LaFleur Brooks' Health Unit Coordinating

7th edition

Chapter 22

Medical Terminology, Basic Human Structure, Diseases, and Disorders

Lesson 22.6

Unit 6: The Cardiovascular and Lymphatic Systems

1. List the organs and describe three functions of the circulatory system.
2. Identify the pericardium and list three layers and four chambers of the heart.
3. Name types of blood vessels and briefly describe the function of each.
4. Trace the flow of blood through the blood vessels of the body and the circulation of blood through the heart.

Lesson 22.6

Unit 6: The Cardiovascular and Lymphatic Systems (cont'd)

5. Describe what systolic and diastolic blood pressure represent.
6. Describe the three main functions of blood and briefly describe the composition of blood and the functions of the three types of blood cells.
7. List the two primary functions of the lymphatic system.
8. Name and describe the functions of the organs of the lymphatic system.

Lesson 22.6

Unit 6: The Cardiovascular and Lymphatic Systems (cont'd)

9. Discuss coronary artery disease, congestive heart failure, anemia, varicose veins, abdominal aortic aneurysm, and acquired immunodeficiency syndrome.
10. Read the objectives related to medical terminology and demonstrate ability to meet the objectives by correctly completing Exercises 1 through 7.
11. Define the unit abbreviations.

Organs of the Circulatory System

- Heart
- Blood vessels
- Blood

Functions of the Circulatory System

- Transportation of nutrients, oxygen, and hormones to cells and removal of wastes
- Protection by white blood cells and antibodies to defend the body against foreign invaders
- Regulation of body temperature, fluids, and water volume of cells

Location and Function of the Heart and Pericardium

- Located in the mediastinum, the cavity between the lungs that is situated behind the sternum
- Performs the action of pumping the blood through the blood vessels to all parts of the body, circulating it in a one-way movement
- Pericardium: loose-fitting double-layered sac that surrounds the heart
  - Serous membranes of the pericardium secrete a small amount of fluid to prevent irritation as the heart contracts.

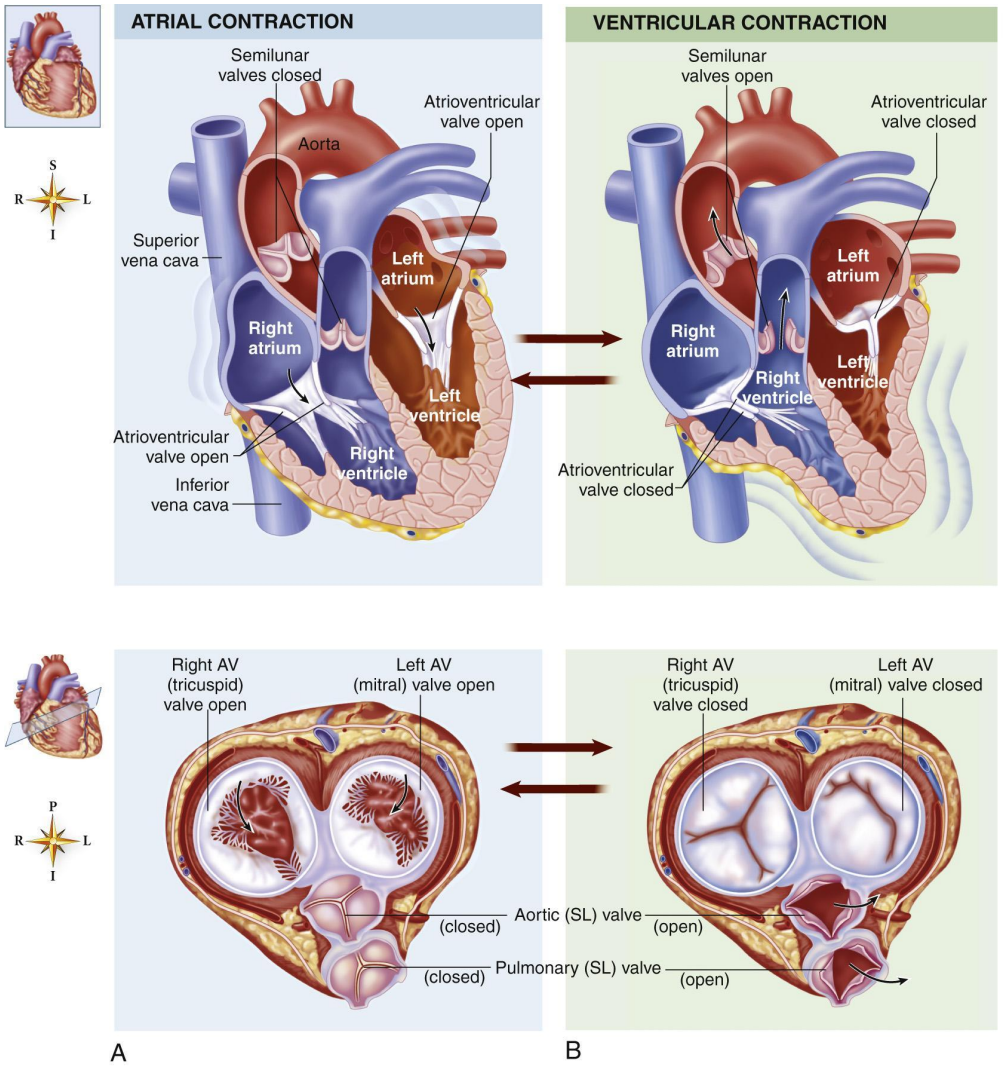
Layers of the Heart

- Epicardium,: outer layer – the visceral layer of the pericardium
- Myocardium: middle, thickest, muscular layer
- Endocardium,: inner lining – also forms the heart valves

Heart Chambers

- Upper chambers:
  - Right atrium
  - Left atrium
- Lower chambers:
  - Right ventricle
  - Left ventricle
- Septum – partition that divides the heart into a right and a left side

The Heart



Three Major Types of Blood Vessels

- Arteries: carry blood away from the heart to the body cells except for the pulmonary artery
  - Arteries carry blood that is high in oxygen concentration, except for the pulmonary artery, which carries blood with a high concentration of carbon dioxide from the heart to the lungs.
  - Arteries branch into arterioles, tiny arteries that connect the arteries to capillaries.
  - The aorta, the largest artery of the body, carries blood away from the left ventricle of the heart.

Three Major Types of Blood Vessels, cont'd

- Veins: carry blood from the capillary beds back to the heart
  - Veins: carry blood from the capillary beds back to the heart
  - Veins carry blood with a high concentration of carbon dioxide and other waste products except for the pulmonary vein
  - The pulmonary vein carries blood that is high in oxygen concentration from the lungs to the heart.
  - Venules are tiny veins that connect the capillaries with the veins.
  - The superior vena cava and inferior vena cava are large veins through which the blood returns from the body to the right atrium.

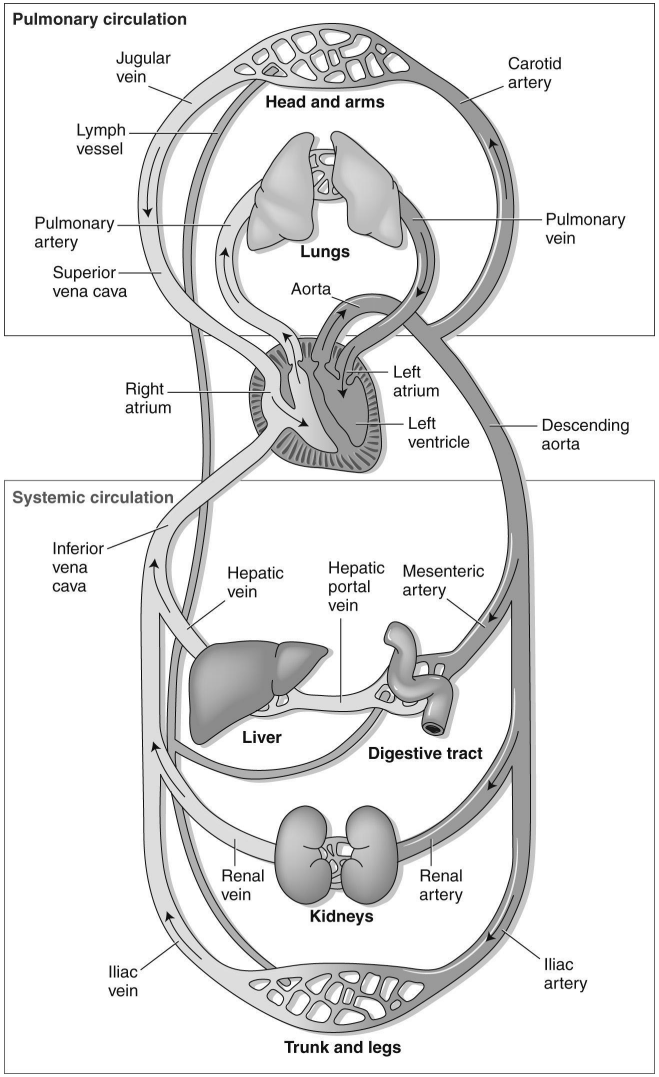
Three Major Types of Blood Vessels, cont'd

- Capillaries: microscopic, thin-walled blood vessels that provide links between arteries and veins
  - The exchange of substances takes place between the blood and the body cells while the blood is in the capillaries.
  - Cells take in nutrients and oxygen from the blood and give off waste and carbon dioxide to the blood.

Circulation of Blood Through the Heart

blood saturated with carbon dioxide (CO_2) returns to the right side of the heart via the inferior and superior venae cavae → right atrium → tricuspid valve → right ventricle → pulmonary valve → pulmonary artery → to the lungs → (exchange of CO_2 and oxygen [O_2] takes place in the lungs) from the lungs saturated with O_2 → pulmonary veins → left atrium → bicuspid valve (mitral valve) → left ventricle → aortic valve → aorta

The Blood Vessels



Blood Pressure

- The upper number (systolic blood pressure) represents the pressure in the aorta and other large arteries during ventricular contraction.
- The lower number (diastolic blood pressure) represents the pressure during relaxation of the heart.

Functions of Blood

- Transportation: carries oxygen from the lungs and nutrients from the digestive tract to the body cells and carries waste products from the cells, carbon dioxide to the lungs, and other waste (urea) to the kidneys
  - Also transports hormones and other chemicals
- Fighting of infection: certain blood cells help the body to fight disease-causing organisms.
- Regulation: distributes hormones and other chemicals as needed, maintains body temperature through dilatation and constriction of blood vessels in the skin, and maintains the homeostatic balance of fluids necessary for survival

Composition of Blood

- Plasma: clear, fluid portion of the blood in which blood cells are suspended
  - Transports nutrients, waste material, hormones, and so forth, to and from the body cells
  - Fibrinogen in the plasma assists in the blood-clotting process.
- Blood Cells:
  - Erythrocytes (RBCs)
  - Leukocytes (WBCs)
  - Platelets (thrombocytes)

Blood Cells – Erythrocytes (RBCs)

- Produced by the red bone marrow
- Carry oxygen (carbon dioxide is dissolved in the plasma)
- Hemoglobin is the oxygen-carrying protein of the erythrocyte that gives blood its color.
- The average RBC count is 4.5 to 5 million/mm3 of blood.

Blood Cells – Leukocytes (WBCs)

- Colorless cells that are produced by the spleen, bone marrow, and lymph nodes
- Fight against pathogenic microorganisms (disease-causing bacteria)
- An elevated blood count may indicate the presence of infection in the body.
- The normal white blood cell (WBC) count is 5000 to 9000/mm3 of blood.

Blood Cells – Platelets (thrombocytes)

- Also are formed in the red bone marrow
- Aid in the clotting of blood
- A normal platelet count is about 250,000/mm3 of blood.

Functions of the Lymphatic System

- Maintenance of fluid balance and immunity
- Lymphatic vessels collect excessive tissue fluids and return them to the blood circulation.

Functions of the Organs of the Lymphatic System

- Spleen:
  - Destroys old RBCs, bacteria, and germs
  - Stores blood for emergency use
  - Produces RBCs in the fetus
- Thymus Gland:
  - Plays an important role in the development of the body's defenses against infection by promoting the maturation of cells that provide immune responses (T lymphocytes)

Coronary Artery Disease (CAD)

- Atherosclerosis: a blockage or narrowing of the arteries caused by the buildup of plaque on the arterial wall (causes CAD)
- Angina pectoris: characterized by chest pain caused by lack of oxygen to the myocardium as a result of atherosclerosis of the coronary arteries
- Coronary occlusion: caused by a completely blocked artery (atherosclerosis)

Coronary Artery Disease (CAD), cont'd

- Coronary thrombosis: a thrombus can develop on segments of the artery that contain plaque, causing a partial or complete blockage.
- Both coronary occlusion and coronary thrombosis may lead to myocardial infarction (MI) (heart attack) because they reduce the flow of blood to the heart, which denies the myocardium the oxygen and nutrients it needs.

Myocardial Infarction (MI) (Heart Attack)

- A symptom of an MI is sudden onset of chest pain, sometimes radiating to the arms.
- The severity of the heart attack depends on which artery is blocked and to what extent it is blocked.

Congestive Heart Failure (CHF)

- Occurs when the heart is unable to pump the required amount of blood, resulting in accumulation of blood in the lungs and the liver
- Develops gradually
  - Symptoms include fatigue, dyspnea (shortness of breath), and peripheral edema.
- Treatment consists of dietary changes and administration of medications
  - Surgical options include coronary bypass surgery, valve repair or replacement, cardiac resynchronization therapy, ventricular remodeling, and heart transplantation.

Anemia

- A disorder characterized by an abnormally low level of hemoglobin in the blood, or inadequate numbers of RBCs
- May result from decreased RBC production, from increased RBC destruction, or from blood loss
- Symptoms include fatigue and pallor.
- Treatment varies according to the cause.
- Aid in the clotting of blood
- A normal platelet count is about 250,000/mm3 of blood.

Varicose Veins

- Swollen, distended, and knotted veins that usually are found among the superficial veins of the leg
- Causes include standing or sitting for prolonged periods, pregnancy, obesity, illness, injury, and heredity.
  - Treatment includes:
    - Elevation of the legs
    - Use of elastic stockings
    - Minimally invasive surgery in which the affected veins are pulled out (*ambulatory phlebectomy*) may be required in more severe cases.

Abdominal Aortic Aneurysm (AAA)

- Results from the weakening of the wall of the aorta as it passes through the abdomen
- If the aneurysm dissects, it may rupture and cause death.
  - if it is stable, it may be monitored with regular abdominal ultrasound studies.
- Surgical intervention is usually required, or it may be repaired endoscopically using a catheter and an endoluminal graft.

Acquired Immunodeficiency Syndrome (AIDS)

- Manifests as the destruction of patients' immune systems; carriers are highly susceptible to infection.
- Caused by the human immunodeficiency virus (HIV), which infects certain WBCs of the body's immune system and gradually destroys the body's ability to fight infection
- The virus cannot penetrate intact skin.

Unit 6 Abbreviations

AAA	abdominal aortic aneurysm
ASHD	atherosclerotic heart disease
BP	blood pressure
CABG	coronary bypass graft
CAD	coronary artery disease
CHF	congestive heart failure
DVT	deep vein thrombosis
ECG	electrocardiogram
EchoCG	echocardiogram
ECMO	extracorporeal membrane oxygenation

Lesson 22.7

Unit 7: The Digestive System

1. List seven organs of the digestive tract and five accessory organs.
2. Define four functions of the digestive system.
3. Discuss the process that begins in the mouth and identify the accessory organs that aid in the process.
4. Name and discuss the purpose of the five sphincters of the digestive tract.
5. Identify the term for the involuntary wavelike movements that move food through the digestive tract.

Lesson 22.7

Unit 7: The Digestive System (cont'd)

6. Describe the function of the stomach in continuing the chemical breakdown of food until it is liquefied (chyme) and explain the time it takes for the stomach to completely empty.
7. Identify the 20-foot-long organ in which, after secretions of enzymes and bile, digestion is completed and absorption takes place.
8. Describe two functions of the large intestine.
9. Trace the passage of food through the digestive tract.

Lesson 22.7

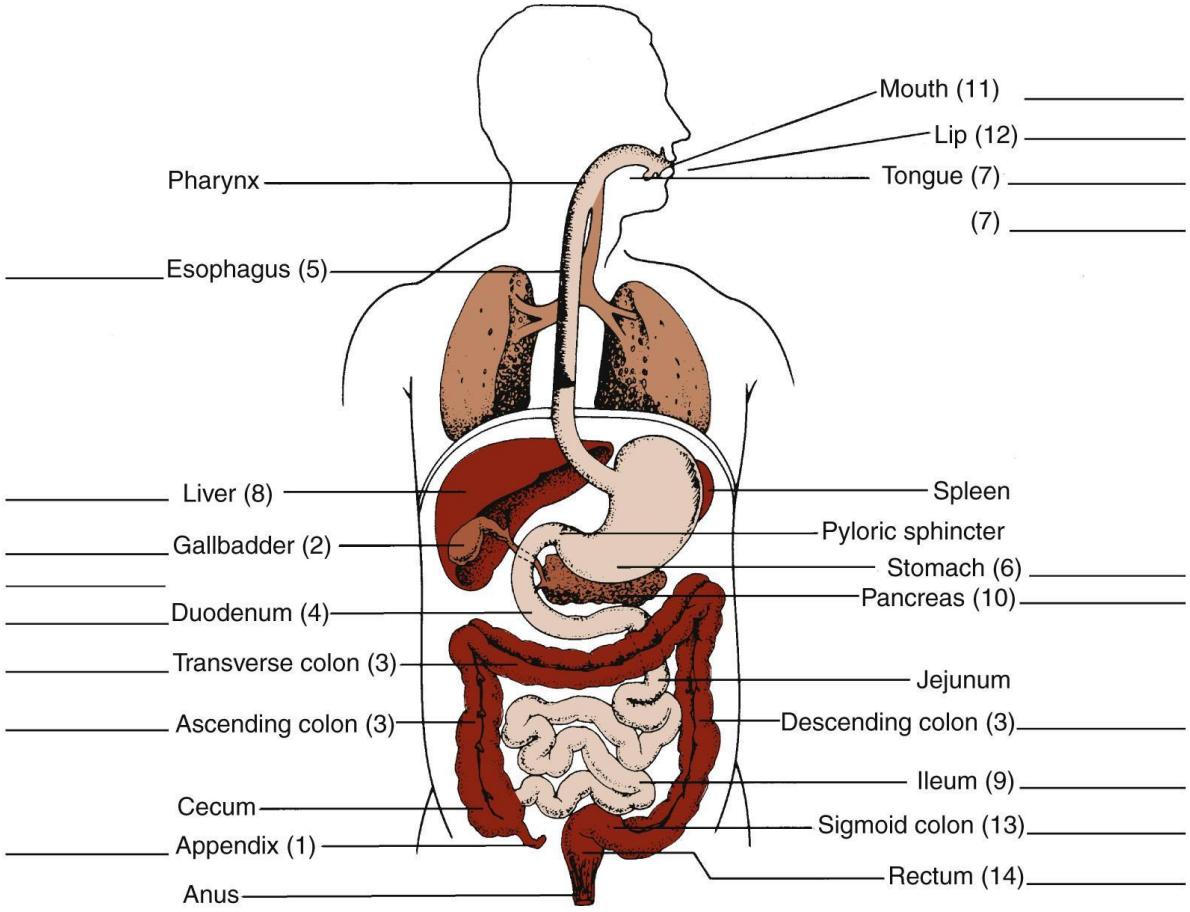
Unit 7: The Digestive System (cont'd)

10. Discuss the functions of the liver, gallbladder, andpancreas and explain how each contributes to thedigestive process.
11. Describe gastritis and peptic ulcer disease, diverticular disease, cholelithiasis (gallstones) and choledocholithiasis, and pyloric stenosis.
12. Read the objectives related to medical terminology and demonstrate ability to meet the objectives by correctly completing Exercises 1 through 8.
13. Define the unit abbreviations.

Organs of the Digestive System

- Digestive Tract:
  - Mouth
  - Pharynx
  - Digestive sphincter muscles
  - Esophagus
  - Stomach
  - Small intestine
  - Large intestine

The Digestive System



Accessory Organs of the Digestive System

- Accessory Organs:
  - Salivary glands
  - Teeth and tongue
  - Liver
  - Gallbladder
  - Pancreas

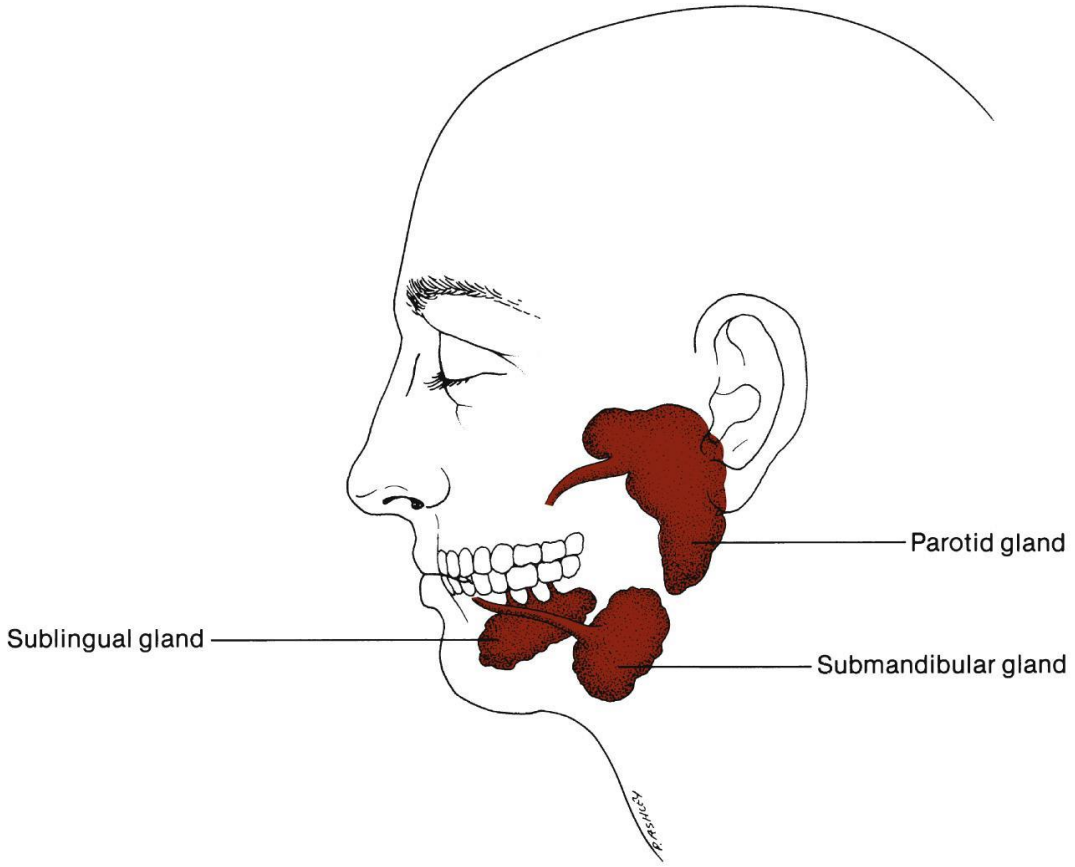
Functions of the Digestive System

- Ingestion: taking nutrients into the digestive tract through the mouth
- Digestion: the mechanical and chemical breakdown of food for use by body cells
- Absorption: the transfer of digested food from the small intestine to the bloodstream
- Elimination: the removal of solid waste from the body

Digestion Process

- Begins in the mouth with mastication, which starts the mechanical breakdown of food necessary for metabolism
  - The tongue helps guide the food to the teeth.
- The salivary glands produce saliva that contains the enzyme amylase, which starts the chemical breakdown of carbohydrates (starches and sugars).
- The pharynx (throat) allows for the passage of food from the mouth to the esophagus.

The Salivary Glands



Digestive Sphincter Muscles

- Upper esophageal
- Lower esophageal (cardiac)
- Pyloric
- Ileocecal
- Anal

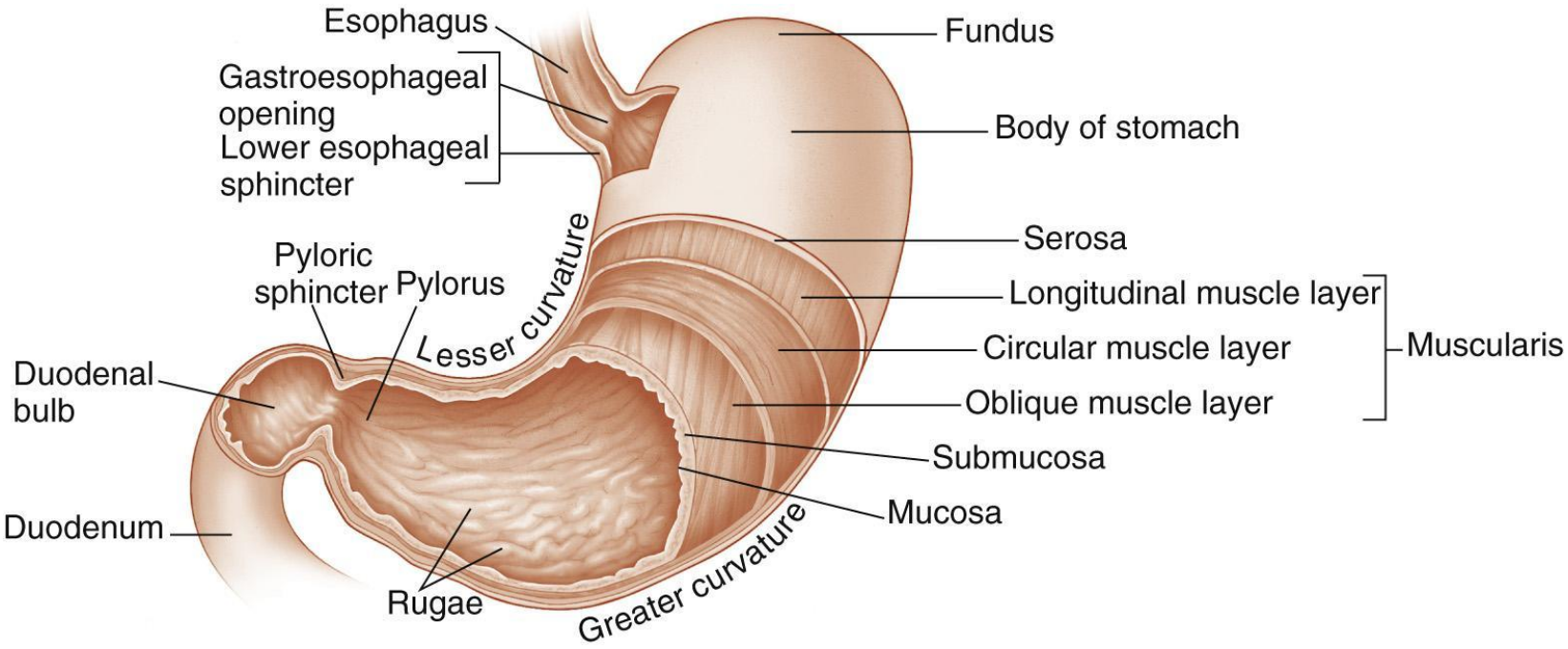
Esophagus and Peristalsis

- Esophagus: a muscular tube that extends from the pharynx to the stomach (passes through the thoracic cavity, behind the heart, to the abdominal cavity)
  - Its function is simply the passage of food.
- Peristalsis: involuntary wave-like movements that propels food along through the digestive tract

Role of the Stomach in the Digestive System

- Gastric glands secrete enzymes (lipase and pepsin) and hydrochloric acid, continuing chemical breakdown of food.
- Food is mixed and churned, continuing the mechanical breakdown of food to a liquid consistency called chyme.
- After about 30 minutes, the food begins to leave the stomach at 30-minute intervals.
- It takes two to four hours for the stomach to empty completely.

The Stomach



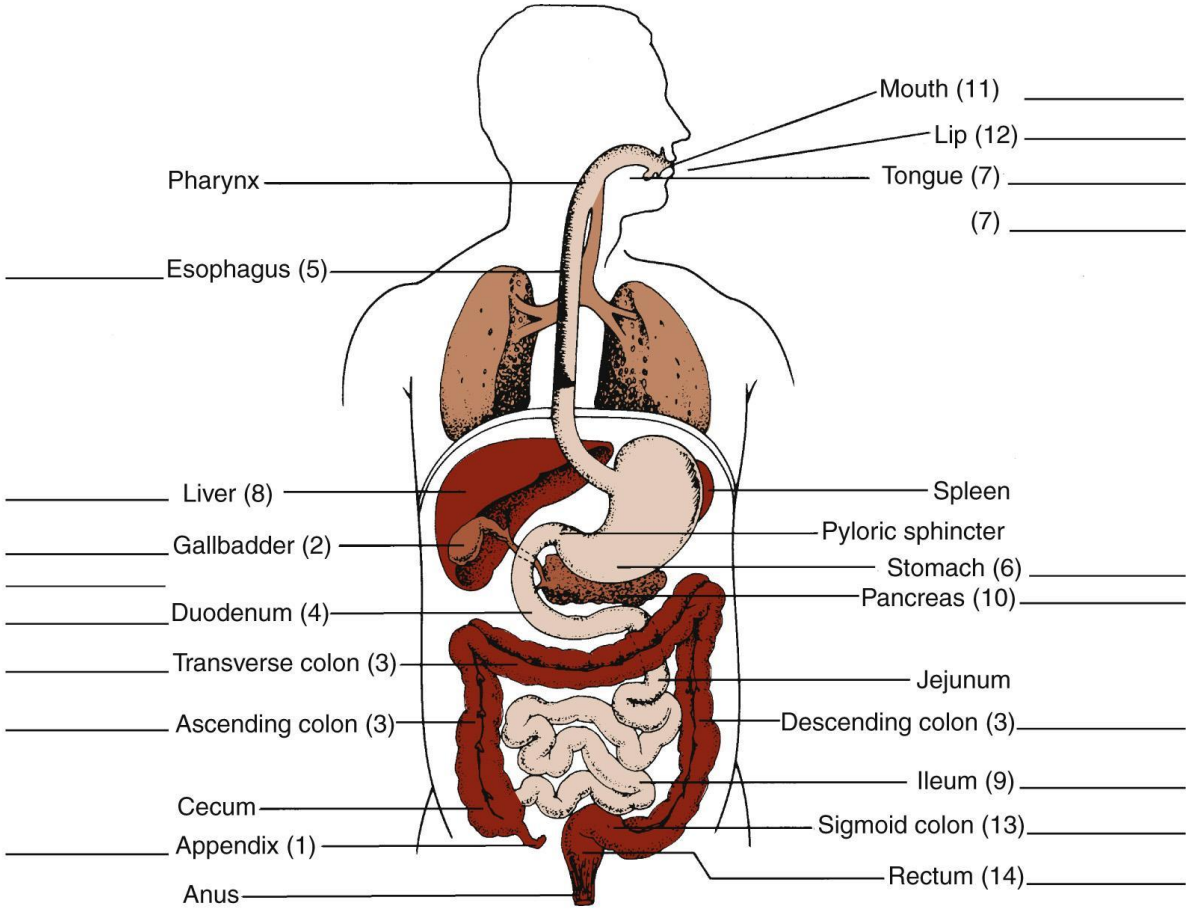
Role of the Small Intestine in the Digestive Process

- The duodenum is the first part of small intestines (20” long).
- Two accessory organs secrete into the duodenum through tiny tubes called ducts:
  - Pancreas secretes enzymes necessary for digestion.
  - Gallbladder secretes bile that has been produced by the liver and stored in the gallbladder.
- The jejunum, followed by the ileum, forms the remainder of the small intestine.

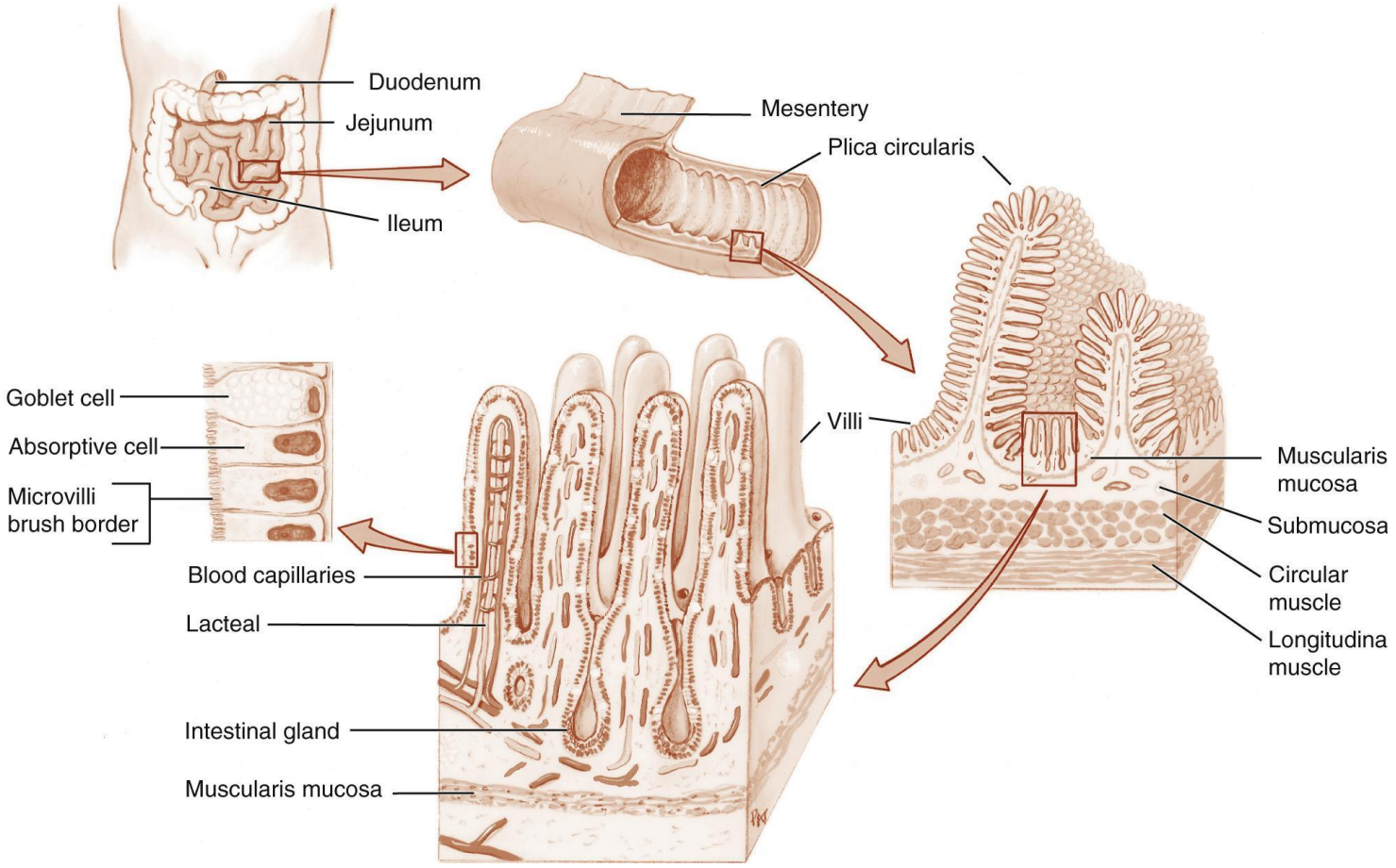
Role of the Small Intestine in the Digestive Process, cont'd

- Mucosal cells located in the lining of the small intestine secrete enzymes that continue the chemical breakdown of food.
- Enzymes include sucrase, maltase, lipase, peptidase, and lactase.
- Digestion is completed in the small intestine.
- Absorption is the passage of the end products of digestion from the small intestine into the bloodstream.

The Digestive System



Intestinal Villi



Divisions and Functions of the Large Intestine

- Divisions:
  - Cecum
  - Colon: ascending colon, transverse colon, the descending colon, sigmoid colon
  - Rectum
- Functions:
  - Absorption of water
  - Elimination of solid waste products of digestion from the body

Passage of Food Through the Digestive Tract

food ingestion → mouth → esophagus → cardiac sphincter → stomach → pyloric sphincter → small intestine (duodenum, jejunum, ileum) → nutrients absorption by the blood and carried to all cells for metabolic waste → ileocecal sphincter → large intestine (cecum, ascending colon, transverse colon, descending colon, sigmoid colon, rectum) → anal sphincter → elimination

Functions of the Liver, Gallbladder, and Pancreas in Digestive Process

- Liver: secretes bile, which aids in the digestion of fats
- Gallbladder: stores the bile and concentrates the bile by reabsorbing water
  - When food (especially food that contains fat) enters the duodenum from the stomach, the gallbladder is stimulated to contract and release bile into the duodenum.
- Pancreas: secretes the enzymes lipase, protease, amylase, and bicarbonate into the duodenum

Functions of the Liver, Gallbladder, and Pancreas in Digestive Process, cont'd

- The islets of Langerhans are contained in the pancreas.
  - They secrete two hormones—glucagon and insulin—that are released directly into the bloodstream.
- Insulin is necessary for the metabolism of carbohydrates in the body, and it decreases blood glucose levels.
- Glucagon, also instrumental in digestion, increases blood glucose.

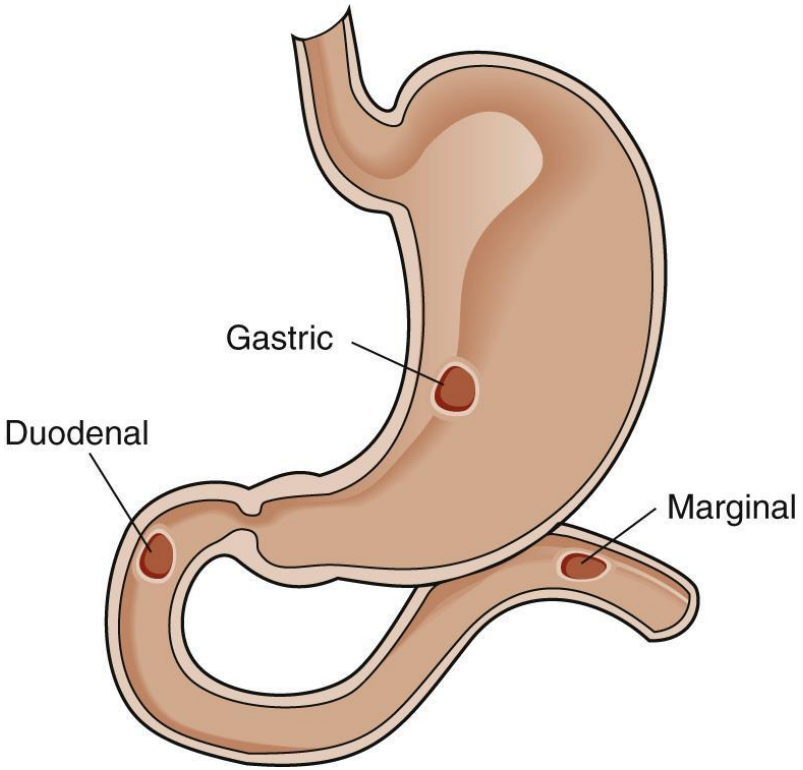
Gastritis

- Describes a group of conditions with one thing in common: inflammation of the lining of the stomach
- May occur suddenly (acute gastritis), or it can occur slowly over time (chronic gastritis).
- Symptoms may include a burning ache or pain (indigestion), nausea, vomiting, and/or a feeling of fullness in upper abdomen after eating.
- If condition worsens and goes untreated, gastritis can lead to ulcers.

Peptic Ulcer Disease

- A lesion or sore of the mucous membrane of the stomach (gastric ulcer) or duodenum (duodenal ulcer)
- Causes may include excessive secretion of gastric enzymes, hydrochloric acid, Helicobacter pylori, heredity, and taking certain drugs, especially NSAIDs
- If untreated, bleeding, hemorrhage, or perforation may occur.
- Surgery may be indicated when scarring, recurrent bleeding, or perforation occurs.

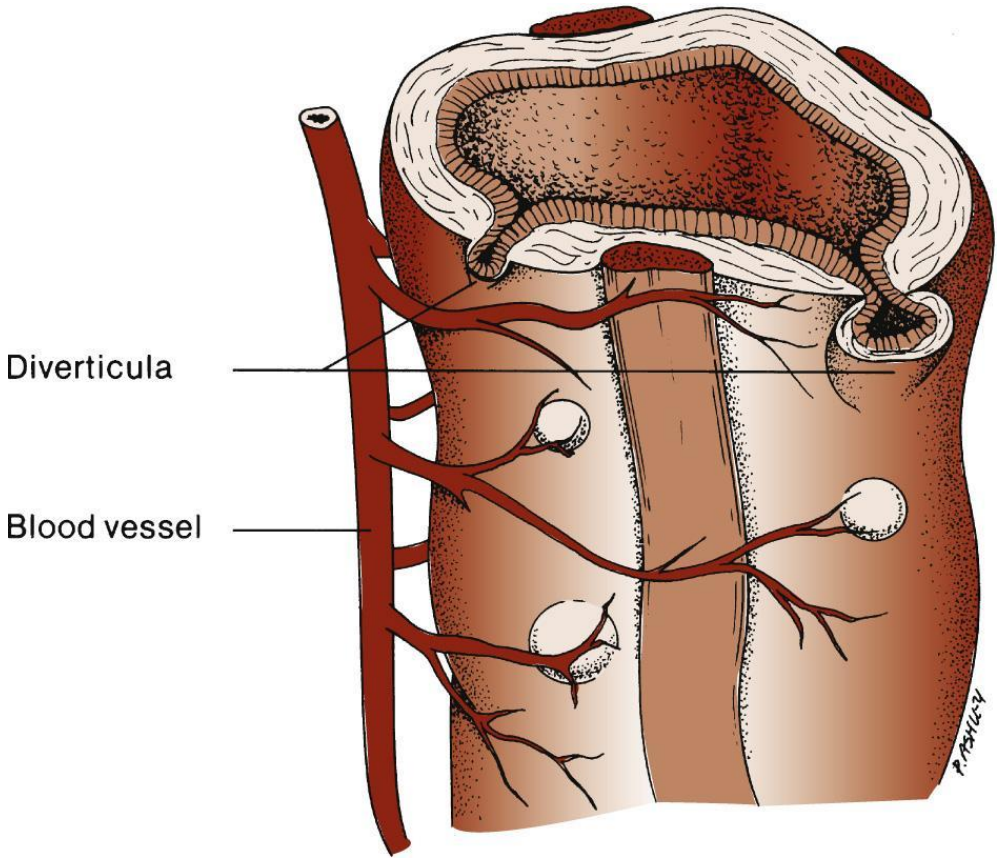
Types of Ulcers



Diverticular Disease

- Caused by the formation of small pouches, called diverticula, on the wall of the large intestine, generally the colon.
- Two types:
  - Diverticulosis
  - Diverticulitis
- Symptoms include cramping in the abdomen and muscle spasms.

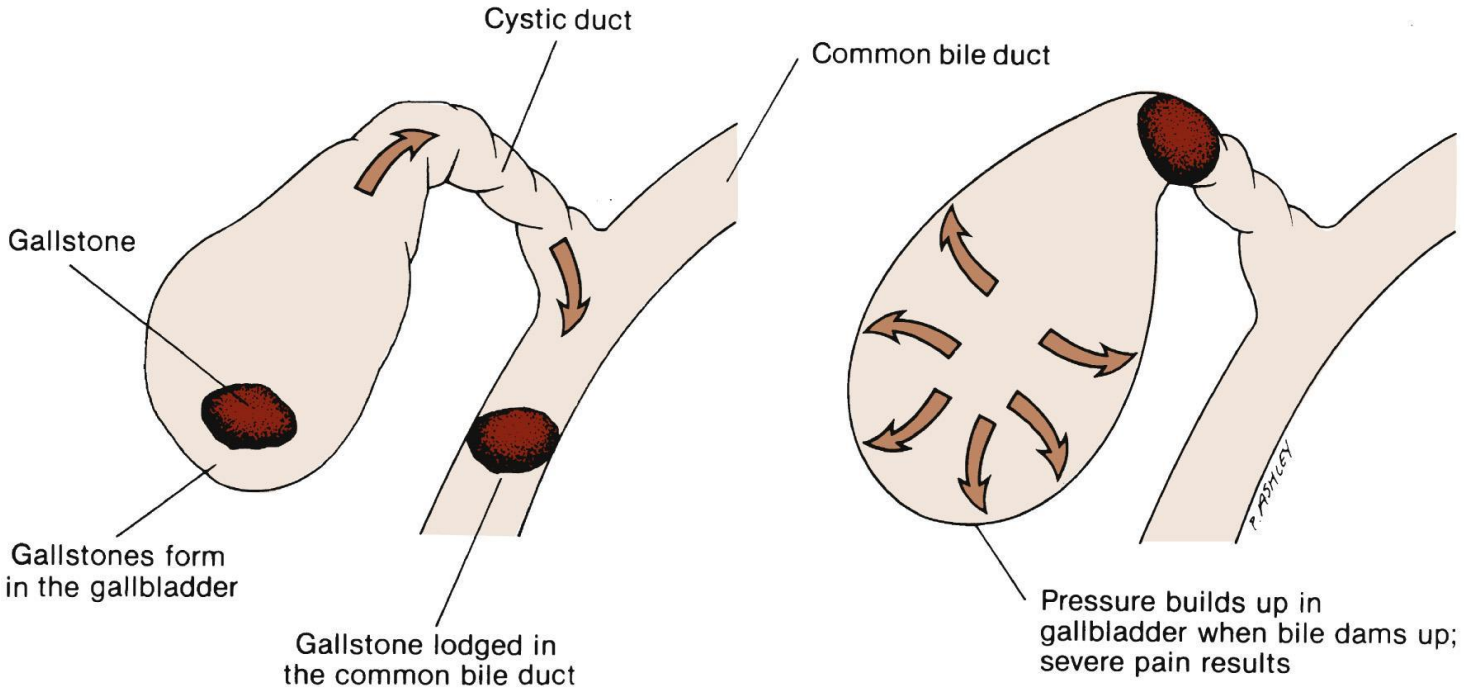
Diverticula



Cholelithiasis (Gallstones) and Choledocholithiasis

- Cholelithiasis: condition that affects 20% of the population older than 40 years of age; is more common in women than in men
  - Stones form because of changes in bile content.
- Choledocholithiasis: gallstones lodged in the common bile duct, which leads to the duodenum
- Symptoms of a typical gallbladder attack include acute abdominal pain after eating a fatty meal and/or digestive disturbances, such as belching and flatulence.

Gallstones



Pyloric Stenosis

- An obstruction that is caused by narrowing of the pyloric sphincter muscle
- Condition may be congenital or acquired.
- In adults: most often is caused by peptic ulceration or tumors that may be cancerous.
- Symptoms include:
  - Vomiting that becomes progressively more frequent and forceful
  - Adults experience a gradual weight loss.
- Treatment: usually surgical

Unit 7 Abbreviations

BE	barium enema
EGD	esophagogastroduodenoscopy
GE	gastroenterology/gastroenterologist
GERD	gastroesophageal reflux disease
GI	gastrointestinal
PUD	peptic ulcer disease
UGI	upper gastrointestinal

Lesson 22.8

Unit 8: The Respiratory System

1. Describe the overall function of the respiratory system and identify the organs included in the upper and lower respiratory systems.
2. Compare internal respiration with external respiration.
3. Name and discuss the function of each organ of the respiratory system.
4. Describe the pathway of air from the outside to the capillary blood in the lungs.

Lesson 22.8

Unit 8: The Respiratory System (cont'd)

5. Discuss pneumothorax, hemothorax, pulmonary embolism, chronic obstructive pulmonary disease (COPD), and acute respiratory distress syndrome (ARDS).
6. Read the objectives related to medical terminology and demonstrate ability to meet the objectives by correctly completing Exercises 1 through 8.
7. Define the unit abbreviations.

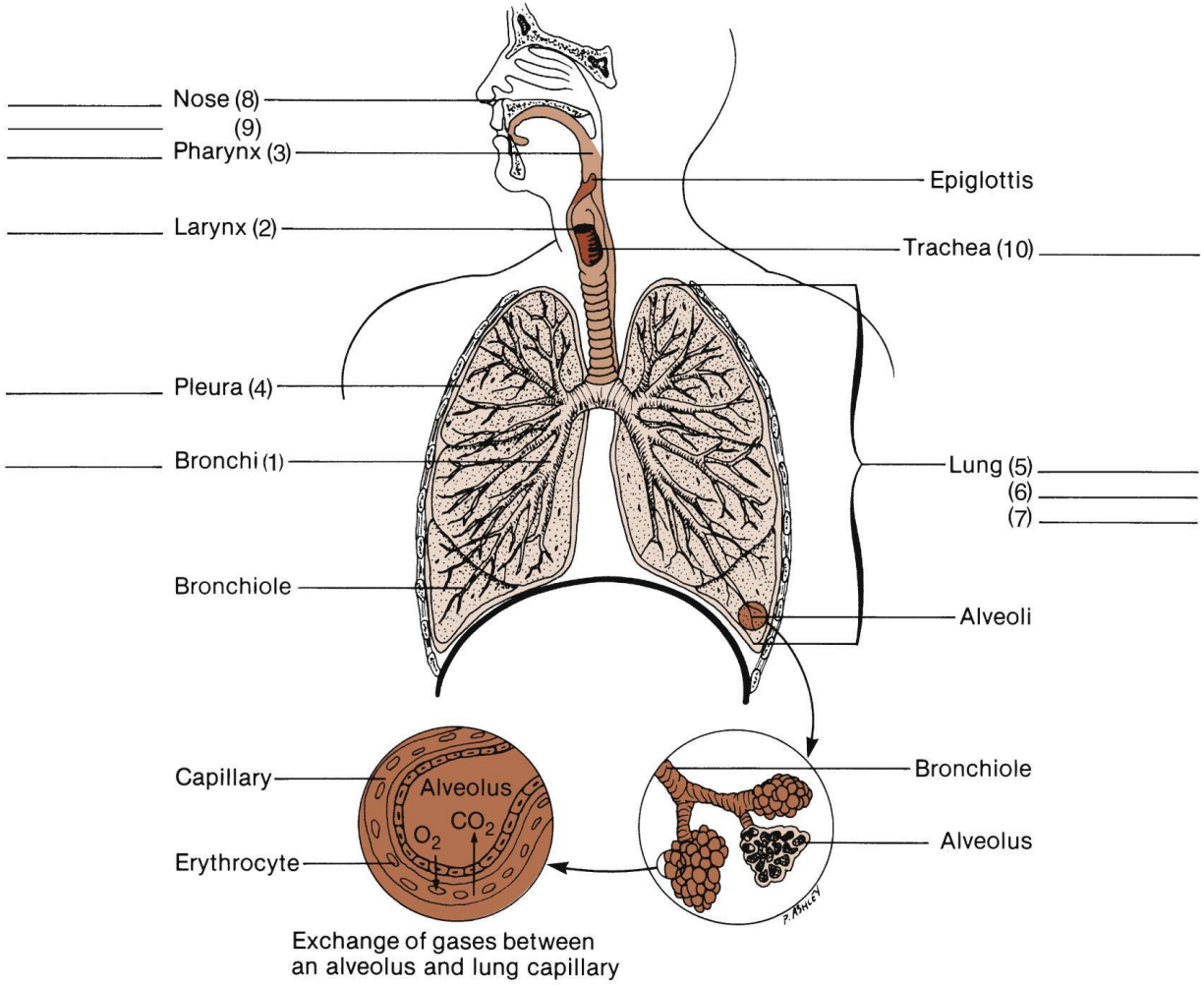
Functions of the Respiratory System

- Exchange of gases:
  - Oxygen is taken into the body.
  - Carbon dioxide is removed.
- This process is referred to as respiration.
- Helps to regulate the acid-base balance

Division of the Respiratory System

- Upper Respiratory System:
  - Nose, nasal cavities, sinuses, pharynx, and larynx
- Lower Respiratory System:
  - Trachea, bronchi, alveoli, and lungs

The Respiratory System



External Respiration

- The exchange of gases between the lungs and the blood
  - Oxygen is inhaled into the lungs and passes through the capillary wall into the blood to be carried to the blood cells.
  - Carbon dioxide passes out of the capillary blood to the lungs to be exhaled to the outside environment.

Internal Respiration

- The exchange of gases within the body between the blood in the capillaries and individual body cells
- Cells take O_2 from blood; give off CO_2 at same time to be transported to lungs.

Functions of the Respiratory Organs

- Nose: prepares the air for the body by:
  - Warming and moistening the air
  - Removing pathogenic microorganisms
  - Removing foreign particles, such as dust, from the air
- Pharynx (throat): passage of
  - Air from the pharynx into the larynx, which is located anterior to the esophagus
  - Food from the pharynx to the esophagus

Functions of the Respiratory Organs, cont'd

- Larynx (voice box): contains the vocal cords
  - As air is exhaled past the vocal cords, the vibration of the cords produces sound.
- Epiglottis (a flap of cartilage): automatically covers the larynx during the act of swallowing to prevent the passage of food from the pharynx into the larynx
- Trachea (windpipe): passage of air
- Bronchi ((singular: bronchus): passage of air

Functions of the Respiratory Organs, cont'd

- Lungs: the bronchus enters the lung; it divides into smaller tubes and continues to subdivide into even smaller tubes called bronchioles.
- Alveoli (singular: alveolus): grape-like cluster of air sacs located at the end of each bronchiole
  - The walls of alveoli are single-celled, which allows for the exchange of gases to take place between the alveoli and the capillaries.

Functions of the Respiratory Organs, cont'd

- Pleura: a double sac that surrounds each lung and lines the walls of the thoracic cavity
- Visceral pleura: lines the outer surface of the lungs
- Parietal pleura: covers the chest wall

Pathway of Air from the Outside to the Capillary Blood in the Lungs

air → nose → pharynx → larynx → trachea → bronchi → bronchioles → alveoli, where the exchange of carbon dioxide and oxygen takes place

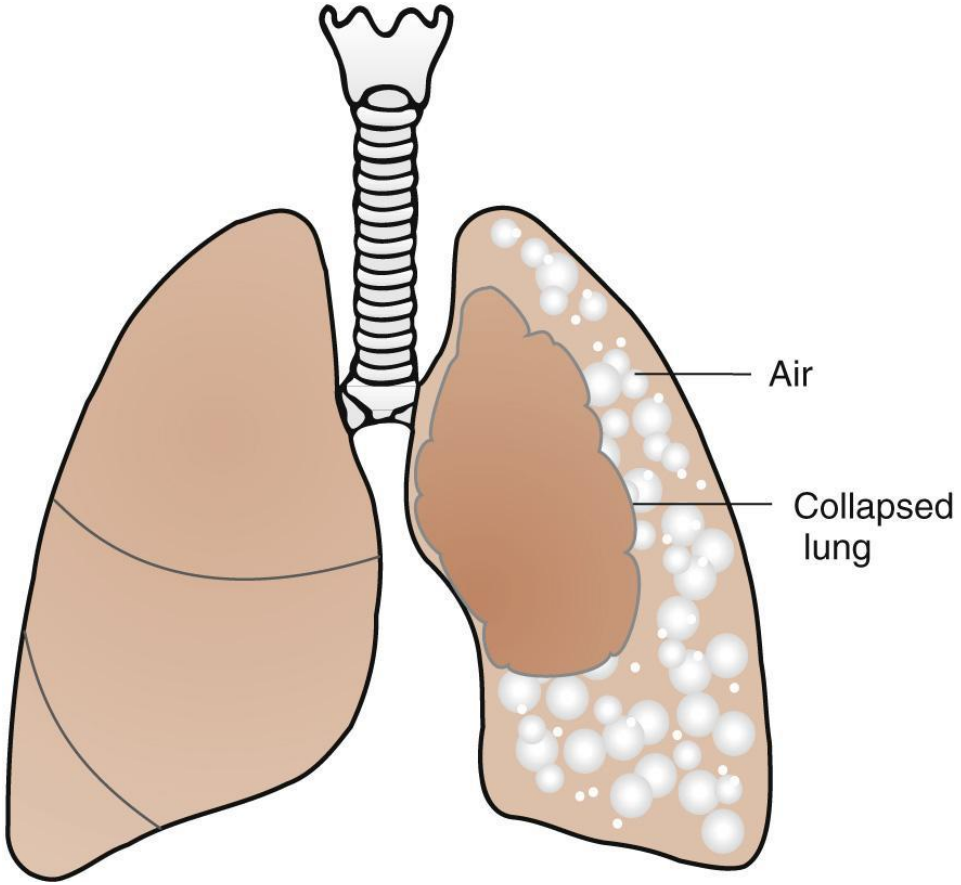
Pneumothorax

- Collection of air or gas in the pleural cavity, resulting in a collapsed lung, or atelectasis
- May be caused by a chest wound, or it may be a spontaneous collapse due to lung disease
- Symptoms include sudden sharp chest pain, shortness of breath, cyanosis, and stopping of normal chest movements on the affected side.

Pneumothorax, cont'd

- Treatment:
  - Observation and supplemental oxygen for an uncomplicated pneumothorax
  - Thoracentesis to remove the air or gas from the cavity and
  - Thoracotomy with insertion of chest tubes that are connected to an underwater drainage system with suction and remain in place until air is no longer expelled from the pleural space

Pneumothorax



Hemothorax

- The collection of blood in the pleural cavity
- Usually caused by chest trauma
- Symptoms include chest pain, shortness of breath, respiratory failure, tachycardia, and anxiety.
- Treatment includes stabilizing the patient, stopping the bleeding, inserting a chest tube to evacuate blood and air from the pleural space, and reexpanding the lung.

Pulmonary Embolism (PE)

- The most common complication in hospitalized patients
- Usually caused by a blood clot that has been dislodged from a leg or pelvic vein (deep vein thrombosis [DVT]) and blocks a pulmonary artery
- Symptoms include:
  - Cough, dyspnea, chest pain, cyanosis, tachycardia, and shock
- Treatment includes:
  - Thrombolytic, anticoagulant, and oxygen therapy

Chronic Obstructive Pulmonary Disease (COPD)

- Persistent obstruction of bronchial air flow
- A group of respiratory diseases
  - Bronchitis, asthma, and emphysema are the most common.
- Attributed to:
  - Cigarette smoking, environmental pollution, occupational hazards, and chronic infection
- Symptoms include:
  - Shortness of breath, chronic cough, wheezing, increased sputum production, and fatigability upon even mild exertion

Chronic Obstructive Pulmonary Disease (COPD), cont'd

- Symptoms are progressive, and lung damage is irreversible.
- No cure is known.
- Treatment focuses on maintaining remaining lung function and relieving symptoms as much as possible.

Acute (or Adult) Respiratory Distress Syndrome (ARDS)

- Respiratory failure, usually in the adult patient, that occurs as a result of disease or injury
- Symptoms include pulmonary edema, dyspnea, tachypnea, and hypoxemia with cyanosis.
- The patient with ARDS usually requires intensive medical intervention (in an intensive care unit [ICU]).
- The mortality rate is approximately 50% to 60%.

Unit 8 Abbreviations

ARDS acute respiratory distress syndrome
COPD chronic obstructive pulmonary disease
ET endotracheal
NP nasopharyngeal
PE pulmonary embolism
RSVP respiratory syncytial virus
SARS severe acute respiratory syndrome (viral)
TB tuberculosis (mycobacterial)
URI upper respiratory infection

Graves' Disease, cont'd

- Diagnosis may include T_3 and T_4 uptake tests and a thyroid scan.
- Treatment includes antithyroid drugs, radioactive iodine, and subtotal thyroidectomy.

Unit 11 Abbreviations

ACTH adrenocorticotropic hormone
DKA diabetic ketoacidosis
DM diabetes mellitus
FSH follicle-stimulating hormone
HbA1c hemoglobin A1C, or glycosylated hemoglobin
LH luteinizing hormone
PRL prolactin
PTH parathyroid hormone
TSH thyroid-stimulating hormone