

**STUDENT
LABORATORY
GUIDE**

**BIOLOGICAL
SCIENCE**

AN INQUIRY INTO LIFE

BIOLOGICAL SCIENCES CURRICULUM STUDY



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Contents

The *Student Laboratory Guide* contains 89 inquiries. Each presents different content and illustrates different aspects of an investigation or a concept. Many involve different equipment and techniques. Some are graded in terms of open-endedness, with earlier inquiries more highly structured than later ones. This variety in the inquiries increases the flexibility within the classroom and laboratory environments and necessarily involves the teacher in decisions between different inquiries as basic or supplementary.

A decision to use all the inquiries involves assigning different teams of students different inquiries at least some of the time. Whether this is feasible depends not only upon the necessary laboratory facilities and supplies but upon the degree of independence students are to have in their laboratory work. If all students are to undertake the same inquiries, some – perhaps many – of the inquiries will not be assigned, but students of high initiative will want to undertake certain optional inquiries on their own.

One suggested organization of the 89 inquiries into basic and optional categories is given in this table of contents, with optional inquiries indented. The decision of which inquiries to use, however, remains the teacher's.

INQUIRY 1-1	Life in Unexpected Places?	1
	An investigation basic to Chapter 1, to development of the need for microscopes, and to preparations for Inquiry 2-1. It may be omitted if Inquiry 2-1 will not be assigned.	
INQUIRY 1-2	The Compound Microscope – A Scientific Tool	3
	Basic techniques of microscopic observation.	
INQUIRY 1-3	Measuring the Invisible	8
	An optional inquiry into quantitative techniques with the compound microscope.	
INQUIRY 1-4	Types of Microscopes	10
	An optional inquiry into specialized types of compound microscopes and comparisons of their capabilities with those of the electron microscope.	
INQUIRY 2-1	Life from Nonlife?	22
	A basic inquiry continuing the investigations begun in Inquiry 1-1 and establishing their relationship to the biogenesis-abiogenesis controversy of Chapter 2.	
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	A classical investigation of the plant part in which cells first were discovered.	

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	Where around us are microorganisms found? A basic inquiry into a surprisingly extensive domain.	
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	The Gram stain technique and its use in microscopic studies of bacteria.	
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	An investigation showing how to keep track of reproducing microorganisms and how to obtain pure cultures.	
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	An opportunity to test the relative effectiveness of known drugs on bacteria.	
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	An optional inquiry related to Inquiry 6-3, replacing tissue cells with microorganisms in a study of interaction with the environment. The use of an ultraviolet light source requires special precautions.	
INQUIRY 11-4	Discriminating Microorganisms	80
	An investigation of differences in the metabolism of several types of microorganisms—specifically in their utilization of sugars.	
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	A basic inquiry into the value of a questioning attitude instead of rigid concepts of organisms as “plants” or “animals.”	
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	An optional investigation of types of fungi.	
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	The basis for plant classification, and an introduction to plant phylogeny.	
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	A search for reasons why green algae are central to considerations of the evolution of green land plants.	
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	An investigation of a prominent pattern in the life cycles of both green algae and green land plants. Mosses are the laboratory example.	

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	Is chlorophyll necessary to photosynthesis?	
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	An opportunity to investigate complementarity of structure and function.	
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	Experimental evidence for an essential plant process, and an investigation of the physical factors involved.	
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	A morphological study of the reproductive structures of flowering plants.	

INQUIRY 17-2 A Simple Key to Flowering Plants
An optional introduction to the use of a key in classifying plants—in this case, representatives of common families of flowering plants.

INQUIRY 17-3 From Seed to Seedling
An extension of Inquiry 14-3, proceeding from seeds to the growth and development of new plants; also an investigation into the use of energy for the process.

INQUIRY 17-4 Plant Reactions to Environment
Do plants show "behavior"? A basic inquiry that investigates responses of plants to various stimuli.

INQUIRY 17-5 Regulation of Growth in Plants
An analysis of a classical investigation in plant growth, leading to a pattern of evidence about one mechanism involved.

INQUIRY 18-1 Plants or Animals?
A basic inquiry that explores in greater detail the question raised by study of a single organism in Inquiry 12-1.

INQUIRY 18-2 Structure and Function in *Paramecium*
The introduction to a series of investigations of basic animal processes in a single-celled animal. Hypotheses affecting successful investigations are required from the initial observations.

INQUIRY 18-3 Locomotion of *Paramecium*
The hypotheses of locomotion from Inquiry 18-2 are investigated and are confirmed or rejected.

INQUIRY 18-4 Ingestion and Digestion in *Paramecium*
Several related hypotheses from Inquiry 18-2 are investigated. *Paramecium* is fed and observed.

INQUIRY 18-5 Contractile Vacuoles in *Paramecium*
An investigation of a homeostatic mechanism associated with one of the more hypotheses from Inquiry 18-2.

INQUIRY 18-6 Reproduction in *Paramecium*
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