Chapter 2: Cells, Organs, and Microenvironments of the Immune System

1. All blood cells in an adult human can trace their ancestry to which compartment within the body?

A) Thymus
B) Bone marrow
C) Lymph node
D) Peyer's patch
E) None of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Which of the above is a reservoir of stem cells?
Source: Test Bank
Sequence: 2001

2. If a human were unable to produce lymphoid progenitor cells, predict which part of the immune system would be MOST greatly impacted?

A) Innate immunity
B) Adaptive immunity
C) Both innate and adaptive would be equally impacted
D) Neither innate nor adaptive immunity would be impacted
E) None of the answers would be impacted.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1

Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Moderate
Hint: HSCs differentiate into more than one cell type.
Source: Test Bank
Sequence: 2002

3. A pluripotent stem cell can do which of the following?

A) Differentiate into a finite number of different cell types
B) Differentiate into any type of cell found in the adult
C) Divide an infinite number of times
D) All of the answers are correct.
E) None of the answers are correct.

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: A pluripotent stem cell is not always a totipotent cell.
Source: Test Bank
Sequence: 2003

4. Which of the following is the pluripotent stem cell that gives rise to all blood cells?

A) CLP
B) CMP
C) CEP
D) HSC
E) None of the answers are correct.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding

Level of Difficulty: Moderate
Hint: One of the cell types listed gives rise to the other three, which, in turn, give rise to the cellular heterogeneity in the blood.
Source: Test Bank
Sequence: 2004

5. From which of the following stem cells are NK cells derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP are correct.
E) None of the answers are correct.

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2005

6. Which cell can differentiate into the GREATEST variety of cells during hematopoiesis?

A) B-cell progenitor
B) Basophil progenitor
C) T-cell progenitor
D) Eosinophil progenitor
E) Myeloid progenitor

Answer: E
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult

Hint: Hematopoiesis generates a variety of progenitor cells.
Source: Test Bank
Sequence: 2006

7. Using a light microscope, you observe a human blood smear. Among the abundance of erythrocytes, you note a leukocyte that appears to contain a multilobed nucleus. What is the MOST likely identity of the observed leukocyte?

A) T lymphocyte
B) B lymphocyte
C) Neutrophil
D) Eosinophil
E) Both Neutrophil and eosinophil are equally likely.

Answer: E
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: Some leukocytes can be distinguished by morphological characteristics.
Source: Test Bank
Sequence: 2007

8. From which of the following stem cells are DCs derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate

Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2008

9. From which of the following stem cells are platelets derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2009

10. From which of the following stem cells are eosinophils derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank

Sequence: 2010

11. From which of the following stem cells are helper T cells (T_H) derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2011

12. From which of the following stem cells are monocytes derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2012

13. From which of the following stem cells are RBCs derived?

A) CLP
B) CMP
C) CEP
D) Both CLP and CMP.
E) None of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Know which stem cells give rise to which effectors; DCs are tricky.
Source: Test Bank
Sequence: 2013

14. What level of gene expression is regulated by such factors as Notch1, GATA-2 and *Bmi-1*?

A) Replication
B) Transcription
C) RNA processing
D) Translation
E) None of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Many cellular differentiation programs in the immune system are regulated by master regulators that function early in gene expression.
Source: Test Bank
Sequence: 2014

15. Which lineage of immune cells constitutes the first line of defense against an infection?

A) Lymphoid
B) Erythroid
C) Myeloid
D) All of the answers are correct.
E) None of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Granulocytes are important first responders; from what kind of progenitor do they develop?
Source: Test Bank
Sequence: 2015

16. You have consumed a salad contaminated with *Salmonella enterica*, which typically causes a self-limiting, gastrointestinal disease in humans. Based on this information, which immune organ is MOST likely to first recognize and mount a response against the pathogen?

A) Spleen
B) SALT
C) Thymus
D) GALT
E) Lymph node

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.3
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: Secondary immune organs are strategically placed throughout the body.
Source: Test Bank
Sequence: 2016

17. Which properties listed below are shared by both naïve B cells and mature T cells?

A) Are derived from lymphoid progenitor cells
B) Are considered lymphocytes
C) Contain membrane-bound antigen receptors
D) All of the answers are correct.
E) None of the answers are correct.

Answer: E
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: Naïve B cells contain BCRs, and T cells contain TCRs.
Source: Test Bank
Sequence: 2017

18. Which of the following is NOT descended from the common lymphoid progenitor?

A) T cells
B) NK cells
C) B cells
D) Eosinophils
E) All of the answers are descended from the common lymphoid progenitor.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: One of the choices develops from the CMP.
Source: Test Bank
Sequence: 2018

19. Which of the following granulocytes contains histamine within its granules?

A) Neutrophils
B) Eosinophils
C) Basophils
D) Both Eosinophils and Basophils
E) All of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Only one of the types listed above features histamine within its granules.
Source: Test Bank
Sequence: 2019

20. Which of the following is NOT true about monocytes?

A) They comprise between 5–10% of circulating leukocytes.
B) They have the ability to differentiate into macrophages or dendritic cells.
C) They can be subdivided into inflammatory monocytes and patrolling monocytes.
D) They can give rise to platelets.
E) All of the answers are true.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: One of the statements is not true; what cell types descend from monocytes?
Source: Test Bank
Sequence: 2020

21. Which of the following cell types is responsible for the secretion of immunoglobulins?

A) T_H1
B) T_H2
C) T_H17
D) T_{FH}
E) Plasma cell

Answer: E
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which types of lymphocytes are responsible for the regulation of immune responses; which specialize in production of antigen-specific antibodies?
Source: Test Bank
Sequence: 2021

22. Which of the following cell types is responsible for regulating responses against intracellular pathogens?

A) T_H1
B) T_H2
C) T_H17
D) T_{FH}
E) Plasma cell

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which types of lymphocytes are responsible for the regulation of immune responses; which specialize in production of antigen-specific antibodies?
Source: Test Bank
Sequence: 2022

23. Which of the following cell types is responsible for activating B cells in germinal centers?

A) T_H1
B) T_H2
C) T_H17
D) T_{FH}
E) Plasma cell

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which types of lymphocytes are responsible for the regulation of immune responses; which specialize in production of antigen-specific antibodies?
Source: Test Bank
Sequence: 2023

24. Which of the following cell types is responsible for regulating responses against predominantly extracellular pathogens?

A) T_H1
B) T_H2
C) T_H17
D) T_{FH}
E) Plasma cell

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which types of lymphocytes are responsible for the regulation of immune responses; which specialize in production of antigen-specific antibodies?
Source: Test Bank
Sequence: 2024

25. Which of the following cell types secretes IL-17 and may play a role in antifungal responses?

A) T_H1
B) T_H2
C) T_H17
D) T_{FH}
E) Plasma cell

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which types of lymphocytes are responsible for the regulation of immune responses; which specialize in production of antigen-specific antibodies?
Source: Test Bank
Sequence: 2025

26. Which of the following effector T lymphocyte populations is produced via the activation of a naïve T cell through antigen presented in MHC Class I?

A) CTL
B) T_H1
C) T_H2
D) T_H17
E) None of the answers are correct.

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which of the choices comes from a $CD8^+$ naïve T cell?
Source: Test Bank
Sequence: 2026

27. Which of the following types of effector T lymphocytes is capable of inhibiting an immune response to an antigen recognized with its T-cell receptor (TCR)?

A) T_H1
B) T_{REG}
C) T_H2
D) T_H17
E) None of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which cells listed stimulate specific elements of the immune response?
Source: Test Bank
Sequence: 2027

28. Which of the following descendants of the CLP act in the innate immune response?

A) T cells
B) NK cells
C) B cells
D) Plasma cells
E) All of the answers are correct.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.1
Cognitive Level: LOC
Blooms Level: Remembering
Level of Difficulty: Easy
Hint: Which cell type does not regulate immune responses or secrete antibodies?
Source: Test Bank
Sequence: 2028

29. Imagine that you are a thymocyte that has just entered the thymus. Assuming you will survive positive and negative selection, what changes will you experience before developing in a naïve $CD4^+$ T cell?

Answer:
Feedback: The thymocyte would change from a DN cell, to a DP cell, to an SP cell. In this case the SP cell would contain CD4 on the surface but not CD8.
Question Type: Essay
Chapter Name: 2
Section: 2.2
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Developing thymocytes can be distinguished by their expression of CD molecules.
Source: Test Bank
Sequence: 2029

30. Name three parts of the human body where you would expect to find secondary lymphoid tissues.

Answer:
Feedback: More than three answers are possible. Correct answers would include areas of the body most directly exposed to potential, outside pathogens, including the skin, the lungs, the upper respiratory tract, the small intestine, and the large intestine.
Question Type: Essay
Chapter Name: 2
Section: 2.3
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Skin and mucosal membranes are the major sites of entry for many pathogens.
Source: Test Bank
Sequence: 2030

31. In your own words, explain how an NKT cell displays properties of both innate and adaptive immunity.

Answer:
Feedback: NKT cells have TCRs, yet also express surface markers associated with innate immunity. NKT cells do not require antigen presentation for activity. NKT TCRs are not diverse.

Question Type: Essay
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: NKT cells are derived from lymphoid progenitors.
Source: Test Bank
Sequence: 2031

32. Plasma cells can secrete thousands of antibodies per second. Based on this observation, name two organelles that you might expect to find in abundance within an active plasma cell.

Answer:
Feedback: An abundance of Golgi and endoplasmic reticulum would be anticipated, allowing for efficient production of secreted antibodies.
Question Type: Essay
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Antibodies are glycoproteins.
Source: Test Bank
Sequence: 2032

33. Which of the following is NOT considered primary lymphoid tissue?

A) Draining lymph node
B) Thymus
C) Peyer's patch
D) Neither draining lymph node nor Peyer's patch are primary lymphoid tissue.
E) None of the answers are primary lymphoid tissue.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.2
Cognitive Level: LOC
Blooms Level: Understanding

Level of Difficulty: Moderate
Hint: How do primary and secondary lymphoid tissue differ functionally; what happens in each of the tissues listed?
Source: Test Bank
Sequence: 2033

34. In mammals, T-cell development occurs in the _____, whereas B-cell development occurs predominantly in the _____.

A) thymus; bursa of Fabricius
B) bone marrow; mesenteric lymph nodes
C) bone marrow; thymus
D) thymus; bone marrow
E) None of the answers are correct.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: B cells (and their antigen-specific receptors) develop in different sites in mammals than in birds.
Source: Test Bank
Sequence: 2034

35. As thymocytes develop, they are classified on the basis of the state of their T-cell receptors and which of the following?

A) Which class of MHC they express on their surface
B) The state of the immunoglobulin heavy and light chains on their surface
C) The presence of coreceptor proteins CD4 and CD8 on their surface
D) The expression of the transcription factor, FoxP3
E) None of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.2

Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Which of the above factors on the surface of T cells is essential for T-cell function?
Source: Test Bank
Sequence: 2035

36. Upon entering the thymus, thymocytes are classified as double _____ with regard to coreceptors; before exiting as single-positive, naïve T cells, they pass through a period in which they are double _____.

A) positive; negative
B) negative; positive
C) Both "positive; negative" and "negative; positive" are correct.
D) Neither "positive; negative" nor "negative; positive" are correct.
E) Coreceptor expression state does not change in the thymus.

Answer: B
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.2
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Expression of the coreceptor genes change during thymocyte development.
Source: Test Bank
Sequence: 2036

37. What important role do antibodies play in the isolation of HSCs from the bone marrow?

Answer:
Feedback: Antibodies can be used to eliminate bone marrow cells that express surface molecules not expressed by HSCs. Antibodies can also be used to select for bone marrow cells that express HSCs-associated molecular markers.
Question Type: Essay
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate

Hint: Antibodies bind molecules selectively.
Source: Test Bank
Sequence: 2039

38. A graduate student observes a strain of mice that are impaired in their ability to combat parasitic worms. Given this observation, which arm of hematopoiesis is MOST likely deficient in this strain?

Answer:
Feedback: The myeloid arm of hematopoiesis. The myeloid branch gives rise to innate cells specialized in the defense against parasitic worms including eosinophils and basophils.
Question Type: Essay
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Lymphoid and myeloid progenitors give rise to distinct populations of immune cells.
Source: Test Bank
Sequence: 2038

39. In addition to the bone marrow, HSCs have been observed to occur within the blood. How has this observation improved the procedures used to transplant HSCs from donors to recipients that are bone marrow deficient?

Answer:
Feedback: In some cases, it is now possible to obtain HSCs directly from blood draws from donors; as opposed to bone marrow aspirations, which are painful and require anesthesia.
Question Type: Essay
Chapter Name: 2
Section: 2.2
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Historically, collecting HSCs from donors required direct access to bone marrow tissue.
Source: Test Bank
Sequence: 2039

40. Contraction of which of the following types of muscles is responsible for propulsion of lymph through the lymphatic system?

A) Cardiac
B) Skeletal
C) Smooth
D) Both skeletal and smooth are correct.
E) None of the answers are correct.

Answer: D
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.3
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Lymph is not propelled through the body the same way blood is.
Source: Test Bank
Sequence: 2040

41. Naïve lymphocytes enter secondary lymphoid tissues via which of the following structures?

A) Afferent lymphatics
B) Efferent lymphatics
C) HEVs
D) Marginal sinus
E) None of the answers are correct.

Answer: C
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.3
Cognitive Level: LOC
Blooms Level: Understanding
Level of Difficulty: Moderate
Hint: Lymphocytes enter via a different route than antigens.
Source: Test Bank
Sequence: 2041

42. Which of the following does NOT appear to utilize the FRCC system as its primary means for trafficking through the lymph node?

A) B cells
B) T cells
C) Free antigen that entered via an afferent lymphatic
D) Cytokines and chemokines
E) None of the answers utilizes the FRCC system.

Answer: A
Question Type: Multiple Choice
Chapter Name: 2
Section: 2.3
Cognitive Level: HOC
Blooms Level: Applying
Level of Difficulty: Difficult
Hint: How does the FRCC system help molecules and cells move through the lymph node?
Source: Test Bank
Sequence: 2042

43. Can you think of two cellular activities occurring within a swelling lymph node that has been exposed to antigen from a pathogen?

Answer:
Feedback: Immune cells are actively migrating into the lymph node, and T and B cells within the node are proliferating via clonal selection and expansion. Collectively, these activities are contributing to swelling.
Question Type: Essay
Chapter Name: 2
Section: 2.3
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Lymph nodes are sites within which an immune response can be amplified.
Source: Test Bank
Sequence: 2043

44. Beyond structural differences, name functional differences between a lymph node and the spleen.

Answer:
Feedback: Two major functional differences exist when comparing the spleen to a lymph node. First, the spleen primarily reacts to antigens present in the blood, whereas lymph nodes react to lymph-borne antigens. Second, the spleen has well-defined functions not directly related to mounting an immune response including being a site where old and defective red blood cells are eliminated.
Question Type: Essay
Chapter Name: 2
Section: 2.3
Cognitive Level: HOC
Blooms Level: Analyzing
Level of Difficulty: Moderate
Hint: Patients without a spleen are more susceptible to blood-borne pathogens.
Source: Test Bank
Sequence: 2044

45. You have discovered a potentially new leukocyte that appears to share a common progenitor with $CD8^+$ T cells, lack antigen-specific receptors, do not participate in antigen presentation, and have a capacity for ADCC. Using knowledge of hematopoiesis, which cell type MOST closely resembles the potentially new leukocyte?

Answer:
Feedback: Innate lymphoid cells, which arise from lymphoid progenitors. ILCs lack antigen-specific receptors, but can participate in ADCC via the expression of Fc receptors.
Question Type: Essay
Chapter Name: 2
Section: 2.1
Cognitive Level: HOC
Blooms Level: Evaluating
Level of Difficulty: Difficult
Hint: Select cells of the lymphoid lineage can display properties of innate and adaptive immunity.
Source: Test Bank
Sequence: 2045