ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark scheme June 2003

GCE

Biology / Human Biology A

Unit BYA3

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Question 1

(a)	(i)	Translation;	1
	(ii)	Amino acid;	1
(a)		CAT (1 mark) CAU (2 marks)	2
(c)	(i)	Bind to CCC/codon; Hydrogen bond/complementary base-pairing;	
	(ii)	Joins to amino acid/molecule P/peptide/polypeptide; By peptide bond/condensation;	max 3

Total 7 marks

Question 2

(a)	(i)	Molecule/part of molecule/protein/glycoprotein; [*Allow: polysaccharide*] Stimulates immune response;	2
	(ii)	These antigens/antibodies have complementary/particular shape; [*Reject: Active site*] Allow fitting/binding with (relevant) antibody/antigen;	2
(b)		Calichaemicin delivered specifically to cancer cells/less likely to/will not harm normal/healthy cells; Lower dose of calichaemicin needed to be effective;	2

Total 6 marks

Question 3

(a)	(i)	20 units;	
	(ii)	40 units;	2
(b)	(i)	S-phase; When DNA replicates/new DNA is produced;	2
	(ii)	Cytarabine different shape (from cytosine); Will not fit with guanine/cannot form template/will not base pair;	2

Total 6 marks

Question 4

(a) Calcium;
Prothrombin and thrombin;
Fibrinogen and fibrin; 3

(b) (i) Blood vessels have broken/tissue damage (releasing thromboplastin); 1

(ii) Blood clots may lead to thrombosis/MI/stroke; 1

Total 5 marks

Question 5

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

(a) <u>Any two from</u>
(Many) bacteria/cells do not take up plasmid/gene;
Modified bacteria/only bacteria with the plasmid will survive/grow/ multiply;
Since plasmid/bacterial cell 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 <u>tetracycline</u> resistance/gene for <u>tetracycline</u> resistance cannot be expressed/unmodified have intact <u>tetracycline</u> resistance gene;
Bacteria/cells with hGH gene are killed by <u>tetracycline</u> / unmodified bacteria/ cells are not killed by <u>tetracycline</u>; 2

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

Total 9 marks

Question 6

(a) (i) Enzyme/glucose oxidase has active site (with particular shape);
Only glucose complementary/able to fit; 2

(ii) To detect/react with hydrogen peroxide;
Gives a colour change/visible change; 2

(a) Test can be done in most situations/no need for laboratory;
Can be done by non-scientists;
Portable;
Thermostable;
Can use sample again;
(Easier/quicker/convenient) because you do not need to measure enzyme/ gives (semi-)quantitative results; max 2

Total 6 marks

Question 7

(a) measured diameter (mm) = magnification; 1
1.94
[*Note: marks in this answer are awarded for explanation. The answer gains no marks*]

(b) (i) Lumen narrower (in diseased artery);
Wall thicker (in diseased artery);
Cholesterol/fatty tissue/plaque/lipids/atheroma/foam cells invading wall/ in wall(i.e. not on endothelium); max 2
[*Note: If answers start "it" assume this refers to the diseased artery*]

(ii) Atheroma/fatty material deposited in wall of artery;
Causes turbulence/damage to endothelium/raises blood pressure;
Blood clot formation;
Atheroma/blood clot lodges in narrowed blood vessel/coronary artery;
Reduces oxygen (supply) to (region of) heart muscle/heart cells; max 3

Total 6 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 prevent contamination of apparatus with other organisms;
To prevent personal contact with bacteria (which may be hazardous);
To prevent release of bacteria (which may be hazardous) max 2

(ii) Increase in population divided by time taken; 1
[*Accept: calculate gradient*]

(iii) Horizontal line from curve at 3 hours; 1
[*Allow: horizontal line, then down OR slow increase as long as it goes horizontal at the end*]

(b) Bacteria already had the enzymes needed to metabolise glucose/took time to synthesise enzymes needed to metabolise xylose; 1

(c) 20 bacteria in cell;
Cell volume is 0.2 x 0.2 x 0.1 mm^3 = 0.004mm^3;
250 cells make 1 mm^3 / 1/0.004 = 250;
250 x 20 = 5000 bacteria (in 1mm^3); 4
[*Note: Wrong number of bacteria - don't credit first point. Correct answer with no working = 4*]

(d)
1 *Salmonella* enter body in (contaminated) food/drink;
2 <u>enter cells</u> (lining small) intestine/digestive system/gut; [*Reject: stomach*]
3 (endo) toxin released;
4 Causes diarrhoea/vomiting/nausea/abdominal pain;
5 *Mycobacterium tuberculosis* usually infects lung/respiratory tract;
6 Droplet infection/spread by coughing/sneezing;
7 Bacteria destroy lung tissue/fever/weight loss/persistent coughing/coughing up blood/fluid in pleural cavity;
8 Can infect many other organs;
9 Drinking milk from infected cattle; 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) (i) Part of life cycle spent in water snail; 1

(ii) Lives in or on host;
Causes harm to host; 2

(iii) One mark for adaptation and one for description, e.g.

Parasite has suckers; [*Note: Not hooks*]
Secures parasite to wall of blood vessel;

Streamlined shape;
Does not block blood vessels;

Large SA for gas exchange;
Low oxygen concentration in veins;

Cover themselves with host antigens/proteins/has capsule/tegument;
To avoid being attacked by host immune system;

Female lies (permanently) inside groove on male;
Allows them to copulate without being separated/"washed away" in blood; 2

(b) (Make) antibodies to schistome antigen/use antigen to detect antibodies in mummy;
Antibodies specific so will only bind to correct antigen;
Means of identifying if antibody has attached to antigen; max 2

(b) 1 Probe is sequence of DNA/nucleotides;
2 Single strand; [*Note: Credit either for probe or DNA from mummy*]
3 Complementary to Frohlich's disease gene;
4 DNA cut (into fragments);
5 Using restriction enzyme;
6 Electrophoresis separates DNA (by charge/size);
7 Apply probe to fragments;
8 Gene present if probe binds;
9 Probe detected by radioactivity/fluorescence; max 6

(c) Results from (fusion of) 2 gametes, one from each parent;
Gametes haploid/formed by meiosis; 2

Total 15 marks