Mark Scheme (Results)

October 2017

Pearson Edexcel International Advanced Level 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)	**B -** cerebral hemispheres The only correct answer is B A is not correct because the cerebellum is not involved in the ability to see C is not correct because the hypothalamus is not involved in the ability to see D is not correct because the medulla oblongata is not involved in the ability to see	**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	1. idea that they do not waste energy running away from {humans / unnecessary stimulus / harmless stimulus } ; 2. idea that there will be more energy to {run away from predators / use for another purpose } ; 3. idea that the warning signal will not be ignored if there is a predator ;	**2. Ignore** idea that they will be better adapted	**(2)**

Question Number	Answer	Mark
1(b)(i)	**A -** cerebellum The only correct answer is A B is not correct because the cerebral hemisphere is a different part of the brain C is not correct because the hypothalamus is a different part of the brain D is not correct because the medulla oblongata is a different part of the brain	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	1. idea that rats are living organisms and {using / harming / killing} them is wrong ; 2. idea that we need to carry out research and that this cannot be done on humans ; 3. the brain of a rat is similar to a human brain / eq ; 4. idea that rats are unable to give consent ;	**1. Allow:** idea that rats feel pain **Ignore:** reference to rats being badly treated **Ignore:** reference to animals having rights **Ignore:** unethical unless qualified **2. Ignore:** justification as gaining information unless qualified in terms of using primates/humans	**(2)**

Question Number	Answer	Additional guidance	Mark
1(c)	1. time between each stimulus / eq ; 2. duration of the stimulus / eq ; 3. {strength / type / eq} of the stimulus /eq ;	**Ignore:** reference to events at the synapse e.g. neurotransmitter release **Allow:** 'smell' instead of 'stimulus' in all marking points **1. Allow:** how often stimulus is given / frequency of stimulus	**(2)**

Question Number	Answer	Mark
2(a)	**D - M** The only correct answer is D A is not correct because J labels cartilage and not the cruciate ligament B is not correct because K labels the meniscus and not the cruciate ligament C is not correct because L labels cartilage and not the cruciate ligament	**(1)**

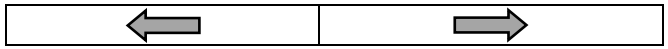
Question Number	Answer	Mark
2(b)(i)	**C -** springer The only correct answer is C A is not correct because the springer is the only dog breed that shows an increase at each age B is not correct because the springer is the only dog breed that shows an increase at each age D is not correct because the springer is the only dog breed that shows an increase at each age	**(1)**

Question Number	Answer	Mark
2(b)(ii)	**B -** rottweiler The only correct answer is B A is not correct because the greatest change in incidence is 38 % for the rottweiler C is not correct because the greatest change in incidence is 38 % for the rottweiler D is not correct because the greatest change in incidence is 38 % for the rottweiler	**(1)**

Question Number	Answer	Mark
2(b)(iii)	**A -** 1 The only correct answer is A B is not correct because only one statement, statement 2, is supported by the data C is not correct because only one statement, statement 2, is supported by the data D is not correct because only one statement, statement 2, is supported by the data	**(1)**

Question Number	Answer	Additional guidance	Mark
2(c)	1. reference to keyhole surgery ; 2. idea that this is done through small incisions ; 3. idea that surgeon watches procedure on a monitor ; 4. idea of using tendon (to replace ligament) ;	 **2. Allow:** through small holes **3. Allow:** use a camera	**(2)**

Question Number	Answer	Mark
3(a)(i)	**B** <table><tr><td>sensory</td><td>motor</td><td>relay</td></tr></table> The only correct answer is B A is not correct because P is a sensory neurone, Q a motor neurone and R a relay neurone C is not correct because P is a sensory neurone, Q a motor neurone and R a relay neurone D is not correct because P is a sensory neurone, Q a motor neurone and R a relay neurone	**(1)**

Question Number	Answer	Mark
3(a)(ii)	**D**  The only correct answer is D A is not correct because impulses move from the dendrites to the axon B is not correct because impulses move from the dendrites to the axon C is not correct because impulses move from the dendrites to the axon	**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	1. to transmit the nerve impulse across the synapse / eq ; 2. because the action potential cannot cross the gap ; 3. credit detail e.g. released from presynaptic neurone, diffusion across synapse, binding to receptors on post-synaptic membrane, released from vesicles, released by exocytosis ; 4. initiates an action potential in the post synaptic cell / eq ;	**1.Allow:** carries / transfer impulse across synapse **3.** must be about acetylcholine **4. Allow:** depolarisation of post synaptic membrane **Ignore:** generator potential	**(2)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	1. acetylcholinesterase is needed to release acetylcholine from receptors (on post-synaptic membrane) ; 2. idea of continuous {action potentials / stimulation} (in the post-synaptic cell) ; 3. the pre-synaptic cell will run out of acetylcholine / eq ;	**1. Allow:** acetylcholinesterase is needed to break down acetylcholine / acetylcholine concentrations in the synaptic cleft remain high / acetylcholine is not broken down **2. Ignore:** reference to continuous contraction	**(2)**

Question Number	Answer	Additional guidance	Mark
3(c)	1. idea of using a gene that confers resistance (to insects) ; 2. credit indication of what gene could code for ; 3. idea that gene would have to be {isolated from an insect-resistant plant / synthesised} ; 4. reference to use of a {vector / gene gun } (to introduce gene into plant cell) ; 5. idea of testing {plants / cells } for presence of gene ;	**2**. e.g. insect enzymes inhibitor, toxin, tough cell wall component **4. Allow:** Agrobacterium tumefaciens, Ti plasmid, T-DNA, plasmid, liposome in place of vector	**(4)**

Question Number	Answer	Additional guidance	Mark
4(a)(i)	1. indicating that 1% = 3 (bpm) ; 2. 9 (bpm) ;	Correct answer with no working gains 2 marks	**(2)**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	1. reference to cardiovascular control centre ; 2. nerve impulses transmitted down parasympathetic nerve ; 3. to the {SAN / sinoatrial node} ; 4. idea of decreasing the frequency of {signals / waves of excitation / eq} (from the SAN) ;	**1. Allow:** cardiac centre / medulla (oblongata) / cardiovascular centre **4. DO NOT ACCEPT** nerve impulses	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)	to generate heat energy (to raise the body temperature) / eq ;	Must be about producing heat not just to keep warm	**(1)**

Question Number	Answer	Additional guidance	Mark
4(c)(i)	1. increase in slow twitch muscle fibres ; 2. increase in fast twitch type I but decrease in type II / (total) decrease in fast twitch ;	**2.** Piece together	**(2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>4(c)(ii)</td><td>

Property	Slow twitch	Fast twitch
Myoglobin	more	less
Mitochondria	many	few
Glycogen	less	more
Capillaries	many	few
Myosin ATPase activity	low	high
Fibre diameter	small	large
Creatinine phosphate	low	high

;;;</td><td>Comparisons should be clear but do not need to be in the same sentence.</td><td>(3)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>4(c)(iii)</td><td>1. idea that the supply of oxygen is low ;

2. idea that fast twitch muscle cells respire anaerobically / eq ;

3. idea that shivering involves fast twitch fibres / is very rapid muscle contractions ;

4. more heat energy released when slow twitch contract ;</td><td></td><td>(2)</td></tr>
</table>

Question Number	Answer	Additional guidance	Mark
5(a)	maintenance of (steady) internal body conditions / eq ;	**Ignore:** maintain body's environment **Do not accept:** maintain body's external environment	**(1)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	1. idea of breaking bonds (between glucose molecules) using water ; 2. reference to 1-4 **and** 1-6 glycosidic bonds ;	2. **NOT** β	**(2)**

Question Number	Answer	Additional guidance	Mark
***5(b)(ii)**	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. during exercise the muscles need more ATP ; 2. during exercise { water / sodium } is lost by sweating ; 3. **adrenaline** more ATP produced / more pyruvate for the Krebs cycle / eq ; 4. **ACTH** increases the glucose in the blood stream / eq ; 5. **glucagon** increases the glucose in the blood stream / eq ; 6. **insulin** decrease {maintains the level of glucose in the blood stream / ensures glucose reaches the muscles / eq} ; 7. **aldosterone** maintains sodium to compensate for sodium lost in sweat ; 8. **ADH** maintains water in body to compensate for water lost in sweat / eq ;	QWC Emphasis on clarity of expression **6. Ignore** stimulates uptake of glucose from the blood	**(6)**

Question Number	Answer	Additional guidance	Mark
5(b)(iii)	1. idea that (some) hormones are proteins ; 2. idea that genes need to be switched on before hormones can be synthesised / eq ; 3. idea that transcription factors bind to {specific regions of DNA / promoter sequences / eq } ; 4. so that RNA polymerase binding can be controlled / transcription can be controlled / eq ; 5. idea that synthesis of insulin needs to be stopped ; 6. idea that transcription factors can switch off genes ;	**3. Allow:** correctly named region e.g. TATA box	**(4)**

Question Number	Answer	Additional guidance	Mark
6(a)	1. reference to rhodopsin in the rod (cells) ; 2. rhodopsin absorbs light ; 3. *cis*-retinal is converted into *trans*-retinal ; 4. (rhodopsin) splits into opsin and retinal ; 5. idea that rod cells become less permeable to sodium ions ; 6. resulting in {hyperpolarisation / generator potential} ; 7. idea that if stimulus is large enough an action potential is formed in the bipolar cell ; 8. idea of nerve impulse along optic nerve to brain ;	**3. Ignore**: unqualified reference to bleaching **4. Allow:** {sodium / cation} channels close	**(5)**

Question Number	Answer	Additional guidance	Mark
6(b)	1. idea that short dark period (*Hibiscus)* flowers / long dark period (*Hibiscus)* does not flower ; 2. reference to phytochrome ; 3. P_R absorbs {white / red / sun} light and becomes P_{FR} ; 4. in the dark P_{FR} (slowly) converts to P_R ; 5. idea that when there is a larger proportion of light to dark there will be {more P_{FR} / less P_R} ; 6. P_{FR} stimulates flowering ; 7. flash of light results in P_R being converted (quickly) into P_{FR} / eq ; 8. so {more P_{FR} / less P_R} so flowering does occur ;	1. **ACCEPT** day for light and night for dark **1. ACCEPT** converse e.g. long light period flowers **2.Ignore** P_R / P_{FR} **3. ACCEPT** P_{660} for P_R and P_{730} for P_{FR} **ALLOW** in the light P_R is converted to P_{FR} **5. Allow** when light period exceeds critical period enough P_{FR} produced **6. ALLOW** P_R inhibit flowering	**(5)**

Question Number	Answer	Additional guidance	Mark
7(a)	1. idea that myelin insulates the axon ; 2. without the myelin the nerve impulses are transmitted more slowly ; 3. idea that different neurones will be transmitting nerve impulses at different rates ;	**2. ALLOW**: saltatory conduction is disrupted / lost	**(2)**

Question Number	Answer	Additional guidance	Mark
7(b)	idea that the body's specific defence mechanism is attacking its own {tissues / cells} ;	**ALLOW** immune system	**(1)**

Question Number	Answer	Additional guidance	Mark
7(c)	1. idea that MRI {takes a picture / shows an image} of the brain ; 2. shows areas of {demyelination / eq} in the (brain / spinal cord) ;	1. **ACCEPT** organs / (soft) tissues / CNS in place of brain **2. ACCEPT** lesions	**(2)**

Question Number	Answer	Additional guidance	Mark
7(d)	1. genetic predisposition is a combination of alleles that increases the risk of developing a disease / eq ; 2. a genetic disorder is due to mutation of {DNA / genes / chromosomes} ;	**1. ALLOW** interaction of genes and environmental factors required for disorder **2. ACCEPT** faulty alleles	**(2)**

Question Number	Answer	Additional guidance	Mark
7(e)	1. idea that {pathogens / eq} are transmitted from one person to another more readily ; 2. credit a named mode of transmission ;	 **2.** e.g. skin to skin contact, inhalation **2. ALLOW** direct or physical contact	 **(2)**

Question Number	Answer	Additional guidance	Mark
7(f)	1. bacteria can damage {cells / tissues} ; 2. bacteria can release toxins / eq ; 3. idea that viruses can destroy cells ; 4. T killer cells destroy infected cells / eq ; 5. idea that some symptoms of disease are part of the body's response to infection ; 6. idea that they can adversely affect the immune system ;	 **5.** e.g. inflammation, increased temperature **6.** e.g trigger autoimmune response / immune suppression	 **(3)**

Question Number	Answer	Additional guidance	Mark
7(g)	1. idea that endurance exercise requires more ATP ; 2. (to release the energy) for the detachment of the myosin head from the actin ; 3. (most) ATP made by oxidative phosphorylation ; 4. oxygen is needed as a terminal electron acceptor / eq ; 5. so that the electron transport chain will continue to function ; 6. and reduced NAD can be oxidised ;	**4. ACCEPT** as hydrogen acceptor / H^+ acceptor **6. ACCEPT** reduced FAD can be oxidised	**(4)**

Question Number	Answer	Additional guidance	Mark
***7(h)**	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. use a large number of people ; 2. all the people are on the same diet / eq ; 3. one group receives the {antioxidant / dietary supplement} ; 4. one receives a placebo (which replaces antioxidants) ; 5. idea of a double-blind trial ; 6. idea of a long-term study ; 7. idea of monitoring incidence of {heart disease / cancer} ;	**QWC emphasis on logical sequence** **4. ACCEPT** description of placebo e.g. 'starch pill'	**(6)**

Question Number	Answer	Additional guidance	Mark
7(i)	idea that an enzyme's active site has to bind to the source of free radicals whereas a non-enzymatic antioxidant reacts directly with the source of the free radicals ;	**ALLOW** idea that enzyme antioxidants are specific – non enzyme antioxidants are non specific	**(1)**

Question Number	Answer	Additional guidance	Mark
7(j)	1. idea that other factors affect immunity ; 2. idea that the level of exercise is arbitrary ;	**2. ACCEPT** type of exercise is not known	**(2)**

Question Number	Answer	Additional guidance	Mark
7(k)	1. idea that figures 1 and 2 separate individuals into different groups ; 2. idea that the elite group in figure 2 {changes the shape of the curve / has a reduced infection rate } ;	**1. ALLOW** figure 1 does not have an elite athlete group	**(2)**

Question Number	Answer	Additional guidance	Mark
7(l)	1. bone marrow is a source of (adult) stem cells ; 2. these are pluripotent ; 3. that can differentiate into {leucocytes / blood cells} ;	 **2. ACCEPT** multipotent **3. ACCEPT** produce a named white blood cell e.g. neutrophils	**(3)**

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