

# Mark Scheme (Results)

January 2015

Pearson Edexcel International  
Advanced Level  
in Biology (WBI05) Paper 01

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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.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that 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. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

## Quality of Written Communication

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 will be awarded if the candidate has demonstrated the above abilities.

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

A penalty for a QWC should only be applied once only. If a response has gained additional marking points to the maximum allowed, then a QWC should not be applied.



<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(a)</b>	B ; nervous coordination is faster and lasts for a shorter time	<b>(1)</b>

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(b)(i)</b>	D ;	<b>(1)</b>

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

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(b)(iii)</b>	D ; cis-retinal changes to trans-retinal	<b>(1)</b>

<b>Question Number</b>	<b>Answer</b>	<b>Mark</b>
<b>1(b)(iv)</b>	B ; sodium ion channels close while the sodium ion pump continues to work	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
1(c)(i)	1. increased elongation as IAA concentration increases / eq ; 2. elongation with no IAA more than 0.01 IAA / IAA inhibits at 0.01 concentration / eq ;	IGNORE refs to range	(2)

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	One from: 1. temperature ; 2. light ; 3. species of stem / age of stem ; 4. volume of IAA solution ; 5. pH ;	2. IGNORE sun 3. ALLOW plant / seedling / variety	(1)

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	{dish 4 / eq} because it has {the greatest range / standard deviation / $\pm 4.0$ is larger than others / eq } ;		(1)

**Total 9 marks**

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	0.40 to 0.42 dm <sup>3</sup> (min <sup>-1</sup> ) ;	Units must be included ACCEPT l / litres	(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	1. $\div 70 \times 60 / \times 60 \div 70$ ; 2. 0.34 to 0.36 ;	If the volume is incorrect, allow one mark for showing the correct calculation, $\div 70$ $\times 60$ or $\times 60 \div 70$  The correct answer with no working shown gains two marks	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	Two from: 1. more peaks / peaks closer together / eq ; 2. {higher / longer} peaks / eq ; 3. steeper slope / more oxygen used / eq ;	ALLOW converse	(2)



Question Number	Answer	Additional Guidance	Mark
2(b)(i)	soda lime ;	ACCEPT sodium hydroxide / NaOH / potassium hydroxide / KOH	(1)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. no downward slope / no change in volume / eq ; 2. exhaled carbon dioxide equals consumed oxygen / eq ; OR 3. {tidal volumes / breathing rate / height of peaks} increase / eq ; 4. due to increase in carbon dioxide concentration / eq ;		(2)

Question Number	Answer	Additional Guidance	Mark
2(c)	1. carbon dioxide increase in {blood / plasma} / eq ; 2. fall in {blood / plasma} pH / eq ; 3. chemoreceptors ; 4. reference to {medulla / carotid bodies / aortic bodies} ; 5. impulses sent / eq ; 6. reference to ventilation centre / respiratory centre ; 7. reference to intercostal muscles / diaphragm ; 8. increased breathing rate / increased depth of breathing / eq ;		<b>(4)</b>

**Total 12 mark**

Question Number	Answer	Mark
3(a)(i)	B ; node of Ranvier	(1)

Question Number	Answer	Mark
3(a)(ii)	A ; depolarised	(1)

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	<ol style="list-style-type: none"> <li>1. reference to myelination ;</li> <li>2. saltatory conduction / impulse jumps from node to node / eq ;</li> <li>3. idea that this increases {speed / conduction velocity} (of the impulse) ;</li> </ol>		(2)

Question Number	Answer	Additional Guidance	Mark
<b>3(b)(i)</b>	1. idea that impulses cannot be transmitted / action potentials not possible ;  Any three from the following:  2. sodium ions {move / diffuse / eq} into axon / neurone ;  3. down a concentration gradient / eq ;  4. neurone is depolarised / eq ;  5. idea that depolarisation is permanent ;  6. idea that resting potential cannot be (re)established ;		<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
<b>3(b)(ii)</b>	1. idea that {ion channel / channel protein} is different ;  2. poison cannot bind ;  3. idea of poison metabolised / broken down / eq ;	IGNORE adapted / resistant	<b>(2)</b>

**Total 10 marks**

Question Number	Answer	Additional Guidance	Mark
<b>4(a)</b>	1. risk of death decreases with increasing exercise (for old and young until 70) / eq ; 2. greater decrease with old people / eq ; 3. old at more risk at each level (until 80) / eq ; 4. risk of death is the same at {80 / highest level of exercise} ; 5. idea that {at more than 70 / 70 to 80} of exercise no change in the risk of death in the young ; 6. idea that at very high levels of exercise older are at less risk than less active young ones ;	1. ACCEPT negative correlation	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
<b>4 (b)(i)</b>	exercise decreases the risk / eq ;	ACCEPT converse	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
4 (b)(ii)	One of: 1. low intensity reduces immunity ; 2. moderate intensity increases immunity ; 3. high intensity reduces immunity ;	ACCEPT converse	(1)

Question Number	Answer	Additional Guidance	Mark
4(c)(i)*	1. reference to anaerobic respiration ; 2. reference to glycolysis ; 3. idea that glucose is phosphorylated ; 4. reference to {NAD / NADH} ; 5. reference to formation of pyruvate ; 6. (net gain of) 2 ATP molecules (per glucose molecule) ; 7. idea of need to regenerate oxidised NAD ; 8. pyruvate converted to lactate ;	QWC emphasis is logical sequence  Penalise non-logical sequence once only  4. IGNORE if in Kreb's	(6)

Question Number	Answer	Additional Guidance	Mark
<b>4(c) (ii)</b>	1. lactate produced / lactic acid produced ;  2. stimulates (pain) receptors / lowers pH / damage muscle (cells) / fatigue in muscle (cells) / enzymes inhibited / enzymes denatured ;	2. IGNORE pain alone	<b>(2)</b>

**Total 13 marks**

Question Number	Answer	Additional Guidance	Mark
5(a) (i)	1. venom A more toxic ; 2. LD <sub>50</sub> value for {A / 3.6 to 3.8} is lower than LD <sub>50</sub> value for {B / 7.2 to 7.4} / same percentage killed at lower dose / at each dose more killed / comparative use of data / eq ;	ALLOW converse	(2)

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	A ; dose of venom		(1)

Question Number	Answer	Additional Guidance	Mark
5(b)	<i>P. bahiensis</i> ;		(1)



Question Number	Answer	Additional Guidance	Mark
<b>5(c)</b>	1. reference to the release of calcium ions ; 2. (calcium ions) from sarcoplasmic reticulum / eq ; 3. (continued stimulation means) high concentration of calcium ions / calcium ions remain ; 4. calcium ions bind to troponin ; 5. reference to {tropomyosin / myosin / actin / actomyosin} (involved in muscle contraction) ;		<b>(4)</b>

**Total 8 marks**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	<p><b>P</b> – NAD<sup>+</sup> / NAD / oxidised NAD ;</p> <p><b>Q</b> – oxygen / O<sub>2</sub> / ½ O<sub>2</sub> / O ;</p> <p><b>R</b> – water / H<sub>2</sub>O ;</p>		(3)

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	B ; inner mitochondrial membrane		(1)

Question Number	Answer	Additional Guidance	Mark
6(b)	<ol style="list-style-type: none"> <li>1. reduced carrier cannot be oxidised / oxygen cannot be used to make water / electrons cannot be passed to oxygen / oxygen cannot be used as electron acceptor / eq ;</li> <li>2. idea that transport of electrons prevented / ETC stops ;</li> <li>3. ATP not made ;</li> <li>4. reference to oxidative phosphorylation ;</li> <li>5. ATP (only) from {glycolysis / anaerobic respiration} ;</li> <li>6. {respiratory / heart / eq } muscles cannot contract / eq ;</li> </ol>		(4)

Question Number	Answer	Additional Guidance	Mark
<b>7 (a)</b>	1. tissue culture / computer modelling / use of humans / population studies ;  2. reduce use of animals / no animals harmed / more ethical ;	1. IGNORE plants  2. ACCEPT humans provide feedback about side effects / eq	<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
<b>7(b)</b>	Two from:  1. need to find out if the drug works / efficacy ;  2. need to find out if the drug is safe / toxic / has side effects ;  3. need to find the correct dose ;		<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
7 (c)	<ol style="list-style-type: none"> <li>1. differential gene expression / different genes expressed in different cells / eq ;</li> <li>2. supercoiling prevents transcription / uncoiling allows transcription / eq ;</li> <li>3. RNA polymerase binds to {DNA / promoter region} ;</li> <li>4. mRNA synthesised / mRNA transcribed ;</li> <li>5. idea that protein is synthesised ;</li> <li>6. reference to transcription factors (in gene expression) ;</li> <li>7. idea that (transcription factor) binds to {DNA / gene / promoter region} ;</li> <li>8. repressor molecules {prevent transcription / switch gene off} / eq ;</li> </ol>		<b>(4)</b>

Question Number	Answer	Additional Guidance	Mark
7(d)	1. control genetic make-up / these mice are homogeneous / humans have genetic variety / eq ; 2. idea that this allows (one) gene function to be investigated ; 3. drugs can be used which {cannot be used / are unethical for use} with humans / eq ; 4. larger sample size can be used / eq ;	1. ALLOW humans are heterogeneous 4. IGNORE idea of quicker to get results / mice are abundant / mice reproduce quickly	(2)

Question Number	Answer	Additional Guidance	Mark
7(e)	test during pregnancy / eq ;		(1)

Question Number	Answer	Additional Guidance	Mark
7 (f)	{all / entire / eq} the {DNA / genes / chromosomes / bases / base sequence / genetic material / eq} ;		(1)

Question Number	Answer	Additional Guidance	Mark
7 (g)	1. need to use living nerve tissue ; 2. vaccine contains {live virus / virus may revert to virulence / virus causes disease in humans / eq} ;	2. IGNORE vaccine causes harm	(2)

Question Number	Answer	Additional Guidance	Mark
7 (h)	1. mutation ; 2. idea that resistant organisms survive ; 3. pass on {gene / allele} to offspring ; 4. number of resistant organisms increases / frequency of {gene/ allele} increases / eq ; 5. reference to selection ;	IGNORE converse	(3)

Question Number	Answer	Additional Guidance	Mark
7 (i)	1. always acceptable to use animals / eq ; 2. regardless of suffering / animals have no rights / animal rights not as important as human rights / eq ; OR 3. never acceptable to use animals / eq ; 4. regardless of possible benefit to humans / animals have rights / animal rights are as important as human rights / humans are responsible for animal well-being / eq ;		<b>(2)</b>

Question Number	Answer	Additional Guidance	Mark
7 (j)	use animals providing there is (human) benefit / idea that it is wrong to use animals for testing but there may be circumstances when it is acceptable / idea of a balance between animal suffering and (human) benefit ;	ALLOW "minimise the suffering inflicted on animals used in research while maximising the scientific and medical gain"	<b>(1)</b>

Question Number	Answer	Additional Guidance	Mark
7 (k)	1. results would not be reliable ; 2. results would not be valid ; 3. idea that the conclusion would not be reliable ; 4. insufficient data for a statistical test ;	3. ACCEPT (conclusion) invalid / misleading / lacks confidence / based on chance / anomaly / error / eq	(2)

Question Number	Answer	Additional Guidance	Mark
7 (l)	1. reference to restriction (enzyme) ; 2. {gene / allele / DNA} inserted into {cells / neurones}; 3. reference to vector ; 4. liposomes / viruses / plasmid / gene gun / eq ;		(3)



Question Number	Answer	Additional Guidance	Mark
7 (m)*	<p>1. investigated development of <i>visual cortex</i> ;</p> <p>2. reference to <i>ocular (dominance) columns</i> ;</p> <p>3. reference to <i>critical window / critical period</i> ;</p> <p>4. period when <i>neural / neurone</i> connections made in the brain / eq ;</p> <p>5. idea of closing eye(s) to deprive vision ;</p> <p>6. idea of {less firing / fewer <i>impulses</i>} in <i>neurones</i> in closed eye(s) ;</p> <p>7. loss of {<i>neurones / synapses / axons</i>} / eq ;</p> <p>8. idea that closing eye {before critical period / newborn / one week old / very young / before eyes normally open} has no effect on vision / eq ;</p> <p>OR</p> <p>9. if eye closed {4 to 5 weeks / during critical period} become blind ;</p> <p>OR</p> <p>10. closing eye {after 4 months / after critical period / in older animals} has no effect on vision / eq ;</p>	<p><b>QWC Emphasis on spelling of technical terms.</b></p> <p>Penalise spelling errors once only</p>	<b>(5)</b>

**Total 30 marks**

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