Glencoe Science

Chapter Resources

Interactions of Human Systems

Includes:

Reproducible Student Pages

**ASSESSMENT**
- ✔ Chapter Tests
- ✔ Chapter Review

**HANDS-ON ACTIVITIES**
- ✔ Lab Worksheets for each Student Edition Activity
- ✔ Laboratory Activities
- ✔ Foldables—Reading and Study Skills activity sheet

**MEETING INDIVIDUAL NEEDS**
- ✔ Directed Reading for Content Mastery
- ✔ Directed Reading for Content Mastery in Spanish
- ✔ Reinforcement
- ✔ Enrichment
- ✔ Note-taking Worksheets

**TRANSPARENCY ACTIVITIES**
- ✔ Section Focus Transparency Activities
- ✔ Teaching Transparency Activity
- ✔ Assessment Transparency Activity

**Teacher Support and Planning**
- ✔ Content Outline for Teaching
- ✔ Spanish Resources
- ✔ Teacher Guide and Answers

McGraw-Hill

Glencoe

New York, New York  Columbus, Ohio  Chicago, Illinois  Peoria, Illinois  Woodland Hills, California
Photo Credits
Section Focus Transparency 1: SuperStock
Section Focus Transparency 2: Dr. Arthur Tucker/Science Photo Library/Photo Researchers
Teaching Transparency: Bob Daemmrich
Reproducible Student Pages

Reproducible Student Pages

Hands-On Activities
- MiniLAB: Try at Home Observing the Gases That You Exhale............. 3
- MiniLAB: Observing a Chemical Reaction................................. 4
- Lab: Observing Cells .......................................................... 5
- Lab: Design Your Own Does Exercise Affect Respiration?............... 7
- Laboratory Activity 1: Minerals and Good Health...................... 9
- Laboratory Activity 2: Transporting Nutrients.......................... 15
- Foldables: Reading and Study Skills..................................... 19

Meeting Individual Needs
- Extension and Intervention
  - Directed Reading for Content Mastery................................. 21
  - Directed Reading for Content Mastery in Spanish.................. 25
  - Reinforcement ............................................................... 29
  - Enrichment ........................................................................ 31
  - Note-taking Worksheet ...................................................... 33

Assessment
- Chapter Review ................................................................. 37
- Chapter Test ..................................................................... 39

Transparency Activities
- Section Focus Transparency Activities................................. 44
- Teaching Transparency Activity .......................................... 47
- Assessment Transparency Activity ....................................... 49
Hands-On Activities
Observing the Gases That You Exhale

Procedure
1. Dry your hands with a **towel**.
2. Hold the palm of your hand up to your mouth, then exhale into it.
3. Feel your palm with your other hand. Record your observations in the Data and Observations section.
4. Hold a **mirror** up to your mouth and exhale again. Observe what happens to the mirror. Record your observations in the Data and Observations section.

Data and Observations

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Analysis
1. How did your hand feel after you breathed on it?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. What happened to the mirror when you breathed on it?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

3. Besides carbon dioxide, hypothesize what other things are exhaled.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Observing a Chemical Reaction

Procedure
1. Pour a small amount of 3% hydrogen peroxide solution into a petri dish.
2. Use a thermometer probe to take the temperature of the peroxide solution.
3. Place a small chunk of fresh liver in the petri dish. Observe what happens. Record your observations in the Data and Observations section.
4. Wait 1 min, then take the temperature of the solution a second time.

Data and Observations

| Temperature of hydrogen peroxide solution | Observations of hydrogen peroxide solution and liver | Temperature after 1 min |

Analysis
1. Was energy released during this chemical reaction? How do you know?

2. How is this chemical reaction similar to the process of respiration in cells?
Lab Preview

Directions: Answer these questions before you begin the Lab.

1. What toxic substance does the skull and crossbones symbol warn against?

2. What two microscope settings will you use to examine the cheek cells and the onion cells?

Cells come in a variety of shapes and sizes. They might look different and perform different functions, but they have some common structures.

Real-World Question

How do prepared human cheek cells and living onion cells compare?

Materials

- compound light microscope
- forceps
- microscope slide
- iodine solution
- coverslip
- water
- prepared human cheek cell slide
- medicine dropper
- small piece of onion

Goals

- Observe the structure of human cheek cells.
- Observe the structure of onion cells.

Safety Precautions

WARNING: These solutions can cause stains. Do not allow them to contact your skin or clothing.

Procedure

1. Obtain a prepared slide of human cheek cells from your teacher.
2. Examine the cheek cells under low power of the microscope and then under high power. In the Data and Observations section, draw several cheek cells as they appear under high power.
3. Using forceps, remove a small section of paper-thin tissue from the onion. Prepare a wet-mount slide of the onion tissue. Before putting on the coverslip, place a drop of iodine on the onion tissue.
4. Examine the onion-tissue slide under low power, then under high power. In the Data and Observations section, draw several onion cells as they appear under high power.
Hands-On Activities

Data and Observations

Human Cheek Cell Drawings

Onion Cell Drawings

Conclude and Apply

1. Describe the shape of human cheek cells.

2. Describe the shape of the onion cells.

3. Name the structure you saw in the onion cell but not in the human cheek cell.

Communicating Your Data

Make a colorful, poster-sized illustration of one of these cells. Label all visible parts of the cell. For more help, refer to the Science Skill Handbook.
Lab Preview

Directions: Answer these questions before you begin the Lab.

1. Why are balloons listed as a possible material?

2. What purpose does an indicator solution like bromthymol blue serve?

When you exercise, muscle cells in your body use up a lot of energy. Carbon dioxide is a waste product of respiration, the energy-releasing process in your cells.

Real-World Question

Does exercise affect the amount of carbon dioxide exhaled by the lungs?

Form a Hypothesis

Make a hypothesis about how exercise affects respiration. Will exercise increase or decrease the amount of carbon dioxide you exhale?

Possible Materials

- graduated cylinder
- large beakers (2)
- straws (2)
- balloons (2)
- bromthymol blue indicator solution (200 mL)
- stopwatch
- clock with a second hand
- glass-marking pencil

*Alternate materials

Goals

- **Observe** the effect of carbon dioxide on the bromthymol blue indicator solution.
- **Predict** how exercise will affect the amount of carbon dioxide that is exhaled by the body.

Test Your Hypothesis

Make a Plan

1. As a group, predict how exercise will affect the amount of carbon dioxide exhaled by the lungs. Identify a way that you can test your hypothesis.

2. List the steps you will follow to test your hypothesis. Be sure to describe exactly what you will do in each step.

3. Make a data table in your Science Journal to record your observations.

4. Read over your entire experimental procedure. Do the steps make sense? Are they arranged in the correct order?

Follow Your Plan

1. Make sure your teacher approves your plan and your data table before you start.

2. Carry out the experiment according to the approved plan.

3. Record all of your observations in your data table.
**Analyze Your Data**

1. What caused the indicator solution to change color? Describe the color change.

   

2. **Compare** the time it took the bromthymol blue indicator solution to change color before exercising and after exercising.

   

3. **Compare** your results with the results of other groups in your class.

   

**Conclude and Apply**

1. **Explain** whether the results supported your hypothesis.

   

2. **Describe** how exercise affects the amount of carbon dioxide you exhale.

   

**Communicating Your Data**

Prepare a poster project showing how increasing levels of activity affect the production of carbon dioxide. Include photos, a data table, and a step-by-step procedure.
Minerals and other inorganic substances are essential for a healthy growing body. Calcium, phosphorus, and magnesium all contribute to bone growth. Iron helps your blood carry oxygen from your lungs and bring back carbon dioxide. Minerals bond with organic molecules to help your cells function properly. Minerals are especially important for young people. Children who grow up in some of the poorer regions of the world are at highest risk for mineral deficiencies. Most of the minerals people need come from various foods and from water. What you eat has a huge impact on what minerals you get. Scientists have come up with a standard recommendation for quantities of each mineral required to maintain a healthy body. The standard, called Recommended Daily Allowance (RDA), provides guidelines as to how much of each mineral the human body can use each day. The Reference Daily Intake, based on the RDA, provides a guideline as to how much of each mineral a person should consume each day in order to maintain healthy mineral levels. Labels on foods are required to include information about how much of the RDA for various vitamins and minerals that product provides per serving. In this laboratory activity, you will be looking at RDAs, RDIs, and labels for various foods and collecting data on how you can meet your mineral needs.

Strategy
You will research and record the quantities of certain nutritional minerals in typical servings of various foods.
You will determine if these foods satisfy established daily requirements for those minerals.
You will identify which body parts or functions use certain minerals.

Procedure
1. Choosing from the items for which you have labels in your classroom and the additional items in Table 2, assemble a one day menu for yourself. Enter your selection in Table 1.
2. For each menu item, record the mineral content information in Table 1. You will find this information in the Nutrition Facts panel from the food packaging or in Table 2.
3. Calculate the total mineral intake for each mineral for the day’s menu and record your findings in Table 1.
4. Compare your results with the RDIs listed for each mineral in Table 3.
5. Examine Table 1 in your textbook to find other types of foods that might be used to make up any shortcomings in your menu’s mineral content. Remember, though, that replacing one food with another to increase a particular mineral might cause a reduction in a different mineral. Record your ideas in the Data and Observations section.
**Laboratory Activity 1** (continued)

**Data and Observations**

**Table 1**

<table>
<thead>
<tr>
<th>Menu</th>
<th>Sodium (mg)</th>
<th>Calcium (mg)</th>
<th>Potassium (mg)</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total mineral intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

10  Interactions of Human Systems
# Laboratory Activity 1 (continued)

## Table 2

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Sodium (mg)</th>
<th>Calcium (mg)</th>
<th>Potassium (mg)</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamburger</td>
<td>660</td>
<td>20</td>
<td>190</td>
<td>2</td>
</tr>
<tr>
<td>Chicken (roast)</td>
<td>70</td>
<td>9</td>
<td>270</td>
<td>8</td>
</tr>
<tr>
<td>Beef (roast)</td>
<td>55</td>
<td>10</td>
<td>300</td>
<td>2</td>
</tr>
<tr>
<td>Pork chop</td>
<td>70</td>
<td>9</td>
<td>300</td>
<td>9</td>
</tr>
<tr>
<td>Pizza (cheese/tomato)</td>
<td>340</td>
<td>240</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>Cheddar cheese</td>
<td>610</td>
<td>800</td>
<td>120</td>
<td>4</td>
</tr>
<tr>
<td>Cheese (processed)</td>
<td>1360</td>
<td>700</td>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>Egg (scrambled)</td>
<td>1050</td>
<td>60</td>
<td>130</td>
<td>2</td>
</tr>
<tr>
<td>Pancake</td>
<td>50</td>
<td>120</td>
<td>140</td>
<td>9</td>
</tr>
<tr>
<td>Strawberries (4)</td>
<td>0.5</td>
<td>7</td>
<td>80</td>
<td>0.2</td>
</tr>
<tr>
<td>Apple</td>
<td>2</td>
<td>3</td>
<td>90</td>
<td>2</td>
</tr>
<tr>
<td>Banana</td>
<td>1</td>
<td>7</td>
<td>350</td>
<td>4</td>
</tr>
<tr>
<td>Orange</td>
<td>2</td>
<td>30</td>
<td>150</td>
<td>3</td>
</tr>
<tr>
<td>Carrot (raw)</td>
<td>100</td>
<td>50</td>
<td>220</td>
<td>0.6</td>
</tr>
<tr>
<td>Broccoli (boiled)</td>
<td>6</td>
<td>80</td>
<td>220</td>
<td>1</td>
</tr>
<tr>
<td>Potato (baked)</td>
<td>6</td>
<td>8</td>
<td>550</td>
<td>0.6</td>
</tr>
<tr>
<td>Tomato (raw)</td>
<td>3</td>
<td>10</td>
<td>290</td>
<td>0.4</td>
</tr>
<tr>
<td>Doughnut</td>
<td>60</td>
<td>70</td>
<td>110</td>
<td>2</td>
</tr>
<tr>
<td>Cheesecake</td>
<td>260</td>
<td>70</td>
<td>120</td>
<td>7</td>
</tr>
</tbody>
</table>

## Table 3

<table>
<thead>
<tr>
<th>Mineral</th>
<th>US-RDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>1,000 mg</td>
</tr>
<tr>
<td>Iron</td>
<td>10 mg, males; 18 mg, females</td>
</tr>
<tr>
<td>Potassium</td>
<td>99 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>30–2,300 mg</td>
</tr>
</tbody>
</table>

*Note: RDA for potassium can safely go as high as 2,000 mg*
Laboratory Activity 1 (continued)

1. Is there too much or too little of any mineral in your menu, as compared with the RDIs? If so, what do you think is the reason?

2. What foods could you change or add to your menu to increase the minerals your menu is lacking?

3. Study the Tables on page 11.
   a. Which type of food in Table 2 is the highest in calcium?

   b. Does one serving of this food meet the daily requirement for calcium? Explain.

Questions and Conclusions

1. Did your menu meet all the RDIs for the four minerals you examined? If not, which minerals fell short?

2. Suggest any possible shortcomings you see for the possible replacement foods you listed to increase certain minerals in your menu.

3. Did any of the foods you selected provide the entire day’s RDI? Which?

4. According to Table 1 from your text, what body parts or functions benefit from the minerals you examined?
Laboratory Activity 1 (continued)

5. Do you think it’s important for young people to eat a wide variety of foods to get the minerals they need? Why?

Strategy Check

_____ Can you research and record quantities of certain nutritional minerals in typical servings of various foods?

_____ Can you determine if those foods satisfy established daily requirements for those minerals?

_____ Can you identify which body parts or functions use certain minerals?
Transporting Nutrients

The cells in your body get the nutrition they need by passing substances across their membranes. Some substances pass easily across the membranes. Others need some help in the form of energy or membrane proteins. Membranes that allow some substances to pass through easily, but not others, are called semipermeable membranes. In this laboratory, you will examine some of the processes by which nutrients and wastes enter and leave a cell. Diffusion and osmosis are the most common ways substances pass through a membrane. You will simulate these processes and be able to observe a semipermeable membrane.

Strategy
You will observe diffusion.
You will observe and describe how a semipermeable membrane works.

Materials
- water
- test tube
- potassium permanganate (two or three large crystals)
- test-tube rack
- metric ruler
- 500-mL beaker
- dialysis bagging cut into 2 6–8-cm strips
- rubber bands or string (2 pieces, 8 cm)
- masking tape (2 pieces, 4 cm)
- measuring spoons
- dark corn syrup

Procedure

Part A—Observing Diffusion
1. Pour water into a test tube until it is about three-fourths full.
2. Your teacher will put two to three large crystals of potassium permanganate into your test tube. As the potassium permanganate becomes diluted, it will turn a deep purple. **WARNING:** Potassium permanganate is an irritant, and it will also stain your clothing. Be careful when handling it.
3. Put the test tube in the test-tube rack. Do not touch or shake the test tube in any way. Note the time in Table 1 in the Data and Observations section.
4. After 10 minutes, observe the color change in the water. Measure the highest point the deep purple color has reached. Record your measurement in Table 1 in the Data and Observations section.
5. Repeat step 4 two more times.

Part B—Observing a Semipermeable Membrane
1. Pour water into a 500-mL beaker until it is about half-full of water. Be sure there is plenty of room to put your bagging in it without spilling the water.
2. Take one end of the dialysis bagging and tie it off securely with a rubber band or string.
3. Open the other end of the bagging. The bagging will probably be very difficult to pry open, just like some supermarket plastic bags. If the tubing is dry, place masking tape on your thumb and forefinger and pull aside the edges of the open end. If it is wet, rub the edges of the open end until they come apart.
4. Place about 1 teaspoon of the dark corn syrup in the bag and tie off that end as you did the other.
5. Place the entire bag, with corn syrup in it, into the water beaker. Record your observations of the bag in Table 2 in the Data and Observations section.
6. Wait for 20 minutes and observe the bag of corn syrup. Record your observations in Table 2 in the Data and Observations section.
Laboratory Activity 2 (continued)

Data and Observations

Table 1

<table>
<thead>
<tr>
<th>Beginning Time</th>
<th>Height (cm) after 10 Minutes</th>
<th>Height (cm) after 20 Minutes</th>
<th>Height (cm) after 30 Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2

Beginning Observations:

<table>
<thead>
<tr>
<th>After 20 Minutes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Questions and Conclusions
1. What happened to the color of the water in the test tube with the potassium permanganate?
Laboratory Activity 2 (continued)

2. What can you conclude about how some cells in your body get some of their nutrition?

3. In the experiment with the corn syrup, did the water enter the bag?

4. Did the corn syrup appear to leave the bag?

5. Which substance do you think has larger molecules—water or corn syrup? Why?

6. This type of barrier is called a semipermeable membrane. What does it mean when the membrane of a human cell is called semipermeable?

Strategy Check

_____ Can you observe diffusion?

_____ Can you observe and describe how a semipermeable membrane works?
Interactions of Human Systems

Directions: Use this page to label your Foldable at the beginning of the chapter.

mineral
organic compound
cell
tissue
organ
organ system
digestion
enzyme
villi
absorption
cellular respiration
alveoli
excretion
homeostasis
negative feedback
Meeting Individual Needs
Overview
Interactions of Human Systems

Directions: The flow chart below shows levels of organization in the human body. In the spaces provided, write these levels in order from simplest to most complex.

organ  tissue  organism  cell  organ system

Simplest
1.
2.
3.
4.
5.

Most complex

Directions: Complete the following sentences using the terms listed below.

urinary  homeostasis  digestive  negative  respiratory

6. The circulatory and ____________________ systems work together to break down food and transport it to the cells.

7. The circulatory and ____________________ systems work together to release carbon dioxide and take in oxygen.

8. The circulatory and ____________________ systems work together to remove wastes and return water, sugar, and salt to the blood.

9. Your body has the ability to respond to changes and keep its internal environment stable. The process by which it does this is called ____________________.

10. Bodily responses that occur when you exercise or become overheated are called ____________________ feedback.
Section 1 - The Human Organism

Directions: Use the clues below to complete the crossword puzzle.

Across
2. The smaller units that make up tissues
5. Organic compounds that store information needed for making proteins
7. Organic compounds that are the main energy source of all living things
8. Organic compounds that make up many of the body’s structures (such as skin and muscles) and that help carry out body processes (such as digestion)

Down
1. An inorganic substance that plays an important part of nearly every body process
3. Another name for a fat or an oil; an organic compound that is stored in the body as an energy reserve
4. Inorganic substances, such as calcium and iron, that are needed by the body in small amounts
6. Examples include the stomach, brain, and heart

22 Interactions of Human Systems
Directions: For each of the following, write the letter of the term or phrase that best completes the sentence.

1. The main organs of the respiratory system are the ______.
   a. kidneys  
   b. lungs

2. ______ is the process by which the body maintains a stable internal environment.
   a. Homeostasis  
   b. Absorption

3. Positive feedback mechanisms are ______ common in the body than negative feedback mechanisms are.
   a. more  
   b. less

4. The digestive system and the ______ system work together to break down food and transport it to cells.
   a. excretory  
   b. circulatory

5. Food molecules pass from the small intestine into the bloodstream through tiny fingerlike projections called ______.
   a. villi  
   b. nephrons

6. ______ is a process in which food molecules and oxygen are combined to release energy. This process produces carbon dioxide and water as wastes.
   a. Cellular respiration  
   b. Digestion

7. The waste liquid produced by the kidneys is called ______.
   a. sweat  
   b. urine

8. Shivering helps to increase the body’s temperature. Shivering when you are cold is an example of a ______ feedback mechanism.
   a. negative  
   b. positive

9. The clotting of blood is an example of ______ feedback.
   a. negative  
   b. positive

10. The circulatory system and the ______ system work together to remove carbon dioxide from the body.
    a. respiratory  
    b. urinary
Key Terms
Interactions of Human Systems

Directions: Write the term that matches each description below on the spaces provided. Some letters have been provided. The letters in the dark, vertical box will spell the answer to question 10.

1. type of carbon-containing compounds that include proteins and lipids
2. type of protein that helps carry out chemical reactions
3. smallest functional unit of any living thing
4. group of different tissues that perform a particular function
5. process in which food molecules pass from the small intestine to the blood
6. process in which wastes are removed from the body
7. tiny sacs in the lungs through which oxygen and carbon dioxide are exchanged
8. group of similar cells that perform a function
9. process in which the body breaks down food into molecules that can be used by cells
10. find the hidden word that answers this question: What body process is most like Goldilocks? (Hint: It keeps your body “just right.”)

Meeting Individual Needs

24 Interactions of Human Systems
**Sinopsis**

**Interacciones entre los sistemas humanos**

**Instrucciones:** El siguiente diagrama de flujo muestra los niveles de organización del cuerpo humano. En los espacios dados, escribe estos niveles en orden, desde el más simple al más complejo.

<table>
<thead>
<tr>
<th>órgano</th>
<th>tejido</th>
<th>organismo</th>
<th>célula</th>
<th>sistema de órganos</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Más simple</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td>Más complejo</td>
</tr>
</tbody>
</table>

**Instrucciones:** Completa las siguientes oraciones usando los términos de la lista.

<table>
<thead>
<tr>
<th>urinario</th>
<th>homeostasis</th>
<th>digestivo</th>
<th>negativa</th>
<th>respiratorio</th>
</tr>
</thead>
</table>

6. Los sistemas circulatorio y ____________________ funcionan juntos para desintegrar los alimentos y transportarlos a las células.

7. Los sistemas circulatorio y ____________________ funcionan juntos para liberar dióxido de carbono y tomar oxígeno.

8. Los sistemas circulatorio y ____________________ funcionan juntos para eliminar desechos y devolver agua, azúcar y sales a la sangre.

9. Tu cuerpo tiene la capacidad de responder a los cambios y mantener su ambiente interno estable. El proceso que usa para esto se llama ____________________.

10. Las respuestas corporales que ocurren cuando haces ejercicios o te sobrecalientas se llaman retroalimentación ____________________.
Sección 1  •  El organismo humano

Instrucciones: Usa las pistas para hacer el crucigrama.

Horizontales
1. Compuestos orgánicos que almacenan la información necesaria para elaborar proteínas
4. Sustancia inorgánica que juega un papel importante en casi todos los procesos celulares
7. Compuestos orgánicos que son la fuente más importante de energía para los seres vivos
8. Sustancias inorgánicas, como el calcio y el hierro, que el cuerpo necesita en pequeñas cantidades

Verticales
2. Las unidades más pequeñas que forman los tejidos
3. Ejemplos son el estómago, el encéfalo y el corazón
5. Compuestos orgánicos que forman muchas de las estructuras del cuerpo (como la piel y los músculos) y que ayudan a llevar a cabo los procesos corporales (como la digestión)
6. Otro nombre que se da a las grasas y aceites; compuesto orgánico que el cuerpo acumula como reserva de energía

26 Interacciones entre los sistemas humanos
Instrucciones: En cada una de las siguientes, escribe la letra del término que complete mejor cada oración.

1. Los principales órganos del sistema respiratorio son los ______.
   a. riñones                      b. pulmones

2. La ______ es el proceso por medio del cual el cuerpo mantiene un ambiente interno estable.
   a. homeostasis                  b. absorción

3. Los mecanismos de retroalimentación positiva son ______ comunes en el cuerpo que los mecanismos de retroalimentación negativa.
   a. más                          b. menos

4. El sistema digestivo y el sistema ______ trabajan juntos para desintegrar los alimentos y transportarlos a las células.
   a. excretorio                   b. circulatorio

5. Las moléculas de alimento pasan del intestino delgado al flujo sanguíneo a través de pequeñas proyecciones tipo dedos llamadas ______.
   a. microvellosidades            b. nefrones

6. La ______ es el proceso en que se combinan las moléculas alimenticias y el oxígeno para liberar energía. Este proceso produce dióxido de carbono y agua como desechos.
   a. respiración celular          b. digestión

7. El desecho líquido que producen los riñones se llama ______.
   a. sudor                        b. orina

8. El tiritar ayuda a elevar la temperatura corporal. El tiritar cuando tienes frío es ejemplo de un mecanismo de retroalimentación ______.
   a. negativa                     b. positiva

9. La coagulación de la sangre es ejemplo de retroalimentación ______.
   a. negativa                     b. positiva

10. El sistema circulatorio y el sistema ______ trabajan juntos para eliminar el dióxido de carbono del cuerpo.
    a. respiratorio                 b. urinario
<table>
<thead>
<tr>
<th></th>
<th>Términos claves</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interacciones entre los sistemas humanos</td>
</tr>
</tbody>
</table>

**Instrucciones:** Escribe el término que corresponde a cada descripción en los espacios dados. Se dan algunas letras. Las letras que aparecerán en la caja vertical oscura responden la pregunta 10.

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. tipo de compuestos del carbono que incluye proteínas y lípidos
2. tipo de proteína que ayuda a que ocurran las reacciones químicas
3. unidad funcional básica más pequeña de todos los seres vivos
4. proceso mediante el cual se eliminan los desechos del cuerpo
5. proceso mediante el cual las moléculas alimenticias pasan del intestino delgado a la sangre
6. diferentes grupos de tejidos que llevan a cabo una función particular
7. sacos diminutos en los pulmones a través de los cuales se intercambian el oxígeno y el dióxido de carbono
8. grupo de tejidos que llevan a cabo una función específica
9. grupo de células similares que trabajan juntas
10. encuentra la palabra escondida que responde esta pregunta: ¿Cuál proceso corporal se parece más a Ricitos de Oro? (Pista: Mantiene tu cuerpo "afinado").
### Directions: Write the term from the following list that matches each description on the line provided.

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Lipids</th>
<th>Nucleic Acids</th>
<th>Organic Compounds</th>
<th>Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. main source of energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. most of the compounds containing carbon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. large, complex compounds that store information in the form of code</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. substances that are part of a person’s hair, nails, skin, muscles, and blood vessels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. stored in the body as energy reserves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Explain how the above terms are related.

---

### Directions: Select the term from the following list that matches each description.

<table>
<thead>
<tr>
<th>Cell</th>
<th>Organ</th>
<th>Organ System</th>
<th>Tissues</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. groups of similar cells that do the same kind of work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. structure made up of different types of tissues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. smallest functional unit in an organism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. groups of organs that work together to do a specific job</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Explain how the above terms are related.

---

Interactions of Human Systems 29
How Your Body Works

Directions: Use the words in the list to fill in the blanks.

alveoli enzymes villi absorbed

cellular respiration carbon dioxide negative feedback

1. In the process of ____________________________, oxygen combines with food molecules and energy is released.

2. _________________ are proteins that help break down the chemicals in food.

3. Nutrients are carried through the bloodstream after they are _________________ in the small intestine.

4. In the small intestine, nutrients pass through small, fingerlike projections, called _________________.

5. Thin-walled sacs in the lungs are called _________________.

6. Oxygen and _________________ are exchanged in the lungs.

7. The mechanism of _________________ helps the body maintain homeostasis.

Directions: Answer the following questions on the lines provided.

8. Why is excretion an important life process?

9. What are nephrons? What job do kidneys perform?

10. How do rapid breathing, flushing, and sweating help maintain homeostasis?
Tissue Preservation

At any given time, thousands of people experience failure of a body organ and require a replacement in order to survive. These people are on waiting lists for an organ or tissue transplant, a process in which the tissue or organ is removed from a donor and placed in a recipient. A major problem with the donation process is that a removed organ will survive outside the body for only a short period of time. Often organs must be transported long distances between the donor and recipient.

Chilling Out
To solve this problem, scientists have been working on methods of tissue preservation. One way of preserving tissue, although not viable for organ transplants, is to freeze it. Unfortunately, since cells contain significant amounts of water, just placing the tissue in a freezer would create ice crystals that would puncture the cell membranes. To prevent ice crystal formation, scientists use cryoprotectants, such as glycerol, which act as antifreeze agents. In addition, the cooling rate is carefully controlled. Once the samples are completely cooled, they are stored in liquid nitrogen. This method has been fairly successful. Even though scientists are not able to preserve all frozen cells, they can preserve enough cells that will divide and multiply once they are thawed.

Recently a new cryoprotectant has been discovered that has greatly increased the number of cells successfully preserved—a sugar called trehalose. Trehalose takes the place of water inside a cell and helps to protect the cell’s membranes, DNA, and enzymes from damage. More than 70 percent of cells treated with trehalose can survive. Another benefit of this sugar is that it can preserve cells that have been dried. Normally, dried human cells die after only one day. However, with trehalose, the cells can survive up to five days.

Fresh Possibilities
Scientists are exploring many new possibilities for freezing cells preserved with trehalose. For instance, some researchers are experimenting with using trehalose to preserve a woman’s ovaries while she undergoes cancer treatment. This would prevent a woman’s eggs from being exposed to the dangers of chemotherapy drugs. Other scientists are using trehalose to preserve dried vaccines. This eliminates the need to refrigerate the vaccines and could prolong their shelf life. With all the new research being done in the area of tissue preservation, scientists may one day be able to preserve organs indefinitely, so that anyone needing an organ or tissue transplant can receive one.

1. How can a cell become damaged when it is frozen?

2. List several methods scientists use to prevent cell damage when freezing cells.

3. Currently most vaccines require almost constant refrigeration. How will the use of dried vaccines help health professionals?
Our bodies require energy to live. To get that energy from the food we eat, the food must first be processed by our digestive system, then absorbed by all of our cells. Our bodies perform two types of digestion simultaneously: physical breakdown and chemical breakdown. Physical breakdown is smashing food into smaller pieces. Chemical breakdown involves separating the molecules in the food and then digesting, or breaking apart, the bonds the molecules contain. Essential to chemical digestion are many enzymes that help perform molecular digestion at various stages of the digestive process.

**Shaping Up**

Each enzyme has a unique number of atoms and a unique shape. The shape of the enzyme determines its function. For example, amylase is an enzyme that helps break down starches. The enzyme and the starch fit together like two puzzle pieces, each fitting exactly only with the other. However, enzymes require other molecules to ensure proper activity. These molecules are called coenzymes.

Many coenzymes are vitamins. If a person is not consuming a proper diet, complete with all vitamins and minerals, certain enzyme processes may not function properly. Many medical problems are linked with low levels, or even the absence, of certain enzymes.

A condition known as lactose intolerance is a common condition in which a body can't digest lactose, the sugar in milk products. If a person lacks the lactose-digesting enzyme, lactase, that person may need to reduce or eliminate milk products from his or her diet, or possibly take enzyme supplements. While lactose intolerance is not life threatening, it causes increased gas production, upset stomach, or intestinal distress.

**Serious Problems**

Some enzyme deficiencies, such as Gaucher's disease, can be more serious. This disease is caused by a deficiency in the enzyme that digests glycolipids (glucose combined with fats or oils). Without this enzyme, blood levels of glycolipids can increase and cause serious problems. These problems may include an enlarged spleen and liver, anemia (low blood oxygen), and severe bone and joint pain.

For those people who have enzyme deficiencies, identified by a physician, enzyme supplements offer one possible treatment. Most medical professionals agree, however, that healthy people manufacture all the enzymes they require, so supplements are not necessary. Further, most digestive problems are correctable by making sure a proper diet is consumed that provides the body with all the nutrients it needs to maintain the right levels of enzyme activity.

1. What is the function of a digestive enzyme?

2. What gives enzymes the ability to digest the molecules they are supposed to digest?

3. A person may show symptoms of reduced enzyme function. Explain how this may be caused by a vitamin or mineral deficiency.

4. How do you think digestive enzymes assist the body in maintaining overall homeostasis?
Interactions of Human Systems

Section 1  The Human Organism

A. The human body is _______________ in a series of building blocks that differ in size and complexity.

B. Life is based in _______________; substances are either elements or compounds.
   1. _______________ substances—come from nonliving things
      a. _______________ are involved in many of the body's chemical reactions.
      b. _______________ makes up more than 70 percent of the body's tissues and plays a role in nearly every body function.
   2. _______________ compounds contain carbon and make up living things.
      a. _______________ (made up of carbon, hydrogen, and oxygen) are the main source of energy for living things.
      b. _______________ (fats and oils) are stored as energy reserves; they contain more energy per molecule than carbohydrates do.
      c. _______________ acids (DNA and RNA) direct cell activities including instructions for making proteins.
      d. _______________ make up body structures and help carry out body processes.

C. _______________, the smallest functional units in an organism, take in raw materials and make proteins and other products through chemical reactions.
   1. Cells are organized into _______________, groups of similar cells that do the same sort of work.
   2. Tissues are organized into _______________, structures made up of different types of tissue that work together.
   3. Organs are organized into organ _______________, groups of organs working together to do a particular job.

Section 2  How Your Body Works

A. Systems in the body _______________ and work together.
   1. The _______________ and lungs put oxygen into blood and take carbon dioxide out of it.
   2. Chemicals from _______________ are distributed throughout the body for important body functions.
B. **________________**—the breakdown of foods into molecules that cells can use; digestive system is a long tube that runs through the body
   1. **________________**—proteins that aid chemical reactions; some break down the chemicals in food.
   2. Villi are tiny, fingerlike projections in the ______________ intestine.
   3. Nutrients enter the __________________ by passing through the villi in the process of absorption.

C. **_____________________________** is a series of chemical processes in which oxygen combines with food molecules and energy is released; carbon dioxide and water are waste products.
   1. The respiratory system interacts with the circulatory system in the ______________.
      a. Lungs are made up of millions of ________________, tiny, thin-walled sacs surrounded by capillaries.
      b. Oxygen and carbon dioxide are ________________ between the alveoli and the capillaries.
   2. ________________—the removal of waste products that occurs through the circulatory, respiratory, digestive, and urinary systems
   3. ________________, part of the urinary system, remove cell wastes and control the amount of water in blood.
   4. ________________ in the kidneys filter the blood and produce urine.

D. **____________________**—process used by the body to maintain a stable internal environment
   1. _________________ feedback— the body changes an internal condition back to its normal state; the most common way the body regulates itself
      a. Example: When blood pressure rises, the heart _________________.
      b. Example: When glucose levels are too ________________, the pancreas secretes insulin to stimulate the absorption of glucose and the conversion of glucose into glycogen.
   2. _________________ feedback—the body reacts to a change from the normal state by causing an even greater change
      a. When contractions in the uterus push a baby into the birth canal, contractions in the uterus _________________.
      b. When a blood vessel is damaged, the vessel ________________ and chemicals are released to plug and repair the hole.
Assessment
Part A. Vocabulary Review

Directions: Use the clues below to complete the crossword puzzle.

Across
4. Most of the compounds that contain carbon
9. Protein that helps the body carry out chemical reactions
10. Mechanism that allows the body to change an internal condition back to normal
11. Fingerlike projections lining the small intestine that absorb food into the bloodstream
12. Process by which food enters the bloodstream from the small intestine
14. Large, complex organic compounds that store information in code form

Down
1. Process by which the body is able to keep its internal environment stable
2. Organic compound stored in the body as an energy reserve
3. Group of similar cells that do the same kind of work
5. Smallest functional unit in an organism
6. Inorganic substance that is involved in many chemical reactions in the body
7. Breakdown of foods into smaller and simpler molecules that can be used by cells
8. Thin-walled sacs that make up the lungs
10. Tiny units that make up the kidneys
13. Structure made of different tissues
Part B. Concept Review

Directions: Identify each of the following as an example of negative feedback or positive feedback by writing positive or negative in the space provided.

1. blood clotting  
2. decrease in blood pressure  
3. amount of insulin the body secretes  
4. contractions of the uterus

5. Put these structures in order from the simplest level (1) to the most complex (5) by writing the correct number on the lines provided.

   a. organs  
   b. cells  
   c. tissues  
   d. organism  
   e. organ system

Directions: Complete the table by writing the organ system to which each major organ belongs.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Organ System</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Heart</td>
<td></td>
</tr>
<tr>
<td>7. Lungs</td>
<td></td>
</tr>
<tr>
<td>8. Intestines</td>
<td></td>
</tr>
<tr>
<td>9. Kidneys</td>
<td></td>
</tr>
</tbody>
</table>

Directions: Identify each substance or compound as organic or inorganic in the space provided.

10. air  
11. carbohydrates  
12. concrete  
13. water  
14. proteins  
15. salt  
16. minerals  
17. nucleic acids  
18. DNA  
19. lipids
Transparency Activities
Have you ever watched bees buzzing about a honeycomb? Perhaps it looks like a mess of random activity. Actually, beehives are very organized. A honeycomb is made of many hexagonal cells. Each cell has a different function, like holding food or eggs.

1. How is a honeycomb like the human body?
2. How do bees work together for the well-being of the hive?
Running Hot and Cold

A typical camera records an image similar to what is actually seen. Other cameras, however, record things that cannot be seen. The image below was taken in a grocery store with a camera that senses heat.

1. Which colors show hotter regions? Which colors are cooler?
2. What section of the grocery store do you think this person is in? Why?
3. If this person had just finished running, how might this image be different?
SECTION 1
Teaching Transparency
Activity

The Human Organism
Teaching Transparency Activity (continued)

1. What do organ systems working together form?

2. Name the levels of organization in the human body.

3. What are tissues?

4. What does blood tissue transport to and from cells?

5. What do cardiac cells working together make up?
Interactions of Human Systems

**Directions:** Carefully review the table and answer the following questions.

### Nutrition Facts

**Whole Milk**
- **Serving Size:** 1 cup (240 mL)
- **Servings per container:** 16

| Amount per Serving | % Daily Value *
|--------------------|------------------
| Calories 150       | Calories from Fat 70 |
| Total Fat 8g        | 12%               |
| Saturated Fat 5g    | 25%               |
| Cholesterol 35mg    | 11%               |
| Sodium 125mg        | 5%                |
| Total Carbohydrate 11g | 4%           |
| Dietary Fiber 0g    | 0%                |
| Sugar 10g           |                   |
| Protein 8g          |                   |

Vitamin A 6% • Vitamin C 4%  
Calcium 30% • Iron 0%  
Vitamin D 25% • Phosphorus 20%  

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

1. The body needs organic compounds such as carbohydrates, fats, proteins, and nucleic acids to survive. Which of these is NOT listed on a standard food label like the one shown?
   - A Carbohydrates
   - B Fats
   - C Proteins
   - D Nucleic acids

2. Which vitamin or mineral makes up 30 percent of your recommended daily intake according to the label?
   - F Vitamin C
   - G Calcium
   - H Vitamin A
   - J Phosphorus

3. According to the label, if Bobby drank a 16-ounce glass of whole milk, how many grams of fat would he ingest?
   - A 8 g
   - B 16 g
   - C 4 g
   - D 12 g