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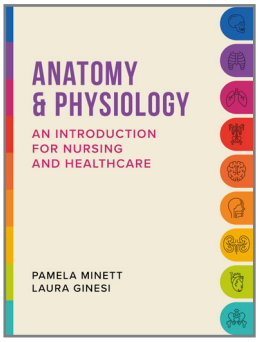

Questions to accompany *Anatomy and Physiology*

CHAPTER 14 IMMUNITY

Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options.
You must pick the one correct answer.

1. The function of the immune system is to:

A. resist pathogens which have the potential to cause disease
B. help pathogens to invade the human body
C. fight off illness
D. make your nose bleed
E. give you diarrhoea

2. First-line defences do NOT include:

A. unbroken skin
B. coughing
C. acid
D. antibodies
E. blink reflex

3. As part of your immune system, the function of white cells is to defend against pathogens and infection. What are white cells also known as?

A. influenza virus
B. glands
C. goblet cells
D. leucocytes
E. lymphatics

4. Which of the following substances or group of substances is NOT an example of a cytokine?

A. interferons
B. histamine
C. tumour necrosis factor
D. dopamine
E. prostaglandins

5. When basophils have moved into the tissues they are known as mast cells and release:

A. insulin
B. cortisol
C. adrenaline
D. melatonin
E. histamine

6. Which of the following cells carry out phagocytosis as part of the innate immune response?

A. lymphocytes
B. erythrocytes
C. neutrophils
D. basophils
E. hepatocytes

7. Which of the following circulate in blood as part of the adaptive immune response?

A. antigens
B. antibodies
C. monocytes
D. natural killer cells
E. neutrophils

8. With which part of an antibody molecule does an antigen form a complex?

A. light chain
B. heavy chain
C. Fc region
D. hinge
E. binding site

9. The secondary antibody response occurs:

A. on exposure to the antigen for the first time
B. when an antigen is presented to a B-lymphocyte
C. when the level of antibody in blood begins to rise
D. when symptoms start to decline
E. when the person is exposed to the antigen on a subsequent occasion

10. What is the most abundant type of antibody in the human body?

A. immunoglobulin A (IgA)
B. IgG
C. IgM
D. IgE
E. IgD

11. Which of the following is NOT an example of passive immunity?

A. maternal transfer across the placenta
B. colostrum or breast milk
C. antiserum
D. immunisation by the injection of antibodies
E. inflammatory response

12. When a person's immune system begins to attack their own healthy cells, it is known as:

A. immunosenescence
B. anaphylaxis
C. allergy
D. immunodeficiency
E. autoimmunity

Critical thinking: ARQs (assertion reasoning questions)

These questions consist of two statements:
- an assertion, and
- a reason.

You must first determine whether each statement is *TRUE* or *FALSE*.
- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.
- If both statements are false, then the answer is option 5.

There is one option for each possible outcome.

Question 13

A = the Assertion	**R = the Reason**
The second line of the body's immune defence is the acquired immune response	The acquired immune response is not specific, but provides a response that destroys pathogens rapidly and promotes healing
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

Question 14

A = the Assertion	**R = the Reason**
A vaccine is a special preparation of antibody that is used to produce active, measurable immunity to a specific disease	Antibodies are proteins that are able to bind specifically and precisely to antigen molecules, e.g. from a pathogenic bacterium
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

Question 15

A = the Assertion	**R = the Reason**
B-lymphocytes are white cells that circulate until they meet and bind specifically with an antigen before they produce antibodies	$CD8^+$ T-lymphocytes are sometimes called "helper" T cells because they interact closely with antigen-presenting cells and B-lymphocytes to stimulate production of antibodies
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

Question 16

A = the Assertion	**R = the Reason**
The characteristic signs of inflammation are heat, redness or discolouration, swelling and pain or loss of function	Tissue damage stimulates the release of histamine and other cytokine molecules that trigger vasodilation, increase blood flow and make blood vessels more permeable
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

Question 17

A = the Assertion	**R = the Reason**
Body temperature is normally controlled in the hypothalamus, so when the set point is raised by a fever, the affected person may feel warm, cold, sweaty or shivery	A fever is a high core temperature, and occurs when body temperature rises above the normal range, due to a physiological mechanism that increases the temperature set point in an attempt to combat a pathogen
Options	
1) Both A and R are true and R is the correct explanation of A	
2) Both A and R are true but R is NOT the explanation of A	
3) A is true but R is false	
4) A is false but R is true	
5) Both A and R are false	

Putting it all together

Question 18

a) What are the key signs of inflammation?
b) What cells are involved in the inflammatory response? What is their role in creating the response?
c) What is the role of cytokines in the inflammatory response?

Question 19

Complete the following paragraph using the words in the bullet list.

- acquired
- antibodies
- antigens
- B cells
- bone marrow
- pathogens
- T cells

Lymphocytes are the primary cells involved in the _____ immune response. They are small white cells that originate in _____ . Two important groups of lymphocytes are _____ , which produce _____ , and _____ , which detect _____ and are capable of attacking and destroying _____ .

Question 20

a) Sketch a diagram of a typical antibody molecule. Label all of the parts and briefly describe the role of each part.
b) Explain how B-lymphocytes are activated to produce antibodies.

Answers to questions

Answers are supplied to most, but not all questions. Some may require you to carry out further research using the book.

Multiple Choice Questions (MCQs)

Each question consists of a stem statement or question, and 5 options. You must pick the one correct answer.

1. **The function of the immune system is to:**
   A. resist pathogens which have the potential to cause disease

2. **First-line defences do NOT include:**
   D. antibodies

3. **As part of your immune system, the function of white cells is to defend against pathogens and infection. What are white cells also known as?**
   D. leucocytes

4. **Which of the following substances or group of substances is NOT an example of a cytokine?**
   D. dopamine

5. **When basophils have moved into the tissues they are known as mast cells and release:**
   E. histamine

6. **Which of the following cells carry out phagocytosis as part of the innate immune response?**
   C. neutrophils

7. **Which of the following circulate in blood as part of the adaptive immune response?**
   B. antibodies

8. **With which part of an antibody molecule does an antigen form a complex?**
   E. binding site

9. **The secondary antibody response occurs:**
   E. when the person is exposed to the antigen on a subsequent occasion

10. **What is the most abundant type of antibody in the human body?**
    B. IgG

11. **Which of the following is NOT an example of passive immunity?**
    E. inflammatory response

12. **When a person's immune system begins to attack their own healthy cells, it is known as:**
    E. autoimmunity

Critical thinking: ARQs (assertion reasoning questions)

These questions consist of two statements:
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You must first determine whether each statement is *TRUE* or *FALSE*.
- If both statements are true, you must next determine whether the reason correctly explains the assertion. The answer will be option 1 or option 2.
- If one statement is true and the other is false then the answer is option 3 or option 4, depending on which of the statements is correct.
- If both statements are false, then the answer is option 5.

There is one option for each possible outcome.

Question 13

A = the Assertion	R = the Reason
The second line of the body's immune defence is the acquired immune response	The acquired immune response is not specific, but provides a response that destroys pathogens rapidly and promotes healing

5. Both A and R are false

Explanation

The Assertion (A) is *FALSE*. The acquired immune response is considered to be the third line of defence against pathogens; the physical and chemical barriers of the body provide first-line defences, and the second line of defence is the innate immune response, which is not specific.

The Reason (R) is *FALSE*. The acquired immune response is highly specific for each pathogen, and it takes time for lymphocytes to actively develop their primary response to exposure to a pathogen or other antigen. On re-exposure to an antigen, memory cells ensure the secondary response is rapid and specific.

Since both statements are incorrect, **option 5 is the appropriate one to select.**

Question 14

A = the Assertion	R = the Reason
A vaccine is a special preparation of antibody that is used to produce active, measurable immunity to a specific disease	Antibodies are proteins that are able to bind specifically and precisely to antigen molecules, e.g. from a pathogenic bacterium

4. A is false but R is true

Explanation

The Assertion (A) is *FALSE*. Vaccines are preparations of antigenic material, not preparations of antibodies. Vaccines are designed to stimulate the acquired immune response and produce active immunity to a specific disease by stimulating the production of antibodies.

The Reason (R) is *TRUE*. Antibodies are glycoproteins that are made by B-lymphocytes (plasma cells) and they belong to the family of immunoglobulins. All antibody molecules possess a hypervariable region, which forms an antigen-binding site that binds to an antigen in a lock-and-key manner that is specific.

Since A is FALSE and R is TRUE, **option 4 is correct**.

Question 15

A = the Assertion	R = the Reason
B-lymphocytes are white cells that circulate until they meet and bind specifically with an antigen before they produce antibodies	$CD8^+$ T-lymphocytes are sometimes called "helper" T cells because they interact closely with antigen-presenting cells and B-lymphocytes to stimulate production of antibodies

3. A is true but R is false

Explanation

The Assertion (A) is *TRUE*. B-lymphocytes are the cells which, when activated, divide by mitosis to form a clone of plasma cells whose function is to produce antibody molecules.

The Reason (R) is *FALSE*. The statement describes the function of $CD4^+$ lymphocytes, which are the so-called "helper" group of T cells.

The function of $CD8^+$ T cells is to seek out, recognise and destroy cells that have been attacked by viruses or have become malignant.

Since A is correct and R is incorrect, **option 3 is the appropriate one to select**.

Question 16

A = the Assertion	R = the Reason
The characteristic signs of inflammation are heat, redness or discolouration, swelling and pain or loss of function	Tissue damage stimulates the release of histamine and other cytokine molecules that trigger vasodilation, increase blood flow and make blood vessels more permeable

1. Both A and R are true and R is the correct explanation of A

Explanation

The Assertion (A) is *TRUE* because it describes the characteristic signs of an inflammatory response to trauma or injury such as a wound, insect bite or foreign body. Inflammation can be acute or chronic and may also be caused by a hypersensitivity reaction to something in the environment.

The Reason (R) is also *TRUE*. Histamine is a chemical that is released when tissue is damaged or infected and results in dilation of blood vessels. This increases the flow of blood to the area, which becomes hot and warm. Capillaries become more permeable, allowing fluid to leak into the tissue spaces, causing swelling (oedema).

The wound or trauma may limit movement, but itching and pain are often triggered by histamine, which stimulates sensory nerve endings to transmit information to the spinal cord and onwards to the brain. This activation is perceived as pain.

Both statements are correct and R is the correct explanation of A, **so the correct option is 1.**

Question 17

A = the Assertion	R = the Reason
Body temperature is normally controlled in the hypothalamus, so when the set point is raised by a fever, the affected person may feel warm, cold, sweaty or shivery	A fever is a high core temperature, and occurs when body temperature rises above the normal range, due to a physiological mechanism that increases the temperature set point in an attempt to combat a pathogen

1. Both A and R are true and R is the correct explanation of A

Explanation

The Assertion (A) is *TRUE*. A fever, also called pyrexia, is when the core temperature of the body rises above the normal range. The affected person may feel warm, cold or shivery because the upward rise in the set point triggers heat-generating effects such as muscle contraction to increase metabolic rate and reduced heat loss through the skin, which make the person feel cold and shivery. When the normal homeostatic set point is restored, the end of the heat-generating processes can make the person feel very warm, while sweating helps to cool the body to the new, lower setting.

The Reason (R) is *TRUE*. A *fever* is usually a symptom of an underlying condition, most often an infection. The normal homeostatic range for body temperature is 36.5–37.5°C, but part of the natural response to the presence of pathogen is to increase the body temperature to a new, higher set point. The upward rise in temperature caused by *pyrogens* such as prostaglandins may create an environment that is unfavourable for heat-sensitive pathogens.

Both A and R are true and R is the correct explanation of A, so **the correct answer is option 1**.

Putting it all together

Question 19

Complete the following paragraph using the words in the bullet list.

- acquired
- antibodies
- antigens
- B cells
- bone marrow
- pathogens
- T cells

Lymphocytes are the primary cells involved in the **acquired** immune response. They are small white cells that originate in **bone marrow**. Two important groups of lymphocytes are **B cells**, which produce **antibodies**, and **T cells**, which detect **antigens** and are capable of attacking and destroying **pathogens**.