ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme January 2002

GCE

Biology A / Human Biology

Unit BYA2

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Question 1

(a)	(i)	DACB		1
	(ii)	Attachment of centromeres; Separation of (daughter) chromatids;		2
(a)		Meiosis halves the number of chromosomes; Restoration of diploid number at fertilisation; Introduces variation; Correct reference to natural selection / survival;		2 max
(c)	(i)	Sperm is haploid, liver is diploid / sperm formed by meiosis, liver cell formed by mitosis;		1
	(ii)	It has no nucleus;		1
			Total	7

Question 2

(a)	(i)	Increasing CO_2 increases grain yield; Raising CO_2 concentration increases (rate of) photosynthesis		2
	(ii)	Increasing the temperature means insects complete their life cycle faster / more insects; Therefore more crop eaten;		2
(b)		(Aerenchyma) is a source of oxygen for (aerobic) respiration; Allows oxygen to pass to roots / submerged parts; OR Aerenchyma allows rapid elongation; Doesn't have to make as many cells;		2
			Total	6

Question 3

(a)	(i)	Optimum growth of culture; Prevents denaturation of enzymes;	2
	(ii)	(Removes) heat <u>produced</u> by microorganisms (during respiration) / in reactions; Prevents denaturation of enzymes;	2
(a)		Other microorganisms may compete with desired microorganism (for nutrients); Reduces yield of product; <u>OR</u> Other microorganisms may produce by-products / alter pH; Which will contaminate the product / dilute product / denature enzymes; <u>OR</u> Other microorganisms may be pathogenic to culture; Fewer microorganisms producing enzymes; <u>OR</u> May produce toxins; Fewer microorganisms producing enzymes; *If candidates refer to the enzyme as a microorganism, do not award credit. Can score 2 reasons or 1 reason plus amplification*	2 max
(b)		Downstream processing is more complex; Need to break open cells; Extract enzyme from other substances present;	2 max
		Total	8

Question 4

(a)		Greater effect on straw / no significant difference / 2% more on straw; Grain yield increases 30.1% / 30%; Straw yield increases 32.24% / 32%;	3
(b)	(i)	324 / 622; = 0.524; <u>OR</u> 622 / 324; = 1.92; *One mark for working, one mark for correct answer*	2
	(ii)	Grain is useful but straw is not / less useful;	1

(c) Competition for named factor;

Early	Later
More available for crop / crop establishes / later in season, outcompete weeds;	Less available for crop / crop doesn't establish well / when weeds removed cannot make up lost production;

2 max

Total 8

Question 5

(a) A molecule which stimulates an immune response / antibody production / surface protein / glycoprotein / non-self protein; 1

(b) (i) Plasma cells; 1

(ii) Memory (B) cells; 1

(c) Carried (an immunological) memory of the specific antigen;
Produces large amounts of plasma cells quickly if the same antigen is encountered a second time;
Rapid production of antibodies; 2 max
Not just 'bigger immune response'

(d)

Measles	Influenza
One antigen / unchanging;	Several antigens / changing;
One type of memory cell / antibody needed;	Several types of memory cell / antibodies needed;

3 max

Total 8

Question 6

(a)	(i)	Enable reactions to occur at lower temperatures / pressures (therefore energy savings) / lowers activation energy;	
	(ii)	Enzymes are (highly) specific therefore side reactions less likely to occur / only one product;	2
(b)	(i)	Idea that restriction enzymes cut DNA specifically / acid hydrolysis is random;	
	(ii)	Benedict's test detects all reducing sugars / enzyme is specific / enzyme more sensitive / enzyme gives quantitative result;	2
(c)		Can be used over and over again; Saves cost of making new enzyme / enzyme recovered from product; Protects enzyme from pH / temperature changes / enzyme more stable if temp / pH change / can run process at higher temperature; Enzyme maintains activity / remains stable Allows process to be continuous; Increases yield; Product easily separated from enzyme; Product not contaminated with enzyme / saves purification / simplifies downstream processing; max 2 x 2	4
		Total	8

Question 7

(a)		DNA unwinds / splits / separates / hydrogen bonds break; To allow assembly of mRNA; Using mRNA nucleotides; Via RNA polymerase; Complementary sequence / or equivalent; mRNA joins to ribosome; tRNA carries a specific amino acid; Codon-anticodon relationship / or explained / defined; Peptide bonds form between amino acids;	6 max
(b)	(i)	UACCGUA;	
	(ii)	AUGGCAU	2
	(iii)	Needed as a signal for the gene to be transcribed; *Or equivalent – NOT translated*	1

(c)	(i)	Sequence / bases complementary; Reference to hydrogen bonds; *NOT 'corresponding' bases*	2
	(ii)	RNA duplex has uracil / U, DNA has thymine / T; RNA duplex has ribose, DNA has deoxyribose; RNA duplex shorter than DNA;	2 max
	(iii)	Ribose will not fit on double-stranded RNA; No exposed bases; Needed for tRNA to attach;	2 max
		Total	15

Question 8

(a)		FSH stimulates growth of a follicle; Developing follicle produces oestrogen; (FSH) and LH bring about ovulation / oestrus; LH stimulates formation of corpus luteum; LH stimulates production of progesterone; Fall in LH / FSH means oestrogen production no longer stimulated;	5 max
(b)	(i)	Progesterone inhibits FSH; No follicles develop;	
	(ii)	Causes rise in FSH / inhibition of FSH removed; Stimulates follicle development;	4
(c)	(i)	(Ewes) produce lambs at similar times / inseminate at same time; Allows farmer to prepare for many births at same time / employing extra labour / can give all ewes similar feeding rations in line with their stage of pregnancy / save veterinary fees;	2
	(ii)	18-22 days; This is time interval between the two peaks of lambing in synchronised ewes;	2
(d)		Given an inert substance instead of progesterone / no hormone given; Otherwise kept under same conditions as experimental group / Valid example of controlled variable e.g. food supply;	2
		Total	15