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

8A,

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.

8B

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

(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.

8C

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 antigens 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.