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Mark Scheme (Results)

June 2011

GCE Biology (6BI05) 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.

Quality of Written Communication

- Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
Eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[CE] or [TE]	Consecutive error / transferred error

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored

Question Number	Answer	Mark
1(a)	D ;	**(1)**

Question Number	Answer	Mark
1(a)	B ;	**(1)**

Question Number	Answer	Mark
1(a)	C ;	**(1)**

Question Number	Answer	Mark
1(a)	A ;	**(1)**

Question Number	Answer	Mark
1(b)	1. reference to (electrical) insulation / eq ; 2. reference to depolarisation at nodes ; 3. impulse jumps from node to node / eq ; 4. saltatory conduction ; 5. reference to faster conduction ;	**(4)**

Question Number	Answer	Mark
1(c)	1. idea that phospholipid restricts ion movement / eq ; 2. proteins span the membrane / eq ; 3. idea that sodium potassium pump moves ions / eq ; 4. (protein) {gates / channels} allow {diffusion / movement} of ions / eq ;	**(3)**

Question Number	Answer	Mark
2(a)	shoot bends to right /eq ;	**(1)**

Question Number	Answer	Mark
*** 2(b) QWC**	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) 1. reference (photo)tropism ; 2. light causes {redistribution / eq} of {auxin / IAA / eq} ; 3. high concentration {away from light / in block B} / eq ; 4. (auxin / eq) diffuses (down) into shoot ; 5. stimulates cell elongation / eq ; 6. description of change in cell e.g. fewer cross links in cellulose, cell wall more plastic, acidification, stimulation of enzyme production, vacuolation ; 7. {side away from / eq} light longer / eq ;	**(4)**

Question Number	Answer	Mark
2(c)	1. both chemical / eq ; 2. both transported away from production site / eq ; 3. comparison of mechanism of transport described e.g. diffusion in plants, blood system in animals ; 4. speed of action compared e.g. slower in plants, some animal hormones are faster ; 5. duration of effect compared e.g. some animal hormones have a shorter term effect ; 6. idea that this plant response involves {growth / cell elongation} only e.g. animal hormones do not just affect growth ; 7. comparison of stimuli ;	**(4)**

Question Number	Answer	Mark
3(a)(i)	1. breath identified ; 2. reference to time (for one / several peaks) ; 3. ref method for tidal volume e.g. height from peak to trough on trace ; 4. reference to calibration for volume ;	**(3)**

Question Number	Answer	Mark
3(a)(ii)	breathing rate x tidal volume / eq ;	**(1)**

Question Number	Answer	Mark
3(b)(i)	stroke volume / strength of (cardiac) muscle contraction / blood viscosity / size {atria/ventricles/chambers} / adrenaline / eq ;	**(1)**

Question Number	Answer	Mark
3(b)(ii)	1. there is little difference in ventilation rate / does not increase as much / eq ; 2. oxygen uptake increases / eq ; 3. credit use of manipulated figures ;	**(3)**

Question Number	Answer	Mark
3(b)(iii)	1. idea that there is more blood passing through (lungs) / eq ; 2. oxygen diffuses into blood / eq ; 3. {diffusion/eq} gradient being maintained / eq ; 4. oxygen (diffuses) in faster / eq ;	**(3)**

Question Number	Answer	Mark
3(b)(iv)	1. increased heart rate (from 50-100) {increases oxygen uptake / increases ventilation rate less} / eq ; 2. idea that heart rate has a greater effect on oxygen uptake than on ventilation rate ;	**(2)**

Question Number	Answer	Mark
4(a)	C ; A ; D ;	**(3)**

Question Number	Answer	Mark
4(b)(i)	1. high frequency of impulses / eq ; 2. {depletes /eq} neurotransmitter / eq ; 3. calcium ion channels do not open / are less responsive / eq ; 4. reference to synapse / synaptic {membrane / knob / eq } ; 5. (post synaptic) membrane not depolarised / eq ; 6. impulses do not reach gill / eq ;	**(3)**

Question Number	Answer	Mark
4(b)(ii)	1. avoids wasted {effort / time / resources / eq} / eq ; 2. to {non-threatening / unimportant / eq} stimulus / eq ; 3. reference to natural frequent stimuli e.g. wave action ;	**(2)**

Question Number	Answer	Mark
5(a)	1. change for fast twitch = 0.6 ; 2. reading at pH 7 = 0.9 to 1.0, reading at pH 6 = 1.95-2.05, to give answer within the range 0.95 - 1.15 ;	**(2)**

Question Number	Answer	Mark
5(b)	1. lower pH, both {less / eq} sensitive to calcium ions / lower pH more calcium ions needed for (50%) contraction / eq ; 2. effect on slow twitch is greater / eq ; 3. lower pH decreases contraction (in both) / eq ; 4. lower pH has no effect at high calcium ion concentration (in both) / eq ;	**(2)**

Question Number	Answer	Mark
5(c)(i)	Anaerobic {conditions/respiration} / lack of oxygen / process that reduces pH / eq ;	**(1)**

Question Number	Answer	Mark
5(c)(ii)	1. fast twitch anaerobic / slow twitch aerobic ; 2. fast twitch more likely to experience low pH / eq ; 3. low pH due to lactate / eq ; 4. (fast twitch) is less affected by change in pH / eq ; 5. can continue to respond to stimulus at lower pH / eq ;	**(2)**

Question Number	Answer	Mark
5(d)	1. troponin binds calcium ions / eq ; 2. tropomyosin {moved / eq }; 3. (causing) myosin binding sites exposed / eq ; 4. on actin ; 5. calcium binding site sensitive to pH / eq ; 6. idea that troponin is different in each fibre ;	**(3)**

Question Number	Answer	Mark
6(a)	1. more {muscle contraction / respiration} / eq ; 2. idea that heat energy released ; 3. idea that more heat produced than lost ;	**(2)**

Question Number	Answer	Mark
6(b)	1. ref to {detection of temperature change / temperature receptors} ; 2. reference hypothalamus ; 3. more sweating / eq ; 4. loss of heat due to evaporation (of water) / eq ; 5. vasodilation (of arterioles) / eq ; 6. loss of radiant heat / eq ; 7. heat gained equal heat lost / eq ; 8. reference negative feedback ; 9. behavioural heat loss mechanism described / eq ;	**(5)**

Question Number	Answer	Mark
6(c)	1. idea of dehydration ; 2. no longer sweating / eq ; 3. cooling mechanisms failing / eq ; 4. heat production greater than heat loss / eq ; 5. increase of pace / eq ;	**(2)**

Question Number	Answer	Mark
7(a)	1. reference to epo receptor ; 2. (gene) transcription stops / eq ; 3. reference to role of {transcription factors / repressors} ; 4. no mRNA produced / eq ; 5. no translation (of mRNA) / eq ;	**(3)**

Question Number	Answer	Mark
***7(b) QWC**	(QWC – Spelling of technical terms *(shown in italics)* must be correct and the answer must be organised in a logical sequence) General: 1. reference *antigens* (on the virus) ; 2. reference to *antigen* presentation ; 3. {stimulation / activation / eq} of {*lymphocytes* / T cell / B cell} / eq ; 4. proliferation (of l*ymphocytes*) qualified / eq ; 5. leads to {*cell mediated* / *humoral*} response ; Cell mediated: 6. reference T killer cells ; 7. causes virus-infected cell lysis / eq ; Humoral : 8. reference to {*plasma* cells / B *effector* cells}; 9. {produce / release / eq} (*antigen* specific) *antibodies* ; 10. description of *antibody* action ; 11. reference to {*phagocytosis* / *macrophage* action} ; 12. Reference to *interferon* action ;	**(5)**

Question Number	Answer	Mark
7(c)	1. {DNA / eq} degrades / eq ; 2. (modified) cells die / eq ; 3. reference to (modified) cells removed by immune response ; 4. reference to {DNA / eq} lost from cells ;	**(2)**

Question Number	Answer	Mark
7(d)	1. reference to effect on artery walls / eq ; 2. damages endothelium / eq ; 3. triggers inflammation / eq ; 4. starts formation of atheroma / eq ; 5. idea that artery narrows leading to (further) increase in blood pressure ;	**(3)**

Question Number	Answer	Mark
7(e)	arterioles / arteries ;	**(1)**

Question Number	Answer	Mark
7(f)	post transcription modification of RNA / mutation / eq ;	**(1)**

Question Number	Answer	Mark
7(g)	Any 3 from the following: Drugs: epo, steroids, IGF, insulin, velcade, astemizole, other growth factors, antibodies to myostatin, to block atrogin 1 protein Gene therapy: {epo, IGF, MGF} gene Atrophy treatment to block out any of the following: Foxo, Atrogens,{Atrogin 1/MAFbx}, muRF1, Ubiquitin ligase, UPP pathway, erg1(a) ; ; ;	**(3)**

Question Number	Answer	Mark
7(h)	1. prevent unfair advantage / eq ; 2. prevent risk to their health / eq ;	**(2)**

Question Number	Answer	Mark
7(i)	1. enzymes ; 2. break peptide bonds / eq ; 3. ref hydrolysis ;	**(2)**

Question Number	Answer	Mark
7(j)	1. redistribution of ions / eq ; 2. across the cell membrane /eq ; 3. causes {change in / different} potential difference / return to resting potential ;	**(2)**

Question Number	Answer	Mark
7(k)	1. {provide / eq} ATP ; 2. reference to aerobic respiration / eq ; 3. for contraction / (pumping) Ca^{2+} back into sarcoplasmic reticulum / eq ;	**(2)**

Question Number	Answer	Mark
7(l)	1. mother has heterozygous genotype / eq ; 2. father has heterozygous genotype / eq ; 3. correct gametes ; 4. genotype of boy identified as homozygous / eq ; 5. reference to mutation arising in sperm / fathers germ cell ;	**(4)**

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