Chapter 12: Effector Responses: Antibody- and Cell-Mediated Immunity

1. What is the effector molecule of humoral immunity?

A) Antibodies
B) Cytotoxic T cells
C) Dendritic cells
D) Helper T cells
E) Plasma cells

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.0
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Humoral immunity is based on activated B cells.
Source: Test Bank
Sequence: 12001

2. The role of cell-mediated immunity is

A) to find cells infected with intracellular pathogens.
B) to find and eliminate cells infected with intracellular pathogens.
C) to present antigens to T_H cells.
D) to produce memory B cells.
E) to secrete antibodies.

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.0
Cognitive Level: LOC
Blooms Level: Remembering

Level of Difficulty: Easy
Hint: Cell-mediated immunity uses T cells.
Source: Test Bank
Sequence: 12002

3. Cell-mediated immunity includes

A) antibodies.
B) plasma cells.
C) T_C cells.
D) both antibodies and T_C cells.
E) both plasma cells and T_C cells.

Answer: E
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.0
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Cell-mediated immunity uses T-lineage cells.
Source: Test Bank
Sequence: 12003

4. Examples of cytotoxic effector cells include all of the following EXCEPT

A) basophils.
B) eosinophils.
C) macrophages.
D) NK cells.
E) T_C cells.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.0
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Cytotoxic effector cells are responsible for inducing cell death of the target cell.

Source: Test Bank
Sequence: 12004

5. NK T cells (NKTs) express

A) CD4.
B) CD8.
C) CD12.
D) CD33.
E) both CD4 and CD8.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.0
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: T_H CD expression.
Source: Test Bank
Sequence: 12005

6. _____ describes the action of antibodies whereby antibodies bind to a pathogen and prevent the pathogen from interacting with cell receptors.

A) Antibody-dependent cell-mediated cytotoxicity
B) Antigen presentation
C) Complement fixation
D) Neutralization
E) Opsonization

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Blocking of receptors prevents a pathogen from invading a host cell.
Source: Test Bank

Sequence: 12006

7. _____ describes the recruitment of phagocytic cells by the Fab portion of an antibody.

A) Antibody-dependent cell-mediated cytotoxicity
B) Antigen presentation
C) Complement fixation
D) Neutralization
E) Opsonization

Answer: E
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Recruitment of phagocytes.
Source: Test Bank
Sequence: 12007

8. Lysis of a pathogen by MAC formation is an example of

A) antibody-dependent cell-mediated cytotoxicity.
B) antigen presentation.
C) complement fixation.
D) neutralization.
E) opsonization.

Answer: C
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: MAC formation is a result of complement.
Source: Test Bank
Sequence: 12008

9. Virally infected host cells are tagged with antigen-antibody complexes. These complexes recruit NK cells that trigger apoptosis in the infected host cell. This is an example of

A) antibody-dependent cell-mediated cytotoxicity.
B) antigen presentation.
C) complement fixation.
D) neutralization.
E) opsonization.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Antibodies are used to mediate cell death.
Source: Test Bank
Sequence: 12009

10. Which class of antibodies is the FIRST to be produced during the primary immune response?

A) IgA
B) IgD
C) IgE
D) IgG
E) IgM

Answer: E
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Produced by B-1 cells; known as “natural” antibodies.
Source: Test Bank
Sequence: 12010

11. Which class of antibodies is good at fixing complement?

A) IgA
B) IgD
C) IgE
D) IgG
E) IgM

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: The Fc-receptor enhances phagocytosis.
Source: Test Bank
Sequence: 12011

12. IgA is typically found as a dimer in high levels of secretions such as milk, tears, and saliva. What is the primary function of IgA in secretions?

A) To alert plasma cells of an invading pathogen
B) To neutralize toxins and pathogens
C) To secrete nonspecific enzymes such as lysozyme
D) To stimulate the growth of normal microbiota (normal flora) species
E) To trigger apoptosis in infected mucosal cells

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: IgA represents an early barrier to pathogens.
Source: Test Bank
Sequence: 12012

13. Monoclonal antibodies may be used to treat cancer in all of the following ways EXCEPT

A) directly binding of monoclonal antibodies may trigger apoptosis or antibody-dependent cell-mediated cytotoxicity.
B) monoclonal antibodies compete with growth factors to bind receptors on tumor cells.
C) monoclonal antibodies may prevent the formation of new blood vessels to tumors.
D) monoclonal antibodies may recruit T_H cells to a developing tumor.
E) monoclonal antibodies may serve as a vector to target tumor cells for toxin mediated therapy.

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Monoclonal antibodies are made against one specific antigen.
Source: Test Bank
Sequence: 12013

14. Fc-receptor molecules tend to have short cytoplasmic tails. How does this influence signaling events within the Fc-receptor cell?

A) The Fc-receptor is adjacent to secondary messengers (e.g., MAP kinase) that translocate into the nucleus to affect transcription.
B) The Fc-receptor is dependent upon a coreceptor (e.g., ITAM or ITIM) that will trigger signaling events within the cell.
C) The Fc-receptor is not directly involved in a signaling event.
D) The Fc-receptor serves only to enhance or dampen a signaling event.
E) The Fc-receptor translocates into the cytoplasm where it will bind to secondary messengers.

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Immune receptor signaling.
Source: Test Bank
Sequence: 12014

15. Which Fc-receptor is responsible for triggering the release of histamine, proteases, and other inflammatory signals from IgE?

A) Fcα receptor
B) Fcε receptor
C) Fcγ receptor
D) Neonatal Fc-receptor
E) Polymeric immunoglobulin receptor (pIgR)

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Ig receptors carry their isotype class in their receptor name.
Source: Test Bank
Sequence: 12015

16. Why is IgM the class of antibody able to form large polymers?

A) IgM is the strongest binding antibody class.
B) IgM is considered the most important type of antibody.
C) IgM has low affinity and benefits from having a large number of binding sites.
D) IgM is used exclusively against parasites.
E) IgM requires form polymers traveling through the body.

Answer: C
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: One type of antibody is predominantly made before somatic mutations occur.
Source: Test Bank
Sequence: 12016

17. Which type of antibody is MOST effective against the largest variety of pathogens?

A) IgM
B) IgG
C) IgA
D) IgE
E) IgD

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.1
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: One antibody class has subclasses.
Source: Test Bank
Sequence: 12017

18. Which two classes of antibodies are BEST at agglutinating pathogens? Explain.

Answer:
Feedback: IgM and IgA; both can form polymers, which increases the total number of antigen binding sites.
Question Type: Essay
Chapter Name: 12
Section: 12.1
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Consider effector functions.
Source: Test Bank
Sequence: 12018

19. Compared to other effector functions, why is there such diversity in antibody FcR interactions?

Answer:

Feedback: Antibodies are unique among effector functions in that different antibody classes carry information about the nature of the pathogen to other cell types. Therefore, it makes sense that different effector cells would have their own subsets of FcR molecules to respond appropriately to different kinds of pathogens. As we have seen, the best and most appropriate responses are pathogen specific — for example, bound IgE will interact with FcεRI to produce antiparasitic responses, whereas FcγRI is used to facilitate phagocytosis after opsonization by IgG3.
Question Type: Essay
Chapter Name: 12
Section: 12.1
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: See Figure 12-4.
Source: Test Bank
Sequence: 12019

20. Why were early monoclonal antibodies poor therapeutics? Support your answer by providing two ways that these antibodies were modified to make them more suitable for human use.

Answer:
Feedback: The first monoclonal antibodies were derived from murine B cells, which are immunogenic in humans. Current versions of these antibodies are "humanized" by replacing either their Fc region or everything except the antigen-binding site, or they are developed by screening phage display or yeast libraries for useful human antibodies.
Question Type: Essay
Chapter Name: 12
Section: 12.1
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Refer to Box 12-1.
Source: Test Bank
Sequence: 12020

21. Cell-mediated effector cells include

A) CTLs and NKT cells.
B) Plasma cells and dendritic cells.
C) T_C cells and NK cells.

D) T_C cells, NKT cells, and NK cells.
E) T_C cells and memory T_H cells.

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Cell-mediated immune reaction involves T-cell lineage cells.
Source: Test Bank
Sequence: 12021

22. The Fas ligand (FasL) represents a key signaling pathway among cell-mediated effector cells. What is the function of the Fas-FasL signaling pathway?

A) Activation of the Fas-FasL signaling pathway triggers apoptosis.
B) Binding of Fas to FasL induces phagocytosis by dendritic cells.
C) Expression of Fas occurs only on naïve B cells.
D) FAS-FASL binding recruits T_H cells.
E) TNF-α is released by NKT cells triggering histamine release in infected target cells.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Fas-signaling pathway is found in T_C cells.
Source: Test Bank
Sequence: 12022

23. At what location are naïve T_C cells activated to become CTLs?

A) Blood stream
B) Bone marrow
C) Lymph node
D) Site of infection

E) Thymus

Answer: C
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: T_C activation occurs in secondary lymphoid tissues.
Source: Test Bank
Sequence: 12023

24. CTLs mediate a powerful and lethal immune response to infected host cells. Which of the following steps is NOT involved with CTL activation and function?

A) Antigen presented with MHC class I is recognized by CTLs.
B) APC presentation occurs to both T_C and T_H cells.
C) Fas-FasL signaling pathway is activated, triggering apoptosis.
D) Histamine is released from cytoplasmic granules, recruiting macrophages to the site of infection.
E) Perforin and granzymes are released, triggering apoptosis of infected cell.

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: CTL signaling pathway for apoptosis
Source: Test Bank
Sequence: 12024

25. Precursor CTLs are characterized by each of the following EXCEPT

A) they do not divide.
B) they do not express high affinity for CD25.
C) they express CD4.
D) they lack cytotoxic activity.

E) they produce low amounts of IL-2.

Answer: C
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: T_H expresses CD4.
Source: Test Bank
Sequence: 12025

26. Which of the following statements about NK T cells is TRUE?

A) Activated NKT cells can act as both a T_H and a T_C cell.
B) CD4 is expressed by all NKT cells.
C) NKT cells rely on p53 expression to cause apoptosis in an infected host cell.
D) NKT cells express most of the T cell lineage characteristics.
E) The TCR on NKT cells recognizes antigens presented with MHC class I and class II molecules.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: NKT cells develop from the T-cell lineage but are distinct from T_C and T_H cells.
Source: Test Bank
Sequence: 12026

27. Licensing on an NK cells refers to

A) activation of an NK cell by MHC class II displayed peptide antigen.
B) expression of IFN-γ and TNF-α by NK cells.
C) production of memory cells.
D) suppressing the activity of a self-recognizing NK cell.
E) testing an NK cell to ensure that it will not target healthy host cells.

Answer: E
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: NK cells target infected self-cells and induce apoptosis.
Source: Test Bank
Sequence: 12027

28. In a recent experiment, NK cells were collect from an MCMV infected mouse and placed into a healthy mouse. Upon exposure to the MCMV virus, the healthy mouse quickly mounted an immune response. How could these results BEST be interpreted?

A) MCMV virus failed to infect the healthy mouse.
B) NK cells show memory and are quickly able to recognize MCMV infected cells in the healthy mouse.
C) Plasma cells were transferred along with NK cells and produced antibodies that target MCMV virus particles.
D) T_C cells were transferred along with the NK cells and have been targeting MCMV virus particles.
E) T_H cells were transferred to the healthy mouse instead of NK cells and have stimulated B cells to activate.

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: NK cell functions.
Source: Test Bank
Sequence: 12028

29. How many subpopulations of T_C cells are there?

A) One: T_C

B) Two: T_C1 and T_C2
C) Three: T_C1, T_C2, and T_C3
D) Five: T_CA, T_CD, T_CE, T_CG, and T_CM
E) It varies depending on the type of infection that is found.

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: T_C subpopulations are similar to T_H populations.
Source: Test Bank
Sequence: 12029

30. MHC tetramers

A) are a novel way to detect and follow specific T-cell populations within an organism.
B) are found only in mice though a parallel system in humans is under current investigation.
C) describe high-functioning T_C cells found in autoimmune response.
D) represent novel immunotherapy for patients with Crohn's disease.
E) use fluorescent staining to bind to MHC class I molecules on dendritic cells.

Answer: A
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: A method used to follow specific T_C cells.
Source: Test Bank
Sequence: 12030

31. A new pathogenic bacterium has been discovered — it is an intracellular parasite and can prevent MHC molecules from being properly made in infected cells. Which of the following cell types would be MOST effective at fighting this pathogen?

A) CTL

B) NK cell
C) B cell
D) Dendritic cell
E) Basophil

Answer: B
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: One of the answer choices recognizes “missing self.”
Source: Test Bank
Sequence: 12031

32. Which of the following effector function components would have the GREATEST impact on a patient’s cells if the cells were not functioning properly during a viral infection?

A) Perforin
B) Granzyme B
C) Fas
D) MHC I
E) FcR

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: One molecule is needed for both NK and CTL function.
Source: Test Bank
Sequence: 12032

33. Which molecule can induce the GREATEST variety of effector functions?

A) MHC I
B) MHC II

C) TCR
D) Bound antibody
E) NCRs

Answer: D
Question Type: Multiple Choice
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: FcR interactions.
Source: Test Bank
Sequence: 12033

34. What three steps must occur before a CTL is ready to kill target cells? Explain why these steps must occur.

Answer:
Feedback: To become activated, a CTL precursor must receive the following signals: high affinity binding to an antigen/MHC complex on a licensed APC by the T cell's TCR; a costimulatory signal from the same APC; and binding of IL-2 to its receptor on the CTL. All of this is necessary due to the destructive power of CTLs and the damage to the host that could occur if they were too easily activated.
Question Type: Essay
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Consider cell-mediated effector responses.
Source: Test Bank
Sequence: 12034

35. What are the two means by which activated CTLs kill target cells? Explain the significance of both events.

Answer:
Feedback: CTLs can kill target cells by either activating a signaling pathway in the target cell or by directly releasing proapoptotic molecules. First, many CTLs release a combination of two

molecules, perforin and granzyme. Perforin is a pore-forming molecule that is similar to the complement component C9. It polymerizes in endosomes and allows granzyme molecules to enter the cell. The other method CTLs use is activation of the Fas molecule on a target cell with its ligand FasL on activated CTLs. Both of these actions activate caspases inside the target cell, leading to apoptosis.
Question Type: Essay
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: See Figure 12-13.
Source: Test Bank
Sequence: 12035

36. What two properties of NK cells make them innate-like in their function? What two properties are more closely aligned with the adaptive immune system? Explain.

Answer:
Feedback: NK cells do not undergo rearrangement of receptor genes in development. They are also immediately able to target and signal cells to undergo apoptosis without activation by other cells. On the other hand, NK cells interact with MHC molecules on target cells, which are part of the adaptive immune response of T cells. Recently, it has also become known that NK cells are capable of forming “memory” cells.
Question Type: Essay
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: On what does NK cell activity depend?
Source: Test Bank
Sequence: 12036

37. Why are NK cells such an important component of the immune system?

Answer:
Feedback: NK cells serve as a counter to CTLs in a host. Although both cells are capable of direct cell killing, CTLs are not present in high numbers until 7-10 days after the start of an infection and are completely dependent on MHC/TCR interactions. In contrast, NK cells do not

depend on as many signals to become activated, do not undergo genetic rearrangement in development, and use MHC as an inhibitory molecule instead of an activating one. They are also capable of killing cells via ADCC, which means using antibodies to recognize antigens outside of MHC complexes.
Question Type: Essay
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Consider adaptive immunity.
Source: Test Bank
Sequence: 12037

38. Identify the components of an NKT cell that are NK-like and those that are T-cell-like. Which components are like neither? Explain.

Answer:
Feedback: NKT cells display a TCR, induce apoptosis via Fas/FasL interactions, and have helper and cytotoxic populations like T cells. However, their surface proteins have more in common with NK cells, and they do not interact with either MHC I or MHC II. What makes NKT cells unique is their ability to interact with CD1 and recognize foreign lipid molecules.
Question Type: Essay
Chapter Name: 12
Section: 12.2
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: In what ways do NKT cells bridge the innate and adaptive immune systems?
Source: Test Bank
Sequence: 12038

39. Compare and contrast the ways in which antibodies and T cells interact with their cognate antigen. Explain how this benefits the host.

Answer:
Feedback: Both antibodies and T cells use genetic rearrangement to produce molecules that can recognize and bind antigen — small components of nonhost molecules. The variable region of an antibody binds directly to antigens in the environment, whereas the TCR is dependent on antigen presentation via MHC proteins. T cells also need helper proteins (either CD8 or CD4) to

facilitate this interaction. Antibodies can bind to many types of molecules, such as proteins and carbohydrates, and these can be either denatured or in a native confirmation. T cells can only recognize short, digest peptide fragments. This is advantageous for the host because it allows the immune system to monitor the extracellular environment with antibodies and inside its own cells with T cells.
Question Type: Essay
Chapter Name: 12
Section: 12.1; 12.2
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Consider how antigen-specific T cells are detected.
Source: Test Bank
Sequence: 12039

40. The use of CAR therapy has been a major breakthrough in cancer treatment. CAR stands for "Chimeric Antigen Receptor," and it is a combination of the antigen-binding domain of an antibody and the intracellular domain of the TCR. What advantage might this construct have over endogenous cellular machinery?

Answer:
Feedback: A CAR molecule combines the versatility of antibodies with the direct cell-killing power of T cells. CAR cells are able to recognize antigens without processing and presentation on MHC molecules. Once the CAR binds its cognate antigen, it is able to induce apoptosis of the cancer cell directly using existing CTL pathways.
Question Type: Essay
Chapter Name: 12
Section: 12.1; 12.2
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Refer to Box 12-1.
Source: Test Bank
Sequence: 12040