



ANSWER BOOK

The specific response: selected, cloned, remembered

Pathogens, disease and immunity · Unit B11

AQA 3.2.4 · OCR A 4.1.1 · Edexcel A Topic 6.6 · CAIE 11.1

5 questions · 19 marks

NAVY EDITION

SECTION A · Short, 1 to 2 marks

- A1** **B1** clonal selection is the binding of an antigen to the one lymphocyte whose [2]
receptor is complementary to it, activating that cell and no others. **B1** clonal expansion
is the repeated division of that selected lymphocyte by mitosis, producing a large clone
of genetically identical cells.
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SECTION B · Standard, 3 to 5 marks

- B1** **B1** the pathogen is engulfed by a phagocyte, which hydrolyses it and presents [5]
its antigens on its own cell-surface membrane. **B1** a T-helper cell with a
complementary receptor binds to the presented antigen and is activated, which is
clonal selection, and divides by mitosis. **B1** the same antigen binds to the surface
antibody of the B cell that fits it, and that B cell takes the antigen in, processes it and
presents it. **B1** an activated T-helper cell binds to the presenting B cell and stimulates it
to divide by mitosis, which is clonal expansion. **B1** the clone differentiates into plasma
cells, which secrete antibody, and memory cells, which secrete nothing.
- B2** **B1** on the first exposure the antigen must first be presented by a phagocyte, [4]
and the few lymphocytes with a complementary receptor must be selected out of
millions. **B1** those selected cells must then divide repeatedly by mitosis before enough
exist to matter, and only then do plasma cells appear and begin secreting. **B1** on the
second exposure, memory cells specific to that antigen are already circulating in
thousands rather than ones, so selection has already happened. **B1** the memory cells
divide rapidly straight into plasma cells, so antibody is secreted in quantity within
about two days.
- B3** **B1** HIV infects T-helper cells specifically, using the CD4 protein on their surface [4]
as its way in, and replicates inside them. **B1** the infected cells are destroyed as new
virus particles are released, so over years the number of T-helper cells falls. **B1** B cells
are no longer properly activated, so few plasma cells are produced and little antibody
is secreted. **B1** T-killer cells are no longer activated, so infected body cells are not
destroyed; the infections that follow are what constitute AIDS.
- B4** **B1** a cell containing a replicating virus displays viral antigens on its own [4]
cell-surface membrane. **B1** a T-killer cell with a complementary receptor binds to that
cell and releases perforin, which makes pores in the cell-surface membrane. **B1** the
membrane is no longer a barrier, substances move freely in and out, and the infected
cell dies before the virus inside it can finish replicating. **B1** antibody binds antigens
outside cells, so it cannot reach virus particles already inside a host cell; only
destroying the infected cell removes them.
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