



General Certificate of Education

Biology 5411

Specification A

BYA2 Making Use of Biology

Mark Scheme

2008 examination - January series

For Confidential Packs

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Question 1

(a) (i) Nucleus; 1

(ii)

Statement	DNA Replication	Transcription
Involves mRNA synthesis	✗	✓
Requires free nucleotides	✓	✓
Involves complementary base pairing	✓	✓

2

1 mark for each correct column

Mark blank spaces and hybrid tick-crosses as incorrect

(b) 12 000;
1 deoxyribose per nucleotide/base; 2

Total 5**Question 2**

(a) Interphase/S-(phase)/synthesis; 1

(b) (i) B;
Acts during DNA replication; 2
Ignore reference to wrong named stage

(ii) This is when chromosomes/ chromatids are separating;
Pulled by spindle fibres; 2

Total 5

Question 3

- (a) Three bases code for one amino acid;
Determine sequence of bases/ codons needed
Synthesise DNA with correct base-sequence/ codons;
Second strand complementary to first/ DNA codons complementary to RNA
codons; 3 max
- (b) (i) Protein/immunoglobulin;
Made by plasma cell/ B cell;
Specific to one antigen; 2 max
- (ii) Macrophage presents antigen;
B-cell activated/ clonal selection;
Divide/clonal expansion;
Produces plasma cells;
Plasma/ B cells make specific antibodies; 4 max
- Total 9**

Question 4

- (a) (i) Joins inserted DNA to host DNA; 1
- (ii) Contains inserted gene/ gene from other organism;
Vector/carries gene into (microbial) cells; 2
- (iii) Distinguishes modified microbial cells from non-modified cells; 1
- (b) Reference to aseptic/sterile conditions;
Nutrient medium;
Suitable pH/temperature/aeration; 3
- Total 7**

Question 5

- (a) FSH causes follicles to develop;
These produce oestrogen; 2
- (b) Causes ovulation; 1
- (c) Oestrogen not produced;
Oestrogen inhibits FSH; 2
- Total 5**

Question 6

- (a) Method of separating cells/removing fungus, e.g. filtration/centrifugation;
Method of concentrating enzyme, e.g. evaporation, crystallisation; 2
- (b) (Made of protein, therefore) biodegradable;
Avoids use of polluting chemicals/ not toxic;
Works at low temperatures;
Specific (to one reaction)/ no unwanted byproducts; 2 max
- (c) More stable at high temperatures/pH changes;
Can be separated from product;
Can be used over and over again;
Can be used in a continuous process; 3 max

Total 7**Question 7**

- (a) (To increase amount) for analysis/because you would only get a small quantity/
degrades over time; 1
- (b) Nucleotides;
(DNA) polymerase; 2
Accept two different named nucleotides
- (c) Primers have specific sequence;
Join to mammoth DNA specifically/other DNA has different sequence; 2
- (d) Find DNA base sequence;
Compare;

OR

Single-stranded DNA;
Compare degree of base pairing;

OR

Carry out genetic fingerprinting;
Compare banding pattern; 2

Total 7

Question 8(a) *Sorghum*

- 1 Thick waxy cuticle;
- 2 Sunken stomata;
- 3 Reduces water loss;
- 4 Adult/embryo plants tolerate high temperatures;

Both

- 5 Special kind of photosynthesis/C4;
- 6 Allows photosynthesis when stomata closed/more efficient at high temperatures;
- 7 Dense/wide root system; *accept 'deep' only in relation to sorghum*
- 8 Allows water to be collected from large area;
- 9 Rolling of leaves;
- 10 Reduces water loss (if not given already);

6 max

(b) (i) 5.6 tonnes ha⁻¹;
Line of best fit/credit suitable annotation of script;

2

(ii) Correlation does not prove cause;
Data from different plots/different conditions;
Named variable not controlled;

3

(c) (i) 86 **OR** 86.4 **OR** 86.36%;;
Allow 1 mark for 8.2-4.4

2

(ii) Different crops need different amount of nitrogen/ fertiliser;
May stimulate growth of leaves more than grain in some crops;
Other nutrients not taken into consideration;

2 max

Total 15

Question 9

- (a) Lack of natural predators/good food supply; 1
- (b) 1 DNA splits / separates / hydrogen bonds break;
Accept unzips
 2 Make mRNA/ use RNA nucleotides;
 3 Via RNA polymerase;
 4 Complementary sequence / eq.;
 5 Introns/junk/non-coding DNA spliced out;
Maximum of 4 marks from points 1-5
- 6 mRNA joins to ribosome;
Accept travels to ribosome
 7 tRNA carries a specific amino acid;
 8 Codon-anticodon relationship / explained;
 9 Peptide bonds form between amino acids; 6 max

(c) (i)

	Sequence of bases					
Aromatase gene	T	G	G	C	A	T
mRNA produced from aromatase gene	A	C	C	G	U	A
Extra piece of DNA	A	C	C	G	T	A
mRNA produced by extra piece of DNA	U	G	G	C	A	U

3

2 marks for mRNA row but only 1 if T instead of U
1 mark for DNA row

- (ii) mRNA of inserted gene binds to mRNA of aromatase gene;
 Aromatase mRNA cannot bind to ribosome;
 No translation of aromatase; 3
- (d) (All released fish male) mate with normal females;
 Pass on inserted gene;
 All offspring male/no female offspring;
 Reduces females in population (and thus breeding potential); 2 max

Total 15