Mark Scheme (Results)

January 2018

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

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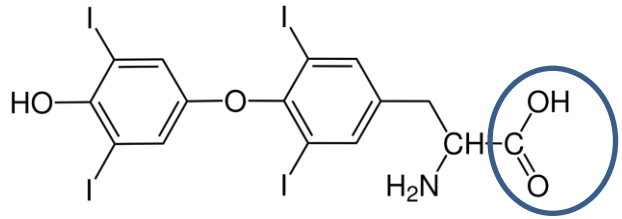
General Marking Guidance

- 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)	C - rough endoplasmic reticulum The only correct answer is C *A is not correct because protein synthesis takes place on the ribosomes associated with the rough ER* *B is not correct because protein synthesis takes place on the ribosomes associated with the rough ER* *D is not correct because protein synthesis takes place on the ribosomes associated with the rough ER*	(1)

Question Number	Answer	Mark
1(a)(ii)	A - Golgi apparatus The only correct answer is A *B is not correct because modification of proteins to form glycoproteins takes place in the Golgi apparatus* *C is not correct because modification of proteins to form glycoproteins takes place in the Golgi apparatus* *D is not correct because modification of proteins to form glycoproteins takes place in the Golgi apparatus*	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	carboxyl group correctly encircled		(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	<table><tr><th></th><th>hormonal</th><th>nervous</th></tr><tr><td>1</td><td>chemical</td><td>impulse / electrical ;</td></tr><tr><td>2</td><td>transported in blood</td><td>carried by { nerves / neurones } ;</td></tr><tr><td>3</td><td>slow speed (of transmission)</td><td>fast speed ;</td></tr><tr><td>4</td><td>long-lasting response</td><td>short-lived response ;</td></tr><tr><td>5</td><td>widespread effect</td><td>localised effect ;</td></tr></table>	A comparison is required for each marking point 3 ACCPET slower/ faster in correct context 4 ACCPET longer / shorter in correct context 5 ACCPET more localised / more widespread in correct context	(3)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	1. thyroxine binds to receptors ; 2. { enters / moves to } the nucleus ; 3. activates transcription factors / stimulates transcription / eq ; 4. increased { protein / enzyme } synthesis / eq ; 5. synthesis of (more) adrenaline / eq ;	1 IGNORE binds to second messengers 3 ACCEPT acts as a transcription factor 4 must be in the correct context. 4 IGNORE increased adrenaline synthesis	(4)

Question Number	Answer	Mark
2(a)(i)	A - J The only correct answer is A *B is not correct because K represents inspiratory reserve volume* *C is not correct because L represents expiratory reserve volume* *D is not correct because M represents the vital capacity*	(1)

Question Number	Answer	Mark
2(a)(ii)	A - 8.1 dm^3 min^{-1} The only correct answer is C *A is not correct because the minute volume is calculated by multiplying the breathing rate by the tidal volume (18 x 0.450 = 8.1 dm^3 min^{-1})* *B is not correct because is not correct because the minute volume is calculated by multiplying the breathing rate by the tidal volume (18 x 0.450 = 8.1 dm^3 min^{-1})* *D is not correct because is not correct because the minute volume is calculated by multiplying the breathing rate by the tidal volume (18 x 0.450 = 8.1 dm^3 min^{-1})*	(1)

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	1. count the number of peaks ; 2. measure distance on the trace and convert to time / eq ; Or 3. measure the distance between two peaks ; 4. convert to a rate knowing the speed of rotation / eq ; Or 5. record time taken to form the trace 6. divide number of peaks by time taken	ACCEPT idea of calibration of the trace ACCEPT idea of calibration of the trace 6 Must be idea of recording time taken to produce a trace - not just count number of peaks formed in one minute	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	1. as cycling speed increases, tidal volume also increases ; 2. credit an appropriate manipulated quantitative reference ;	1 ACCEPT exercise in place of cycling speed 2 ACCEPT manipulation for maximum changes e.g. tidal volume increases by 2400 cm^3 / tidal volume increases 5 fold / tidal volume shows a 400 % increase	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. as cycling speed increases, both rate and depth of breathing increase ; 2. idea that increase in cycling speed increases { respiration / production of carbon dioxide } ; 3. lactate may also be produced ; 4. { fall in pH / increase in carbon dioxide / increase in H^+ } detected by chemoreceptors ; 5. stimulates respiratory centre (located) in the medulla (oblongata) ; 6. which sends more impulses to { intercostal muscles / diaphragm } ; 7. the diaphragm and intercostal muscles contract more frequently ;	2 IGNORE idea of increased need demand for oxygen 5 ACCEPT ventilation centre 7 ACCEPT (stimulating) stronger contractions of the diaphragm and intercostal muscles	(5)

Question Number	Answer	Additional Guidance	Mark
3(a)	1. idea that a change in one direction causes a change in the opposite direction ; 2. to ensure a constant value / set point / narrow range of values / eq ;	e.g 'mechanism that returns a change away from normal value back to normal value' e.g. 'keeping a constant value'	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)	1. correct difference ; 2. divided by original value x 100 = 150 (%) ;	20 920 − 8 368 = 12 552 (12 552 ÷ 8 368) x 100 = 150 Correct answer with no working shown gains 2 marks	(2)

Question Number	Answer	Additional Guidance	Mark
3(c)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. (thermo)receptors in { skin / hypothalamus } ; 2. send { impulses / action potentials } to the { hypothalamus / thermoregulatory centre / heat loss centre } ; 3. causes { vasodilation / blood vessels to dilate } so more blood flows to the { skin / superficial capillaries } ; 4. hair arrector muscles relax (so) more heat loss by { convection / radiation } ; 5. increased sweating so more { evaporation } ; 6. inhibition of { shivering / muscle contraction } so less heat generated ; 7. decreased { metabolism / metabolic rate / respiration } so less heat generated ; 8. credit idea of { panting / salivation / decreased adrenaline production } ;	QWC - emphasis on clarity of expression MP3 and 4 may be mixed together in candidates responses	(6)

Question Number	Answer	Additional Guidance	Mark
4(a)	1. muscles are an antagonistic pair ; 2. triceps contracts and the biceps relaxes ;	1 ACCEPT muscles act antagonistically	(2)

Question Number	Answer			Mark
4(b)	B	actin	myosin	(1)

The only correct answer is B

A - is not correct because myoglobin is not a structural protein involved in muscle contraction

C - is not correct because myoglobin is not a structural protein involved in muscle contraction

D - is not correct because sarcomere is not a structural protein involved in muscle contraction

Question Number	Answer	Additional Guidance	Mark
4(c)(i)	1. eye and leg muscles contract with the same force ; 2. eye muscles { contract / relax / respond } more quickly / eq ; 3. eye muscles { contract and relax / respond } over a shorter period of time ;	2 ACCEPT eye muscle force { increases / decreases } more quickly 2 and 3 ACCEPT converse for leg muscles 3 Must be clear candidate is describing length of time of complete response contraction and relaxation e.g describe in terms of force or contraction and relaxation	(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>Any THREE of:

<table>
<tr><th>Fast twitch muscle fibre</th><th>Slow twitch muscle fibre</th></tr>
<tr><td>anaerobic</td><td>aerobic</td></tr>
<tr><td>lactate production</td><td>no lactate production</td></tr>
<tr><td>few mitochondria</td><td>many mitochondria</td></tr>
<tr><td>less ATP produced</td><td>more ATP</td></tr>
<tr><td>more creatine (phosphate)</td><td>less creatine (phosphate)</td></tr>
<tr><td>less myoglobin</td><td>more myoglobin</td></tr>
<tr><td>low capillary density</td><td>high capillary density</td></tr>
<tr><td>more glycogen</td><td>less glycogen</td></tr>
<tr><td>more easily fatigued</td><td>less easily fatigued</td></tr>
<tr><td>white /paler</td><td>red / darker</td></tr>
<tr><td>contract rapidly</td><td>contract slowly</td></tr>
<tr><td>larger diameter fibres</td><td>smaller diameter fibres</td></tr>
<tr><td>larger capacity of sarcoplasmic reticulum</td><td>smaller capacity of sarcoplasmic reticulum</td></tr>
</table>
; ; ;</td><td></td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
4(d)	1. unfair advantage ; 2. unethical ; 3. idea of health risks / named example ; 4. idea of not being a good role model ; 5. idea of cost to health services ;		(2)

Question Number	Answer	Mark
5(a)(i)	C - sodium channels open and sodium ions move into the axon The only correct answer is C *A is not correct because movement of sodium ions into the axon causes depolarisation* *B is not correct because movement of sodium ions into the axon causes depolarisation* *D is not correct because movement of sodium ions into the axon causes depolarisation*	(1)

Question Number	Answer	Mark
5(a)(ii)	A - potassium ions into the axon and sodium ions out of the axon The only correct answer is A *B is not correct because the sodium potassium pump pumps potassium ions into the axon and sodium ions out of the axon* *C is not correct because the sodium potassium pump pumps potassium ions into the axon and sodium ions out of the axon* *D is not correct because the sodium potassium pump pumps potassium ions into the axon and sodium ions out of the axon*	(1)

Question Number	Answer	Additional Guidance	Mark
5(b)	1. idea that the impulse reaches the presynaptic { membrane / knob } ; 2. calcium channels open / calcium ions diffuse in ; 3. causing vesicles to { move towards / fuse with } the membrane ; 4. { release / exocytosis } of neurotransmitter (into synaptic cleft) ;	ACCEPT action potentials in place of impulses	(3)

Question Number	Answer	Additional Guidance	Mark
5(c)	1. idea that { neurotransmitters / vesicles } are found only in the presynaptic knob ; 2. idea that receptors (for neurotransmitters) are found only on the postsynaptic membrane ;		(2)

Question Number	Answer	Additional Guidance	Mark
5(d)	1. acetylcholine depolarises postsynaptic cell at an excitatory synapse but hyperpolarises postsynaptic cell at an inhibitory synapse / eq ; 2. acetylcholine has a faster effect at an excitatory synapse / slower (more sustained) effect at an inhibitory synapse / eq ; 3. acetylcholine causes a greater change in membrane potential at an excitatory synapse / eq ;	ACCEPT membrane potential increases at excitatory synapse and decreases at inhibitory synapse MP2 and 3 must be comparative. MP3 e.g. changes of almost 10 mV and almost 3 mV	(3)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	rhodopsin	ACCEPT visual purple	(1)

Question Number	Answer	Mark
6(a)(ii)	B - cation channels close and the rod cell becomes hyperpolarised *The only correct answer is B* *A is not correct because the rod cell becomes hyperpolarised* *C is not correct because the cation channels close and the rod cell becomes hyperpolarised* *D is not correct because the cation channels close*	(1)

Question Number	Answer	Additional Guidance	Mark
6(b)	1. idea that IAA is produced in the growing tip ; 2. IAA moves (laterally) away from source of light / IAA accumulates on the shaded side of shoot / eq ; 3. causes cell elongation (on this side) / eq ; 4. (therefore) shoot grows towards the light / eq ;		(3)

Question Number	Answer	Additional Guidance	Mark
6(c)	1. the results suggest that cocklebur is a short-day plant ; 2. reference to involvement of phytochrome ; 3. in the dark, P_{FR} (slowly) reverts to P_R / eq ; 4. these plants need a sufficiently long dark period to allow P_{FR} to reach critical (low) concentration ; 5. (high) P_R promotes flowering / (high) P_{FR} inhibits flowering ; 6. short period of light during darkness converts P_R back to P_{FR} ;	ACCEPT P_{730} for P_{FR} and P_{660} for P_R 1 ACCEPT long-night plant	(4)

Question Number	Answer	Additional Guidance	Mark
7(a)	1. idea that a number of different mutations are associated with Parkinson's disease ; 2. credit at least two stated examples of mutations associated with Parkinson's disease ; 3. credit at least two stated examples of environmental factors associated with Parkinson's disease ; 4. comment made about the evidence from the studies on twins ;	1 Can be pieced together 2 e.g. PARK1, PARK2, PARK4 3 e.g. smoking, caffeine, pesticides	(4)

Question Number	Answer	Additional Guidance	Mark
*7(b)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. idea that if there are no electrons (from NADH) the electron transport chain will not operate ; 2. therefore no hydrogen ions will be pumped into the inter membrane space ; 3. so there will be no release of energy as the hydrogen ions pass through the ATPase channels ; 4. resulting in reduced { ATP production / oxidative phosphorylation } ; 5. idea that neurones will die without ATP for { active transport / chemical reactions / named chemical reaction } ; 6. idea that NADH will not be reoxidised so will not be able to bind more hydrogen ions ; 7. resulting in a decrease in pH of the { cytoplasm / matrix } ; 8. so the cell will die as its enzymes will not function ;	QWC emphasis on logical sequence 1 ACCEPT electrons will not be transferred to the electron transport chain 3 ACCEPT no chemiosmosis of H^+ 5 ACCEPT metabolic processes	(5)

Question Number	Answer	Additional Guidance	Mark
7(c)(i)	1. both axes correctly labelled x = concentration of uric acid and y = (percentage) risk of PD ; 2. line graph / plotted points with downward slope;	ACCEPT x= level of uric acid and y = chance of developing PD ACCEPT scatter graph sloping downwards	(2)

Question Number	Answer	Additional Guidance	Mark
7(c)(ii)	1. (blood of) Parkinson's patients tested for uric acid concentration / eq ; 2. and compared to concentration of uric acid in blood of people without Parkinson's disease ; OR 1. collect uric acid concentrations (in blood) of a large group of people ; 2. observe which people develop PD ;		(2)

Question Number	Answer	Additional Guidance	Mark
7(d)	1. scientific conferences / eq ; 2. scientific journals / eq ; 3. internet / TV / radio / eq ;	3 ACCEPT use a search engine websites / blogs	(2)

Question Number	Answer	Additional Guidance	Mark
7(e)	1. idea of comparing the nonmotor attributes before medication and whilst taking medication ; 2. idea of comparing the nonmotor attributes of two groups one receiving treatment and one not ; 3. reference to use of a placebo ; 4. credit example of nonmotor symptom ;		(3)

Question Number	Answer	Additional Guidance	Mark
7(f)	1. idea that different organisms react differently to different drugs ; 2. idea that animals do not suffer from Parkinson's disease so not really testing the drug's effect ; 3. idea that animal models of Parkinson's disease are not similar enough to the human disease ;	ACCEPT [humans / animals} have different brain structure / nervous system	(2)

Question Number	Answer	Additional Guidance	Mark
7(g)	1. idea that it avoids { swallowing tablets / injections / eq } ; 2. idea that the quantity of drug can be { controlled / given gradually } ; 3. idea that it avoids the need for the patient to remember to take the drug ; 4. idea that the route of entry is more appropriate ;	1 ACCEPT example of problems e.g. difficult to inject / risk of infection from reused needles / drugs broken down in stomach 4 ACCEPT fewer barriers / can reach target more easily / acts locally ;	(2)

Question Number	Answer	Additional Guidance	Mark
7(h)	1. idea that less { dopamine / neurotransmitter } present in synaptic cleft ; 2. to bind to receptors on post-synaptic membrane ; 3. { fewer / no } sodium { channels open on / ions enter } post-synaptic neurone ; 4. resulting in { threshold value } for depolarisation not being reached ; 5. fewer { excitatory pathways initiated / action potentials in excitatory pathway } ; 6. more inhibitory pathways initiated ;	2 ACCEPT to move / diffuse to the post-synaptic membrane 4 must refer to threshold value	(5)

Question Number	Answer	Additional Guidance	Mark
7(i)	1. idea that viruses infect { host / target cells / neurones } ; 2. viruses have { proteins / molecules / antigens / receptors } that bind to host cells / eq ; 3. adeno-associated virus type 2 has { proteins / molecules / antigens / receptors } that are complementary to the { proteins / molecules / antigens / receptors } on neurones ;	ACCEPT abbreviations of adeno-associated virus 1 IGNORE AAV carry genetic information to neurones 3 MP3 gains both MP 2 and 3	(3)

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