Chapter 40

The Immune System and Disease

Section 40–1 Infectious Disease (pages 1029–1033)
This section describes the causes of disease and explains how infectious diseases are transmitted.

Introduction (page 1029)
1. Any change, other than an injury, that disrupts the normal functions of the body, is a(an) ______ disease_____.
2. What are three ways diseases can come about? Diseases can be inherited, caused by materials in the environment, or produced by organisms.
3. Disease-causing organisms are called ______ pathogens_____.

The Germ Theory of Disease (pages 1029–1030)
4. State the germ theory of disease. Infectious diseases are caused by microorganisms, or germs.
5. Circle the letter of each scientist whose work led to the germ theory of disease.
6. Is the following sentence true or false? Lyme disease is caused by bacteria. ______ true_____
7. Circle the letter of the type of organism that spreads Lyme disease.
a. mosquito b. deer tick c. deer fly d. horse fly

Koch’s Postulates (page 1030)
8. What are scientists trying to identify when they use Koch’s postulates? They are trying to identify the microorganism that causes a specific disease.
9. Number the steps in the flowchart below so they show how to apply Koch’s postulates.

Pathogen identified → Pathogen injected into healthy lab mouse → Pathogen grown in pure culture → Healthy mouse becomes sick → Pathogen identified

1     2     3   4   5
Chapter 40, The Immune System and Disease (continued)

Agents of Disease (page 1031)

10. Is the following sentence true or false? Most of the bacteria and yeast that are found in the body are harmful and cause disease.
   false

11. List two ways that bacteria can produce illness.
   a. Breaking down tissues
   b. Releasing toxins

12. Poisons that produce illness by disrupting body functions are called ________ toxins ________.

13. How does a virus reproduce inside a host cell? It uses the materials of the host cell to make copies of itself.

14. Pathogens that live and feed inside infected organisms are called ________ parasites ________.

Match each type of pathogen with a disease caused by that type.

<table>
<thead>
<tr>
<th>Type of Pathogen</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>d 15. Virus</td>
<td>a. Athlete’s foot</td>
</tr>
<tr>
<td>b 16. Bacterium</td>
<td>b. Tetanus</td>
</tr>
<tr>
<td>e 17. Protist</td>
<td>c. Tapeworm</td>
</tr>
<tr>
<td>c 18. Worm</td>
<td>d. Influenza</td>
</tr>
<tr>
<td>a 19. Fungus</td>
<td>e. Malaria</td>
</tr>
</tbody>
</table>

How Diseases Are Spread (page 1032)

20. List three ways that infectious diseases are spread.
   a. Coughing, sneezing, or physical contact
   b. Contaminated water or food
   c. Infected animals

21. Animals that carry disease-causing organisms from person to person are called ________ vectors ________.

22. Is the following sentence true or false? Thorough handwashing does not help prevent the spread of many pathogens.
   false

23. Is the following sentence true or false? Some of the most dangerous disease-causing organisms are spread from one person to another by sexual contact.
   true

24. Circle the letter of each choice that is a sexually transmitted disease.
   a. syphilis  b. gonorrhea  c. AIDS  d. malaria
Fighting Infectious Diseases (page 1033)

25. Compounds that kill bacteria without harming the cells of humans or animals are called _______ antibiotics _______.

26. Circle the letter of each sentence that is true about antibiotics.
   a. They work by interfering with the cellular processes of microorganisms.
   b. Many of them are produced by living organisms.
   c. They were first discovered in the 1940s.
   d. They are effective against viruses.

27. How do antiviral drugs fight viral diseases? _______ Antiviral drugs inhibit the ability of viruses to invade cells and to multiply once inside of cells _______.

Section 40–2 The Immune System (pages 1034–1040)

This section describes the body’s defenses against disease-causing organisms and explains what immunity is.

Nonspecific Defenses (pages 1034–1035)

1. The body’s primary defense against pathogens is the _______ immune system _______.

Match the type of defense with its role in the body.

<table>
<thead>
<tr>
<th>Defense</th>
<th>Role</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Nonspecific</td>
<td>a. Destroying harmful pathogens that enter the body</td>
<td></td>
</tr>
<tr>
<td>a. Specific</td>
<td>b. Preventing pathogens from entering the body</td>
<td></td>
</tr>
</tbody>
</table>

4. What is the job of the body’s first line of defense? _______ Its job is to keep pathogens out of the body _______.

5. List the four components of the body’s first line of defense.
   a. Skin _______ c. Sweat _______
   b. Mucus _______ d. Tears _______

6. Is the following sentence true or false? The body’s most important nonspecific defense is the skin. _______ true _______

7. How does mucus help protect the body from disease? _______ It traps bacteria and viruses _______.

8. Body secretions contain an enzyme, called _______ lysozyme _______, that kills bacteria.

9. When does the body’s second line of defense come into play? _______ It comes into play when pathogens enter the body _______.

10. Is the following sentence true or false? The inflammatory response is a nonspecific reaction to tissue damage caused by injury or infection. _______ true _______.

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Chapter 40, The Immune System and Disease (continued)

11. White blood cells called ______ phagocytes ______ engulf and destroy bacteria.

12. Why does an increase in the number of white blood cells indicate that the body is dealing with a serious infection? When pathogens are detected in the body, the immune system produces millions of white blood cells to fight the infection.

13. An elevated body temperature is called a(an) ______ fever ______.

14. Circle the letter of each sentence that is true about elevated body temperature.
   
   a. It kills many pathogens.
   b. It speeds up the action of white blood cells.
   c. It decreases heart rate.
   d. It slows down chemical reactions.

15. Is the following sentence true or false? Interferon is a protein that helps fight bacterial infections. ______ false ______

Specific Defenses (pages 1036–1039)

16. What is the immune response? __It is a series of specific defenses that attack a disease-causing agent.__

17. A substance that triggers the immune response is known as a(an) ______ antigen ______.

18. What are some examples of antigens? Examples include carbohydrates, proteins, and lipids on the surfaces of viruses, bacteria, and other pathogens.

19. List the two different immune responses.
   
   a. Humoral immunity ____________
   b. Cell-mediated immunity ____________

20. Circle the letter of each sentence that is true about humoral immunity.
   
   a. It is a response to pathogens in body fluids.
   b. It depends on lymphocytes.
   c. It involves antibodies.
   d. It involves plasma cells.

21. A protein that helps destroy pathogens is called a(an) ______ antibody ______.

22. What happens to a clump of viruses and antibodies? The clump attracts phagocytes, which engulf and destroy it.

23. Is the following sentence true or false? Antibodies can fight viruses but not bacteria. ______ false ______
24. Label the antigen-binding sites in the drawing below.

\[\text{Antigen-binding site}\]
\[\text{Antigen}\]
\[\text{Antibody}\]

Match the type of cell with its role in humoral immunity.

<table>
<thead>
<tr>
<th>Type of Cell</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>b 25. B cell</td>
<td>a. Assisting plasma cells</td>
</tr>
<tr>
<td>a 26. T cell</td>
<td>b. Producing antibodies</td>
</tr>
</tbody>
</table>

27. Is the following sentence true or false? Plasma cells are specialized B cells. **true**

28. How does permanent immunity develop? **Once the body has been exposed to certain pathogens, millions of memory B cells remain capable of producing specific antibodies to that pathogen. This ensures that the disease never gets a chance to develop a second time.**

29. Circle the letter of each sentence that is true about cell-mediated immunity.

- a. It relies on lymphocytes. **c. It involves antibodies.**
- b. It involves killer T cells. **d. It causes pathogen cells to rupture and die.**

30. Is the following sentence true or false? Cell-mediated immunity is particularly important for diseases caused by prokaryotic pathogens. **false**

Active Immunity  (pages 1039–1040)

31. The first smallpox vaccine was produced by _______ Edward Jenner _______.

32. What is vaccination? **It is the injection of a weakened or mild form of a pathogen to produce immunity.**

33. How do vaccines work? **Vaccines stimulate the immune system to create millions of plasma cells ready to produce specific types of antibodies should you ever be exposed to the pathogen.**
Chapter 40, The Immune System and Disease (continued)

Passive Immunity (page 1040)

34. Complete the Venn diagram comparing types of immunity.

<table>
<thead>
<tr>
<th>Active Immunity</th>
<th>Passive Immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is due to antigens</td>
<td>Can result from vaccination</td>
</tr>
<tr>
<td>Lasts for life</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is due to antibodies</td>
</tr>
<tr>
<td></td>
<td>Lasts for a short time</td>
</tr>
</tbody>
</table>

Section 40–3 Immune System Disorders (pages 1041–1044)

This section describes diseases that affect the immune system.

Allergies (pages 1041–1042)

1. An overreaction of the immune system caused by antigens is called a(an) ______ allergy _______.

2. Circle the letter of each choice that is a result of allergens binding to mast cells.
   a. The mast cells release chemicals known as histamines.
   b. There is increased flow of blood and fluids to the surrounding area.
   c. Sneezing, runny eyes, and other symptoms occur.
   d. Antihistamines are released by the mast cells.

3. A condition in which smooth muscle contractions reduce the size of air passageways in the lungs and make breathing very difficult is called ______ asthma _______.

4. Circle the letter of the choice that is the usual trigger of an asthma attack.
   a. A combination of many different antigens
   b. A particular antigen
   c. A drug that is inhaled
   d. Relaxation of the smooth muscles

5. Is the following sentence true or false? The best way to avoid an asthma attack is to avoid the antigen that produces the attack. ______ true _______
Autoimmune Disease (page 1042)

6. What produces an autoimmune disease? It is produced by the immune system making a mistake and attacking the body's own cells.

7. Complete the compare-and-contrast table.

<table>
<thead>
<tr>
<th>Autoimmune Disease</th>
<th>Organ or Tissue That Is Attacked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatic fever</td>
<td>Lining and valves of the heart</td>
</tr>
<tr>
<td>Juvenile-onset diabetes</td>
<td>Insulin-producing cells of the pancreas</td>
</tr>
<tr>
<td>Myasthenia gravis</td>
<td>Nerve receptors of muscles</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Myelin sheath surrounding nerve fibers</td>
</tr>
</tbody>
</table>

AIDS (pages 1042–1044)

8. Is the following sentence true or false? AIDS is a type of disease in which the immune system is weakened by infection. ________


10. List some of the diseases that may be symptoms of AIDS.
    a. Protozoa in the lungs
    b. A rare form of skin cancer
    c. Severe fungal infections in the mouth and throat

11. What made scientists suspect that AIDS was caused by a virus? The spread of the disease made scientists suspect this.

12. Circle the letter of the choice that refers to the cells that are attacked by HIV.
    a. Helper T cells
    b. Killer T cells
    c. Red blood cells
    d. Helper B cells

13. Is the following sentence true or false? The body does not produce antibodies against HIV. ________

14. Circle the letter of each choice that is true about the spread of HIV.
    a. It is usually spread by casual contact.
    b. It is spread only by sexual contact.
    c. It can be spread by sharing intravenous drug needles.
    d. It is spread only by contact with infected blood or other body fluids.
Chapter 40, The Immune System and Disease (continued)

15. Is the following sentence true or false? Any sexual contact carries some risk of contracting HIV. _______true_______

Reading Skill Practice

When you read about new or difficult concepts, making a concept map can help you better understand and remember the ideas. Make a concept map that shows how immune system disorders are classified, based on the material in Section 40–3. For more information about concept maps, see Appendix A of your text. Do your work on a separate sheet of paper.

Students’ concept maps should show that immune system disorders are classified as allergies, in which the immune system overreacts to antigens; autoimmune diseases, in which the immune system attacks the body's own cells; and diseases such as AIDS, in which the immune system itself is attacked.

Section 40–4 Cancer (pages 1046–1048)

This section explains what cancer is, identifies its causes, and describes how it is treated.

Introduction (page 1046)

1. Circle the letter of each sentence that is true about cancer.
   a. It is generally a life-threatening disease.
   b. It is characterized by cells multiplying uncontrollably and destroying healthy tissue.
   c. It is caused by foreign cells invading the body.
   d. Its is easy to treat and to understand.

A Cellular Disease (page 1046)

2. When do cancers begin? _______Cancers begin when something goes wrong with the controls that normally regulate cell growth and division._______

3. A mass of growing tissue is known as a(an) _______tumor_____.

4. Is the following sentence true or false? All tumors are cancerous. _______false_______

Match the type of tumor with its description.

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 5. Benign</td>
<td>a. Does not spread to surrounding healthy tissue or to other parts of the body</td>
</tr>
<tr>
<td>b. 6. Malignant</td>
<td>b. Can invade and destroy surrounding healthy tissue or spread to other parts of the body</td>
</tr>
</tbody>
</table>

7. The spread of cancerous tumors beyond their original site is called _______metastasis_____.

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8. List three ways that cancer cells cause illness as they spread.
   a. They absorb the nutrients needed by other cells.
   b. They block nerve connections.
   c. They prevent the organs they invade from functioning properly.

Causes of Cancer (pages 1046–1047)
9. Complete the concept map.

![Diagram of causes of cancer]

10. What is an example of a virus that causes cancer in humans? An example is the human papilloma virus, or HPV.

11. Chemical compounds that are known to cause cancer are called carcinogens.

Fighting Cancer (pages 1047–1048)
12. Why is it important to detect cancer early? If cancer is detected early, there is a better chance of treating it successfully.

13. List the three general categories of treatments for cancer.
   a. Surgery
   b. Radiation therapy
   c. Drug therapy

14. Which types of tumors are often removed by surgery? Localized cancerous tumors, or those that do not spread quickly, are often removed by surgery.

15. Another name for drug therapy is chemotherapy.

16. Is the following sentence true or false? Radiation destroys fast-growing cancer cells more slowly than normal cells. False
Chapter 40, The Immune System and Disease  (continued)

Progress Against Cancer  (page 1048)

17. Circle the letter of each sentence that is true about cancer in the United States since 1990.
   a. There has been little progress in fighting cancer.
   b. The incidence of cancer has increased.
   c. The rate of cancer deaths has declined steadily.
   d. Researchers have developed antibiotics that destroy cancer cells.

WordWise

Answer the questions by writing the correct vocabulary terms from Chapter 40 in the blanks. Use the circled letter from each term to find the hidden word. Then, write a definition for the hidden word.

1. What type of treatment uses a combination of chemicals to destroy cancer cells?
   chemotherapy

2. What is a compound that blocks the growth and reproduction of bacteria?
   antibiotic

3. What is a mass of rapidly growing cells?
   tumor

4. What is a chemical that is released by activated mast cells?
   histamine

5. What is a specialized protein produced by the immune system that helps destroy disease-causing organisms?
   antibody

6. What is a tumor called if it can invade and destroy surrounding healthy tissue?
   malignant

7. What is the spread of a cancerous tumor beyond its original site?
   metastasis

8. What is a substance that triggers an immune response?
   antigen

Hidden Word:  pathogen

Definition:  A pathogen is a disease-causing organism.