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Mark Scheme (Results)

Summer 2012

GCE Biology (6BI04) Paper 01
The Natural Environment and Species Survival

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Summer 2012
Publications Code UA031779

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.

Question Number	Answer	Mark
1(a)	1. idea of the {role / purpose / interaction / eq} of {organism / sea anemone / species / eq} ; 2. reference to trophic level(s) ; 3. it is a predator/ controls population of prey / eq ; 4. it is prey / provides food for other animals / eq ; 5. provide {shelter / home /eq} for some animals / eq ;	(3)

Question Number	Answer	Mark
1(b)	1. idea of reduces surface area (to volume) ; 2. idea of less water loss e.g. dehydration, drying out ; 3. idea of reduces visibility (to predators) ; 4. idea of protection from {predators / carnivores / named eg} ; 5. idea that there is no need for the tentacles to be exposed ; 6. energy {will be conserved /will not be wasted/ eq} ;	(3)

Question Number	Answer	Mark
1(c)(i)	C – systematic ;	(1)

Question Number	Answer	Mark
1(c)(ii)	1. idea of no indication that temperature has an effect e.g. little variation, only 2°C ; 2. idea that distribution is influenced by height (above low water mark) ; 3. idea of more likely to dry out at higher levels ; 4. idea of food availability differs e.g. less at higher levels, more at lower levels ; 5. idea of more likely to be eaten at lower levels ;	(3)

Question Number	Answer	Mark
1(c)(iii)	1. plot graph(s) of numbers of anemones against {height and temperature / abiotic factors / eq} ; 2. reference to correlation ; 3. idea of using statistical analysis ; 4. named appropriate statistical test ;	(2)

Question Number	Answer	Mark
2(a)(i)	C – hydrolysis ;	(1)

Question Number	Answer	Mark
2(a)(ii)	C – glucose ;	(1)

Question Number	Answer	Mark
2(b)	1. reference to {low pH / (hydrochloric) acid / HCl / eq} ; 2. idea that acid destroys bacteria ; 3. reference to {low / no} oxygen ; 4. reference to using anaerobic respiration ; 5. idea of resistant to {(stomach) enzymes / protease / named protease} ; 6. idea of bacterial cell resistant to digestion ; 7. ref to adaptation to cow's temperature ;	(3)

Question Number	Answer	Mark
2(c)(i)	1. group A = 720 and group B = {662 / 662.4} ; 2. units correct = {dm^3 day^{-1} / dm^3 per day} ;	(2)

Question Number	Answer	Mark
* 2(c)(ii) QWC	Take into account quality of written communication when awarding the following points. 1. reference to less { *greenhouse gas* / *methane* / *carbon dioxide*} ; 2. *carbon dioxide* and *methane* are (both) { *greenhouse gases* / cause *greenhouse effect*} ; 3. (that can) { *absorb* / trap / eq} { *heat* / *infra red* / longer *wavelengths*} (*radiation*) ; 4. { *reflected* / eq} from the Earth / eq ; 5. reference to decrease in { these gases / *carbon dioxide* / *methane*} leads to { reduced / eq} *greenhouse* effect ; 6. idea of *methane* having a greater *greenhouse* effect than *carbon dioxide* ; 7. idea of *temperature* of { Earth's surface / *atmosphere*} less likely to rise ; 8. reference to reduced possibility of *climate* change ; 9. description of example of effect of this (e.g. ice caps melting, crop failure) ;	(5)

Question Number	Answer	Mark
3(a)	1. idea of taller (growing) plants could {develop / grow} in the clear areas ; 2. idea of loss of {low-growing plants / clear zones} ; 3. idea that different animals appear ; 4. reference to (secondary) succession ; 5. reference to climax community (of the taller plants) ;	(3)

Question Number	Answer	Mark
3(b)(i)	1. named abiotic factor ; 2. appropriate description of how named factor affects the {number / distribution / growth / eq} of these plants ; 3. appropriate explanation ;	(3)

Question Number	Answer	Mark
3(b)(ii)	1. idea of no {(inter) breeding / reproduction / mating / eq} (between the *B. Selene*); 2. (because) {geographical / physical} barrier / eq ; 3. idea of different behaviour ; 4. idea of incompatible genitalia ; 5. idea of each population having a {discrete / eq} gene pool e.g. restricted gene flow, different mutations, different alleles ;	(3)

Question Number	Answer	Mark
3(b)(iii)	1. { low-growing plants would die out / eq } / { taller plants would outgrow the low-growing plants / eq} ; 2. idea of (*B. Selene*) unable to feed e.g. no nectar (for the adults) ; 3. (*B.selene*) unable to lay eggs / eq ; 4. no suitable plants for { caterpillars / eq } to feed on / eq ; 5. idea of very little { variation / genetic diversity / eq} in a small population ;	(3)

Question Number	Answer	Mark
4(a)	D - stroma;	(1)

Question Number	Answer	Mark
4(b)(i)	1. idea that samples (of cells) can be taken {easily / eq} ; 2. reference no damage to {plant / leaf / other cells} (during sampling) / eq ; 3. idea of carbon dioxide level (in water) can be {adjusted / maintained / changed / eq} (easily) ; 4. idea of {RuBP / GP / products / eq} cannot pass into {other cells / rest of plant} ; 5. reference to only one kind of cell / eq ; 6. idea of controlling the {mass / number/surface area} of cells ; 7. idea that genetically-similar cells used ;	(2)

Question Number	Answer	Mark
4(b)(ii)	1. light is needed for light-dependent reaction ; 2. light (intensity) will not be a limiting factor / eq ; 3. idea that {the effect of carbon dioxide concentration can be seen / carbon dioxide (concentration) is (only) limiting factor / eq } ; 4. {ATP / NADPH / eq} produced during light-dependent reactions ; 5. {ATP / NADPH / light-dependent products / eq} required for {light-independent reactions / Calvin cycle / carbon dioxide fixation} ;	(3)

Question Number	Answer	Mark
4(b)(iii)	1. both RuBP and GP levels constant until carbon dioxide {lowered / eq} ; 2. ref to (RuBP and GP in) Calvin cycle ; RuBP 3. (at lower carbon dioxide levels) the RuBP increases and drops (and then stays constant) ; 4. rises because being regenerated / eq ; 5. falls as being used to {fix / eq} carbon dioxide ; 6. idea that RuBP level remains constant once (new) equilibrium reached ; GP 7. (at lower carbon dioxide levels) the GP drops (and then stays constant) ; 8. drops because less {carbon dioxide available to convert into GP) / less carbon fixation / eq} ; 9. levels out at a lower level as carbon dioxide still available but at lower level; 10. credit correct manipulation of figures for a description of either RuBP or GP ;	(6)

Question Number	Answer	Mark
5(a)	B – forensic entomology ;	(1)

Question Number	Answer	Mark
5(b)(i)	D – temperature ;	(1)

Question Number	Answer	Mark
5(b)(ii)	1. idea that the body has been dead for a while ; 2. (because) more than one species of insect present / eq ; 3. reference to succession (of insect species) ; 4. idea that life cycle {times / stages} of the insects are {known / used / eq} ; 5. idea that life cycle times depend on (environmental) temperature ; 6. credit specific ref to information in table e.g. blowfly cycle complete ;	(3)

Question Number	Answer	Mark
5(c)(i)	1. idea that a drop in body temperature is linked to time after death e.g. algor mortis ; 2. idea that factors affect temperature drop e.g. environmental temperature, body size, clothing ; 3. (useful because) time of death can be calculated if (ambient) temperature known / eq ; 4. only useful for short period of time following death e.g. 24 hours, a day ;	(2)

Question Number	Answer	Mark
5(c)(ii)	1. idea that body decomposes in a specific sequence (with time) ; 2. idea that factors affect decomposition e.g. environmental temperature, wounds ; 3. (not useful) if all the body has decomposed / eq ;	(2)

Question Number	Answer	Mark
6(a)	C – plasma cell ;	(1)

Question Number	Answer	Mark
6(b)(i)	1. idea of using { virus / PCV2} as vaccine ; 2. which is { modified / attenuated / harmless / similar / part of / eq} ; 3. idea that the vaccine contains the antigen ; 4. idea of { activation / proliferation} of (specific) { B cell / T cell / lymphocyte} ; 5. reference to production of (B / T) memory cells ; 6. idea that body now able to produce (specific) antibody { faster / at higher concentration / eq} on another exposure to PCV2 ;	(3)

Question Number	Answer	Mark
6(b)(ii)	1. reference to giving a placebo (to group B) ; 2. idea that all (other) { conditions / factors / variables} should be { controlled / same as group A} ; 3. stated example e.g. food, temperature of housing / eq ; 4. reference to group B is a control group ; 5. (so that) only the (effect of) { vaccine / vaccination} is tested / eq ; 6. ref to { valid / validity} ;	(3)

Question Number	Answer	Mark
6(b)(iii)	1. { Greater change / higher / eq} in group A (than B) / eq ; 2. group A rises for first 30 days, group B rises (slightly) for first 20 days / eq ; 3. (this) rise for group A is { faster / greater} than for group B / eq ; 4. (after the rise) group A falls, group B levels off / eq (until day 140) ; 5. after day 140, group A rises, group B falls / eq ; 6. credit use of comparative manipulated figures (with units) ;	(3)

Question Number	Answer	Mark
6(b)(iv)	1. idea that (antibodies present at birth as) both groups received antibodies from mother ; 2. via { placenta / blood / milk / breast feeding} ; 3. reference to passive immunity ; 4. group A concentration falls because { piglets not infected by (PCV2) virus/ antibodies excreted / passive immunity is short term} /eq ; 5. group B concentration rises because { PCV2 / virus} present / eq ;	(3)

Question Number	Answer	Mark
7(a)	B – bacteria ; C – fungi ;	(2)

Question Number	Answer	Mark
7(b)		(3)

Statement	True	False
Compost formation involves respiration by microorganisms.	✓	
I added nitrate fertiliser so that the microorganisms could synthesise nucleic acids.	✓	
My compost heap only contains one trophic level only.		✓

1 mark each correct row ;;;

Question Number	Answer	Mark
7(c)	1. ref to increase in temperature for first 4 weeks ; 2. idea of heat (energy) related to temperature change ; 3. ref to {metabolism / respiration / named metabolic reaction} ; 4. appropriate comment on changes in numbers of microorganisms ; 5. ref to decrease in temperature after 4 weeks ; 6. comment on {enzymes denaturing / eq} ; 7. idea that {substrate / eq} {is running out / has run out} ;	(4)

Question Number	Answer	Mark
7(d)	1. idea that {heat is lost from outer surface of compost heap / temperature will vary in different parts of the compost heap} ; 2. idea that long thermometer measures {internal / core / eq} (temperature) of heap ; 3. this improves validity (of the method) ; 4. repeated readings to obtain {mean / average} ; 5. this improves reliability (of the results) ;	(3)

Question Number	Answer	Mark
8(a)	1. (Double-stranded because made of) two strands ; 2. (strands joined) by hydrogen bonds (between bases) ; 3. (polynucleotide) of {many / eq} nucleotides ; 4. (nucleotides) linked by phospho(di)ester bonds / eq ;	(3)

Question Number	Answer	Mark
* 8(b) QWC	Take into account quality of written communication when awarding the following points. 1. idea of sequence of bases {forming the genetic code / determines the amino acid sequence} ; 2. idea that one triplet codes for an amino acid; 3. ref to (DNA) acting as a template ; 4. reference to transcription OR detail of transcription e.g. DNA unzips, mRNA synthesis ; 5. idea that mRNA moves from nucleus to cytoplasm / eq ; 6. reference to translation OR detail of translation e.g. role of ribosome, codon-anticodon interaction ; 7. idea that tRNA carries an amino acid ; 8. ref to formation of peptide bonds between amino acids ; 9. idea that primary structure is the {sequence /order / eq} of amino acids ; 10. comment on post-transcriptional modification of mRNA (between transcription and translation)e.g. removal of introns, splicing ;	(5)

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Order Code UA031779 Summer 2012

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