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Mark Scheme (Results)

January 2017

Pearson Edexcel
International Advanced Subsidiary 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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
 - ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
 - iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

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.

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1(a)(i) | <p>The only correct answer is A</p> <p>B is incorrect because intermembrane space is where protons accumulate</p> <p>C is incorrect because matrix is overall structure where reactions take place</p> <p>D is incorrect because outer mitochondrial membrane acts as a transport structure</p> | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1(a)(ii) | <p>The only correct answer is C</p> <p>A is incorrect because eukaryotic organelles have both nucleic acids-DNA and RNA</p> <p>B is incorrect because eukaryotic organelles have both nucleic acids-DNA and RNA</p> <p>D is incorrect because eukaryotic organelles have both nucleic acids-DNA and RNA</p> | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 1(a)(iii) | <p>The only correct answer is C</p> <p>A is incorrect because cristae is involved in oxidative phosphorylation</p> <p>B is incorrect because protons accumulate here</p> <p>D is incorrect because contains enzymes involved in ATP synthesis</p> | (1) |

| Question Number | Answer | Mark |
|------------------------|--|--|
| 1(a)(iv) | The only correct answer is B A is incorrect because used the incorrect calculation C is incorrect because used the incorrect calculation D is incorrect because used the incorrect calculation | (1) |

| Question Number | Answer | Mark |
|------------------------|---|--|
| 1(a)(v) | The only correct answer is C A is incorrect because has no visible ribosomes on surface B is incorrect because has no visible ribosomes on surface D is incorrect because has no visible ribosomes on surface | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|-------------------------------------|
| 1(b) | <ol style="list-style-type: none"> 1. idea of no / reduced chemiosmosis / electron transport chain / oxidative phosphorylation ; 2. less production of {reduced NAD / NADH} ; 3. idea of less active transport of hydrogen ions ; 4. fewer {H⁺ / hydrogen ions / protons} in intermembrane space ; 5. lower/less steep { concentration / electrochemical / proton / H⁺ } gradient ; 6. less diffusion of {H⁺ / hydrogen ions / protons } ; 7. reference to {stalked particles / ATP synthase} ; 8. the production of ATP will be reduced / eq ; | <p>ACCEPT 'no' in place of 'less' or 'reduced'</p> <p>MP1 ACCEPT 'ETC' for electron transport chain</p> <p>MP2 ACCEPT reduced FAD/FADH</p> <p>MP3 ACCEPT a description of active transport</p> <p>MP7 ACCEPT ATPase or ATP synthetase</p> | <p>Exp</p> <p>(5)</p> |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|----------------|
| 2(a) | 1. fMRI scan shows activity of { auditory cortex / brain } / eq ; 2. fMRI measures uptake of oxygen ; 3. idea that active area of brain gets more { blood / oxygen / oxygenated blood / uses oxygen } ; 4. idea that { oxyhaemoglobin / deoxyhaemoglobin } involved ; 5. more active area appears { light / white / bright / coloured / eq } ; 6. idea that if habituation occurs then brain activity falls with repeated stimulus ; | MP3 ACCEPT converse MP3 and 4. "Active area has more oxyhaem/less deoxyhaem" gets MP3 AND MP4 MP5 ACCEPT converse MP6 ACCEPT converse | Exp (5) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 2(b) | The only correct answer is C A is incorrect because calcium channels not found here B is incorrect because calcium channels not found here D is incorrect because habituation involves a decrease in response | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|--------------------------|
| 3(c) | 1. { binds to / blocks / eq } sodium (ion) channels ; 2. no sodium ions diffuse in / eq ; 3. no depolarisation ; 4. no {action potential / impulse / electrical activity} in (motor) neurones ; 5. reduced muscle contraction ; | | Exp (4) |

| Question Number | Answer | Additional guidance | Mark | | | | | | |
|-----------------------|--|---|------------------------|----------------|---|-----------------------|---------------------------------------|--|-------------------------------|
| 4(c) | <table border="1"> <thead> <tr> <th>Symptom</th> <th>Part of brain affected</th> </tr> </thead> <tbody> <tr> <td>loss of vision</td> <td>visual cortex / occipital lobe / cerebral hemisphere / cerebral cortex / cerebrum ;</td> </tr> <tr> <td>difficulty in walking</td> <td>cerebellum / cerebrum / motor cortex;</td> </tr> </tbody> </table> | Symptom | Part of brain affected | loss of vision | visual cortex / occipital lobe / cerebral hemisphere / cerebral cortex / cerebrum ; | difficulty in walking | cerebellum / cerebrum / motor cortex; | | Grad (2) |
| | Symptom | Part of brain affected | | | | | | | |
| | loss of vision | visual cortex / occipital lobe / cerebral hemisphere / cerebral cortex / cerebrum ; | | | | | | | |
| difficulty in walking | cerebellum / cerebrum / motor cortex; | | | | | | | | |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------------------------------|
| 4(d) | <p>1. both parents are { heterozygous / carriers } ;</p> <p>2. child inherits one recessive allele from { each parent / both parents } OR child is homozygous recessive ;</p> | <p>ACCEPT genetic diagram or Punnet square for both MP1 and MP2</p> <p>MP1 DO NOT ACCEPT 'may be'</p> <p>MP2 DO NOT ACCEPT 'gene'</p> | Exp (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|-------------------------------------|
| *5(b) | <p>QWC -Spelling of technical terms must be correct and answer must be organised in a logical sequence</p> <p>1. less able to hold breath after exercise compared to deep breathing ;</p> <p>2. exercise increases CO₂ ;</p> <p>1. deep breathing reduces CO₂ ;</p> <p>4. reference to change in { pH / formation of carbonic acid / formation of hydrogen ions } ;</p> <p>5. reference to chemoreceptors ;</p> <p>6. reference to { medulla / ventilation centre / carotid body / aortic body } ;</p> <p>7. reference to impulses ;</p> <p>8. contraction of { diaphragm / intercostal muscles } ;</p> | <p>QWC-emphasis is for clarity of expression</p> <p>MP1 ACCEPT converse</p> <p>MP2 IGNORE fall in O₂</p> <p>MP4 change correctly related to either exercise or deep breathing</p> | <p>Exp</p> <p>(6)</p> |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 5 (c)(i) | <p>The only correct answer is C</p> <p>A is incorrect because is a miscalculation</p> <p>B is incorrect because is a miscalculation</p> <p>D is incorrect because is a miscalculation</p> | (1) |

| Question Number | Answer | Additional Guidance | Mark |
|-----------------|--|--|-------------------------------------|
| 5(c) (ii) | <ol style="list-style-type: none"> 1. the volume exhaled by non-smokers is higher than the volume exhaled by smokers ; 2. credit comparative use of data ; 3. idea that non-smokers breathe out faster than smokers ; 4. non-smokers level out sooner / graph plateaus earlier than smokers / eq ; | <p>MP1 ACCEPT 'FEV1 is higher for non-smokers'</p> <p>ACCEPT converse for all MPs</p> | <p>Exp</p> <p>(3)</p> |

Total 12 marks

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|------------------------------|
| 6(a) | 1. gene for pyrethrin synthesis { removed / eq } from flowers ; 2. (using) restriction enzyme / endonuclease ; 3. use of vector / named vector ; 4. use of (DNA) ligase (for joining gene to plasmid) ; 5. idea of culturing yeast cells (to produce pyrethrin) ; | MP1 ACCEPT 'DNA' for 'gene' MP3 e.g. virus, liposome, plasmid | Exp (4) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------------------------|
| 6(b) | 1. idea that (protein) channels are different ; 2. idea that pyrethrin cannot bind ; 3. idea of metabolised in mammals ; 4. idea of dilution in mammals ; | | Exp (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|-------------------------------|
| 6(c) | 1. circular muscles contract ; 2. radial muscles relax ; | | Grad (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|----------------|
| 6(d) | <ol style="list-style-type: none"> idea that increasing concentration kills more flies ; more of species A killed (at a lower concentration) than species B in pyrethrin ; more species B killed (at a lower concentration) than species A in organochlorine ; { 100% / all killed } at { lower concentration / 4.4 } in pyrethrin / at { higher concentration / 5.2 } with organochlorine ; | <p>ACCEPT converse for MPs 2 and 3</p> <p>MP4 ACCEPT + or - 0.1</p> | Exp (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|----------------|
| 6(e) | <ol style="list-style-type: none"> idea of { less / slower / poor / stunted / inhibited / eq } growth ; { less / no } { cell elongation / phototropism } ; | | Exp (2) |

Total 13 marks

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|--------------------|
| 7(a) | 1. idea of not introducing (new) pathogens / eq ; 2. risk of { disease / infection / named example } ; 3. idea of the blood being a complete match ; 4. no { immune response / rejection / transfusion reaction } ; | | Exp (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|--------------------|
| 7(b) | 1. one person tested / no repeats ; 2. idea that performance also depends on muscle fibre type ; 3. type of training is unspecified ; 4. idea that { other factors / named factor } not controlled ; | MP4 e.g. diet, gender, drug use | Exp (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|---------------------|
| 7(g) | idea that { two substances / IGF-1 and HGH } work together to { improve / enhance / eq } an effect ; | | Grad (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|--------------------|
| 7(h) | <ol style="list-style-type: none"> 1. { virus / HIV } in T helper cells (introduced into recipient) ; 2. idea that HIV will burst out of these T helper cells ; 3. and infect the T helper cells of the recipient ; 4. reduce numbers of T helper cells / destroys T helper cells ; 5. resulting in the development of { AIDS / infection / eq } ; | MP5 ALLOW named infection e.g. pneumonia | Exp (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|-------------------------------------|
| *7(i) | <p>QWC - Spelling of technical terms must be correct and answer must be organised in a logical sequence</p> <ol style="list-style-type: none"> 1. idea that neurotransmitter { remains / increases in concentration / accumulates } in synapse ; 2. neurotransmitter binds to receptors ; 3. on postsynaptic { membrane / neurone } ; 4. sodium (ion) channels open ; 5. sodium ions enter postsynaptic neurone ; 6. reference to depolarisation ; 7. idea that { impulses / action potentials } { continue / increase in frequency } ; 8. increase in mental alertness ; | <p>QWC emphasis is for logical sequence</p> <p>MP1 DO NOT ACCEPT 'stops reuptake'</p> | <p>Exp</p> <p>(6)</p> |

Total 30 marks

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