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Mark Scheme (Results)

January 2012

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

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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

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Question Number	Answer	Mark
1(a)	Substance X = (DNA)primer(s) ; Substance Y = (mono)nucleotide(s) ; Substance Z = DNA strand(s) ;	**(3)**

Question Number	Answer	Mark
1(b)(i)	A ;	**(1)**

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

Question Number	Answer	Mark
1(b)(iii)	B ;	**(1)**

Question Number	Answer	Mark
1(c)(i)	1. Idea that human enzymes will not work at {high / these/ above 37^{o}C eq} ; 2. reference to {denaturation /change in shape of active site}(at temperatures in PCR) ;	**(2)**

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Question Number	Answer	Mark
1(c)(ii)	1. (xylem / wood) made of dead material / has no {living material / cytoplasm / cell contents / nuclei / mitochondria} / eq ; 2. no {DNA / nucleic acid} present / eq ;	**(2)**

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

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

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

Question Number	Answer	Mark
2(b)	ACCEPT any mark point from a clearly annotated diagram 1. reference to {granum / grana} ; 2. reference to (a granum is) a stack of {thylakoids / membranes} OR grana are connected by lamellae ; 3. reference to (thylakoids contain) {electron carriers / eq} / chlorophyll / photosystems ; 4. reference to (membranes contain) {ATPase / ATPase channel} ; 5. idea that {electron carriers / ATPase /eq} are associated with {thylakoid / thylakoid membranes} ;	**(3)**

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Question Number	Answer	Mark
2(c)	1. GALP is a 3C molecule / eq ; 2. reference to formation of {glucose / hexose/ 6C sugar} (from GALP) ; 3. idea of enzymes involved in the synthesis of {glucose / cellulose} ; 4. idea that cellulose consists of {ß-glucose / beta glucose } ; 5. joined by glycosidic bonds / eq; 6. reference to 1-4 (bonds) ; 7. reference to condensation reactions (between glucoses) ; 8. idea that cellulose is a long chain molecule e.g. polysaccharide, polymer ; 9. {unbranched / eq} molecule ;	**(5)**

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

Question Number	Answer	Mark
3(b)	1. {no / little / eq} change in pre-monsoon temperature, post-monsoon has risen / eq ; 2. idea that both {fluctuate / eq } ; 3. idea that {fluctuations / eq} match each other ; 4. reference to {fluctuations / changes} {within / less than / eq} 1^{o}C ; 5. reference to a particular change in both e.g. both decreased between 1800 to 1850 ; 6. Credit correct manipulation of figures to compare pre-monsoon and post-monsoon changes units needed ; 7. idea that the range of (mean) temperatures is greater OR greater fluctuations, in post-monsoon period ;	**(3)**

Question Number	Answer	Mark
3(c)(i)	1. idea of {extrapolating / eq} data ; 2. idea of use for {modelling / investigation of correlations} ; 3. idea of providing evidence for global warming ; 4. idea of using this data along with data from other sources ;	**(3)**

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Question Number	Answer	Mark
3(c)(ii)	1. Idea that there is not enough data ; 2. idea that data has only been collected from Nepal ; 3. reference to {no way of confirming data / no proof / not reliable} ; 4. idea of { fluctuations too great / no real trend} ; 5. idea that means are a poor representation of raw data ; 6. reference to {scatter / spread / eq} (of raw data) is indicator of reliability ; 7. idea that method of estimated temperature from growth rings is questionable / eq ; 8. other environmental changes (affecting trees)not taken into account / eq ;	**(3)**

Question Number	Answer	Mark
3(d)	Any **one** from: 1. (estimates of) carbon dioxide levels (in air) 2. (pollen) from peat 3. temperature records ;	**(1)**

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

Question Number	Answer	Mark
***4(b) QWC**	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. idea of *geographical isolation e.g. physical barrier* between Corsican and mainland birds / *allopatric speciation* ; 2. idea that there are different *selection pressures* (between Corsica and the mainland) ; 3. an example of selection pressure e.g. food source, different habitats ; 4. idea that *mutations* occurred ; 5. Idea that this results in *adaptation* to the conditions **;** 6. these {*alleles /genes*} passed on (to *offspring*); 7. idea of change in *gene pool* e.g. increasing *frequency* of (these) *alleles,* changes in *gene pool* ; 8. reference to *reproductive isolation* (of Corsican nuthatches from mainland nuthatches) ; 9. idea that birds on mainland could live in all regions as there is no restriction on *gene flow* ;	**(5)**

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Question Number	Answer	Mark
4(c)(i)	ACCEPT the converse in the context of *S. europaea*, if clearly expressed 1. reference to *S. whiteheadi* adapted to {colder / mountainous} regions ; 2. (if climate warms) {food supply / pine seeds / invertebrates} less available ; 3. idea of {small population / only 2500 pairs} (of S *whiteheadi*) ; 4. idea of limited {gene pool / genetic diversity / variety of alleles} ; 5. idea that all the *S. whiteheadi* will be adversely affected ; 6. idea that the *S. whiteheadi* cannot fly to other regions ;	**(3)**

Question Number	Answer	Mark
4(c)(ii)	1. idea that S. whiteheadi have a variety of food sources e.g. can change their feeding habits, eat seeds and invertebrates} ; 2. idea that {more / different} {invertebrates /seeds / food / eq} might become available ; 3. idea that they have another allele that gives a survival advantage ; 4. idea that they could migrate (NOT south, somewhere warmer) ;	**(2)**

Question Number	Answer	Mark
4(d)	1. idea of captive-breeding programmes ; 2. reference to {conserve / preserve / eq} {alleles /genes / gene pools} ; 3. reference to {re-introduction / releasing of S. *whiteheadi* into suitable habitats} ;	**(2)**

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Question Number	Answer	Mark
5(a)	<table><tr><th>Feature</th><th>Bacteria only</th><th>Viruses only</th><th>Both bacteria and viruses</th></tr><tr><td>Nucleic acid</td><td></td><td></td><td>✓</td></tr><tr><td>Cytoplasm</td><td>✓</td><td></td><td></td></tr><tr><td>Protein capsid</td><td></td><td>✓</td><td></td></tr></table> 1 mark each correct row ;;;	**(3)**

Question Number	Answer	Mark
5(b)(i)	1. idea of (SCAG is) caused by {a bacterium / bacteria} ; 2. antibiotics {kill / stop reproduction / eq} of bacteria / are {bactericidal / bacteriostatic} ;	**(2)**

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Question Number	Answer	Mark
***5(b)(ii) QWC**	Spelling of technical terms must be correct and the answer must be organised in a logical sequence 1. as age increases, acid secretion decreases / eq ; 2. as age increases (above 30) , stomach cancer increase / eq ; 3. as acid secretion decreases (below 120), stomach cancers increases / eq ; 4. idea that the {higher age groups (51+) have low acid and high cancer / lower age groups (up to 30) have high acid and low cancer} ; 5. Idea of {acid / low pH} (in stomach) kills {bacteria / *Helicobacter}* ; 6. reference to development of SCAG {inhibited / prevented / eq} (by low pH / more stomach acid) ; 7. idea of age affects the immune system ; 8. idea that the older you are acid-producing cells are less effective e.g. fewer acid-producing cells / cancer cells replace the acid-producing cells ; 9. idea that {acid / low pH} destroys cancer cells ; 10. idea that mutations (leading to cancer) more likely to occur with age ;	**(5)**

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Question Number	Answer	Mark
6(a)(i)	1. (rate of) {production of / energy incorporated into / eq} {biomass / organic material / organic molecules / tissue} ; 2. reference to {losses in respiration / GPP- R } ; 3. in {producers / plants / eq } ;	**(2)**

Question Number	Answer	Mark
6(a)(ii)	1. correct readings from graph indicated e.g. (11 and 1) ; 2. correct subtraction e.g. (11-1 / 10) ; 3. correct division (by 1) x 100/1 to give 1000% ; [correct answer = 3 marks]	**(3)**

Question Number	Answer	Mark
6(b)	1. idea that the rate of {(bio)chemical / metabolic / photosynthetic / named} reactions increases ; 2. idea of increase in {movement / kinetic energy} of {enzyme / substrate / molecules / particles} / eq ; 3. idea of (increase in reaction rate) because of more enzyme substrate interaction ;	**(2)**

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Question Number	Answer	Mark
6(c)	1. (between January and April) NPP increases as light increases ; 2. idea of a correlation between NPP and light ; 3. idea that the changes in NPP are occurring after the changes in light / peak light is April and peak NPP is May ; 4. reference to increase in light increases {(rate of) photosynthesis / (ATP) energy available for Calvin Cycle / eq} ; 5. credit correct details of photosynthesis e.g. light results in excitation of electrons ; 6. idea that there is no real correlation between temperature and NPP / reference to temperature fluctuating ; 7. idea that the temperature affects how quickly enzymes work ; 8. reference to NPP falling (from May) but temperature remaining high ; 9. reference to (light / temperature) limiting factor ;	**(4)**

Question Number	Answer	Mark
6(d)	Any **two** biotic factors e.g. 1. grazing / {consumers / herbivores / named herbivore} / eq ; 2. trampling / eq ; 3. shading by {plants / named plant} / eq ; 4. competition from other plants / eq ; 5. disease / eq ;	**(2)**

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

Question Number	Answer	Mark
7(b)(i)	1. {T helper / CD4 (positive)} (cell / lymphocytes) ; 2. phagocytic cells e.g. macrophages, dendritic cell ;	**(2)**

Question Number	Answer	Mark
7(b)(ii)	1. reference to (HIV) binds to (CD4) receptors on cell (surface) ; 2. ref to CD4 (receptors on cells) ; 3. reference to {glycoprotein / gp120} on virus (surface) ; 4. reference to fusion of virus (envelope) with (cell surface) membrane ; 5. idea of phagocytosis (in macrophage / eq) ;	**(3)**

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Question Number	Answer	Mark
7(b)(iii)	1. reference to viral RNA ; 2. reference to production of (viral) DNA (using viral RNA as a copy) ; 3. correct ref to reverse transcriptase ; 4. reference to incorporation of viral DNA into host cell's {DNA /genome } / reference to provirus / eq ; 5. correct ref to integrase ; 6. reference to production of {viruses / viral RNA and proteins} / eq ; 7. idea of infection of further (T helper) cells ; 8. reference to destruction of (T helper) cells by T killer cells OR reference to cell lysis / eq ; 9. reference to lowering of immunity ;(to other diseases ; 10. credit reference to role of T helper cells in immune response e.g. produce cytokines, activate B cells / killer cells ; 11. death is caused by e.g. opportunistic disease, pneumonia , TB, Kaposi's sarcoma, cancer, dementia, extreme weight loss, meningitis, toxoplasmosis ;	**(6)**

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Question Number	Answer	Mark
8(a)		

Description	True	False
B and T cells are formed in the bone marrow	✓	
B cells stimulate T cells to produce clones of memory cells		✓
T helper cells produce chemicals that destroy pathogens		✓
B and T cells are able to form clones by mitosis	✓	

1 mark each correct row ;;;;

(4)

Question Number	Answer	Mark
8(b)	1. (bacteria are) too small / reference to limitation of {magnification / resolution} ; 2. (bacteria) not stained ; 3. idea of bacteria already {removed / destroyed} e.g. phagocytosis ; 4. idea that bacteria are not present in the blood e.g. only a small {region / sample} shown, reference to local infection ;	**(2)**

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Question Number	Answer	Mark
8(c)(i)	Either: 1. idea of fewer {lymphocytes / eq} ; 2. reference to {lymphocytes / eq} no longer needed / eq ; 3. (as) {antibiotics / drugs} {kill / destroy / eq} bacteria ; Or: 4. more {lymphocytes / eq} ; 5. idea of clonal expansion (of lymphocytes) / eq ; 6. idea that the antibiotics have not killed all the bacteria yet ;	**(2)**

Question Number	Answer	Mark
8(c)(ii)	1. idea that a placebo has no effect ; 2. (therefore there will be) more bacteria / eq ; 3. (therefore there will be) more {lymphocytes / eq} ; 4. (more lymphocytes due to) clonal expansion / eq ;	**(2)**

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