Immunity mini test - ms

QUESTIONSHEET 2

(a) (i) antigens on the dead pathogen detected by (T/B) lymphocytes;
specific B lymphocytes clone/divide rapidly by mitosis;
plasma cells released to blood;
plasma cells secrete antibody into blood;
levels fall once all antigens are destroyed; **max 4**

(ii) memory cells formed by first challenge/equivalent allow even greater/faster cloning (and so greater/more antibody release); **1**

(b) influenza virus/pathogen has high rate of mutation;
polio/tetanus pathogens have low rate of mutation;
mutation changes antigens/proteins on surface of pathogen;
antibodies unable to recognise changed antigens/new antibody needed to react with changed antigen; **max 2**

(c) (i) antibodies against tetanus bacteria; **1**

(ii) immediate rise due to injection;
steady fall because liver destroys the antibodies;
lymphocytes are not stimulated/passive immunity so no new antibodies made; **2**

TOTAL 10

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ANSWERS & MARK SCHEMES

QUESTIONSHEET 4

(a) (i) an antigen;
on the surface of a red blood cell; **2**

(ii) an antibody;
dissolved in blood plasma; **2**

(iii) when agglutinin a comes into contact with agglutinogen A/when agglutinin b comes into contact with agglutinogen B;
due to incompatible blood transfusion;

red cells are clumped together by agglutinins reacting with agglutinogens;
ref one molecule of agglutinin combines with five molecules of agglutinogen/agglutinin has a valency of five,
which makes clumping very effective;
clumped cells can block small blood vessels causing glomerular/kidney/heart/brain damage/other correct example/
may result in death; **max 4**

(b) (i) group B into group A;
group A into group B;
group AB into group A;
group AB into group B;
4

(ii) agglutinins a and b will not clump the red cells in A, B or AB blood;
because they are greatly diluted by the greater blood volume of the recipient;
would only become a problem if large volumes were transfused; **max 2**

TOTAL 14

QUESTIONSHEET 6

(a) (i) macrophages congregate in regions of infection in the tissues/ref chemotaxic attraction;
engulf bacteria and digest them/ref to lysozyme activity;
carry antigens into lymph nodes/spleen/nearest lymphatic tissue;
present antigens to T-cells/bind to T-cells with HLA receptors and present antigen to T-cell;
thus enable T-cells in lymphatic tissue to become activated by antigens (from elsewhere in the body); **max 4**

(ii) means that thousands/millions of cells are available to destroy/disable the antigen;
since they are genetically identical they will all recognise/react against the (specific) antigen; **2**

(b) (i) leave lymph nodes/spleen/lymphatic tissue/lymph flow/blood stream and move to site of infection;
ref amoeboid action/chemotaxis;
congregate/collect around bacteria and secrete cytotoxic chemicals over them;
ref to specific cytotoxins/lymphotoxin/perforin;
also secrete chemicals/lymphokines that stimulate development of more killer T-cells/attract macrophages to the infection;
max 3

(ii) retain the memory of the antigen allowing a rapid response if a second infection occurs/
gives long term immunity against the antigen; **1**

(iii) produce an interleukin/lymphokine that induces production of more killer T-cells/aid B-cells/
plasma cells to develop/produce more antibodies; **1**

TOTAL 11

QUESTIONSHEET 7

Feature	T-cells	B-cells
May produce antibodies	✗	✓ ;
Are classed as small lymphocytes	✓	✓ ;
Develop in the thymus	✓	✗ ;
May secrete interferon	✓	✗ ;
Give passive immunity to the organism which possesses them	✗	✗ ;
Give active immunity to the organisms which possesses them	✓	✓ ;

TOTAL 6

QUESTIONSHEET 8

(a) diphtheria bacilli are stable and do not mutate/rarely mutate into new (antigenic) forms;
influenza viruses constantly mutate to produce new (antigenic) forms;
new strains of virus appear every few months;
thus memory cells for diphtheria antigens are effective throughout life but memory cells against influenza may not recognise the new strains; **max 3**

(b) smallpox virus showed little variation (antigenically) across the world/basically all the same strain/vaccines were available against all strains;
smallpox victims could be easily isolated thus preventing cross infections (of people not yet immunised when cases did occur);
difficult to prevent cross infection with cholera/tuberculosis which is in contaminated water/food supplies/malaria with a mosquito vector;
these organisms have a higher mutation rate which changes their (antigenic) structure more frequently than smallpox; **max 3**

(c) colostrum/breast milk contains many antibodies produced in the mother;
these can be absorbed by the baby via the stomach (from the milk);
they can persist in the baby's body for several weeks;
giving short term immunity/passive immunity against many diseases/prevalent diseases; **max 3**

(d) antibodies/killer T-cells are produced against the Streptococci;
some cell surfaces of the infected person may antigenically resemble the Streptococci;
for example, β-cells of the islets of Langerhans/thyroid cells/glomeruli;
thus body's own antibodies/killer T-cells may destroy these body tissues; **max 3**

TOTAL 12

QUESTIONSHEET 9

(a) (i) antigen in lymph/blood/plasma;
attaches to antibody on B-cell in lymph node/spleen;
B-cell processes/modifies antigen and presents it on the cell membrane;
presented antigen and self HLA antigen can then be recognised by receptors on helper T-cell;
this produces substances which stimulate mitosis and differentiation of B-cells/activates B-cells; **max 4**

(ii) many cells produced so that immune response is bigger/sufficient to counter large quantities of antigen;
all cells genetically identical so that they respond to the same antigen/immune response is focussed on same antigen; **2**

(iii) secrete specific antibody against antigen;
antibody molecules are released from lymph node/spleen into lymph/blood;
each cell can release up to 2000 antibody molecules per second for about five days/huge quantities of antibodies are released; **max 2**

(iv) retain memory of specific antigen so that a quicker/ more forceful response can occur to a second infection by the same antigen; **1**

(b) the primary response involves the activation/multiplication of lymphocytes and elimination of the antigens;
takes 7 – 10 days to develop/ levels of antigen rise slowly/ lasts about two weeks;
the secondary response involves activation of (long lived) memory cells;
takes 2-3 days to develop/levels of antigen rise much higher/can last for months; **max 3**

TOTAL 12

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ANSWERS & MARK SCHEMES

QUESTIONSHEET 12

(a) (i) no response visible from first injection for 10 days, response to second injection visible at 3 - 4 days;
much higher levels of antibody appeared (in the plasma/blood) after the second injection;
antibody titre/level falls fairly sharply after 20 days from the first injection, persists/does not fall much after second injection;
3

(ii) memory cells can be immediately activated after second injection allowing a rapid response;
after first injection B-cells must receive and modify the antigen and interact with helper T-cells before activation (and this takes time);
after first injection a few activated B-cells must undergo many mitoses to produce a clone of several million (antibody producing) plasma cells;
several million memory cells probably exist and only need a few mitoses to produce the needed number of plasma cells;
thus more plasma cells means more antibody molecules produced more quickly (after second injection);
larger number of antibody molecules means that they will persist longer/take longer to be recycled by liver; **max 4**

(a) body cells have many surface antigens which differ from person to person;
these can provoke an immune response when foreign tissue is transplanted into another person;
resulting in T-cell immunity/cellular immunity/production of killer T-cells;
which will destroy/damage the transplanted tissue;
tissues to be transplanted must have antigens which closely match those of the recipient; **max 3**

TOTAL 10

Question 7

(a) enzyme;
makes DNA;
single-stranded(DNA);
using RNA template/starting with RNA/complementary to RNA; 2 max

(b) (i) incorporated into DNA (during replication);
resulting DNA will not replicate/undergo transcription; 2

(ii) idea of attacking virus at different stages in life-cycle/reduces chance of virus developing resistance/need drugs to control side-effects/many different strains of virus/virus changes surface antigens; 1

(c) HIV destroys/damages T-cells;
(more vulnerable to TB with) impaired immunity/immune response; 2

Total 7

Question 2

(a) (i) Molecule/part of molecule/protein/glycoprotein;
[Allow: polysaccharide]
Stimulates immune response; 2

(ii) These antigens/antibodies have complementary/particular shape;
[Reject: Active site]
Allow fitting/binding with (relevant) antibody/antigen; 2

(b) Calichaemicin delivered specifically to cancer cells/less likely to/will not harm normal/healthy cells;
Lower dose of calichaemicin needed to be effective; 2

Total 6 marks

Question 9

(a) (i) protein/immunoglobulin;
specific to antigen;
idea of .fit./complementary shape; 2 max

(ii) 1. virus contains antigen;
2. virus engulfed by phagocyte/macrophage;
3. presents antigen to B-cell;
4. memory cells/B-cell becomes activated;
5. (divides to) form clones;
6. by mitosis;
7. plasma cells produce antibodies;
8. antibodies specific to antigen;
9. correct reference to T-cells/ cytokines;
6 max

(b) 1. antibody gene located using gene probe;
2. cut using restriction enzyme;
3. at specific base pairs;
4. leaving sticky ends/unpaired bases;
5. cut maize/DNA /vector using same restriction enzyme;
6. join using DNA ligase;
7. introduce vector into maize/crop/recombinant DNA into maize; 4 max

(c) passive;
person is not making own antibodies/antibodies not replaced;
memory cells not produced; 2 max

(d) fewer ethical difficulties/
less risk of infection;
1

Total 15