesise to remove carbon dioxide} (1) • plants will use less land than animals to obtain the same {energy / mass of food} (1)	**Accept** plant based foods are eaten directly by humans **Accept** less energy lost between trophic levels **Accept** cattle equivalent to animals **Accept** plants act as a carbon sink	**(2)**

Question number	Answer	Additional guidance	Mark
9(c)	An explanation that makes reference to four of the following points: • glucose is converted into ethanol and carbon dioxide (1) • glucose is broken down into pyruvate / glycolysis occurs (1) • alcohol is formed when pyruvate {is reduced / undergoes decarboxylation / converted to ethanal} (1) • when (pyruvate) is used to oxidise NADH (1) • (in anaerobic respiration) only glycolysis occurs / pyruvate will not go through {link reaction / Kreb's cycle} (1)	**Ignore** references to lactate **Piece together** **Accept** regenerate NAD / convert NADH to NAD	**(4)**

Question number	Answer	Additional guidance	Mark
9(d)	An explanation that makes reference to three of the following points: • probiotics increase the natural gut flora / enhance the microbiome (1) • when they have been depleted by {antibiotics / disease} (1) • so that pathogens can be reduced by competition for {space / nutrients} (1) • so that pathogens can be {inhibited / destroyed / reduce growth} by toxins produced by gut flora (1) • in order to reduce inflammation / prevent infection (1)	**Ignore** maintaining gut flora / microbiome **Accept** depleted by aging **Accept** outcompeted as equivalent for 'reduced by competition' **Accept** chemicals produced instead of toxins	**(3)**

Question number	Answer	Additional guidance	Mark
9(e)	An explanation that makes reference to two of the following points: • fewer free radicals would cause less {cell / endothelium lining / oxidative stress} damage (1) • therefore reduction in {atheroma / plaque} formation (if damage is in blood vessels) (1) • which would result in fewer {heart attacks / strokes / deaths} (1) **OR** • fewer free radicals would reduce damage to DNA (1) • therefore less {chance of mutation / change in base sequence} (1) • which would result in fewer cases of {cancer / death} (1)	**Accept** tissue as equivalent for cell **Accept** reduced (risk of) CVD / angina	**(2)**

Question number	Answer	Additional guidance	Mark
9(f)	An explanation that makes reference to two of the following points: • microorganisms reproduce **rapidly** (1) • therefore **rapid** protein synthesis (1) • RNA needed for translation (1)	**Accept** replicate / divide **rapidly** **Accept** {lots of / more / increased} protein synthesis **Accept** description of translation	**(2)**

Question number	Answer	Additional guidance	Mark
9(g)	An explanation that makes reference to three of the following points: • the genes for pleasant {texture / taste} are {identified / isolated / cut} (1) • use the same restriction enzymes to cut the gene out (from the organism) and cut the vector (1) • insert the gene into a vector (1) • introduce the vector into the microorganism (1) • genetically modified organisms identified and cloned (1)	**Accept** plasmid for vector throughout **Accept** use (DNA) ligase to insert the gene into a vector **Accept** suitable method of introducing vector into microorganism	**(3)**

Question number	Answer	Additional guidance	Mark
9(h)	An explanation that makes reference to the following points: • to identify the sources of information • so that other people's work can be cited **OR** so that the original work can be looked at **OR** to verify the work of the author **OR** to obtain further information about the work (1)	**Accept** these are the {references / bibliography} **Accept** for copyright reasons **Accept** original work can be read **Accept** to help peer reviews **E.g.** date of publication	**(2)**