



## General Certificate of Education

# Biology 5416

## *Specification B*

*BYB1 Core Principles*

# Mark Scheme

*2006 examination – June 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.

## BYB1 Core Principles

### Question 1

- (a) (i) A mitochondrion and B nucleus; 1  
(need both for one mark)
- (ii) increased surface area; 2  
for respiration/enzymes;
- (b) *any suitable feature* 1  
e.g. plasmid/capsule/70S ribosomes/smaller ribosomes/complex cell wall/mesosome/no nucleus;
- (c) use of differential centrifugation/or description; 3 max  
first/low-spin pellet discarded / spin at low speed to remove cell wall material/cell debris;  
supernatant re-spun at higher speed / until pellet with chloroplasts is found;  
method of identifying chloroplasts e.g. microscopy;

**Total 7**

### Question 2

- (a) *two of the following:*  
form (water) impermeable barrier to water-soluble substances / selectively permeable / allows non-polar molecules to pass through;  
allows cell to maintain different concentrations either side;  
makes membranes self-sealing/able to fuse with other membranes/able to form vesicles / gives flexibility/fluidity; 2 max
- (b) (surface/extrinsic protein) for cell recognition / binding to hormones/identification 1
- (c) (i) involves carrier/transmembrane/transport proteins; 1  
(*reject channel proteins*)
- (ii) requires energy/requires use of ATP / moves substances/ions/molecules against a concentration gradient; 1
- (iii) the curve levels off above a certain external concentration of substance; as channel proteins are saturated with molecules (and no more can be carried); 2

**Total 7**

**Question 3**

- (a) **three of the following:**  
contraction of intercostal muscles pulls ribs up/out;  
contraction of diaphragm muscles and it flattens;  
increase in volume of thorax / decrease in pressure in thorax;  
air moves in down pressure gradient; 3 max  
*(accept also nerve impulses pass from the respiratory centre (to the intercostal muscles and diaphragm));*
- (b) not enough O<sub>2</sub>;  
for increased respiration / for ATP needed for exercise; 2
- reference to decreased surface area of alveoli/ longer diffusion pathway;  
less gas exchange/less diffusion/less oxygen passes into the blood;
- OR*
- reference to decreased elasticity/reduced elastic recoil;  
meaning breathing becomes more difficult/laboured/shallower/lungs do not empty; 2
- Total 7**

**Question 4**

- (a) **A and** structure (of **A**) is complementary to that of the active site; 1
- (b) idea that non-competitive inhibitor (**C**) binds at a site not the active site;  
binding causes a change in the shape of the active site;  
substrate is no longer able to bind to the active site; 3
- (c) peptide; 1
- (d) idea that amino acid chain folds/tertiary structure;  
named bond holding tertiary structure e.g. ionic disulphide hydrogen;  
*(reject peptide)* 2
- Total 7**

**Question 5**

- (a) external solution lower / more negative water potential;  
water is lost from the cell by osmosis;  
cell/cell membrane comes away from the cell wall; 2 max
- (b) (i) active transport of sugars/mineral ions;  
from (vascular) tissue carrying (water) sugar/mineral ions; 2
- (ii) cortex (cells) take up water by osmosis (from vascular tissue);  
become turgid;  
cells expand and press against each other/epidermis;  
idea of epidermis restricting/preventing expansion of stem section;  
physical/mechanical support of stem in terms of vertical support/prevent  
bending; 3 max
- Total 7**

**Question 6**

- (a) (diffusion) gradient will be maintained all the way along the gill / the amount of  
oxygen in the water is always higher than in the blood / the numbers in the water are  
always higher than in the blood;  
more oxygen will diffuse into the blood; 2
- (i) 100 cycles per minute; 2  
*(principle of 60/x or 0.6 seen gains one mark)*
- (ii) shuts mouth;  
raises the floor of the mouth cavity;  
decreases volume in the mouth cavity; 2 max
- (iii) the fish has lowered the floor of its mouth cavity;  
(therefore) the pressure in the mouth falls below that of the opercular cavity;
- OR*
- the fish has closed the flap covering the opercular cavity;  
(therefore) the pressure in the opercular cavity increases above that of the  
mouth cavity; 2

**Total 8**

**Question 7**

(a) *feature and adaptation;; e.g.*

**stomach**

1. extra muscle layers;
2. churning action;
3. gastric pits/glands or named cells;
4. mucus to protect stomach wall/ acid/HCl to kill bacteria or optimal pH/ pepsinogen or pepsin or endopeptidase for (protein) digestion;

*Detail mark*

5. goblet cells produce mucus;
6. oxyntic cells produce acid;
7. chief or zymogen cells produce pepsinogen/pepsin/endopeptidase;

**Ileum**

8. villi;
9. microvilli on epithelial cells;
10. larger surface area for absorption;
11. single layer of cells / capillary/blood vessels close to surface;
12. short diffusion pathway;
13. (extensive) capillary network / large number of blood vessels/lacteals;
14. maintain diffusion gradient;
15. feature of transmembrane/carrier/transport/intrinsic protein / many mitochondria;
16. active uptake/facilitated diffusion;
17. lacteals (in villi)/lymph vessels;
18. carry away lipids/fats or equivalent;
19. Brunner's glands;
20. secrete alkaline fluid which neutralises acid (suitable environment for intestinal enzyme)
21. correct named enzyme + location e.g. maltase in membrane of epithelial cells;
22. linked function e.g. hydrolyses maltose to glucose;
23. antagonistic / circular and longitudinal muscles;
24. peristalsis;

**3 features max**

**2 features max for each area**

**max 4 for answers relating to stomach**

**max 4 for answers relating to ileum**

6 max

- (b) carbohydrase (zero) only breaks down carbohydrates;  
exopeptidase (slow) only taking amino acids/dipeptides off ends;  
endopeptidase (slow) only breaking (peptide) bonds inside;  
endopeptidase and exopeptidase (fast) because endopeptidases produces more ends  
for exopeptidases; 4

**Total 10**

**QWC 1**