Life Sciences 11

LG 7

Monerans and Bacteria

Bacteria – Small but Mighty! Bacteria are everywhere, on your skin, in your food, deep in the ocean, and even in space! These microscopic organisms are some of the most successful life forms to ever exist, shaping our planet and influencing life in ways we often overlook. In this Learning Guide, you'll explore what makes bacteria unique, how they survive, reproduce, and interact with the world, and why we rely on them far more than you might think. Through readings, diagrams, case studies, and online investigations, you'll discover the surprising roles bacteria play in health, food, technology, and the environment. By the end of this unit, you'll be able to explain why bacteria are essential to life, and why we literally couldn't live without them. The Biology 11 teachers tried to make a joke about bacteria… but there was *no culture* for it to grow!

Use pages 360–372 of your Biology 11 textbook to complete this learning guide. Digital link (if easier):
https://www.thssscience.com/resources/Biology%20Miller%20Levine%20Chapter%2017.pdf

Answer all questions in full sentences. Include diagrams, labelled images, and examples where requested.

A. Introduction to Prokaryotes

1. **Prokaryotes 101:**
   What are prokaryotes, and where are they found on Earth?

2. **Observing Bacteria:**
   Look at Figure 17-7 on page 360. Describe what you see.
   What are colonies, and how do they form?

3. **Kingdom Monera Overview:**
   What is Kingdom Monera? Name the four phyla in this kingdom and explain why all four are commonly referred to as "bacteria."

B. Bacterial Structure, Microscopy & Size

4. **Prokaryotic Cell Structure:**
   Use this interactive link to draw, label, and define the parts of a bacterium:
   https://ib.bioninja.com.au/standard-level/topic-1-cell-biology/12-ultrastructure-of-cells/prokaryotic-cells.html

5. **Electron Microscopes:**
   From the same link above, click **"Electron Microscopy."**
   • Compare **TEM vs SEM** (how they work + the images they produce).
   • Why are electron microscopes better than light microscopes for studying bacteria?

6. **How Small Are They?**
   Using the textbook, state the **size range** of bacteria (in micrometres, µm).
   Why are bacteria generally smaller than eukaryotic cells?

C. Types, Shapes, and Cell Walls

7. **The Four Phyla of Monerans:**
   Summarize the **key features** of each of the 4 phyla. (Use a chart if helpful.)

8. **Bacterial Shapes:**
   Explain the **three main shapes** of bacteria.
   Include a drawing for each shape.

9. **Gram Staining & Cell Walls:**
   Why is **Gram staining** important in microbiology?
   • Compare **Gram-positive vs Gram-negative** bacteria (cell wall, peptidoglycan, staining results, etc.).
   • Explain what **peptidoglycan** is and how **antibiotics** target it.

D. Nutrition, Respiration & Reproduction

10. **Movement:**
    Do bacteria move? If yes, how?
    Include a labelled diagram of a **flagellum** and a **cilium**. What is the difference?

11. **Autotrophs vs Heterotrophs:**
    Differentiate between these two nutritional strategies with **clear depth and examples**.

12. **Case Studies – Food Poisoning:**
    Read page 366 (**Food Poisoning, Case Studies 1 & 2**) and complete the **Analysis** questions.

13. **Bacterial Respiration:**
    Describe the different ways bacteria can obtain energy using oxygen (**aerobic**, **anaerobic**, **facultative**).
    How does **botulism** occur?

14. **Reproduction:**
    Compare and contrast **binary fission** and **conjugation**.
    Include labelled diagrams (your own or high-quality images).

15. **Endospores:**
    What is an **endospore**? Include a diagram that clearly shows how one forms.

E. Bacteria in the Real World

16. **Why We Need Bacteria:**
    Pages 369–372 provide examples of how monerans benefit humans.
    List and briefly describe **all examples** from these pages.

17. **Growing Bacteria:**
    Research how a **petri dish** is used to grow bacteria.
    What nutrients are used, and what is the purpose of **agar**?

18. **Plasmids & Antibiotic Resistance:**
    What are **plasmids**? How do they contribute to **antibiotic resistance**?
    Define **antibiotics** and explain how they work.