Chapter 1
Cell Structure and Function

Includes:

**LEVELED ASSESSMENT**
- Chapter Review
- Chapter Tests
  - Test A (Below Level) **BL**
  - Test B (On Level) **OL**
  - Test C (Advanced Learner) **AL**

**LABS**
For leveled labs, use the **LabManager**.
- Lab worksheets from Student Edition Labs
  - MiniLab
  - Lab: Version A (Below Level) **BL**
  - Lab: Version B (On Level) **OL**
    (Advanced Learner) **AL**

**UNIVERSAL ACCESS/LEVELED RESOURCES**
- Target Your Reading
- Chapter Content Mastery English (Below Level) **BL**
- Chapter Content Mastery Spanish (Below Level) **BL**
- Reinforcement (On Level) **OL**
- Enrichment (Advanced Learner) **AL**

**READING SUPPORT**
- Content Vocabulary
- Chapter Outline

**TEACHER SUPPORT AND PLANNING**
- Chapter Outline for Teaching
- Teacher Guide and Answers

McGraw-Hill Glencoe

New York, New York  Columbus, Ohio  Chicago, Illinois  Peoria, Illinois  Woodland Hills, California
Photo Credits
Cover: Greg Probst/Getty Images
# Table of Contents

## To the Teacher

---

## Reproducible Student Pages

### Hands-On Activities
- MiniLab: *How can you model a cell?* ........................................ 2
- MiniLab: *How can you see photosynthesis?* ........................... 3
- Lab Version A: *Exploring the Unknown* ............................... 4
- Lab Version B: *Exploring the Unknown* ............................... 7

### Meeting Individual Needs

#### Below, On, Advanced
- Target Your Reading ................................................................. 10
- Chapter Content Mastery ........................................................... 11
- Spanish Chapter Content Mastery ............................................... 14
- Reinforcement .............................................................................. 17
- Enrichment ................................................................................ 20
- Content Vocabulary .................................................................... 23
- Chapter Outline Worksheets ......................................................... 36

### Assessment

- Chapter Review ........................................................................... 25
- Chapter Test A ............................................................................. 27
- Chapter Test B ............................................................................. 30
- Chapter Test C ............................................................................. 33

### Teacher Support and Planning

- Chapter Outline for Teaching ......................................................... T2
- Teacher Guide and Answers ........................................................ T6

---

### Additional Assessment Resources available with Glencoe Science:

- ExamView® Assessment Suite
- Assessment Transparencies
- Performance Assessment in the Science Classroom
- Standardized Test Practice Booklet
- MindJogger Videoquizzes
- Vocabulary PuzzleMaker at [science.glencoe.com](http://science.glencoe.com)
- Interactive Classroom
- The Glencoe Science Web site at [science.glencoe.com](http://science.glencoe.com)
- An interactive version of this textbook along with assessment resources are available online at [mhln.com](http://mhln.com).
To the Teacher

This chapter-based booklet contains resource materials to help you teach this chapter more effectively. Within you will find the following:

Reproducible pages for
- hands-on activities;
- meeting individual needs (below, on, advanced);
- student assessment

A teacher support and planning section including
- chapter outline;
- answers for the worksheets

HANDS-ON ACTIVITIES

MiniLab Worksheets (All Students): These worksheets are an expanded version of each MiniLab found in the Student Edition. The materials lists, procedures, and questions are repeated so that students do not need their textbooks open during the laboratory activity. Write-on lines are included for any questions. Tables/charts/graphs are often included for students to record their observations or space has been made available. Additional lab preparation information is provided in the Teacher Guide and Answers section.

Lab Versions A and B Worksheets (Below, On, Advanced):

These worksheets are an expanded version of the two-page lab found in the student textbook. The materials lists, procedures, and questions are repeated so that students do not need their textbooks open during the laboratory activity. Write-on lines are included for any questions. Tables, charts, and graphs are often included for students to record their observations.

The labs are further expanded to be accessible for all students. Lab Version A, for below-level students, includes slightly modified and expanded steps, as well as check boxes next to key steps so students can track their progress. Lab Version B, for on-level and advanced learners, is the student edition lab with the addition of a Going Further section at the end. Going Further includes several questions that will challenge your advanced learners. Additional lab information is provided in the Teacher Guide and Answers section.

MEETING INDIVIDUAL NEEDS (BELOW, ON, ADVANCED)

Target Your Reading (All Students): The Target Your Reading activity provides the teacher with a pre-assessment strategy. First, students should complete the Before You Read activity to the best of their ability. Judging from their answers, the teacher can determine how much prior knowledge the students possess about the topic, and thus, how much time to spend on the chapter. This activity can also be used as a check at the end of the chapter to gauge how much the students have learned. Target Your Reading also serves as an anticipation guide to excite students about new material.

Chapter Content Mastery (Below Level): These worksheets are designed to aid students who have learning difficulties in learning and understanding the vocabulary and major concepts of each chapter. The Chapter Content Mastery worksheets contain a variety of formats to engage students as they master the basics of the chapter. Answers are provided in the Teacher Guide and Answers section.
Spanish Chapter Content Mastery (Below Level): A Spanish version of the Chapter Content Mastery is provided for Spanish-speaking students who are learning English.

Reinforcement (On Level): These worksheets provide an additional resource for reviewing the concepts of the chapter. There is one worksheet for each lesson of the chapter. The Reinforcement worksheets are designed to focus primarily on science content and less on vocabulary, although knowledge of the lesson vocabulary supports understanding of the content. The worksheets are designed for a full range of students; however, they will be more challenging for lower-level students. Answers are provided in the Teacher Guide and Answers section.

Enrichment (Advanced Learners): These worksheets are directed toward advanced learners and allow them to further explore the information and concepts introduced in the lesson. A variety of formats are used for these worksheets: concepts to analyze; problems to solve; diagrams to examine and analyze; or a simple activity or lab, which students can complete in the classroom or at home. Answers are provided in the Teacher Guide and Answers section.

Content Vocabulary (All Students): These review and reinforcement activities help students to master unfamiliar content terms used in the student textbook. The worksheets emphasize identification of word meanings and provide visual and kinesthetic reinforcement of vocabulary words.

Chapter Outline (All Students): The Chapter Outline mirrors the content contained in the teacher version—Chapter Outline for Teaching. These worksheets can be used to allow students to take notes during class, as an additional review of the material in the chapter, or as study notes for students who have been absent.

Assessment

Chapter Review (All Students): These worksheets prepare students for the chapter test. The Chapter Review worksheets cover all major vocabulary, concepts, and objectives of the chapter. The first part is a vocabulary review, and the second part is a concept review. Answers and objective correlations are provided in the Teacher Guide and Answers section.

Chapter Tests A, B, and C (Below, On, Advanced): The chapter tests are written to accommodate all students. Test A, for below-level students, provides students with more guided questions, such as multiple choice, matching, and fill-in-the-blank with word banks. Test B, for on-level students, tests average students with more short answer and completion questions. Test C challenges advanced learners with more difficult and open-ended questions.

All chapter tests require students to use process skills and understand content. Although all questions involve memory to some degree, you will find that your students will need to discover relationships among facts and concepts in some questions and will need to use higher levels of critical thinking to apply concepts in other questions. Answers and objectives are provided in the Teacher Guide and Answers section.

Teacher Support and Planning

Chapter Outline for Teaching: These pages provide a synopsis of the chapter by lesson and include suggested discussion questions. Also included are the terms that complete the sentences in the student Chapter Outline worksheets.

Answer Key: Answers for all the worksheets can be found in the Answer Key at the end of the booklet.
Student Lab/Activity Safety Form

Student Name: ________________________________
Date: ________________________________
Lab/Activity Title: ________________________________

In order to show your teacher that you understand the safety concerns of this lab/activity, the following questions must be answered after the teacher explains the information to you. You must have your teacher initial this form before you can proceed with the activity/lab.

1. How would you describe what you will be doing during this lab/activity?

2. What are the safety concerns associated with this lab/activity (as explained by your teacher)?
   •
   •
   •
   •
   •

3. What additional safety concerns or questions do you have?

MiniLab

How can you model a cell?

Procedure
1. Complete a lab safety form.
2. Build the cell type that your teacher assigns your lab group, using available materials.
3. Briefly present your group’s model to your class. Draw a picture of your model in the Data and Observations section.

Data and Observations

Analysis
1. Explain how you decided what to include in your cell model.

__________________________________________________________________________

__________________________________________________________________________

2. Compare and contrast this model and your drawings from the Launch Lab.

__________________________________________________________________________

__________________________________________________________________________

3. Justify structures you included in your cell model.

__________________________________________________________________________

__________________________________________________________________________
MiniLab

How can you see photosynthesis?

Even using the most powerful microscope, you cannot observe the chemical processes taking place inside a cell. However, it is possible to observe what happens when chemical processes do not occur.

Procedure

1. Read and complete a lab safety form.
2. Obtain a potted plant from your teacher.
3. Using scissors, cut a piece of aluminum foil about the same length and width of a leaf.
4. Fold the foil in half lengthwise and place it around a leaf. The foil should cover about half of the leaf. Use a paper clip to hold the foil in place.
5. Place the plant in a sunny location for at least four days.
6. Predict the appearance of the leaf under the foil after the four days. Record your prediction in the Data and Observations section.
7. On the fifth day, remove the foil, and observe the leaf. Record your observations.

Data and Observations

Analysis

1. Compare and contrast your prediction about the leaf and your observation of the leaf.

2. Infer whether cellular respiration or photosynthesis was most affected by the presence of foil.

3. Form a hypothesis to explain if covering an edible leaf, such as spinach, would affect its taste.
Problem A cell biologist collected an unknown cell while on an expedition. Using the scientific observation skills you have used in this chapter’s labs, determine if the cell is prokaryotic or eukaryotic and the type of organisms that it came from.

Form a Hypothesis Consider the diversity of life on Earth. Before you observe the cell sample, predict what it will be. What hypothesis would be supported if your prediction is true? What hypothesis would be supported if your prediction is false?

Materials
compound light microscope
prepared slide of an unknown cell

Safety Precautions

Procedure
Directions: Check the boxes below as you complete each step of the procedure.

☐ 1. Read and complete a lab safety form.
☐ 2. Create a data page similar to the one on the next page to record your observations.
☐ 3. Observe a prepared slide of an unknown cell at low magnifications.
   ☐ Sketch the cell.
   ☐ Observe the same cell at high magnifications.
☐ Sketch the cell.
☐ Include organelles such as vacuoles and the golgi apparatus.
☐ 4. Record any special adaptations the cell has that might indicate the cell’s function. An example of an adaptation would be cilia or a flagellum that helps the cell move.
## Lab: Version A CONTINUED

<table>
<thead>
<tr>
<th>Sketch of Cell at Low Magnification</th>
<th>Sketch of Cell at High Magnification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cell Organelles Observed**

**Adaptations/Function**

**Conclusion**

### Analyze and Conclude

1. **Describe** what you observed on your data page. Is the unknown cell similar to something you have seen before?

   _______________________________________________________

   _______________________________________________________

2. **Explain** how the presence or absence of organelles affects your identification. Recall how you made decisions about organelles when you built your model.

   _______________________________________________________

   _______________________________________________________
Lab: Version A CONTINUED

3. **Summarize** the information you have about the unknown cell.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. **Create** a table to compare and contrast the unknown cell with plant and animal cells.

<table>
<thead>
<tr>
<th>Similar</th>
<th>Different</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **Draw a conclusion** about the unknown cell.

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

---

**Communicate**

Prepare a brief report to share your conclusion with the class. In the report, detail what observations you made and what types of lab work helped you reach your final conclusion. Use the information on your data page to defend your decision.
Problem  A cell biologist collected an unknown cell while on an expedition. Using the scientific observation skills you have used in this chapter’s labs, determine if the cell is prokaryotic or eukaryotic and the type of organisms that it came from.

Form a Hypothesis  Consider the diversity of life on Earth. Before you observe the cell sample, predict what it will be. What hypothesis would be supported if your prediction is true? What hypothesis would be supported if your prediction is false?

Materials
compound light microscope
prepared slide of an unknown cell

Safety Precautions

Procedure
Directions: Check the boxes below as you complete each step of the procedure.

☐ 1. Read and complete a lab safety form.
☐ 2. Create a data page similar to the one on the next page to record your observations.
☐ 3. Observe a prepared slide of an unknown cell at low and high magnifications. Sketch your cell at each magnification.
☐ 4. Record any special adaptations the cell has that might indicate the cell’s function.
**Lab: Version B**

<table>
<thead>
<tr>
<th>Sketch of Cell at Low Magnification</th>
<th>Sketch of Cell at High Magnification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cell Organelles Observed**

**Adaptations/Function**

**Conclusion**

---

**Analyze and Conclude**

1. **Describe** what you observed on your data page. Is the unknown cell similar to something you have seen before?

   

2. **Explain** how the presence or absence of organelles affects your identification. Recall how you made decisions about organelles when you built your model.

   

3. **Summarize** the information you have about the unknown cell.

   

---
Lab: Version B  CONTINUED

4. Create a table on a separate piece of paper to compare and contrast the unknown cell with plant and animal cells.
5. Draw a conclusion about the unknown cell.

______________________________________________________________________________________________________________________________________________________________________________________________

Going Further

Challenge

6. Conclude how the cell would be different if it were a plant cell.

______________________________________________________________________________________________________________________________________________________________________________________________

7. Hypothesize what you could observe on your cell if you used an electron microscope.

______________________________________________________________________________________________________________________________________________________________________________________________

Extension

Create Use the cell from your lab to create a children’s book titled *A Day in the Life of a Cell.* Explain the parts of the cell and the functions the cell will carry out.

Communicate

Prepare a brief report to share your conclusion with the class. In the report, detail what observations you made and what types of lab work helped you reach your final conclusion. Use the information on your data page to defend your decision.
### Target Your Reading

**Cell Structure and Function**

**CHAPTER 1**

**Use this to focus on the main ideas as you read the chapter.**

1. **Before you read** the chapter, respond to the statements below on your worksheet or on a numbered sheet of paper.
   - Write an **A** if you **agree** with the statement.
   - Write a **D** if you **disagree** with the statement.

2. **After you read** the chapter, look back to this page to see if you’ve changed your mind about any of the statements.
   - If any of your answers changed, explain why.
   - Change any false statements into true statements.
   - Use your revised statements as a study guide.

<table>
<thead>
<tr>
<th>Before You Read A or D</th>
<th>Statement</th>
<th>After You Read A or D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All new cells come from preexisting cells.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. A microscope is needed to see most cells.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Some living things do not require water to survive.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Chromosomes are in the nucleus of every cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Bacteria have specialized compartments called organelles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The cell wall and cytoplasm determine the shape of a cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Oxygen is not required for cellular respiration.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Cilia are short, hairlike cellular appendages.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Most multicellular organisms are not dependent on photosynthesis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Plant cells are the only cells that can transform light energy.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Directions: For each of the following, write the letter of the correct term or phrase to complete each sentence.

1. Your body is made of many different _________________.
   A. cells  B. cell walls

2. A(n) ________________ can enlarge an image 100,000 times or more.
   A. light microscope  B. electron microscope

3. ________________ are the building blocks of cells.
   A. Cellulose and sugars  B. Atoms and molecules

4. Five hundred years ago, people thought life came from _________________.
   A. tiny organisms  B. nonliving things

5. The ________________ is the smallest unit of life.
   A. cell  B. molecule

6. When an organism keeps its internal environment within certain limits, this is known as _________________.
   A. homeostasis  B. organization

7. Cells use ________________ to transport substances, reproduce, and perform chemical reactions.
   A. energy  B. bacteria

8. The ________________ provides energy for nearly all organisms on Earth.
   A. Sun  B. soil

9. ________________ are folded chains or groups of folded chains of molecules called amino acids.
   A. Proteins  B. Carbohydrates

10. ________________ are important in making proteins.
    A. Lipids  B. Nucleic acids
Directions: Complete the concept map using the terms listed below.

- cell
- cell membrane
- cytoplasm
- nucleus

1. A

is a tiny organized structure made of

2. a

that helps to control what enters and leaves a cell

3. a

that controls most of the cell’s activities

4. a

that contains many chemicals the cell needs

5. vacuoles

that store food, water, minerals, and waste

6. mitochondria

that convert food energy to a usable form

Directions: Write T if the statement is true; write F if the statement is false.

5. DNA is found in the cell’s chromosomes.

6. Cells without a nucleus are classified as eukaryotes.

7. Plants and animals have eukaryotic cells.

8. The Golgi apparatus is the cell’s processing plant.

9. Animal cells are enclosed in a cell wall.
Chapter Content Mastery
Cells and Energy

**Directions:** Order the steps of cellular respiration by writing 1, 2, or 3 on each blank provided.

1. Steps in Cellular Respiration

   _______ A. Small molecules produced by glycolysis are broken down into molecules of carbon dioxide.

   _______ B. ATP is produced from released electrons in the presence of oxygen.

   _______ C. A glucose molecule is broken down into two smaller molecules.

**Directions:** Match the process of energy release with the corresponding use.

   _______ 2. cellular respiration

   _______ 3. lactic acid fermentation

   _______ 4. alcohol fermentation

   A. reaction of yeast used in making bread

   B. supplying of energy by overworked muscles

   C. transformation of food to cellular energy

**Directions:** Answer each question or respond to each statement below in the spaces provided.

Name two cell appendages that are used for mobility.

5. ______________________

6. ______________________

In what two parts of the cell does cellular respiration take place?

7. ______________________

8. ______________________

9. What is photosynthesis?

   ______________________

10. Why is photosynthesis necessary in order for us to breathe?

    ______________________
Las células y la vida

Instrucciones: Para cada una de las siguientes oraciones, escribe la letra del término o la frase correcto(a) para completarlas.

   1. Tu cuerpo está formado de muchas diferentes
      A. células  B. paredes de células

   2. Un ______________ puede ampliar una imagen 100,000 veces o más.
      A. microscopio de luz  B. microscopio electrónico

   3. _______________ son los bloques de la estructura de las células.
      A. La celulosa y el azúcar  B. Los átomos y las moléculas

   4. Hace quinientos años que la gente pensaba que la vida venía
de _________________.
      A. organismos pequeños  B. cosas sin vida

   5. La ______________ es la unidad más pequeña de vida.
      A. célula  B. molécula

   6. Cuando un organismo mantiene su ambiente interno dentro de ciertos límites, esto
se conoce como _________________.
      A. homeostasis  B. organización

   7. Las células usan ________________ para transportar sustancias, para
reproducir y para efectuar reacciones químicas.
      A. energía  B. bacteria

   8. El ________________ provee la energía para casi todos los organismos en
la Tierra.
      A. Sol  B. suelo

   9. Las (Los) ________________ son cadenas plegadas o grupos de cadenas
plegadas de moléculas que se llaman aminoácidos.
      A. proteínas  B. carbohidratos

   10. Los ________________ son importantes para hacer proteínas.
       A. lípidos  B. ácidos nucleídos
**Instrucciones:** Complétable el mapa de conceptos usando los siguientes términos.

- **célula**
- **citoplasma**
- **membrana celular**
- **núcleo**

1. Un(a) ________________ es una estructura pequeña hecha de ________________.
2. Un(a) ________________ que ayuda a controlar lo que entra y sale de una célula.
3. Un(a) ________________ que controla la mayoría de las actividades de la célula.
4. Un(a) ________________ que almacenan alimento, agua, minerales y desperdicio.
5. Un(a) ________________ que contiene muchos químicos que la célula necesita.
6. Un(a) ________________ que convierten la energía del alimento a una forma utilizable.

**Instrucciones:** Escribe **V** si la oración es cierta; escribe **F** si la oración es falsa.

- 5. La DNA se encuentra en los cromosomas de la célula. **V**
- 6. Las células sin núcleo son clasificadas como eucariotas. **F**
- 7. Las plantas y los animales tienen células eucariotas. **V**
- 8. El aparato Golgi es la planta de procesamiento de la célula. **V**
- 9. Las células de los animales están en una pared de la célula. **V**
**Las células y la energía**

**Instrucciones:** Ordena los pasos de la respiración celular poniendo los números 1, 2, o 3 en los espacios.

1. Los pasos en la respiración celular

   ______ A. Las moléculas pequeñas producidas por glucólisis se reducen a moléculas de dióxido de carbono.

   ______ B. ATP se produce cuando los electrones se sueltan en la presencia del oxígeno.

   ______ C. Una molécula de glucosa se reduce a dos moléculas más pequeñas.

**Instrucciones:** Coincide el proceso de la liberación de energía con el uso correspondiente.

   ______ 2. la respiración celular

   ______ 3. la fermentación del ácido láctico

   ______ 4. la fermentación alcohólica

   A. la reacción de la levadura cuando se hace pan

   B. el suministro de energía por el exceso de trabajo de los músculos

   C. la transformación del alimento a energía celular

**Instrucciones:** Escribe las respuestas en las líneas para las preguntas.

Nombra dos apéndices de la célula que se usan para la movilidad.

5. __________________________

6. __________________________

¿En qué dos partes de la célula se lleva a cabo la respiración celular?

7. __________________________

8. __________________________

9. ¿Qué es fotosíntesis?

10. ¿Por qué es la fotosíntesis necesaria para que podamos respirar?
Reinforcement Cells and Life

Directions: In numbers 1 through 4 below, a code letter has been substituted for each letter of the alphabet. To find out what the sentence says, use the following key to decode it. In the key, the code letters are shown directly below the corresponding alphabet letter. Write the correct letter above each code letter, and then read the sentence aloud.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Z Y X W V U T S R Q P O N M L K J I H G F E D C B A


2. Z X V O O R H G S V Y Z H R X F M R G  L U  H G I F X G F I V


5. G S R H  R H  X Z O O V W  G S V  X V O O  G S V L I P

Directions: Answer each question or respond to each statement on the lines provided.

6. What instrument uses light and one or more lenses to view cells?
   
7. What instrument uses a magnetic field to magnify images 100,000 times or more?
   
8. Give two examples of how your body maintains homeostasis.
   
9. What are some properties of water that make it important in cell chemistry?
Reinforcement: The Cell

Directions: Study the following diagram. Then identify each part of the animal cell by filling in each blank.

1. 
2. 
3. 
4. 
5. 
6. 

Directions: Answer each question on the lines provided.

7. What type of cell does not have a nucleus or other organelles?

8. What is the function of a cell membrane?

9. What organelles do plant cells have that animal cells do not?

10. What are two cell appendages that help cells move?

Directions: Write the correct term in the space beside each definition.

11. a gelatin-like substance that fills the inside of a cell

12. where the hereditary material of the cell is held, except in bacteria

13. a place for storage inside the cell

14. the outer support and protective structure of a plant cell
**Reinforcement: Cells and Energy**

**Directions:** Fill in the blanks in the description below.

Cellular (1) ____________ happens in three steps. First, (2) ____________ breaks down a glucose molecule into two smaller molecules. This happens in the cell’s (3) ____________. This chemical reaction releases (4) ____________ that are used in the third step.

The second step happens in the (5) ____________. The smaller (6) ____________ produced by glycolysis are further broken down into molecules of (7) ____________. In this step, more electrons are (8) ____________.

The final step requires the presence of (9) ____________. This step produces large amounts of (10) ____________, using the released electrons and water.

**Directions:** For each of the statements below, write either lactic acid or alcohol in the space provided to indicate the type of fermentation.

11. This process produces ethanol.

12. Muscle cells release energy using this process.

13. Cheese and yogurt are produced using this process.

14. One-celled fungi called yeast use this process.

15. This process is used in baking bread.

16. Why is photosynthesis important to you?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

17. How do you think the air quality of a busy city and a forest might differ? Explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Enrichment Using the Microscope

There are many different kinds of microscopes. A magnifying glass is a simple microscope. The term microscope commonly refers to a compound light microscope. These microscopes are called “compound” because they are made of two sets of glass lenses in a tube or tubes.

The total magnifying power of a compound light microscope is the product of the magnifying power of the lens in the eyepiece and the magnifying power of the lens in the objective. Most compound light microscopes can magnify a specimen up to 1,000 times its real size.

Microscopes allow you to see fine details. Spaces between objects that are closer together than 0.1 mm can be seen. The ability of a microscope to separate very small distances is called resolving power. If the resolving power of the lens is not good, the image will appear blurred.

When you look into the eyepiece of a microscope, the circular area you see is the field of view. When a ruler is placed across the opening on the stage, the field of view can be measured in millimeters.

Directions: Using the information above, compute the magnifying powers missing from the table and fill in the blanks.

<table>
<thead>
<tr>
<th>Eyepiece Lens</th>
<th>Objective Lens</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microscope 1</td>
<td>10× Low 5×</td>
<td>High 40×</td>
</tr>
<tr>
<td>Microscope 2</td>
<td>8× Low 10×</td>
<td>High 60×</td>
</tr>
<tr>
<td>Microscope 3</td>
<td>4. Low 10×</td>
<td>High 5.</td>
</tr>
</tbody>
</table>

6. Imagine you are looking through a microscope and the image appears blurred. What might be wrong and how might you solve the problem?

7. Estimate the width of the field of view shown above in centimeters and in millimeters.

8. Examine images of cells and one-celled organisms in an encyclopedia or in other library reference materials. Distinguish between images seen through a light microscope and those seen through an electron or other microscope. How do they differ?
Fossil evidence suggests that life began on Earth in the form of one-celled organisms. Between 540 and 700 million years ago (in the late Precambrian), these one-celled organisms began evolving into many-celled organisms. The many-celled organisms consisted of groups of specialized cells that performed different tasks. Scientists continue to debate why this change began to happen, but one recent study points to a likely explanation.

The cells that remained alone began to decline in number, while the groups of cells continued to thrive. Over time, the algal colonies began to form in groups of mostly eight cells. Normally, cell walls of one-celled organisms living in groups separate when the cells divide, but in the case of the eight-celled groups, the walls remained intact to hold together the colony. This enabled the colonies to replicate as eight-celled groups rather than as individual cells.

Directions: Respond to each statement in the space provided.

1. Formulate a statement of what the study proved about one-celled organisms.

2. Decide what sort of changes would have to occur in a group of one-celled organisms to form one many-celled organism. Write your conclusion.

3. Assess why you think studying the behavior of cells is important. Present your ideas on a separate sheet of paper.
Enrichment  What makes dough rise?

Yeasts are often used when baking breads, pizza dough, and rolls. As yeasts grow, they use sugar for energy and produce alcohol and carbon dioxide as waste products. The carbon dioxide causes baked goods to rise.

Materials
- 250 mL flour
- 15 mL sugar
- glass jar
- graduated cylinder
- warm tap water
- one package of dried baker’s yeast
- spoon
- marker
- clock
- pan of warm water

Procedure
1. Put the flour and sugar into the glass jar.
2. Put 60 mL warm tap water into the graduated cylinder. Add the package of yeast, and stir with a spoon.
3. Slowly stir the yeast water into the flour and sugar mixture. Stir until dough forms. Push the dough down to the bottom of the jar. Mark the height of the dough on the outside of the jar.
4. Put the jar in a warm place, such as near a heat outlet or in a pan of warm water.
5. Watch the clock. Every ten minutes, mark the height of the dough on the outside of the jar. Continue this for an hour.

Conclude and Apply
1. Detect  What did you notice happening to the dough during the hour?

2. Analyze  the situation to determine which ingredients in the materials list are responsible for this reaction and why.

3. Conclude  what caused the bubbles in the dough. These bubbles are part of what process?
Content Vocabulary

Cell Structure and Function

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

Across
8. transports molecules
10. yeast uses this type of fermentation
13. process by which cell maintains its internal environment
16. molecule that won't dissolve in water
17. chains of amino acids
18. tail-like appendage
19. network of fibers in cells

Down
1. cell without a nucleus
2. microscope that can enlarge images up to 1,500 times
3. structure inside the nucleus
4. type of fermentation used by muscle cells
5. DNA and RNA are these
6. proteins are built inside these
7. transforms energy in food molecules to usable energy
9. cell with a nucleus and organelles
11. short, hairlike appendage
12. store energy for quick release
14. first step in cellular respiration
15. usable energy found in molecules
Directions: Show that you understand the functions of the parts of the cell by using the terms below in original complete sentences.

20. cell membrane
21. vacuoles
22. mitochondria
23. chloroplasts
24. cytoplasm
25. nucleus
26. cell wall
27. Golgi apparatus
28. endoplasmic reticulum
29. chromosomes
30. organelles

Directions: Briefly define the following terms.

31. photosynthesis
32. cell theory
Part A. Vocabulary Review

Directions: Write the unscrambled word next to the scrambled word on the lines below. Use these words to fill in the blanks in the sentences that follow.

carbohydrates chromosomes cilia cytoplasm
homeostasis lipid microscope nucleic acids
organelles photosynthesis proteins vesicle

1. The invention of the __________________________ allowed scientists to learn about cells.

2. Cells maintain their internal environment through __________________________.

3. __________________________ are structures in cells with specific functions.

4. The genetic material of the cell is contained in its __________________________.

5. Some one-celled organisms move by coordinating numerous __________________________.

6. __________________________ are made of sugar molecules.

7. Fat is a type of __________________________.

8. __________________________ are molecules necessary for nearly every cell function.

9. During __________________________, light energy, water, and carbon dioxide combine to make sugars.

10. Proteins are made using long chains of molecules called __________________________.

11. Inside the cell is the __________________________, a thick fluid made mostly of water.

12. A __________________________ transports molecules throughout the cell.
Part B. Concept Review

Directions: Compare the diagrams of plant and animal cells. Write P above the plant cell and A above the animal cell. Then categorize the cell parts from the numbered list as belonging to plant cells, animal cells, or both by writing the number of each part beside the arrow pointing to it.

1. ________
2. ________

3. cell membrane 4. cell wall 5. chloroplast 6. cytoskeleton
11. nucleus 12. ribosomes 13. vacuole

14. Demonstrate your understanding of cellular respiration and the production of ATP by presenting the three steps.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

15. Consider how the cell theory must have changed people’s understanding of living things. Write your thoughts in the space provided.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

16. Compare prokaryotic cells and eukaryotic cells.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

17. Contrast lactic acid fermentation and alcohol fermentation by describing two differences.

________________________________________________________________________
________________________________________________________________________
Chapter Test A

Cell Structure and Function

Part A. Multiple Choice

Directions: Write the letter of the term or phrase that correctly answers each question in the space at the left.

1. Which describes the basis of cell theory?
   A. Cells divide rapidly.
   B. Cells have different functions.
   C. All cells come from pre-existing cells.
   D. Cells carry out processing and manufacturing functions.

2. With which function of cell life does the Golgi apparatus assist?
   A. storing
   B. processing
   C. controlling
   D. manufacturing

3. Which term names a series of chemical reactions that transforms energy in food molecules into usable energy?
   A. glycolosis
   B. photosynthesis
   C. cellular respiration
   D. lactic acid fermentation

4. Which part of a plant cell uses light energy to make food?
   A. cellulose
   B. vacuoles
   C. cytoplasm
   D. chloroplasts

Part B. Matching

Directions: Write the letter of the correct term on the line next to its description.

Matching Set 1

1. involved in protein production
   A. lipids
2. help reduce water loss and form a barrier to invaders
   B. proteins
3. store energy that can be released quickly
   C. nucleic acids
Chapter Test A CONTINUED

Matching Set 2

1. tail-like appendage
2. short, hair-like appendages
3. network of fibers

Part C. Labeling a Diagram

Directions: Use the following terms to complete the diagram: cell membrane, cell wall, chromosome, cytoplasm, chloroplast, mitochondria, nucleus, vacuole.

1. __________
2. __________
3. __________
4. __________
5. __________
6. __________
7. __________
8. __________
9. __________
10. __________
11. __________
12. __________
13. __________
14. __________

15. What type of cell does each diagram show? What is unique to each diagram?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
Chapter Test A CONTINUED

Part D. Short Answer

Directions: Respond to each statement in the space provided.

1. Explain why a nucleus is important to a cell.

2. Describe cellular respiration.

3. Explain lactic acid fermentation.

Part E. Concept Application

Directions: Respond to each statement in the space provided.

1. Name some uses for bacteria.

2. Explain why photosynthesis is important to humans.
Part A. Multiple Choice

Directions: Write in the letter of the term or phrase that correctly answers each question.

1. Which shows the correct sequence from smallest magnification to largest magnification?
   A. hand lens, light microscope, electron microscope
   B. electron microscope, light microscope, hand lens
   C. light microscope, electron microscope, hand lens
   D. hand lens, electron microscope, light microscope

2. Which organelle is responsible for making, sorting, and shipping molecules?
   A. vesicle
   B. vacuole
   C. mitochondria
   D. Golgi apparatus

3. What is the final product of cellular respiration?
   A. ER
   B. ATP
   C. DNA
   D. RNA

4. What is released during photosynthesis?
   A. oxygen
   B. chlorophyll
   C. chloroplasts
   D. carbon dioxide

Part B. Matching and Completion

Directions: Write the letter of the correct term on the line next to its description.

1. rigid covering surrounding the cell outside its membrane
   A. cytoplasm
   B. cytoskeleton
   C. cell membrane
   D. cell wall
   E. chloroplast
Chapter Test B

Directions: Incorporate the term or phrase that best completes each sentence.

5. The ____________________ is considered the control center of the cell.

6. Ribosomes are small structures where ____________________ are manufactured.

7. There are two types of endoplasmic reticulum: ____________________ and ____________________.

8. ____________________ transform unusable energy in food molecules into energy the cell can use.

9. ____________________ use light energy to make food.

Part C. Labeling and Interpreting a Diagram

Directions: Label the parts of each cell.

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
13. ____________________
14. ____________________

15. What type of cell does each diagram show? What is unique to each diagram?
Chapter Test B CONTINUED

Part D. Short Answer

Directions: Write your response to each statement in the space provided.

1. **Contrast** the nucleus and nucleolus.

2. **Explain** cellular respiration, describing the three main steps.

3. **Analyze** what you have learned to decide which process, cellular respiration or lactic acid fermentation, is the preferred method of energy production.

Part E. Concept Application

Directions: Respond to each statement in the space provided.

1. **Indicate** how bacteria can be beneficial to people.

2. **Demonstrate** the relationship between photosynthesis and cellular respiration.

3. **Explain** Dani is outside on a cold day. He begins to shiver. Explain why his body reacts this way.
Chapter Test

Cell Structure and Function

Part A. Multiple Choice

Directions: Write the letter of the term, phrase, or sentence that correctly answers each question in the space at the left.

1. What describes the magnification of an electron microscope?
   A. 100 times
   B. 1,000 times
   C. 10,000 times
   D. 100,000 times

2. Which best describes the Golgi apparatus?
   A. power plant
   B. control center
   C. storage facility
   D. processing factory

3. Which statement tells about photosynthesis?
   A. ATP is produced.
   B. Food is produced.
   C. Oxygen is required.
   D. Glucose is broken down.

4. What is the pigment in plants that captures light energy and produces sugar molecules for food?
   A. cellulose
   B. cytoplasm
   C. chlorophyll
   D. chloroplasts

5. How many pairs of chromosomes are contained in a human skin cell?
   A. 13
   B. 18
   C. 21
   D. 23

6. Why might muscle cells have more mitochondria than skin cells?
   A. Muscle cells use more energy than skin cells.
   B. Muscle cells have more glucose than skin cells.
   C. Muscle cells are more porous than skin cells.
   D. Muscle cells contain more DNA than skin cells.
Chapter Test C  CONTINUED

Part B. Completion

Directions: Choose the term or phrase that best completes each statement.

1. The ___________________________ is considered the control center of the cell.
2. Inside it, the ___________________________ helps to make structures that make proteins.
3. The ___________________________ are structures that hold long chains of DNA.
4. One of the important roles of the cell is manufacturing ___________________________.
5. The proteins are manufactured in ___________________________.
6. There are two types of endoplasmic reticulum (ER). The smooth ER helps manufacture ___________________________, while the rough ER helps make ___________________________.

Part C. Creating a Diagram

Directions: Label the parts of each cell.

1. ___________________________
2. ___________________________
3. ___________________________
4. ___________________________
5. ___________________________
6. ___________________________
7. ___________________________
8. ___________________________
9. ___________________________
10. ___________________________
11. ___________________________
12. ___________________________
13. ___________________________
14. ___________________________
15. What type of cell does each diagram show? What is unique to each diagram?

______________________________

______________________________

______________________________

Cell Structure and Function
Part D. Short Answer

Directions: Respond to each statement in the space provided.

1. **Hypothesize**  What would happen if the membrane surrounding the nucleus were non-porous?

2. **Theorize**  What would happen in each step of cellular respiration without oxygen?

3. **Explain** lactic acid fermentation. Create an example to illustrate when this process might be useful.

Part E. Concept Application

Directions: Respond to each statement in the space provided.

1. **Describe** what the forest floor might be like without the presence of bacteria.

2. Rey has placed a plant in a dark closet. **Predict** what will happen to the plant.

3. A scientist grows two sets of cells in a dish. Dish A has healthy cells. The cells divide and reproduce until they touch each other. When they touch, a chemical messenger sends a message to the cells to stop dividing and reproducing. Dish B has cancer cells. These cells continue to divide and reproduce when they touch each other. **Speculate** about which cells are exhibiting homeostasis and why.
Lesson 1: Cells and Life

A. Cells are too small to be seen without a ____________________________ device.

B. The invention of the ____________________________ in the 1600s changed people’s ideas about cells.
   1. ____________________________ can enlarge images up to 1,500 times.
   2. ____________________________ microscopes can enlarge images 100,000 times or more.

C. The ____________________________ describes how cells relate to living things.
   1. All ____________________________ are made of one or more cells.
   2. The ____________________________ is the smallest unit of life.
   3. All new cells come from ____________________________ cells.

D. Scientists agree that all living things have common ____________________________.
   1. All cells are ____________________________ with certain structures performing specialized functions.
   2. Cells ____________________________ to changes in the environment.
   3. ____________________________ in many-celled organisms usually occurs as cell number increases.
   4. Organisms ____________________________ and create offspring similar to themselves.
   5. Organisms maintain their internal environment through ____________________________.
   6. Cells use ____________________________ to transport substances, make new cells, and perform chemical reactions.

E. Atoms and ____________________________ are the building blocks of cells.
   1. ____________________________ has unique properties to help cells with homeostasis and substance transport.
   2. Cells also contain such basic substances as ____________________________, ____________, ____________, and ____________.
      a. Proteins are composed of folded ____________________________ of molecules called amino acids.
Chapter Outline CONTINUED

b. _______________ include ________________, which contains the cell’s genetic information, and RNA, which is used to make proteins.

c. _______________ include fats, which store large amounts of chemical energy.

d. Carbohydrates, composed of ________________ molecules, store energy for quick release.

Lesson 2: The Cell

A. Cells have different shapes and sizes depending on their ________________.

1. Every cell has a flexible covering called a ________________, which is selectively permeable.

2. Plant, fungi, and some bacteria cells have a rigid ________________ outside the cell membrane.

3. ________________, such as tail-like flagella or short hairlike cilia, help cells move.

4. Inside a cell is the ________________, a thick fluid in which cell structures are suspended.
   a. Cells have a network of fibers in the cytoplasm called the ________________.
   b. The cytoskeleton aids in ________________ contraction, cell division, movement, and shape.

B. Structures in the cell that have specific functions are called ________________.

1. The ________________ is the control center of the cell.
   a. The nucleus contains the cell’s ________________ material in long chains of DNA.
   b. DNA chains are coiled into structures called ________________.
   c. Inside the nucleus is the _________________. It helps make structures that make proteins.

2. The ________________ of proteins is an important function in cells.
   a. Proteins are built within ribosomes, which can attach to the ________________.
   b. Endoplasmic reticulum (ER) with ________________ is called rough ER and is important for making proteins.
   c. ER without ribosomes is called smooth ER and is important for making ________________.
3. Two kinds of organelles process the ___________ used by cells.
   a. Most of the cell’s energy is produced in the ___________.
   b. Organisms that produce their own food manufacture it within ___________.
4. The ___________ processes, transports, and stores molecules.
   a. ___________, which carry substances to the cell membrane for release, form from the Golgi apparatus.
   b. Small ___________ store food molecules, water, or waste products.
   c. An animal cell has a vacuole called the ____________, which stores digestive enzymes.
   d. A ___________ cell has a central vacuole, which stores water and other molecules.
C. Cells are classified as ___________ or eukaryotic cells.
   1. Cells ___________ a nucleus or organelles are prokaryotic.
      a. Prokaryotic organisms, made up of one prokaryotic cell, were the only living things on Earth for ___________ of years.
      b. A prokaryotic cell has a loop of DNA ___________ of chromosomes.
      c. Prokaryotes, also known as ___________, can be harmful or beneficial to humans.
      d. Bacteria are essential for ___________ and can survive in extreme environments.
   2. Cells with a ___________ and other organelles are classified as eukaryotic.
      a. Plants, animals, fungi, and protists all are made up of one or more ___________ cells.
      b. Many scientists suggest that eukaryotes ___________ as a result of one prokaryotic cell becoming part of another prokaryotic cell.

Lesson 3: Cells and Energy
A. ___________ transforms stored energy in food molecules into usable energy in molecules called adenosine triphosphate (ATP).
1. The first step in cellular respiration happens in the ________________, where ________________ breaks down a glucose molecule into two smaller molecules, releasing electrons.

2. The second and third steps of cellular respiration happen in the ________________.
   a. The smaller molecules break down into ________________, releasing more electrons.
   b. ________________ is produced using the released electrons and water.

3. Our muscle cells can release energy through ________________ fermentation.
   a. Lactic acid fermentation takes place entirely in the ________________.
   b. It uses glucose and produces ________________ and carbon dioxide.
   c. Lactic acid fermentation is used in the production of ________________ and yogurt.

4. One-celled fungi called ________________ use alcohol fermentation to produce energy.
   a. Alcohol fermentation uses glucose and produces ethanol and ________________.
   b. Alcohol fermentation produces ________________ ATP molecules than lactic acid fermentation.
   c. Alcohol fermentation is used in baking ________________.

B. Some organisms use ________________ to make food using a light source.

1. Light energy is absorbed by chlorophyll and other pigments in the ________________.
   a. In photosynthesis, ________________ energy, water, and carbon dioxide are used to make sugar.
   b. Oxygen is released into the ________________ during photosynthesis.

2. Most organisms use the ________________ from photosynthesis, and photosynthesis supplies the ________________ we breathe.
Teacher Support and Planning

Chapter Outline for Teaching ................. T2
Teacher Guide and Answers ..................... T6
Lesson 1: Cells and Life

A. Cells are too small to be seen without a magnifying device.

B. The invention of the microscope in the 1600s changed people’s ideas about cells.
   1. Light microscopes can enlarge images up to 1,500 times.
   2. Electron microscopes can enlarge images 100,000 times or more.

C. The cell theory describes how cells relate to living things.
   1. All organisms are made of one or more cells.
   2. The cell is the smallest unit of life.
   3. All new cells come from pre-existing cells.

D. Scientists agree that all living things have common characteristics.
   1. All cells are organized with certain structures performing specialized functions.
   2. Cells respond to changes in the environment.
   3. Growth in many-celled organisms usually occurs as cell number increases.
   4. Organisms reproduce and create offspring similar to themselves.
   5. Organisms maintain their internal environment through homeostasis.
   6. Cells use energy to transport substances, make new cells, and perform chemical reactions.

E. Atoms and molecules are the building blocks of cells.
   1. Water has unique properties to help cells with homeostasis and substance transport.
   2. Cells also contain such basic substances as proteins, nucleic acids, lipids, and carbohydrates.
      a. Proteins are composed of folded chains of molecules called amino acids.
      b. Nucleic acids include DNA, which contains the cell’s genetic information, and RNA, which is used to make proteins.
      c. Lipids include fats, which store large amounts of chemical energy.
      d. Carbohydrates, composed of sugar molecules, store energy for quick release.
DISCUSSION QUESTION:
Explain why the characteristics of life—organization, response to stimuli, growth and reproduction, homeostasis, and transport of substances—are important to cells and organisms. Use human beings as an example. The cells in the human body are organized so that we can breathe, eat, move, and perform other necessary functions. Transporting substances such as oxygen, blood, and food is important to the performance of those functions; we respond to stimuli externally and maintain homeostasis internally to survive environmental change, and we grow and reproduce for species survival.

Lesson 2: The Cell

A. Cells have different shapes and sizes depending on their function.
   1. Every cell has a flexible covering called a **cell membrane**, which is selectively permeable.
   2. Plant, fungi, and some bacteria cells have a rigid **cell wall** outside the cell membrane.
   3. **Appendages**, such as tail-like **flagella** or short hairlike **cilia**, help cells move.
   4. Inside a cell is the **cytoplasm**, a thick fluid in which cell structures are suspended.
      a. Cells have a network of fibers in the cytoplasm called the **cytoskeleton**.
      b. The cytoskeleton aids in muscle contraction, cell division, movement, and shape.

B. Structures in the cell that have specific functions are called **organelles**.
   1. The **nucleus** is the control center of the cell.
      a. The nucleus contains the cell’s **genetic** material in long chains of DNA.
      b. DNA chains are coiled into structures called **chromosomes**.
      c. Inside the nucleus is the **nucleolus**. It helps make structures that make proteins.
   2. The manufacture of **proteins** is an important function in cells.
      a. Proteins are built within **ribosomes**, which can attach to the **endoplasmic reticulum**.
      b. Endoplasmic reticulum (ER) with ribosomes is called rough ER and is important for making proteins.
      c. ER without ribosomes is called smooth ER and is important for making lipids.
   3. Two kinds of organelles process the **energy** used by cells.
      a. Most of the cell’s energy is produced in the **mitochondria**.
      b. Organisms that produce their own food manufacture it within **chloroplasts**.
4. The **Golgi apparatus** processes, transports, and stores molecules.
   a. **Vesicles**, which carry substances to the cell membrane for release, form from the Golgi apparatus.
   b. Small **vacuoles** store food molecules, water, or waste products.
   c. An animal cell has a vacuole called the **lysosome**, which stores digestive enzymes.
   d. A **plant** cell has a central vacuole, which stores water and other molecules.

C. Cells are classified as **prokaryotic cells** or **eukaryotic cells**.

1. Cells **without** a nucleus or organelles are prokaryotic.
   a. Prokaryotic organisms, made up of one prokaryotic cell, were the only living things on Earth for billions of years.
   b. A **prokaryotic** cell has a loop of DNA **instead** of chromosomes.
   c. Prokaryotes, also known as **bacteria**, can be harmful or beneficial to humans.
   d. Bacteria are essential for **decomposition** and can survive in extreme environments.

2. Cells with a **nucleus** and other organelles are classified as eukaryotic.
   a. Plants, animals, fungi, and protists all are made up of one or more **eukaryotic** cells.
   b. Many scientists suggest that eukaryotes **evolved** as a result of one prokaryotic cell becoming part of another prokaryotic cell.

**DISCUSSION QUESTION:**
Do you think there are more eukaryotes or more prokaryotes on Earth? Explain your answer.  
*There are probably more prokaryotes because they can survive in all types of environments, they are microscopic, and they live within eukaryotes.*

**Lesson 3: Cells and Energy**

A. **Cellular respiration** transforms stored energy in food molecules into usable energy in molecules called **adenosine triphosphate** (ATP).

1. The first step in cellular respiration happens in the **cytoplasm**, where **glycolysis** breaks down a glucose molecule into two smaller molecules, releasing electrons.

2. The second and third steps of cellular respiration happen in the **mitochondria**.
   a. The smaller molecules break down into **carbon dioxide**, releasing more electrons.
   b. **ATP** is produced using the released electrons and water.
3. Our muscle cells can release energy through lactic acid fermentation.
   a. Lactic acid fermentation takes place entirely in the cytoplasm.
   b. It uses glucose and produces lactic acid and carbon dioxide.
   c. Lactic acid fermentation is used in the production of cheese and yogurt.

4. One-celled fungi called yeast use alcohol fermentation to produce energy.
   a. Alcohol fermentation uses glucose and produces ethanol and carbon dioxide.
   b. Alcohol fermentation produces fewer ATP molecules than lactic acid fermentation.
   c. Alcohol fermentation is used in baking bread.

B. Some organisms use photosynthesis to make food using a light source.
   1. Light energy is absorbed by chlorophyll and other pigments in the chloroplasts.
      a. In photosynthesis, light energy, water, and carbon dioxide are used to make sugar.
      b. Oxygen is released into the atmosphere during photosynthesis.
   2. Most organisms use the sugars from photosynthesis, and photosynthesis supplies the oxygen we breathe.

DISCUSSION QUESTION:
What is the relationship between photosynthesis and cellular respiration? Some organisms, including plants and some bacteria, utilize light energy directly to make food through photosynthesis. Other organisms must obtain energy from food molecules supplied by photosynthesis. They then convert the energy stored in food molecules into usable energy in ATP through cellular respiration.
MiniLab (page 2)
Analysis
1. Accept all well-reasoned responses.
2. Answers will vary depending on what cells the students observed in the Launch Lab.
3. Answers will vary but students should be able to explain how the different appendages and organelles have specific functions for different cells.

MiniLab (page 3)
Analysis
1. Answers will vary.
2. photosynthesis and, to a lesser degree, cellular respiration
3. yes; less sugar produced without chloroplast activity

Lab A (page 4)
Analyze and Conclude
1. Answers will vary but should agree with the prepared slide.
2. Answers should accurately reflect the type of cell observed.
3. Summary should accurately reflect the type of cell observed.
4. Check student tables for accuracy.
5. Answers should accurately reflect the type of cell observed.

Lab B (page 7)
Analyze and Conclude
1. Answers will vary but should agree with the prepared slide.
2. Answers should accurately reflect the type of cell observed.
3. Summary should accurately reflect the type of cell observed.
4. Check student tables for accuracy.
5. Answers should accurately reflect the type of cell observed.
Challenge
6. It would have a cell wall and chloroplasts.
7. Answers will vary. Sample answer: You would be able to see the chromosomes in the nucleus. If you had a powerful electron microscope, you could even see the atoms that make up the cell.

Target Your Reading (page 10)
1. A
2. A
3. D All living things require water to survive.
4. D Chromosomes are in the nucleus of each eukaryotic cell.
5. D Bacteria do not have organelles.
6. D The cell wall and cytoskeleton determine the shape of cells.
7. D Oxygen is required for cellular respiration.
8. A
9. D Most multicellular organisms are dependent on photosynthesis.
10. D Plant cells, some bacteria, and some single-celled organisms can transform light energy.

Chapter Content Mastery (page 11)
Lesson 1 (page 11)
1. A
2. B
3. B
4. B
5. A
6. A
7. A
8. A
9. A
10. B

Lesson 2 (page 12)
1. cell
2. cell membrane
3. nucleus
4. cytoplasm
5. T
6. F
7. T
8. T
9. F

Lesson 3 (page 13)
1. A. 2
   B. 3
   C. 1
2. C
3. B
4. A
5–6. cilia; flagellum (in any order)
7–8. cytoplasm; mitochondria (in any order)
9. Photosynthesis is a series of chemical reactions in which light energy, water, and carbon dioxide are used to make sugars.

Dominio del contenido (página 14)
Lección 1 (página 14)
1. A
2. B
3. B
4. B
5. A
6. A
7. A
8. A
9. A
10. B

Lección 2 (página 15)
1. célula
2. membrana celular
3. núcleo
4. citoplasma
5. V  
6. F  
7. V  
8. V  
9. F

Lección 3 (página 16)
1. A. 2  
   B. 3  
   C. 1  
2. C  
3. B  
4. A  
5–6. cilio; flagelo (en cualquier orden)  
7–8. citoplasma; mitocondria (en cualquier orden)  
9. La fotosíntesis es una serie de reacciones químicas en 
   las cuales la energía de la luz, agua y el dióxido de carbono 
   se usan para hacer azúcar.  
10. La fotosíntesis suelta oxígeno en la atmósfera de la 
    Tierra.

Reinforcement (page 17)
Lesson 1 (page 17)
1. All organisms are made of cells.  
2. A cell is the basic unit of structure 
   and function in an organism.  
3. Every cell comes from another cell.  
4. This is called the cell theory.  
5. light microscope  
6. electron microscope  
8. Sample answer: You perspire when you are hot, 
    shiver when you are cold, change your flow of blood 
    in response to temperature, and need to use the 
    bathroom if you drink a lot of liquid.  
9. Sample answer: Water molecules are attracted to 
    one another through negative and positive charges, 
    making them efficient at bonding; water helps to 
    maintain homeostasis by providing insulation; water 
    dissolves many kinds of molecules, making it useful in 
    transport.

Lesson 2 (page 18)
1. cell membrane  
2. nucleus  
3. cytoplasm  
4. vacuole  
5. mitochondrial  
6. chromosome  
7. prokaryotic  
8. It holds the cell together, forms a boundary between 
    the cell and its environment, and controls what goes 
    into and out of the cell.  
9. They have chloroplasts for photosynthesis.  
10. A flagellum is a tail-like appendage; cilia are short, 
    hairlike appendages.  
11. cytoplasm  
12. nucleus  
13. vacuole  
14. cell wall

Lesson 3 (page 19)
1. respiration  
2. glycolysis  
3. cytoplasm  
4. electrons  
5. mitochondria  
6. molecules  
7. carbon dioxide  
8. released  
9. oxygen  
10. ATP  
11. alcohol  
12. lactic acid  
13. lactic acid  
14. alcohol  
15. alcohol  
16. Sample answer: Photosynthesis is a series of chemical 
    reactions by which light energy, water, and carbon 
    dioxide are used to make sugars. Photosynthesis also 
    releases oxygen. The cells of most organisms use 
    the sugars from photosynthesis. We eat food from 
    photosynthetic plants and breathe oxygen released 
    into the atmosphere by photosynthesis.  
17. The air quality of a forest would likely be better 
    than that of a busy city. Because there are more 
    green plants in a forest, there is more photosynthesis 
    occurring. Photosynthesis supplies Earth’s atmosphere 
    with the oxygen we need to breathe.

Enrichment (page 20)
Lesson 1 (page 20)
1. 50×  
2. 80×  
3. 480×  
4. 5×  
5. 60×  
6. The lenses could have poor resolving power. You 
    would need to replace the lenses with lenses that have 
    better resolving power.  
7. 1.5 cm; 15 mm  
8. Images seen through an electron microscope would 
    have much higher magnification and far greater detail.

Lesson 2 (page 21)
1. The study suggested that one-celled organisms will 
    group together for protection from predators. They 
    then have the ability to replicate as groups that share a 
    cell wall, rather than as individual cells.  
2. The different cells would have to begin carrying out 
    different tasks. They would begin to specialize. 
3. Answers will vary. Students might point out that 
    studying the behavior of cells helps people better 
    understand the history of evolution or the workings 
    of the human body.

Lesson 3 (page 22)
1. The dough increased in size, rising in the jar.  
2. The yeast, warm water, and sugar are the ingredients 
    that caused the reaction. The yeast is a living organism
(a fungus), the warm water provides heat energy, and the sugar provides food.

3. The release of carbon-dioxide gas during alcohol fermentation caused the bubbles.

Content Vocabulary (page 23)


21. The storage organelles of a cell are vacuoles.

22. Chemical processes that release energy used by the cell occur in mitochondria.

23. Plant cells contain chloroplasts, where photosynthesis takes place.

24. The cell’s cytoplasm is a thick fluid made mostly of water.

25. The nucleus is the control center of the cell.

26. The cell wall surrounds the cells of plants, fungi, and some bacteria.

27. The Golgi apparatus is the processing plant for the cell.

28. The endoplasmic reticulum is important for making protein and lipids.

29. The cell’s genetic material is contained in the chromosomes.

30. Structures in the cytoplasm called organelles have specific functions.

31. Photosynthesis combines light energy, water, and carbon dioxide to make sugar.

32. Cell theory is the set of ideas that describes how cells relate to living things.

Chapter Review (page 25)

Part A. Vocabulary Review (page 25)


Part B. Concept Review (page 26)

14. Step 1: Glycolysis breaks down a glucose molecule into two smaller molecules, releasing electrons.

Step 2: The smaller molecules are broken down into molecules of carbon dioxide, and more electrons are released.

Step 3: ATP is produced in the presence of oxygen, using the released electrons and water.

15. People understand that all living things come from other living things, and that all living things are composed of the same basic unit, or structure, called a cell.

16. Prokaryotic cells do not contain a nucleus or organelles. Eukaryotes have a nucleus and other membrane-bound organelles.

17. Answers may include any of the following: Lactic acid fermentation is conducted by muscle cells and certain fungi and bacteria; alcohol fermentation is conducted by yeast and other microorganisms; photosynthesis occurs in plant cells; and cell theory is a set of ideas that describes how cells relate to living things.

Sentences will vary, but should contain the information below.

20. The cell membrane encloses the cytoplasm and organelles of the cell.

21. The storage organelles of a cell are vacuoles.

22. Chemical processes that release energy used by the cell occur in mitochondria.

23. Plant cells contain chloroplasts, where photosynthesis takes place.

24. The cell’s cytoplasm is a thick fluid made mostly of water.
conducted by one-celled fungi called yeast. Lactic-acid fermentation uses glucose and produces lactic acid and carbon dioxide. Alcohol fermentation also uses glucose, but produces alcohol and carbon dioxide. Lactic acid fermentation is used in the dairy industry; alcohol fermentation is used in the baking industry.

Chapter Test A (page 27)
Part A. Multiple Choice (page 27)
1. C
2. C
3. C
4. D

Part B. Matching (page 27)
Matching Set 1
1. C
2. A
3. B

Matching Set 2
4. F
5. E
6. D

Part C. Labeling a Diagram (page 28)
1. mitochondria
2. vacuole
3. chloroplast
4. cell wall
5. cell membrane
6. cytoplasm
7. nucleus
8. chromosome
9. cell membrane
10. nucleus
11. cytoplasm
12. vacuole
13. mitochondria
14. chromosome
15. The top cell is a plant cell. It contains chloroplasts and a cell wall, which the animal cell does not. The bottom cell is an animal cell.

Part D. Short Answer
1. Answers will vary. Sample answer: The nucleus directs all the activities of the cell. The nucleus contains the instructions for everything the cell does. The nucleus carries the instructions on threadlike hereditary material made of proteins and DNA.
2. Cellular respiration is a series of chemical reactions that transforms energy in food molecules into usable energy.
3. Lactic acid fermentation uses glucose and produces ATP, but in smaller amounts than cellular respiration. It does not require oxygen.

Part E. Concept Application
1. Answers may vary. Sample answer: Bacteria can be useful to people. Some bacteria, such as Streptomycyes, are used to produce antibiotics. Some bacteria exist in our intestines and help to protect us from infections and invaders. They also help us to digest our food.
2. Answers will vary. Sample answer: Photosynthesis produces oxygen as a byproduct. The fruits and vegetables that humans and animals eat grow because of photosynthesis. We use the sugars from these plants in our cells.

Chapter Test B (page 30)
Part A. Multiple Choice (page 30)
1. A
2. D
3. B
4. A

Part B. Matching and Completion (page 30)
1. D
2. A
3. B
4. C
5. nucleus
6. proteins
7. smooth, rough
8. Mitochondria
9. Chloroplasts

Part C. Labeling a Diagram (page 31)
1. mitochondria
2. vacuole
3. chloroplast
4. cell wall
5. cell membrane
6. cytoplasm
7. nucleus
8. chromosome
9. cell membrane
10. nucleus
11. cytoplasm
12. vacuole
13. mitochondria
14. chromosome
15. The top cell is a plant cell. It contains chloroplasts and a cell wall, which the animal cell does not. The bottom cell is an animal cell.

Part D. Short Answer (page 32)
1. The nucleus is the control center and contains the genetic material for the cell. The nucleolus is found inside the nucleus. It helps to make structures that make proteins.
2. The first step is called glycolysis. Glucose is broken down into two smaller molecules. In the second step, the smaller molecule is broken down into carbon dioxide. In the last step, large amounts of ATP (usable energy) are produced from water and the electrons released in the first two steps.
3. Cellular respiration produces more ATP, which gives the cell more usable energy.
Part E. Concept Application (page 32)
1. Some bacteria, such as *Streptomyces*, are used to produce antibiotics. Other bacteria, like *Escherichia*, live in our intestines and protect us from infections. Other bacteria keep our environment healthy by decomposing dead plants and animals and recycling their nutrients.
2. Photosynthesis releases oxygen as a waste product. The last stage of cellular respiration requires oxygen to produce ATP. Without the oxygen, the ATP could not be produced. During photosynthesis, sugars are produced. We ingest these sugars, which are then used in cellular respiration to produce ATP.
3. Our body has a way of keeping its internal environment within certain limits, called homeostasis. Dani’s body was getting too cold. The shivering warms the body and helps to keep his temperature within safe limits. Dani’s body was attempting to maintain homeostasis.

Chapter Test C (page 33)
Part A. Multiple Choice (page 33)
1. D
2. D
3. B
4. C
5. D
6. A
Part B. Completion (page 34)
1. nucleus
2. nucleolus
3. chromosomes
4. proteins
5. ribosomes
6. lipids, proteins
Part C. Creating a Diagram (page 34)
Order will vary. The following plant parts should be labeled.
*Plant cell:*
1. mitochondria
2. vacuole
3. chloroplast
4. cell wall
5. cell membrane
6. cytoplasm
7. nucleus
8. chromosome
*Animal cell:*
9. cell membrane
10. nucleus
11. cytoplasm
12. vacuole
13. mitochondria
14. chromosome
15. The top cell is a plant cell. It contains chloroplasts and a cell wall, which the animal cell does not. The bottom cell is an animal cell; it does not contain chloroplasts.

Part D. Short Answer (page 35)
1. The membrane of the nucleus is permeable; it allows substances to pass into and out of the nucleus through small holes or pores. Inside the nucleus is the nucleolus, which helps to make structures that make proteins. If the membrane lost its ability to allow substances in and out, the protein production would be stopped.
2. In the first phase, glycolysis, glucose is broken into smaller molecules. This would not be affected by the absence of oxygen. In the next stage, the smaller molecule is broken down into carbon dioxide. This would not be affected by the absence of oxygen. The last stage of cellular respiration requires oxygen. ATP (usable energy) would not be produced without the presence of oxygen.
3. Lactic acid fermentation uses glucose and produces ATP, but in smaller amounts than in cellular respiration. It does not require oxygen. This type of energy production would be useful at a time when your muscles are using oxygen faster than your lungs and blood can deliver them, such as if you were running in a marathon.

Part E. Concept Application (page 35)
1. Some bacteria in the environment decompose dead organisms and recycle their nutrients. Without these bacteria to decompose dead plants and animals, the forest floor would be littered with the dead materials. The soil would also lack the nutrients the bacteria leave behind.
2. Answers will vary. Sample answer: The plant will die if deprived of light for too long. Plants need light to power the chemical reactions in photosynthesis. The light, water, and carbon dioxide are used to make sugars. These sugars help the plant to grow. Without light, photosynthesis will not occur, and the plant will not have the energy it needs to survive.
3. The healthy cells are an example of homeostasis. Homeostasis is an organism working to keep its internal environment within certain limits. Once the number of cells began to reach overcrowded levels, a signal was sent to stop dividing. This kept the cell numbers within limits.