



General Certificate of Education

Biology 5411

Specification A

BYA2 Making Use of Biology

Mark Scheme

2007 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.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2007 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

Question 1

- (a) (i) Ts opposite As and Cs opposite Gs; 1
- (ii) Deoxyribose / pentose/5C sugar;
Phosphate/phosphoric acid; 2
- (iii) Hydrogen; 1
- (b) (i) The sequence of bases determines the sequence of amino acids;
Three bases code for one amino acid; 2
- (ii) Makes stable / prevents degeneration of molecule /
allows copying/ replication; 1
- Total 7**

Question 2

- (a) Protein / glycoprotein / glycolipid / polysaccharide / molecule;
On surface/membrane (of cell);
Causes immune response / triggers antibody production; 2 max

- (b) Mark in columns

| | | Blood group of sample | | |
|----------------|----------|-----------------------|----|----|
| | | A | AB | O |
| Antibody added | Anti - A | ✓ | ✓ | ✗ |
| | Anti - B | ✗; | ✓; | ✗; |

One mark for each correct column

3

- (c) DNA/ genetic fingerprint is unique to individual /
very small chance of two people having similar genetic finger print;
Few blood groups / many people share a blood group; 2

Total 7

Question 3

- | | | | |
|--------------|------|--|----------|
| (a) | (i) | 95 - 100 minutes; | 1 |
| | (ii) | It shows the distance between the (sister) chromatids increases at this point; As they begin to separate/ move to opposite poles; | 2 |
| (b) | | Chromatids cannot be seen; Valid reason, e.g. chromosomes have not condensed / too diffuse / still in interphase; | 2 |
| (c) | (i) | Zygote; | 1 |
| | (ii) | Avoids doubling of chromosomes number at each generation / maintains chromosome number from generation to generation/ diploid/correct number/ 46 restored at fertilisation; | 1 |
| Total | | | 7 |

Question 4

- | | | | |
|--------------|------|--|----------|
| (a) | | Restriction (enzyme)/ endonuclease/ named example cuts DNA/gene/plasmid; Ligase joins DNA/gene/plasmid; <i>Allow one mark if the two enzymes are correctly named but no function given. Enzymes can be in any order</i> | 2 |
| (b) | (i) | Plasmid contains the resistance gene / resistance gene is intact; | 1 |
| | (ii) | Gene for resistance to Y is disrupted; By inserted gene; Cannot undergo transcription / produce mRNA / cannot break down antibiotic; | 2 max |
| Total | | | 5 |

Question 5

- | | | | |
|-----|------|--|-------|
| (a) | | Same as other plot / named variable controlled; Without fertilizer; | 2 |
| (b) | (i) | 1149 - 1150;; 1 mark for 3224 – 258 or 2966; | 2 max |
| | (ii) | Wheat requires different nutrients; | 2 |
| (c) | | Plant growth limited by another limiting factor; | 1 |

- (d) Known nutrient content;
 Nutrients available immediately/ fast acting;
 Does not contain pests;
 Nutrients concentrated / needed in smaller amounts;
 Better to handle / easy to apply easily / easy to store/transport / avoids soil compaction; 2 max

Total 9

Question 6

- (a) Eat pesticide-containing food;
 Pesticide not biodegradable/broken down;
Stored in tissues/ fat;
 Bioaccumulation / biomagnification;
 Idea that organisms at top of food chain have highest concentration of pesticide; 3 max
- (b) Pike higher in the food chain so more pesticides in their food /
 no/less pesticide in plants, so safe to eat perch; 1
- (c) Smaller fish will be younger;
 Will have eaten less (contaminated) food;
 Therefore contain less pesticide; 2 max
- (d) Combines strengths of different methods / more effective overall;
 Lower quantities of pesticide used;

Detail of chemical method strengths – max 2 from

Kill wide range of pests;
 Effective at high and low pest densities;
 Fast acting;
 Can be applied to one precise area;
 Can eliminate pest;

Detail of biological method strengths – max 2 from

Pest cannot develop resistance to predator;
 Only requires a single release/application;
 Keeps pest at low levels; 4 max

Total 10

Question 7

- (a) Enzyme has active site;
Enzyme/active site has complementary shape to lactose/ fits/binds to/
joins to substrate / forms E-S complex; 2
- (b) Enzyme easily recoverable at end of reaction / can be re-used;
Product not contaminated with enzyme;
Enzyme more resistant to/ not denatured by high temperatures;
Enzyme more resistant to/ not denatured by extremes of pH;
Can be used in continuous flow process; 2 max
- (c) (i) An enzyme which works/ is secreted outside the cell; 1
- (ii) Do not need to break cells to obtain; 1
- (d) Problems / cost maintaining correct temperature /
rare nutritional requirements; 1
- (e) Use of reverse transcriptase;
To form DNA molecule from the mRNA; 2
- (f) 1. DNA splits/separates / hydrogen bonds break (accept 'unzips');
2. mRNA formed;
3. Using RNA nucleotides;
4. Reference to complementary base-pairing;
5. RNA polymerase / links RNA nucleotides together;
6. Introns spliced out (of primary transcript);
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 adjacent amino acids;
Max 4 for transcription 1-6 6 max
- Total 15**

Question 8

- (a) 1. FSH released by pituitary gland;
 2. Hormone travels in blood;
 3. FSH stimulates growth of follicles;
 4. Follicle produces oestrogen;
 5. Oestrogen inhibits FSH production;
 6. LH brings about ovulation;
 7. FSH also involved in ovulation;
 8. High oestrogen stimulates FSH / LH; 6 max
- (b) rFSH can be digested/affected by stomach acid;
 Digestion would alter its shape / tertiary structure/ break down to amino acids;
 Too big to be absorbed/diffuse; 2 max
- (c) (i) rFSH stimulates development of follicles;
Clear answer using appropriate scientific terminology = 2
Correct idea without good use of scientific terminology = 1 2
- (ii) Oestrogen inhibits FSH;
 Prevents inhibition of FSH production; 2
- (d) rFSH more effective (no mark)
 Greater success rate;
 More cost-effective; *reject cheaper*
 0.27 success rate 0.04;
 £528 per pregnancy £906;
 Clomiphene £35 per treatment £140 with rFSH;
Allow other valid calculations 3 max

Total 15