



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2002

GCE

Biology A / Human Biology

Unit BYA2

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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 CO₂; Closes stomata during day; Link between photosynthesis and yield; **2**
- Total 5 marks
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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; **3 max**
Maximum of 2 marks in one section

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 product 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) $7/100 \times 88 = 6.16$ 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
