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Mark Scheme (Results)

Summer 2012

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)(i)	B ;	**(1)**

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

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

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

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

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

Question Number	Answer	Mark
2 (a)(i)	all the {DNA / genes / eq} of (the human species) ;	**(1)**

Question Number	Answer	Mark
2 (a)(ii)	Any **one** from: 1. idea of discrimination e.g. insurers might have access to a person's DNA / 2. idea of who decides whether a person is tested / 3. idea of need for confidentiality / 4. expensive medical treatments might be restricted / eq ;	**(1)**

Question Number	Answer	Mark
2 (b)(i)	1. idea that (Human Genome Project) identifies allele related to melanoma e.g. mutant allele, aberrant allele ; 2. idea that drug targets this allele ; 3. (mutant) allele can no longer express itself / eq ; 4. idea of drug preventing translation ; 5. idea that such a drug is more effective ;	**(3)**

Question Number	Answer	Mark
2 (b)(ii)	1. idea that drug affects expression of the allele ; 2. idea that protein not produced ; 3. idea that (melanoma) cells killed ; 4. idea that (melanoma) cells do not divide ; 5. idea that they are replaced with normal body cells ; 6. through mitosis / eq ; 7. description of specific part of mitosis affected e.g. no spindle fibres ;	**(4)**

Question Number	Answer	Mark
2 (b)(iii)	1. randomised trial / eq ; 2. {large number / eq} of patients ; 3. double blind / eq ; 4. idea of {use of placebo / use of current treatment} ; 5. testing how effective the drug is on patients / eq ;	**(2)**

Question Number	Answer	Mark
2 (c)	1. yeast cells have human collagen {gene / allele / DNA / eq} ; 2. idea that new collagen is recognised as 'self' e.g. has no non-self antigens ; 3. does not trigger immune response / eq ;	**(2)**

Question Number	Answer	Mark
3 (a)(i)	1. cage with no enrichment / eq ; 2. idea of same regime e.g. starvation time, feeding time, time in cage ;	**(2)**

Question Number	Answer	Mark
3 (a)(ii)	idea of motivation e.g. to encourage them to look for food ;	**(1)**

Question Number	Answer	Mark
3 (b)	1. overall trend increases / eq ; 2. idea of rapid increase in visiting over first {2 / 3 / 5} days / eq ; 3. after this the increase in visiting slows down / eq ; 4. comment on lower percentage on day 4 ; 5. comment on levels off from day {5 / 9} ; 6. idea that the rats did not visit all the floors (on each day) e.g. 100% of the floors never achieved ; 7. manipulation of figures / eq ;	**(3)**

Question Number	Answer	Mark
3 (c)	1. idea that exploration encouraged in group P ; 2. due to {enrichment / hidden food / eq} ; 3. idea that they are more intrepid e.g. they visit more of the maze ; 4. {better / more adept / eq} at looking for food / learnt to look for food ;	**(2)**

Question Number	Answer	Mark
3 (d)	1. more synapses /eq ; 2. idea that more {connections between neurones / neurones connected together} ; 3. idea of better learning capacity ;	**(2)**

Question Number	Answer	Mark
***4 (a)**	**Take into account quality of written communication when awarding the following points.** 1. idea of calibration for volume ; 2. idea of calibration for time ; 3. description of how to calculate tidal volume (from trace) / eq ; 4. idea that one peak = one breath ; 5. reference to breathing rate is number of peaks per minute ; 6. idea of standardised group of males and females e.g. same age, non-smokers ; 7. idea that traces taken at rest ; 8. reference to replicates ; 9. description of how to calculate the mean from the trace ;	**(6)**

Question Number	Answer	Mark
4 (b)(i)	1. PEF increases (from 15) to when they are in their 30s and then decreases ; 2. reaches a peak at age {30 to 34} for women / eq ; 3. reaches a peak at age {36 to 39} for men / eq ; 4. idea that PEF falls below value at 15 (later on in life) ; 5. manipulation of figures to illustrate the points above ;	**(4)**

Question Number	Answer	Mark
4 (b)(ii)	weakening of muscles / loss of elasticity of lungs ;	**(1)**

Question Number	Answer	Mark
4 (b)(iii)	1. he is more than 30% below / must be less than 400 dm^3 min^{-1}/ he is {37 to 39 %} below / eq ; 2. therefore his asthma is not under control ;	**(2)**

Question Number	Answer	Mark
4 (b)(iv)	height ;	**(1)**

Question Number	Answer	Mark
5 (a)(i)	{pigment / eq} at back of eye absorbs light / no light is reflected out (from the choroid) ;	**(1)**

Question Number	Answer	Mark
5 (a)(ii)	1. circular muscles contract (and radial muscles relax) to {constrict / eq} pupil ; 2. radial muscles contract (and circular muscles relax) to {dilate / eq} pupil ; 3. need for fine control of aperture to allow pupil to be reset to a different size / allow changing to take account of varying light intensity ; 4. (these) muscles can only shorten / eq ; 5. antagonistic muscles have opposite effects / eq ; 6. idea that contraction of one muscle set stretches the other ;	**(3)**

Question Number	Answer	Mark
5 (a)(iii)	1. details of impulse e.g. depolarisation / eq ; 2. reference to bipolar {neurone / cell / eq} ; 3. reference to sensory neurone / eq ; 4. reference to optic nerve ; 5. reference to {motor / eq} neurone connected to (radial) muscles ; 6. reference to contraction of radial muscle ;	**(3)**

Question Number	Answer	Mark
5 (b)	1. has an effect on nervous system of iris / eq ; 2. radial muscles contract / eq ; 3. idea of prevention of pupil constriction ; 4. larger aperture / pupil dilates / eq ; 5. letting more light in / eq ; 6. (so) can see {more / all / eq} retina ;	**(3)**

Question Number	Answer	Mark
5 (c)	1. retinol and retinal are very similar in structure / eq ; 2. idea of retinol is needed to make retinal / eq ; 3. idea that shortage of retinol in diet leads to less retinal ; 4. in rods ; 5. idea that this leads to reduced vision in {low light / at night / eq} ;	**(3)**

Question Number	Answer	Mark
6		**(4)**

Statement	**Tick (✓) or cross (×)**
Cause cell depolarisation	×
Affected by all wavelengths of light	×
Involved in plant growth and development	✓
Affected by darkness	✓

1 for each correct row.

Question Number	Answer	Mark
7 (a)	1. high numbers of obese people / eq ; 2. this is linked to increased risk of diseases such as {diabetes / CVD / eq} ; 3. idea that this puts an economic burden on society ;	**(2)**

Question Number	Answer	Mark
7 (b)	1. three fatty acids ; 2. contains a glycerol (molecule) / ref. to ester bonds ;	**(2)**

Question Number	Answer	Mark
7 (c)	1. 80% × {10 / 15 / 20} % OR 0.8 × 0.1 OR 0.8 x 0.15 OR 0.8 x 0.2 OR idea that percentage mortality has not changed ; 2. 0% / 8% / 12% / 16% / (range) 8 to 16% ;	**(2)**

Question Number	Answer	Mark
7 (d)	1. (serious) self reflection is associated with increased activity in the mPFC (in both) / eq ; Body image: 2. there is a link between overweight body image in females and activation of mPFC / eq ; 3. there is no (significant) mPFC activation in men when presented with equivalent male images /eq ; Words: 4. {words / eq} associated with increased activation in the amygdala in females / eq ; 5. (and) deactivation of the left mPFC in females / eq ; 6. in men this response was reversed / eq ;	**(4)**

Question Number	Answer	Mark
7 (e)	1. idea that cortisol levels need to be high for a long time ; 2. this leads to {high blood pressure / suppressed thyroid function / impaired immunity / increased intra-abdominal fat / CVD / diabetes / cancer} ;	**(2)**

Question Number	Answer	Mark
7 (f)	1. greater surface area / eq ; 2. idea of more quickly hydrolysed (by enzymes) / eq ; 3. to release energy / for use in respiration / eq ;	**(2)**

Question Number	Answer	Mark
7 (g)	1. UCP-1 is in the mitochondria / eq ; 2. idea that electron transport chain is disrupted ; 3. (therefore) less ATP is produced by the electron transport chain / eq ; 4. UCP-1 might inhibit {ATP synthase / ATPase / eq } OR alter the proton gradient / eq ; 5. more energy as heat / eq ;	**(3)**

Question Number	Answer	Mark
7 (h)	1. it only undergoes the first stage of metabolism / eq ; 2. glucose is completely metabolised / eq ; 3. idea that products of 18F-FDG breakdown cannot be metabolised ; 4. idea that this is due to wrong shape for next enzyme ; 5. (so) cannot bind to active site / binds permanently / eq ; 6. idea that (altered shape means) cannot exit through the same glucose / eq channels they entered by ;	**(3)**

Question Number	Answer	Mark
7 (i)	1. fucoxanthin increases the production of UCP-1 / eq ; 2. UCP-1 {uncouples / disrupts / eq} the electron transport chain / oxidative phosphorylation / eq ; 3. less ATP available for use / eq ; 4. more energy lost as heat / eq ; 5. extra fat is used in {respiration / eq} ;	**(3)**

Question Number	Answer	Mark
***7 (j)**	**Take into account quality of written communication when awarding the following points.** 1. PRDM16 levels higher in BAT than WAT / eq ; 2. loss of PRDM16 causes a loss in heat production / eq ; 3. more energy stored as fat in WAT / eq ; 4. (artificial) excess of PRDM16 causes white fat cells to become brown fat cells / eq ; 5. this influences UCP-1 levels / eq ; 6. genetically engineered mice had high levels of UCP-1 during BAT formation / eq ; 7. increasing PRDM16 in muscle cells causes them to differentiate into brown fat cells / eq ; 8. increased BAT as a result associated with increased {heat production / weight loss / fat loss / eq} / eq ;	**(5)**

Question Number	Answer	Mark
7 (k)	1. anorexia associated with a reduction in {CD68 expression / mRNA coding for fat synthesis / certain proteins / eq} / eq ; 2. anorexia associated with an increase in resistin mRNA expression / eq ; 3. {psychological distress / eq} leads to changes in DNA structure / methylation of DNA / eq ;	**(2)**

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