Chapter Project Worksheet 1
1. It must be able to grasp, lift, and release; it must be activated by a pulled cord or string; it must spring back when the cord is released.
2. The model must have movable parts that can be perform the specified activities. The actions must be under the control of the person using the model prosthesis.
3. Groups should decide upon their own method of selecting the design, but one way would be to use a point system to rate each design criterion on a scale of 1 to 4; the design with the most points wins.
4. Descriptions will vary but must include all the elements needed for the model to perform the required activities.
5. Materials will vary based on students' designs.

Chapter Project Worksheet 2
1. The models must meet the following criteria: the prosthesis must be able to grasp, lift, and release; it must be activated by a pulled cord or string; it must spring back when the cord is released.
2. Responses will vary based on the performance of students' models.
3. Responses will vary depending upon students' critiques of their models.
4. Solutions will vary.

Body Organization and Homeostasis
Guided Reading and Study
Use Target Reading Skills
Body Organization and Homeostasis
I. Cells
   A. Structures of cells
   B. Functions of cells
II. Tissues
III. Organs and organ systems
IV. Homeostasis
   A. Homeostasis in action
   B. Maintaining homeostasis
   C. Stress and homeostasis
1. a. cells
   b. tissues
   c. organs
   d. organ systems
2. cell
3. d
4. nucleus
5. The cytoplasm is the area between the cell membrane and the nucleus. It contains a clear, jellylike substance in which other cell structures are found.
6. true
7. A tissue is a group of similar cells that perform the same function.
8. Muscle: Makes parts of the body move by contracting, or shortening; muscles
   Nervous: Carries messages back and forth between the brain and other parts of the body; brain, spinal cord, or nerves
   Connective: Supports the body and connects all its parts; blood, fat, cartilage, bones, or tendons
   Epithelial: Covers the surfaces of the body, inside and out; skin, lining of digestive system
9. organ
10. c
11. true
12. An organ system is a group of organs working together to perform a major function.
13. d
14. f
15. c
16. a
17. e
18. b
19. homeostasis
20. When a person perspires, the liquid evaporates and the skin cools down. The removal of heat helps the body maintain a constant body temperature.

Body Organization and Homeostasis
Review and Reinforce
1. 2
2. 3
3. 1
4. 4
5. nucleus
6. Muscle; Nervous
7. epithelial
8. organ; organ system
9. cell
10. Connective
11. cytoplasm

Body Organization and Homeostasis
Enrich
1. Because autografts come from the patient's own body, the patient's immune system does not recognize them as foreign.
2. If doctors use an autograft, tissue probably won't be rejected. A person's skin has a very large area, so doctors can move an unburned section from one part of the body to another without endangering the patient.
3. Organs or tissues from a close relative are more likely to be similar to the patient’s own organs and tissues and so they are less likely to be recognized as foreign by the patient’s immune system.

4. Answers will vary. Sample: It would be more difficult to transplant an organ system than an organ because an organ system is made of more than one organ. Transplanting a skeleton, for example, might be impossible, because there are over 200 bones in the human body.

**The Skeletal System**

**Guided Reading and Study**

Use Target Reading Skills

Sample answers:

**What does the skeleton do?** *(The skeleton provides shape and support, helps you to move, protects organs, produces blood cells, and stores minerals and other materials.)*

**How do joints allow movement?** *(Joints allow bones to move forward or backward, in a circle, in a rotating motion, and in a gliding motion.)*

**How strong are bones?** *(Bones can absorb more force without breaking than can granite or concrete.)*

**What can I do to care for my bones?** *(Eat a well-balanced diet and get plenty of exercise.)*

**1. a.** Provides shape and support  
   b. Enables the body to move  
   c. Protects the internal organs  
   d. Produces blood cells  
   e. Stores certain materials until the body needs them

**2. c**

**3. vertebrae**

**4. Muscles pull on the bones to make the body move.**

**5. d**

**6. blood cells**

**7. A joint is a place in the body where two bones come together.**

**8. immovable joints, movable joints**

**9. c**

**10. Allows forward or backward motion; knees and elbows**
   Allows the bone to swing in a circle; shoulder blades and hips
   Allows one bone to rotate around another; neck
   Allows one bone to slide over another; wrists and ankles

**11. ligaments**

**12. a, d**

**13. Bone cells form new tissue during growth, in response to the force of the body’s weight, and to heal broken bones.**

**14. a.** compact bone  
   b. bone marrow  
   c. spongy bone  
   d. outer membrane

**15. d**

**16. a**

**17. b**

**18. c**

**19. cartilage**

**20. b, d**

**21. A combination of a balanced diet and regular exercise will keep the bones healthy.**

**22. osteoporosis**

**The Skeletal System**

**Review and Reinforce**

1. The skeleton provides shape and support, enables you to move, protects your internal organs, produces blood cells, and stores certain materials until your body needs them.

2. A balanced diet and regular exercise

3. Movable joints allow the body move in many different ways. Without movable joints, your body would be as stiff as a board. Movable joints include: gliding joints, hinge joints, pivot joints, and ball-and-socket joints.

4. Outer membrane

5. Compact bone

6. Spongy bone

7. Bone marrow

8. joint

9. Osteoporosis

10. vertebra

11. cartilage

12. ligament

**The Skeletal System**

**Enrich**

1. The keyboard and screen should be centered directly in front of the person to avoid the necessity of twisting the back to type or to look at the screen.

2. First, see if you can pick up a box without straining. Then, bend your knees, keeping your back straight, and lift the box. Keep your back straight as you straighten your knees until you are standing up. Keep the box as close to your body as possible. If the boxes are too heavy to be lifted without strain, push them along the ground.

3. Shoes that do not allow you to stand with
your feet flat on the floor, such as shoes with high heels, would be more likely to cause back pain.

4. Answers will vary. Sample: Try to reduce the amount of stress she feels. Make sure her mattress is firm enough to provide proper support for the back and neck. When she sits, make sure her lower back is against the chair back for support. Make sure she lifts heavy objects correctly.

Diagnosing Bone and Joint Injuries

Guided Reading and Study

Use Target Reading Skills

Sample answers:

**Effect on body cells:**
- X-rays—Can cause damage
- MRI—Causes no damage

**Types of injuries identified:**
- X-rays—Bone (fracture and dislocation)
- MRI—Bone and soft tissue

**How they work:**
- X-rays—pass through soft tissue and are absorbed by bone; bone shows on film
- MRI—Magnetic energy causes atoms to vibrate, which forms a pattern that can be converted into an image

**Cost:**
- X-rays—low cost
- MRI—high cost

1. c
2. a
3. b
4. false
5. X-rays are a form of energy that travels in waves.
6. true
7. a. X-rays cannot be used to view injuries to soft tissues.
   b. The energy in X-rays can damage body cells.
8. magnetic resonance imaging
9. A person is exposed to short bursts of magnetic energy inside the MRI scanner. The magnetic energy causes the body’s atoms to vibrate. A computer analyzes the vibration patterns and produces an image of the area.
10. a, b
11. arthroscope
12. false

Diagnosing Bone and Joint Injuries

Review and Reinforce

1. X-rays pass through the skin and other body tissues and strike the photographic film beneath the area being X-rayed. X-rays are absorbed by bone, so the developed X-ray film shows bones as white areas. X-rays can be used to diagnose broken or dislocated bones.
2. X-rays cannot diagnose injuries to soft tissues such as muscle, and internal organs. Also, the energy in X-rays can damage body cells. However, X-rays are inexpensive compared to MRIs.
3. MRI images are made when the area being imaged is exposed to short bursts of magnetic energy. This energy causes atoms within the body to vibrate. The vibration patterns produce an image a computer can then analyze. MRI images can diagnose injuries both to bones and to soft tissues.
4. MRI images are sharp and clear. MRI can produce images of body tissues at any angle, and does not damage body cells. However, MRI machines are expensive.
5. A fracture is a break in the bone. A fracture occurs when you fall so that all of your weight is placed on only a few bones.
6. A sprain occurs when ligaments are stretched too far and tear in places.
7. Arthritis is a disease of the joints that makes movement painful.

The Muscular System

Guided Reading and Study

Use Target Reading Skills

Sample answers:

**How does skeletal muscle help my body move?**
(Skeletal muscles are attached to the ends of bones and provide the force to move them.)

**Where is smooth muscle found?** (On the inside of many internal organs)

**What are the characteristics of cardiac muscle?**
(It is found only in the heart; it is like smooth muscle because it is involuntary and like skeletal muscle because it is striated.)
1. a. Involuntary muscles are not under conscious control.
   b. Voluntary muscles are under conscious control.
2. b
3. Attached to bones of skeleton, voluntary, striated
   Smooth, involuntary, not
   Only in heart, involuntary, striated
4. tendon
5. true
6. heartbeats
7. Muscles contract when they receive messages from the nervous system.
8. false
9. Because muscle cells can only contract, not extend, skeletal muscles must work in pairs. While one muscle contracts, the other muscle returns to its original length.
10. contracts, original length

The Muscular System Review and Reinforce

1. yes
2. no
3. yes
4. yes
5. no
6. yes
7. no
8. no
9. no
10. yes
11. yes
12. no
13. Skeletal muscles must work in pairs because muscle cells only contract; they do not extend. Therefore, as one muscle contracts, the other muscle in the pair returns to its original length.
14. Muscle injuries can be prevented by warming up before exercising and by using proper safety equipment.
15. Smooth muscles control involuntary actions such as breathing and digestion. They are involuntary muscles.
16. Skeletal muscles control voluntary activities such as running, walking, swimming, and any other voluntary movements. They are voluntary muscles.
17. Cardiac muscle is similar to smooth muscle in that it is involuntary. It is similar to skeletal muscle in that the muscle cells are striated.

The Muscular System Enrich

1. Exercise stimulates protein synthesis. This makes the muscle cells grow wider, and causes the muscles to become thicker.
2. Gradually increase the amount of weight being moved.
3. Two muscles are required to perform each movement. As the biceps contract, the triceps relaxes and the arm raises the weight. To move the weight downward, the biceps must relax and the triceps contracts. The movement would not be possible without both muscles.
4. Samples: Push-ups and pull-ups

Skills Lab

A Look Beneath the Skin

For answers, see the Teacher’s Edition.

The Skin

Guided Reading and Study

Use Target Reading Skills

Main Idea:
The skin has several important functions.

Sample details:
The skin forms a barrier against disease-causing microorganisms and harmful substances, and prevents the loss of important fluids; the skin helps the body maintain a steady temperature; the skin helps to eliminate wastes through perspiration; the skin contains nerves that gather information about the environment; skin cells produce vitamin D that helps your body absorb calcium.

1. b, d
2. true
3. They warn you that something in the surroundings may have injured you.
4. vitamin D
5. epidermis
6. false
7. two weeks
8. true
9. true
10. dermis
11. a, c, d
12. pores
13. Follicles are structures in which strands of hair grow within the dermis.
14. a healthful diet, limiting sun exposure, keeping skin clean
The Skin

Review and Reinforce

1. The skin covers and protects the body from injury, infection, and water loss. The skin also helps to regulate body temperature, eliminate wastes, gather information about the environment, and produce vitamin D.
2. The dead cells of the epidermis provide a protective layer to the body. As these dead cells are shed, they carry with them bacteria and other substances that settle on the skin.
3. The dermis contains nerves, blood vessels, sweat glands, hairs, and oil glands.
5. pore
6. epidermis
7. dermis
8. hair follicle

The Skin

Enrich

1. The epidermis; the epidermis and dermis
2. Answers will vary. Samples: the epidermis, the dermis, the layer of fat, blood vessels, hair follicles, nerves, sweat glands, oil glands
3. Answers may vary. Sample: Infection is one possible complication, because the skin is entirely destroyed, and the skin protects the body from infection.
4. Answers will vary. Samples: Always use a pot holder or an oven mitt to remove hot pots from the stove; keep pot handles turned in to prevent pots from being knocked off the stove; keep clothing from coming into contact with the flame or heating element on the stove.

Design Your Own Lab

Sun Safety

For answers, see the Teacher’s Edition.

Key Terms

1. skeletal
2. pore
3. joint
4. tendon
5. fracture
6. marrow
7. imaging
8. cartilage
9. sprain

Diagonal word is epidermis.
Connecting Concepts

This concept map is only one way to represent the main ideas and relationships in this chapter. Accept other logical answers from students.
Laboratory Investigation
Examining Bones, Muscles, and Skin

Pre-Lab Discussion
1. Skeletal muscles are striated muscles that are voluntary and move bones. Smooth muscles are not striated and are involuntary. Cardiac muscles are in the heart, are striated, and are involuntary.
2. Bones protect internal organs, produce blood cells, and store certain minerals until the body needs them. Skin regulates body temperature, eliminates wastes, and produces vitamin D.

Observations

<table>
<thead>
<tr>
<th>Step</th>
<th>What to Observe</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>How did the water feel when you first put your finger in the room-temperature water?</td>
<td>It felt as if it were warm water.</td>
</tr>
<tr>
<td>3</td>
<td>How did the water feel when you left your finger in the room-temperature water?</td>
<td>The water felt less warm as time passed.</td>
</tr>
<tr>
<td>4</td>
<td>How did the water feel to your other finger when you put it in the room-temperature water?</td>
<td>The water felt cooler to this finger than to the other finger.</td>
</tr>
<tr>
<td>5</td>
<td>How did the water feel when you first put your finger in the room-temperature water this second time?</td>
<td>It felt as if it were warm water.</td>
</tr>
<tr>
<td>6</td>
<td>How did the water feel when you left your finger in the room-temperature water this second time?</td>
<td>It took longer for the water to feel room-temperature rather than warm.</td>
</tr>
<tr>
<td>7</td>
<td>How does the water feel now compared to how it felt in Step 5?</td>
<td>There was a greater difference in perceived temperature than in Step 5.</td>
</tr>
</tbody>
</table>

Critical Thinking and Applications
1. No, there is no relationship between striations and whether a muscle is voluntary or involuntary. For example, both cardiac and skeletal muscles are striated, but skeletal muscle is voluntary muscle while cardiac muscle is not.
2. Answers may vary but should indicate that the bone in the cross-section could be modeled with concentric tubes.
3. The person who had been outside would sense the room as cool, and the person who had been in the air-conditioned room would sense the room as warm.

More to Explore
After placing their fingers in the warm water for 5 seconds, students’ observations should be the opposite of those in the Data Table for Part B; that is, for steps in which the water felt warmer in Part B, the water should feel cooler in More to Explore. Where the water felt cooler, it should now feel warmer.

Chapter Performance Assessment
Analyze and Conclude
1. Answers may vary. Sample: The layer of compact bone in my model is much thinner than it is in a real bone. Also, it does not have nerves. My model of skin does not include oil glands or nerves.
2. The surface layer of the epidermis consists of dead cells. In addition, hair is made of dead cells.
3. Answers may vary. Sample: I could cover the outer surface of the epidermis with a thin layer of water to model sweat. I could replace the thread used to model blood vessels with yarn to show that the blood vessels enlarge.
4. Answers may vary. Sample: I could cut the model in half.
5. skeletal muscles; only skeletal muscles are attached to bones

**Chapter Test**
1. c
2. b
3. b
4. b
5. a
6. d
7. b
8. a
9. c
10. b
11. Homeostasis
12. magnetic resonance imaging (MRI)
13. voluntary or skeletal
14. dermis
15. ligament
16. true
17. true
18. sprain
19. less
20. true
21. Answers may vary. Samples: In this picture, the skin is gathering information about the temperature of the water to see if it is too hot. The skin is also protecting the parts of the body beneath it from injury by the hot water.
22. The biceps muscle of the upper arm contracts to bend the elbow, lifting the forearm and hand. As the biceps contracts, the triceps of the upper arm returns to its original length.
23. Homeostasis is the tendency of the body to maintain constant internal conditions in spite of an outside change. When stress occurs, the body prepares to take quick action. Your breathing speeds up, your heart beats faster, your muscles tense, and your digestive system slows. All of these changes disturb homeostasis.
25. X-rays pass through the skin and other body tissues. When an X-ray is taken, the X-rays strike a photographic film beneath the area being X-rayed. Because bone absorbs X-rays, areas of photographic film beneath the bone are not exposed to X-rays and remain white on the X-ray film.

**ANSWER KEY**

26. A. pivot joint
   B. ball-and-socket joint
   C. gliding joint
   D. hinge joint

27. Cartilage covers the ends of bones in movable joints and prevents them from rubbing against each other.

28. Involuntary muscles of the digestive tract and respiratory system are composed of smooth muscle. If people contract a disease that paralyzes smooth muscles, they could suffocate if their respiratory system failed or choke if their digestive system failed.

29. The skin has many blood vessels. When you become warm, these blood vessels enlarge, which increases the amount of blood that flows through them. This allows heat to escape into the outside environment. Sweat glands in the skin also produce perspiration. As perspiration evaporates from the skin, your skin cools.

30. Answers may vary. Accept any three: MRI images are very sharp and clear. MRI can produce images at any angle. MRI can show images of muscles and soft tissue. MRI does not damage cells. A disadvantage of MRI is that it is very expensive.