

General Certificate of Education

Biology 5411 *Specification A*

BYA2 Making Use of Biology

Mark Scheme

2005 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.

BYA2

Question 1

- | | | |
|-----|---|---------|
| (a) | progesterone/oestrogen;
luteinising hormone/LH;
oestrogen; | 3 |
| (b) | little or no oestrogen;
produced by follicle;
oestrogen inhibits FSH; | 3 |
| | | Total 6 |

Question 2

- | | | |
|-----|---|---------|
| (a) | less damage to fabric/stones may damage machinery/no need to remove stone debris from fabric/uses less energy/quicker; | 1 max |
| (b) | (i) (cut DNA) using restriction enzyme/electrophoresis/probe; | 1 |
| | (ii) cut bacterial DNA/plasmid;
use of restriction enzyme (<i>must be in context of bacterial DNA</i>);
reference to complementary sticky ends/unpaired bases;
use of ligase;
heat shock/calcium chloride/make cells competent; | 3 max |
| | (iii) (grow in) fermenter;
reference to aseptic technique/suitable medium/suitable named condition;
downstream processing/recovery of enzyme from products of fermentation; | 2 max |
| | | Total 7 |

Question 3

- | | | |
|-----|--|---------|
| (a) | aerenchyma; | 1 |
| (b) | (i) same conditions as other seedlings/two correct factors named;
not submerged; | 2 |
| | (ii) aerenchyma/air space transports oxygen/air;
reduces/delays anaerobic respiration/allows aerobic respiration;
alcohol/ethanol tolerance;
shallow roots obtain oxygen; | 3 max |
| | (iii) build-up of ethanol/lack of oxygen/less light for photosynthesis; | 1 |
| | | Total 7 |

Question 4

- | | | | |
|-----|-------|---|---------|
| (a) | (i) | where mitosis/division/growing/ occurs
(reject growing cells) | 1 |
| | (ii) | to distinguish chromosomes/chromosomes not visible without stain; | 1 |
| | (iii) | to let light through/thin layer; | 1 |
| (b) | (i) | $74 + 18/982$;
$= 9.4\% / 9\%$;
(allow 1 mark for identifying prophase & metaphase i.e. 92 or correct method using wrong figures) | 2 |
| | (ii) | genetic differences/different types of garlic;
time of day; chance;
age of root tip;
water availability;
temperature;
nutrient availability;
(environmental factors = 1 but cannot be awarded in addition to a name environmental factor) | 2 max |
| | | | Total 7 |

Question 5

- | | | | |
|-----|-------|---|---------|
| (a) | | nucleotide; | 1 |
| (b) | (i) | 21.4, 21.4; 28.6; | 2 |
| | (ii) | amounts of A and T /C and G/complementary bases different;
therefore no base-pairing; | 2 max |
| | (iii) | both contain phosphate;
pentose/5C sugar;
both have nucleotides/are polymers;
both have purines/pyrimidines/bases/A/C/G; | 2 max |
| | | | Total 7 |

Question 6

- (a) (i) temperature also affects photosynthesis/ rate of reaction;
need to ensure the effect of only one variable is being observed; 1
- (ii) CO₂ used/ O₂ produced/ sugar produced/increase in mass; per unit of time; 2
accept any volume or mass unit; per time unit;
(allow one mark for indicator of photosynthesis – second mark is for time element)
- (b) (i) as carbon dioxide increases, rate of photosynthesis increases; 1
- (ii) carbon dioxide not limiting photosynthesis;
another factor/named factor limiting; 2 max
explanation for named factor;
- Total 6
-

Question 7

- (a) (i) ACG; 1
- (ii) serine; 1
- (b) idea that DNA contains introns/ mRNA is only exons/ mRNA is ‘edited’;
(allow junk/ non-sense DNA) 1
- (c) translation cannot occur;
binds to/blocks codon/ triplet on mRNA;
anticodon/tRNA will not fit in/base-pair;
amino acids not delivered/ joined; 2 max
- Total 5
-

Question 8

- (a) 1. DNA is cut;
2. using restriction enzyme;
3. electrophoresis;
4. separates according to length/mass/size;
5. DNA made single-stranded;
6. transfer to membrane/ Southern blotting;
7. apply probe;
8. radioactive/ single stranded/ detected on film/ fluorescent;
9. reference to tandem repeats/VNTRs/minisatellites;
10. pattern unique to every individual; 6 max
- (b) cells on toothbrush;
DNA present in cell; 2
- (c) (i) toothbrush gives small sample of DNA/ need more DNA for analysis;
PCR gives many copies; 2
- (ii) uses heat;
to separate strands;
- OR*
- PCR replicates pieces of DNA;
because DNA has been cut;
- OR*
- primer added in PCR;
to initiate replication 2 max
- (d) (i) PCR/amplification needed; 1
- (ii) other DNA present;
need to identify 'required' DNA from rest; 2

Total 15

Question 9

- (a) (i) increases, then levels;
idea that nitrogen needed for proteins/nucleic acids in plants/
explanation of constant yield at higher concentrations/
idea that nitrogen is a limiting factor; 2
- (ii) composition known/composition can be varied;
cleaner to apply/ less smelly;
concentrated/less needed/ more compact to transport/lighter machinery;
spread evenly/ control the amount you can apply;
no seeds/pests;
immediate release of nutrients; 2 max
- (b) 1. more growth of algae/ surface plants;
2. blocks light;
3. plants lower down unable to photosynthesise;
4. less oxygen produced
5. dead (plant) material present;
6. broken down by bacteria/decomposers;
7. respiration;
8. depletes oxygen in water;
9. other organisms unable to live/grow; 6 max
- (c) (i) parasite/wasp numbers low, so whitefly can increase;
more food/egg-laying sites for wasp, so wasp increases;
increase in wasps causes fall in whitefly population;
decrease in whiteflies causes fall in wasp population; 3
- (ii) use of predator/parasite/pathogen;
to control pest; 2

Total 15
