



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Biology 6416

Specification B

BYB4 Energy, Control and Continuity

Mark Scheme

2006 examination - January series

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.

General Guidance for the Mark Scheme

The following conventions are used in the mark scheme:

- A semicolon (;) separates each mark point
- An oblique stroke (/) separates alternatives within a mark point
- Underlining of a word or phrase means that the term must be used by candidates
- Brackets are used to indicate contexts for which a mark point is valid, but which may just be implied by a candidate's answer
- '*Accept*' and '*reject*' show answers which should be allowed or not allowed.
- Additional instructions may be shown in *italics*

The scheme shows the minimum acceptable answer(s) for each mark point - better, more detailed, or more advanced answers are always accepted, provided that they cover the same key ideas. Occasionally, a candidate will give a biologically correct answer that has not come up at standardising. If it is equivalent in standard to the mark scheme answers, it may be credited.

In some cases a mark may be awarded for understanding of a general principle, even though the detailed mark points on the scheme have not been made. This will be indicated on the mark scheme.

All mark points are awarded independently, unless a link between points is specified in the scheme.

Converse answers are normally acceptable, unless the wording of the question rules this out.

Disqualifiers

A correct point is disqualified when the candidate contradicts it in the same answer.

The list rule

When a question asks for a specific number of points, and the candidate gives more, any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers.

Valid points from **diagrams** are credited, if they are not duplicated in the text.

Where a question asks for **differences** between X and Y, the mark may be awarded for a feature of X without the converse for Y, if it is absolutely clear which is being referred to.

BYB4**Question 1**

- (a) matrix; 1
- (b) pyruvate;
ADP;
P / inorganic phosphate;
reduced NAD;
oxygen; 2 max
- (c) larger surface area for electron carrier system / oxidative phosphorylation;
provide ATP / energy for contraction; 2

Total 5**Question 2**

- (a) no rods at blind spot or fovea;
greater distribution of rods at edge; 2
- (b) more rods and no / fewer cones present;
rods at the fovea / rods not mainly at periphery;
rods have high sensitivity / show retinal convergence / converse for cones;
rhodopsin 'bleached' at low light intensities / iodopsin 'bleached';
at high light intensities; 3 max
- (c) cannot become as convex;
has reduced refracting / converging power;
focused behind retina; 2 max

Total 7**Question 3**

- (a) electrons;
from chlorophyll / photolysis; 2
- (b) (i) RuBP combines with carbon dioxide to produce 2 x GP; 1
- (ii) less used to combine with carbon dioxide /
less used to form glycerate 3-phosphate; 1
- (c) (i) used in photosynthesis allows detection of products; 1
- (ii) ATP and reduced NADP not formed;
GP is not being used to form RuBP / is being formed from RuBP; 2
- (iii) used in respiration / formation of starch / cellulose; 1

Total 8

Question 4

- (a) one / two / few genes versus many / polygenic;
 limited / none versus significant;
 limited / few versus wide / many; 3
- (b) named difference in environmental factor during pregnancy
 e.g. nutrient supply; 1
- Total 4**

Question 5

- (a) breed together;
 if fertile offspring, then same species; 2
- (b) isolation of two populations;
 variation already present due to mutations;
 different environmental conditions / selection pressures;
 selection of different features and hence different alleles;
 different frequency of alleles;
 separate gene pools / no interbreeding; 4 max
- (c) selection of mate dependent on colour pattern;
 prevents interbreeding / keeps gene pools separate; 2
- Total 8**

Question 6

- (a) (i) black; 1
- (ii) chocolate; 1
- (b) **BE, Be, bE, be and be;**
BbEe, Bbee, bbee, bbEe;
 1 black: 2 yellow: 1 chocolate; 3
- (c) (i) no enzyme coded for when no dominant / **E** allele;
 phaeomelanin not converted – (remains yellow); 2
- (ii) **E** allele results in enzyme producing eumelanin;
B allele – more eumelanin deposited in hairs; 2
- Total 9**

Question 7

- (a) uptake of oxygen / production of carbon dioxide; 1
- (b) constriction / narrowing / shunt effect;
of arterioles;
less blood flow to capillaries;
reduces heat loss via radiation / conduction / convection; 3 max
- (c) (i) metabolism releases heat;
increase in environmental temperature provides heat / warms mammal;
less heat required from metabolism which falls / levels off; 3
- (ii) lack of thermoregulatory control at high temp. / positive feedback;
increase in temperature increases metabolism / respiration; 2
- Total 9**

Question 8

- (a) (i) lateral rectus contracts, medial rectus relaxes;
medial rectus contracts, lateral rectus relaxes; 2
- (b) visual sensory area receives impulses from receptors;
association area interprets impulses using previous experience;
motor area sends impulses to muscles / effectors; 3
- (c) (i) A / dark band is mainly due to myosin filaments;
H zone only myosin filaments;
darker band has both types of filament;
light band has only actin filaments; 2 max
- (ii) H zone narrows;
light band narrows;
outer darker regions of A / dark band widen; 2 max
- (d) (i) breaks down ATP yielding energy;
used to form / break actomyosin bridges; 2
- (ii) **A and B**
tropomyosin covers binding site on actin;
no cross bridges formed / ATPase activity on myosin head reduced; 2
- B and C**
calcium ions remove tropomyosin;
binding / calcium ions increase ATPase activity; 2
- Total 15**

Question 9

- (a) (i) pituitary; 1
- (ii) water potential of blood increases;
water moves in causing swelling, ADH secretion decreases; 2
- (b) (i) sodium ions enter;
stimulates increased permeability to sodium / more sodium gates open;
depolarization occurs;
potassium ions move out;
correct reference to role of sodium / cation pump;
increase in permeability of adjacent area to sodium ions / local circuits; 6
- (c) $130 \times 60 = 780$ plus attempt to calculate 15%
1.17 litres; 2
- (d) (i) permeability of distal tubule / collecting duct to water decreases;
less water reabsorbed by osmosis; 2
- (ii) increased thirst;
frequent urination; 2

Total 15

QWC 1