



General Certificate of Education

Biology 5411
Specification A

BYA2 Making Use of Biology

Mark Scheme

2007 examination - June series

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Question 1

- | | | |
|-------|--|---|
| (a) | Thr-His-Thr-His-Thr; | 1 |
| (b) | (i) TCA; | 1 |
| | (ii) UCA; | 1 |
| (c) | (i) A base from one triplet cannot be used in an adjacent triplet;
<i>Accept each base used only once/once a triplet used, moves to next triplet/suitable diagram</i>
Specified peptide contains only one amino acid/ overlapping code would produce other amino acids/Gln and/or Thr as well/peptide would have more than five amino acids; | 2 |
| | (ii) Some amino acids coded for by more than one codon/triplet/sequence of 3 bases;
ACC and ACA both code for threonine; | 2 |
| Total | | 7 |

Question 2

- | | | |
|-------|--|---|
| (a) | (i) Attaches (chromosome) to spindle/holds (sister) chromatids together; | 1 |
| | (ii) Separate chromatids/centromeres/chromosomes/ aligns chromosomes at equator; | 1 |
| (b) | (i) $n, n, 2n$; | 1 |
| | (ii) X on arrow going from $2n$ to n ; | 1 |
| Total | | 4 |

Question 3

- | | | |
|-------|---|-------|
| (a) | Only one variable/ weeding is only variable; | 1 |
| (b) | (i) The earlier weeding starts, the greater the yield;
First 4 weeks, weeding has same effect/yield constant;
After 4 weeks, yield goes down more;
<i>Accept reference to 'early weeks' and 'late weeks'</i> | 2 max |
| | (ii) Weeds compete (with the beans);
For light/nutrients/water/valid factor; | 2 |
| Total | | 5 |

Question 4

- | | | |
|----------|---|---|
| (a) | To make many copies of DNA/more DNA; | 1 |
| (b) (i) | Nucleotides/ primers/ polymerase;;
<i>Accept two different named nucleotides</i> | 2 |
| (b) (ii) | No need for heating/cooling/temperature stays constant; | 1 |
| Total | | 4 |

Question 5

- | | | |
|----------|---|-------|
| (a) | Grow bacterium in fermenter; <i>reject vats</i>
Reference to aseptic conditions/named conditions for growth;
Reference to use of starch in medium;
Separate cells from contents of fermenter, e.g. filtration, centrifugation;
Isolation of enzyme, e.g. evaporation; | 3 max |
| (b) | Can be used over and over again;
Enzyme does not contaminate product;
Enzyme more stable if temperature/pH change;
Can be used in a continuous process; | 2 max |
| (c) (i) | More (surface area of) enzyme exposed to substrate in smaller beads/ smaller beads have larger SA compared to volume;
As beads get larger, takes more time /further for substrate to reach enzyme/enter bead; | 2 max |
| (c) (ii) | Extrapolate graph;
Line of best fit;
Read rate off y axis;
<i>Allow 1 mark for calculated answer using data from graph</i> | 2 max |
| Total | | 9 |

Question 6

- | | | |
|-----|--|---|
| (a) | Makes single-stranded DNA/cDNA from mRNA;
<i>Reject turns RNA into DNA</i>
Joins DNA; | 2 |
| (b) | (i) Gene transferred alongside target gene/gene used to identify cells containing target gene; | 1 |
| | (ii) Grow cells on a specific medium;
Only cells with chymosin will grow/cells with chymosin look different;
<i>Accept reverse for second point, i.e. replica plating idea</i> | 2 |
| | (iii) Can pass to pathogens;
Unable to use antibiotics to treat disease/ kill pathogen; | 2 |
| | (iv) Lower probability of disease from animals/
acceptable to vegetarians/those with concerns for animal welfare/
purer enzyme obtained/can be produced on larger scale; | 1 |
| | Total | 8 |

Question 7

- (a)
- Extensive/dense root system;
Obtains water from greater area;
 - Thick/very waxy cuticle;
Reduces water loss by evaporation/transpiration;
 - Reduced number of stomata;
Reduces water loss by evaporation/transpiration; *water loss must be qualified*
 - Rolled leaves/motor cells;
Traps moist air/reduces water loss by evaporation/transpiration;
 - C4 special kind of photosynthesis;
More efficient photosynthesis in hot conditions;
 - Sunken stomata;
Traps layer of moist air/reduces water loss by evaporation/transpiration;
 - Tolerant to high temperatures; *accept heat shock proteins*
Able to photosynthesise in tropical conditions; 4 max
- (b) (i) Fields have different environmental factors/named factor e.g. light intensity;
Relate to growth of crop e.g. rate of photosynthesis;
OR
C has higher yield because has all 3 nutrients;
B lower than C because lacks potassium/A lowest because no added nutrients; 2 max
- (ii) Disease/pest;
Because same crop grown every year/effect of disease eg reduced photosynthesis;
OR
Suitable environmental factor, eg drought, low temperature;
Effect on crop e.g. reduced photosynthesis;
OR
Lack of nutrients/suitable nutrient;
Not supplied by fertiliser; 2
- Total 8

Question 8

- | | | | |
|-------|------|---|-------|
| (a) | (i) | Use of parasite/predator/pathogen;
To control (numbers of) a pest organism; | 2 |
| | (ii) | 1 Specific (to mosquito);
2 Only needs one application/reproduces;
<i>Allow long lasting effect</i>
3 Keeps population low;
4 (Mosquitoes) do not develop resistance; <i>not immunity</i>
5 Does not leave chemical residues in environment/bioaccumulates;
<i>Ignore just environmentally friendly</i>
6 Does not get rid of mosquito completely;
7 May become a pest itself;
8 Slow acting/ takes time to reduce mosquito population;
9 Can be used in organic farming;
<i>Accept 'pest' instead of mosquito</i> | 6 max |
| (b) | | To see if the fungus would be effective in houses/environment;
Make sure it would survive/reproduce/grow;
Not harmful to use; | 2 max |
| (c) | | Not (bio)degradable/does not break down;
Remains inside organism;
Idea that one organism may consume many others;
Organisms at top of food chain receive greatest/harmful amount of
DDT/bioaccumulation; | 3 max |
| (d) | | Insecticide gives fast (initial reduction)/biological control slow;
Takes time for fungus to grow; | 2 |
| Total | | | 15 |

Question 9

- | | | |
|-----|--|----------|
| (a) | 1 Pituitary releases FSH;
2 FSH stimulates growth of follicles;
3 Follicle produces oestrogen;
4 Hormone travels in blood;
5 Oestrogen inhibits FSH production;
6 <u>High</u> oestrogen stimulates FSH/LH;
7 LH brings about ovulation;
8 FSH also involved in ovulation; | 6 max |
| (b) | Causes rise in FSH / inhibition of FSH removed;
Stimulates follicle development; | 2 |
| (c) | (i) Same as other group/two named variables the same;
But no progesterone treatment; | 2 |
| | (ii) More lambs/ more sheep give birth;
At closer time interval; | 2 |
| (d) | (i) Without progesterone $185 \times 1.86 = 344.1$
With progesterone $185 \times 1.95 = 360.75$ | |
| OR | 185×0.09 ;

$16/17$ lambs;; <i>Correct answer = 2</i>
<i>Correct method but wrong answer = 1</i> | 2 |
| | (ii) May not be cost-effective/ may wish to stagger lambing; | 1 |
| | | Total 15 |