



On-Level Teacher's Edition

Introduction

This guide will explore various features in the Teacher's Edition of the comprehensive on-level version of Miller & Levine Biology.

It will focus on features that are unique to the Teacher's Edition. For information about the Table of Contents, Visual Guide to the Diversity of Life, or the appendices, view the tutorial about the Student Edition, which teachers can find on myPearsonTraining.com.

This guide will show teachers how to do the following:

- Use front pages of the book, which include explanations of key features, National Science Education Standards, and a quick lab materials list.
- Make use of chapter planners included in each chapter to plan instruction and target activities for differentiated instruction.
- Help students connect with the Big Idea through the Chapter Mystery when launching the chapter.
- Utilize the teaching tools located in the book margins and at the bottom of the pages. These include Getting Started, Understanding by Design, and Teach.
- Use the many options for planning inquiry opportunities for the classroom. Lessons include open-ended and guided inquiry activities.
- Draw on assessments at the end of each lesson, chapter, and unit to monitor student progress.

Front Matter

If teachers are just beginning their implementation of the 2010 Miller & Levine series, they may have many questions about the philosophy, support materials, and teaching tools. The front pages of the Teacher's Edition feature a wealth of helpful information.

With the book closed and spine held down, find these sections by looking for the purple pages at the beginning of the book.

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Chapter Planner

Take a look at the Chapter Planner for Chapter 10 as an example. The Chapter Planner outlines the chapter contents, and it identifies the national science standards addressed in the chapter.

Chapter Contents	NSSES	Time	Core Resources
Chapter Preview			Student Edition , pp. 272–273 Chapter Review , p. 272
10.1 Cell Growth, Division, and Reproduction Links to Cell Size • Cell Division and Reproduction	L.1.N.A.1.a A.1.N.A.1.a A.1.N.A.2.a C.1.N.C.2.a	1 period 1 block	Student Edition , pp. 274–278 Section 10.1 Quick Lab , p. 275 Study Workbook A 10.1 Worksheets Biology.com Real-World Inquiry: Cells as Medicine Factories • Visual Analogy: Growing Pains Assessment Program Book Visual Quiz
10.2 The Process of Cell Division Chromosomes • The Cell Cycle • Mitosis • Cytokinesis	L.1.N.1.b A.1.N.A.1.b C.1.N.C.2.b	1 period 1 block	Student Edition , pp. 279–283 Section 10.2 Quick Lab , p. 281 Study Workbook A 10.2 Worksheets Biology.com Real-World Inquiry: Chromosomes • Data Analysis: Using the Cell Cycle • Mitosis Assessment Program Book Visual Quiz
10.3 Regulating the Cell Cycle Controls on Cell Division • Cancer • Uncontrolled Cell Growth • Technology & Biology: Fluorescence Microscopy	L.1.N.1.c A.1.N.A.2.a C.1.N.C.2.c	1 period 1 block	Student Edition , pp. 284–291 Section 10.3 Analyzing Data , p. 288 Study Workbook A 10.3 Worksheets Section 10.3 Analyzing Data: Growth of Cancer Cells • 10.3 Lab/Quiz • 10.3 Lesson Assessment
10.4 Cell Differentiation From One Cell to Many • Stem Cells and Development • Tumors in Skin: Cell Research	L.1.N.1.d A.1.N.A.1.d C.1.N.C.2.d	1 period 1 block	Student Edition , pp. 292–297 Section 10.4 Analyzing Data , p. 294 Study Workbook A 10.4 Worksheets Biology.com 10.4 Lesson Connection • 10.4 Lesson Notes • 10.4 Lab/Quiz • 10.4 Lesson Assessment
Chapter Pre-Lab	L.1.N.1.e A.1.N.A.1.e A.1.N.C.1.f	1 period 1 block	Student Edition , p. 298 Lab Manual A Preparation for Reproduction What's Special About Reproductive Cells?

Teachers can also use the planner as a pacing guide. In the Time column, note two time intervals. The top duration identifies the number of traditional 45–50 minute school periods needed to cover the material. The bottom duration identifies the amount of time needed during a 90-minute instructional block.

Time
1 period 1/2 block
2 periods 1 block

Also note two additional columns. Core Resources points out the main activities teachers use during the chapter. The Additional Resources column identifies activities that may be used to support or differentiate instruction.

Notice the red boxes at the end of many activities. These boxes are teachers' keys to differentiated instruction. These appear throughout the chapter to assist them in their planning for special populations.

Student Edition, pp. 274–278
Inquiry 10.1 Quick Lab, p. 275
Study Workbook A 10.1 Worksheets
Biology.com Real-World Inquiry: Cells as Medicine Factories • **Visual Analogy: Growing Pains Assessment Program Book Visual Quiz**

In this core section, most of the activities are labeled L2 for On-Level Students. However, look at the Additional Resources section and note the Study Workbook B 10.1 Worksheets for L1 (Special Needs or Struggling Students), ELL (English language learners), and LPR (Less Proficient Readers).

The Chapter Review Section identifies activities that help teachers wrap-up the chapter and prepare students for the chapter assessments. Some of these activities include workbook pages, text resources, and technology connections.

Chapter Review

Student Edition Study Guide, p. 299 •
Unit Project, p. 304 •
Study Workbook A Chapter 10 Vocabulary Review •
Chapter 10 Chapter Mystery/21st Century Skills Activity •
Transparencies, pp. 122–136 •
Biology.com Untamed Science Video • You're the Director •
Editable Worksheets of Study Workbooks A and B and
Lab Manuals A and B • Chapter 10 Flash Cards and
Crossword Puzzle
Untamed Science DVD • Classroom Resources CD
(includes lesson presentations and editable worksheets)

Note the chapter assessments listed in the Chapter Assessment section. Teachers can use this information to administer differentiated assessment based on the individual needs of students.

During the school year, it might be typical for teachers to be faced with the dilemma of being out of school for a week due to inclement weather, or the fire drill always occurring during the biology class period. Both of these situations can impact the biology schedule. This is why the authors have included a Pressed for Time section. This section suggests ways to quickly cover the chapter material while still addressing the key concepts.

Launching a Chapter

Turn to Chapter 10, Cell Growth and Division. Each chapter has a Big Idea and is accompanied by a Big Question. These concepts are the foundation of the chapter. In the left margin, teachers will see a Big Idea section that includes an activity for launching the chapter. This particular launch activity uses a picture of the embryonic whitefish cells.

Connect to the Big Idea

Use the photo of embryonic whitefish cells to help students connect to concepts they will learn in this chapter. First, activate prior knowledge by asking them if they know how many cells an adult human body has. (50,000 to 100,000!) Then, ask where those cells came from. (a single fertilized cell) Ask if that means that all the cells in their body are the same. (No, they have differentiated.)

Now have them study the false-colored micrograph of embryonic whitefish cells. Ask them to describe what they see. Focus their attention on the metaphase chromosomes in the cell at the center of the image. Ask how it differs from surrounding cells. (chromosomes double, lined up for division) Talk about how the rate of division for embryonic cells differs from that of cells in an adult. (Cells in an embryo divide rapidly, so what does them from continuing to divide. Internal, external regulation) Ask them to anticipate the answer to the question, **How does a cell produce a new cell?** Ask what it means that cells are the basic unit of life.

Support Have students read over the Chapter Mystery and predict what they think might happen to the salamander's limb. Use their predictions to help them start connecting the Chapter Mystery to the Big Idea of Growth, Development, and Reproduction.

Support Have students preview the chapter vocabulary terms using the **Flash Cards**.

To the right of the Big Idea, note the main concepts for the chapter lessons.

- INSIDE:**
- 10.1 Cell Growth, Division, and Reproduction
 - 10.2 The Process of Cell Division
 - 10.3 Regulating the Cell Cycle
 - 10.4 Cell Differentiation

Each chapter begins with a Chapter Mystery. This mystery aligns to the big idea and concepts introduced in the chapter lessons.

The Chapter Mystery for Chapter 10 is about Julia. She discovers that one of the limbs of a salamander has been eaten off. Concerned that the salamander might die, she places it in its own tank. She is surprised by the way the salamander's body reacts. Students are asked to determine how the body of the salamander might have reacted to the loss of a limb.

Throughout the chapter, students are directed back to the Chapter Mystery, and they are introduced to clues that can help them solve the mystery by the end of the chapter.

The UbD section at the bottom of the page points out the concepts that are targeted for enduring understanding. Performance goals are also defined in this section. In the diagram to the right of the Big Idea, the essential question and the guiding questions are identified.

UbD Understanding by Design

In unit 3, students are building toward the Enduring Understanding of how a cell is the basic unit of life; the processes that occur at the cellular level provide the energy and basic structure organisms need to survive. In Chapter 10, they will explore cell size, cell division, and the process of differentiation. As shown in the graphic organizer at the right, a Big Idea, Essential Question, and lesson Guiding Questions help frame their exploration of how chapter content informs this Enduring Understanding.

PERFORMANCE GOALS

In Chapter 10, students will be able to express their knowledge of the cell cycle orally, in written words, and by modeling it with classroom objects. Students will apply their knowledge of cell regulation and differentiation by creating real-world analogies for both processes. They will also practice data analysis skills by interpreting cell regulation and differentiation data. At the end of the chapter, students will synthesize what they know by writing a memoir as if they were a cell that had just divided.

The right margin of the book has a What's Online section that lists the digital resources available online at Biology.com. Direct students to view a video of the Chapter Mystery or Untamed Science. They may also use extra help with Tutor Tube or explore the chapter images in Art Review, Interactive Art, or Art in Motion. For more information on digital components, view the other Miller & Levine tutorials on myPearsonTraining.com.

Lesson Features

Turn to Lesson 10.1: Cell Growth, Division, and Reproduction. In the left margin, note the Getting Started section that lists the lesson objectives and student resources. These include resources on Biology.com. Teachers will start a lesson with an activity to help students activate prior knowledge or build background. The right margin includes teaching tips and directions for activities.

Getting Started

Objectives

10.1.1 Explain the problems that growth causes for cells.

10.1.2 Compare asexual and sexual reproduction.

Student Resources

Study Workbooks A and B, 10.1 Worksheets

Spanish Study Workbook, 10.1 Worksheets

Build Math Skills

Lesson Overview • Lesson Notes

• Activities: Real-World Inquiry, Visual Analogy

• Assessment: Self-Test, Lesson Assessment

Activate Prior Knowledge

Have students come to the board, one by one, and build a **Cluster Diagram** that incorporates all they can remember about cell growth. Encourage them to include diagrams when appropriate. Refer back to this diagram as you work through the lesson.

Study Wikibk A/B, Appendix S19, Cluster Diagram, **Transparencies**, GO2.

In this example, there is an activity called Build Math Skills that relates the ratio of surface area to the volume of cells. Suggestions for differentiated instruction for this activity are also suggested.

Build Math Skills

Some students may have limited experience with ratios. Explain that a ratio is a comparison. In this case, it compares the amount of surface area a cell has to its volume. A ratio can be expressed as a proportion, such as 2:1, or as a fraction, such as $\frac{2}{1}$. In **Figure 10-1**, the ratios have been reduced to their simplest form to make it more obvious how the cube's surface area grows in relationship to its volume.

Ask What is the ratio of vowels to consonants in the alphabet? ($\frac{5}{21}$ or $\frac{5}{21}$)

DIFFERENTIATED INSTRUCTION

Special Needs Use clay models to help students understand that a smaller surface area to volume ratio does not mean the cube is getting smaller. Both surface area and cube volume increase as the length of the side increases.

Struggling Students Some students may have a difficult time understanding the information presented in the table. Point out that the cube directly above each column shows the "cell" that the calculations refer to. Then, explain that the first row shows how to find the surface area for each cubic "cell." Use a clay or plastic model of a cube to explain that, when students multiply length and width ($l \times w$), they are finding the surface area of one face of the cube. They need to multiply this area by six, because the cube has six faces.

The Understanding by Design: Teaching for Understanding section is at the bottom of the page. Each UbD section contains a guiding question and an activity or discussion to assess students' understandings. Based on the responses, this section suggests a classroom demonstration of DNA overload. However other sections suggest reteaching activities in the Adjust Instruction section.

UbD Teach for Understanding

ENDURING UNDERSTANDING A cell is the basic unit of life; the processes that occur at the cellular level provide the energy and basic structure organisms need to survive.

GUIDING QUESTION Why do cells divide?

EVIDENCE OF UNDERSTANDING After completing the lesson, give students this assessment to ensure they understand how a small size helps cells survive and function efficiently. Have students use classroom objects to model how DNA overload or material exchange limits the size of cells. For example, they might limit the number of pencils available to the class. As the class size gets bigger, fewer people can be writing compared to the number who do not have a pencil.

Inquiry Opportunities

The program has a variety of inquiry opportunities. These range from open-ended activities where students design their own labs to guided inquiry where teachers ask questions and provide specific directions. Lab explorations include pre-lab activities, lab procedures, and follow-up activities.

Assessment

At the end of each lesson teachers will see section assessments that will help them monitor student understanding. These sections revisit the key concepts of the lesson, and in most cases they ask students to make a connection to another curricular area.

The Assess and Remediate feature provides a pre-assessment activity in the Evaluate Understanding section. In this example, teachers will facilitate a discussion to review students' understanding of the cell cycle and differences between normal cells and cancer cells.

Assess and Remediate

EVALUATE UNDERSTANDING
Call on students at random to explain what regulates the cell cycle and why cancer cells are different from normal cells in the body. Then, have them complete the 10.3 Assessment.

REMEDIAL SUGGESTIONS

Struggling Students If students have a difficult time with developing a hypothesis for **Question 1b**, suggest that they review the text on cyclins and the Analyzing Data feature in this lesson. Have them write down and discuss the role of cyclins in the cell cycle with a partner. Then, have pairs write a hypothesis together.

BIOLOGY.com Students can check their understanding of lesson concepts with the **Self-Test** assessment. They can then take an online version of the **Lesson Assessment**.

After students have completed the lesson assessment, there are remediation suggestions that will help teachers clarify key ideas for struggling students. In this case, students are asked to work in pairs to revisit an Analyzing Data activity.

Note chapter assessments at the end of each chapter. Have students review key concepts and think critically about what they have learned.

Lesson 10.1

UNDERSTAND KEY CONCEPTS

1. d 2. a 3. b

4. Cell volume is the amount of material inside a cell. Cell surface area is the total area of the cell's membrane. Ratio of surface area to volume is the surface area compared to the volume.

5. Asexual reproduction allows populations to increase in number very quickly. Sexual reproduction provides genetic diversity.

THINK CRITICALLY

6. 2.25:1

7. sexually; genetic differences in a population may help the organisms better cope with environmental changes

Students may use the Study Guide to review the key concepts or to prepare for chapter tests. In addition, the UbD section provides a summative performance task that helps students connect to the chapter material on a higher level. To review this chapter, ask them to write a memoir as if they were a cell that had just divided.

A transfer performance task is also provided for Chapter 10. Ask students to make lists of human cells and tissues that humans can regrow. As they finish their list, have them compare their lists with other students. Then, they can answer questions that compare human cell regrowth to that of the salamander in the Chapter Mystery.

UbD Performance Tasks

SUMMATIVE TASK Have each student write a memoir as if he or she were a cell that had just divided. Write the following prompts on the board and tell students that they should mention each of these points in their memoir:

- Why did you decide to divide?
- What signals did you receive that told you it was time to divide? Describe how you decided. What happened? In what order?

TRANSFER TASK Ask each student to make a list of the types of cells and tissues humans can regrow, such as hair and nails. Have small groups of students compare lists and make a comprehensive group list. Then, have each group discuss the following questions:

- How is the regrowth of human hair and nails different than regeneration in salamanders and planarians?
- Why might humans be more limited in their potential to regenerate an entire leg than salamanders?
- Humans can regenerate liver tissue. How is this phenomenon similar to the regrowth of hair and nails? How is it different?
- Stem cells in human bone marrow can produce blood cells. How are stem cells related to regeneration?

Each chapter ends with Standardized Test Prep. These multiple-choice questions prepare students for state testing. Students having trouble answering questions can use the If You Have Trouble With section. This section directs them to the lessons that address the problem. The Teacher’s Edition provides test-taking tips in this section too. Introduce students to strategies, such as eliminating the obvious wrong answers and interpreting visuals.

At the end of each unit, notice the Unit Project, which is an open-ended authentic assessment. The assessment for Unit 3 involves students creating a comic book about a “super hero” cell. The Teacher’s Edition provides a section that helps teachers plan ahead for the unit project, monitor the project, and assess the final results.

Unit Project

Superhero Cell

Imagine the possibilities! Have your own designed a comic book of your own? Start by drawing a superhero cell. Think about how you would give it a name. How do you think it would look? How do you think it would act? How do you think it would talk? How do you think it would fight? How do you think it would save the world? How do you think it would be a hero?

Reflection Questions

1. How do you think your superhero cell would be a hero?
2. How do you think your superhero cell would be a hero?
3. How do you think your superhero cell would be a hero?
4. How do you think your superhero cell would be a hero?

Assessment Rubric

Score	Scientific Content	Quality of Comic Book
4	The student demonstrates a deep understanding of the scientific concepts and details about the structure and function of various organelles and cell processes.	The comic book is well written and includes interesting characters and a plot.
3	The student demonstrates a good understanding of the scientific concepts and details about the structure and function of various organelles and cell processes.	The comic book is well written and includes interesting characters and a plot.
2	The student demonstrates a basic understanding of the scientific concepts and details about the structure and function of various organelles and cell processes.	The comic book is well written and includes interesting characters and a plot.
1	The student demonstrates a limited understanding of the scientific concepts and details about the structure and function of various organelles and cell processes.	The comic book is well written and includes interesting characters and a plot.

Review

This guide explored the following Teacher’s Edition features:

- The front pages of the book
- The Chapter Planner
- The Big Idea and the Chapter Mystery, which teachers can use to launch chapters
- Teaching tools like Getting Started, Understanding by Design, and Teach
- Inquiry opportunities
- Assessments

For more information, watch the other Miller & Levine Biology tutorials on myPearsonTraining.com.