



General Certificate of Education

Biology 5411 *Specification A*

BYA2 Making Use of Biology

Mark Scheme

2007 examination - January series

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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

- (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