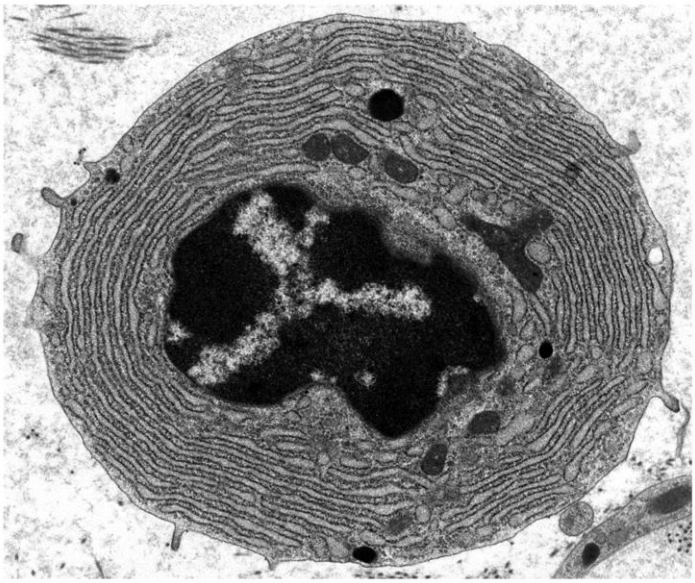
11. Immunity

11.1 The immune system

Paper 1

Question Paper

1 The electron micrograph shows a type of blood cell.



What can be concluded from the electron micrograph?

A The cell secretes products that are toxic to pathogens.

B The cell synthesises a large quantity of proteins.

C The cell synthesises large quantities of antigens.

D The cell digests pathogenic bacteria.

2 Why is mitosis important in the immune response?

A It allows B-lymphocytes to produce plasma cells.

B It allows B-lymphocytes to synthesise antibodies.

C It allows neutrophils to carry out phagocytosis.

D It allows T-lymphocytes to recognise foreign antigens.

3 What is the correct sequence of events in a primary immune response?

A T-lymphocyte activation → B-lymphocyte selection → plasma cell release

B antigen presentation by macrophages → cytokines released by T-helper cells → B-lymphocyte differentiation

C antigen presentation by neutrophils → T-memory cell activation → B-lymphocyte selection

D T-memory cell activation → B-memory cell activation → antibody production

4 What will be produced by the division of memory cells during a secondary immune response?

A macrophages

B plasma cells

C neutrophils

D monocytes

5 Which blood cell type does **not** recognise, engulf and digest non-self particles?

A macrophages

B neutrophils

C phagocytes

D T-killer cells

6 Some responses made by cells of the immune system to a pathogen are listed.

1 mitosis

2 bind to specific antigens

3 produce memory cells

4 secrete antibodies

Which responses are correct for B-lymphocytes?

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 3 only

D 2, 3 and 4 only

7 A patient with kidney failure can be given a kidney transplant. In a kidney transplant, a healthy kidney is taken from another person and put into the patient's body.

Sometimes the donated kidney cells are killed by the patient's body. In this primary immune response, T-lymphocytes bind to antigens on the donated kidney cells and are activated.

The statements describe the next stages of the primary immune response.

1 Activated T-lymphocyte secretes cytokines.

2 B-lymphocytes differentiate into plasma cells and make antibodies.

3 T-killer cells bind to antigens on donor kidney cells.

4 T-killer cells release toxins that destroy the donor kidney cells.

5 T-lymphocytes multiply by mitosis and differentiate into T-killer cells.

Which order correctly explains how donor kidney cells are killed?

A $1 \rightarrow 5 \rightarrow 2 \rightarrow 3$

B $1 \rightarrow 5 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 1 \rightarrow 5 \rightarrow 2$

D $3 \rightarrow 5 \rightarrow 4 \rightarrow 1$

8 A person's blood group is determined by antigens present on the red blood cells.

The table shows the antigens and antibodies in the blood of people with different blood groups.

blood group	presence of A or B antigens on red blood cells	presence of antibodies to A or B in plasma
A	A only	anti-B only
B	B only	anti-A only
AB	A and B	neither
O	neither	anti-A and anti-B

During a blood transfusion, it is essential that the person receiving the blood does not have antibodies to the donor's blood.

Which blood groups can be given to a person with blood group AB?

A AB only

B O only

C A and B only

D A, B, AB and O

9 Which types of cell are stimulated to divide by the cytokines produced by T-helper cells?

A macrophages

B B-lymphocytes only

C T-killer cells only

D B-lymphocytes and T-killer cells

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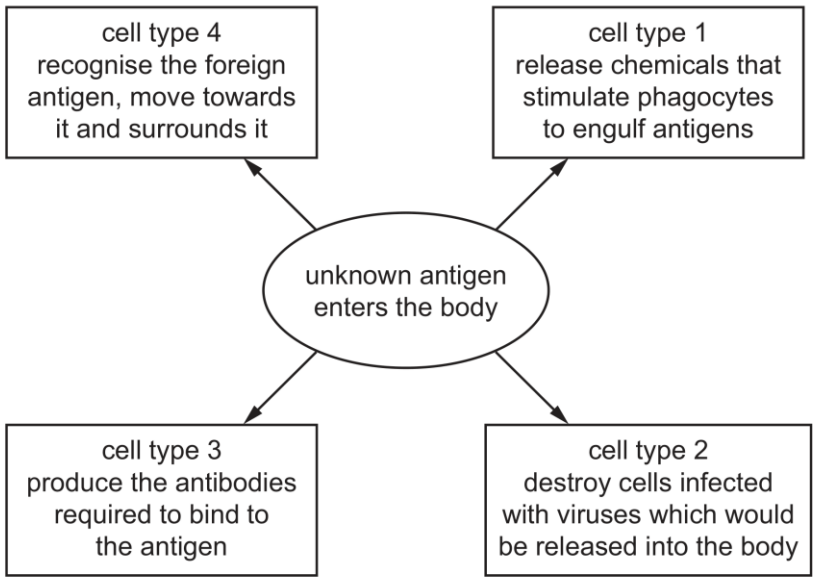
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During a blood transfusion, it is essential that the person who receives the blood does **not** have antibodies to the donor's blood.

Which blood groups can be given to a person with blood group B?

A A and B **B** AB and B **C** AB and O **D** B and O

11 A student used a diagram to show four types of cells involved in the primary immune response.



Which row is correct?

	cell 1	cell 2	cell 3	cell 4
A	B-lymphocyte	macrophage	T-killer cell	T-helper cell
B	macrophage	B-lymphocyte	T-helper cell	T-killer cell
C	T-helper cell	T-killer cell	B-lymphocyte	macrophage
D	T-killer cell	T-helper cell	B-lymphocyte	macrophage

12 What are functions of T-lymphocytes?

1 production of cytokines

2 production of toxins

3 recognition of an antigen bound to an antigen-presenting cell

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

13 What is correct about the role of memory cells in long-term immunity?

1 They divide to form plasma cells and memory cells when the pathogen enters the body a second time.

2 They produce a fast response so that the person infected with the pathogen does not become ill again.

3 They produce more antibodies than were produced during the primary immune response.

4 They remain in the blood and lymphatic system after the pathogen has been destroyed.

A 1, 2 and 3 **B** 1, 2 and 4 **C** 1 and 3 only **D** 2 and 4 only

14 Which statements correctly describe lymphocytes?

1 Each B-lymphocyte has the ability to make several types of antibody molecules.

2 Some B-lymphocytes and T-lymphocytes become memory cells.

3 Plasma cells secrete antibodies into the blood plasma.

4 Some T-lymphocytes stimulate macrophages to kill infected cells.

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1 and 4 only

D 2, 3 and 4 only

15 A country introduced a measles vaccination during a measles epidemic.

Later, it was realised that vaccinated children were more likely to survive childhood than unvaccinated children, even when there were no measles epidemics.

The vaccine had given the children some protection against other pathogenic infections.

Which statement could account for this extra protection?

A B-lymphocytes produced memory cells which gave the children passive immunity to these infections.

B Memory cells produced plasma cells which secreted anti-measles antibodies that bound to antigens that closely resembled measles antigens.

C Memory cells produced plasma cells which secreted anti-measles antibodies that bound to any antigen.

D T-lymphocytes produced memory cells which gave the children natural immunity against these other infections.

16 Which description of a T-lymphocyte is correct?

A They are only found in blood and secrete cytokines in response to infection.

B They can leave the blood and accumulate at sites of inflammation.

C They can leave the blood and secrete cytotoxins when exposed to bacteria.

D They circulate in the blood and always present antigens in response to infection.

17 Which cell type causes the secondary immune response to be much faster than the primary immune response?

A helper T-lymphocyte

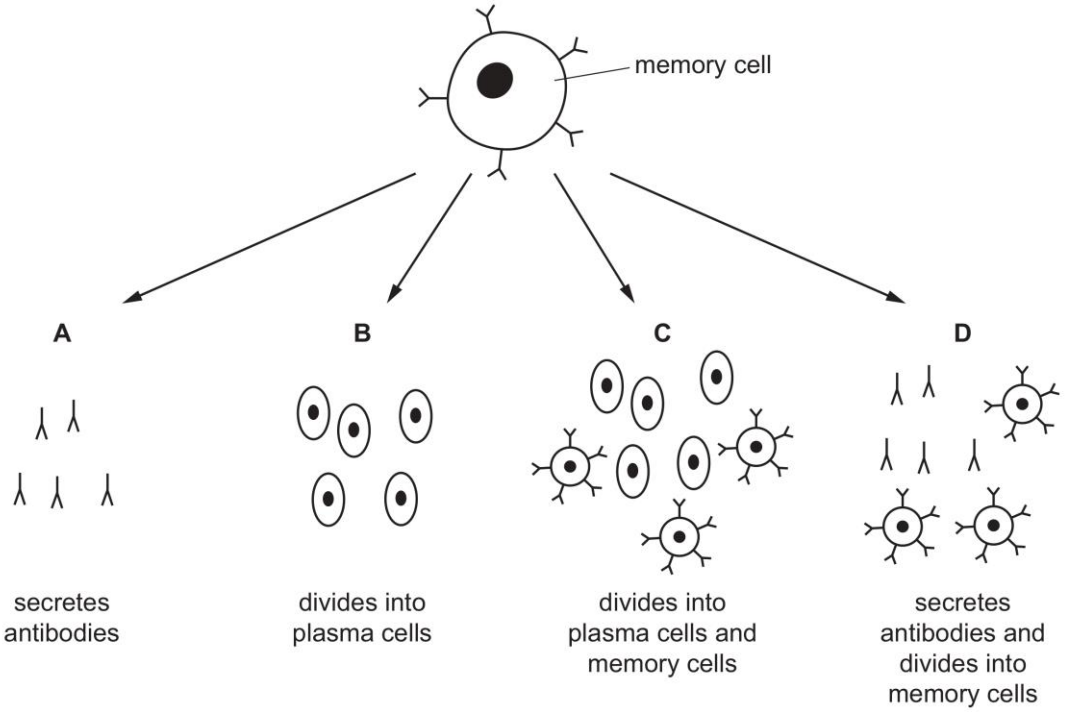
B memory cell

C phagocyte

D plasma cell

18 When exposed to an antigen for a second time, memory cells stimulate a secondary immune response.

Which correctly shows the secondary immune response?



19 Which row is correct for neutrophils and B-lymphocytes?

	neutrophil	B-lymphocyte
A	can change shape	activated by contact with antigens
B	found in organs rather than in blood	kill virus-infected cells
C	may be long-lived cells	always short-lived cells
D	their lysosomal enzymes digest bacteria	secrete cytokines

20 A graft of tissue, such as skin, from a different person is usually rejected by the body.

Which statement about graft rejection is correct?

A The graft is rejected by B-lymphocytes because they make and release antibodies which react with the surface antigens on the graft cells.

B The graft is rejected by B-lymphocytes because T-lymphocytes are not stimulated to produce antibodies.

C The graft is rejected by T-lymphocytes because the graft tissue causes T-lymphocytes to release antibodies.

D The graft is rejected by T-lymphocytes because they circulate in the blood and can gather at the graft site.

21 Which are specific immune responses?

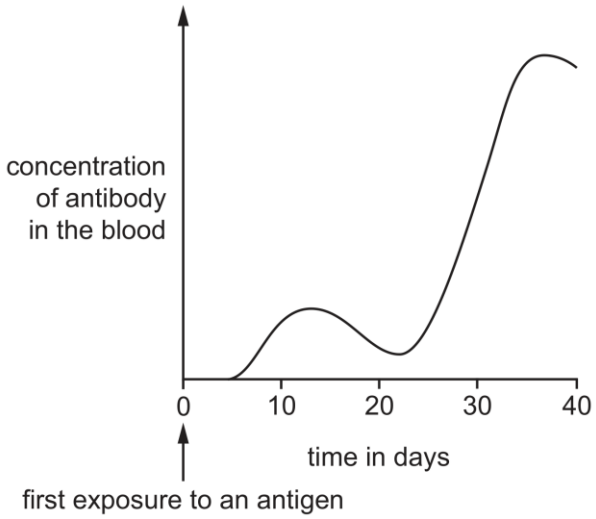
1 phagocytosis

2 production of antibodies

3 production of memory cells

A 1 and 3 only **B** 1 only **C** 2 and 3 only **D** 2 only

22 The graph shows the amount of antibody produced in response to an antigen.



From the graph, which statement is correct?

A It takes 25 days to achieve active immunity.

B Memory cells for this antigen are present in the body within 20 days.

C T-helper lymphocytes are activated on day 12.

D The second exposure to the antigen occurred on day 25.

23 Immune response to a vaccination against a virus can be assessed by making three measurements:

1 the concentration of anti-virus antibody in the blood

2 the time taken to increase the antibody concentration significantly after a booster vaccination

3 the number of virus-specific lymphocytes per cm^3 blood.

What describes the immunity of an individual when the values of 1, 2 and 3 are all low ten years after vaccination?

A active immunity due to the presence of memory cells

B low immunity due to the absence of antibodies

C low immunity due to the absence of memory cells

D passive immunity due to the presence of antibodies

24 Where are antigens found?

	on the surface of pathogen	on the surface of macrophage
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = antigens found

✗ = antigens not found

25 When an organ is transplanted from one person to another, rejection of the non-self organ must be avoided. At the same time, the immune system of the recipient must be maintained to prevent death from infections.

What prevents rejection of the transplanted organ?

A continued activity of B-lymphocytes

B natural active immunity

C natural passive immunity

D suppression of T-lymphocyte activity

26 A vaccine is available against most common strains of the influenza virus.

The virus that causes influenza often undergoes mutation in the gene coding for its antigenic protein.

Which statements explain why vaccinated people are not immune to a mutated influenza virus?

1 They will not have primary immune response to the mutated antigen.

2 They will not have a secondary immune response to the mutated antigen.

3 Their memory cells do not recognise the mutated antigen.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

27 Where are antigens found?

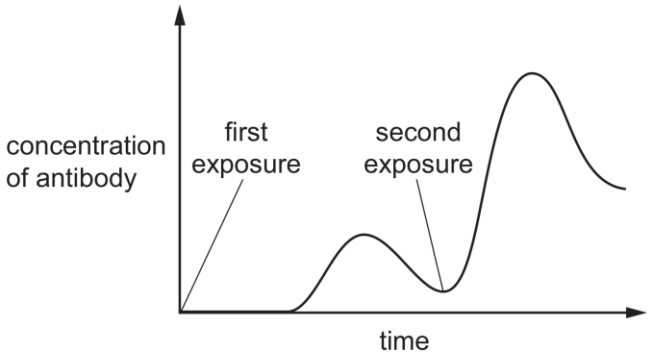
	on the surface of macrophages	in blood plasma
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = antigens found

✗ = antigens not found

28 The graph shows how the body reacts following exposure to an antigen for the first and second time.



What is the direct cause of the increase in antibody production after the second exposure to antigens?

A B-memory cells

B macrophages

C plasma cells

D T-memory cells