



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

# Mark scheme

# January 2003

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## GCE

## Biology B

## Unit BYB4

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Kathleen Tattersall: *Director General*

**Guidance on the award of the mark for Quality of Written Communication on Section B of Unit Tests**

Quality of Written Communication assessment requires candidates to:

- select and use a form and style of writing appropriate to purpose and complex subject matter;
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate; and
- ensure text is legible, and spelling, grammar and punctuation are accurate, so that meaning is clear.

For a candidate to be awarded 1 mark for quality of written communication on Section B in a unit test, the minimum acceptable standard of performance should be:

- the longer parts (worth 4 marks or more) should be structured in a reasonably logical way, appropriate and relevant to the question asked;
- ideas and concepts should be explained sufficiently clearly to be readily understood. Continuous prose should be used and sentences should be generally be complete and constructed grammatically. However, minor errors of punctuation or style should not disqualify;
- appropriate AS/A level terminology should be used. Candidates should not use such phrases as ‘fighting disease’, ‘messages passing along nerves’, ‘enzymes being killed’ etc, but a single lapse would not necessarily disqualify. Technical terms should be spelled correctly, especially where confusion might occur, e.g. mitosis/meiosis, glycogen/glucagon.

The Quality of Written Communication mark is intended as a recognition of competence in written English. Award of the mark should be based on overall impression of performance on Section B. Perfection is not required, and typical slips resulting from exam pressure such as ‘of’ for ‘off’ should not be penalised. Good performance in one area may outweigh poorer performance in another. Care should be taken not to disqualify candidates whose lack of knowledge relating to certain parts of a question hampers their ability to write a clear and coherent answer; in such cases positive achievement on other questions might still be creditworthy. No allowance should be made in the award of this mark for candidates who appear to suffer from dyslexia or for whom English is a second language. Other procedures will be used by the Board for such candidates.

Examiners should record 1 or 0 at the end of Section B in the Quality of Written Communication lozenge. This mark should then be transferred to the designated box on the cover of the script.

## Unit 4: Energy, Control and Continuity

### Question 1

- |        |  |          |       |
|--------|--|----------|-------|
| (a)    | active transport/pumping of sodium (ions across membrane);<br>out of neurone/higher concentration outside;<br>differential permeability to $K^+$ and $Na^+$ ;  |          | 2 max |
| (b)(i) | A – sodium;<br>B – potassium;  | Both for | 1     |
| (ii)   | sodium ions diffuse in;<br>causing depolarisation/described;<br>potassium ions then diffuse out, to start recovery;<br><i>(If first point wrong, <math>K^+</math> in opposite direction mark can still be awarded)</i> |          | 2 max |
| (iii)  | no (new) action potential/nerve impulse be produced in this time;  |          | 1     |
| (iv)   | 1 mark for principle of calculation, time $\div$ stated duration of refractory period/event;<br>360 – 370; ( <i>accept 333–400</i> ) ( <i>correct answer = 2</i> )   |          | 2     |
|        |  | Total    | 8     |

### Question 2

- |         |   |       |       |
|---------|---|-------|-------|
| (a) (i) | reduced NADP/NADPH;<br>ATP;   |       | 2     |
| (ii)    | reduced NADP reduces G3P (to sugar);<br>ATP supplies (extra) energy for reaction;   |       | 2     |
| (b) (i) | chloroplast has (and bacterium does not)/<br>no cell wall;<br>two membranes surrounding chloroplast;<br>grana/thylakoids;<br>starch granules;             |       | 2 max |
| (ii)    | source of hydrogen/used instead of water;<br>for light-dependent reaction/reducing NADP;<br>source of electrons for chlorophyll/electron transport chain; |       | 2 max |
|         |   | Total | 8     |

**Question 3**

- (a) removal of hydrogen/dehydrogenation;  
by enzymes/dehydrogenases;  
H accepted by NAD/reduced NAD formed;  
in Krebs cycle, FAD (used as well); 3 max
- (b) oxygen is terminal/final electron acceptor;  
combines with electron and hydrogen (to form water); 2
- Total 5
- 

**Question 4**

- (a) Two differences with effects;;  
myasthenic has fewer folds/ fewer receptors;  
so less chance of depolarisation/fewer Na<sup>+</sup> channels open;
- wider gap/cleft;  
so takes longer for transmitter to diffuse across;  
different ratio of receptors to esterase;  
so transmitter more likely to be destroyed before binding  
to receptor;
- acetylcholinesterase in shallower folds/more exposed;  
so transmitter destroyed before binding (to receptor); 4 max
- (b) tropomyosin on actin;  
calcium ions needed to move it out of the way;  
allows myosin to bind to actin/formation of cross bridges;  
fewer calcium ions leads to fewer power strokes/  
ratchet actions;  
needed for activation of ATPase; 3 max
- Total 7
-

**Question 5**

- (a) recessive,  
only expressed in phenotype if homozygous;  
codominant alleles,  
both expressed (in phenotype), if both present; 2
- (b) (i)  $F_1 - F^B F^W$ ;  
gametes clearly indicated –  $F^B$  and  $F^W$ ;  
 $F_2$  genotypes correct and in correct order –  $F^B F^B$     $F^W F^W$     $F^B F^W$ ;  
working clearly set out; 4
- (ii) chance related to mating;  
random fusion of gametes;  
small sample size;  
differential mortality; 2 max
- Total 8
- 

**Question 6**

- (a) variation between members of population/species;  
predation/disease/competition results in differential survival;  
some have adaptations that favour survival;  
survive to reproduce/have more offspring/ pass on their alleles/genes;  
produces changes in frequency of alleles/gene pool/  
genotypes/phenotypes; 4 max
- (b)(i) reduces it;  
homozygous much more;  
correct use of figures, hetero by 29/30% and  
homozygous by 92/94%; 2 max
- (ii) people without  $Hb^C$  lower survival rate, so less likely to pass on  $Hb^A$  allele;  
increasing chance of children where both parents carry  $Hb^C$ ;  
homozygous  $Hb^C$  most likely to survive and pass on allele; 2 max
- Total 8
- 

**Question 7**

- (a) heterotrophic/no photosynthesis;  
saprotrophic/extracellular digestion/parasitic;  
cell wall of chitin;  
no motile cells/non-motile; 2 max
- (b) (i) X between zygote and spores; 1
- (ii) independent assortment;  
crossing over; 2
- (iii) some (new phenotypes) may survive adverse  
conditions;  
resistant spores produced; 1 max
- Total 6
-

**Section B****Question 8**

- (a) cones respond to colour, rods only light and absence/black and white;  
cones require a higher light intensity to respond;  
cones greater acuity/rods lower acuity;  
cones connected singly to bipolar/ganglion cells;  
so brain receives nerve impulses from small area (of retina/visual field);  
rods (lower acuity because) connected in groups, to bipolar/ganglion cells;  
rods higher sensitivity, because connected in groups/summation/convergence;  
different pigment sensitivities; 4 max
- (b) (i) A – (speech) motor area/Broca’s area;  
B – (speech) association area/Wernicke’s area; 2
- (ii) (image on the retina) detected by receptors;  
nerve impulses along sensory neurones/optic nerve;  
from right eye to left side of brain;  
to visual sensory area, where nerve impulses/information/image is processed;  
(nerve impulses) to visual association area, where image identified (from memory/experience);  
nerve impulses to the speech association area;  
where correct word selected/identified from memory to match information/nerve impulses;  
nerve impulses to speech motor area;  
where correct muscle movements selected to form word;  
nerve impulses to motor area of face, which sends nerve impulses to  
effectors/muscles in mouth and face; 6 max
- (c) pupil constriction a reflex action;  
circular muscles of iris contract;  
under parasympathetic control;  
failure indicates damage to brain/autonomic nervous system;  
on left side of the brain; 3 max

Total 15

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**Question 9**

- (a) increase in blood sugar leads to lower blood sugar (homeostatic principle)/ (more) insulin secreted;  
binds to (specific) receptors on (liver/muscle) cells;  
leads to more glucose entering cells/carrier activity/increased permeability to glucose;  
glucose leaves the blood;  
glucose entering cell converted to glycogen; 4 max
- (b) keeps glucose in muscle cells/glucose phosphate can not cross cell membranes;  
muscle cells need glucose for respiration. 2
- (c) sympathetic nervous system active, so adrenaline released;  
adrenaline binds to receptors/acts on muscle cell;  
causing increased glycogen phosphorylase activity;  
more glucose (phosphate) for respiration;  
calcium ions enter muscle cells and glycogen broken down/increase in phosphorylase activity;  
lower blood sugar as glucose used by muscles;  
glucagon released and binds to receptors/acts on liver cells;  
causes glycogen to be broken down to glucose/glycogen breakdown increases;  
  
*(one mark for general point that hormones bind to their receptors)* 6 max
- (d) blocks A and B/ C and D work together;  
A and B antagonistic to C and D;  
A and B contract to move tail to the left/right, while C and D relax, then C and D contract;  
muscles act against/ attached to the backbone; 3 max

Total 15