# Mark Scheme (Results)

Summer 2017

Pearson Edexcel International Advanced Level
In Biology (WBI05) Paper 01
Energy, Exercise and Co-ordination

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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)** | The correct answer is **C** - R<br><br>A is incorrect because the pons controls breathing<br>B is incorrect because the pituitary gland releases hormones<br>D is incorrect because the cerebellum co-ordinates movement | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(ii)** | The correct answer it **C** - S<br><br>A is incorrect because the pons controls breathing<br>B is incorrect because the pituitary gland releases hormones<br>D is incorrect because the medulla controls heart rate | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(iii)** | The correct answer it **D** - T<br><br>A is incorrect because the pons controls breathing<br>B is incorrect because the pituitary gland releases hormones<br>C is incorrect because the cerebellum co-ordinates movement | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(b)** | 1. serotonin is a neurotransmitter / eq ;<br><br>2. idea that { low levels / lack } of serotonin linked to **depression** ; | **MP1 ACCEPT** correct description of a neurotransmitter | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1 (c)** | 1. nature involves genes / eq ;<br><br>2. nurture involves environment / eq ; | **MP2 ACCEPT** named environmental factor | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2 (a)** | 1. pests / eq ;<br><br>2. disease / eq ;<br><br>3. competition ;<br><br>4. pollinating insects ; | **MP1 ACCEPT** herbivores / grazers / parasites / trampling<br>**MP1 IGNORE** predators | **2** |

| Question Number | Answer | Mark |
|---|---|---|
| **2 (b)** | The correct answer is **D** – vector<br><br>A is incorrect because a drug is not an artificial chromosome<br>B is incorrect because a plasmid is not an artificial chromosome<br>C is incorrect because a transcription factor is not an artificial chromosome | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2 (c)** | 1. carbon dioxide { is not removed from blood / level in blood increases / level in blood is high } ;<br><br>2. carbonic acid increases / pH decreases (due to increase in $CO_2$ ) ;<br><br>3. ( change ) not detected by chemoreceptors ;<br><br>4. idea that { medulla / ventilation centre } { is not stimulated / receives fewer impulses } ;<br><br>5. idea of { fewer / no } impulses to muscles ( involved in breathing ) ;<br><br>6. { no / decreased } { contractions / ventilation } ( causes death ) ; | **MP4 ACCEPT** respiratory centre / inspiratory centre<br><br>**MP5 ACCEPT** diaphragm / intercostal muscles | **4** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3 (a)** | 1. darkness converts Pfr to Pr / light converts Pr to Pfr ;<br><br>2. { more Pr / less Pfr } in **dark** ;<br><br>3. more IAA present in the dark ;<br><br>4. IAA { softens / eq } cell walls ;<br><br>5. uptake of water by osmosis ;<br><br>6. causes **cell** elongation ; | **ACCEPT** auxin for IAA<br><br>**MP3 DNA** converse<br><br>**MP4 IGNORE** refs to permeability<br><br>**MP6 IGNORE** refs to enlargement / growth / division | **4** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| ***3 (b)** | **Glycolysis:**<br><br>1. produces phosphorylated compounds / named example ;<br><br>2. ( substrate-level ) phosphorylation of ADP ;<br><br>3. produces { reduced NAD / NADH / $NADH^+$ / $NADH_2$ } ;<br><br>**Krebs:**<br><br>4. produces { reduced NAD / eq } **and** { reduced FAD / eq } ;<br><br>5. ( reduced coenzymes ) supply electrons to { ETC / electron carriers } ;<br><br>6. ( substrate-level ) phosphorylation of ADP ;<br><br>7. in the process of oxidative phosphorylation / chemiosmosis ;<br><br>8. reference to ATP synthase / stalked particles ; | QWC emphasis is clarity of expression.<br><br>**MP2 MP6**<br>**ACCEPT** ADP + Pi $\rightarrow$ ATP<br>**IGNORE** refs to "ATP synthesis"<br><br>**MP3 DNA** NADP / NADPH / $NADPH^+$<br><br>**MP8 ACCEPT** ATPase / ATP synthetase | **6** |

| Question Number | Answer | Mark |
|---|---|---|
| **4 (a) (i)** | The correct answer is **C** - high concentration of myoglobin low concentration of myoglobin<br><br>A is incorrect because the converse is correct<br>B is incorrect because the converse is correct<br>D is incorrect because the converse is correct | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **4 (a) (ii)** | The correct answer is **B -** calcium ions are released from the sarcoplasmic reticulum<br><br>A is incorrect because calcium ions do not form cross bridges<br>C is incorrect because sodium ions do not form cross bridges<br>D is incorrect because sodium ions are not released from the sarcoplasmic reticulum | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (b) (i)** | 1. both increase in volume / have a lower percentage decrease ( between 4 to 19 days ) ;<br><br>2. both muscles change by { same / similar } percentage ;<br><br>3. error bars suggest difference in S and G not significant ;<br><br>4. credit correct manipulation of figures ; | **MP4** "both change by 6%" MP2 and MP4 | **2** |

| Question | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (b) (ii)** | 1. gene for actin switched on ;<br><br>2. increased { transcription / synthesis of mRNA } ;<br><br>3. ( increased ) { translation / synthesis of actin } ; | | **2** |

| Question | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (b) (iii)** | line for actin correctly labelled ; |  | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(b) (iv)** | **Two** from:<br><br>myosin ;<br><br>troponin ;<br><br>tropomyosin ; | Any other response negates mark. | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(c)** | 1. idea that astronauts { fatigue quickly / cannot exercise for long periods } ;<br><br>**Two** from:<br><br>2. { less aerobic / more anaerobic } respiration ;<br><br>3. less ATP produced ;<br><br>4. fewer mitochondria ;<br><br>5. lactic acid produced ; | **MP5 ACCEPT** lactate | **3** |

Total 11 marks

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **5 (a)** | 1. reference to { pump / active transport } ;<br><br>2. idea that sodium ions move out of cell **and** potassium ions move into cell ;<br><br>3. membrane is permeable to potassium ions / eq ;<br><br>4. membrane is not permeable to sodium ions / eq ;<br><br>5. membrane is not permeable to organic anions / eq ; | **MP2 DNA** refs to diffusion<br>**MP2 ACCEPT** $Na^+$ $K^+$<br>**MP2 IGNORE** refs to numbers of ions | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **5(b)(i)** | 1. metaflumizone { closes / blocks } sodium ( ion ) channels ;<br><br>2. **no** influx of sodium ions ;<br><br>3. **no** { depolarisation / action potential / impulses } ;<br><br>4. **no** { stimulation / contraction } of muscles ; | **MP1 ACCEPT** channels do not open<br><br>**MP3 IGNORE** signals | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **5(b) (ii)** | 1. use a range of five concentrations ;<br>2. standardisation of the ant ;<br>3. method to assess mobility ;<br>4. large sample size ;<br>5. named variable controlled ;<br>6. repeat with a narrower range of concentrations ; | **IGNORE** any reference to ethics<br>**MP1** minimum of 5<br>**MP2** eg size, age, gender, species.<br>**MP3** eg observation<br>**MP4** minimum 10 if number stated<br>**MP5** eg time, temperature, volume / pH of solution, | **4** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **5(b)(iii)** | 1. mutation in the { DNA / gene / allele } ;<br><br>2. idea that different protein produced ;<br><br>3. enzyme that breaks down metaflumizone ;<br><br>4. idea that metaflumizone no longer { blocks / binds to} channel; | | **3** |

| Question Number | Answer | Mark |
|---|---|---|
| **6 (a)** | The correct answer is **C –** hypothalamus<br><br>A is incorrect because the cerebellum is involved in the co-ordination of movement<br>B is incorrect because the cerebrum is involved in thinking/learning<br>D is incorrect because the medulla oblongata is involved in the control of heart rate | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6 (b) (i)** | 1. core body temperature higher ( than skin temperature ) before eating ice / eq ;<br><br>2. core body temperature falls **and** skin temperature rises **after** eating ice ; | **MP1 ACCEPT** converse | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(b)(ii)** | 1. heat loss decreases (after eating ice) ;<br><br>2. ice reduces core body temperature ;<br><br>3. (reduced) temperature detected by<br>{ hypothalamus / thermoregulatory centre / heat gain centre } ;<br><br>4. nerve impulses / eq ( from hypothalamus / eq ) ;<br><br>5. sweat glands { inhibited / produce less sweat } ;<br><br>6. less evaporation of water ;<br><br>7. reference to latent heat of {vaporisation / evaporation } ; | **MP6 DNA** sweat | **4** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(c)** | 1. idea of reduction in { activity of enzymes / kinetic energy } ;<br><br>2. idea that hypothermia affects { active transport / pumping } of { protons / $H^+$ / hydrogen ions } ;<br><br>3. out of matrix / through inner membrane / to intermembrane ( space ) ;<br><br>4. chemiosmosis requires a {concentration / electrochemical / pH / proton} gradient ;<br><br>5. idea that hypothermia reduces diffusion ( down this gradient ) ;<br><br>6. less energy released by movement of { protons / eq } ;<br><br>7. through { ATP synthase / stalked particles } ; | **MP4 ACCEPT** eq to protons | **5** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(a)** | there is **no significant difference** in the number of people who quit smoking normal cigarettes when using { e-cigarettes / nothing / NRTs / eq } ; | | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(b)** | 1. idea that health problems take a long time to show ;<br><br>2. people chosen will represent different { ages / gender / ethnicity } ;<br><br>3. placebo needed to reduce { psychological effects / bias } ; | | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| ***7(c)(i)** | 1. nicotine { attaches / binds } to receptors on cells of the adrenal gland ;<br><br>2. depolarisation of cell membrane ;<br><br>3. calcium ion channels open ;<br><br>4. influx of calcium ions ;<br><br>5. vesicles {move to / fuse with } ( adrenal ) cell membrane ;<br><br>6. adrenaline is released into blood ;<br><br>7. adrenaline travels to the heart ;<br><br>8. increased activity of the SAN ; | QWC emphasis on logical sequence<br><br>**MP6 ACCEPT** exocytosis | **6** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(c) (ii)** | 1. {increase in / high } blood pressure ;<br><br>2. damage to endothelium ;<br><br>3. reference to inflammatory response ;<br><br>4. details of inflammatory response ; | **MP4** eg cholesterol / WBCs / atheroma | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(d)** | 1. need to repeat ;<br><br>2. idea of peer review ;<br><br>3. idea that mice may respond differently from humans ;<br><br>4. dosage of drug might be too high in mice ; | | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(e)** | 1. idea of an increased risk of { infection / disease } ;<br><br>2. less phagocytosis / description of phagocytosis;<br><br>3. less antigen presentation to **T-helper** cells ; | **MP1 DNA** illness | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(f)** | Correct answer gains two marks<br><br>1. ( 4353 x 0.102 ) = 444 ;<br><br>2. ( 444 x 0.005 ) = 2 ; | **MP1 IGNORE** d.p. | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(g)** | 1. no { MAO inhibitors / MAO activity } in e-cigarettes ;<br><br>2. therefore reduced { adrenergic / dopaminergic } activity ;<br><br>3. idea of less reward behaviour ; | **ACCEPT** converse points for nicotine from burnt tobacco products | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(h)** | 1. ( neurotransmitter is ) **dopamine** ;<br><br>2. idea of { binding / attaching } to receptors in postsynaptic membrane ;<br><br>3. depolarisation of postsynaptic membrane;<br><br>4. generation of { action potentials / nerve impulses } | **MP2 DNA** neurone | **3** |

| Question Number | Answer | Mark |
|---|---|---|
| **7(i)(1)** | The correct answer is **D** - tidal volume during expiration<br><br>A is incorrect because the air left is the residual volume<br>B is incorrect because FVC is a volume not a rate<br>C is incorrect because concentration of CO2 is irrelevant to lung volumes | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(i)(2)** | 1. less { exhalation / air forcibly expelled } ;<br><br>2. narrowed { airways / bronchioles } / bronchoconstriction ;<br><br>3. {reduced elasticity / loss of alveoli} ;<br><br>4. caused by nicotine / chemicals in tobacco smoke ; | | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7(j)** | axes labelled correctly ( x-axis concentration and y-axis cytotoxicity ) and line showing positive correlation ; | **IGNORE** units | **1** |

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