ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCE

Biology / Human Biology A

Unit BYA2

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Question 1

(a) Carbon dioxide;
Photosynthesis; [*Reject: Light-dependent photosynthesis*]

Oxygen;
Respiration ; [*Note: NOT 'anaerobic'*] 4

(b) keep leaves in air/in light/gas transport; 1

(c) Any **three** from:

Low/no oxygen availability/oxygen not very soluble in water;
Must respire/obtain energy anaerobically;
Ethanol/alcohol is a product of anaerobic respiration;
Plant gains enough energy/gains energy needed for growth; max 3

Total 8 marks

Question 2

(a) In table:

	anti-A	anti-B	
A	✓	✗	;
O	✗	✗	;

[*Note: 1 mark per correct row*] 2

(b) (i) Red (blood) cells/rbcs /erythrocytes;
Sticking together/clumping; (*Note: NOT unqualified 'separating'*) **I** clotting 2

(ii) Cell has antigen/protein/specific chemical/type A chemical on its surface;
Antibodies join to antigens/antibodies join cells together; 2
[Reject: attack/fight]

Total 6 marks

Question 3

(a) (i) D – B – A – C ; 1

(ii) Separation of chromatids /chromosomes; 1

(b) (i) Thymine is a component of DNA;
Chromosomes are/DNA is in the nucleus;
Chromosomes/DNA replicates/synthesised in this period; 3

(ii) One copy of each chromosome /of each gene to each daughter cell /
genetically identical to parent / 2 identical daughter cells/to maintain
chromosome number; 1

Total 6 marks

Question 4

(a) Hydrogen (bonds); 1

(b) (i) Primer marks section to be amplified/copied/synthesised/polymerase can only join nucleotides onto end of existing chain/to stop the 2 nucleotide chains rejoining/starting point for new strand of DNA/nucleotides/for DNA polymerase to bind; 1

(ii) T – A – T – C – C – G – T – C 1

(c) 64 ; [*Accept: 63*] 1

(d) Biological contaminants may contain DNA;
Contaminating DNA would also be replicated/amplified/synthesised; 2

Total 6 marks

Question 5

(a) (Damaged leaves cause) reduced photosynthesis;
Organic materials / named e.g. needed for plant (growth); 2

(b) (i) Any **two** from:

Wasp can find the whitefly larvae/pesticide may not reach whitefly larvae/ larvae sheltered (beneath leaves);
Wasp is specific / pesticide kills/harms other spp. / kills/harms beneficial insects/pollinators/predators;
Pesticide can contaminate human food/crop / pesticide can contaminate human during application;
Pest may develop resistance/immunity to pesticide;
Pesticides need to be re-applied; max 2

(ii) Any **two** from:

Chemical kills all pests / need certain level of pest otherwise predator dies out;
Takes longer / pesticide is instant;
Localised application; max 2

Total 6 marks

Question 6

(a) Correct answer: 40.5 (40 to 41);; (=2 mks)

OR Working: $\frac{\text{(Value for 60 – Value for 10)}}{\text{(Value for 10)}} \times 100$

e.g. $\frac{(10.4 - 7.4)}{7.4} \times 100$; (= 1 mk.) 2

(b) Any **two** from:

Fertiliser causes excess foliage and shading of neighbouring plants;

There is another limiting factor e.g. water/ions/physiological factor;

High fertiliser concentration is toxic/damages roots; max 2

Total 4 marks

Question 7

(a) Enzyme 1 = (restriction) endonuclease/restriction (enzyme)/named example;
Enzyme 2 = (DNA) ligase ; 2

(b) Any **two** from:

(Many) bacteria/cells do not take up the plasmid/gene;
Only bacteria with the plasmid/modified/transformed will survive/grow/multiply;
Since plasmid/bacterium has (gene for) ampicillin resistance; max 2
[*Accept: ampicillin tolerance*]

(c) (i) C; 1

(ii) Gene for growth hormone is inserted in the gene for tetracycline resistance/gene for tetracycline resistance cannot be expressed/unmodified have intact tetracycline resistance gene;
Bacteria/cells with hGH gene are killed by tetracycline / unmodified bacteria/cells are not killed by tetracycline; 2

(d) May confer antibiotic resistance to other/pathogenic bacteria/named example;
Can no longer prevent/cure disease/can't treat patient (with this antibiotic); 2
[Note: Not person made immune]

Total 9 marks

Question 8

Quality of language

The answer to this question requires continuous prose. Quality of language should be considered in crediting points in the mark scheme. In order to gain credit, answers must be expressed logically in clear scientific terms.

(a) (i) To sterilise/kill microorganisms/to make aseptic conditions;
Other microorganisms compete for nutrients/oxygen/make unwanted products/ toxins; 2

(ii) Heat / energy is released by metabolism/by respiration/by bacteria/ by (chemical) reactions / by fermentation;
Need to maintain optimum temperature for enzyme activity/enzyme synthesis/to prevent denaturation of enzymes / of proteins; [*Reject: kill bacteria*] 2

(iii) To encourage amylase production (by bacteria);
Amylase not needed / other/named enzymes are needed to utilise sugars; 2

(iv) Any **three** from:

Intracellular: need to break open cells/must be removed from cells;
separate from cell debris;
separate from other enzymes/proteins;
other proteins have similar size/similar chemical properties; max 3

(b) Different enzymes:

1 Each enzyme is specific for certain substrate;
2 Active site of enzyme fits/is complementary to substrate;
[*Reject: Same shape*]

Immobilised enzymes:

3 Stable at high temperature/thermostable/pH stable;
4 Can make more product/make product faster at high temperature;
5 Do not contaminate product/fructose;
6 (Easy) to re-use/recover enzyme;
7 Can be used in continuous process;
8 High/above optimum temperature would denature other unwanted enzymes/would kill contaminating microorganisms; max 6

Total 15 marks

Question 9

Quality of Language
The answer to this question requires continuous prose. Quality of language should be considered in crediting points in the mark scheme. In order to gain credit, answers must be expressed logically in clear scientific terms.

(a) Any **two** from:

Follicle diameter/size drops suddenly on day 21/at this time;
Egg/ovum/oocyte released from follicle (causes size decrease);
Corpus luteum formed on day 21/at this time; max 2
[*Note: Maximum 1 mark if no time given*]

(b) On day 18 oestrogen peaks/at 6.0/rises to highest value;
= 1 day before start of oestrus; 2

(c) Size and concentration show a positive correlation/described;
Corpus luteum produces progesterone; 2

(d) Any **six** from:

1 Progesterone inhibits (release of) FSH/LH;
2 Once progesterone falls (on day 16) FSH increases;
3 FSH increase causes follicles to develop;
4 Developing follicles produce oestrogen;
5 Oestrogen inhibits FSH (release);
6 High oestrogen/approx. day 18 stimulates FSH (release);
7 High oestrogen stimulates LH (release);
8 LH causes ovulation/causes progesterone (release)/formation of corpus luteum; max 6

(e) (i) Knows when to perform A.I./to introduce male/to impregnate /to increase chance of fertilisation / to ensure synchronised birthing; 1

(ii) Any **two** from:

Hormones may be present in animal's muscles / in meat / may be ingested by humans;
Hormones may be toxic / have undesirable / unknown effect in humans/may affect human female menstrual cycle/alter fertility;
(Don't need to because) able to predict oestrus in pig via behaviour/via urine analysis; max 2

Total 15 marks