



General Certificate of Education

Biology 6416 *Specification B*

BYB7/A Microbes and Disease

Mark Scheme

2008 examination - June series

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Question 1

- | | | | |
|-----|------|---|----------------|
| (a) | (i) | <u>Passive</u> ; | 1 |
| | (ii) | (Only) the diseases/pathogens/antigens the mother has been exposed to/has antibodies for/only some antibodies can be transported across to baby/ref to specificity; | 1 |
| (b) | 1 | Not digested/hydrolysed; | |
| | 2 | Enzyme not produced / prevented from working; | |
| | 3 | Carrier/channel proteins; | |
| | 4 | Active transport/facilitated diffusion/endocytosis; | 2 max |
| | | | Total 4 |

Question 2

- | | | | |
|-----|------|--|----------------|
| (a) | (i) | Secreted from cells / produced or released from living cells; | 1 |
| | (ii) | (Endotoxins produced/released) from the breakdown of bacteria / from dead cells; | 1 |
| (b) | | Invasiveness ability to spread in host;
Reduced/no phagocytosis / or description of engulfing or ingesting;
(Consequence) no surface antigen / no stimulation of B or T cells / no cloning of B or T cells / no antibodies;
Population grows / spreads faster/further / infects more cells; | 3 max |
| | | | Total 5 |

Question 3

- (a) (i) Foreign (substance)/non-self/causes an immune response/antibody production / found on bacterium/pathogen/virus; 1
- (ii) (Infinite) variety/specific shape/tertiary/3D structure; 1
- (b) (i) Can replicate/reproduce;
Greater (primary) response/antibody production /more memory cells produced/longer lasting immunity/few boosters required;
(Reject faster) 2
- (ii) Cannot cause /less likely to cause the disease/only mild symptoms occur; 1
- (c) Cut out/isolate/remove required gene from (donor) DNA / description DNA linked to required protein / antigen;
Cut open plasmid/vector;
Sticky ends/description; 2 max

Total 7**Question 4**

- (a) (i) Dispersed / to prevent clumping/precipitation/sedimentation of cells / to give a representative sample/accurate count / even distribution / dispersal of oxygen/nutrient / dispersal of heat /prevent hot spots; 1 max
- (ii) Flame neck of flask;
Sterile pipette/syringe;
(Minimising exposure of flask to air) stopper/bung replaced quickly;
(Sterile work surface) use of bactericidal agent / use Bunsen flame to promote air flow; 2 max
- (b) (Principle volume of square calculated)

$$(0.2 \times 0.2 \times 0.1) = 0.004\text{mm}^3 / \frac{1}{250} / 4 \times 10^{-3};$$

(Principle calculation of number in square)

$$(0.004) \times 2000 = 8, / \frac{8}{4 \times 10^{-3}};$$

Grid x; 3
(Correct answer without working 1 mark)

Total 6

Question 5

- (a) (i) Binary fission; 1
- (b) (i) 1 Switch on genes;
 2 Synthesise enzymes;
 3 To breakdown acetate;
 4 Acetate may contain less energy less energy for growth / energy required for acetate metabolism/;
 5 Slower absorption/less carrier proteins/synthesis of carrier proteins required;
 3 max
- (ii) Culture 3 (faster growth rate because) no/reduced amino acid synthesis; 1
- (c) Frequent DNA replication;
 Mutations;
 Giving advantage selected / reference to competition; 3
- Total 8**

Question 6

- (a) Two advantages;;
 e.g.
 1 Production more efficient / faster rate of growth, as in exponential phase;
 2 Amount of product not limited by initial amount of substrate;
 3 No end-product inhibition;
 4 Less build up of toxins;
 5 Quality of product more consistent;
 6 Smaller vessels required;
 7 Cheaper/more economical more productive because less down time/less labour intensive; 2 max
- (b) (i) Source of nitrogen/amino groups; 1
- (ii) $58 - 3.2 = \frac{2.6}{12}$ (*principal mark of gradient*)
 $0.22 \text{ (g dm}^{-3} \text{ h}^{-1}\text{)}$; 2
 (*Allow 0.2 to 0.24 = 0.22*)
 (*Correct answer award 2 marks*)
- (c) (i) More lysine less lysine produced;
 Competitive/non-competitive inhibition/change in pH; 2 max
- (ii) 1 Higher yield of lysine
 2 All aspartate used in lysine production;
 3 No threonine to separate from lysine / easier or less downstream processing / no contamination of product; 3 max

Total 10

Question 7

- (a) Change in antigen/shape/new antigen on virus;
Not recognised by β /plasma cells T cells /no memory cells / no antibodies present;
New antibodies/new β cells/T cells need to be produced/time to make antibodies; 3
- (b) (i) 1 (Interferon binds on to receptor)complementary shapes;
2 Switch on gene for enzyme A;
3 No translation/protein synthesis;
4 No enzyme production;
5 Infected cell dies;
6 No viral RNA;
7 No viral proteins/capsids;
8 No viral particles produced / assembled/ no replication of viruses;
9 No viruses released; 6 max
- (ii) Protein synthesis continues in these cells/ cells do not die; 1

Total 10