



ASSESSMENT and
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ALLIANCE

General Certificate of Education

Biology 5416/6416 *Specification B*

Microbes and Disease BYB7/A

Mark Scheme

2005 examination – June series

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Dr Michael Cresswell Director General

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;
<i>(sweat and sebum neutral)</i>
<i>(accept (commensal) skin flora kill/compete with microbe)</i>
<i>(accept skin acidity kills microbes)</i> | 1 |
| | (ii) | mucus traps microorganisms;
<i>(cilia neutral)</i> | 1 |
| | (iii) | tears contain lysozyme/contain enzymes which kill microbes;
<i>(accept bactericide)</i> | 1 |
| (b) | | move to site of infection;
phagocytosis/engulf bacteria; <i>(digest neutral)</i>
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;
<i>(accept folded membrane for two marks)</i> | 2 max |
| | (ii) | <i>(it = bacterium)</i>
cell wall;
capsule;
flagellum;
mesosome;
no nucleus / nuclear membrane / DNA free;
no mitochondria;
<i>(accept 'no membrane-bound organelles' if neither nucleus nor mitochondria mark scored)</i>
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