

AP[®] BIOLOGY
2015 SCORING GUIDELINES

Question 8

An individual has lost the ability to activate B-cells and mount a humoral immune response.

- (a) **Propose** ONE direct consequence of the loss of B-cell activity on the individual's humoral immune response to an initial exposure to a bacterial pathogen.

Proposal (1 point)

- Does not produce antibodies
- Does not produce memory B cells

- (b) **Propose** ONE direct consequence of the loss of B-cell activity on the speed of the individual's humoral immune response to a second exposure to the bacterial pathogen.

Proposal (1 point)

- Does not mount a faster response than the first response
- Mounts a second response at the same speed as the first response
- Mounts a second response more slowly than would a normal individual

- (c) **Describe** ONE characteristic of the individual's immune response to the bacterial pathogen that is not affected by the loss of B cells.

Description (1 point)

- Cell-mediated immunity still active
- Components of cell mediated immunity (e.g., Natural Killer/ Cytotoxic T cells) still active
- Nonspecific immune response remains active
- Components of non-specific immunity (e.g., macrophage/ phagocyte, epidermis) still active

8. An individual has lost the ability to activate B cells and mount a humoral immune response.
- (a) **Propose** ONE direct consequence of the loss of B-cell activity on the individual's humoral immune response to the initial exposure to a bacterial pathogen.
 - (b) **Propose** ONE direct consequence of the loss of B-cell activity on the speed of the individual's humoral immune response to a second exposure to the bacterial pathogen.
 - (c) **Describe** ONE characteristic of the individual's immune response to the bacterial pathogen that is not affected by the loss of B cells.

PAGE FOR ANSWERING QUESTION 8

a) The individual will not be able to secrete antibodies to fight off the bacterial pathogen.

b) The individual will react very slowly as there are no memory B cells that recognize the bacterial pathogen, so the second response will be at the same rate as the primary response.

c) The individual will still have helper-T cells, cytotoxic T-cells, and memory T cells that will defend against the pathogen.

8. An individual has lost the ability to activate B cells and mount a humoral immune response.
- (a) **Propose** ONE direct consequence of the loss of B-cell activity on the individual's humoral immune response to the initial exposure to a bacterial pathogen.
 - (b) **Propose** ONE direct consequence of the loss of B-cell activity on the speed of the individual's humoral immune response to a second exposure to the bacterial pathogen.
 - (c) **Describe** ONE characteristic of the individual's immune response to the bacterial pathogen that is not affected by the loss of B cells.

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- (8a) The individual would not be able to produce antibodies to help fight the pathogen.
- (8b) The individual would not be able to produce memory cells, causing the inability to recognize and fight against old pathogens.
- (8c) The loss of the B cells does not affect the macrophages, which engulf and digest the unknown materials.

8. An individual has lost the ability to activate B cells and mount a humoral immune response.
- (a) **Propose** ONE direct consequence of the loss of B-cell activity on the individual's humoral immune response to the initial exposure to a bacterial pathogen.
 - (b) **Propose** ONE direct consequence of the loss of B-cell activity on the speed of the individual's humoral immune response to a second exposure to the bacterial pathogen.
 - (c) **Describe** ONE characteristic of the individual's immune response to the bacterial pathogen that is not affected by the loss of B cells.

PAGE FOR ANSWERING QUESTION 8

a. The loss of B-cell activity means that the immune system will be unable to create antibodies that are specific to that pathogen.

b. The second exposure will not have a stronger response to the pathogen because there are no B-cells to remember which antigens to activate for the pathogen.

c. The pathogen will still be targeted by killer-T cells that will attack and cause the pathogen to lyse.

AP[®] BIOLOGY

2015 SCORING COMMENTARY

Question 8

Question 8 was written to the following Learning Objectives in the AP[®] Biology Curriculum Framework: 2.28, 2.29, and 2.30.

Overview

This question focused on the ability of an individual lacking B cells to mount an immune response. Students were asked to propose one direct consequence of the loss of B-cell activity on the humoral immune response of the individual during an initial exposure to a bacterial pathogen. Students were then asked to propose one direct consequence of the loss of B-cell activity on the speed of the immune response of the individual during a second exposure to the same pathogen. Finally, students were asked to describe one characteristic of the individual's immune response that is not affected by the loss of B-cell activity.

Sample: 8A

Score: 3

The response earned 1 point in part (a) for proposing that the individual will not be able to secrete antibodies.

The response earned 1 point in part (b) for proposing that the second response will be at the same rate as the primary response.

The response earned 1 point in part (c) for describing that helper T cells are not affected by the loss of B cells.

Sample: 8B

Score: 2

The response earned 1 point in part (a) for proposing that the individual would not be able to produce antibodies.

The response earned 1 point in part (c) for describing that macrophages are not affected by the loss of B cells.

Sample: 8C

Score: 1

The response earned 1 point in part (c) for describing that killer T cells are not affected by the loss of B cells.