



The immune response: practice questions

8 questions • 32 marks • mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 32

1 UNIT 4 STYLE [4 marks]

A Level only

Explain how inflammation helps to destroy pathogens at a site of infection.

2 UNIT 4 STYLE [4 marks]

A Level only

Describe how interferon and lysozyme each help to protect the body from infection.

3 UNIT 4 STYLE [3 marks]

A Level only

Explain why an antibody that binds to the surface of one species of bacterium does not bind to a different species.

4 UNIT 4 STYLE

[6 marks]

A Level only

Describe the roles of B cells and T cells in the immune response to a pathogen that the body has not met before.

5 UNIT 4 STYLE

[5 marks]

A Level only

A person was given a vaccine on day 0 and a second dose of the same vaccine on day 28. The table shows the concentration of antibody in the blood. (a) Describe the differences between the response to the first dose and the response to the second dose. (3) (b) Explain the differences you have described. (2)

Antibody concentration after vaccination

Day	Antibody concentration / arbitrary units
0	0
7	2
14	18
21	30
28	22
35	95
42	150
49	120

6 UNIT 4 STYLE

[4 marks]

A Level only

Compare and contrast natural passive immunity with artificial active immunity.

7 UNIT 4 STYLE

[1 mark]

A Level only

A baby is protected from infection by antibodies in colostrum. What type of immunity is this?

- A. ☐ Natural active
- B. ☐ Natural passive
- C. ☐ Artificial active
- D. ☐ Artificial passive

8 UNIT 4 STYLE

[5 marks]

A Level only

Explain how the way in which HIV evades the immune system supports the theory of an evolutionary race between pathogens and their hosts.

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [4] A Level only

- mast cells / damaged cells release histamine (1)
- vasodilation increases blood flow to the area (1)
- capillary walls become more permeable, so more tissue fluid / plasma leaves (1)
- phagocytes / neutrophils / macrophages move out of the capillaries to the site (1)
- phagocytes engulf and digest pathogens (1)
- Max 4

2. [4] A Level only

- interferon is released by virus-infected cells (1)
- it binds to receptors on neighbouring cells (1)
- switching on genes for enzymes that break down viral mRNA / stop protein synthesis (1)
- lysozyme hydrolyses peptidoglycan in the bacterial cell wall (1)
- so the cell bursts by osmosis (1)
- Max 4

3. [3] A Level only

- antibody has a specific tertiary structure in the variable region (1)
- which is complementary in shape to the antigen on the first bacterium (1)
- the different species has different antigens that do not fit the antigen-binding site (1)

4. [6] A Level only

- macrophage / antigen-presenting cell presents antigen on its surface (1)
- T helper cell with complementary receptor binds to the antigen and is activated (1)
- T helper cell divides / clonal expansion and releases cytokines (1)
- cytokines activate B cells with complementary antibody receptors (1) which divide by mitosis and differentiate into plasma cells and B memory cells (1)
- plasma cells secrete antibody (1)
- cytokines activate T killer cells (1) which kill infected cells by releasing perforin / enzymes (1)
- T memory cells and B memory cells produced for future responses (1)
- Max 6

5. [5] A Level only

- (a) after the first dose the antibody concentration rises slowly / takes about 14 days to rise significantly (1)
- after the second dose the concentration rises much faster / is 95 units by day 35, 7 days later (1)
- the peak after the second dose is higher (150 compared with 30 units) (1)
- (b) memory cells are present after the first dose (1)
- they divide rapidly into plasma cells that secrete large amounts of antibody (1)
- Max 5

6. [4] A Level only

- both involve antibodies in the blood / both give protection against a pathogen (1)
- natural passive: antibodies come from the mother (across the placenta or breast milk) and artificial active: antibodies are made by the person after vaccination (1)
- passive does not form memory cells, active does (1)
- passive protection is immediate but short-lived, active takes time but lasts longer (1)
- Max 4

7. [1] A Level only

B B (1)

8. [5] A Level only

- HIV has a high mutation rate because reverse transcriptase makes errors / does not proofread (1)
- so surface antigens (gp120) change / antigenic variation (1)
- memory cells and antibodies for the earlier antigens do not recognise the new antigens (1)
- HIV infects helper T cells, destroying them, so the immune response fails / HIV hides in cells as a provirus (1)
- pathogens with advantageous mutations survive, reproduce and pass them on (natural selection), then hosts evolve further resistance (1)
- Max 5