Version 1.0: 0806

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 6416
Specification B

BYB7/A Microbes and Disease

Mark Scheme

2006 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.

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 Microbes and Disease

Question 1

(a) (i) protection against chemicals/desiccation/phagocytic cells/antibiotic/ viruses/antibodies /increase virulence/ to stick together in colonies; 1

(ii) site of respiration / may be involved in cell division/DNA replication / uptake of materials / production of ATP / site of electron transfer chain; 1

(b) differential centrifugation/centrifuge in stages/at different speeds; 1
until have pellet containing ribosomes / ribosomes separate last; 1

Total 4

Question 2

(a) side effects / allergic reactions / low toxicity to cells;
interaction with other drugs / effective in conditions of use / reasonably stable;
should only act on the problem bacteria / narrow spectrum;
how much resistance the bacteria have built up; 2 max

(b) (i) tetracycline
prevents tRNA binding to ribosomes/amino acid/mRNA; 1
amino acids not available /brought/picked up;

chloramphenicol
prevents amino acids being joined / prevents primary structure forming; 1
no enzymes / no structural proteins formed; 1
(*accept cell wall formation if qualified)*
(*prevents protein synthesis gains one mark in either section, once only*)

(ii) only prevents tRNA binding to 70S/prokaryotic/bacterial ribosomes / human ribosomes are different sizes/shapes/structure; 1

Total 7

Question 3

(a)
1. macrophages present antigens to B lymphocytes;
2. antigen binds to/is complementary to receptors on lymphocyte;
3. binds to a specific lymphocyte;
4. lymphocytes become competent/sensitised;
5. (B) lymphocytes reproduce by mitosis / (B) lymphocytes cloned;
6. plasma cells secrete antibodies; 4 max

(b)
1. restriction enzyme/endonuclease;
2. to cut plasmid/to form sticky ends in plasmid;
3. (use) ligase (to join) gene to plasmid;
4. culture bacteria with (in medium containing) plasmids
5. to allow uptake of plasmids / transformation;
6. use of cold shock/chemical treatment (to enhance uptake)/ heat shock; 3 max
(ignore bullets/electroporation /microinjection)

Total 7

Question 4

(a) (i) bond with a cross-linking agent;
entrapment in a gel;
bind on to surface / adsorb on to material; 2 max

(ii) **A** (because immobilising) increases stability /maintains (protein) shape / reduces denaturation; 1

(b) larger lumen;
same volume of blood;
larger volume/cross-sectional area of vessel/arteriole;

OR

increased blood flow into capillary beds (e.g. in skin.);
so reduction in blood volume in the arteries;

2 max

Total 5

Question 5

(a) (i) increases slowly until 1997 then much more rapid increase; 1

(ii) not all cases of HIV develop into AIDS/time delay in onset of AIDS/ dormant/ trigger factor; 1
improved medical care/antiviral drugs that prevents/slows down onset of AIDS; 1

(b) 4.92×10^8 / 4.93×10^8 /492500000; 2
(394/80 or 78.8/16 or 492500000 with decimal place incorrect gains 1 mark)

Total 5

Question 6

(a) (i) to destroy bacteria/microbes / sterilise / pasteurise; 1

(ii) respiration/ metabolism of bacteria; 1

(b) compare colours/readings/values/masses; 1
take samples at regular intervals and heat; 1
construct calibration curve/graph/colour gradient using known concentrations; 1

(c) (i) total count is living and dead cells; 1
viable count is only living/growing/reproducing cells; 1

(ii) 1. sample at regular/known time intervals; *(one day maximum if time stated)*
2. produce a serial dilution;
3. known volume of bacteria on plate/agar;
4. incubate for suitable time period;
5. count colonies;
6. make repeats of plates to improve accuracy; 4 max
(*for wrong method allow equivalents to mark points 3 and 5)*

Total 11

Question 7

(a) bacteria have ligands/antigens/proteins/glycoproteins /polysaccharides (on membrane / wall); 1
complementary to receptors/fits/binds/attaches to specific receptor 1

(b) (i) hypothalamus;
sends impulses to heat loss centre;
causes/makes/sends impulses to effectors/named effector e.g. sweat glands/muscles of arterioles; 2 max

(ii) enzymes denatured/tertiary/secondary structure altered/altered active sites/breaks hydrogen bonds; 1
prevents named chemical reactions/metabolic pathways; 1

(c) inhibits/kills other bacteria/fungi/decomposers/reduces competition; 1

(d) 1. prepare a bacterial lawn/culture/sample; (*accept mix bacteria with agar/medium*)
2. with oil and one with control/water / range of concentrations;
3. appropriate method of standardising how sample applied, e.g. discs/wells;
4. appropriate measure of effectiveness/size/diameter of clear zone;
5. the larger the zone the greater the effectiveness;
6. use of aseptic technique; 4 max
(*ignore haemocytometer*)

Total 11