

# Mark Scheme (Results)

Summer 2016

Pearson Edexcel  
International Advanced Level  
in Biology (WBI05) Paper 01  
Energy, Exercise and Coordination

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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.

## Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

## General Information

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Phrase/words inside round brackets are not essential for the award of the mark. It helps the examiner to get the context of the expected answer.
<b>Bold Text</b>	Phrases/words in bold indicate that the <u>meaning</u> of the phrase or the actual word is essential to the answer.
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[ECF]	Consecutive error / transferred error. A wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Answers must be in the correct context. A correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored.

## Quality of Written Communication (QWC)

Questions where QWC is likely to be particularly important are indicated with an asterisk (\*) in the mark scheme, but this does not preclude others.

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks should be awarded if the candidate has demonstrated the above abilities.

QWC penalties should be applied after the total number of mark points has been decided.

Emphasis on *logical sequence* – penalise if response does not follow a logical/correct sequence.

Emphasis on *spelling of technical terms* – penalise incorrect spelling of italicised technical terms once only.

Emphasis on *clarity of expression* – penalise if response is not clearly contextualised or defined.

## Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

## Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous  
E.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not  
E.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not  
E.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not  
E.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark.

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
1(a)(i)	C 4	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
1(a)(ii)	C 3	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
1(a)(iii)	A depolarisation	(1)

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
1(a)(iv)	A P	(1)

Question Number	Answer	Additional guidance	Mark
1(b)(i)	<ol style="list-style-type: none"> <li>1. correct references to change in {CO<sub>2</sub> / pH / lactate / O<sub>2</sub> level / temperature} ;</li> <li>2. correct reference to {chemoreceptors / thermoreceptors / stretch receptors} ;</li> <li>3. correct reference to{aortic body / carotid body} / {hypothalamus / skin} / {atria / heart muscle walls / skeletal muscles / tendons} ;</li> <li>4. reference to {medulla / cardiovascular centre} ;</li> <li>5. reference to {sympathetic / accelerator} nerve / autonomic nervous system ;</li> <li>6. reference to SAN ;</li> </ol>	          <p><b>Max 4</b></p>	(4)

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	<ol style="list-style-type: none"> <li>1. Similarity: both {affect the SAN / can increase heart rate / involuntary} ;</li> <li>2. Difference: hormonal is slower / nervous is faster / hormonal lasts longer / nervous is shorter / hormonal is chemical but nervous is electrical or by impulse / hormonal uses blood but nervous uses neurones ;</li> </ol>		(2)

Question Number	Answer	Additional guidance	Mark
2(a)	1. idea of a {reduced response to / ignoring} a stimulus ; 2. that is {repeated / harmless / unimportant / eq} ; 3. idea that habituation is a form of learning ;	<b>IGNORE</b> adapt / getting used to  <b>Max 2</b>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
2(b)(i)	1. use of a scarecrow ; 2. idea of measuring or counting {seeds eaten / number of birds / time taken to fly away / eq} ; 3. reference to more than one trial / repeats over time ; 4. idea of control of biotic or abiotic variable ;  5. idea of replication of the investigation ; 6. reference to expected result if habituation occurs ;	2. Eg. release birds and count how many fly away  4. Eg. same bird species / same crop / same field / same time of day / same light intensity / same wind / same aspect / eq  5. Eg. many fields  <b>Max 5</b>	<b>(5)</b>



Question Number	Answer	Additional guidance	Mark
2(b)(ii)	<p>1. axes labelled number of {birds / seeds eaten / eq} on y axis and {trial / time / days / weeks / eq} on x axis ;</p> <p>2. {line / plotted points} showing upward slope ;</p>	<p><b>ALLOW</b> bar chart</p> <p><b>ALLOW</b> Mp1 and Mp2 if y axis is biologically correct Eg. number of birds frightened and downward slope</p> <p>Time to habituate on y axis = 0 for Mp1 but allow Mp2 for downward slope</p>	(2)

Question Number	Answer	Additional guidance	Mark
3(a)(i)	circle drawn around H <sub>2</sub> N only;		(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	1. reference to sodium (ion) channels ; 2. idea of less influx of sodium ions (into neurone / axon) ; 3. idea that there is {less / no / eq} depolarisation ; 4. idea that there are {fewer / no / eq} action potentials generated ; 5. idea of {fewer / no / eq} impulses (to brain) ;	<b>ALLOW</b> Na <sup>+</sup>  <b>2. IGNORE</b> sodium    <b>5. IGNORE</b> signal / message  <b>Max 4</b>	(4)

Question Number	Answer	Additional guidance	Mark
3(a)(iii)	1. idea that {blood vessels are narrowed / blood flow is reduced};  2. idea that the {drug is not removed / pain relief lasts longer / bleeding is reduced} ;	1. Do not allow if veins / capillaries named	(2)

Question Number	Answer	Additional guidance	Mark
3(b)	1. idea that calcium (ion) channels {blocked / closed}; 2. idea that {fewer / no} calcium ions enter {(pre)synaptic knob}; 3. idea that vesicles do not {fuse with / move to} presynaptic membrane ; 4. idea of less neurotransmitter release ; 5. idea of reduced {binding / movement} to receptors on the {postsynaptic membrane / postsynaptic neurone} ; 6. idea of reduced depolarisation / action potentials / entry of sodium ions / impulses (to brain) ;	<b>ALLOW</b> Ca <sup>2+</sup>  <b>2. IGNORE</b> calcium  <b>ALLOW</b> Mps for answers that describe events at a synapse and then state they do not happen in presence of drug  <b>Max 4</b>	<b>(4)</b>

Question Number	Answer	Additional guidance	Mark
3(c)	1. drug A provides pain relief for less time ; 2. drug A provides {faster / quicker} pain relief ; 3. drug A provides more pain relief ; 4. reference to application of drug A to dental treatment ;	<b>ACCEPT</b> converse for drug B  4. Eg. drug A is better for brief dental treatment ; <b>Max 3</b>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
4(a)(i)	1. idea that no damage ;  OR  idea that there could be brain damage to parts of the brain not involved with the pupil reflex ;  2. pupil diameter decreases / small difference in pupil diameter (for each patient) ;	1. <b>IGNORE</b> little damage	(2)

Question Number	Answer	Mark
4(a)(ii)	C radial muscles relax and circular muscles contract	(1)

Question Number	Answer	Additional guidance	Mark
*4(b)	<p><b>(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. reference to { <i>photoreceptor / rod / cone</i> } cells ;</li> <li>2. reference to { <i>rhodopsin</i> conversion into <i>retinal</i> and <i>opsin</i> / conversion of <i>cis-retinal</i> to <i>trans-retinal</i> } ;</li> <li>3. idea that { <i>sodium / cation</i> } channels close and sodium ions { cannot enter / are pumped out } ;</li> <li>4. reference to { <i>hyperpolarisation / generator potential /</i> inside more <i>negative</i> } ;</li> <li>5. reduced release of { <i>glutamate / neurotransmitter</i> } ;</li> <li>6. reference to <i>depolarisation</i> of <i>bipolar</i> cell ;</li> <li>7. reference to { <i>action potential / impulse</i> } in { <i>sensory neurone / optic nerve</i> } ;</li> </ol>	<p>QWC emphasis is spelling of technical terms</p> <p><b>3. ALLOW</b> Na<sup>+</sup></p> <p><b>ACCEPT</b> z for s in Mp4 and Mp6</p> <p><b>Max 5</b></p>	<p><b>(5)</b></p>

Question Number	Answer	Additional guidance	Mark
5(a)	Correct answer gains TWO marks 1. 1.85 ; 2. units as s / seconds / secs ;		(2)

Question Number	Answer	Mark
5(b)(i)	D an anaerobic enzyme in the vastus lateralis	(1)

Question Number	Answer	Mark
5 (b) (ii)	C pyruvate and oxidised NAD to reduced NAD	(1)

Question Number	Answer	Additional guidance	Mark
5(c)(i)	idea that there is no (significant) difference in the proportion of fast and slow twitch fibres in (wild and captive) cheetahs ;	<b>IGNORE</b> correlation	(1)

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	1. idea that there is no difference in percentage of muscle fibre type / the difference is not {significant} ; 2. idea of overlap between standard deviation of muscle fibre type (in vastus lateralis) ;	<b>1. ALLOW</b> the null hypothesis is accepted <b>2. ALLOW</b> idea of range / error bars / eq linked to overlap	(2)

Question Number	Answer	Additional guidance	Mark
5(d)	1. idea that muscles have more fast twitch fibres ; 2. idea of { fewer capillaries / less myoglobin } ; 3. idea of less oxygen supply ; 4. (less) aerobic respiration / (more) anaerobic respiration ; 5. idea of fewer mitochondria / less ATP made ; 6. idea that lactate produced / low pH produced ;	5. <b>IGNORE</b> less energy  Max 5	(5)

Question Number	Answer	Mark
6(a)(i)	<b>B</b> cerebral hemispheres ;	(1)

Question Number	Answer	Mark
6(a)(ii)	<b>A</b> cerebellum ;	(1)

Question Number	Answer	Additional guidance	Mark																			
6(b)	<table border="1"> <thead> <tr> <th rowspan="2">Statement</th> <th colspan="3">Method of scanning</th> </tr> <tr> <th>MRI</th> <th>CT</th> <th>fMRI</th> </tr> </thead> <tbody> <tr> <td>Uses X-rays</td> <td>×</td> <td>✓</td> <td>×</td> </tr> <tr> <td>Allows observation of the brain in action</td> <td>×</td> <td>×</td> <td>✓</td> </tr> <tr> <td>Provides images in soft tissue without contrast medium</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	Statement	Method of scanning			MRI	CT	fMRI	Uses X-rays	×	✓	×	Allows observation of the brain in action	×	×	✓	Provides images in soft tissue without contrast medium	✓	✓	✓	<p>One mark for two correct rows</p> <p>Two marks for three correct rows</p> <p>Hybrid tick cross = 0</p> <p>Blank = 0</p>	(2)
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Allows observation of the brain in action	×	×	✓																			
Provides images in soft tissue without contrast medium	✓	✓	✓																			

Question Number	Answer	Additional guidance	Mark
6(c)	<ol style="list-style-type: none"> <li>1. reference to {<b>restriction enzyme / ligase</b>} ;</li> <li>2. reference to {gene / allele / DNA} for the drug ;</li> <li>3. reference to <b>vector</b> ;</li> <li>4. reference to {liposome / virus / plasmid / gene gun / eq} ;</li> </ol>	<p>1. <b>ACCEPT</b> endonuclease</p> <p><b>Max 3</b></p>	(3)



Question Number	Answer	Additional guidance	Mark
7(a)	idea that {ageing / increasing age} increases the development of CHD increases ;	<b>ALLOW</b> it is a positive correlation	<b>(1)</b>

Question Number	Answer	Additional guidance	Mark
7(b)	1. idea of reduced {exhalation / inhalation / ventilation / removal of air / tidal volume / eq} ;  2. idea of reduced {concentration / diffusion / oxygen / carbon dioxide} gradient ;		<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
*7 (c)	<p><b>(QWC – spelling of technical terms must be correct and the answer must be in a logical sequence)</b></p> <ol style="list-style-type: none"> <li>1. calcium ions released from sarcoplasmic reticulum ;</li> <li>2. idea that calcium ions {attach / bind} to troponin ;</li> <li>3. idea of {pulling / moving} tropomyosin ;</li> <li>4. idea of exposure of myosin binding sites ;</li> <li>5. idea that myosin attaches to actin ;</li> <li>6. idea that ADP and Pi release {changes shape of myosin / myosin head moves} ;</li> <li>7. reference to <b>sliding filament</b> ;</li> <li>8. idea that ATP is used to {detach myosin head / break cross bridges} ;</li> </ol>	<p>QWC emphasis is logical sequence</p> <p><b>ALLOW</b> Ca<sup>2+</sup> <b>IGNORE</b> calcium</p> <p><b>Max 6</b></p>	<p><b>(6)</b></p>

Question Number	Answer	Additional guidance	Mark
7(d)	idea of reduced supply of a named component needed for wound healing ;	Eg. oxygen / glucose / blood cells / clotting factors / platelets / fibrinogen / amino acids / eq	(1)

Question Number	Answer	Additional guidance	Mark
7(e)	1. idea of fewer {T helper cells / T killer cells} ; 2. idea of less cytokine release ; 3. idea of fewer {memory / B effector / plasma} cells ; 4. idea of fewer antibodies produced ; 5. idea of {less destruction of infected cells / more infected cells} ;	<b>IGNORE</b> reduced function    <b>Max 3</b>	(3)

Question Number	Answer	Additional guidance	Mark
7(f)	1. idea of a change in sequence of {bases / nucleotides / codons} ; 2. reference to <b>mRNA</b> ; 3. idea of a change in {sequence of amino acids / primary structure} ; 4. idea of change in position of R groups ; 5. reference to {disulphide / ionic / hydrogen} bonds ; 6. idea that protein has a different {shape / tertiary structure / 3D structure} ;	<b>1. ALLOW</b> description of mutations eg. deletion, substitution, insertion     <b>Max 4</b>	(4)

Question Number	Answer	Additional guidance	Mark
7(g)	1. (10% of 65 million =) 6 500 000 / 6.5 million ; 2. (10% of 6 500 000 =) 650 000 / 650 thousand ;	Correct answer gains TWO marks	(2)

Question Number	Answer	Additional guidance	Mark
7(h)	1. idea that PET shows {blood flow / oxygen level / glucose metabolism} ; OR idea that fMRI shows {blood flow / oxyhaemoglobin / deoxyhaemoglobin / oxygen level} ; OR idea that MRI shows brain tissue {loss / damage / lesions} ; 2. reference to {cerebral hemisphere / cerebrum / amygdala / hippocampus / parietal lobe / temporal lobe / eq} ;		(2)

Question Number	Answer	Additional guidance	Mark
7(i)	1. idea that acetylcholine remains / eq} ; 2. acetylcholine {binds / attaches / eq} to receptor in postsynaptic membrane ; 3. sodium ions enter postsynaptic neurone / depolarisation of postsynaptic membrane / excitatory postsynaptic potential ; 4. idea of {action potential / impulse} occurs ;	<b>1. IGNORE</b> not broken down  <b>2. IGNORE</b> neurone  Reference to dopamine loses Mp1 and Mp2  <b>Max 3</b>	<b>(3)</b>

Question Number	Answer	Additional guidance	Mark
7(j)	1. idea of sample size ; 2. idea of controlling {species / gender / age / genes / size / health} of rats ; 3. idea of controlling {quantity / quality / type} of food ; 4. idea of using same abiotic conditions {temperature / water / bedding / light / eq} ;	<b>1. IGNORE</b> idea of repeats  <b>2. IGNORE</b> activity  <b>Max 2</b>	<b>(2)</b>

Question Number	Answer	Additional guidance	Mark
7(k)	1. idea of increased supply of {nutrients / glucose} to mitochondria ; 2. reference to <b>electron transport chain</b> ; 3. idea of more production of (superoxide / free) radicals ; 4. idea that a lack of vitamin E means fewer radicals removed ; 5. idea that vitamin E prevents damage to cell {membranes / lipid / protein / DNA} ;	3. <b>ALLOW</b> symbol for superoxide 4. <b>ALLOW</b> converse <b>IGNORE</b> scavenger alone  <b>Max 4</b>	<b>(4)</b>

