Name _____ **Period** _____

Chapter 24: The Immune System

Guided Reading Activities

Big idea: Innate immunity

Answer the following questions as you read modules 24.1–24.2:

1. Bacteria, viruses, and other microorganisms that cause disease are referred to as pathogens, and it is the job of your immune system to defend you against them. A hallmark of this system is the innate immunity, which includes a set of defenses that are always active and always the same regardless of the invading organism.

2. Briefly explain why eating food tainted with bacteria that cause food-borne illness is not necessarily a problem.
   Your stomach acid, a component of innate immunity, will likely kill them.

3. A patient presents with aches and nausea. Her doctor takes a blood sample and discovers high levels of interferon. What might the doctor suspect is wrong? Briefly explain your answer.
   She likely has a viral infection because interferons are a defense against viruses.

4. Everyone has experienced inflammation at some point in their lives. What are the primary signs of inflammation?
   Swelling, redness, pain, and warmth.

5. Upon an injury stimulus, mast cells releases histamine, which causes capillaries to dilate.

6. A mutation causes your mast cells to be inhibited in their release of histamine. What general effect does this likely have on the inflammatory response?
   This would likely inhibit inflammation because the blood vessels would be prevented from dilating.

Big idea: Adaptive immunity

Answer the following questions as you read modules 24.3–24.16:

1. Adaptive immunity is to _____ as innate immunity is to _____.

   a. lymphocytes; neutrophils

   b. rapid response; slow response

   c. nonimmune "memory"; immune "memory"

   d. inflammation; lymphocytes

2. Match the following terms to their proper description: active immunity, adaptive immunity, antibody, passive immunity, vaccine, and antigen.

   Any substance that triggers an immune response: antigen

   Immunity as a result of your own body's production of antibodies: active immunity

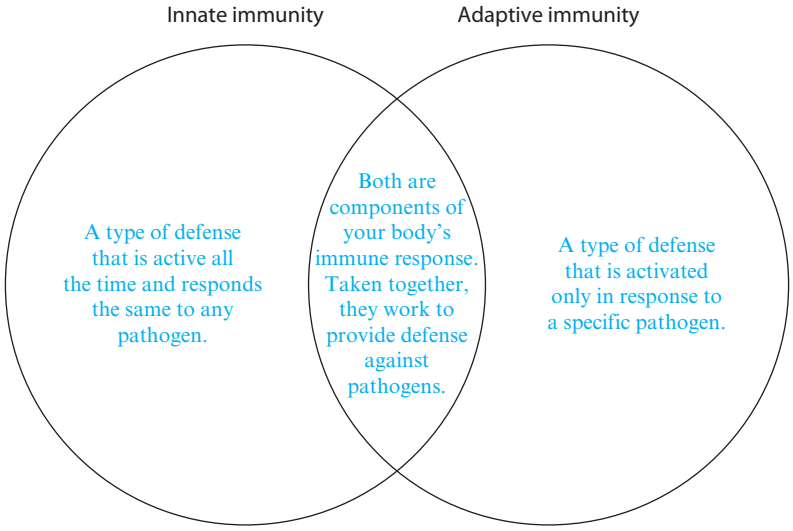
   A defensive protein that binds to surface molecules on pathogens: antibody

   Immunity granted through the receipt of antibodies not made by the person: passive immunity

   A weakened or harmless virus that triggers an immune response: vaccine

   Defenses that are activated in response to a specific invader: adaptive immunity

3. Complete the Venn diagram that compares innate immunity to adaptive immunity.



4. List the two main functions of the lymphatic system.
The lymphatic system fights infection and returns fluid to the circulatory system.

5. Describe how the lymphatic system plays a role in both the innate immune response and the adaptive immune response.
It contains macrophages (cells associated with the innate response) and lymphocytes (cells associated with the adaptive response).

6. B-lymphocytes mature in the bone; T-cells mature in the thymus gland.

7. Briefly explain what actually occurs to a B-cell or T-cell during maturation/differentiation.
They develop their antigen receptors that stick out from the surface of the cell.

8. Complete the following table, which compares humoral immune response to the cell-mediated response.

	Humoral immune response	Cell-mediated immune response
Description	Based on the release of antibodies into the bloodstream; the antibodies recognize and bind to the antigens on the surface of invading pathogens.	Based on the recognition of antigens on the surface of invading pathogens by activated T-cells
Lymphocyte involved	B-lymphocyte	T-lymphocyte

9. True or false: Initiation of both the humoral and cell-mediated immune responses relies on the recognition of antigens by lymphocytes. If false, make it a correct statement.
True

10. What is the relationship between the antigenic determinant and the antigen-binding site?
The antigen-binding site of the antibody recognizes and binds to the antigenic determinant on the antigen.

11. Match the following terms to their description: antigen, antibodies, effector cells, memory cells, and clonal selection.

    a. Proteins that match specific antigens based on shape: antibodies

    b. Immune cells that secrete antibodies or destroy pathogens: effector cells

    c. Lymphocytes that can recognize a pathogen years later: memory cells

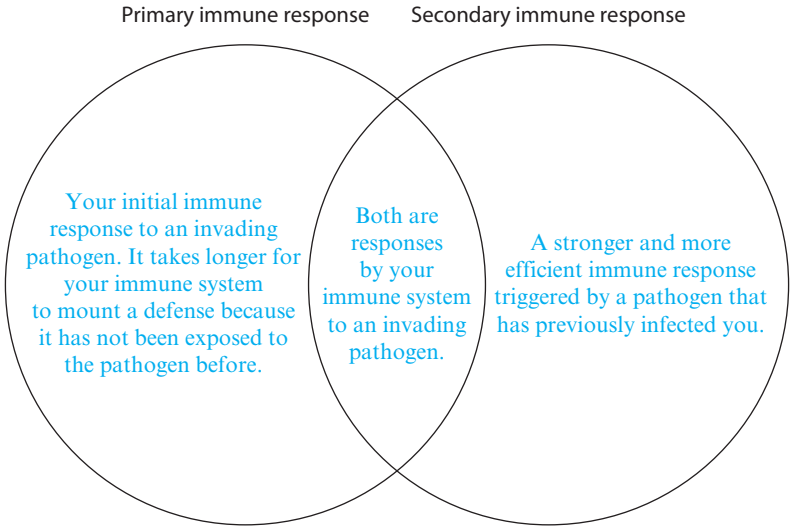
    d. Any molecule that triggers an immune response: antigen

    e. Binding of antigen triggers production of an army of immune cells: clonal selection

12. A new genetic disorder is discovered in which patients are unable to create memory cells during clonal selection. What is the effect of this disorder on patients' immune response?
The patient would not have the ability to form a memory to the pathogen. This would not allow them to mount a secondary immune response.

13. How does the structure of a plasma cell relate to its function?
The plasma cell will have a large amount of rough endoplasmic reticulum and a prominent Golgi apparatus.

14. Complete the Venn diagram that compares the primary immune response to the secondary immune response.



15. Refer to Figure 24.8B on page 493 of your textbook. How many days did it take for antibody concentration to peak after initial exposure to antigen X? How many days did it take for antibody concentration to peak after exposure to antigen X the second time? How many days did it take for the secondary immune response to produce the same concentration of antibodies as the concentration at the peak of the primary immune response?
1) It took approximately 18 days.
2) It took approximately 10 days.
3) It took approximately 3 days.

16. True or false: Antibodies kill viruses and bacteria. If false, make it a correct statement.
False, antibodies bind only to antigens on the pathogens. They can mark the pathogen for destruction, but they don't cause the destruction.

17. Briefly explain how antibodies form a link between the adaptive immune response and the innate immune response.
Antibodies bind to antigens and mark the pathogen for destruction by a nonspecific component of the innate response, such as phagocytosis and the complement system.

18. The authors suggest using an acronym to help you with remembering the mechanisms by which antibodies function. The acronym is called PLAN. What are the mechanisms of antibody function in PLAN?
P = precipitation of the antigen from solution.
L = lysis of the invading cell by the complement system.
A = agglutination of the pathogens.
N = neutralization of the pathogens.

19. List two functions of antibodies outside their "normal" use as defensive proteins in your body.
They can be used to treat cancer, and they are used in home pregnancy tests.

20. ___Gardasil___ and ___Cervarix___ are two vaccines approved for use against HPV.

21. Would vaccination against HPV be considered passive or active immunity? Briefly explain your answer.
It would be considered active immunity because a person is injected with antigens from the virus.

22. List the two types of T-cells that are involved in the cell-mediated immune response. Also list their basic functions.
Helper T-cells stimulate other aspects of the adaptive immune response. Cytotoxic T-cells directly target and destroy invading pathogens.

23. True or false: A helper T-cell can directly recognize and bind to antigens on the surface of pathogens. If false, make it a correct statement.
False, they bind to antigens that are bound to the surface of antigen-presenting cells.

24. A mutation causes the self-protein in antigen-presenting cells to no longer bind to the foreign antigen. What is the general effect of this on your immune response?
This would lead to a decreased ability of the antigen-presenting cells to activate helper T-cells.

25. Which of the following is involved in the secretion of perforin?

    a. Cytotoxic T-cells

    b. Helper T-cells

    c. B-cells

    d. Macrophages

26. True or false: Clonal selection also occurs in cytotoxic T-cells. If false, make it a correct statement.
True

27. A common misconception regarding HIV is that AIDS is the virus. Briefly explain this misconception.
HIV is the virus that eventually leads to the condition called AIDS.

28. AIDS patients end up suffering from opportunistic infections that occur after their immune system is worn down by the HIV virus.

29. HIV is a retrovirus. This means it uses RNA as its molecule of heredity and has reverse transcriptase to make viral DNA from viral RNA. Briefly explain why this makes HIV much more likely to mutate and thus harder to develop vaccines and treatments for it.
RNA does not have the same error-proofing mechanisms that DNA has, which allows it to mutate faster.

30. Proteins that serve as self-markers are known as _____.

    a. antibodies

    b. antigens

    c. major histocompatibility complex molecules

    d. perforin

Big idea: Fermentation: Disorders of the immune system

Answer the following questions as you read modules 24.17–24.18:

1. True or false: Autoimmune disorders occur when the immune system attacks invading pathogens automatically. If false, make it a correct statement.
False, these are disorders where your immune system inappropriately attacks your own tissues.

2. What is the main drawback to the treatment of autoimmune disorders?
It usually relies on drugs that suppress your immune system, which will cause a weaker response to invading pathogens.

3. Complete the following table, which compares autoimmune disorders to immunodeficiency disorders.

	Autoimmune disorders	Immunodeficiency disorders
Description	These are instances when your immune response attacks your own cells.	These are issues that arise because your immune system is not performing as it should.
Example	Rheumatoid arthritis	Severe combined immunodeficiency

4. An overreaction by our immune system to a harmless antigen is known as a(n) ___allergy___ and the harmless antigen is referred to as a(n) ___allergen___.

5. List the steps of an allergic reaction from the initial exposure to subsequent exposures.
   You are exposed to the initial allergen and develop antibodies to it. The antibodies are attached to mast cells. On subsequent exposure, the mast cells release histamine in response to the allergen.
6. A common misunderstanding among students is that the development of allergies is genetic. This is likely based on children being born with food allergies. While your *ability* to develop an allergy can be influenced by genetic factors, the actual development does not have a genetic basis. Briefly explain what your response to a student with this misconception would be.
   You would tell the student that the developing child must have been exposed to the allergen at some point during development in the mother's womb.

CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

Some vaccinations require boosters. What do you think is the reason for this?

