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ASSESSMENT and QUALIFICATIONS ALLIANCE

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) Passive; 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; 2
(Reject faster)

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

(Principle calculation of number in square)
(0.004) x 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 (g dm^{-3} h^{-1}); 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