

1. B cells that respond against self-antigens will undergo:
 - A) receptor editing
 - B) anergy
 - C) apoptosis
 - D) all of these
 - E) two of these

2. A cell that can recall previous contact with a particular antigen so that subsequent exposure leads to a more rapid and more effective immune response than the first encounter is by definition which type of cell?
 - A) memory lymphocyte
 - B) effector lymphocyte
 - C) plasma cell
 - D) stem cell

3. D-J rearrangements only have occurred in which stage of B cell development?
 - A) pro-B cell
 - B) pre-B cell
 - C) immature B cell
 - D) mature B cell

4. The germinal center of a lymph node is made up primarily of which type of cell?
 - A) B cells
 - B) T cells
 - C) dendritic
 - D) macrophages

5. The purpose of negative selection of B cells is to:
 - A) Eliminate B cells that don't express mu.
 - B) Prevent activation of B cells in the bone marrow.
 - C) Direct more B cells to become T cells.
 - D) Identify B cells that are specific for self-antigens.

6. B cells that express low-affinity IgM, respond to bacterial polysaccharides, and express CD5 are known as:
 - A) B-2 cells
 - B) plasma cells
 - C) B-1 cells
 - D) memory B cells

7. When IgM on the surface of an immature B cell binds to a self-antigen, which of the following processes can occur?
- A) class switch
 - B) affinity maturation
 - C) apoptosis
 - D) differentiation
8. Which of the following distinguishes mature B cells from B cells at other stages of development?
- A) co-expression of IgM and IgD
 - B) expression of surrogate light chains
 - C) lack of surface immunoglobulin
 - D) only stage to express IgA and IgB
9. Which of the following would NOT be found on the surface of a mature, naive B cell?
- A) IgA and IgB
 - B) lambda and mu chains
 - C) CD19
 - D) surrogate light chains
10. Antigen-independent differentiation of B cells occurs in the:
- A) bone marrow
 - B) spleen
 - C) lymph node
 - D) Peyer's patches
11. Which of the following would be found on the surface of a pre-B cell?
- A) delta and kappa chains
 - B) gamma and lambda chains
 - C) epsilon and kappa chains
 - D) mu and surrogate light chains
12. The primary site of antigen trapping and presentation to immune cells is the:
- A) spleen
 - B) thymus
 - C) bone marrow
 - D) brain

13. Predominant cell types involved in the humoral immune response are:
- A) eosinophils
 - B) macrophages
 - C) neutrophils
 - D) B cells
14. The receptor for antigen on a mature naïve B cell is:
- A) MHC class I
 - B) IgG
 - C) IgM
 - D) MHC class II
15. The difference in kinetics between a primary and secondary immune response is due to the presence of:
- A) memory cells in the secondary response
 - B) suppressor cells in the primary response
 - C) macrophages in the secondary response
 - D) T cells in the primary response
16. The only cells in the body capable of specifically recognizing and distinguishing different antigenic determinants are:
- A) macrophages
 - B) dendritic cells
 - C) lymphocytes
 - D) neutrophils
17. Tissues that function by trapping and concentrating antigens for presentation to cells of the immune system are known as:
- A) peripheral or secondary lymphoid organs
 - B) primary or generative lymphoid organs
 - C) either of the above
 - D) neither of the above
18. Neutrophils and other cells have receptors on their surface that bind to the Fc region of IgG, which is known as:
- A) CD3
 - B) CD4
 - C) CD8
 - D) CD16

19. T lymphocytes undergo antigen-independent maturation in the:
- A) thymus
 - B) bone marrow
 - C) lymph node
 - D) spleen
20. T helper cells recognize which of the following?
- A) exogenous peptide bound to class II
 - B) native extracellular viral proteins
 - C) endogenous peptides bound to class I
 - D) microbe-specific structures
21. How are cytotoxic T cells and natural killer cells similar?
- A) Both require antibody to be bound to the target cell.
 - B) Both induce apoptosis in the target cell.
 - C) Both recognize peptide plus HLA class I.
 - D) Both kill target cells lacking HLA class I.
22. T cells travel from the bone marrow to the thymus for maturation. What is the correct order of the maturation sequence for T cells in the thymus?
- A) bone marrow to the cortex; after thymic education, released back to peripheral circulation
 - B) storage in either the cortex or medulla; release of T cells into the peripheral circulation
 - C) maturation and selection occur in the cortex, then the medulla; release of mature T cells to secondary lymphoid organs
 - D) activation and selection occur in the medulla; mature T cells stored in the cortex until activated by antigen
23. Immunoglobulin and T-cell receptors are similar in which of the following properties?
- A) multiple gene segments encoding the variable region
 - B) antigen-binding site that recognizes conformational epitopes
 - C) requirement for antigen presentation
 - D) antigen-dependent somatic mutation
24. T cells emerging from the thymus are:
- A) MHC restricted
 - B) self-tolerant
 - C) antigen specific
 - D) all of these

25. Perforin and granzymes are used by which cells to kill target cells?
- A) CD8 T cells
 - B) CD4 T cells
 - C) natural killer cells
 - D) B cells
 - E) two of these
26. Which T cell surface protein is associated with the T-cell receptor and is involved in signal transduction?
- A) CD3
 - B) CD4
 - C) CD8
 - D) CD154
27. Cytotoxic T cells are the primary immune response against which pathogen?
- A) viruses
 - B) intracellular parasites
 - C) extracellular bacteria
 - D) intracellular bacteria
28. The cells that primarily function by secreting large amounts of cytokines are:
- A) plasma cells
 - B) B cells
 - C) T helper cells
 - D) cytotoxic T cells
29. The purpose or end result of negative selection of the T cell is to ensure:
- A) MHC restriction
 - B) self-tolerance
 - C) T-cell receptor expression
 - D) expression of CD3
30. Which of the following binds to CD16 on the surface of natural killer cells?
- A) class I
 - B) Fc of IgG
 - C) T-cell receptor
 - D) peptide

31. Which of the following exhibits allelic exclusion in its expression?
- A) T-cell receptor
 - B) class I
 - C) class II
 - D) killer inhibitory receptor
32. Helper T cells function directly in:
- A) presenting antigen with class I MHC
 - B) delayed-type hypersensitivity
 - C) performing VDJ rearrangement in B cells
 - D) target cells with perforin
33. An immature T cell differs from a mature T cell because an immature T cell:
- A) expresses beta chains and pre-Ta
 - B) does not express T-cell receptor or CD3
 - C) co-expresses CD4 and CD8
 - D) is normally found in lymph nodes
34. Natural killer cells recognize and kill target cells that are:
- A) opsonized with IgE
 - B) lacking expression of HLA-A, B, and C
 - C) lacking expression of HLA-DR, DP, and DQ
 - D) presenting antigen associated with HLA-A, B, or C
35. A T cell that is rarely found in secondary lymphoid organs and recognizes a limited number of native epitopes is known as a(n):
- A) helper T cell
 - B) gamma-delta T cell
 - C) cytotoxic T cell
 - D) alpha-beta T cell
36. Which of the following cells that participate in cell-mediated immunity are antigen specific and directly cytotoxic for target cells?
- A) macrophages
 - B) TH1 cells
 - C) cytotoxic T cells
 - D) natural killer cells

37. Which of the following is a cytotoxic T cell membrane-bound factor that is involved in inducing apoptosis in target cells?
- A) perforin
 - B) IL-2
 - C) granzyme
 - D) Fas ligand
38. T cells differ from B cells in which of the following ways?
- A) T cells express surface immunoglobulin.
 - B) B cells express CD19 but not CD3.
 - C) T cells express CD19, CD3, and CD4.
 - D) B cells express surface immunoglobulin and CD3.
39. The T-cell receptor for antigen comprises which of the following molecules?
- A) alpha and betachains
 - B) two gamma and two delta chains
 - C) epsilon and gamma chains
 - D) alpha chain and beta-2-microglobulin
40. Granzymes activate which of the following in a target cell?
- A) phagocytosis
 - B) apoptosis
 - C) cytokine secretion
 - D) complement activation
41. In antibody-dependent cell-mediated cytotoxicity, target cells are recognized by which of the following?
- A) T-cell receptor on the effector cell binding to Fab of IgG bound to the target cell
 - B) C-type lectin inhibitory receptors on effector cell binding to class I on target cell
 - C) CD16 on the effector cell binding to Fc of IgG bound to the target cell
 - D) CD154 on the effector cell binding to CD40 on the target cell
42. All of the following are characteristic of a lymph node EXCEPT:
- A) filters drainage from tissues
 - B) colonized with T and B cells
 - C) between 1 and 25 mm in size
 - D) considered a primary or central lymphoid organ

43. Which marker would be found on pre-B cells?
- A) CD3
 - B) μ heavy chains
 - C) CD16
 - D) IgD
44. Which of the following represents the best explanation for the action of natural killer (NK) cells?
- A) They recognize specific antigen.
 - B) They kill if MHC class I is present.
 - C) They kill by releasing perforins.
 - D) They participate in phagocytosis.
45. A lymphocyte exhibits the following markers: CD19, IgM, IgD. What is its likely identity?
- A) double-negative T cell
 - B) immature B cell
 - C) double-positive T cell
 - D) mature B cell
46. Sheep red blood cells forming rosettes around T cells is due to the presence of which of the following on T cells?
- A) CD2
 - B) CD8
 - C) CD16
 - D) CD56
47. All lymphocytes arise from stem cells made in the:
- A) bone marrow
 - B) spleen
 - C) lymph nodes
 - D) liver
48. Which best describes the specific antigen receptor that is a part of CD3 found on T cells?
- A) It appears in the double-negative stage.
 - B) Alpha and beta chains bind antigen.
 - C) It is found only on T helper cells.
 - D) All eight chains are specific for antigen.

49. Which is a primary lymphoid organ?
- A) the spleen
 - B) tonsils
 - C) thymus
 - D) lymph nodes
50. Which cell is capable of producing antibody?
- A) plasma cell
 - B) CD4+ T cell
 - C) macrophage
 - D) neutrophil
51. A plasma cell differs from a B cell in which way?
- A) Plasma cells are only found in peripheral blood.
 - B) Only plasma cells secrete circulating antibody.
 - C) Plasma cells secrete cytokines.
 - D) Plasma cells are an immature form in B-cell development.
52. The function of T cells with CD4 antigen is which of the following?
- A) to help B cells make antibody
 - B) to kill virally infected cells
 - C) phagocytosis
 - D) production of opsonins
53. The stage in B-cell development in which TdT and RAG enzymes appear is called:
- A) thymocyte
 - B) pro-B
 - C) pre-B
 - D) plasma cells
54. Which of the following contain B cells that are actively responding to antigen?
- A) peripheral blood
 - B) primary follicles
 - C) germinal centers
 - D) bone marrow

55. Which of the following surface markers are found on mature B cells?
- A) IgM and IgD
 - B) IgG and IgA
 - C) CD4
 - D) CD3
56. Lymphocytes that have IgM, IgD, and MHC class II antigens on their surface, and they mature in the bone marrow itself, are:
- A) B cells
 - B) T cells
 - C) NK cells
 - D) eosinophils
57. Which cells are responsible for killing virally infected host cells and tumor cells?
- A) CD4 T cells
 - B) CD8 T cells
 - C) B cells
 - D) eosinophils
58. Which of the following surface markers are found on mature T cells?
- A) IgM and IgD
 - B) IgG and IgA
 - C) CD19
 - D) CD3
59. Lymphocytes that mature in the thymus are involved in which immune response?
- A) cytokine-mediated responses
 - B) antibody production
 - C) phagocytosis
 - D) any of the above
60. Which marker is found on the group of T cells that assist B cells in making antibody?
- A) CD2
 - B) CD19
 - C) CD4
 - D) CD5

61. Which of the following would be considered a primary lymphoid organ?
- A) spleen
 - B) lymph nodes
 - C) tonsils
 - D) bone marrow
62. Where does contact with antigen and activation of B cells normally occur?
- A) in the peripheral blood
 - B) in connective tissue
 - C) in the thymus
 - D) in lymph nodes

Answer Key

1. D
2. A
3. A
4. A
5. D
6. C
7. C
8. A
9. D
10. A
11. D
12. A
13. D
14. C
15. A
16. C
17. A
18. D
19. A
20. A
21. B
22. C
23. A
24. D
25. E
26. A
27. A
28. C
29. B
30. B
31. A
32. B
33. C
34. B
35. B
36. C
37. D
38. B
39. A
40. B
41. C
42. D
43. B
44. C

- 45. D
- 46. A
- 47. A
- 48. B
- 49. C
- 50. A
- 51. B
- 52. A
- 53. A
- 54. C
- 55. A
- 56. A
- 57. B
- 58. D
- 59. A
- 60. C
- 61. D
- 62. D