



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Biology 5416/6416 *Specification B*

Microbes and Disease BYB7/A

Mark Scheme

2005 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.ork.uk

Copyright © AQA 2005 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.

General Guidance for the Mark Scheme

The following conventions are used in the mark scheme:

- A semicolon (;) separates each mark point
- An oblique stroke (/) separates alternatives within a mark point
- Underlining of a word or phrase means that the term must be used by candidates
- Brackets are used to indicate contexts for which a mark point is valid, but which may just be implied by a candidate's answer
- '*Accept*' and '*reject*' show answers which should be allowed or not allowed.
- Additional instructions may be shown in *italics*

The scheme shows the minimum acceptable answer(s) for each mark point - better, more detailed, or more advanced answers are always accepted, provided that they cover the same key ideas. Occasionally, a candidate will give a biologically correct answer that has not come up at standardising. If it is equivalent in standard to the mark scheme answers, it may be credited.

In some cases a mark may be awarded for understanding of a general principle, even though the detailed mark points on the scheme have not been made. This will be indicated on the mark scheme.

All mark points are awarded independently, unless a link between points is specified in the scheme.

Converse answers are normally acceptable, unless the wording of the question rules this out.

Disqualifiers

A correct point is disqualified when the candidate contradicts it in the same answer.

The list rule

When a question asks for a specific number of points, and the candidate gives more, any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers.

Valid points from **diagrams** are credited, if they are not duplicated in the text.

Where a question asks for **differences** between X and Y, the mark may be awarded for a feature of X without the converse for Y, if it is absolutely clear which is being referred to.

BYB7/A**Question 1**

- (a) (i) dead cells/keratin as barrier; 1
(sweat and sebum neutral)
(accept (commensal) skin flora kill/compete with microbe)
(accept skin acidity kills microbes)
- (ii) mucus traps microorganisms; 1
(cilia neutral)
- (iii) tears contain lysozyme/contain enzymes which kill microbes; 1
(accept bactericide)
- (b) move to site of infection;
 phagocytosis/engulf bacteria; *(digest neutral)*
 stimulate (T)-lymphocytes/B cells/T cells; 2 max

Total 5**Question 2**

- (a) X protein synthesis / translation;
 Y movement; 2
- (b) (i) cytoplasm;
 ribosomes;
 phospholipid membranes / cell membrane / semipermeable membrane; 2 max
(accept folded membrane for two marks)
- (ii) *(it = bacterium)*
 cell wall;
 capsule;
 flagellum;
 mesosome;
 no nucleus / nuclear membrane / DNA free;
 no mitochondria;
(accept 'no membrane-bound organelles' if neither nucleus nor mitochondria mark scored)
 no microvilli;
 no Golgi;
 no ER;
 70S/smaller ribosomes; 2 max

Total 6

Question 3

- (a) number/dose/amount of microorganism/pathogen need to cause/establish disease;
Salmonella has low infectivity/typhoid has high infectivity, linked to first point; 2
 (but lower number of typhoid bacteria / higher number of *Salmonella* bacteria needed to cause infection gains two marks)
- (b) (i) e.g. better treatment of water supplies / sewage; 1
- (ii) e.g. factory farming / misuse of pre-prepared food / longer storage of food in homes or shops / increase in amount of chicken or eggs in diet / cooking qualified e.g. not heated to correct or high enough temperature;
 or
 not cooked for long enough; 1
 (references to personal hygiene neutral)

Total 4**Question 4**

- (a) stop cell walls forming / lysis; 1
- (b) (i) penicillinase produced / enzyme breaks down penicillin;
 or
 capsule/wall and membrane complex that does not allow penetration/penicillin pumped out 1
- (ii) mutation;
 resistant individuals survive/susceptible ones killed by penicillin / mutants have selective advantage;
 survivors breed/proportion of resistant alleles in population increases;
 relevant reference to overuse of penicillin; 3 max
- (c) plasmids/DNA obtained from *E. faecalis*
 via conjugation/sexual reproduction/transformation/transduction; 2

Total 7

Question 5

- (a) less light transmission more bacteria;
since less lysozyme; 2
- (b) (i) 0.35 gains 2 marks;; 2
(evidence of same concentration as lysozyme in tube 3 gains 1 mark)
- (ii) 175 gains 2 marks; (allow ECF from (i)) 2
(else evidence of (answer to (i)) \times dilution factor \times 50 gains 1 mark)
- Total 6**

Question 6

- (a) (i) removes foreign microorganisms;
which would produce unwanted products in culture/competition; 2
- (ii) remove excess heat/prevent overheating/maintain optimum temperature;
heat produced during respiration of fungus; 2
- (b) (i) energy/respiration/carbon source; 1
- (ii) ATP/DNA/RNA/phospholipid; 1
membrane neutral
- (iii) protein production/amino acid production/nitrogen source; 1
- (c) (i) rate increases with increasing lactose then decreases;

quantitative statement, e.g. max rate at 4 a.u./maximum production
400 mg; 2
- (ii) high concentrations of lactose result in increased fungal growth;
penicillin production low when fungal growth rate high;
- or*
- penicillin secondary metabolite;
not produced when fungus is in active growing phase 2

Total 11

Question 7

- (a) protein coat/capsid; (*shape neutral, transcriptase neutral*)
 RNA/nucleic acid;
 (*deduct one mark for each non-viral structure*)
 glycoprotein pegs;
 lipid envelope; 2 max
- (b) primary structure - chain of amino acids;
 secondary structure – folding/pleating/helix in part of protein in membrane;
 tertiary structure – loops outside membrane/total shape/reference to role of sulphur bonds in forming or maintaining tertiary structure;
 (*answers must refer to primary, secondary and tertiary structure*) 3
- (c) (i) addition/deletion/substitution of base(s);
or
 different base sequence/nucleotide sequence; 1
- (ii) different amino acid(s) in CCR5;
 change in tertiary structure/shape of loops;
 no longer complementary shape to virus coat/virus cannot bind;
 (*reject active site for this point only*)
 viral contents/RNA cannot enter cell; 3 max
- (a) smallpox has similar antigen/attachment protein to HIV;
 (*allow same antigen*)
 smallpox vaccination results in production of antibodies/T killer cells;
 smallpox antibodies similar to HIV antibodies;
 memory cells produced by smallpox vaccination recognise HIV;
 antibodies block CCR5;
or
 (killer cells) destroy HIV; 2 max

Total 11