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Chapter 9: B-Cell Development

1. B lymphocytes are made in the

- A) blood stream.
- B) bone marrow.
- C) liver.
- D) thymus.
- E) totipotent cell.

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.0

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: Location of B-cell production from a HSC.

Source: Test Bank

Sequence: 9001

2. How long does B-cell maturation from an HSC to a mature B cell take?

- A) 1 to 2 hours
- B) 1 to 2 days
- C) 1 to 2 weeks
- D) 1 to 2 months
- E) 1 to 2 years

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.0

Cognitive Level: LOC

Blooms Level: Remembering

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Level of Difficulty: Easy

Hint: B cell will begin to secrete antibodies within a few days of infection.

Source: Test Bank

Sequence: 9002

3. Which cell type is found in both B- and T-cell lineages?

- A) Common lymphoid progenitors
- B) Common pro-B-T cells
- C) Immature B cell
- D) Naïve lymphoid progenitor
- E) Pro-B-T cell

Answer: A

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.0

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: B cells belong to the lymphoid lineage.

Source: Test Bank

Sequence: 9003

4. This type of cell will leave the bone marrow and complete maturation in the spleen.

- A) Common lymphoid progenitor cell
- B) Hematopoietic stem cell
- C) Immature B cell
- D) Pro-B cell
- E) Pro-T cell

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.0

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

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Hint: B cells will see potential antigens in the germinal centers of secondary lymphoid organs such as the spleen.

Source: Test Bank

Sequence: 9004

5. All of the following are true regarding B-cell development EXCEPT

- A) B cells complete maturation in the spleen.
- B) B cells are mostly developed when they leave the bone marrow.
- C) B cells, like T cells, are MHC class restricted.
- D) Self-reactive B cells may be eliminated through apoptosis.
- E) Self-reactive B cells may be rendered unreactive (anergic).

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.0

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: B cells display IgD as their BCR.

Source: Test Bank

Sequence: 9005

6. In a succinct manner, can you explain how it was shown that mature, human B cells develop from HSCs in one to two weeks?

Answer:

Feedback: This finding is based primarily on cell transfer experiments. Genetically marked donor HSCs are injected into unmarked recipients. Genetically marked mature B cells then appear in the recipients one to two weeks later.

Question Type: Essay

Chapter Name: 9

Section: 9.0

Cognitive Level: HOC

Blooms Level: Analyzing

Level of Difficulty: Moderate

Hint: Mature B cells, ultimately, are derived from HSCs.

Source: Test Bank

Sequence: 9006

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7. Mature B cells, unlike T cells, are not subject to selection processes during their development as they do not contain receptors that can recognize an array of antigens. Is this statement true?

Answer:

Feedback: No, it is false. In common with T cells, developing B cells must solve the problem of creating a diverse array of receptors capable of recognizing diverse antigens, including potential self-antigens. Also in common with T cells, this problem is approached, in part, by selection against self-reactive B cells.

Question Type: Essay

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Analyzing

Level of Difficulty: Moderate

Hint: Each mature B cell contains a BCR that recognizes a unique antigen.

Source: Test Bank

Sequence: 9007

8. Hematopoiesis produces

- A) B cells only.
- B) Red blood cells only.
- C) myeloid lineage cells only.
- D) lymphoid and myeloid lineage cells.
- E) erythroid, lymphoid, and myeloid lineage cells.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Hematopoietic stem cells produce all blood cells.

Source: Test Bank

Sequence: 9008

9. As B cells develop in the bone marrow, what three primary factors help immunologists define and discriminate between distinct stages of B-cell development?

Answer:

Feedback: The three primary factors, thus far identified by immunologists, are changes in cell surface markers, changes in gene expression, and immunoglobulin gene rearrangements.

Question Type: Essay

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Analyzing

Level of Difficulty: Moderate

Hint: Using modern immunological techniques, distinct cell surface markers can be identified.

Source: Test Bank

Sequence: 9009

10. In examining and characterizing B-cell development, investigators can use knockout genetic approaches to determine the developmental effects of eliminating the expression of targeted transcriptional factors on developmental progress. What is a limitation of the knockout approach?

Answer:

Feedback: A limitation of the knockout approach in such developmental studies is that they typically only define the first stage in differentiation at which the gene is required. Conditional knockouts and knock-in approaches can be used to work around this limitation.

Question Type: Essay

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Evaluating

Level of Difficulty: Difficult

Hint: Knockouts are used to produce null mutants, completely lacking gene functionality.

Source: Test Bank

Sequence: 9010

11. Hematopoiesis begins at around day 7 after fertilization in mice. What is the site of precursor cells at this stage of fetal development?

A) Bone marrow

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- B) Fetal liver
- C) Placenta
- D) Primitive organ
- E) Yolk sac

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Developing embryos do not make bone marrow until the later stages of fetal development.

Source: Test Bank

Sequence: 9011

12. At what site(s) can mature HSCs be found by day 11 in the mouse model?

- A) AGM
- B) Fetal liver
- C) Placenta
- D) Yolk
- E) All of the answers are correct.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Mice have a short gestation period so day 11 represents the halfway point of fetal development. At this point, mature HSCs can be found throughout the developing embryo.

Source: Test Bank

Sequence: 9012

13. What type of cell will predominately be produced by hematopoiesis in the fetal liver of mice?

- A) Erythroid lineage cells
- B) Lymphoid lineage cells

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- C) Myeloid lineage cells only
- D) Lymphoid and myeloid lineage cells
- E) Erythroid, lymphoid, and myeloid lineage cells

Answer: A

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Red blood cell development occurs in the liver.

Source: Test Bank

Sequence: 9013

14. V-DJ recombination occurs during which phase of a B cell's development?

- A) Activated B cell
- B) Mature B cell
- C) Naïve B cell
- D) Pro-B cell
- E) Immature B cell

Answer: D

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: V-DJ recombination takes place while B cells develop in the bone marrow. Unsuccessful recombinations in young B cells result in apoptosis.

Source: Test Bank

Sequence: 9014

15. What are two functions of bone marrow stromal cells with respect to B-cell development?

- A) Cytokine expression traps developing B cells in a specific location
- B) Recruits macrophages to phagocytize self-recognizing B cells and decreases HSC when no active infection is present

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- C) Secretes release factors that direct the B cell to the spleen and expresses necessary cytokines
- D) Traps developing B cells in a specific location and recruits red blood cells to bring oxygen to developing B cells
- E) Triggers HSCs to produce more pro-B cells and secretes cytokines to stimulate osteoblast development

Answer: A

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Bone marrow stromal cells provide the proper environment for B-cell development.

Source: Test Bank

Sequence: 9015

16. Which of the following influence the development of B cells in the bone marrow?

- A) Changes in cell surface markers
- B) Changes in gene expression
- C) BCR gene rearrangements
- D) DNA modification by methylation
- E) All the answers influence B-cell development.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: Recently epigenetics has been shown to play a role in B-cell development.

Source: Test Bank

Sequence: 9016

17. Which molecule is required for a pre-pro-B cell to begin entering the pro-B cell stage?

- A) IL-7
- B) CXCL12

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- C) CD117
- D) SCF
- E) None of the answers are correct.

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: The molecule is a cytokine.

Source: Test Bank

Sequence: 9017

18. Immature B cells in the bone marrow that are found to bear self-antigen reactive BCRs undergo which of the following?

- A) Clonal deletion
- B) Light chain receptor editing
- C) Development of anergy
- D) All of the answers are correct.
- E) None of the answers are correct.

Answer: D

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: Clonal deletion is a consequence of apoptosis.

Source: Test Bank

Sequence: 9018

19. Which molecule listed below appears to play a critical role in trafficking B cells from the bone marrow to the spleen to complete cellular maturation?

- A) SCF
- B) S1P

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- C) IL-7
- D) BIM
- E) Both SCF and S1P are correct.

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.2

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: A chemoattractant plays a significant role.

Source: Test Bank

Sequence: 9019

20. Individuals of retirement age or older show lower antibody mediated immune responses due to all the following reasons EXCEPT

- A) increased likelihood of autoimmune disorders.
- B) limited HSC production of pro-B cells.
- C) poor antibody response to vaccination.
- D) reduced-memory B-cell generation.
- E) smaller thymus.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: B-cell production and the checkpoints that ensure only non-self-recognizing B cells are allowed to live decreases as an individual ages.

Source: Test Bank

Sequence: 9020

21. What type of immunoglobulin gene rearrangement occurs during B-cell progenitor development?

- A) D_H-J_H rearrangement

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- B) D_L-J_L rearrangement
- C) Both heavy- and light-chain rearrangement
- D) V_H-DJ_H rearrangement
- E) V_L-DJ_L rearrangement

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: B cells must have a functional BCR (IgD) before leaving the bone marrow.

Source: Test Bank

Sequence: 9021

22. The common lymphoid progenitor cell gives rise to all the following cell lines EXCEPT

- A) dendritic cells.
- B) megakaryocytes.
- C) natural killer cells.
- D) pre-pro B cells.
- E) T-cell progenitor.

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Megakaryocytes produce platelets (thrombocytes).

Source: Test Bank

Sequence: 9022

23. Which of the following statements regarding HSCs is/are TRUE?

- I. HSCs are not self-renewing.
- II. HSCs can make copies of themselves.
- III. HSCs give rise to one cell lineage.

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- IV. HSCs are multipotent.
- V. HSCs express both RAG1 and RAG2 surface markers.

- A) Statement I only
- B) Statements I and III only
- C) Statements II and III only
- D) Statements II and IV only
- E) Statements III and V only

Answer: D

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Multipotent cells are self-renewing and give rise to multiple cell lines.

Source: Test Bank

Sequence: 9023

24. Where can early lymphoid progenitor cells (ELPs) be found in humans?

- A) Blood stream
- B) Bone marrow
- C) Lymphatic tissue
- D) Thymus
- E) Both bone marrow and lymphatic tissue are correct.

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: ELPs are young common lymphoid progenitor cells that will give rise to NK cells, B cells, and T cells.

Source: Test Bank

Sequence: 9024

25. At what stage of development does a B cell begin to express a pre-B-cell receptor?

- A) Pre-pro B cell
- B) Early pro-B cell
- C) Late pro-B cell
- D) Late pre-B cell
- E) Immature B cell

Answer: D

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: Pre-BCRs are expressed immediately after V_H - DJ_H rearrangement.

Source: Test Bank

Sequence: 9025

26. At what stage of development does a B cell undergo D - J_H rearrangement?

- A) Pre-pro B cell
- B) Early pro-B cell
- C) Late pro-B cell
- D) Late pre-B cell
- E) Immature B cell

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: The first checkpoint for self-reactivity with a B cell is V_H - DJ_H rearrangement.

Source: Test Bank

Sequence: 9026

27. At what stage of development does a B cell begin to display an IgM receptor?

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- A) Pre-pro B cell
- B) Early pro-B cell
- C) Late pro-B cell
- D) Late pre-B cell
- E) Immature B cell

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: IgM is the first Ig displayed on a developing B cell, and it is functional just before the second checkpoint for self-reactivity during B-cell development.

Source: Test Bank

Sequence: 9027

28. B-cell development has one checkpoint to determine if V-DJ rearrangement has produced a successful V_H - DJ_H combination that does not recognize self. If no successful combination is produced, then the B cell will undergo apoptosis. At what point of B-cell development does this checkpoint occur?

- A) Pre-pro-B cell
- B) Early pro-B cell
- C) Late pro-B cell
- D) Late pre-B cell
- E) Immature B cell

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: V_H - DJ_H rearrangement occurs during the late pro-B cell phase.

Source: Test Bank

Sequence: 9028

29. How does allelic exclusion prevent multiple heavy-chain rearrangements from occurring in pre-B cells?

- A) RAG1 and RAG2 are downregulated, and TdT activity is lost so that no additional heavy-chain rearrangements may take place.
- B) RAG1 is upregulated whereas RAG2 and TdT are downregulated to prevent heavy-chain recombination on the second set of chromosomes.
- C) RAG1 and RAG2 induce silencing of the second alleles for V_H-DJ_H rearrangement.
- D) TdT initiates light-chain rearrangement.
- E) TdT releases a cytokine to trigger apoptosis in the pre-B cell.

Answer: A

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: RAG1, RAG2, and TdT are signals that allow heavy-chain rearrangement.

Source: Test Bank

Sequence: 9029

30. Of the cells listed below, which one represents the MOST developed B cell?

- A) Pre-pro-B cell
- B) Pro-B cell
- C) Pre-B cell
- D) T1 B cells
- E) T2 B cells

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.2

Cognitive Level: HOC

Blooms Level: Applying

Level of Difficulty: Difficult

Hint: T1 and T2 cells are found in the spleen, after developing B cells have left the marrow.

Source: Test Bank

Sequence: 9030

31. Transgenic animals that fail to express a BCR during the immature B-cell stages lose the capacity to produce any B cells at all. What does this observation indicate?

Answer:

Feedback: The observation indicates that some low level of antigen-independent signaling through the BCR is required for the continued generation and survival of immature B cells during development.

Question Type: Essay

Chapter Name: 9

Section: 9.2

Cognitive Level: HOC

Blooms Level: Evaluating

Level of Difficulty: Difficult

Hint: BCRs appear to have functionality beyond just antigen binding.

Source: Test Bank

Sequence: 9031

32. BAFF is produced by macrophages and dendritic cells in response to select cytokines, and, therefore, BAFF levels may increase during infections. What is a potential advantage and disadvantage of increasing BAFF levels transiently during infections?

Answer:

Feedback: A potential advantage is to sustain the number of B cells and diverse BCRs that could, theoretically, respond to infections. However, a disadvantage is to allow B cells that would typically be removed by selection, due to a potential to respond to self-antigen, to survive in higher levels of BAFF.

Question Type: Essay

Chapter Name: 9

Section: 9.2

Cognitive Level: HOC

Blooms Level: Evaluating

Level of Difficulty: Difficult

Hint: BAFF is a cytokine required for survival of transitional B cells.

Source: Test Bank

Sequence: 9032

33. Recent experiments have focused on identifying differences between signal transduction events leading to B-cell activation versus B-cell anergy. As a new tutor for immunology, how would you summarize these recent experiments to a student client?

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Answer:

Feedback: Anergic B cells show less antigen-induced phosphorylation of signaling molecules, antigen-stimulated calcium release into the cytoplasm is reduced, and higher levels of BIM.

Higher than normal levels of BIM make anergic B cells more prone to apoptosis.

Question Type: Essay

Chapter Name: 9

Section: 9.2

Cognitive Level: HOC

Blooms Level: Evaluating

Level of Difficulty: Difficult

Hint: Mechanisms to arrest the development of human cells are known and can be related to alterations of signal transduction pathways.

Source: Test Bank

Sequence: 9033

34. Mature naïve B cells express high levels of _____ on their cell surfaces.

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

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.1

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: Membrane-bound IgD serves as the BCR.

Source: Test Bank

Sequence: 9034

35. Mature B-2 or follicular B cells are most commonly found in the

- A) bone marrow.
- B) lymph node.
- C) marginal zones of the spleen.

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- D) peritoneal.
- E) secondary lymphoid organs.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.3

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: B-2 cells are the conventional B cells found in germinal centers of the spleen, Peyer's patch, MALT, skin, tonsils, and adenoids.

Source: Test Bank

Sequence: 9035

36. Mature B-1 cells show _____ diversity in their V-region.

- A) high
- B) moderate (somewhat restricted)
- C) low (restricted)
- D) high or low depending on active infection
- E) high or low depending on CD21 expression

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.3

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: B-1 cells reside in the peritoneal and pleural cavities and typically target carbohydrate antigens.

Source: Test Bank

Sequence: 9036

37. Marginal-zone B cells express

- A) IgD.
- B) IgG.
- C) IgM.

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- D) IgE.
- E) Both IgG and IgM are correct.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.3

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: Marginal-zone B cells are designed to recognize and respond to blood-borne antigens.

Source: Test Bank

Sequence: 9037

38. Which type of mature B cell is MOST likely to respond to a protein antigen?

- A) B-1 B cells
- B) B-2 B cells
- C) MZ B cells
- D) B-2 B cells and MZ B cells
- E) B-1 B cells, B-2 B cells, and MZ B cells

Answer: D

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.3

Cognitive Level: LOC

Blooms Level: Understanding

Level of Difficulty: Moderate

Hint: B cells that target protein or peptide antigens show higher variable region diversity than B cells that target carbohydrate antigens.

Source: Test Bank

Sequence: 9038

39. Is it true to state that mature B cells, in the form of B-2 cells, are the only mature B cells?
Please justify your answer.

Answer:

Feedback: Although the majority of mature B cells are B-2 cells, recent evidence had identified additional subpopulations of mature B cells. B-1 and marginal zone (MZ) B-cells also exist, arise

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from other developmental programs, occupy distinct anatomical locations, and have distinct functions.

Question Type: Essay

Chapter Name: 9

Section: 9.3

Cognitive Level: HOC

Blooms Level: Analyzing

Level of Difficulty: Moderate

Hint: More than one form have been identified and characterized.

Source: Test Bank

Sequence: 9039

40. Compare and contrast the major differences between a B-1a cell and a B-2 cell.

Answer:

Feedback: B-1a cells differ from B-2 cells in their surface markers, have a less diverse repertoire of antibody specificities, spontaneously generate natural antibodies, and can generate antibody responses without the T-cell assistance.

Question Type: Essay

Chapter Name: 9

Section: 9.3

Cognitive Level: HOC

Blooms Level: Analyzing

Level of Difficulty: Moderate

Hint: Consider which B cells, specifically, are capable of generating “natural antibodies.”

Source: Test Bank

Sequence: 9040

41. What are the significant, common trends or features when comparing the overall development of T cells and B cells?

Answer:

Feedback: The major common denominators include the commitment to a cell lineage, sequential rearrangement of antigen receptor genes, developmental checkpoints that test for productive rearrangements, and selection for cells with appropriate antigen-binding specificities.

Question Type: Essay

Chapter Name: 9

Section: 9.4

Cognitive Level: HOC

Blooms Level: Analyzing

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Level of Difficulty: Moderate

Hint: Recall that both must produce cells incapable of binding self-antigens, to avoid auto-reactivity.

Source: Test Bank

Sequence: 9041

42. What is the initial location of B-cell and T-cell development?

- A) Blood for B cell and thymus for T cell
- B) Bone marrow for both B cell and T cell
- C) Bone marrow for B cell and thymus for T cell
- D) Secondary lymphoid organs for B cell and thymus for T cell
- E) Thymus for both B cell and T cell

Answer: B

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.4

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: B cells and T cells come from common lymphoid progenitor cells.

Source: Test Bank

Sequence: 9042

43. Which cell type undergoes negative selection of ectopic expressing self-antigen cells in primary lymphoid organs?

- A) B cells
- B) MZ B cells
- C) T cells
- D) Both B cells and T cells.
- E) Neither B cells nor T cells.

Answer: C

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.4

Cognitive Level: LOC

Blooms Level: Remembering

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Level of Difficulty: Easy

Hint: B cells that bind self-antigens are selected against during B-cell development whereas T-cell selection occurs in the thymus.

Source: Test Bank

Sequence: 9043

44. V-J rearrangement occurs in

- A) all B cells.
- B) all T cells.
- C) only B-1 B cells.
- D) only B-2 B cells.
- E) both B cells and T cells.

Answer: E

Question Type: Multiple Choice

Chapter Name: 9

Section: 9.4

Cognitive Level: LOC

Blooms Level: Remembering

Level of Difficulty: Easy

Hint: The BCR and TCR undergo V-J rearrangement during development.

Source: Test Bank

Sequence: 9044