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ASSESSMENT and QUALIFICATIONS ALLIANCE

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/immunoglobin; 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 <u>cells</u> 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%;; 2
Allow 1 mark for 8.2-4.4

(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