



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Human Biology 5413
Specification A

BYA3 Pathogens and Disease

Mark Scheme

2007 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2007 AQA and its licensors. All rights reserved.

COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

Question 1

(a)	Thr-His-Thr-His-Thr;	1
(b)	(i) TCA;	1
	(ii) UCA;	1
(c)	(i) A base from one triplet cannot be used in an adjacent triplet; <i>Accept each base used only once/once a triplet used, moves to next triplet/suitable diagram</i> Specified peptide contains only one amino acid/ overlapping code would produce other amino acids/Gln and/or Thr as well/peptide would have more than five amino acids;	2
	(ii) Some amino acids coded for by more than one codon/triplet/ sequence of 3 bases; ACC and ACA both code for threonine;	2
		Total 7

Question 2

(a)	1. Similar (in shape) to adrenaline/noradrenaline/ β agonists; <i>Reject <u>same</u> shape as receptor</i> 2. (Fit into) receptors on heart muscle/lining of artery; 3. Stops adrenaline/noradrenaline/ β agonists binding; 4. Slow down heart rate/relax muscles in artery walls/enlarge lumen of arteries;	3 max
(b)	1. (Reduced hypertension means) less turbulence; 2. Thrombus/blood clot less likely to form; <i>Reject <u>no</u> blood clots</i> 3. Which could block artery/ arteriole; 4. Less damage to artery wall; 5. Less atheroma formed/ less plaques formed; 6. Less likely to get aneurysm; <i>Accept converse for all points</i>	3 max
		Total 6

Question 3

- | | | | |
|-------|------|---|---|
| (a) | (i) | Attaches (chromosome) to spindle/holds (sister) chromatids together; | 1 |
| | (ii) | Separate chromatids/centromeres/chromosomes/ aligns chromosomes at equator; | 1 |
| (b) | (i) | n,n,2n; | 1 |
| | (ii) | X on arrow going from 2n to n; | 1 |
| Total | | | 4 |

Question 4

- | | | | |
|-------|------|--|---|
| (a) | | Glucose oxidase;
Peroxidase; | 2 |
| (b) | (i) | Enzymes are specific/shape of active site(s);
Substrate/heroin/morphine has complementary shape/fits; | 2 |
| | (ii) | Gives a colour change if heroin/morphine present; | 1 |
| Total | | | 5 |

Question 5

- | | | | |
|-------|------|---|-------|
| (a) | (i) | Cuts DNA/gene/genetic material/ vector;
Reference to specific sites/sticky ends; | |
| | (ii) | Joins/binds/anneals DNA/genetic material/ sugar-phosphate backbone;
Reference to sticky ends;
<i>Credit sticky ends or eq in one section only</i> | 3 max |
| (b) | | Acts as antigen;
Stimulates immune response/antibody production;
Immune system <u>only</u> detects molecules on surface; | 2 max |
| (c) | | For comparison;
To ensure that it was not just injection giving protection; | 2 |
| (d) | | Allows time for memory cell formation; | 1 |
| (e) | | Memory cells present;
Stimulate antibody formation very quickly;
Specificity of antibodies;
Eliminate virus before it can cause symptoms; | 3 max |
| Total | | | 11 |

Question 6

- (a) Contains carcinogens/cancer-causing substances;
Causes mutation/changes in DNA/genes/genetic material;
Of genes controlling cell division;
Tumour suppressor genes;
(proto)Oncogenes;
Leads to uncontrolled division/mitosis; 4 max
- (b) 1.Graph 1 shows no data before 1930;
2.Smoking causes other diseases/other kinds of cancer which may cause death;
3.Average number of cigarettes smoked includes non-smokers/ no separate data for non-smokers;
4.Time delay between starting smoking and getting cancer;
5.Trend on the two graphs is different/lung cancer deaths drop after 1960 but cigarettes smoked does not show corresponding drop;
6.Correlation does not indicate cause/may be an associated factor causing lung cancer/ other causes of lung cancer; 3 max
- Total 7

Question 7

- (a) So it can stick/join/bind to (DNA) probe; 1
- (b) (i) Single-stranded;
Base-sequence complementary (to gene); 2
[A-T/G-C not enough. Reject: matching/corresponding]
- (ii) Probe is radioactive/fluorescent;
Shows up on (X-ray) film/in UV light; 2
- Total 5

Question 8

- (a) (i) 1. Enters body in (contaminated) food/drink;
 2. Any acceptable source of contamination (e.g. raw eggs, raw or undercooked meat, faeces);
 3. Enters (epithelium) cells (lining small) intestine/digestive system/gut;
Reject: stomach
 4. (Endo)toxin released when bacterium dies;
 5. Toxin causes symptoms;
 6. Diarrhoea/vomiting/abdominal pain/fever/headache;
Two symptoms per mark to max 1. Ignore: nausea/sickness/weight loss
 7. Time delay before symptoms appear;
 8. Toxin lowers water potential (in intestines);
 9. Water moves in by osmosis (leading to diarrhoea); 6 max
- (ii) 1 mark for each suitable rule of hygiene up to max 2, one mark for each explanation to max 3
- Wash hands after going to the toilet;
Salmonella present in faeces;
- Store food in fridge;
 Low temperatures reduce rate of growth;
- Boil/throw away dishcloths after use;
 Bacteria can multiply/spread in cloth;
- Thoroughly thaw food before cooking/cook food thoroughly;
 Kills bacteria present in food;
- Store uncooked meat below cooked foods (in fridge);
 Prevents transfer of bacteria to cooked foods;
- Wash hands/utensils in contact with raw meat before touching cooked foods;
 Prevents transfer of bacteria to cooked foods;
- Use different chopping boards for raw and cooked meats;
 Prevents transfer of bacteria to cooked foods; 3 max
- (b) (i) Hydrogen bonding;
 Complementary base-pairing; (*Accept: U on mRNA to A on DNA/
 A on mRNA to T on DNA/ C/G on mRNA to G/C on DNA*) 2
- (ii) Each pathogen has different base sequence/DNA/genes/genetic code;
 Therefore produce different mRNA;
 DNA must be complementary to the different mRNAs; 2 max
- (c) RNA has ribose, DNA has deoxyribose/they have different pentose sugars;
 RNA has uracil/U, DNA has thymine/T; 2

Total 15

Question 9

- (a) 1. Transmitted by mosquito;
2. Penetrates new host;
3. Lacks locomotory structures;
4. Moved round human body in blood/ transported by human blood;
5. Changes antigens;
6. In red blood cells/ liver cells;
7. Avoids immune response;
8. High reproductive rate/ reproduces at several stages in life cycle;
9. Ensures survival/ increases probability of finding new host/ completing life cycle; 6 max
- (b) Number (of children) may differ between communities;
Allows comparison; 2
- (c) (i) (No. cases of malaria per 100 children per month in) villages within 3km of lake
(No. cases of malaria per 100 children per month in) villages 8-10km from lake
Or equivalent answer using suitable figures from table; 1
- (ii) (Yes)
Shows malaria much higher near lakes;
Away from lakes, risk varies little with season;

(No)
May be other variables that study hasn't considered/named suggestion;
Other reasons for siting villages other than malaria incidence; 2 max
- (d) Mosquitoes breed in (still) water;
More mosquitoes closer to lake; *Ignore swamps*
More chance of being bitten; 3
- (e) Country A has better healthcare/ less virulent form of malaria/ die of something else/ emigrate;
Ignore: sickle cell anaemia/vaccines/resistance 1
- Total 15