ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2002

GCE

Biology A / Human Biology

Unit BYA2

Question 1

(a) (i) Inability to distinguish effects of light intensity and temperature / light intensity will also affect photosynthesis / light is a limiting factor / so there is only one variable; **1**

(ii) Both go up to a peak (then decrease) / both go up and then down;
Related to enzyme activity;
OR
Maize has a higher photosynthetic rate than wheat at higher temperatures / wheat has a higher rate at lower temperatures;
Maize has a different type of photosynthesis from wheat; **2**

(b) Maize has more effective photosynthesis at high temperatures / low CO_2;
Closes stomata during day;
Link between photosynthesis and yield; **2**

Total 5 marks

Question 2

(a) (i) 20 **1**

(ii) 10 **1**

(iii) 10 **1**

(b) (i) (Daughter) chromatids will not separate / centromere won't divide;
Centromere attaches to spindle fibres; **2**
NOT 'chromosomes can't be pulled apart'. Ignore references to stages of mitosis.

(ii) Red blood cells formed / produced by mitosis; **1**

Total 6 marks

Question 3

(a)	(i)	Use of predator / parasite / pathogen to limit the population of a pest organism / another organism / keep pest numbers down;	**1**
	(ii)	Must be able to reproduce in the conditions; Feeds mainly / exclusively on the pest organism / doesn't destroy other organisms; Doesn't damage the crop;	**2 max**
(b)		Biological control; Lower numbers of pests throughout the season / don't get peaks in population / don't need to reapply;	**2**
(c)	(i)	Some pests resistant to insecticide; Don't get sprayed / newly hatched / spray only affects one stage of life-cycle idea; (Rapid) increase in numbers after spraying;	
	(ii)	When spider mite population falls, predatory mite population falls; Because of lack of food; Resurgence of spider mite; *Maximum of 2 marks in one section*	**3 max**

Total 8 marks

Question 4

(a)	(Yes) The bands in the baby that don't come from the mother are shared with the footballer;	**1**
(b)	Cuts the DNA at the same base sequence / specific points; *Allow 'cuts at same minisatellite'* Gives repeats of the same piece of DNA;	**1**
(c)	DNA is not visible on the gel / radioactivity can be (easily) detected; Shows up on photographic film / autoradiography;	**2**
(d)	Idea of pairing animals with dissimilar fingerprints;	**1**

Total 5 marks

Question 5

(a) Grow in (large) fermenter;
Reference to aseptic technique / sterile conditions;
Suitable nutrients / pH / temperature;
Separate product by downstream processing / filtration / centrifugation; **3**

(b) Allows the pectinase to be used again / enzyme will not be 'washed away';
Prevents <u>product</u> being contaminated with enzyme;
Enzyme will be more stable / can be used at a higher temperature / greater pH range;
Allows continuous production; **2 max**

(c) Rate at which pectin / substrate flows through column / number of times passed through column;
Diameter / surface area / size of beads containing enzyme;
Concentration of enzyme (inside beads);
Concentration of pectin suspension; **3 max**

Total 8 marks

Question 6

(a) Protein / glycoprotein / molecule on surface of virus;
Stimulates immune response / antibody production; **2**

(b) Greater / more rapid production of antibodies following second vaccination;
First encounter takes time for B cells to become activated / clonal selection process / time delay before antibodies can be produced;
Memory cells present as result of first vaccination; **3**

Total 5 marks

Question 7

(a)
P = cytosine
Q = deoxyribose / 5C sugar / pentose
R = phosphate / phosphoric acid **2**
3 right = 2 marks
2 right = 1 mark
<2 right = 0 marks

(b)
DNA strand separates / H-bonds break; *accept 'unzips'*
New molecules formed have one 'old' strand and one 'new' strand; **2**

(c)
DNA has deoxyribose, mRNA has ribose;
DNA has thymine, mRNA has uracil; *accept T/U*
DNA double stranded, mRNA single stranded;
DNA is longer than mRNA; *ignore larger/smaller*
DNA has hydrogen bonds, mRNA doesn't; **2 max**

(d)
15% cytosine, therefore 70% adenine and thymine
70% / 2 = 35% **2**
Correct answer of 35% gains 2 marks.
Incorrect answer clearly showing that C + G = A + T gains 1 mark

Total 8 marks

Question 8

(a) (i) Venom contains antigens;
Macrophage / phagocyte presents antigen;
B lymphocytes become sensitised to specific antigen;
Clone / divide to form plasma cells;
Plasma cells produce specific antibody; *accept 'antibody to venom'* **3 max**

(ii) Different venoms contain different antigens;
Antibodies only fit with antigens of the right shape / complementary / specific; **2**

(b) (i) 3 bases in (RNA / DNA) code for one amino acid;
Work out correct base sequence; **2**

(ii) Some amino acids are coded for by more than one codon / code is degenerate;
Artificial gene may have different codons;
Natural gene may contain introns / junk DNA; **2 max**

(iii)
1. DNA separates / hydrogen bonds break;
accept unzips NOT unwinds
2. To allow assembly of mRNA;
3. Using (m)RNA nucleotides;
4. Via RNA polymerase;
5. Complementary sequence / or equivalent;
6. mRNA joins to ribosome;
allow travels to ribosome
7. tRNA carries a specific amino acid;
8. Codon-anticodon relationship / or explained / defined;
9. Peptide bonds form between amino acids; **6 max**

Total 15 marks

Question 9

(a)
1. FSH released by pituitary gland;
2. Travels to ovaries in blood;
3. FSH stimulates growth of follicles;
4. Follicle produces oestrogen;
5. Oestrogen inhibits FSH production;
6. LH brings about ovulation;
7. FSH also involved in ovulation;
8. High oestrogen stimulates FSH/LH; **6 max**

(b) (i) 7/100 x 88 = 6.16 Answer 6 cows **2**
Correct answer = 2 marks
Correct formula but arithmetic error = 1 mark

(ii) Endometrium / uterine lining needs to be at suitable state of readiness;
If progesterone too low, pregnancy will not be successful; **2**

(c) (i) FSH / LH / both;
More embryos (in treated pigs); **2**

(ii) Less time between weaning and oestrus / more litters per year;
More pigs born per litter / pregnancy; **2**

(iii) Increasing litter size may increase mortality among piglets /
piglets may be undersized / may not be cost-effective; **1**

Total 15 marks