Mark Scheme (Results)

June 2019

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

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please visit our website at www.edexcel.com.

Our website subject pages hold useful resources, support material and live feeds from our subject advisors giving you access to a portal of information. If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

June 2019
Publications Code WBI05_01_1906_MS

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)	A contraction initiated in a muscle cell The only correct answer is A *B is not correct because contraction does not start in a nerve cell* *C is not correct because myogenic is the process of contraction and not nerve impulses* *D is not correct because myogenic is the process of contraction and not nerve impulses and occurs in muscle cells*	**(1)**

Question Number	Answer	Mark
1(a)(ii)	B left ventricle The only correct answer is B *A is not correct because the left ventricle contracts with the greatest force* *C is not correct because the left ventricle contracts with the greatest force* *D is not correct because the left ventricle contracts with the greatest force*	**(1)**

Question Number	Answer	Mark
1(a)(iii)	C volume of blood ejected from the left ventricle in each beat multiplied by the heart rate The only correct answer is C *A is not correct because cardiac output is the volume of blood ejected from the left ventricle in each beat multiplied by the heart rate* *B is not correct because cardiac output is the volume of blood ejected from the left ventricle in each beat multiplied by the heart rate* *D is not correct because cardiac output is the volume of blood ejected from the left ventricle in each beat multiplied by the heart rate*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. (11.7 x 0.2) ÷ 3 = 0.78 (seconds per beat) ; 2. 76.9 (beats per minute)	**ALLOW** (11.8 x 0.2) ÷ 3 = 0.787 **ALLOW** 75.9 to 77 Correct answer with no working gains both marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	the distance between peaks would be shorter / eq ;	**ALLOW** more frequent peaks **IGNORE** more peaks	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(c)	1. receives impulses from cardiac control centre / eq ; 2. acts as the **pacemaker** ; 3. produces {waves of excitation / impulses / waves of depolarisation } ; 4. (which) {spread across atria /start contraction of atria / triggering atrial systole } ; 5. travels to the AVN ;	**ALLOW** cardiovascular centre / medulla (oblongata) **IGNORE** nerve impulses **ALLOW** excites the AVN	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. a donor tendon may be recognised as being foreign / eq ; 2. results in an immune response / eq ; 3. leading to rejection of the (graft / repair / tendon) ; 4. use of donor tendon requires immunosuppression ;	**ALLOW** converse statements **ALLOW** will not have the same antigens **ALLOW** damaging the (graft / repair / tendon)	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. idea of less invasive ; 2. idea of shorter recovery time ; 3. reduced risk of infection ;	**MP1 ALLOW** less blood loss / scarring / less painful **MP3 ALLOW** less antibiotic required	**(2)**

Question Number	Answer	Mark
2(c)(i)	C 2 A is not correct as two of the statements are correct – statements 2 and 3 B is not correct as two of the statements are correct – statements 2 and 3	**(1)**

	C is not correct as two of the statements are correct – statements 2 and 3	

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	1. idea of extending the study (to assess the success rate) ; 2. control {height / mass / BMI } ; 3. description of how successful outcome would be assessed ; 4. compare patients with a tendon of **7 mm** with patients with a tendon of a different diameter ;	**ALLOW** use a larger group / carry out the study for a longer period / repeat the study / include males **MP3** e.g joint flexibility / recovery of athletic ability / time repair lasts / time taken for (full) recovery	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)	B is the only correct answer [x] B 	When internal body conditions change, sensors detect	Effectors carry out responses that
---	---
increases or decreases in the condition	reverse the change | A is not correct as in negative feedback the effectors reverse the detected change C is not correct as in negative feedback the sensors detect increases and decreases in internal body conditions and the effectors reverse the detected change D is not correct as in negative feedback the sensors detect increases and decreases in internal body conditions		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. thermoreceptors detect an increase in (core) temperature ; 2. send impulses to the { hypothalamus / thermoregulatory centre / heat loss centre } ; 3. sends impulses to {effector organs / example of effector organ} ; 4. to increase heat loss ; 5. returns body temperature to set value ;	**ALLOW** comparison to a set point value **IGNORE** location of thermoreceptors **ALLOW** thermosensors / temperature receptors **IGNORE** medulla (oblongata) MP2 and 3 ignore signals e.g sweat glands / arterioles / erector (hair) muscles **ALLOW** temperature returns to normal	**(4)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(c)</td><td>
<table>
<tr><th>Hormonal coordination</th><th>Nervous coordination</th><th></th></tr>
<tr><td>use chemicals</td><td>use impulses</td><td>;</td></tr>
<tr><td>transported in blood</td><td>carried by neurones</td><td>;</td></tr>
<tr><td>slow</td><td>fast</td><td>;</td></tr>
<tr><td>long lasting response</td><td>short-lived response</td><td>;</td></tr>
<tr><td>widespread effects</td><td>localised effects</td><td>;</td></tr>
</table>
</td><td>ALLOW both use chemicals
ALLOW use electrical signals</td><td>(3)</td></tr>
</table>

Question Number	Answer	Mark
4(a)	B phytochrome The only correct answer is B *A is not correct because IAA (auxin) is a plant hormone produced in response to light stimulation but is not itself a photoreceptor* *C is not correct because retinal is a part of rhodopsin the photoreceptor in mammals* *D is not correct because rhodopsin is the photoreceptor in mammals*	**(1)**

Question Number	Answer	Mark
4(b)	A 0.26 a.u. The only correct answer is A *B is not correct because 0.82 – 0.56 = 0.26 a.u. not 0.26 nm* *C is not correct because 70 is the difference in wavelength between the two peaks not the difference in absorbance* *D is not correct because 70 is the difference in wavelength between the two peaks not the difference in absorbance*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	1. 9 and 2.8 / 6.2 ; 2. 221 (%) ; OR 1. 9 and 2.8 / 6.2 ; 2. 69 (%) ;	**ALLOW** 8.9 and 2.8 / 6.1 / 6.2 **ALLOW** 221.4 **ALLOW** 8.9 and 2.8 / 6.1 / 6.2 **ALLOW** 68.9 / 68.89 Correct answer with no working gains both marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(c)(ii)	1. far-red light inhibits germination / eq ; 2. increasing the intensity (of red light) increases the germination in (A or B) / eq ; 3. less red light is required at 48 h compared to 3 h / eq ; 4. 0 – 1 has less effect on germination compared to 1 – 4 a.u. OR 6 to 8 has less effect on germination compared to 8 to 9 a.u. ;	**ALLOW** growth in place of germination **ALLOW** batch B germinate at lower light intensity than batch A	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(c)(iii)	1. in (red) light P_R is converted to P_{FR} ; 2. greater the (red light) intensity the more P_{FR} produced / eq ; 3. in the {dark / far red light} P_{FR} converts back to P_R ; 4. P_{FR} stimulates germination / P_R inhibits germination ; 5. If P_{FR} is produced {too soon / at 3 h} it converts back to P_R before seed is ready to {respond to P_{FR} / germinate} ;	**ALLOW** P_{660} P_{730} **ALLOW** growth for germination	**(4)**

Question Number	Answer	Mark
5(a)(i)	B hydrolysis of ATP The only correct answer is B *A is not correct because the question asks about the energy stored in ATP not ADP* *C is not correct because phosphorylation of ADP requires energy* *D is not correct because ATP is not phosphorylated*	**(1)**

Question Number	Answer	Mark
5(a)(ii)	A NAD accepts electrons in glycolysis and in the Krebs cycle The only correct answer is A *B is not correct because it is NAD not reduced NAD that accepts electrons* *C is not correct because NAD is an electron acceptor in both glycolysis and Krebs cycle* *D is not correct because it is NAD not reduced NAD that accepts electrons and because NAD is an electron acceptor in both glycolysis and Krebs cycle*	**(1)**

Question Number	Answer	Additional Guidance	Mark
***5(b)(i)**	**QWC – emphasis is clarity of expression** 1. rate of lactate production decreased with duration of activity / eq ; 2. rate of ATP production decreased with duration of activity / eq ; 3. glycogen used increases with duration of activity /eq ; 4. as glycogen is converted to glucose ; 5. glucose is converted to lactate / eq ; 6. after 120 seconds glycogen used levels off / eq ; 7. anaerobic respiration { decreases / stops } ; 8. because glycogen has been (completely) used up ;		**(6)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	1. lactate produced during anaerobic respiration (accumulates in the blood) ; 2. oxygen is required to convert lactate back to { pyruvate / glucose } (after period of activity) ; 3. so that glycogen stores are replenished (in muscles) ; 4. oxygen is used in aerobic respiration ; 5. oxygen is used to oxidise reduced NAD (to produce water and NAD) ; 6. reference to other correct requirement for oxygen ;	**MP5 Allow** oxygen used in oxidative phosphorylation to regenerate NAD **MP6** e.g. repay oxygen debt / re-oxygenate myoglobin / aerobic respiration of breathing muscles / aerobic respiration of breathing muscles / increased metabolic rate	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)(iii)	1. (Krebs cycle) produces reduced NAD ;	**ALLOW** $NADH^+$ $NADH_2$ $FADH_2$ reduced FAD	
	2. electrons transferred to electron transport chain (from reduced NAD) ;	**ALLOW** ETC	
	3. reference to **oxidative phosphorylation** ;		
	4. (some ATP is produced) by substrate level phosphorylation ;	**ALLOW** some ATP is also produced directly ;	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	1. idea that it is a period of time during which a stimulus is required for (normal) development ; 2. period when rats must be exposed to low oxygen concentration ; 3. for development of the ventilation centre ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	1. group at 11 to 15 days showed a smaller increase in breathing rate (compared to the other groups / control) ; 2. group at 11 to 15 days showed a decreased tidal volume (compared to the other groups / control) ; 3. groups at { 1 to 5 / 21 to 25 days } showed a similar change to the { control group / to each other };		**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)	1. stretch receptors control the resting breathing rate ; 2. {chemosensors / chemoreceptors} detect {low oxygen / low pH / high CO_2} concentration (in blood) ; 3. send impulses to ventilation centre ; 4. ventilation centre sends more frequent impulses to the { diaphragm / intercostal muscles } ; 5. increasing frequency of contraction of (breathing muscles / intercostal muscles / diaphragm) ; 6. increasing the rate and depth of breathing ;	**ALLOW** respiratory centre / medulla **ALLOW** tidal volume for depth of breathing	**(4)**

Question Number	Answer	Additional Guidance	Mark
6(c)	1. could be beneficial to humans;	**ALLOW** (important) research that needs to be done	
	2. rats have similar {respiratory system / physiology} to humans ;	**ALLOW** similar brains	
	3. idea of rats being a useful animal model ;	e.g genetically similar to each other / relatively cheap / easily obtained / have been used in many studies / short life cycle	
	4. not ethical to do the investigation with babies ;	**ALLOW** humans	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)	1. neuromuscular system controls movement ;		
	2. nervous communication is rapid ;		
	3. quickly stops movement (of adversary or prey) ;	**ALLOW** slows down /paralyses / immobilises	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. act as a neurotransmitter ; 2. binds to postsynaptic { membrane / receptors } / opens sodium channels (in axons) ; 3. generating (more frequent) nerve impulses ; 4. in motor neurones ;	**ALLOW** prevent reuptake of neurotransmitter / stimulates release of neurotransmitter **ALLOW** keeps sodium (ion) channels open **ALLOW** continuous { action potentials / release of calcium ions from sarcoplasmic reticulum } **ALLOW** on muscle fibres	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(c)	1. the primary structure is the sequence of amino acids (in the protein) ; 2. primary structure determines the folding of the protein ; 3. so that hydrophilic {R groups / amino acids} will be on the outside of the protein ;	**ALLOW** tertiary structure / 3D shape **ALLOW** polar R groups	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(d)	QWC emphasis is logical sequence 1. use of bacterial {lawn / broth} ; 2. method of applying antibiotic and scorpion haemolymph to cultures ; 3. detail of incubation method ; 4. idea of testing against different microorganisms ; 5. idea of testing at different {concentrations / dilutions} ; 6. description of how comparison can be made ; 7. credit an example of aseptic technique ;	 **IGNORE** streak plates e.g incubate for 24 hours / incubate at 20^{o}C IGNORE temperatures above 35 ^{o}C or below 10 ^{o}C e.g. bacteria and fungi / different bacteria IGNORE viruses e.g larger {diameter / area} of clear zone indicates more effective antibiotic e.g. sterile petri dish / sterile media / flaming a wire loop	**(5)**

Question Number	Answer	Additional Guidance	Mark
7(e)	1. (blocking potassium ion channel) stops potassium ions leaving (the neurone) ; 2. the membrane {stays depolarised / cannot be repolarised} ; 3. {action potential / impulses } continuously generated ;	**IGNORE** potassium / K **ALLOW** K^+	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(f)	1. (random) mutation in DNA (in the American cockroach) ; 2. allele for resistance present (in American cockroach population) ; 3. selective pressure acts on (American cockroach population) ; 4. resulting in a change in allele frequency ; 5. allele conferring resistance / selective pressure not present for German cockroach ;	**ALLOW** natural selection takes place	**(4)**

Question Number	Answer	Additional Guidance	Mark
7(g)	1. calcium ions (entering presynaptic neurone) bind to vesicles containing neurotransmitter ; 2. causing vesicles to {move to / fuse with } presynaptic membrane ; 3. releasing contents into synapse ;	**ALLOW** release contents by exocytosis	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(h)	1. serotonin is a neurotransmitter ; 2. binds to pain receptors ; 3. on sensory neurones ; 4. impulses pass to the {brain / CNS} ;	**ALLOW** binds to post synaptic receptors / membrane	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(i)	1. using fMRI ; 2. compare images from control and stung individuals / observe changes in stung individual ;		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(j)	1. allow animal to be stung ; 2. while letting them hear the honeybee ; 3. (at time intervals) after being stung observe response to sound of honeybees ; 4. idea that if learning takes place avoidance response is quicker or stronger ;	 **ALLOW** (so that) sound of bee is associated with a sting e.g. run away / goes down burrow	**(4)**

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom