

CHAPTER 6

BLOOD AND THE LYMPHATIC AND IMMUNE SYSTEMS

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MEDIA LIBRARY

Student DVD-ROM

- Twelve different interactive learning games
- Flash card generator
- Audio Glossary
- Professional Profile videos—Clinical Laboratory Science
 - Clinical or Medical Laboratory Science Technologist
 - Clinical or Medical Laboratory Science Technicians
 - Phlebotomist
- Body Rhythms
- Terminology Translator

Companion Website

- Multiple Choice, True/False, and Fill-in-the-Blank practice questions
- Labeling exercises
- Case study
- Additional Professional Profile information
- *New York Times* link for research into specific pathologies
- Web Destination activities
- Audio Glossary
- Link to VangoNotes
- Link to drug updates

IRDVD

- Animations
 - 3D interactive animation of lymphatic system anatomy
 - Sickle cell anemia
- Drag-and-drop labeling activity for:
 - Blood typing
 - Lymphatic system anatomy
- Videos
 - Leukemia
 - Phlebotomy
- Inflammation
- Anaphylaxis
- AIDS
- Digital library of all figures from text chapter, labeled and unlabeled
- Test bank with 200 objective questions per chapter plus two short answer questions
- 20 classroom response questions
- PowerPoint presentation for classroom or online utilization

OBJECTIVE 1

Identify and define the combining forms and suffixes introduced in this chapter.

Text pages: 168; 179; PowerPoint slides: 6–8; 65–67

LECTURE NOTES

Blood Combining Forms

agglutin/o	clumping
bas/o	base
chrom/o	color
coagul/o	clotting
eosin/o	rosy red
erythr/o	red
fibrin/o	fibers, fibrous
granul/o	granules
hem/o	blood
hemat/o	blood
leuk/o	white
morph/o	shape
neutr/o	neutral
phag/o	eat, swallow
sanguin/o	blood
thromb/o	clot

Blood Suffixes

-apheresis	removal, carry away
-cytosis	more than the normal number of cells
-emia	blood condition
-globin	protein

TEACHING STRATEGIES

- Encourage/remind students to add new word parts to flash cards.

Medical Terminology Bee

- Create PowerPoint flash cards of new combining forms and suffixes presented in this chapter; have all students stand and then define word part; if student is correct, he/she remains standing; if student is wrong, he/she sits down; continue until only one student is standing.

LEARNING ACTIVITIES

Worksheet 6A

- New Combining Form and Suffix Handout

Worksheet 6B

- Med Term Analysis

Quiz 6A

- May be used as a worksheet

Text

- Practice Exercises

Student DVD-ROM

- Learning games
- Make flash cards

-penia	abnormal decrease, too few
-phil	attracted to
-poiesis	formation
-stasis	standing still

Lymphatic and Immune Systems Combining Forms

adenoid/o	adenoids
immun/o	protection
lymph/o	lymph
lymphaden/o	lymph node
lymphangi/o	lymph vessel
path/o	disease
splen/o	spleen
thym/o	thymus
tonsill/o	tonsils
tox/o	poison

Lymphatic and Immune Systems Suffixes

-globulin	protein
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CW

- Practice questions

ASSESSMENTS

Quiz 6A—New Word Parts Quiz
Test Bank—Fill-in-the-Blank questions

OBJECTIVE 2

Correctly spell and pronounce medical terms and major anatomical structures relating to blood and the lymphatic and immune systems.

LECTURE NOTES

Pronunciation for medical terms in this chapter can be found:

- In parentheses following key terms
- In the Audio Glossary on Student DVD-ROM
- In the Audio Glossary at Companion Website

TEACHING STRATEGIES

Emphasize to students:

- Importance of correctly spelling terms.
- How sounding out terms can assist in learning how to spell the terms.

Say each new term in class and have students repeat it.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension of spelling strategies.

LEARNING ACTIVITIES

Worksheet 6B

- Medical Term Analysis

Terminology Checklist

- Can be used to practice pronunciation using the Audio Glossary as a reference

Text

- Practice Exercises

Flash cards

- Look at definition and write out/pronounce terms

Student DVD-ROM

- Audio Glossary
- Spelling Challenge game
- Crossword and Word Search puzzles

ASSESSMENTS

Quiz 6B—Spelling Quiz

Suggested terms:

1. hematopoiesis
2. erythrocyte
3. eosinophil
4. thromboplastin
5. leukocytopenia
6. dyscrasia
7. septicemia
8. hypochromic
9. pernicious
10. thalassemia
11. hematocrit
12. phlebotomy
13. plasmapheresis
14. macrophage
15. vaccination
16. lymphadenopathy
17. anaphylaxis
18. urticaria
19. immunodeficiency
20. sarcoidosis

Test Bank—questions

OBJECTIVE 3

Locate and describe the major components, structures, and organs of blood and the lymphatic and immune systems and their functions.

Text pages: 170–172; 181–184; PowerPoint slides: 9–23; 68–89

LECTURE NOTES

Blood

- Average adult has about five liters of blood
- Circulates throughout body within blood vessels
- Mixture of cells floating in watery **plasma**
- Cells are referred to as **formed elements**; three different kinds: **erythrocytes** or **red blood cells**, **leukocytes** or **white blood cells**, and **platelets**
- Cells produced in red bone marrow by process of **hematopoiesis**
- Plasma and erythrocytes are responsible for transporting substances
- Leukocytes protect body from invading microorganisms
- Platelets play role in controlling bleeding

Plasma

- Liquid plasma composes about 55 percent of whole blood

TEACHING STRATEGIES

Visual Aids

- Use full-size anatomical charts and models to illustrate different types of blood cells and lymphatic system organs.

IRDVD

- See PowerPoint presentation on the Instructor's Resource DVD for a drag-and-drop lymphatic system anatomy activity; display on screen and have students discuss and place labels during class.
- See PowerPoint presentation on the Instructor's Resource DVD for a 3D animation of the lymphatic system organs.

- 90 to 92 percent water; remaining 8 to 10 percent portion of plasma is dissolved substances, especially **plasma proteins** such as **albumin, globulins, and fibrinogen**
- Albumin helps transport fatty substances that cannot dissolve in watery plasma
- Three main types of globulins; most commonly known is **gamma globulin**, which acts as antibodies
- Fibrinogen is blood-clotting protein
- Smaller amounts of other important substances are dissolved in plasma for transport: **calcium, potassium, sodium, glucose, amino acids, fats**, and waste products such as **urea** and **creatinine**

Erythrocytes

- Red blood cells (RBCs)
- Biconcave disks and are **enucleated**, meaning they no longer contain a nucleus; see ■ Figure 6.1
- Appear red in color because contain **hemoglobin**, iron-containing pigment; part of red blood cell that picks up oxygen from lungs and delivers it to tissues
- About five million erythrocytes per cubic millimeter of blood; total number in an average-sized adult is 35 trillion; males have more red blood cells than females
- Average life span of 120 days; spleen removes worn-out and damaged ones from circulation; much can be recycled, like iron; but **bilirubin** is waste product disposed of by liver

Leukocytes

- White blood cells (WBCs)
- Provide protection against invasion of **pathogens** such as bacteria, viruses, and foreign material
- Have spherical shape with large nucleus; see ■ Figure 6.2
- About 8,000 per cubic millimeter of blood
- Five different types of white blood cells, each with own strategy for protecting body; can be subdivided into two categories: **granulocytes** (with granules in the cytoplasm) and **agranulocytes** (without granules in the cytoplasm)
- See ■ Table 6.1

TABLE 6.1 Types of Leukocytes

Leukocyte	Function
Granulocytes	
Basophils (basos)	Release histamine and heparin to damaged tissues
Eosinophils (eosins)	Destroy parasites and increase during allergic reactions
Neutrophils	Important for phagocytosis; most numerous of the leukocytes
Agranulocytes	
Monocytes (monos)	Important for phagocytosis
Lymphocytes (lymphs)	Provide protection through an immunity activity

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Labeling exercise
- Practice Exercises

Student DVD-ROM

- Labeling exercise
- Learning games

CW

- Labeling exercise
- Practice questions

Quizzes 6C & 6D

- May be used as a worksheet

ASSESSMENTS

Quizzes 6C & 6D—Labeling Diagrams

Test Bank—questions

Platelets

- Modern term for **thrombocyte**
- Smallest of all formed blood elements
- Not whole cells, but rather are formed when cytoplasm of large precursor cell shatters into small plate-like fragments; see ■ Figure 6.3
- Between 200,000 and 300,000 per cubic millimeter
- Play critical part in blood-clotting process or **hemostasis**; they **agglutinate** or clump together into small clusters when blood vessel is cut or damaged
- Also release substance called **thromboplastin**, which, in presence of calcium, reacts with **prothrombin**, clotting protein in blood, to form **thrombin**; thrombin works to convert fibrinogen to **fibrin**, which eventually becomes the mesh-like blood clot

Lymphatic and Immune Systems

- Lymphatic system consists of network of **lymphatic vessels**, **lymph nodes**, **spleen**, **thymus gland**, and **tonsils**
- Perform several quite diverse functions
 1. Collect excess tissue fluid throughout body; return it to circulatory system; fluid once inside lymphatic vessel is referred to as **lymph**; see ■ Figure 6.7
 2. Lymph vessels around small intestines called **lacteals**; able to pick up absorbed fats for transport
 3. Lymphatic system works with immune system to form groups of cells, tissues, organs, and molecules that serve as body's primary defense against invasion of pathogens, as well as removing our own cells that have become diseased

Lymphatic Vessels

- Extensive network of vessels throughout entire body
- Unlike circulatory system, these vessels not in closed loop; serve as one-way pipes conducting lymph from tissues toward thoracic cavity
- See Figures ■ 6.8 and 6.9
- Begin as very small **lymphatic capillaries** in tissues; excessive tissue fluid enters capillaries to begin trip back to circulatory system
- Capillaries merge into larger lymphatic vessels; very low pressure system; vessels have **valves** along length to ensure lymph moves forward toward thoracic cavity
- Vessels drain into one of two large **lymphatic ducts**, **right lymphatic duct** or **thoracic duct**; smaller right lymphatic duct drains right arm and right side of neck and chest; duct empties lymph into right subclavian vein; larger thoracic duct drains lymph from rest of body and empties into left subclavian vein

Lymph Nodes

- Small organs composed of lymphatic tissue located along route of lymphatic vessels
- Also referred to as **lymph glands**
- House lymphocytes and antibodies
- Work to remove pathogens and cell debris as lymph passes through them on way back to thoracic cavity
- Also serve to trap and destroy cells from cancerous tumors
- Particularly concentrated in several regions; see ■ Figure 6.9 and Table 6.2 for description of some of the most important sites for lymph nodes

TABLE 6.2 Common Lymph Node Locations

Name	Location	Function
Axillary	Armpits	Become enlarged during infections of arms and breasts; cancer cells from breasts may be present
Cervical	Neck	Drains parts of head and neck; may be enlarged during upper respiratory infections
Inguinal	Groin	Drains area of the legs and lower pelvis
Mediastinal	Chest	Assists in draining infection from within the chest cavity

Tonsils

- Collections of lymphatic tissue located on each side of throat or **pharynx**
- See ■ Figure 6.11
- Three sets of tonsils: **palatine tonsils**; **pharyngeal tonsils** (commonly referred to as **adenoids**); and **lingual tonsils**
- Contain large number of leukocytes
- Act as filters to protect body from invasion of pathogens through digestive or respiratory systems
- Not vital organs and can safely be removed if they become continuous site of infection

Spleen

- Located in upper left quadrant of abdomen
- Consists of lymphatic tissue highly infiltrated with blood vessels
- See ■ Figure 6.12
- Vessels spread out into slow-moving **blood sinuses**
- Filters out and destroys old red blood cells, recycles iron, and also stores some of blood supply for body
- Phagocytic **macrophages** line blood sinuses engulf and remove pathogens; blood moves through spleen slowly, macrophages have time to carefully identify pathogens and worn-out red blood cells
- Not a vital organ and can be removed due to injury or disease; without spleen, person's susceptibility to bloodstream infection may be increased

Thymus Gland

- Located in upper portion of the mediastinum
- Essential for proper development of immune system
- See ■ Figure 6.13
- Assists body with immune function and development of antibodies
- Secretes hormone, **thymosin**; changes lymphocytes to **T lymphocytes** (simply called **T cells**); play important role in immune response
- Active in unborn child and throughout childhood until adolescence, when it begins to shrink in size

OBJECTIVE 4

Describe the blood typing systems.

Text pages: 172–173; PowerPoint slides: 24–30

LECTURE NOTES

- Each person's blood different due to presence of antigens on surface of erythrocytes
- Before person receives blood transfusion important to do **blood typing**
- Laboratory test to determine if donated blood is compatible with recipient's blood
- Many different subgroups of blood markers, but two most important ones are **ABO system** and **Rh factor**

ABO System

- In ABO blood system there are two possible red blood cell markers, A and B
- Markers are one method by which cells identify themselves
- Person with A marker is said to have **type A** blood; type A blood produces anti-B antibodies that attack type B blood
- B marker gives **type B** blood and anti-A antibodies that will attack type A blood
- Both markers are present, the blood is **type AB** and does not contain any antibodies; type AB blood will not attack other blood types
- Absence of either A or B marker results in **type O** blood; contains both anti-A and anti-B antibodies; type O blood attacks all other blood types
- Further information on antibodies is in lymphatic section later in this chapter
- **Universal donor:** because type O blood does not have either marker A or B, it will not react with anti-A or anti-B antibodies; for this reason person with type O blood is referred to as **universal donor**; in extreme cases, type O blood may be given to person with any of other blood types
- **Universal recipient:** type AB blood is **universal recipient**; person with type AB blood has no antibodies against other blood types; in extreme cases, can receive any type of blood

Rh Factor

- Not as difficult to understand as ABO system
- Person with Rh factor on his or her red blood cells is **Rh-positive (Rh+)**; this person has factor so will not make anti-Rh antibodies
- Person without Rh factor is **Rh-negative (Rh-)**; will produce anti-Rh antibodies
- Rh+ person may receive both Rh+ and Rh- transfusion
- Rh- person can receive only Rh- blood

TEACHING STRATEGIES

IRDVD

- See PowerPoint presentation on the Instructor's Resource DVD for drag-and-drop activity on blood typing; display on screen and have students discuss and place labels during class.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture

Guest Speaker

- Invite someone from a blood bank, American Red Cross, or plasma donation center to speak to the class; if possible, have him or her do blood typing for volunteers from the class.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Practice Exercises

Student DVD-ROM

- Learning games

CW

- Practice questions

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

OBJECTIVE 5

Describe immunity, the immune response, and standard precautions.

Text pages: 184–186; PowerPoint slides: 90–100

LECTURE NOTES

Immunity

- Body's ability to defend itself against pathogens, such as **bacteria, viruses, fungi, protozoans, toxins, and cancerous tumors**
- Comes in two forms: **natural immunity** and **acquired immunity**
- Natural immunity, also called *innate immunity*, is not specific to particular disease; does not require prior exposure to pathogenic agent; example is **macrophage**; these leukocytes are present throughout all tissues of body, but are concentrated in areas of high exposure to invading bacteria, like lungs and digestive system; very active phagocytic cells, ingesting and digesting any pathogen they encounter (see ■ Figure 6.14)
- Acquired immunity is body's response to specific pathogen; may be established either passively or actively
- **Passive acquired immunity** results when person receives protective substances produced by another human or animal; may take form of maternal antibodies crossing placenta to baby, or antitoxin or gamma globulin injection
- **Active acquired immunity** develops following direct exposure to pathogenic agent; agent stimulates body's **immune response**, series of different mechanisms all geared to neutralize the agent; example — person typically can catch chickenpox only once because once body has successfully fought virus it will be able to more quickly recognize and kill it in future
- **Immunizations** or **vaccinations** are special types of active acquired immunity; instead of actually being exposed to infectious agent and having disease, person is exposed to modified or weakened pathogen still capable of stimulating immune response but not actually causing disease

Immune Response

- Disease-causing agents are recognized as being foreign because they display proteins that are different from person's own natural proteins
- Foreign proteins, called **antigens**, stimulate immune response; consists of two distinct and different processes: **humoral immunity** (also called **antibody-mediated immunity**) and **cellular immunity** (also called **cell-mediated immunity**)
- Humoral immunity refers to production of **B lymphocytes**, also called **B cells**; respond to antigens by producing protective protein, **antibody**; antibodies combine with antigen to form **antigen-antibody complex**; complex either targets foreign substance for phagocytosis or prevents infectious agent from damaging healthy cells
- Cellular immunity involves production of T cells and **natural killer (NK) cells**; these defense cells are **cytotoxic**, meaning they physically attack and destroy pathogenic cells

TEACHING STRATEGIES

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Practice Exercises

Student DVD-ROM

- Learning games

CW

- Practice tests

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

Standard Precautions

- Hospital and other healthcare settings contain large number of infective pathogens; patients and healthcare workers are exposed to each other's pathogens and sometimes become infected; infection acquired in this manner is referred to as **nosocomial infection**; spread in several ways
 1. **Cross infection**—person, either patient or healthcare worker, acquires pathogen from another patient or healthcare worker
 2. **Reinfection**—patient becomes infected again with same pathogen that originally brought him or her to hospital
 3. **Self-inoculation**—person becomes infected in different part of body by pathogen from another part of his or her own body—such as intestinal bacteria spreading to the urethra
- Appearance of human immunodeficiency virus (HIV) and hepatitis B virus (HBV) in the mid-1980s, fight against spreading infections took on even greater significance; in 1987 **Occupational Safety and Health Administration (OSHA)** issued mandatory guidelines to ensure that all employees at risk of exposure to body fluids are provided with personal protective equipment
- Guidelines state that all human blood, tissue, and body fluids must be treated as if they were infected with HIV, HBV, or other blood-borne pathogens
- Guidelines expanded in 1992 and 1996 to encourage fight against not just blood-borne pathogens, but all nosocomial infections spread by contact with blood, mucous membranes, nonintact skin, and all body fluids (including amniotic fluid, vaginal secretions, pleural fluid, cerebrospinal fluid, peritoneal fluid, pericardial fluid, and semen)
- Guidelines are commonly referred to as Standard Precautions:
 1. Wash hands before putting on and after removing gloves and before and after working with each patient or patient equipment.
 2. Wear gloves when in contact with any body fluid, mucous membrane, or nonintact skin or if you have chapped hands, rash, or open sores.
 3. Wear nonpermeable gown or apron during procedures that are likely to expose you to any body fluid, mucous membrane, or nonintact skin.
 4. Wear mask and protective equipment or face shield when patients are coughing often or if body fluid droplets or splashes are likely.
 5. Wear facemask and eyewear that seal close to face during procedures that cause body tissues to be vaporized.
 6. Remove for proper cleaning any shared equipment—such as thermometer, stethoscope, or blood pressure cuff—that has come into contact with body fluids, mucous membrane, or non-intact skin.

OBJECTIVE 6

Build and define blood and lymphatic and immune systems medical terms from word parts.

Text pages: 173; 187; PowerPoint slides: 31–35; 101–104

LECTURE NOTES

Blood

Combining Form	Medical Term	Definition
fibrin/o	fibrinogen	fiber producing
	fibrinolysis	destruction of fibers
	fibrinous	pertaining to fibers
hem/o	hemoglobin	blood protein
	hemolysis	blood destruction
	hemolytic	blood destruction
hemat/o	hemorrhage	rapid flow of blood
	hematologist	blood specialist
	hematic	pertaining to blood
sanguin/o	sanguinous	pertaining to blood
Suffix	Medical Term	Definition
-cyte	erythrocyte	red cell
	leukocyte	white cell
	thrombocyte	clotting cell
	granulocyte	granular cell
	agranulocyte	nongranular cell
-cytosis	erythrocytosis	too many red cells
	leukocytosis	too many white cells
	thrombocytosis	too many clotting cells
-penia	erythropenia	too few red (cells)
	leukopenia	too few white (cells)
	thrombopenia	too few clotting (cells)
-poiesis	pancytopenia	too few of all cells
	erythropoiesis	red (cell) producing
	hematopoiesis	blood producing
	leukopoiesis	white (cell) producing
	thrombopoiesis	clotting (cell) producing

Lymphatic and Immune Systems

Combining Form	Medical Term	Definition
adenoid/o	adenoidectomy	removal of adenoids
	adenoiditis	inflammation of adenoids
	immun/o	immunologist
lymph/o	lymphadenectomy	removal of lymph gland
	lymphadenopathy	lymph gland disease
	lymphangiogram	record of lymph vessels
	lymphangioma	lymph vessel tumor
	lymphoma	lymph tumor
path/o	lymphatic	pertaining to lymph
	pathogenic	disease producing
	pathology	study of disease

TEACHING STRATEGIES

- Reinforce how many blood and lymphatic and immune system terms can be constructed from word parts.
- Read aloud chapter terms that are made up of word parts; have students identify the parts and define the terms, either aloud or individually on paper.
- Write sentences on the board using common words; have students substitute correct medical terms.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture

LEARNING ACTIVITIES

Worksheet 6A

- New Word Parts handout

Worksheet 6B

- Med Term Analysis

Worksheet 6C

- Chapter Review

Quiz 6E

- May be used as a worksheet

Text

- Practice Exercises
- Terminology Checklist

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions

ASSESSMENTS

Quiz 6E—Word Building quiz

Quiz 6G—Chapter Review quiz

Test Bank—questions

splen/o	splenectomy	removal of spleen
	splenomegaly	enlarged spleen
thym/o	thymectomy	removal of thymus
	thymoma	thymus tumor
tonsill/o	tonsillar	pertaining to tonsils
	tonsillectomy	removal of tonsils
	tonsillitis	inflammation of tonsils

OBJECTIVE 7

Identify and define blood and lymphatic and immune systems vocabulary terms.

Text pages: 174; 187–188; PowerPoint slides: 36–38; 105–110

LECTURE NOTES

Blood

Term	Definition
blood clot	hard collection of fibrin, blood cells, and tissue debris that is end result of hemostasis or blood-clotting process
coagulate	convert from liquid to gel or solid, as in blood coagulation
dyscrasia	general term indicating presence of disease affecting blood
hematology	branch of medicine specializes in treating diseases and conditions of blood; physician is <i>hematologist</i>
hematoma	collection of blood under skin as result of blood escaping into tissue from damaged blood vessels; commonly referred to as <i>bruise</i>
hemostasis	to stop bleeding or stagnation of blood flow through tissues
packed cells	transfusion of only formed elements and without plasma
whole blood	mixture of both plasma and formed elements

Lymphatic and Immune Systems

Term	Definition
allergen	antigen that causes allergic reaction
allergist	physician specializes in testing for and treating allergies
allergy	hypersensitivity to common substance in environment or to medication
autoimmune disease	disease resulting from body's immune system attacking its own cells as if they were pathogens; examples include systemic lupus erythematosus, rheumatoid arthritis, and multiple sclerosis
hives	appearance of wheals as part of allergic reaction
human immunodeficiency virus (HIV)	virus that causes AIDS; also known as a retrovirus
immunocompromised	immune system that is unable to respond properly to pathogens; also called <i>immunodeficiency disorder</i>

TEACHING STRATEGIES

- Write sentences on the board using common words; have students substitute correct medical terms.

Jeopardy Game

- Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Pathology, Diagnostic, and Therapeutic terms.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions
- Case Study

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

immunoglobulins	antibodies secreted by B cells; antibodies are immunoglobulins and assist in protecting body and its surfaces from invasion of bacteria; example, immunoglobulin IgA in colostrum, first milk from mother, helps protect newborn from infection
immunology	branch of medicine concerned with diagnosis and treatment of infectious diseases and other disorders of immune system; physician is <i>immunologist</i>
inflammation	tissues' response to injury from pathogens or physical agents; characterized by redness, pain, swelling, and feeling hot to touch
lymphedema	edema appearing in extremities due to obstruction of lymph flow through lymphatic vessels
opportunistic infections	infectious diseases associated with patients who have compromised immune systems and therefore lowered resistance to infections and parasites; may be result of HIV infection
urticaria	severe itching associated with hives, usually linked to food allergy, stress, or drug reactions

OBJECTIVE 8

Identify and define selected blood and lymphatic and immune systems pathology terms.

Text pages: 174–175; 189; PowerPoint slides: 39–46; 111–118

LECTURE NOTES

Blood

Term	Definition
Blood	hereditary blood disease; blood-clotting time is prolonged due to lack of one vital clotting factor; transmitted by sex-linked trait from females to males, appearing almost exclusively in males
hemophilia	condition of having too high level of lipids such as cholesterol in bloodstream; risk factor for developing atherosclerosis and coronary artery disease
hyperlipidemia	bacteria or their toxins in bloodstream; <i>sepsis</i> is term that means putrefaction; commonly called <i>blood poisoning</i>

Erythrocytes

anemia	large group of conditions characterized by reduction in number of red blood cells or amount of hemoglobin in blood; results in less oxygen reaching the tissues
aplastic anemia	severe form of anemia that develops as consequence of loss of functioning red bone marrow; results in decrease in number of all formed elements; treatment may eventually require bone marrow transplant

TEACHING STRATEGIES

- Select two students to do 5-minute presentations of their Internet research in class.
- Write sentences on the board using common words; have students substitute correct medical terms.

Jeopardy Game

- Have students create questions for terms in this section for Jeopardy game to be played in class—may be combined with Vocabulary, Diagnostic, and Therapeutic terms.

IRDVD

- See PowerPoint presentation on the Instructor's Resource DVD for videos on the following topics:
 - Leukemia
 - Inflammation
 - Anaphylaxis
 - AIDS
- See PowerPoint presentation on the Instructor's Resource DVD for an animation on the topic of sickle cell anemia.

hemolytic anemia	anemia develops as result of excessive loss of erythrocytes
hemolytic reaction	destruction of patient's erythrocytes; occurs when receiving transfusion of incompatible blood type; also called <i>transfusion reaction</i>
hypochromic anemia	insufficient hemoglobin in erythrocytes; named because hemoglobin molecule is responsible for dark red color of erythrocytes
iron-deficiency anemia	insufficient iron to manufacture hemoglobin
pernicious anemia (PA)	insufficient absorption of vitamin B ₁₂ by digestive system; necessary for erythrocyte production
polycythemia vera	production of too many red blood cells by bone marrow; blood becomes too thick to easily flow through blood vessels
sickle cell anemia	genetic disorder; erythrocytes take on abnormal curved or "sickle" shape; cells are fragile and are easily damaged, leading to hemolytic anemia
thalassemia	genetic disorder; body is unable to make functioning hemoglobin, resulting in anemia
Leukocytes	
leukemia	cancer of white blood cell-forming red bone marrow; resulting in a large number of abnormal and immature white blood cells circulating in blood

Lymphatic and Immune Systems

Term	Definition
Allergic Reactions	
anaphylactic shock	life-threatening condition severe allergic reaction; may be triggered by bee stings, medications, or foods; circulatory and respiratory problems occur, including respiratory distress, hypotension, edema, tachycardia, and convulsions; also called <i>anaphylaxis</i>
Lymphatic System	
elephantiasis	inflammation, obstruction, and destruction of lymph vessels; results in enlarged tissues due to edema
Hodgkin's disease (HD)	also called <i>Hodgkin's lymphoma</i> ; cancer of lymphatic cells found in lymph nodes
lymphadenitis	inflammation of lymph nodes; referred to as <i>swollen glands</i>
mononucleosis (mono)	acute infectious disease with large number of abnormal lymphocytes; caused by Epstein-Barr virus; abnormal liver function may occur
non-Hodgkin's lymphoma (NHL)	cancer of lymphatic tissues other than Hodgkin's lymphoma

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Internet Research

- Have students select a specific pathology and use internet resources to research its symptoms, diagnosis, and treatments.

Worksheet 6C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM

- Learning games
- flash cards

CW

- Practice questions
- Case Study
- Web Destination activities on leukemia and sickle cell anemia
- *New York Times* link for research into specific pathologies

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

Immune System

acquired immunodeficiency syndrome (AIDS)	defect in cell-mediated immunity system; syndrome of opportunistic infections occurring in final stages of infection with human immunodeficiency virus (HIV); virus attacks T ₄ lymphocytes and destroys them, reducing the person's ability to fight infection
AIDS-related complex (ARC)	early stage of AIDS; positive test for virus but only mild symptoms of weight loss, fatigue, skin rash, and anorexia
graft vs. host disease (GVHD)	serious complication of bone marrow transplant (graft); immune cells from donor bone marrow attack recipient's (host's) tissues
Kaposi's sarcoma (KS)	form of skin cancer frequently seen in AIDS patients; consists of brownish-purple papules that metastasize from skin to internal organs
<i>Pneumocystis carinii</i> pneumonia (PCP)	pneumonia common in patients with AIDS; caused by infection with opportunistic parasite
sarcoidosis	disease of unknown cause that forms fibrous lesions commonly appearing in lymph nodes, liver, skin, lungs, spleen, eyes, and small bones of hands and feet
severe combined immunodeficiency syndrome (SCIDS)	disease seen in children born with nonfunctioning immune system; often forced to live in sealed sterile rooms

OBJECTIVE 9

Identify and define selected blood and lymphatic and immune systems diagnostic procedures.

Text pages: 176–177; 190; PowerPoint slides: 47–54; 119–122

LECTURE NOTES

Blood

Term

Clinical Laboratory Tests

blood culture and sensitivity (C&S)

Definition

sample of blood is incubated in laboratory to check for bacterial growth; if bacteria are present, they are identified and tested to determine to which antibiotics they are sensitive

complete blood count (CBC)

blood test; consists of red blood cell count (RBC), white blood cell count (WBC), hemoglobin (Hgb), hematocrit (Hct), white blood cell differential, and platelet count

TEACHING STRATEGIES

- Review actual laboratory report of blood test results.
- Write sentences on the board using common words; have students substitute correct medical terms.

IRDVD

- See PowerPoint presentation on the Instructor's Resource DVD for video on the topic of phlebotomy.

Jeopardy Game

- Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Vocabulary, Pathology, and Therapeutic terms.

erythrocyte sedimentation rate (ESR, sed rate)	blood test; determines rate at which mature red blood cells settle out of blood after addition of an anticoagulant; is indicator of presence of inflammatory disease
hematocrit (HCT, Hct, crit)	blood test; measures volume of red blood cells within total volume of blood
hemoglobin (Hgb, hb)	blood test; measures amount of hemoglobin present in given volume of blood
platelet count	blood test; determines number of platelets in given volume of blood
prothrombin time (Pro time, PT)	blood test; measures blood's coagulation abilities by measuring how long it takes for clot to form after prothrombin has been activated
red blood cell count (RBC)	blood test; determines number of erythrocytes in volume of blood; decrease in red blood cells may indicate anemia; an increase may indicate polycythemia vera
red blood cell morphology	examination of specimen of blood for abnormalities in shape (morphology) of erythrocytes; determines diseases like sickle cell anemia
sequential multiple analyzer computer (SMAC)	machine for doing multiple blood chemistry tests automatically
white blood cell count (WBC)	blood test; measures number of leukocytes in volume of blood; increase may indicate presence of infection or a disease such as leukemia; decrease may be caused by radiation therapy or chemotherapy
white blood cell differential (diff)	blood test; determines number of each variety of leukocytes

Medical Procedures

bone marrow aspiration	sample of bone marrow is removed by aspiration with needle and examined for diseases such as leukemia or aplastic anemia
phlebotomy	incision into vein to remove blood for diagnostic test; also called <i>venipuncture</i>

Lymphatic and Immune Systems

Term

Clinical Laboratory Tests

Term	Definition
Enzyme-linked immunosorbent assay (ELISA)	blood test for antibody to AIDS virus; positive test means person has been exposed to virus; may be false-positive reading and then Western blot test would be used to verify results
Western blot	test used as backup to ELISA blood test to detect the presence of antibody to HIV (AIDS virus) in blood

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

Guest Speaker

- Invite a Clinical Lab Technologist or Technician or phlebotomist to class to discuss laboratory procedures.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions
- Case Study
- *New York Times* link for research into specific diagnostic procedures

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

Diagnostic Imaging

lymphangiography

X-ray taken of lymph vessels after injection of dye; lymph flow through chest is traced

Additional Diagnostic Procedures

Monospot

test for infectious mononucleosis

scratch test

allergy testing in which body is exposed to allergen through light scratch in skin

OBJECTIVE 10

Identify and define selected blood and lymphatic and immune systems therapeutic procedures.

Text pages: 177; 191; PowerPoint slides: 55–56; 123–124

LECTURE NOTES

Blood

Term

Medical Procedures

autologous transfusion

Definition

procedure for collecting and storing patient's own blood several weeks prior to actual need; used to replace blood lost during surgical procedure

blood transfusion

artificial transfer of blood into bloodstream

bone marrow transplant (BMT)

patient receives red bone marrow from donor after patient's own bone marrow has been destroyed by radiation or chemotherapy

homologous transfusion

replacement of blood by transfusion of blood received from another person

plasmapheresis

removing plasma from body without depleting formed elements; whole blood is removed and cells and plasma are separated; cells are returned to patient along with donor plasma transfusion

Lymphatic and Immune Systems

Term

Medical

Procedures

Definition

immunotherapy

injection of immunoglobulins or antibodies in order to treat disease; antibodies may be produced by another person or animal, for example, antivenom for snake bites; more recent developments include treatments to boost activity of immune system, especially to treat cancer and AIDS

vaccination

exposure to weakened pathogen that stimulates immune response and antibody production in order to confer protection against full-blown disease; also called *immunization*

TEACHING STRATEGIES

- Write sentences on the board using common words; have students substitute correct medical terms.

Jeopardy Game

- Have students create questions for terms in this section for a Jeopardy game to be played in class—may be combined with Vocabulary, Pathology, & Diagnostic terms.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

Guest Speaker

- Invite someone from the local blood bank or American Red Cross to speak to the class about blood transfusions.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist
- Medical Record Analysis
- Chart Note Transcription

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions
- Case Study

Surgical Procedures

lymphadenectomy removal of lymph node; usually done to test for malignancy

- Web Destination activity on kidney transplants
- *New York Times* link for research into specific treatment procedures

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

OBJECTIVE 11

Identify and define selected medications relating to blood and the lymphatic and immune systems.

Text pages: 178; 191; PowerPoint slides: 57; 125–126

LECTURE NOTES

Blood

Classification	Action
anticoagulant	prevents blood clot formation; commonly called <i>blood thinners</i>
antihemorrhagic	prevents or stops hemorrhaging; also called <i>hemostatic agent</i>
antiplatelet agents	interferes with action of platelets; prolongs bleeding time; used to prevent heart attacks and strokes
hematinic	increases number of erythrocytes or amount of hemoglobin in blood
thrombolytic	dissolves existing blood clots

Generic and Brand Names
heparin, HepLock; warfarin, coumadin
aminocaproic acid, Amicar; vitamin K
clopidogrel, Plavix; ticlopidine, Ticlid
epoetin alfa, Procrit; darbepoetin alfa, Aranesp
alteplase, Activase; streptokinase, Streptase

Lymphatic and Immune Systems

Classification	Action
antihistamines	block effects of histamine released by body during allergic reaction
corticosteroids	hormone produced by the adrenal cortex; has very strong anti-inflammatory properties; used to treat autoimmune diseases

Generic and Brand Names
cetirizine, Zyrtec; diphenhydramine, Benadryl
prednisone; methylprednisolone, Solu-Medrol

TEACHING STRATEGIES

Pop Questions

- Use Clicker questions as either pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

- Have students use a PDR and/or the Internet to look up additional information regarding these medications, such as dosage, side effects, and contraindications

Worksheet 6C

- Chapter Review

Text

- Practice Exercises
- Terminology Checklist

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions

ASSESSMENTS

Quiz 6G—Chapter Review

Test Bank—questions

immunosuppressants	block certain actions of immune system; prevents rejection of transplanted organ	mycophenolate mofetil, CellCept; cyclosporine, Neoral
protease inhibitor drugs	inhibits protease, an enzyme viruses need to reproduce	indinavir, Crixivan; saquinavir, Fortovase
reverse transcriptase inhibitor drugs	inhibits reverse transcriptase, an enzyme needed by viruses to reproduce	lamivudine, Epivir; zidovudine, Retrovir

OBJECTIVE 12

Define selected abbreviations associated with blood and lymphatic and immune systems.

Text pages: 178; 191; PowerPoint slides: 58–61; 127–128

LECTURE NOTES

Blood

ALL	acute lymphocytic leukemia
AML	acute myelogenous leukemia
basos	basophils
BMT	bone marrow transplant
CBC	complete blood count
CLL	chronic lymphocytic leukemia
CML	chronic myelogenous leukemia
diff	differential
eosins, eos	eosinophils
ESR, SR, sed rate	erythrocyte sedimentation rate
HCT, Hct, crit	hematocrit
Hgb, Hb, HGB	hemoglobin
lymphs	lymphocytes
monos	monocytes
PA	pernicious anemia
PCV	packed cell volume
PMN, polys	polymorphonuclear neutrophil
PT, pro-time	prothrombin time
RBC	red blood cell
Rh+	Rh-positive
Rh-	Rh-negative
segs	segmented neutrophils
SMAC	sequential multiple analyzer computer
WBC	white blood cell

TEACHING STRATEGIES

- Emphasize the importance of learning abbreviations and their full meanings; point out how some abbreviations, such as CBC, Hgb, sed rate, and GVHD are typically used rather than full terms.
- Encourage students to add abbreviations to their flash cards.
- Write sentences on the board using medical terms; have students substitute correct abbreviations for terms.

Memory Game

- Have students assist in creating a memory game to play in class.

Pop Questions

- Use Clicker questions as either a pretest or posttest quiz to gauge student comprehension during lecture.

LEARNING ACTIVITIES

Worksheet 6C

- Chapter Review

Quiz 6F

- May be used as a worksheet

Text

- Practice Exercises

Lymphatic and Immune Systems

AIDS	acquired immunodeficiency syndrome
ARC	AIDS-related complex
ELISA	enzyme-linked immunosorbent assay
GVHD	graft vs. host disease
HD	Hodgkin's disease
HIV	human immunodeficiency virus
Ig	immunoglobulins (IgA, IgD, IgE, IgG, IgM)
KS	Kaposi's sarcoma
mono	mononucleosis
NHL	non-Hodgkin's lymphoma
NK	natural killer cells
PCP	<i>Pneumocystis carinii</i> pneumonia
SCIDS	severe combined immunodeficiency syndrome

Student DVD-ROM

- Learning games
- Flash cards

CW

- Practice questions

ASSESSMENTS

Quiz 6F—Abbreviations Quiz

Quiz 6G—Chapter Review

Test Bank—questions

Worksheet 6A

New Combining Form and Suffix Handout

Directions: For each combining form below, write out its meaning and then locate a new term from the chapter that uses the combining form or suffix.

Combining Forms	Meaning	Chapter Term	Meaning
1. agglutin/o	_____	_____	_____
2. bas/o	_____	_____	_____
3. chrom/o	_____	_____	_____
4. coagul/o	_____	_____	_____
5. eosin/o	_____	_____	_____
6. erythr/o	_____	_____	_____
7. fibrin/o	_____	_____	_____
8. granul/o	_____	_____	_____
9. hem/o	_____	_____	_____
10. hemat/o	_____	_____	_____
11. leuk/o	_____	_____	_____
12. morph/o	_____	_____	_____
13. neutr/o	_____	_____	_____
14. phag/o	_____	_____	_____
15. sanguin/o	_____	_____	_____
16. thromb/o	_____	_____	_____
17. adenoid/o	_____	_____	_____
18. immun/o	_____	_____	_____
19. lymph/o	_____	_____	_____
20. lymphaden/o	_____	_____	_____
21. lymphangi/o	_____	_____	_____
22. path/o	_____	_____	_____

(Continued)

Combining Forms	Meaning	Chapter Term	Meaning
23. splen/o	_____	_____	_____
24. thym/o	_____	_____	_____
25. tonsill/o	_____	_____	_____
26. tox/o	_____	_____	_____
Suffixes			
27. -apheresis	_____	_____	_____
28. -cytosis	_____	_____	_____
29. -emia	_____	_____	_____
30. -globin	_____	_____	_____
31. -penia	_____	_____	_____
32. -phil	_____	_____	_____
33. -poiesis	_____	_____	_____
34. -stasis	_____	_____	_____
35. -globulin	_____	_____	_____

Worksheet 6B

Medical Term Analysis

Directions: Below are terms built from word parts used in this chapter that are not analyzed in the Word Building Table. Many are built from word parts you have learned in previous chapters. Analyze each term presented below and list and define the word parts used to build each term.

Medical Term	Word Part Analysis
1. basophil	_____

2. eosinophil	_____

3. lymphocyte	_____

4. neutrophil	_____

5. hemostasis	_____

6. hematology	_____

7. hematoma	_____

8. hypochromic	_____

9. morphology	_____

10. phlebotomy	_____

11. thoracic	_____

(Continued)

12. immunoglobulin _____

13. immunology _____

14. lymphadenitis _____

15. lymphangiography _____

16. immunotherapy _____

Worksheet 6C

Chapter Review

Anatomy and Physiology

1. The formed elements of the blood are: _____, _____, and _____.
2. The watery fluid of blood is _____.
3. Three examples of plasma proteins are: _____, _____, and _____.
4. _____ is the iron-containing pigment that gives red blood cells their color.
5. Platelets release _____, which initiates the blood clotting process.
6. The universal donor is type _____ blood; the universal recipient is type _____ blood.
7. _____ are lymphatic vessels around the small intestine.
8. Lymph nodes house _____ and _____ to remove pathogens from lymph.
9. Tonsils protect the body from invasion of pathogens through the _____ or _____ system.
10. _____ immunity develops following direct exposure to a pathogen.

Word Building

Directions: Build a term that means:

1. blood protein _____
2. pertaining to fibers _____
3. clotting cell _____
4. too many red cells _____
5. too few clotting (cells) _____
6. blood producing _____
7. enlarged spleen _____
8. removal of tonsils _____
9. record of lymph vessels _____
10. study of disease _____

(Continued)

Matching

- | | |
|------------------------------|---|
| _____ 1. allergy | a. body attacks its own cells |
| _____ 2. inflammation | b. prevents blood clot formation |
| _____ 3. urticaria | c. born with nonfunctioning immune system |
| _____ 4. autoimmune disease | d. to stop bleeding |
| _____ 5. opportunistic | e. bruise |
| _____ 6. anaphylaxis | f. severe itching with hives |
| _____ 7. Hodgkin's disease | g. immunization |
| _____ 8. mononucleosis | h. caused by vitamin B ₁₂ deficiency |
| _____ 9. SCIDS | i. red bone marrow stops making blood cells |
| _____ 10. vaccination | j. hypersensitivity to common allergen |
| _____ 11. protease inhibitor | k. dissolves clots |
| _____ 12. ELISA | l. computer to do blood chemistry tests |
| _____ 13. dyscrasia | m. drug that keeps virus from reproducing |
| _____ 14. hemostasis | n. cancer of lymphatic cells in lymph nodes |
| _____ 15. hemophilia | o. test to identify infecting bacteria |
| _____ 16. aplastic anemia | p. lab test for AIDS |
| _____ 17. polycythemia vera | q. infection occurring in immunocompromised |
| _____ 18. C&S | r. measures volume of erythrocytes in blood |
| _____ 19. phlebotomy | s. general term for blood condition |
| _____ 20. anticoagulant | t. tissues' response to injury |
| _____ 21. thrombolytic | u. venipuncture |
| _____ 22. SMAC | v. prolonged blood-clotting time |
| _____ 23. hematocrit | w. life-threatening allergic reaction |
| _____ 24. pernicious anemia | x. too many red blood cells |
| _____ 25. hematoma | y. caused by Epstein-Barr virus |

Name _____

Date _____

Score _____

Quiz 6A

New Word Parts Quiz

Directions: Define the combining form or suffix in the spaces provided.

1. thromb/o _____
2. agglutin/o _____
3. chrom/o _____
4. coagul/o _____
5. erythr/o _____
6. fibrin/o _____
7. hemat/o _____
8. phag/o _____
9. leuk/o _____
10. morph/o _____
11. sanguin/o _____
12. eosin/o _____
13. thym/o _____
14. adenoid/o _____
15. tonsill/o _____
16. tox/o _____
17. splen/o _____
19. lymphaden/o _____
20. lymphangi/o _____
21. -cytosis _____
22. -globin _____
23. -poiesis _____
24. -penia _____
25. -stasis _____

Name _____ Date _____ Score _____

Quiz 6B

Spelling Quiz

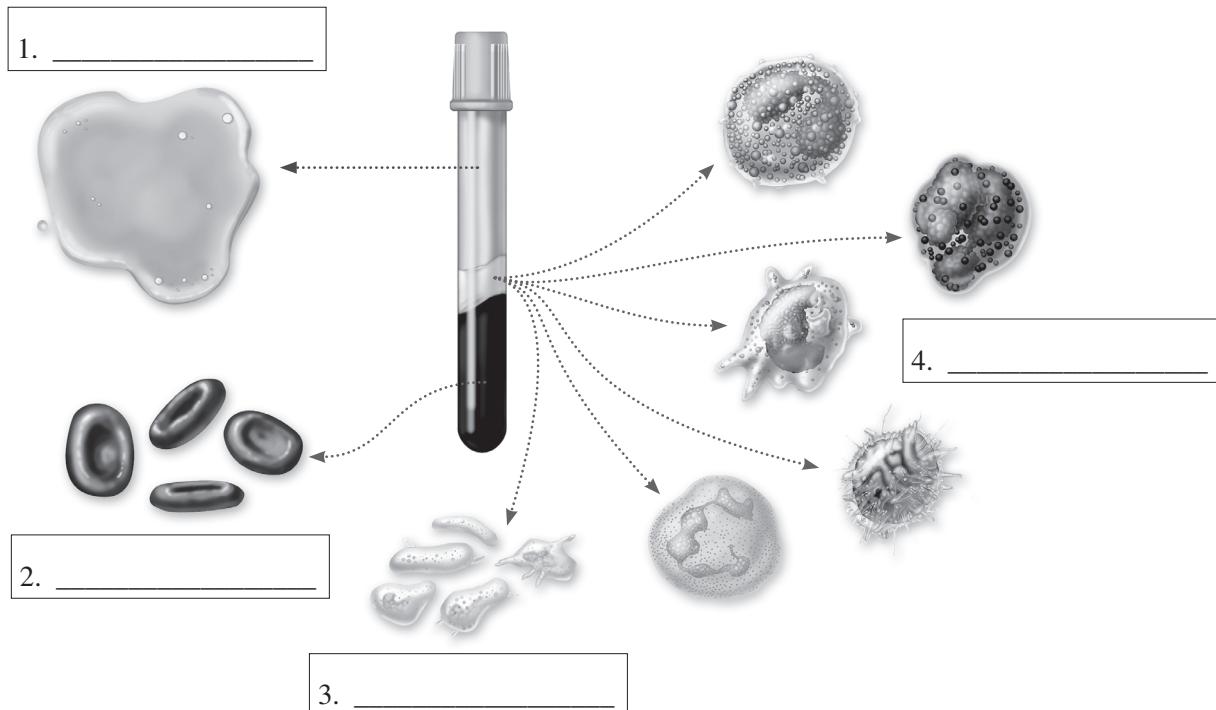
Directions: Write each term as your instructor pronounces it.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Quiz 6C

Labeling Diagram

Directions: Label the components of whole blood.



Name _____

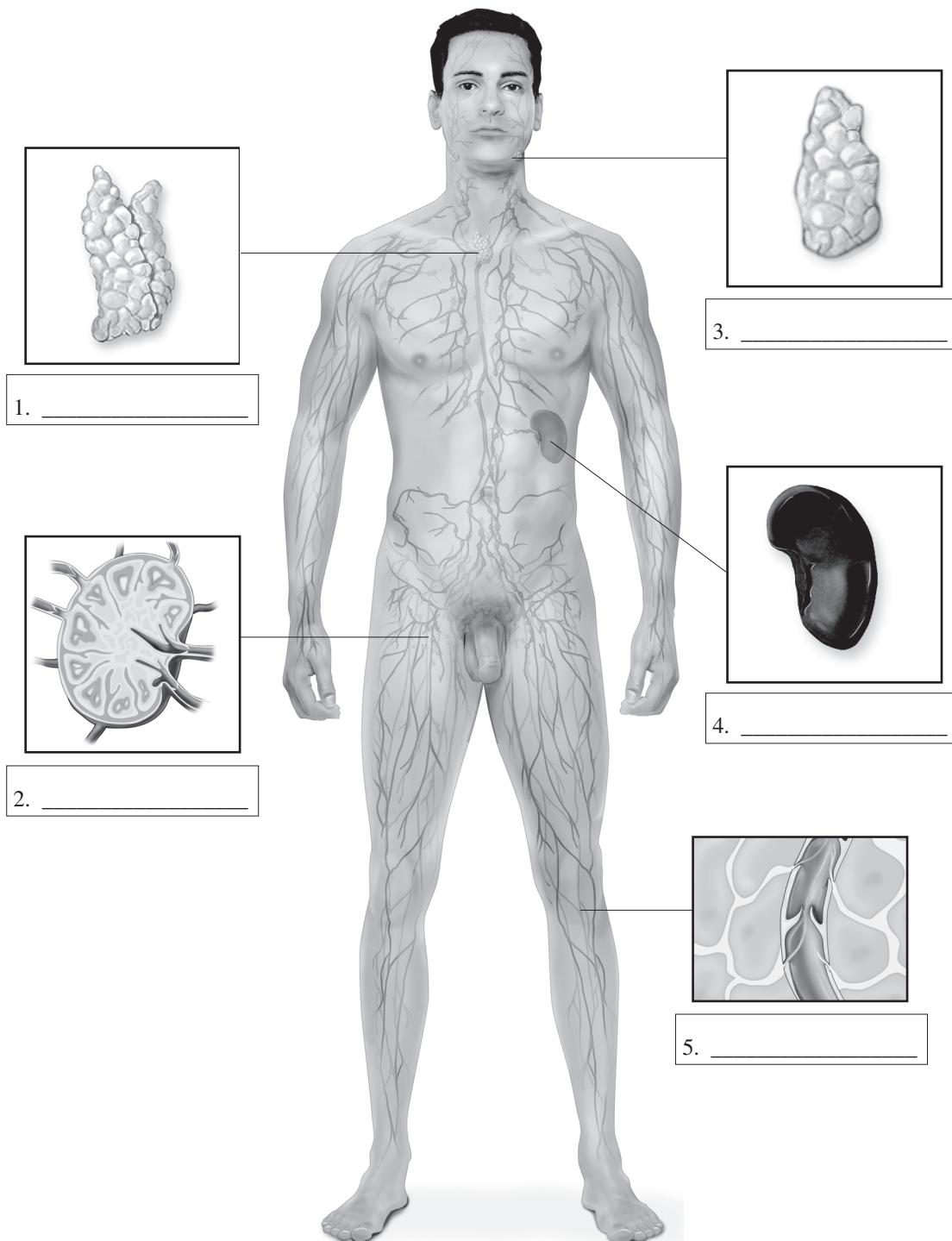
Date _____

Score _____

Quiz 6D

Labeling Diagram

Directions: Label the organs of the lymphatic system.



Name _____

Date _____

Score _____

Quiz 6E

Word Building Quiz

Directions: Build a single medical term for each phrase below.

1. inflammation of adenoids _____
2. removal of lymph gland _____
3. lymph vessel tumor _____
4. disease producing _____
5. enlarged spleen _____
6. pertaining to tonsils _____
7. clot dissolving _____
8. vein incision _____
9. blood protein _____
10. red cell _____
11. pertaining to insufficient color _____
12. blood protein _____
13. too few of all cells _____
14. rapid flow of blood _____
15. fiber producing _____
16. more than normal number white cells _____
17. blood stopping _____
18. blood tumor _____

Name _____

Date _____

Score _____

Quiz 6F

Abbreviations Quiz

Directions: Write the medical term for which each abbreviation stands.

1. AIDS _____
2. GVHD _____
3. HD _____
4. Ig _____
5. mono _____
6. KS _____
7. NK _____
8. PCP _____
9. SCIDS _____
10. HIV _____
11. CBC _____
12. BMT _____
13. diff _____
14. ESR _____
15. HCT _____
16. Hgb _____
17. PA _____
18. PT _____
19. RBC _____
20. WBC _____
21. SMAC _____
22. lymphs _____
23. ALL _____
24. eosins _____
25. monos _____

Quiz 6G

Chapter Review

PART I: Multiple Choice

Directions: Circle the correct answer.

1. A blood disorder characterized by excessive increase in abnormal white blood cells is
 - a. Hodgkin's disease.
 - b. leukemia.
 - c. hemophilia.
 - d. leukoplakia.

2. The lymph nodes located in the underarm region are termed
 - a. axillary.
 - b. cervical.
 - c. mediastinal.
 - d. inguinal.

3. Which blood type is known as the universal recipient?
 - a. type O
 - b. type A
 - c. type B
 - d. type AB

4. An example of active acquired immunity would be
 - a. mother's antibodies crossing placenta.
 - b. having the disease.
 - c. receiving an antitoxin.
 - d. macrophages engulfing bacteria.

5. Which is NOT a type of leukocyte?
 - a. basophil
 - b. eosinophil
 - c. hemocyte
 - d. lymphocyte

6. Which blood test measures the volume of erythrocytes in a given volume of blood?
 - a. differential
 - b. bleeding time
 - c. hematocrit
 - d. hemoglobin

7. Which is a test for infectious mononucleosis?
 - a. menatocrit
 - b. prothrombin time
 - c. erythrocyte sedimentation rate
 - d. monospot

8. In which type of blood transfusion does the blood come from another person?
 - a. autohemotherapy
 - b. dialysis transfusion
 - c. autologous transfusion
 - d. homologous transfusion

9. The largest lymph vessels are called
 - a. ducts.
 - b. arteries.
 - c. capillaries.
 - d. angios.

10. Which type of anemia is inherited?
 - a. pernicious anemia
 - b. aplastic anemia
 - c. sickle cell anemia
 - d. iron-deficiency anemia

(Continued)

PART II: Matching

Directions: Match the term with its definition.

- | | |
|-------------------------------|--|
| _____ 1. platelets | a. increases number of erythrocytes |
| _____ 2. ABO | b. plasma and formed elements |
| _____ 3. whole blood | c. pharyngeal tonsils |
| _____ 4. septicemia | d. test for inflammation in the body |
| _____ 5. sed rate | e. acquired in a hospital |
| _____ 6. hematinic | f. play role in blood clotting process |
| _____ 7. adenoids | g. caused by blocked lymph flow |
| _____ 8. nosocomial infection | h. an autoimmune disease |
| _____ 9. lymphedema | i. blood poisoning |
| _____ 10. sarcoidosis | j. blood typing system |

PART III: Abbreviations

Directions: Write the full meaning of the following abbreviations.

1. ARC _____
2. GVHD _____
3. PCP _____
4. CBC _____
5. PA _____

Chapter 6 Answer Keys

Worksheet 6A Answer Key

Combining Forms

- | | |
|--------------------|------------------|
| 1. clumping | 14. eat, swallow |
| 2. base | 15. blood |
| 3. color | 16. clot |
| 4. clotting | 17. adenoids |
| 5. rosy red | 18. protection |
| 6. red | 19. lymph |
| 7. fibers, fibrous | 20. lymph node |
| 8. granules | 21. lymph vessel |
| 9. blood | 22. disease |
| 10. blood | 23. spleen |
| 11. white | 24. thymus |
| 12. shape | 25. tonsils |
| 13. neutral | 26. poison |

Suffixes

27. removal, carry away
28. more than normal number of cells
29. blood condition
30. protein
31. abnormal decrease, too few
32. attracted to
33. formation
34. standing still
35. protein

Worksheet 6B Answer Key

- | | |
|---|--|
| 1. bas/o = base; -phil = attracted to | 9. morph/o = shape; -logy = study of |
| 2. eosin/o = red; -phil = attracted to | 10. phleb/o = vein; -otomy = incision into |
| 3. lymph/o = lymph; -cyte = cell | 11. thorac/o = chest; -ic = pertaining to |
| 4. neutr/o = neutral; -phil = attracted to | 12. immune/o = protection; -globulin = protein |
| 5. hem/o = blood; -stasis = standing still | 13. immun/o = protection; -logy = study of |
| 6. hemat/o = blood; -logy = study of | 14. lymph/o = lymph; aden/o = gland; -itis = inflammation |
| 7. hemat/o = blood; -oma = growth | 15. lymph/o = lymph; angi/o = vessel; -graphy = process of recording |
| 8. hypo- = insufficient; chrom/o = color; -ic = pertaining to | 16. immun/o = protection; -therapy = treatment |

Worksheet 6C Answer Key

Anatomy and Physiology

- | | |
|--|----------------------------|
| 1. erythrocytes, leukocytes, platelets | 6. O, AB |
| 2. plasma | 7. lacteals |
| 3. albumin, globulins, fibrinogen | 8. lymphocytes, antibodies |
| 4. hemoglobin | 9. respiratory, digestive |
| 5. thromboplastin | 10. active acquired |

Word Building

1. hemoglobin
2. fibrinous
3. thrombocyte
4. erythrocytosis
5. thrombopenia
6. hematopoiesis
7. splenomegaly
8. tonsillectomy
9. lymphangiogram
10. pathology

Matching

- | | |
|-------|-------|
| 1. j | 14. d |
| 2. t | 15. v |
| 3. f | 16. i |
| 4. a | 17. x |
| 5. q | 18. o |
| 6. w | 19. u |
| 7. n | 20. b |
| 8. y | 21. k |
| 9. c | 22. l |
| 10. g | 23. r |
| 11. m | 24. h |
| 12. p | 25. e |
| 13. s | |

Quiz 6A Answer Key

- | | |
|--------------------|--|
| 1. clot | 13. thymus |
| 2. clumping | 14. adenoids |
| 3. color | 15. tonsils |
| 4. clotting | 16. poison |
| 5. red | 17. spleen |
| 6. fibers, fibrous | 19. lymph node |
| 7. blood | 20. lymph vessel |
| 8. eat, swallow | 21. more than the normal number of cells |
| 9. white | 22. protein |
| 10. shape | 23. formation |
| 11. blood | 24. abnormal decrease, too few |
| 12. rosy red | 25. standing still |

Quiz 6B Answer Key

- | | |
|-------------------|-----------------|
| 1. hematopoiesis | 7. septicemia |
| 2. erythrocyte | 8. hypochromic |
| 3. eosinophil | 9. pernicious |
| 4. thromboplastin | 10. thalassemia |
| 5. leukocytopenia | 11. hematocrit |
| 6. dyscrasia | 12. phlebotomy |

13. plasmapheresis
14. macrophage
15. vaccination
16. lymphadenopathy
17. anaphylaxis
18. urticaria
19. immunodeficiency
20. sarcoidosis

Quiz 6C Answer Key

1. plasma
2. red blood cells or erythrocytes
3. platelets or thrombocytes
4. white blood cells or leukocytes

Quiz 6D Answer Key

1. thymus gland
2. lymph node
3. tonsil
4. spleen
5. lymphatic vessels

Quiz 6E Answer Key

1. adenoiditis
2. lymphadenectomy
3. lymphangioma
4. pathogenic
5. splenomegaly
6. tonsillar
7. thrombolytic
8. phlebotomy
9. hemoglobin
10. erythrocyte
11. hypochromic
12. hemoglobin
13. pancytopenia
14. hemorrhage
15. fibrinogen
16. leukocytosis
17. hemostasis
18. hematoma

Quiz 6F Answer Key

1. acquired immunodeficiency syndrome
2. graft vs. host disease
3. Hodgkin's disease
4. immunoglobulins
5. mononucleosis
6. Kaposi's sarcoma
7. natural killer cells
8. *Pneumocystis carinii* pneumonia
9. severe combined immunodeficiency syndrome
10. human immunodeficiency virus
11. complete blood count
12. bone marrow transplant
13. differential
14. erythrocyte sedimentation rate
15. hematocrit
16. hemoglobin
17. pernicious anemia
18. pro-time
19. red blood cell
20. white blood cell
21. sequential multiple analyzer computer
22. lymphocytes
23. acute lymphocytic leukemia
24. eosinophils
25. monocytes

Quiz 6G Answer Key

Multiple Choice

- | | |
|------|-------|
| 1. B | 6. C |
| 2. A | 7. D |
| 3. D | 8. D |
| 4. B | 9. A |
| 5. C | 10. C |

Matching

- | | |
|------|-------|
| 1. f | 6. a |
| 2. j | 7. c |
| 3. b | 8. e |
| 4. i | 9. g |
| 5. d | 10. h |

Abbreviations

- | | |
|--|-------------------------|
| 1. AIDS-related complex | 4. complete blood count |
| 2. graft vs. host disease | 5. pernicious anemia |
| 3. <i>Pneumocystis carinii</i> pneumonia | |