Mark Scheme (Results)

October 2019

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	Additional Guidance	Mark
1(a)(i)	The correct answer is **B** pea **A** is not correct because the carnation requires a longer period of daylight than period of darkness **C** is not correct because flowering in the rose is not affected by day-length **D** is not correct because flowering in the tomato is not affected by day-length		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	The correct answer is **C** phytochrome **A** is not correct because acetylcholine is a neurotransmitter found in animals **B** is not correct because IAA is a plant hormone released in response to light but does not itself detect light **D** is not correct as rhodopsin is the molecule in mammalian eye that detects light		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	1. temperature; 2. light intensity; 3. soil moisture concentration; 4. (soil) pH; 5. mineral ion concentration; 6. age of plant;	**2. ACCEPT** wavelength of light **3. ACCEPT** water availability / humidity **5. ACCEPT** named mineral ion availability **6. IGNORE species of plant**	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	The correct answer is **A** P which is the cerebral cortex **B** is not correct because Q is the cerebellum **C** is not correct because R is the medulla oblongata **D** is not correct because S is the hypothalamus		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	The correct answer is **A** cerebellum **B** is not correct because the cerebellum coordinates movement not the cerebral hemisphere **C** is not correct because the cerebellum coordinates movement not the hypothalamus **D** is not correct because the cerebellum coordinates movement not the medulla oblongata		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	The correct answer is **D** S which is the hypothalamus **A** is not correct because P is the cerebral hemisphere **B** is not correct because Q is the cerebellum **C** is not correct because R is the medulla oblongata		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iv)	The correct answer is **C** homeostasis which covers temperature regulation **A** is not correct because dendrochronology is the study of tree growth **B** is not correct because habituation is a form of learning in which an organism decreases or ceases its responses to a stimulus **D** is not correct because respiration does not regulate temperature		**(1)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. idea of simulating a game of squash;	e.g. show a video of someone hitting a squash ball / ask someone to think about hitting a squash ball	**(3)**
	2. stimulates parts of brain / eq;	**ACCEPT** regions of brain involved respond	
	3. (fMRI) these parts have an increased {blood flow / supply of oxygen / oxyhaemoglobin};		
	4. { oxyhaemoglobin does not absorb / deoxyhaemoglobin absorbs } radio waves ;	**ACCEPT** { oxyhaemoglobin reflects deoxyhaemoglobin does not reflect } radio waves	

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	1. the general trend is that as duration of exercise increases (blood) pH decreases; 2. (duration) up to 420 s has {little / no} effect on pH; 3. (duration) greater than 420 s decreases the pH ;	**1.ACCEPT** negative correlation **2.ACCEPT** up to 300 / 420 s **3.ACCEPT** from 300 / 420 s	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	1. Initially aerobic respiration takes place / eq 2. CO_2 produced by aerobic respiration is expired / eq; 3. so, the pH stays nearly constant / eq; 4. idea that {eventually / after 400 s} anaerobic respiration utilized; 5. lactic acid produced (reducing blood pH);	**4. ACCEPT** from 300 / 420 s **4.ACCEPT** the greater the duration of exercise the more anaerobic respiration **4. ACCEPT** idea of increased carbon dioxide dissolving to produce carbonic acid	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	inner membrane;	**ACCEPT** crista / cristae / inside membrane **IGNORE** membrane or intermembrane space	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	1. first box: { reduced NAD / NADH / $NADH_2$ } and second box : { NAD^+ / NAD } ; 2. middle box: {H^+ / hydrogen ion / proton} ; 3. fourth box: { oxygen / ½ O_2 / O} and fifth box: { water / H_2O };	**2. IGNORE** hydrogen / H_2 / H	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. reference to chemiosmosis; 2. {use / release} energy from electrons; 3. protons moved {through the inner membrane / into the intermembrane space} ; 4. reference to {ATP synthase / stalked particles}; 5. formation of phosphate bond between phosphate in ADP and inorganic phosphate / eq; 6. by the movement of protons (from intermembrane space) into matrix ;	**2. ACCEPT** reference to transfer of electrons along ETC **4. ACCEPT** ATP synthetase / ATP-ase **5. IGNORE** phosphorylation makes ATP **ACCEPT** ADP + Pi -> ATP	**(5)**

Question Number	Answer	Additional Guidance	Mark
4(a)	1. X (is muscle tissue that) attaches (via tendons) to bones / eq; 2. { X / muscle} can contract to move bones / eq; 3. W (is a ligament that) attaches bones to bones / eq; 4. { W/ ligament } is elastic to allow movement of bones / eq; 5. Y (is a tendon that) attaches muscle to bone / eq; 6. {Y /tendon} is inelastic so when muscles contract it causes the bones to move / eq;	**2. ACCEPT** X { is a flexor / causes the angle of joint to decrease} **4**. **ACCEPT** prevents dislocation of {bones / joints} **6**. **ACCEPT** inelastic so it transmits force to the bones	**(6)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	1. 100 – 9 = 91 ; 2. 546 ;	**Correct answer with no working shown gains both marks**	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	1. large tear had greater effect than a small tear on {named change / all of the changes} 2. idea that most common change is reduced cartilage surface area (in all groups); 3. large tears are more likely to result in osteoarthritis;	**1.ACCEPT** large tear had greatest effect on {named change / all of the changes} 1.**ACCEPT** converse **3. ACCEPT** converse	**(2)**

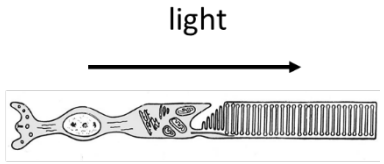
Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	osteoarthritis takes many years to develop / individuals examined only 24 months after injury;	**IGNORE** osteoarthritis takes {a while / time} to develop **ACCEPT** the study was not carried out for long enough	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	(1200 – 800) = 400 ; 33 (%) ;	**Correct answer with no working shown gains both marks** **ALLOW** 33.3% / 33.33%	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. length of exercise; 2. {type / intensity} of exercise; 3. fitness of volunteers; 4. (ambient) temperature; 5. food / drug consumption (during the study);	**IGNORE** gender / age **3. ACCEPT** BMI / mass / weight **4. IGNORE body** temperature **5**. **IGNORE** diet	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)	1. cardiac output increases; 2. (to) increase blood flow to muscles; 3. to provide {oxygen / glucose} for (increased) respiration in muscles; 4. increased blood flow to skin for {heat loss / thermoregulation}; 5. (because exercise causes) increased heat production /eq; 6. decreased flow to {abdominal organs / kidney} to allow blood to be diverted to other tissues / eq; 7. blood flow to the brain does not change as the brain requirements for oxygen does not change / eq;	**1.ACCEPT** increased heart rate /stroke volume increases **2. and 3. ACCEPT** reference to heart or skeletal muscle **3**. **ACCEPT** to meet increased demand for oxygen 5. **ACCEPT** increase in body temperature 6. **ACCEPT** idea of more oxygen reaching other tissues if diverted away from abdominal organs	**(5)**

Question Number	Answer	Additional Guidance	Mark
***5(c)**	QWC 1. cardiac {muscle / tissue } is myogenic / eq; 2. impulses from cardiovascular (control) centre / eq; 3. regulate the rhythm of the SAN; 4. wave of {depolarisation / excitation} from the SAN; 5. (which) causes {atria to contract / atrial systole}; 6. AVN delays conduction (to ventricles): 7. (wave of depolarisation) passes to the {bundle of His / Purkyne tissue}; 8. (which) causes { contraction of ventricles / ventricular systole } ;	**QWC emphasis is on logical sequence** **1. ACCEPT** 'heart' for 'cardiac', cardiac cells are myogenic **IGNORE** SAN is myogenic **2.IGNORE** medulla **3. ACCEPT** control the SAN **4.IGNORE** impulses **7. ACCEPT** Purkyne fibres for tissue **ACCEPT** Purkinje	**(6)**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	The correct answer is **D**  **A** is not correct because rod cells are organised with the outer segment at the back of the retina and the synaptic region at the front of the retina **B** is not correct because is not correct because rod cells are organised with the outer segment at the back of the retina and the synaptic region at the front of the retina **C** is not correct because is not correct because rod cells are organised with the outer segment at the back of the retina and the synaptic region at the front of the retina		**(1)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	The correct answer is **B** rhodopsin is bleached producing opsin and trans-retinal **A** is not correct because rhodopsin is not bleached to produce cis-retinal **C** is not correct because rhodopsin is not formed from cis-retinal **D** is not correct because rhodopsin is not formed when light enters rod cells		**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>6(a)(iii)</td><td>
<table>
<tr><th></th><th>membrane permeability to sodium ions</th><th>activity of the sodium ion pump</th></tr>
<tr><td>The correct answer is A</td><td>decreases</td><td>no change</td></tr>
</table>
B is not correct because activity of the sodium ion pump remains constant
C is not correct because membrane permeability to sodium ions decreases
D is not correct because membrane permeability to sodium ions decreases and activity of the sodium ion pump remains constant
</td><td></td><td>(1)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	1. the greater dose the greater the increase in diameter; 2. the greater the dose the longer lasting the effect / eq; 3. the greater the dose the more rapid the increase in dilation / eq;	**ACCEPT** increasing either drops or concentration in place of greater dose	**(3)**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	1. (phenylephrine) stimulates { opening of calcium channel / release of calcium ions out of sarcoplasmic reticulum } ; 2. causing radial muscle to contract; 3. circular muscles relax;	**1. IGNORE** reference to reflexes / nerves/ synapses	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(a)	1. tap vial with same force / eq; 2. at regular (time) intervals / eq; 3. record number of flies that climb / eq; 4. if fewer flies climb over time habituation has taken place / eq;	**1.ACCEPT** same tapping 2**.** e.g at the same frequency 3. e.g. observe number reaching particular height / record height climbed by flies **4. ACCEPT** {if fewer flies respond / if flies ignore the stimulus} habituation has taken place **ACCEPT** converse	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(b)	1. idea of obtaining iPSCs from individuals with Parkinson's disease; 2. (stimulate) iPSCs to differentiate into {nerve cells / neurones / nerve tissue}; 3. reference to use of cultured (nerve) cells for {drug testing / investigation of expression of genes associated with Parkinson's};	**IGNORE** use of IPSCs / tissues in treatment of Parkinson's disease **2.ACCEPT** iPSCs can be used to produce {nerve cells / neurones / nerve tissue}; **3.ACCEPT** observe effect of inserting genes causing Parkinson's on differentiation of iPSC's	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(c)	1. (proteins with similar amino acid sequences) will have similar bonding; 2. therefore will have similar {folding / 3D shape / tertiary structure } ; 3. therefore will have similar shaped {active sites / binding sites / eq};	1. **ACCEPT** {primary structure / amino acid sequence} determines {position / type} of bonds (in the protein); 2. **ACCEPT** (primary structure) determines {folding / 3D shape / tertiary structure } of protein; **3. ACCEPT** have similar named property e.g. solubility	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(d)	1. (alpha-synuclein / SNCA) causes cell death / eq; 2. reference to dopamine producing cells; 3. reduced dopamine production / eq; 4. (resulting in a) loss of motor control / eq;	**1. ACCEPT** causes apoptosis / loss of neurones **2. ACCEPT** death of cells in the {midbrain / substantia nigra}; **4**. **ACCEPT** locomotor dysfunction **IGNORE** loss of coordination	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(e)	1. lipase; 2. {hydrolyses /breaks} the ester bonds; 3. producing glycerol and fatty acids;		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(f)	1. folding (of polypeptide chain); 2. so that hydrophobic groups are on the outside of protein; 3. bonds are formed between proteins; 4. making the protein insoluble in the cytoplasm ;	**1. ACCEPT** misfolding **2. ACCEPT** non-polar groups on outside of protein	**(2)**

Question Number	Answer	Additional Guidance	Mark
***7(g)**	QWC 1. (Diazepam) binds to {receptors / binding site}; 2. on the post synaptic membrane; 3. prevents serotonin from binding; 4. opening chloride ion channels / chloride ions move into the cell; 5. making the inside of the membrane more negative; 6. post-synaptic membrane is not depolarised; 7. making an action potential (in the post synaptic neurone) less likely ;	**QWC emphasis is clarity of expression** 2. **IGNORE** 'post synaptic neurone' **7. ACCEPT** no { action potential / nerve impulses } produced	**(5)**

Question Number	Answer	Additional Guidance	Mark
7(h)	1. disease (cells) produce signal molecules; 2. (these) signal molecules bind to receptors on cells; 3. idea of triggering signal pathways; 4. changing transcription factor {activity / concentrations} ;	**1. ACCEPT** chemicals / hormones / cytokines / metabolites / enzymes **2. ACCEPT** bind to transcription factors in the cytoplasm/nucleus e.g. activate second messengers, or named example **4. ACCEPT** forming or activating a transcription factor	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(i)	1. recessive trait requires {two copies of mutation / no copies of functioning gene} ; 2. this would result in no gene {transcription / expression }; 3. in a dominant trait only one copy of the mutation is required; 4. if a single copy of the mutation is present the gene will be {transcribed / expressed} ;	**ACCEPT 'allele' for 'mutation' in mps 1 and 3.** **1. ACCEPT** recessive trait expressed in homozygous individuals **3. ACCEPT** dominant trait expressed in individuals that are heterozygous or homozygous	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(j)	1. failure of (a pair of) chromosomes (21) to separate; 2. during meiosis; 3. resulting in a gamete with two copies of the same chromosome; 4. zygote receive two copies of the chromosome from one gamete and one from the other;	**ACCEPT** chromatids for chromosomes **1. ACCEPT** description of partial separation **3. ACCEPT** gametes produced containing 24 chromosomes **4. ACCEPT** receive two copies of some genes from one gamete and one from the other **ACCEPT** zygote has three copies of the (21) chromosome	**(3)**

Question Number	Answer	Additional Guidance	Mark
7(k)	1. (human genome sequencing) allows genes for the condition to be identified; 2. genes (from humans) can be inserted into *Drosophila* ; 3. comparable genes can be identified in *Drosophila*; 4. drugs can be tested on {the disease model / *Drosophila* };	**1. ACCEPT** 'UDN' allows (candidate) genes to be identified **2. ACCEPT** *Drosophila* can be genetically engineered **3**. **ACCEPT** these genes can be mutated to create a disease model;	**(3)**

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