

Mark Scheme (Results)

January 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.

| Question Number | Answer | Mark |
|------------------------|------------------|-------------|
| 1(a)(i) | D - a spirometer | (1) |

| Question Number | Answer | Mark |
|------------------------|-------------------------|-------------|
| 1(a)(ii) | A - 0.5 dm ³ | (1) |

| Question Number | Answer | Mark |
|------------------------|---------------------------------|-------------|
| 1(a)(iii) | A - 3 breaths min ⁻¹ | (1) |

| Question Number | Answer | Mark |
|------------------------|---|-------------|
| 1(a)(iv) | D - ventilation centre more sensitive to carbon dioxide | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 1(b) | <ol style="list-style-type: none">1. idea that (rate of) diffusion reduced ;2. idea that { difference in concentration / concentration gradient } is reduced ;3. idea of smaller { surface / area } (of aveoli) ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------|
| 1(c) | <ol style="list-style-type: none">1. idea that { core / blood / body } temperature increases ;2. reference to { hypothalamus / heat loss centre / thermoregulation centre / thermoreceptors / temperature receptors } ;3. idea that nerves send { impulses / action potentials } to sweat glands ; | | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 2(a) | C - positive phototropism to light from the left | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 2(b)(i) | 1. idea of movement against a concentration gradient ; 2. idea that { ATP / energy / pumps } needed ; | IGNORE along / down / from low concentration gradient to high concentration gradient | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|------------|-------------------------------|------|
| 2(b)(ii) | hydrogen ; | ACCEPT 'H' or 'H bond' | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 2(b)(iii) | 1. cells absorb water ; 2. by osmosis ; 3. idea that cells { elongate / grow / stretch / expand / eq } ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 2(c)(i) | <ol style="list-style-type: none"> idea of no change between 10^{-6} and 10^{-4} ppm idea of { optimum at 1 ppm / increase to 1 ppm / decrease after 1 ppm } ; idea of inhibition { between 10^2 and 10^3 ppm / at 10^3 } ; | | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 2(c)(ii) | <ol style="list-style-type: none"> idea of { repeat / use many sections / more than one coleoptile / finding mean / finding average } ; idea that sections must be left for the same time ; idea that sections must be from same { age / source / species / eq } ; idea that light intensity is controlled ; idea that temperature is controlled ; idea of same volume of IAA ; | <p>IGNORE same length</p> <p>IGNORE same minerals / humidity</p> <p>3. IGNORE same plant</p> <p>6. IGNORE amount</p> | (5) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 3(a) | A - drugs affect selection of mutations in parasites | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 3(b) | <ol style="list-style-type: none"> 1. phospholipid bilayer drawn correctly ; 2. protein channel spanning whole membrane and correctly indicated ; | <ol style="list-style-type: none"> 1. phospholipids must have two tails and be aligned correctly 2. Allow solid channel | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|------|
| 3(c)(i) | <ol style="list-style-type: none"> 1. infected with hookworms ; 2. given non GM bacteria ; | <ol style="list-style-type: none"> 2. Do not accept 'not given GM bacteria' | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 3(c)(ii) | <ol style="list-style-type: none"> 1. idea of difference in original number (of hookworms) and number (of hookworms) in treated hamsters ; 2. divided by original number (of hookworms) and multiply by 100 ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------|
| 3(d) | 1. idea of testing for { safety / non-toxicity / side effects / eq } ; 2. idea of testing for efficacy ; | | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 4(a) | D - oxidative phosphorylation in the mitochondria | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------|
| 4(b)(i) | <ol style="list-style-type: none"> 1. idea of insufficient oxygen supply ; 2. reference to glycolysis ; 3. idea that reduced NAD is produced ; 4. idea that pyruvate is converted to lactate ; 5. idea that conversion of pyruvate involves oxidation of reduced NAD ; | | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|------|
| 4(b)(ii) | <ol style="list-style-type: none"> 1. idea of { increased oxygen supply / more aerobic respiration / less anaerobic respiration } ; 2. idea of increased { stroke volume / cardiac output / capillarisation / 3. idea of increased { ventilation / gas exchange / vital capacity } ; | <p>Allow converse</p> <p>'more oxygenated blood' gains Mp1 and Mp2</p> | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---------------------------|---|------------|
| 4(c)(i) | NADH / reduced NAD / eq ; | Allow NADH + H ⁺ NADH ₂ | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------|
| 4(c)(ii) | <ol style="list-style-type: none">1. (molecule Y is) pyruvate ;2. converted to acetyl CoA / enters link reaction / enters Krebs cycle / converted to carbon dioxide and water ;3. converted to glucose ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--------------------------------------|------|
| 5(a) | 1. idea of increase in number of mitochondria ; 2. idea that the increase is greater with more weeks of training ; | 1. Allow positive correlation | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 5(b)(i) | 1. difference between high and low value divided by low value ; 2. answer between 36.36 and 47.61 ; | Correct answer with no working gains TWO marks 1. Allow correct method with incorrect values low value range of 2.1 to 2.2 and high range value of 3.0 to 3.1 | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|------------|
| *5(b)(ii) | <p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. reference to cristae ; 2. reference to oxidative phosphorylation ; 3. reference to electron transport chain ; 4. idea of electrons passed along carriers ; 5. idea that { hydrogen ions / H⁺ / protons } moved to intermembrane space ; 6. idea of { hydrogen ions / H⁺ / proton / electrochemical / concentration } gradient produced ; 7. reference to { chemiosmosis / stalked particles / ATPase } ; 8. idea that more ATP synthesised ; | <p>(QWC emphasis on logical sequence)</p> <p>3. Allow ETC</p> | (6) |

| Question Number | Answer | Mark |
|-----------------|----------|------|
| 6(a)(i) | A - bone | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 6(a)(ii) | B - they contain collagen making them inelastic | (1) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 6(b) | 1. $(30 \div 100\,000) \times 65\,000\,000$; 2. 19 500 ; | Correct answer with no working gains TWO marks Allow one mark for any correct calculation or correct answer in working | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|-----------------------|------------|
| 6(c)(i) | 1. idea that failure rate { allograft / donor / different person / eq } is higher ; Plus TWO from: 2. idea of { immune response / rejection / antibody production / eq } with allografts ; 3. idea of { non-self / foreign antigens / different antigens / eq } ; 4. idea of disease transmission likely with allografts ; | Allow converse | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------|
| 6(c)(ii) | 1. age of patients ; 2. ethnicity of patients ; 3. idea of sample size ; 4. severity of torn ligaments ; 5. statistical analysis ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|-----------------------------------|------------|
| 6(c)(iii) | 1. idea that procedure is less invasive ; 2. idea of less pain after operation ; 3. idea of faster { healing / recovery } ; 4. idea that there will be { less scarring / better aesthetics / eq } ; 5. idea of reduced risk of infection ; | 1. e.g. fewer / smaller incisions | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------------|
| 7(a) | <ol style="list-style-type: none"> 1. idea of low levels of { neurotransmitter / serotonin / dopamine / noradrenaline } ; 2. idea of reduced depolarisation of postsynaptic membrane ; 3. idea of fewer { impulses / action potentials } in postsynaptic { membrane / neurone } ; | 2. ACCEPT receptors on postsynaptic membrane not stimulated | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|-------------------------------------|------------|
| 7(b) | <ol style="list-style-type: none"> 1. reference to bleaching (of rhodopsin) ; 2. idea of change { to opsin and retinal / cis-retinal to trans-retinal / trans-retinal formed } ; 3. idea of { sodium (ion) channels close / reduced permeability to sodium (ions) } ; 4. idea that { sodium (ion) pump continues / active transport continues to move sodium (ions) out } ; | IGNORE reference to segments | (4) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---|------------|
| 7(c) | <ol style="list-style-type: none"> 1. sodium (ion) channels open ; 2. sodium (ions) enter { neurone / axon } ; 3. idea of { depolarisation / potential difference reversed / more positive inside / becomes +30 to +40 mV inside } ; 4. idea that { impulse / action potential } is produced ; | <p>Ignore events at synapse</p> <p>2. Ignore enter membrane</p> | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|--|------------|
| 7(d) | <ol style="list-style-type: none"> 1. line drawn starting between -70 mV and -80 mV and increasing to +30 mV or above ; 2. line drawn showing hyperpolarisation below starting resting potential ; | If several action potentials drawn, mark first one | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|---------------------|------------|
| 7(e) | <ol style="list-style-type: none"> 1. idea that epinephrine binds to receptor on membrane ; 2. idea of { (secondary) messenger molecule / cAMP } ; 3. reference to protein kinase cascade ; 4. reference to transcription factor ; 5. idea that { gene switched on / gene activated / mRNA synthesised / RNA polymerase involved } | | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|--|-----------------------|------------|
| 7(f) | <ol style="list-style-type: none"> 1. idea that firing of neurones { require energy / respire } ; 2. idea of { increased blood flow / oxyhaemoglobin / deoxyhaemoglobin } involved ; 3. idea of { radio waves / signals } involved ; 4. active area of brain { light up / visible / bright / white / colour / eq } ; | Allow converse | (3) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 7(g) | 1. idea of using light to stimulate (GM dopamine) neurones (when grandchildren present); 2. idea that dopamine involved ; 3. idea that { depression reduced / feelings of reward increased } ; 4. reference to conditioning ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 7(h) | 1. idea that dopamine is released at synapse ; 2. idea of { depolarisation / impulses / action potential } at postsynaptic {membrane / neurone } ; | | (2) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|--|------------|
| *7(i) | <p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. idea that fast twitch fibres are stimulated more than slow twitch fibres ; 2. idea that fast twitch fibres contain <i>few mitochondria</i> ; 3. idea that fast twitch fibres contain <i>few capillaries</i> ; 4. idea that fast twitch fibres <i>fatigue</i> quickly ; 5. idea that fast twitch fibres contain little <i>myoglobin</i> ; 6. idea of { less <i>aerobic</i> respiration / more <i>anaerobic</i> respiration } ; 7. reference to <i>lactate / lactic acid</i> ; | <p>QWC emphasis on spelling of technical terms</p> <p>Penalise once only</p> <p>Allow converse for Mps 2 to 7 if refer to slow twitch fibres</p> | (5) |

| Question Number | Answer | Additional guidance | Mark |
|-----------------|---|---|------------|
| 7(j) | <ol style="list-style-type: none">1. idea of using { gene / DNA / allele } (for ion channel protein) ;2. reference to use of restriction enzyme ;3. reference to the use of ligase ;4. reference to vector ;5. named example of vector ; | <ol style="list-style-type: none">2. Allow endonuclease 5. E.g. plasmid / virus / liposome / (micro)injection / microprojectile | (4) |

