Joints in the Human Body

Complete this concept map of the types and functions of joints in the human body. Then give examples of each type. Use these words or phrases once: wrist, ball-and-socket, fingers, toes, rotational motion, hip, shoulder, back-and-forth motion, ankle, knee, hinge, gliding, elbow, pivot.

Types and Functions of Moveable Joints

1. [ ]
   - allows for [ ]
   - examples [ ]

2. [ ]
   - twisting motion [ ]
   - examples [ ]

3. [ ]
   - [ ]

4. [ ]
   - allows for [ ]
   - examples [ ]

5. [ ]
   - [ ]

6. [ ]
   - allows for [ ]
   - examples [ ]

7. [ ]
   - sliding motion between bones [ ]
   - examples [ ]

8. [ ]
   - [ ]

9. [ ]
   - allows for [ ]
   - examples [ ]

10. [ ]
    - [ ]

Use with Chapter 34, Section 34.2
Each type of joint in the human body allows a certain range of motion. For example, the hinge joints of the knees allow leverlike motion in one plane only, permitting bending and straightening of the leg. The ball-and-socket joints of the hip allow universal motion so that the legs can be lifted, swung out and back, or rotated with a circular motion.

Another important joint is the saddle joint of the thumb. As the name implies, it looks like two saddles that fit together and can slide over each other without losing their close fit. The saddle joint of the thumb allows for a wide range of motion. Study the drawings below. Then answer the questions that follow.

1. As you can see, abduction of the thumb involves moving it away from the central axis of the hand. Adduction is a movement toward the axis of the hand. Which type of motion would you call swinging a straightened arm from your sides outward?

2. The opposable thumb played an important role in human evolution. Early primates were the first animals in which this adaptation appeared. What advantages do you think it offers?

3. How useful is flexion as an adaptation? What does it allow us to do?

4. Suppose the saddle joint were only a hinge joint. How would the various actions of the thumb be affected?
1. What causes the striated appearance of skeletal muscles?

2. What is a sarcomere?

3. When a nerve signals a muscle to contract, where is calcium released?

4. Study the drawings in the transparency showing two sarcomeres in relaxed, contracting, and maximally contracted states. What happens in the presence of calcium?

5. What is needed besides calcium for contraction to occur?

6. What is the name of the theory of muscle contraction illustrated in the transparency?

7. In terms of your control over muscle contraction, how does skeletal muscle differ from smooth muscle or cardiac muscle?

8. In what way is the appearance of cardiac muscle similar to that of skeletal muscle?
Frontalis

Orbicularis oculi

Sternocleidomastoid

Deltoid

Pectoralis major

Triceps

Biceps

Brachioradialis

Rectus abdominis

External oblique

Quadriceps femoris

Adductor longus

Gastrocnemius

Sartorius

Extensor digitorum longus

Tibialis anterior
1. What do all the muscles shown in the transparency have in common?

2. Using the transparency, determine what movement occurs when the deltoid muscle contracts.

3. If you are sitting and want to raise your lower leg so that your entire leg is straight, what muscle must your brain order to contract?

4. If you want to bend your foot upward from the ankle, what muscle must you contract?

5. If you were to bend your elbow in order to touch your shoulder, what arm muscle would contract?

6. Which abdominal muscles help you to do a sit-up?

7. What happens to the gastrocnemius when you stand on the balls of your feet, lifting your heels off the ground?

8. You are sitting in a chair at your desk. Someone enters the room, and you turn at the waist to see who it is. Which abdominal muscles allow you to make this turn?

9. Which chest muscles are primarily responsible for your ability to do a push-up?

10. Which muscle allows you to lift your eyebrows?
**Chapter 34**

**Protection, Support, and Locomotion**

**Reviewing Vocabulary**

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where two or more bones meet</td>
<td>a. ligament</td>
</tr>
<tr>
<td>Fluid-filled sac on the outside of a joint</td>
<td>b. marrow</td>
</tr>
<tr>
<td>Potential bone cell found in cartilage of embryo</td>
<td>c. melanin</td>
</tr>
<tr>
<td>Soft tissue that fills center cavities of bones</td>
<td>d. osteoblast</td>
</tr>
<tr>
<td>Protein in dead epidermal cells that protects underlying cells</td>
<td>e. bursa</td>
</tr>
<tr>
<td>Cell pigment that colors skin and protects it from solar radiation</td>
<td>f. sarcomere</td>
</tr>
<tr>
<td>Band of tissue connecting bone to bone</td>
<td>g. keratin</td>
</tr>
<tr>
<td>Smaller unit in a muscle fiber</td>
<td>h. joint</td>
</tr>
<tr>
<td>The functional unit of a myofibril</td>
<td>i. myofibril</td>
</tr>
</tbody>
</table>

**Compare and contrast each pair of related terms.**

10. compact bone, spongy bone

11. axial skeleton, appendicular skeleton

12. voluntary muscle, involuntary muscle

13. epidermis, dermis
Chapter Assessment

Understanding Main Ideas (Part A)

Write the word or phrase that best completes the statement.

1. Beneath the scab of a wound, ___________________________ begin to multiply to fill in the gap.

2. ___________________________ produces red blood cells, some white blood cells, and cell fragments involved in blood clotting.

3. The mineral ___________________________ , found in dairy products, is a critical part of the diet for healthy, strong bones.

4. Contraction of ___________________________ muscle, the muscle of internal organs, is slow and prolonged.

5. Bones grow in length at the ___________________________ of the bone. They grow in diameter on the ___________________________ surface of the bone.

6. Muscle strength depends on the ___________________________ of the fibers and the number of fibers that ___________________________ at one time.

7. When an inadequate supply of oxygen is available to meet a muscle cell’s oxygen needs, ______________ becomes the primary source of ATP.

Answer the following questions.

8. Why is the skin considered an organ? Name two important functions of skin.

9. Explain what causes a sprain and what the effects are.
Thinking Critically

Because it usually goes unnoticed until back pain or a spontaneous fracture occurs, osteoporosis is often referred to as the silent disease. This skeletal disease is characterized by a decrease in bone mass resulting in bones so porous they break as a result of even everyday activities. Though most prevalent after the age of 50, intervention before the age of 30 can significantly decrease the risk of developing osteoporosis later in life. The table below shows some of the risk factors associated with developing osteoporosis later in life. Use the table to answer questions 1 and 2.

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>After the middle or later forties, bone mass begins to decrease.</td>
</tr>
<tr>
<td>Alcohol Intake</td>
<td>Excessive alcohol intake increases the risk of osteoporosis, especially in men.</td>
</tr>
<tr>
<td>Body frame/weight</td>
<td>Small-framed women and men are at greater risk for developing osteoporosis.</td>
</tr>
<tr>
<td>Cigarette Smoking</td>
<td>Smokers generally have lower bone densities than nonsmokers.</td>
</tr>
<tr>
<td>Diet</td>
<td>Calcium intake below the RDA throughout life increases the risk of osteoporosis.</td>
</tr>
<tr>
<td>Genetics</td>
<td>Having a close relative with osteoporosis or an osteoporotic fracture increases the risk of developing the disease.</td>
</tr>
<tr>
<td>Gender</td>
<td>Though both men and women develop osteoporosis, women are about four to five times more likely to develop the disease.</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Regular physical activity, especially weight-bearing exercise, increases bone density.</td>
</tr>
</tbody>
</table>

1. Which of the factors listed in the table are controllable? Which are not controllable?

2. Why would weight-bearing exercises increase bone density? ________________________________

Answer the following questions.

3. Bone fractures in children are often different from fractures in adults. Explain why this may be so.

4. A paramedic at an accident is aware of pressure points, areas where a major blood vessel crosses a bone close to the body surface. How might the paramedic use these points to stop bleeding?
**MinMax**

**35.1**

**Evaluate a Bowl of Soup**

As a consumer, you are bombarded by advertising that promotes the nutritional benefits of specific food products. Choosing a food to eat on the basis of such ads may not make nutritional sense. By examining the product labels that list ingredients of processed foods, you can learn important things about their nutritional content.

<table>
<thead>
<tr>
<th>Data Table</th>
<th>Percentage of Daily Value (DV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>60%</td>
</tr>
<tr>
<td>Fat</td>
<td>30%</td>
</tr>
<tr>
<td>Saturated Fats</td>
<td>10%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>1.5%</td>
</tr>
<tr>
<td>Protein</td>
<td>10%</td>
</tr>
<tr>
<td>Total Calories</td>
<td>2000</td>
</tr>
</tbody>
</table>

**Procedure**

1. Examine the information in the table listing the daily value (DV) of various nutrients. DV expresses what percent of Calories should come from certain nutrients. For instance, in the proposed diet of 2000 Calories, 60 percent of the Calories should come from carbohydrates.

2. Examine the nutritional information on the soup can label on page 927 of your text and compare it with the DV table.

**Analysis**

1. Does your bowl of soup provide more than 30 percent of any of the daily nutrients? Which ones?

2. Calculate the percentage of Calories in soup that are provided by saturated fat.

3. Is this soup a nutritious meal? Explain.
In your textbook, read about the functions of the digestive tract, the mouth, and the stomach.

Complete each statement.

1. The entire process of digestion involves first ______________ food, then ______________ it into simpler compounds, then ______________ nutrients for use by body cells, and, finally, ______________ wastes.

2. By chewing your food, you ______________ its surface area.

3. Various enzymes play a role in ______________ digestion, while the action of teeth, tongue, and muscles are involved in ______________ digestion.

4. In your mouth, the enzyme ______________ is released from ______________ glands to begin the chemical breakdown of ______________.

5. Your ______________ are adapted for cutting food, while your ______________ are best suited for grinding food.

If the statement is true, write true. If it is not, rewrite the italicized part to make it true.

6. During swallowing, the epiglottis covers the esophagus to prevent choking.

7. Food is moved through the digestive tract by rhythmic waves of voluntary muscle contractions called peristalsis.

8. The churning actions of the stomach help mix the food with pancreatic juices.

9. Pepsin is a protein-digesting enzyme that only works in an acidic environment.

10. The stomach releases its contents into the small intestine suddenly, all at once.
In your textbook, read about the small intestine and the large intestine.

Answer the following questions.

11. What role do the enzymes secreted by the pancreas play in the digestive process?

12. Explain the relationship between the liver, the gallbladder, and bile.

13. Once in the small intestine, what happens to
   a. digested food?
   b. indigestible materials?

Complete the table by checking the correct column(s) for each function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Small Intestine</th>
<th>Large Intestine</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Water is absorbed through walls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Digestion is essentially completed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Vitamin K is produced.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Nutrients are absorbed by villi.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Contents are moved by peristalsis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Indigestible material is collected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Bile and pancreatic juices are added.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about carbohydrates, fats, and proteins.

Complete the table by checking the correct column(s) for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Carbohydrates</th>
<th>Fats</th>
<th>Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the most energy-rich nutrients</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. sugars, starches, and cellulose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. broken down into amino acids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. part of a nutritious, balanced diet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. normally used for building muscle, but can be used for energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. broken down into glucose, fructose, and other simple sugars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. used to insulate the body from cold</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In your textbook, read about minerals and vitamins, water, and metabolism and calories.

Complete each statement.

8. ____________________________ are inorganic substances that help to build tissue or take part in chemical reactions in the body.

9. Unlike minerals, ____________________________ are organic nutrients that help to regulate body processes.

10. The two major vitamin groups are the ____________________________ and the ____________________________ vitamins.

11. The energy content of food is measured in ____________________________, each of which is equal to ____________________________ calories.

12. Despite the claims of many fad diets, the only way to lose weight is to ____________________________ more calories than you ____________________________.
The Digestive and Endocrine Systems

Carbohydrates, Fats, and Proteins in Nutrition

Complete this concept map showing the role of carbohydrates, fats, and proteins in nutrition. Use these words or phrases once: muscles, antibodies, carbohydrates, proteins, chemicals for blood-clotting, amino acids, glycerol, body functions, fatty acids, the liver, indigestible cellulose, glycogen, fat, body cells, hormones, cell structure, enzymes, simple sugars.

The digestive system

<table>
<thead>
<tr>
<th>breaks down</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
</tr>
<tr>
<td>into</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>which fuel</td>
</tr>
<tr>
<td>leaving</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>into</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>which stimulates</td>
</tr>
<tr>
<td>digestive tract</td>
</tr>
</tbody>
</table>

fat

1. into

2. which fuel

3. leaving

4. which stimulates

5. converted by

6. stored as

7. absorbed by

8. which are

9. and used to

10. into

11. which are

12. absorbed by

13. and used to

14. synthesized

15. synthesized

16. synthesized

17. synthesized

18. synthesized
**Regulation of Blood Glucose Concentration**

*Use with Chapter 35, Section 35.3*

1. **After a meal**
   - Blood glucose increased
   - Beta cells secrete insulin
   - Liver glycogen is broken down to glucose
   - Blood glucose is used by target tissues
   - Glucose is stored in the liver as glycogen

2. **Between meals**
   - Blood glucose decreased
   - Alpha cells secrete glucagon
   - Liver glycogen is broken down to glucose
   - Blood glucose is used by target tissues
   - Glucose is released into the blood from the liver
1. What two factors influence blood glucose concentration?

2. Where is glucose converted into glycogen?

3. What triggers the production of glucose-regulating hormones?

4. What kind of feedback control does the transparency show?

5. Describe the source and function of glucagon.

6. Describe the source and function of insulin.

7. Explain why a doctor will request that a person fast for 12 hours before blood is drawn to determine blood glucose concentration.
Function of the Small Intestine

Use with Chapter 35, Section 35.1

- Villus
- Columnar epithelium
- Blood vessel network
- Amino acids
- Fatty acids
- Monosaccharides
- Lymph vessel
Use with Chapter 35, Section 35.1

Function of the Small Intestine

Much of the work of the digestive system is actually a preparation for the absorption that takes place in the small intestine. In the space provided, explain the mechanical and chemical function of each structure involved in “digestion preparation.” (Some items may have only mechanical or only chemical function.)

1. Mouth

2. Esophagus

3. Stomach

4. Duodenum of the small intestine

5. Pancreas

6. Liver

7. Gallbladder

8. Large intestine

9. Describe a villus in the small intestine.

10. Explain the function of a villus.
**Reviewing Vocabulary**

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>__________ 1. Digestive enzyme that breaks down starch into smaller</td>
<td>a. epiglottis</td>
</tr>
<tr>
<td>molecules</td>
<td></td>
</tr>
<tr>
<td>__________ 2. Muscular tube that connects the mouth to the stomach</td>
<td>b. pepsin</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 3. Series of involuntary muscle contractions along the</td>
<td>c. rectum</td>
</tr>
<tr>
<td>walls of the digestive tract</td>
<td></td>
</tr>
<tr>
<td>__________ 4. Flap of cartilage that covers the opening to the</td>
<td>d. amylase</td>
</tr>
<tr>
<td>respiratory tract during swallowing</td>
<td></td>
</tr>
<tr>
<td>__________ 5. Muscular, pouchlike enlargement of the digestive tract</td>
<td>e. stomach</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 6. Digestive enzyme that begins the chemical digestion</td>
<td>f. target cells</td>
</tr>
<tr>
<td>of proteins</td>
<td></td>
</tr>
<tr>
<td>__________ 7. Chemical that breaks down fats into small droplets</td>
<td>g. esophagus</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 8. Last section of the digestive system from which feces</td>
<td>h. endocrine gland</td>
</tr>
<tr>
<td>are eliminated</td>
<td></td>
</tr>
<tr>
<td>__________ 9. Regulates metabolism, growth, and development</td>
<td>i. small intestine</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 10. Specific cells in the body to which hormones convey</td>
<td>j. liver</td>
</tr>
<tr>
<td>information</td>
<td></td>
</tr>
<tr>
<td>__________ 11. Unit of heat used to measure the energy content of food</td>
<td>k. thyroid gland</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 12. Narrow, muscular tube in which digestion is completed</td>
<td>l. bile</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>__________ 13. Organ that releases hormones directly into the</td>
<td>m. peristalsis</td>
</tr>
<tr>
<td>bloodstream</td>
<td></td>
</tr>
<tr>
<td>__________ 14. Organ that produces bile</td>
<td>n. Calorie</td>
</tr>
</tbody>
</table>
Understanding Main Ideas (Part A)

In the space at the left, write the letter of the word or phrase that best completes the statement or answers the question.

1. Starches are large
   a. fats.  
   b. proteins.  
   c. polysaccharides.  
   d. monosaccharides.

2. Which of the following is not mechanical digestion?
   a. chewing food  
   b. breakdown of fats by bile  
   c. churning of the stomach  
   d. action of pepsin on proteins

3. The surface area of the small intestine is greatly increased by
   a. a large number of villi.  
   b. chemical digestion.  
   c. peristalsis.  
   d. mechanical digestion.

4. Which of the following is part of the digestive tract?
   a. liver  
   b. small intestine  
   c. gallbladder  
   d. pancreas

5. Which of the following occurs in the large intestine as the work of anaerobic bacteria?
   a. absorption of water  
   b. synthesis of vitamin K and some B vitamins  
   c. change of glucose to glycogen  
   d. elimination of indigestible matter

6. Vitamins are used by the body to
   a. provide energy.  
   b. maintain growth and metabolism.  
   c. supply building materials.  
   d. digest proteins.

7. Which is the most abundant substance in the body?
   a. fat  
   b. water  
   c. sugar  
   d. protein

8. The body’s preferred energy source is
   a. carbohydrates.  
   b. vitamins.  
   c. proteins.  
   d. minerals.

9. As a result of digestion, proteins are broken down into
   a. monosaccharides.  
   b. amino acids.  
   c. triglycerides.  
   d. glycerol.

10. Cellulose is important in the diet as a source of
    a. energy.  
    b. protein.  
    c. fat.  
    d. fiber.

11. Pepsin works best in the presence of
    a. amylase.  
    b. protein.  
    c. saliva.  
    d. hydrochloric acid.
In your textbook, read about neurons—basic units of the nervous system.

Complete the table by filling in the missing information in each case.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>carry impulses toward the brain and spinal cord</td>
</tr>
<tr>
<td>2. dendrites</td>
<td></td>
</tr>
<tr>
<td>3. motor neurons</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>transmit impulses within the brain and spinal cord</td>
</tr>
<tr>
<td>5.</td>
<td>carry impulses away from neuron cell bodies</td>
</tr>
</tbody>
</table>

Order the steps in impulse transmission from 1 to 7.

_________ 6. A wave of depolarization moves down the neuron.

_________ 7. The Na⁺/K⁺ pump takes over again, pumping sodium ions out across the membrane, and pumping potassium ions in.

_________ 8. Sodium channels in the neural membrane open.

_________ 9. A neuron receives a stimulus.

_________ 10. As the wave of depolarization passes, sodium channels close and potassium channels open.

_________ 11. The neuron returns to a resting state.

_________ 12. Sodium ions flow into the neuron, causing the inside of the neuron to become positively charged.
In your textbook, read about the central nervous system and the peripheral nervous system.

Label the diagram of the brain to show the cerebrum, cerebellum, and brain stem.

Write the name of the part labeled above that matches each description in the table.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Includes the medulla and pons</td>
<td></td>
</tr>
<tr>
<td>17. Controls conscious activities and movement</td>
<td></td>
</tr>
<tr>
<td>18. Important for keeping your balance</td>
<td></td>
</tr>
<tr>
<td>19. If damaged, heart rate might be affected</td>
<td></td>
</tr>
<tr>
<td>20. If damaged, memory might be affected</td>
<td></td>
</tr>
<tr>
<td>21. Ensures that movements are coordinated</td>
<td></td>
</tr>
</tbody>
</table>

Complete the table by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Autonomic Nervous System Division</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sympathetic</td>
</tr>
<tr>
<td>22. Controls internal activities when the body is at rest</td>
<td></td>
</tr>
<tr>
<td>23. Increases breathing rate</td>
<td></td>
</tr>
<tr>
<td>24. Tenses muscles</td>
<td></td>
</tr>
<tr>
<td>25. Slows heart rate down</td>
<td></td>
</tr>
<tr>
<td>26. Activates fight or flight response</td>
<td></td>
</tr>
</tbody>
</table>
In your textbook, read about sensing chemicals and sensing light.

Determine if each statement is true or false.

1. Impulses coming from sensory receptors in your nose and mouth are interpreted as odors and tastes by the cerebrum.
   - True

2. The senses of taste and smell are closely linked.
   - True

3. The lens in the eye controls the amount of light that strikes the retina.
   - False

4. On a bright sunny day, the cones in your eyes play a greater role in your sense of sight than the rods.
   - True

5. Only the left hemisphere of the brain is involved in the sense of sight.
   - False

6. When you are looking at an object, each of your eyes sees the object from the same perspective.
   - False

7. The retina contains two types of light receptor cells.
   - True

In your textbook, read about sensing mechanical stimulation.

Circle the letter of the response that best completes each statement.

8. Sound waves are converted into nerve impulses inside the
   a. ear canal.  
   b. cochlea.  
   c. malleus.  
   d. optic nerve.
   - b. cochlea.

9. If the semicircular canals in one of your ears were damaged, you might
   a. lose your ability to hear low-frequency sounds.  
   b. lose your ability to coordinate your neck muscles.  
   c. lose your sense of balance.  
   d. lose your sense of rhythm.
   - c. lose your sense of balance.

10. The malleus, incus, and stapes are found in the
    a. outer ear.  
    b. eardrum.  
    c. middle ear.  
    d. inner ear.
    - c. middle ear.

11. Your senses of hearing and touch both depend on nerve impulses being generated by
    a. electrical stimulation.  
    b. sound waves.  
    c. a change in temperature.  
    d. mechanical stimulation.
    - d. mechanical stimulation.

12. In the skin of your fingertips, you might expect to find receptors for
    a. touch.  
    b. pressure.  
    c. pain.  
    d. all of these
    - d. all of these
In your textbook, read about how drugs act on the body, their medicinal uses, and abuse of drugs.

Answer the following questions.

1. Distinguish between a drug and a medicine.

2. What is a narcotic?

3. Compare the effect of a stimulant on the CNS with the effect of a depressant.

4. What is an addiction?

5. How does a person’s body develop a tolerance for a drug?

In your textbook, read about the classes of commonly abused drugs.

Complete the table by checking the correct column for each example.

<table>
<thead>
<tr>
<th>Example</th>
<th>Stimulant</th>
<th>Depressant</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Drugs that cause an increase in heart rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Alcohol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Nicotine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Caffeine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Barbiturates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Drugs that cause vasoconstriction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Opiates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Hallucinogens</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Sense of Touch

Complete this concept map for the sense of touch. Use these words or phrases one or more times: dermis, temperature, nerve endings, heat, cold, light pressure, eyelids, skin surface, tip of tongue, palms of hands, epidermis, fingertips, organs, muscle tissue, lower layers, heavy pressure, soles of feet.

![Concept Map for the Sense of Touch](image-url)
The Nervous System

Analyzing Sensory-Somatic Responses

There is more than one kind of reflex. Figure 1 shows the patellar reflex that occurs when a tendon in the knee is suddenly tapped. The action causes a muscle to tense and raise the leg slightly. Simple reflexes such as the patellar reflex are referred to as monosynaptic reflexes. Figure 2 shows what happens when the tip of the finger accidentally comes in contact with a flame. Just as with the patellar reflex, the withdrawal reflex occurs immediately, without first having to consult the brain. Yet it is more complex than the patellar reflex shown in Figure 1 because it is a polysynaptic reflex.

1. Trace the path of each reflex. How do the two reflexes differ in complexity?

   - Monosynaptic Reflex:
   - Polysynaptic Reflex:

2. The interneurons that transmit a message to motor neurons and cause the withdrawal response also carry information to conscious areas of the brain. Based on this information, explain what advantage a polysynaptic reflex provides over a monosynaptic reflex.

   - Monosynaptic Reflex:
   - Polysynaptic Reflex:
1. Which part of the brain controls balance, posture, and coordination?

2. To which division of the nervous system do the brain and spinal cord belong?

3. Which part of the brain consists of two hemispheres? What are some of the functions it controls?

4. How is the structure of the cerebrum thought to relate to the evolution of human intelligence?

5. Which functions are controlled by the medulla oblongata?

6. What role is played by the pons and midbrain of the brain stem?

7. How might an injury to your cerebellum affect your movements?

8. What is meant by “white matter” and “gray matter”?
Organization of the Nervous System

Basic Concepts

Nervous System

Central Nervous System (CNS)
- Brain, spinal cord

Peripheral Nervous System (PNS)

Somatic Nervous System (voluntary)
- Relays information to and from skin and skeletal muscles.

Autonomic Nervous System (involuntary)
- Relays information to internal organs.

Sympathetic Nervous System
- Controls organs in times of stress.

Parasympathetic Nervous System
- Controls organs when body is at rest.
Organization of the Nervous System

**Basic Concepts**

*Use with Chapter 36, Section 36.1*

1. What is the control center of the entire nervous system?

2. Which part of the CNS is made up of the midbrain, pons, and medulla oblongata?

3. Which part of the nervous system carries impulses between the body and the central nervous system?

4. List three kinds of neurons that would be involved in a reflex impulse.

5. Which part of the brain sends impulses to the autonomic nervous system during life-threatening emergencies?

6. Compare the parasympathetic nervous system with the sympathetic nervous system.

7. Trace the pathway of impulses through the nervous system in response to feeling rain on your skin.
**Process of Hearing**

**Use with Chapter 36, Section 36.2**

**A**
- Outer ear
- Middle ear
- Inner ear

**B**
- Stapes
- Incus
- Malleus
- Eardrum
- Ear canal
- Cochlea
- Semicircular canals
- Oval window
- Auditory nerve

**C**
- Cochlear duct
- Fluid
- To auditory nerve

**D**
- Hair cells
- Sensory neurons
1. What is the function of the outer ear?

2. What is the membrane at the end of the ear canal that vibrates in response to sound waves?

3. Identify the three bones of the middle ear. What function do they serve?

4. Where is the mechanical stimulation of sound converted into a nerve impulse?

5. How is the movement of nerve impulses in the inner ear passed to the auditory nerve?

6. Which parts of the brain receive the impulses from the auditory nerve?

7. What is the function of the semicircular canals?

8. Suppose you closed your eyes and began spinning in place as fast as possible and then suddenly stopped. Why would you feel dizzy for a few moments?
Structure of the Ear

Use with Chapter 36, Section 36.2
1. Study the shape and structure of the outer ear. Then infer how the shape and structure help a person hear.

2. Which structures are part of the middle ear?

3. What is the relationship between the eardrum and the structures of the middle ear?

4. What is the cochlea, and how does it affect hair cells?

5. What are hair cells, and what is their relationship to the auditory nerve?

6. What are the semicircular canals, and where are they located?

7. Describe the function of the semicircular canals.

8. Describe the other types of mechanical stimulation that the body can detect.
**Investigate BioLab**

**Measuring Respiration**

**Preparation**

**Problem**
How can you measure respiratory rate and estimate tidal volume?

**Objectives**
In this BioLab, you will:
- **Measure** resting breathing rate.
- **Estimate** tidal volume by exhaling into a balloon.
- **Calculate** the amount of air inhaled per minute.

**Materials**
- round balloon
- string (1 m)
- metric ruler
- clock or watch with second hand

**Safety Precautions**
CAUTION: Always use laboratory materials appropriately.

**Skill Handbook**
Use the Skill Handbook if you need additional help with this lab.

**Procedure**

**Part A: Breathing Rate at Rest**

1. Use Data Table 1.
2. Have your partner count the number of times you inhale in 30 s. Repeat step 2 two more times.
3. Calculate the average number of breaths. Multiply the average number of breaths by two to get the average resting breathing rate in breaths per minute.

<table>
<thead>
<tr>
<th>Data Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resting breathing rate</strong></td>
</tr>
<tr>
<td><strong>Trial</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>Average number breaths</td>
</tr>
</tbody>
</table>

**Part B: Estimating Tidal Volume**

1. Use Data Table 2.
2. Take a regular breath and exhale normally into the balloon. Pinch the balloon closed.
3. Have a partner fit the string around the balloon at the widest part.
4. Measure the length of the string, in centimeters, around the circumference of the balloon. Record this measurement.
5. Repeat steps 2–4 four more times.
6. Calculate the average circumference of the five measurements.
7. Calculate the average radius of the balloon by dividing the average circumference by 6.28 (which is approximately equal to 2π).
8. Calculate the average tidal volume using the formula for determining the volume of a sphere. Use the average balloon radius for r and 3.14 for π.

\[
\text{Volume of a sphere} = \frac{4\pi r^3}{3}
\]

where \( r = \text{radius} \) and \( \pi = 3.14 \).
Part C: Amount of Air Inhaled

1. Use Data Table 3.

2. Multiply the average tidal volume by the average number of breaths per minute to calculate the amount of air you inhale per minute.

3. Divide the number of milliliters of air by 1000 to get the number of liters of air you inhale per minute.

Data Table 3

<table>
<thead>
<tr>
<th>Amount of air inhaled</th>
</tr>
</thead>
<tbody>
<tr>
<td>mL/min</td>
</tr>
<tr>
<td>L/min</td>
</tr>
</tbody>
</table>

9. Your calculated volume will be in cubic centimeters: 1 cm³ = 1 mL.

1. Making Comparisons Compare your average number of breaths per minute and tidal volume per minute with those of other students.

2. Thinking Critically An average adult inhales 6000 mL of air per minute. Compare your estimated average volume of air with this figure. What factors could account for any differences?

3. Making Predictions Predict what would happen to your resting breathing rate after exercise.

4. Error Analysis List reasons that explain why there are differences between your results and those of other students. What changes could you make to this experiment to obtain more accurate results?
Respiration, Circulation, and Excretion

**Chapter 37**

In your textbook, read about air passageways and lungs.

**Circle the letter of the choice that best completes the statement or answers the question.**

1. During the process of respiration,
   a. oxygen is delivered to body cells.
   b. carbon dioxide is expelled from the body.
   c. oxygen is used in cells to produce ATP.
   d. all of these.

2. When you swallow, your epiglottis momentarily covers the top of the trachea so that
   a. you can swallow more easily.
   b. you can breathe more easily.
   c. you don’t get food in your air passages.
   d. you can cough up foreign matter.

3. The cilia that line your trachea and bronchi
   a. produce dirt-trapping mucus.
   b. help in the exchange of oxygen and CO₂.
   c. move mucus and dirt upward.
   d. only beat when you inhale.

4. The first branches off the trachea are called
   a. bronchioles.
   b. bronchi.
   c. arterioles.
   d. alveoli.

5. Inside the alveoli, carbon dioxide and oxygen
   a. are exchanged between air and blood.
   b. are transported along microscopic tubules.
   c. are produced inside cells.
   d. are exchanged for other gases.

6. Which is the correct sequence for the path of oxygen through the respiratory system?
   a. nasal passages, bronchi, trachea, bronchioles, cells, blood, alveoli
   b. cells, blood, alveoli, bronchioles, bronchi, trachea, nasal passages
   c. nasal passages, blood, alveoli, bronchi, cells, trachea, bronchioles
   d. nasal passages, trachea, bronchi, bronchioles, alveoli, blood, cells

In your textbook, read about the mechanics of breathing and the control of respiration.

**For each statement below, write true or false.**

7. Homeostasis in respiration is controlled by the cerebrum.

8. As you exhale, the bronchioles in the lungs release most of their air.

9. When you inhale, the muscles between your ribs contract.

10. Relaxation of the diaphragm causes a slight vacuum in the lungs.

11. Air rushes into the lungs because the air pressure outside the body is greater than the air pressure inside the lungs.

12. Relaxation of the diaphragm causes it to flatten.
In your textbook, read about your blood, ABO blood types, and blood vessels.

Answer the following questions.

1. What cells and substances would you expect to find suspended or dissolved in plasma?

2. How is carbon dioxide transported in blood?

Complete the table below by checking the correct column for each description.

<table>
<thead>
<tr>
<th>Description</th>
<th>Red Blood Cells</th>
<th>White Blood Cells</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Contain hemoglobin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Fight infection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Lack a nucleus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Help clot blood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Transport oxygen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Comparatively large and nucleated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each statement below, write true or false.

9. Your blood type can be changed with a blood transfusion.

10. Different blood types result from different antibodies being present on the membranes of red blood cells.

11. If you have type B blood, then you have anti-A antibodies in your plasma.

12. Risks involving incompatible Rh factors are greatest for a woman’s first child.
In your textbook, read about your heart, blood’s path through the heart, and inside your heart.

Label the parts of the human heart in the diagram below. Use these choices:

- aorta
- left atrium
- left ventricle
- pulmonary arteries
- pulmonary veins
- right atrium
- right ventricle

20. Where does blood go from the pulmonary veins? From the right ventricle? From the left ventricle?

21. What prevents blood from mixing between atria and ventricles?

In your textbook, read about heartbeat regulation, control of the heart, and blood pressure.

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

22. The surge of blood through an artery is called the cardiac output. ______________________________

23. The pacemaker initiates heartbeats by generating electrical impulses. ______________________________

24. An electrocardiogram is a record of the strength of each heartbeat. ______________________________

25. The atrioventricular node, along with sensory cells in arteries near the heart, regulates the pacemaker.

26. Diastolic pressure occurs when the heart’s ventricles contract. ______________________________
In your textbook, read about kidneys, nephrons, and the formation of urine.

Answer the following questions.

1. What is the major function of kidneys?

2. What role does the bladder play in the urinary system?

3. What are nephrons?

Order the following steps in the filtration of blood from 1 to 7.

4. From the Bowman’s capsule, fluid flows through a U-shaped tubule.

5. Under high pressure, blood flows into capillaries that make up the glomerulus.

6. After being stored in the bladder, urine exits the body via the urethra.

7. Fluid moves from the end of the nephron’s tubule to the ureter.

8. Blood enters the nephron from a branch of the renal artery.

9. Water, glucose, amino acids, and ions are reabsorbed into the blood.

10. Water, glucose, amino acids, wastes, and other substances move from glomerular capillaries into a Bowman’s capsule.

In your textbook, read about the urinary system and homeostasis.

Complete each statement.

11. __________________________ and __________________________ are two toxic nitrogenous wastes that your kidneys constantly remove from your bloodstream.

12. The kidneys also help regulate the blood’s __________________________, __________________________, and __________________________.

13. Individuals with diabetes have excess levels of __________________________ in their blood.
Circulation in Humans

Complete the concept map on human circulation and heart function. Use these words or phrases once: high $O_2$, low $O_2$, venae cavae, left atrium, right ventricle, right atrium, high $CO_2$, low $CO_2$, pulmonary veins, left ventricle, aorta, lungs.

1. Blood enters
2. from
3. condition of blood is
4. blood is pumped to
5. and the into
6. pulmonary artery
7. which leads to
8. blood leaves
9. condition of blood is
10. which carries blood to
   all parts of body
   pumped into the
   and then to
   returns to
In Chapter 37, you learned how the respiratory, circulatory, and excretory systems function in maintaining homeostasis in the body. The following questions relate to problems that affect these systems. Using what you have learned about these body systems, answer the questions.

1. Why is an overweight heart-attack patient advised to lose weight?

2. Red blood cells carry oxygen to body cells. At high altitudes, there is less atmospheric pressure than at low altitudes, which means less oxygen is present in each breath of air. Over a period of time under these conditions, the body produces an increased number of red blood cells. Why would an athlete who has trained at sea level have to spend a few months training at a higher altitude in order to compete with athletes accustomed to the high altitudes?

3. Why would you not get an accurate blood pressure reading right after playing a strenuous game of basketball?

4. A shipwrecked survivor is afloat in a boat without fresh water to drink. Explain how his body tries to maintain water balance.

5. A patient’s urine sample contains large plasma proteins. Which kidney structures are not functioning well?
1. This is a simplified diagram of the blood circulation in humans. Why do you think two separate loops are necessary?

2. What do you think is represented by the network of capillaries at the top? The network of capillaries at the bottom?
1. Follow the flow of blood through this diagram of the operation of the kidney. What, in general, is happening along the horizontal part of the diagram?

2. What substances are being conserved (saved) in the blood? What substances are being discarded?
## Blood Types

### Basic Concepts

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Antigen(s)</th>
<th>Antibody(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Type A</td>
<td>Antigen A</td>
<td>Anti-B antibody</td>
</tr>
<tr>
<td>Blood Type B</td>
<td>Antigen B</td>
<td>Anti-A antibody</td>
</tr>
<tr>
<td>Blood Type AB</td>
<td>Antigen A</td>
<td>No antibodies</td>
</tr>
<tr>
<td>Blood Type O</td>
<td>No antigens</td>
<td>No antibodies</td>
</tr>
</tbody>
</table>

**Use with Chapter 37, Section 37.2**
1. What is an antigen?

2. What is an antibody?

3. What determines the blood type of a person?

4. If you have type A blood, what kind of antigens and antibodies do you have in your blood?

5. If you have type A blood, why would it be dangerous to have a transfusion of type B blood?

6. Compare and contrast type AB blood and type O blood.

7. Why must a person with type O blood receive a transfusion only from a donor who also has type O blood?

8. Why is a person with type O blood called a universal donor and a person with type AB blood called a universal receiver?
Your Blood Vessels

Use with Chapter 37, Section 37.2

- Arterioles
- Capillaries
- Vein
- Venules
- To heart
- Contracted skeletal muscles
- Valve open
- Valve closed
- Relaxed skeletal muscles
- Vein
- To heart
- Contracted skeletal muscles
- Valve open
- Valve closed
- Relaxed skeletal muscles
- Vein
- To heart
1. Describe the structure and function of arteries.

2. In the top illustration of the transparency, why is the color of the blood shown in the veins much darker than the blood shown in the arteries?

3. Compare the structure of arterioles, venules, and capillaries.

4. How does the pressure of blood in the arteries affect the flow of blood from the heart to the tissues?

5. How does the pressure of blood in the veins compare with the pressure in the arteries? How does this difference in pressure relate to the fact that some veins are equipped with valves?

6. Study the drawing of skeletal muscles at the bottom of the transparency. Describe what happens to the valves in the veins when the skeletal muscles relax or contract.
Your Heart

Use with Chapter 37, Section 37.2

1. Superior vena cava
2. Arch of aorta
3. Pulmonary trunk
4. Left lung
5. Left atrium
6. Left ventricle
7. Rib (cut)
8. Cut edge of pericardium
9. Left coronary artery
10. Diaphragm
11. Right lung
12. Right atrium
13. Right ventricle
14. Right coronary artery
15. Pulmonary veins
16. Inferior vena cava
17. Pulmonary arteries
18. Pulmonary veins
19. Capillaries
20. Right lung
21. Left lung
1. What is the function of the pericardium?

2. Describe the atrial and ventricular contractions that occur each time the heart beats.

3. Of the four heart chambers, which perform more work? How does the transparency support your conclusion?

4. What is the function of the pulmonary arteries? The pulmonary veins?

5. Contrast the functions of the venae cavae and the aorta.

6. Explain the function of a heart valve.

7. Briefly trace the path of a drop of blood through the heart, starting at the point where it returns from the body through a venae cavae.
The Urinary System

Use with Chapter 37, Section 37.3

Basic Concepts

Blood cells, water, salts, nutrients, urea

Water

Urea

Salts

Nutrients

The Kidney

Aorta

Renal arteries

Renal veins

Ureters

Urethra

Vena cava

Kidney

Collections duct to ureters

Urine, excess water and salts

Blood cells, water, salts, nutrients

Bowman's capsule

Glomerulus

Bowman's capsule

From renal artery

To renal vein

Tubule

To ureter

A Nephron

Artery:

Capillaries

Tubule

Vein:

Renal artery

Renal vein

Duct to bladder

From renal artery

To renal vein

Capillaries

To ureters

To renal vein
Worksheet 73

The Urinary System

Use with Chapter 37, Section 37.3

1. What is the function of the kidneys?

2. Describe the structure and function of a nephron.

3. What is a glomerulus?

4. According to the transparency, which materials are filtered out of the blood in the Bowman's capsule?

5. According to the transparency, which substances that enter the kidney through the renal artery are recycled into the bloodstream through the renal vein?

6. According to the transparency, which materials does the collecting duct deliver to the ureter?

7. Describe the role of the ureters and bladder.

8. What is the function of the urethra?
Circulatory Path Through the Heart

Use with Chapter 37, Section 37.2

From pulmonary artery

To pulmonary vein

Capillary blood

Pulmonary vein

Pulmonary artery

Superior vena cava

Inferior vena cava

Aorta

Capillaries

Right lung

Left lung
1. Compare arteries and veins.

2. What muscles push blood through arteries and veins?

3. Describe capillaries, and explain how they function.

4. What large blood vessels deliver blood from the body to the heart?

5. Humans have a four-chambered heart. Describe the function of each chamber.
   a. right atrium (top chamber, right side)
   b. right ventricle (lower chamber, right side)
   c. left atrium (top chamber, left side)
   d. left ventricle (lower chamber, left side)

6. Where does carbon dioxide in the blood come from? Why do cells require a good supply of oxygen?

7. Where in the lungs does gas exchange take place?

8. What blood vessel receives oxygen-rich blood from the heart and moves it into the body?
Chapter 37

Respiration, Circulation, and Excretion

Reviewing Vocabulary

Match the definition in Column A with the term in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Passageway leading from the larynx to the lungs</td>
<td>a. alveoli</td>
</tr>
<tr>
<td>2. Sac of the lungs where exchange of oxygen and carbon dioxide takes place</td>
<td>b. antibody</td>
</tr>
<tr>
<td>3. Fluid portion of blood in which blood cells move</td>
<td>c. antigen</td>
</tr>
<tr>
<td>4. Iron-containing protein that picks up oxygen after it enters the blood vessels in the lungs</td>
<td>d. aorta</td>
</tr>
<tr>
<td>5. Cell fragments that help blood to clot after an injury</td>
<td>e. artery</td>
</tr>
<tr>
<td>6. A substance that stimulates an immune response in the body</td>
<td>f. atrium</td>
</tr>
<tr>
<td>7. Microscopic blood vessel</td>
<td>g. urine</td>
</tr>
<tr>
<td>8. Protein that reacts with an antigen</td>
<td>h. capillary</td>
</tr>
<tr>
<td>9. A kind of large, muscular, thick-walled elastic vessel that carries blood away from the heart</td>
<td>i. hemoglobin</td>
</tr>
<tr>
<td>10. A kind of large blood vessel that carries blood from the tissues to the heart</td>
<td>j. nephron</td>
</tr>
<tr>
<td>11. An upper chamber of the heart</td>
<td>k. plasma</td>
</tr>
<tr>
<td>12. A lower chamber of the heart</td>
<td>l. platelets</td>
</tr>
<tr>
<td>13. Largest blood vessel in the body</td>
<td>m. pulse</td>
</tr>
<tr>
<td>14. Regular surge of blood through an artery</td>
<td>n. trachea</td>
</tr>
<tr>
<td>15. Solution of body wastes consisting of excess water, waste molecules, and excess ions</td>
<td>o. vein</td>
</tr>
<tr>
<td>16. A filtering unit in the kidney</td>
<td>p. ventricle</td>
</tr>
</tbody>
</table>
Understanding Main Ideas (Part A)

In the space at the left, write true if the statement is true. If the statement is false, change the italicized word or phrase to make it true.

1. Red blood cells are produced in the spleen.
2. The blood in the veins is prevented from flowing backward because of pressure in these blood vessels.
3. The only veins that carry oxygen-rich blood are the vena cavae.
4. When blood first enters the heart, it passes into the ventricles.
5. As the liquid passes through the U-shaped tubule in the nephron, most of the ions and water and all of the glucose and amino acids are reabsorbed into the bloodstream.
6. The major waste products of the cells are ammonia and the wastes from the breakdown of carbohydrates.
7. The urine of a person who has diabetes may contain excess salts.
8. Carbon dioxide and oxygen are the waste products of cellular respiration.
9. When your diaphragm contracts, the space in the chest cavity becomes larger.
10. Breathing is controlled by changes in the chemistry of the blood, which cause the medulla oblongata to react.
11. Your pulse represents the pressure that blood exerts as it pushes the walls of a(n) vein.
12. If you have type A blood and anti-A is added during a transfusion, no clumps will form.
13. External respiration uses oxygen in the breakdown of glucose in cells in order to provide energy in the form of ATP.
Understanding Main Ideas (Part B)

Answer the following questions.

1. How does the respiratory system prevent most of the foreign matter in urban air from reaching your lungs?

2. Distinguish between systolic pressure and diastolic pressure.

3. What problem may arise when a woman with Rh– blood is pregnant with an Rh+ fetus?

4. How does a pacemaker set the heart rate?

5. How does the urinary system maintain homeostasis?