



General Certificate of Education

Biology 5411

Specification A

BYA2 Making Use of Biology

Mark Scheme

2008 examination - June series

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Question 1

- | | | | |
|-------|--|------------------|-------|
| (a) | (i) | Ribosome; | 1 |
| | (ii) | AUC; | 1 |
| | (iii) | GCT ATC ATA GTA; | 1 |
| (b) | Frameshift mutation/ribosome reads (all) codons differently /alters base sequence;
(All) amino acids changed/ sequence of amino acids has changed;
Different (shape) protein made; | | 2 max |
| Total | | | 5 |

Question 2

- | | | |
|-------|---|-------|
| (a) | (B)DAC; | 1 |
| (b) | Chromatids/chromosomes separating (accept splitting);
(They are) pulled;
by spindle fibres;
<i>Ignore references to phases</i> | 2 max |
| (c) | (i) Chromosomes visible / can be counted ; | 1 |
| | (ii) To stop cells during mitosis/in prophase/metaphase;
To stop cells getting to anaphase;
Chromosomes are visible in many cells;
To ensure chromosomes are spread out; | 1 |
| Total | | 5 |

Question 3

(a)

Blood group	Antigen(s) present on surface of red blood cells
A	A
B	B
AB	A and B
O	none

(Accept lower case letters, do not accept without a gap/and, in A B) 1

(b) No antibodies (in plasma);
Cannot be agglutinated (donor cells) *Reject clotting;* 2

(c) (i) Cuts DNA/gene/genetic material;
At specific base sequence/recognition site;
Leaves sticky ends;
Accept splice in correct context 2 max

(ii) Joins/binds/anneals DNA/genetic material/sugar-phosphate/
backbone/sticky ends;
Accept splice in correct context 1

(d) Blood cells would have no antigens;
Therefore cannot be agglutinated/not recognised by antibodies; 2

Total 8

Question 4

(a) (i) Separates DNA; *Accept mini satellites*
By length/mass/charge/size; 2

(ii) Binds to specific/complementary base sequences;
Makes DNA visible/'show up'; 2

(b) (DNA fingerprint) identical (to mother)/
all bands/markers same/in same position; *Reject similar* 1

Total 5

Question 5

- (a) Time taken for substrate to penetrate bead;
 By diffusion;
 Not all the enzymes are on surface of bead/substrate may not bind so effectively/immobilisation may affect shape of enzyme/enzymes have less kinetic energy;
 Fewer enzyme/substrate collisions/complexes; 3 max
- (b) Protects enzyme;
 Holds it in shape/ tertiary structure less likely to change/less likely to denature; 2
- Total 5

Question 6

- (a) Known composition/concentration/specific composition for a crop;
 More concentrated/can be applied in smaller amounts;
 Can use lighter machinery/less soil compaction/less change by heavy machinery;
 Easier to handle/apply/store/transport/spread evenly/less bulky;
 Nutrients available immediately/fast acting;
 Does not contain pests/seeds/fungi/spores; 2 max
- (b) Leaches/washed into streams; *Reject nitrogen/N*
 Stimulates growth of algae/algal blooms/plants;
 Less light so less photosynthesis;
 Plants (lower down) die;
 Increase in bacteria/microorganisms/decomposers;
 Bacterial respiration/decomposition uses up oxygen/is aerobic; 4 max
- Total 6

Question 7

- (a) Storing air/filled with air/air spaces; *Ignore oxygen/carbon dioxide*
 Allows oxygen to get to roots/submerged parts of plant; *Ignore buoyancy*
 Delays anaerobic respiration/allows aerobic respiration; 2 max
- (b) Low concentration of oxygen available (to roots);
 Anaerobic respiration;
 Produces alcohol/ethanol; 2 max
- Total 4

Question 8

- (a) (i) Up to 50 000, number of weeds increases;
Above 50 000, number of weeds decreases; 2
Award 1 mark for increase then decrease if no figures given
- (ii) Interspecific competition/described;
(Competition) for named resource, e.g. light, nutrients, water;
Idea that the more sorghum plants, the less likely that weeds will be able to
establish; 2 max
- (b) EITHER
Little competition from sorghum;
More competition between the weeds;
(Some) weeds plants grow very large;
- OR
- Sorghum plants grow bigger/faster;
Less intraspecific competition;
Weeds unable to compete; 2 max
- (c) (Intraspecific) competition with other sorghum plants/
Cost of seed not outweighed by increased yield/not economic/cost effective; 1
- Total 7

Question 9

- (a) Three bases/codon code for one amino acid;
Look up genetic code using table/find mRNA codons/DNA sequence;
Synthesise DNA with correct base sequence; 2 max
- (b) (i) Means of getting new DNA into cell/host/gene carrier; 1
- (ii) Codes for characteristic that is easy to detect / gives valid example;
Allows identification of modified cells/cells that have taken up the
gene/DNA/vector/plasmid with the gene; 2
- (c) To ensure that the (antibacterial) protein is produced;
To show that the (antibacterial) protein is effective;
To check that no by-products/toxins produced;
To ensure people do not become allergic/no side effects/safe; 2 max
- (d) To prevent cross-breeding/pollination with other rice crops/plants;
Prevent new gene transferring to other plants;
Example of disadvantage, e.g. consumer opposition; 2 max
- (e)
1. DNA splits / separates / hydrogen bonds break; *Accept DNA unzips; Ignore unwinds*
 2. Make mRNA/using RNA nucleotides;
 3. Via RNA polymerase;
 4. Complementary pairing / eq.;
 5. Introns/non-coding DNA removed; *Accept junk DNA removed*
- max. 4 on points 1-5
6. mRNA joins to ribosome/travels to ribosome;
 7. tRNA carries a specific amino acid;
 8. Codon-anticodon relationship / explained;
 9. Peptide bonds form between amino acids; 6 max

Total 15

Question 10(a) *To produce more eggs:*

1. FSH used; *Ignore LH*
2. To stimulate development (*Reject produce*) of (many) follicles;
3. Oestrogen produced;
4. Which triggers /LH;
5. LH triggers ovulation/egg release;

Synchronising breeding

6. Progesterone used;
7. Inhibits FSH;
8. When progesterone is stopped or (progesterone releasing) coil removed, inhibition stops/FSH secreted; *Reject references to oestrogen*
9. Follicle develops;

6 max

- (b) BST gives greater milk yield /above 20mg decreases milk yield;
Higher fat content of milk;
Reduces protein content of milk (up to 20mg) / it remains the same;
No significant difference between figures;

2 max

- (c) Reducing the effect of other variables/a named variable / variation in the groups would be as similar as possible / it eliminates bias; Accept: no other variables 1

- (d) (i) So that genetic factors are not an influence/some breeds are better at producing milk than others/ milk of some breeds has different fat/protein contents/have different hormone levels/react differently to hormone; 1

- (ii) Nutrient content must be same for each cow;
More/different nutrients affect milk composition/yield;
Quantity of food eaten affects milk yield; 2 max

- (e) (i) Milk production high already / without use of hormone / cow feeding calves; 1

- (ii) $4/27.4 \times 100\%$;
14.6% *Accept 14.59%; award 2 marks for right answer without working* 2

Total 15