



# General Certificate of Education

## Biology 5411 *Specification A*

### *BYA2 Making Use of Biology*

# 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.

**Question 1**

- |     |       |  |         |
|-----|-------|--|---------|
| (a) | (i)   | dissolve (in soil water) / run-off / leaching; <i>reject nitrogen dissolving.</i>  | 1       |
|     | (ii)  | insoluble/less soluble;<br>(molecules) require breaking down / slow release;   | 2       |
|     | (iii) | increased growth / algal bloom;<br>blocks light;<br>less photosynthesis;<br>plants die;<br>increase in decomposers/bacteria; <i>ignore growth of bacteria</i><br>bacteria respire;<br>less oxygen; | 4 max   |
|     |       |  | Total 7 |
- 

**Question 2**

- |     |  |   |         |
|-----|--|---|---------|
| (a) |  | divide by mitosis / form clones;<br>produce plasma cells;<br>(plasma cells) make antibodies;<br>(plasma cells) produce memory cells;                                      | 4       |
| (b) |  | glycoprotein;<br>different shape to body proteins / body phospholipids are the same /<br>located on the outside of the cell / the haemoglobin is located inside the cell; | 2       |
|     |  |   | Total 7 |
- 

**Question 3**

- |     |      |  |         |
|-----|------|--|---------|
| (a) |      | Chromosomes: <b>C = 8 and D = 4;</b><br>DNA: <b>C = 300 and D = 150;</b> | 2       |
| (b) | (i)  | testis / ovary;<br><i>accept anther / carpel / stamen / testicle</i>     | 1       |
|     | (ii) | to make chromosomes / chromatids / DNA / genetic material<br>visible;    | 1       |
|     |      |  | Total 4 |
-

**Question 4**

- |       |   |   |
|-------|---|---|
| (a)   | restriction (enzyme) / endonuclease / named example;  | 1 |
| (b)   | unpaired bases / sticky ends / staggered;<br>complementary / explained;   | 2 |
| (c)   | <i>1 mark for each correct outcome</i><br>plasmid with foreign DNA joined in ring;<br>ring with plasmid only;<br>ring of foreign DNA only;<br><i>ignore linear structures</i> | 3 |
| Total |   | 6 |

**Question 5**

- |       |  |       |
|-------|--|-------|
| (a)   | 235-240;;<br><i>(one mark for an answer between 200-300 based on 2 - 3 stomata in 0.01mm<sup>2</sup><br/>Alternatively, one mark for calculating the area of the rectangle correctly as<br/>0.016 - 0.017mm<sup>2</sup>)</i> | 2     |
| (b)   | (i) grows in arid / dry conditions;<br>less surface area;<br>(rate of) transpiration / water loss would be reduced;  | 3     |
|       | (ii) rolled leaves / hinge cells/eq;<br>extensive/wide/spreading root system;<br>thick cuticle;<br>sunken stomata;<br>special mechanism of photosynthesis; <i>accept C4 photosynthesis</i><br>heat shock proteins;           | 2 max |
| Total |  | 5     |

**Question 6**

- |     |  |         |
|-----|--|---------|
| (a) | a length of DNA;<br>that codes for a single protein / polypeptide;   | 2       |
| (b) | by heating;<br>to break the H-bonds (between complementary bases);   | 2       |
| (c) | (i) to allow the DNA polymerase to attach / start addition of nucleotides / mark start and end of sequence to be copied / prevents strands re-joining; | 1       |
|     | (ii) because the sequences at the ends of the target sequence are different / one is at the beginning and one at the end;                              | 1       |
| (d) | 8; <i>accept 7</i>   | 1       |
|     |  | Total 7 |
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**Question 7**

- |     |   |         |
|-----|---|---------|
| (a) | (i) <b>R, P, Q;</b>   | 1       |
|     | (ii) luteinising hormone/LH;  | 1       |
| (b) | stimulates growth of/maintains uterine lining;<br>stimulates growth of blood vessels in uterine lining;<br>stimulates invagination of uterine lining;<br>stimulates production of mucus;<br>inhibits contraction of uterus; | 2 max   |
| (c) | inhibits follicle stimulating hormone/FSH;<br>prevents follicle developing / releasing an ovum;<br><i>Reject stops ova being produced or release of follicle.</i>   | 2       |
| (d) | removes inhibition of FSH / FSH production starts;<br>stimulating follicle development;   |         |
|     | OR  |         |
|     | removes inhibition of LH / LH production starts;<br>stimulating ovulation;  | 2       |
|     |   | Total 8 |
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**Question 8**

- (a) 1. can be carried out at lower temperatures / enzymes lower activation energy;  
2. (therefore) saves energy;  
3. safety hazards of using concentrated acid avoided;  
4. problems associated with supply/ disposal of acid;  
5. single fermentation / no cost of later yeast fermentation / can be performed in same place at same time;  
6. no unwanted byproducts / enzyme specific; 4 max
- (b) enzymes specific;  
so the two reactions do not interfere with each other / cellulase not inhibited;  
(named) conditions required for action of cellulose;  
also suitable for the (enzymes produced by) yeast; 2 max
- (c) increase surface area (of cellulose);  
therefore more contact with enzyme / more enzyme-substrate complexes /  
faster rate of reaction; 2
- (d) (i) 1. grow in (large) fermenter/vat;  
2. reference to aseptic technique / sterile conditions;  
3. suitable nutrients / named nutrients;  
4. suitable named conditions / pH / temperature /  
aerobic/anaerobic;  
5. cellulose in medium;  
6. downstream processing;  
7. filtration / centrifugation / ultrafiltration / flocculation;  
8. purification of enzyme / crystallisation / named method; 6 max
- (ii) easier to separate / no need to break open cells; 1

Total 15

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**Question 9**

- (a) (i) base / named bases; 1  
*reject nucleotide or uracil*
- (ii) it has been produced by semi-conservative replication / one old strand and one new;  
 one strand has  $^{15}\text{N}$  bases and the other  $^{14}\text{N}$ ; *Accept light / heavy N*  
 (therefore) it is less dense / lighter; 2 max
- (iii) one band is in same position as generation 1;  
 one band higher;  
*accept a line. N.B. need a visible gap* 2
- (b) (i) A = 31 and T = 31;  
 C = 19; 2
- (ii) viral DNA single-stranded / not double-stranded;  
 evidence from table e.g. not equal amount of A and T / C and G / all different; 2  
*ignore no base-pairing In this question assume 'It' means viral DNA*
- (c) 1. DNA splits / separates / hydrogen bonds break;  
*accept DNA unzips*  
 2. to make mRNA;  
 3. using RNA nucleotides;  
 4. via RNA polymerase;  
 5. complementary pairing / eq.;  
 6. introns/non-coding DNA spliced out;  
*accept junk DNA spliced out*
- max. 4 on points 1-6*
7. mRNA joins to ribosome (*accept travels to ribosome*);  
 8. tRNA carries a specific amino acid;  
 9. codon-anticodon relationship / explained;  
 10. peptide bonds form between amino acids; 6 max

Total 15

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