



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2004

GCE

Biology B

Unit BYB4

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Guidance on the award of the mark for Quality of Written Communication

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 the question identified as assessing QWC 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 the question identified on the paper as assessing QWC. 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 the paper in the Quality of Written Communication lozenge. This mark should then be transferred to the designated box on the cover of the script.

Question 1

- | | | |
|-------|--|---|
| (a) | W = myosin X = actin; | 1 |
| (b) | myofibril is <u>contracting</u> in Figure 3 / <u>relaxing</u> in Figure 2 ; movement of actin fibres between myosin fibres; | 2 |
| (c) | interact with/move/touch tropomyosin; (<i>allow troponin as alternative</i>) to reveal binding sites on actin; (<i>not active sites</i>) allowing myosin (heads) to bind/touch actin / actinomyosin formed; activate ATPase / energy released from ATP; | 4 |
| Total | | 7 |
-

Question 2

- | | | |
|-------|---|-------|
| (a) | 6; | 1 |
| (b) | (i) chromosomes are arranged in (homologous) pairs/bivalents; crossing over/chiasma present / exchange of genetic information; bivalents arranged independently; | 2 max |
| | (ii) separation/splitting/pulling apart of <u>homologous</u> chromosomes/ <u>pairs</u> of chromosomes; (<i>must give indication that one chromosome moves to each side</i>) (<i>must be in the context of meiosis – not chromatid movements</i> <i>and not chromosomes separate</i>) pulled at centromere / by spindle / fibres; | 2 |
| (c) | (i) the short arm of both chromosomes labelled on the middle homologous pair; (B and b must be labelled on separate chromosomes) | 1 |
| | (ii) 8 = 2 marks; working showing genotypes with 1 allele from each pair (for example, B C D) = 1 mark | 2 |
| Total | | 8 |
-

Question 3

- (a) **X** clearly written in a motor area;
in the right hemisphere; 2
- (b) impulses along neurones/(optic) nerve; *(not signal, message, image or information)*
to visual (sensory) area/cortex;
to (visual) association area;
linked with memory; *(allow past experiences)* 3 max
- (c) (impulses) from (receptors in) hand to sensory area of brain;
(allow information – lose sensory area mark if eyes are involved)
to association area concerned with memory (to recognise the toothbrush's presence);
in right hemisphere/side of brain;
(do not credit references to association areas in the left hemisphere)
no communication with (left) hemisphere where speech centre is located;
(credit references to speech controlled on left side) 3 max
- Total 8
-

Question 4

- (a) insulin binds to specific receptors (on membranes);
insulin activates carrier proteins / opens channels / causes more channels to form;
insulin increases the permeability of liver/muscle cells/tissues to glucose;
insulin action results in glucose conversion to glycogen / glycogenesis; 3 max
- (b) glucose is used in cell respiration / as energy source / in metabolism;
(must qualify how glucose is used)
glucose enters cells / converted to glycogen in cells;
glucose is excreted / in urine;
(do not credit no reabsorption of glucose in kidneys) 2 max
- (b) line from 80mg, increasing but keeping below line for diabetic,
dropping to 80mg; *(line must stabilise at, or fluctuate around 80mg)* 1
- (d) (i) fast acting insulin reduces blood glucose from breakfast;
slow acting insulin reduces blood glucose from other meals before the evening meal / eliminates the need to inject at lunch;
(must be a reference to the meals)
(one mark if neither of the above but a clear reference is made to glucose conversion to glycogen); 2

- (ii) glucagon is still active;
glycogen converted to glucose / glycogenolysis;
insulin injected at breakfast causes cells to take up glucose
too slowly for levels to become dangerously low;
person is not active so little glucose used in respiration;
(do not credit statements about consuming large breakfasts) 1 max

Total 9

Question 5

- (a) gene located on X/Y/one sex chromosome;
(allow gene on X or Y chromosome, not X and Y) 1

- (b) (i) black; 1

- (ii) $X^G X^g$; 1
(lose this mark if the wrong genotype is given for the female in (iii))
(must show X chromosomes to gain the mark)

correct parent gametes

(X^g and Y from male, X^G and X^g from female);

correct offspring genotypes ($X^g X^g$, $X^G X^g$, $X^G Y$, $X^g Y$);

correct link of offspring genotypes with phenotypes;

$X^g X^g$ black female

$X^G X^g$ tortoiseshell female

$X^G Y$ ginger male

$X^g Y$ black male 3

*(correct gametes, offspring genotypes and link with phenotypes
based on incorrect parent genotype = 3 marks)*

- (c) $X^G Y dd$;
correct male kitten genotypes ($X^g Y Dd$ and $X^g Y dd$);
correct link of kitten genotypes with phenotypes; *(ignore female kittens)* 3

$X^g Y Dd$ black

$X^g Y dd$ grey

*(correct kitten genotypes and phenotypes based on incorrect parent
genotype = 2 marks)*

Total 9

Question 6

- (a) the more light absorbed, the greater the rate of photosynthesis;
light provides the energy for light dependent reactions / photolysis /
light independent reactions / production of reduced NADP /
exciting electrons in chlorophyll;
(do not give credit if energy is used in photosynthesis) 2
- (b) count the number of bubbles / measure the volume of gas / measure the
change in pH / carbon dioxide / hydrogen carbonate ions;
(credit oxygen produced) 1
- (c) 530 – 630 nm; *(any values within this range)*
limited absorption of light / (green) plants reflect green light /
limited photosynthesis at these wavelengths of light; 2
(allow references to no light absorbed or no photosynthesis)
- (d) (i) chlorophyll excited / reduced NADP formed;
electrons from chlorophyll / reduced NADP changes the dye
colour; 2
- (ii) ADP and phosphate needed to produce ATP / ATP is a product of
the light dependent reactions;
ADP levels are a limiting factor; 2
*(must explain the idea of limiting factors – do not credit answers
like more ADP causes more photosynthesis)*
- Total 9
-

Question 7

- (a) membrane relatively impermeable / less permeable to sodium ions /
gated channels are closed / fewer channels;
sodium ions pumped / actively transported out;
by sodium ion carrier / intrinsic proteins;
higher concentration of sodium ions outside the neurone;
inside negative compared to outside / 3 sodium ions out for two potassium
ions in; 4 max
(if sodium mentioned but not in context of ions, negate 1 mark)
- (b) (i) 1.6; 1
- (ii) $18 \div 1.6 = 11.25$;
multiply by 1000 to convert from ms to s / 11 250; 2
(correct method = 1 mark, i.e. distance or $\times 1000$)
time
(correct answer based on (b) (i) = 2 marks)

| | | |
|-------|---|-------|
| (iii) | time for transmission / diffusion across the neuromuscular junction / synapse; time for muscle (fibrils) to contract; | 1 max |
| (c) | movement by diffusion; binding to receptors on (post-synaptic) membrane; causing sodium channels to open / sodium ions to move in to muscle (cell); | 3 |
| (d) | (i) toxin binds to/competes for / blocks the acetylcholine receptors; acetylcholine can not depolarise the membrane / the toxin does not cause depolarisation; <i>(allow references to generating action potentials instead of depolarisation, do not allow references to impulses in muscles)</i> | 2 |
| (ii) | acetylcholinesterase is unable to breakdown acetylcholine; acetylcholine still available to depolarise the membrane / generate action potentials in the membrane; | 2 |
| Total | | 15 |

Question 8

| | | |
|-----|--|---|
| (a) | phylum, class, family, genus; | 1 |
| (b) | (i) presence of a nucleus / membrane bound organelles / named organelles only 80S ribosomes / lacks a cell wall; | 1 |
| | (ii) lacks a cell wall / no chitin / is motile / has one nucleus / no hyphae; <i>(do not credit it has a nucleus)</i> | 1 |
| | <i>(credit only one answer relating to a lack of cell wall; if more than one answer is given in (i) and / or (ii), incorrect answers negate)</i> | |
| (c) | (i) more recent common ancestor / DNA in common; | 1 |

- (ii) mutation;
there is variation;
genes (coding) for protein / cytochrome c with different structures;
EITHER
individuals with a modified cytochrome c have a selective
advantage / are selected for;
these individuals are more likely to survive to have offspring /
have more offspring;
(*must link a comparison of survival to reproduction*)
gene / allele frequency changes over generations / time;
OR
changed structure does not affect protein function;
these structural differences accumulate over time; 4 max
- (c) oxidation of/removal of electrons / removal of H⁺ from pyruvate/
acetyl CoA / 6 carbon compound; (*credit oxidative decarboxylation*)
substrate level production of ATP / ATP produced in Krebs cycle;
production of reduced NAD / FAD (*allow they take up hydrogen*);
in matrix of mitochondria;
electrons fed into electron transport chain / used in oxidative
phosphorylation / description of electron transfer;
on cristae / inner membrane;
linked to ATP production;
ATPase / stalked particles involved;
electrons lose energy as passed along chain / electron carriers
arranged in order of decreasing energy levels; 7 max
- Total 15
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QWC (See guidance)

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