Name: _____ **AP Biology** [redacted]

Chapter 35 Active Reading Guide
The Immune System

Section 1

1. Phagocytosis plays an important role in the immune systems of both invertebrates and vertebrates. Review the process by briefly explaining the six steps to ingestion and destruction of a microbe by a phagocytic cell.
   1.

   2.

   3.

   4.

   5.

   6.

2. Explain the role of the Toll receptor in producing antimicrobial peptides.

3. List the three innate defenses vertebrates share with invertebrates and the two defenses unique to vertebrates.

4. In the following chart, describe how five examples of barrier defenses work.

Barrier Defense	How the Barrier Repels Pathogens
Mucous Membranes	
Saliva	
Stomach Acid	
Secretions from Oil and Sweat Glands	
Skin	

5. Explain how Toll-like receptors are used in cellular innate defenses, using TLR3 and TLR4 as examples.

6. In the chart below, explain the role of the four phagocytic cells.

Phagocytic Cell Type	**Role in Innate Defense**
Neutrophils	
Macrophages	
Dendritic Cells	
Eosinophils	

7. Natural killer cells are not phagocytic. How do they assist in innate defenses and what types of cells do they detect?

8. Explain the role of the following two antimicrobial compounds.
   interferon:

   complement:

9. Explain the three steps of an inflammatory response.
   1.

   2.

   3.

10. It might seem like pathogens have little hope of mounting an infection, but do not forget that pathogens are constantly evolving ways to circumvent our immune system. As examples, how do the pathogens that cause pneumonia and tuberculosis avoid our immune responses?

Section 2

11. From the first four paragraphs of this concept, summarize where T cells and B cells develop, and give an overview of their functions. (Note that they are a type of white blood cell known as a lymphocyte.)

12. What is immunological memory, and why is it important?

13. Explain how cytokines help coordinate the innate and adaptive immune responses.

14. The following brief questions will serve as a beginning primer for immune system recognition.
    a. What is an antigen?

    b. What is the relationship between an antigen receptor, an antibody, and an immunoglobin?

    c. How is an epitope related to an antigen? (Look at Figure 43.10 in your text.)

15. What forms the specific antigen-binding site? (Be sure to recognize that each B cell produces only one antigen receptor. For any one cell, all antigen receptors or antibodies produced are identical.)

16. T cells also display only one receptor on the surface of the cell. Compare and contrast a T cell with a B cell.

17. B cell receptors recognize and bind to antigens whether they are free antigens (like a secreted toxin) or on the surface of a pathogen. Explain the role of the major histocompatibility complex (MHC) to T cell receptor binding.

18. Explain how a host cell uses the MHC to display an antigen.

19. List four major characteristics of the adaptive immune system.
    1.

    2.

    3.

    4.

20. Explain how the body develops self-tolerance in the immune system.

21. Define the following terms.
    effector cells:

    memory cells:

    clonal selection:

22. Using the blue text in the margin of Figure 35.11, explain the three key events to clonal selection.
    1.

    2.

    3.

23. Graphs similar to the one in Figure 35.12 have been seen on several AP Biology exams. It depicts the primary and secondary immune response. The first arrow shows exposure to antigen A. The second arrow shows exposure to antigen A again, and also antigen B. Explain the difference between a primary and secondary immune response.

Section 3

24. Explain fully the function of the two divisions of acquired immunity.
    humoral immune response:

    cell-mediated immune response:

25. Helper T cells play a critical role in activation of both T cells and B cells. In full detail, explain the three steps involved using Figure 35.13. This is an important step!
    1.

    2.

    3.

26. Explain the role of dendritic cells and macrophages in starting a primary and secondary immune response.

27. _____ are the effector cells in cell-mediated immunity.

28. What must occur for a cytotoxic T cell to become activated?

29. Explain the three primary steps that occur as a cytotoxic T cell destroys a target cell.
    1.

    2.

    3.

30. How is B-cell antigen presentation unique?

31. Explain the three primary steps that occur in B cell activation.
    1.

    2.

    3.

32. What is the difference between plasma cells and memory cells produced from the activation of B cells?

33. Explain these three ways antibodies can dispose of antigens.
    viral neutralization:

    opsonization:

    activation of complement:

34. How do antibodies and natural killer cells work together to fight viral infections while the virus is inside the body?

35. Using examples, explain the difference between active and passive immunity.

36. Describe how immunizations can serve as an example of active immunity.

37. Explain how monoclonal antibodies are used in home pregnancy kits.

38. Why is the antibody response to a microbial infection polyclonal?

39. Why is immune rejection an example of a healthy immune system?

40. Briefly describe the following features of immune rejection.
    a. Explain how antibodies against blood types are present.

    b. What is the role of MHC in tissue and organ transplants?

    c. Why are bone marrow transplants medically unique?

41. What are allergies?

42. Label Figure 35.17 and then use it to explain a typical allergic response.
    1.

    2.

    3.

43. Explain what happens if a person experiences anaphylactic shock.

44. Autoimmune diseases occur when the immune system turns against particular molecules of the body. Describe the cause and symptoms of the following autoimmune diseases.
    lupus:

    rheumatoid arthritis:

    type 1 diabetes mellitus:

    multiple sclerosis:

45. Explain how immunodeficiency diseases are different from autoimmune diseases.

46. Just as our immune system has evolved to thwart pathogens, pathogens have evolved to thwart our immune system. Describe the following pathogen strategies.
    antigenic variation:

    latency:

    attack on the immune system: HIV:

47. Explain how the high mutation rate in surface antigen genes in HIV has hampered development of a vaccine for AIDS. (You might take note that HIV—human immunodeficiency virus—is the virus that causes the disease AIDS—acquired immunodeficiency syndrome. These acronyms are often used incorrectly.)