ASSESSMENT and QUALIFICATIONS ALLIANCE

# Mark scheme
# January 2004

# GCE

# Biology A/ Human Biology

## Unit BYA3

## *Question 1*

| | | | |
|---|---|---|---|
| (a) | (i) | sugar or phosphate / S-P / nucleotide chain/backbone / original/parent DNA; | 1 |
| | (ii) | X thymine; Y guanine; Z adenine;<br>(*Allow T, G and A*) *Reject: thiamine* | 3 |
| (b) | | here two chains constructed – in transcription only one /<br>base thymine would be used instead of uracil /<br>sugar would be deoxyribose instead of ribose /<br>produces DNA, not RNA /<br>both strands of DNA copied, not just sense strand /<br>uses different enzyme;<br>(*Allow T,U*) | 1 |

Total 5 marks

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## *Question 2*

| | | | |
|---|---|---|---|
| (a) | | replication / duplication / doubling of chromosomes / replication of DNA /<br>transcription of DNA; | 1 |
| (b) | (i) | cell to show correct number of chromosomes;<br>correct shape & position of centromere; | 2 |
| | (ii) | as (i) except everything halved - ignore crossing over; | 2 |
| (c) | | (to compensate for) high loss of cells from lining as food passes; | 1 |

Total 6 marks

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## *Question 3*

*Please note in this question main ideas*

(a) *Sequence*: mutant allele leads to formation/ref. transcription of mRNA;
with incorrect base(s)/incorrect codon;
*Order of amino acids*: therefore translation/arrangement of/order of amino acids is incorrect;
so protein has wrong secondary/tertiary structure/shape; max 3

(b) pancreatic enzymes/amylase/lipase found in blood;
where not normally present;
OR low levels of pancreatic enzymes found in faeces;
where not normally so low; 2

(c) (i) (glucose oxidase) catalyses oxidation/breakdown of glucose;
(ii) $H_2O_2$ reduced/broken down (by peroxidase enzyme); 2

Total marks = 7

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## *Question 4*

(a) (i) benign does not cause cancer /
does not invade other tissues causing damage /
with benign cancer, pieces which break off do not start new tumours elsewhere in body/metastasis; 1

(ii) may damage organ concerned;
may cause blockages/obstructions;
may damage/exert pressure on other organs; max 2

(b) (i) because sun's radiation contains ultra violet radiation;
this causes mutation of genes which control division; 2

(ii) because fair skin has little melanin which protects against u.v. radiation; 1

(iii) because cancer has genetic component / may have inherited (onco)gene / gene which gives predisposition to/causes cancer; 1

Total 7 marks

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## Question 5

| | | | | |
|---|---|---|---|---|
| (a) | (i) | to ensure that no unwanted bacteria will be present; | | 1 |
| | (ii) | to check that bacteria cells do not die anyway / to show water/solvent has no effect on growth; | | 1 |
| (b) | | antibiotic damages/prevents formation of cell walls;<br>antibiotic prevents DNA replication so cells die;<br>antibiotic prevents protein synthesis/translation/transcription of mRNA; | max. | 2 |
| (c) | | some bacteria are resistant / some areas of dish have no antibiotic / antibiotic not spread evenly; | | 1 |

Total 7 marks

## Question 6

| | | | | |
|---|---|---|---|---|
| (a) | | converts prothrombin to thrombin; | | 1 |
| (b) | (i) | fibrin formed from fibrinogen;<br>by the action of thrombin; | | 2 |
| | (ii) | forms mesh of fibres which trap (platelets and blood) cells; | | 1 |
| (c) | (i) | warfarin prevents blood clotting which causes thrombosis in coronary arteries/may block c. arteries/ arteries supplying heart muscle; | | 1 |
| | (ii) | $\left(\frac{36}{210}\right)$ = 17%; | | 1 |
| | (iii) | $\left(\frac{409}{1334}\right)$ = 30%; | | 1 |
| | (iv) | yes: smaller % age have thrombosis if already taking warfarin;<br>substantial difference in figures/large sample;<br>OR<br>no: those taking warfarin obviously more likely to develop thrombosis;<br>not matched with control group; | | 2 |

Total 9 marks

## Question 7

| | | | |
|---|---|---|---|
| (a) | (i) | because there are big differences;<br>any correct named example e.g.lung cancer/bronchitis much lower in women than in men; | 2 |
| | (ii) | easier to compare if sample size effectively the same;<br>different numbers of people in each group; | 2 |
| (b) | | ANY TWO: more stress / more saturated fats in diet / less time to exercise / reliance on cars; | 2 |

Total 6 marks

## Question 8

| | | | |
|---|---|---|---|
| (a) | | molecule (on cell surface);<br>that triggers immune response; | 2 |
| (b) | (i) | axes right way round and labelled;<br>2nd peak drawn higher;<br>steeper gradient on second rise; | 3 |
| | (ii) | because one dose does not give a high enough level of antibody to be effective/ because the antibody falls after a while; | 1 |
| | (iii) | antigens are only single molecules/part of parasite;<br>do not actually cause disease; | 2 |
| (c) | | malaria sufferers would have parasites in red blood cells; | 1 |
| (d) | | 1 complex life cycle with several stages;<br>2 allows production of large numbers of offspring;<br>3 uses two hosts to transfer it/one stage to next;<br>4 therefore no need for/no locomotory organs;<br>5 lives inside cells so does not need to regulate water content/digest food;<br>6 lives inside host cells so avoids attack by host;<br>7 does not need attachment;<br>8 penetrates host using vector i.e. mosquito; | max. 6 |

Total 15 marks

## Question 9

| | | | | |
|---|---|---|---|---|
| (a) | (i) | may be growing but not dividing much;<br>may be synthesising enzymes needed in new medium;<br>may be coming out of dormancy; | max | 2 |
| | (ii) | total bacterial cells curve stays high because it shows dead and alive cells;<br>total living cells curve starts to fall because no. living cells falling;<br>because of shortage of oxygen/food or build-up of waste products;<br>dead bacterial cells still visible/do not break down; | max | 3 |
| (b) | (i) | correct answer - 640 000 000 = 2 marks;;<br>(correct method but 1 error e.g. 1 doubling short, 1 '0' missing = 1); | | 2 |
| | (ii) | not all cells will divide at all/at this rate;<br>some of original cells will be dead;<br>may be limiting factor e.g. food supply; | max | 2 |
| (c) | | 1 EITHER cut desired gene from DNA of human cell;<br>2 using restriction endonuclease/ enzyme;<br>1 OR use mRNA from human cell which will code for insulin;<br>2 and use reverse transcriptase to form desired DNA;<br>1 OR make artificial DNA;<br>2 with correct sequence of bases;<br><br>3 plasmids released from bacteria using $Ca^{2+}$/heat treatment;<br>4 cut plasmid open;<br>5 with (same) restriction endonuclease;<br>6 ref. sticky ends/unpaired bases attached;<br>7 use DNA ligase to join free ends;<br>8 return plasmid to bacterial cells; | max | 6 |

Total 15 marks