

Cell Mediated Immune Response practice exam questions

SECTION A - Multiple-choice questions

Question 1 (1 mark)

A Cytotoxic T cell contributes to an adaptive (specific) immune response by:

- A Killing infected cells
- B Capturing and presenting antigen
- C Secreting a molecule similar to its T cell receptor
- D Capturing and digesting viruses

Question 2 (1 mark)

Human Immunodeficiency Virus (HIV) infects Helper T cells. Infection without treatment can lead to a weakened immune system. Which of the following could contribute to this weakening?

- A Antibodies entering Helper T cells to bind to virus
- B Normal B cell function
- C Normal Cytotoxic T cell function
- D Antibodies binding to virus outside Helper T cells

SECTION B - Written responses

Question 1 (7 marks)

Human cytomegalovirus (HCMV) infects cells lining many different organs and tissues and is transmitted between people via bodily fluids, such as saliva, blood, semen, and breast milk. The virus is normally cleared by cell-mediated immunity, however, HCMV can become a lifelong infection in healthy individuals, even if they show no symptoms. HCMV achieves this by remaining dormant for an extended period of time inside host cells in the bone marrow and by suppressing cell-mediated immunity when it re-emerges to infect other body cells.

1a. Outline the steps in activating cytotoxic T cells in the lymphoid tissue. (3 marks)

1b. Compare and contrast how an activated cytotoxic T cell interacts with an uninfected body cell and a HCMV-infected body cell. (3 marks)

1c. Suggest one strategy HCMV could use to suppress cell-mediated immunity. (1 mark)

Suggested responses begin on the next page.

The cell-mediated immune response written responses: Suggest responses.

In general, note the command terms: outline, compare and contrast, suggest.

1a. Outline the steps in activating cytotoxic T cells in the lymphoid tissue.

Response you wrote:

Suggested response:

- Antigen presenting cells present antigen to cytotoxic T cells and helper T cells and activates those with matching T cell receptors
- Helper T cells stimulate cytotoxic T cells to clone;
- Most clones leave the lymph node to interact with body cells while other clones become memory cytotoxic T cells

Tips for answering this question: The command term is “outline” so the student is required to give a brief summary of the key events, rather than a detailed description of the process. Three marks indicates three points that the student is required to make. In this case, consider the key cells involved (antigen presenting cells, cytotoxic T cells, helper T cells) and record their role for each mark.

1b. Compare and contrast how an activated cytotoxic T cell interacts with an uninfected body cell and a HCMV-infected body cell. (3 marks)

Response you wrote:

Suggested response:

- In both cases, cytotoxic T cells use their T cell receptor to scan for antigens being presented on the surface of body cells
- Uninfected body cells present self-molecules whereas HCMV-infected body cells present self-molecules and HCMV antigens.
- Cytotoxic T cells recognise HCMV antigen and signal to infected body cells to undergo apoptosis while ignoring uninfected body cells.

Tips for answering this question: The command terms are “compare and contrast” so the student must take account of the similarities and differences between two (or more) items or concepts. When discussing either the similarities or differences, students must be clear about which item(s) or concept(s) they are referring to (e.g. in this question the similarity is how T cells scan for antigens presented on the surface of body cells, and differences are what is presented by body cells that are infected and those that are not, and then how this impacts whether the Cytotoxic T cell stimulates apoptosis in the body cell). In order to gain full marks, it is necessary to refer to both similarities and differences. It is insufficient to give only similarities (compare) or to give only differences (contrast). Similarities and differences do not have to be given in equal measure, especially for a 3-mark question, but for full marks, it is ideal to make three points in the response.

1c. Suggest one strategy HCMV could use to suppress cell-mediated immunity.**Response you wrote:****Suggested response:**

- The virus prevents the infected cell presenting antigen so cytotoxic T cells do not detect infected cells
OR
- The virus interferes with how the infected cell detects apoptosis signals from the cytotoxic T cell (e.g. cytokines) so the infected cell does not die
OR
- The virus inhibits the apoptosis pathway within the infected cell so that the infected cell does not respond to the signal to die

Tips for answering this question: Notes: The command term is “suggest” so the answer is open to possibilities or different hypotheses. Any sensible answer is likely to be awarded a mark. It is not sufficient to simply re-state the scenario (e.g. HCMV suppresses cell-mediated immunity). The question asks for “one strategy” rather than a specific mechanism so refer to a key step in the cell-mediated immune response that can be interrupted.