GCE 2005
January Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Biology Specification B

BYB4 Energy, Control and Continuity

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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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.

BYB4

Question 1

(a) A – granum/thylakoid;
chlorophyll molecules to trap light / light absorbing pigments/
light dependent reaction / part of light dependent reaction; 2

B – stroma;
(contains enzymes for) carbon dioxide fixation/light-independent reaction/
part of light-independent reaction;
(allow ribosome role of protein in photosynthesis) 2

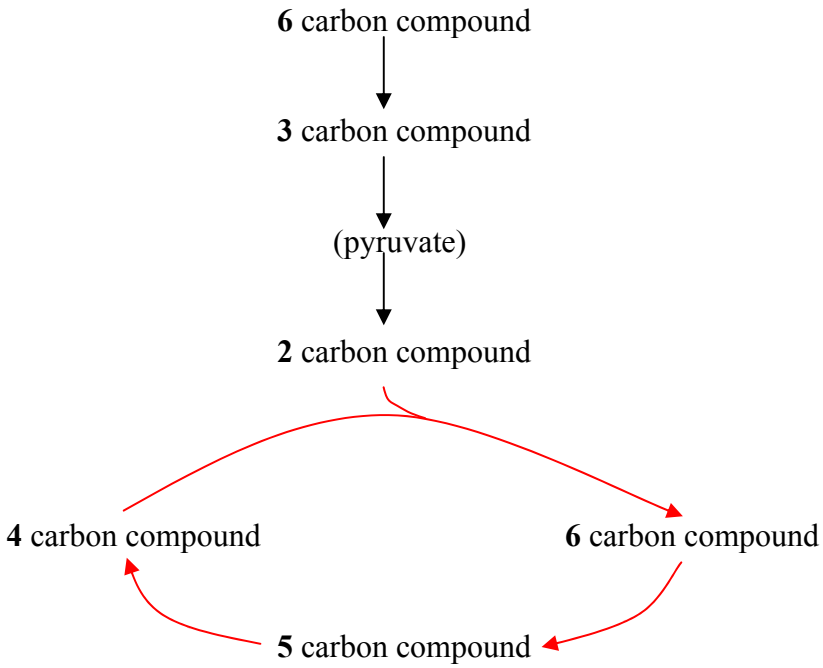
(b) (i) C – starch; 1

(ii) from glucose in a condensation/polymerisation reaction / many
glucose molecules joined together; 1

Total 6

Question 2

(a)



(*1 mark for three correct answers*)
(*2 marks for six correct answers*) 2

reduced NAD/NADH/$NADH_2$;
reduced FAD/FADH/$FADH_2$; 3
ATP;

Total 5

Question 3

(a) calcium ions;
bind to/displace tropomysin; *(allow troponin)*
reveal binding site on actin;
myosin binds to exposed sites on actin/actomyosin formed/
cross bridges form between actin and myosin;
activates ATPase; 3 max

(b) distance single actin filament moves divided by distance moved using 1 ATP;
15 ATP; 2

(c) respiration stops;
no ATP produced;
ATP required for separation of actin and myosin/cross bridges; 2 max

Total 7

Question 4

(a) cell walls with chitin / hyphae / mycelium; 1

(b)

	prokaryotes	protoctists	fungi	plants	animals
Includes organisms which photosynthesise	✓	✓	x	✓	x
Includes organisms which have cell walls	✓	✓	✓	✓	x
Includes organisms with mitochondria in their cells	x	✓	✓	✓	✓

3

Total 4

Question 5

(a) epistasis;
one gene influences the expression of another/ description using example in question; 2

(b) aaDD, aa Dd (or DDaa, Ddaa); 1

(c) (i) AaDd (or DdAa); 1

(ii) aadd, Aadd (or ddaa, ddAa); 1

(iii) cross with black individual / genotype aaDd or aaDD;
genotype is Aadd if agouti offspring/genotype is aadd if no agouti offspring;
Accept;
repeat cross using original parents many times;
ratio is 4 albino : 3 agouti : 1 black if Aa, or 2 albino : 1 agouti : 1 black if aa; 2

Total 7

Question 6

(a) sodium gates or channels open / increase in permeability of axon membrane to sodium ion;
sodium ions enter axon; 2

(a) non-myelinated – next section of membrane depolarised / whole membrane;
myelinated – depolarisation / ion movement only at nodes;
impulse jumps from node to node /saltatory conduction; 3

Total 5

Question 7

(a) variation present in (original population);
(copper) tolerant individuals more likely to survive;
(these reproduce and) pass on genes (to next generation/offspring);
more/increase (in frequency) of copper tolerance alleles/genes; 4

(b) 1. reproductively isolated / no interbreeding (due to different flowering times);
2. conditions different for two populations / different selection pressures;
3. different features or plants are selected or survive /different adaptations;
4. populations become (genetically) different;
5. unable to produce fertile offspring; 4

Total 8

Question 8

(a)

A		A		a		a	
b		b		B		B	

1

(b) bivalent; 1

(c) (i) Ab, aB;

(ii) AB, ab; 2

(d) mutation;
different/new allele formed / genes deleted or duplicated/ sequence of genes changed *(reject genetic information)*;

<u>random</u> fusion of gametes / fertilisation;
new combination of alleles;

independent assortment (of chromosomes) *(accept random)*;
shuffling of maternal and paternal chromosomes/new combination of alleles;
(ignore references to stages of meiosis)
any 2x2 4 max

Total 8

Question 9

(a) (i) retina *(allow fovea)*; 1

(ii) sympathetic (nervous system) causes pupil to dilate/radial muscles (of iris) to contract;
parasympathetic causes pupil to constrict / circular muscles (of iris) to contract;
sympathetic and parasympathetic have antagonistic/ opposite effects *(ignore pupil contracts)*; 2

(b) 1. both pigments on lamellae;
2. both pigments break down/bleach in presence of light;
3. rods have rhodopsin;
4. cones have iodopsin;
5. rhodopsin/pigment/rods sensitive to white light/wide range of wavelengths;
6. rhodopsin/pigment/rods sensitive to lower light intensities than iodopsin/cones;
7. three types of pigment/iodopsin or three types of cone sensitive to red, blue or green light *(not red/green/blue cones without further explanation)*; *(max 4 for differences only)* 5 max

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(c) (i) all/more cones in central region of retina in humans / converse; 1

(ii)
1. limited colour vision/fewer colours distinguished;
2. unable to distinguish G/Y/O/R (any two) / red-green colour blind;
3. as only one type of cone stimulated over this range / no overlap in absorption spectra over this range;
4. better vision in dim light;
5. as higher frequency of rods;
6. lower visual acuity;
7. as higher convergence/summation occurs with rods / converse;
8. better peripheral/all round vision / wider field of view;
9. binocular vision limited to directly in front; 6 max

Total 15

Question 10

(a) as distance from skin surface increases the temperature increases/ steep temperature gradient;
temperature at depth of 50mm/inside of blubber similar to body core temperature; 2

(b) EITHER

1. increased (blood) temperature results in increased blood flow through capillaries in blubber / vasodilation in blubber;
2. increased skin temperature;
3. increased loss of heat from skin;
4. decreased temperature results in reduced blood flow through blubber capillaries/ vasoconstriction in blubber;
5. correct reference to (sphincter/circular) muscles of arterioles;
6. correct reference to role of shunt vessels;

OR

1. decreased (blood) temperature results in decreased blood flow through capillaries in blubber / vasoconstriction in blubber;
2. decreased skin temperature;
3. decreased loss of heat from skin;
4. increased temperature results in increased blood flow through blubber capillaries/ vasodilation in blubber;
5. correct reference to (sphincter/circular) muscles of arterioles;
6. correct reference to role of shunt vessels; 4 max

(c) counter-current principle;
temperature of blood flowing to flipper greater than that leaving it / temperature of blood greater in artery than vein;
therefore heat (energy) transfer artery to vein;
less heat lost as not transferred to environment/transferred to body core; 3 max

(b) 1. salt/(sodium) ions diffuse into descending limb;
2. water moves out of descending limb;
3. salt/(sodium) ions actively removed from ascending limb;
4. ascending limb impermeable to water;
5. low water potential/ high concentration of ions in medulla/tissue fluid;
6. water leaves collecting duct / distal tubule;
7. due to difference in water potential / by osmosis; 6 max

Total 15

QWC (See guidance) 1