

Preface

To the Instructor

The laboratory exercises in this manual are coordinated with *Human Biology*, a text that has two primary functions: (1) to achieve an understanding of how the human body works, and (2) to show the relationship of humans to other living things in the biosphere.

This manual may also be used in coordination with other biology texts. There are a sufficient number of laboratories and exercises within each lab to tailor the laboratory experience as desired. Then, too, many exercises may be performed as demonstrations rather than as student activities, thereby shortening the time required to cover a particular concept.

The Exercises

All exercises have been tested for student interest, preparation time, time of completion, and feasibility. The following features are particularly appreciated by adopters:

Integrated Opening. Integrated Opening. Each laboratory begins with a list of Learning Outcomes organized according to the major sections of the laboratory. The major sections of the laboratory are numbered in the laboratory text material.

Prelab Questions. The Learning Outcomes contain one prelab question per major section. These questions are meant to encourage students to read the laboratory before they start work. Instructors can require that the prelab questions be answered and turned in on the day of the lab and/or instructors can select a few to include in a laboratory quiz.

Self-Contained Content. Each laboratory gives all the background information necessary to understand the concepts being studied and to answer the questions asked. This feature will reduce student frustration and increase learning.

Human Emphasis. This manual accompanies *Human Biology*, so it is fitting for the laboratories to have a human emphasis. This emphasis means that it is not necessary to include "Human" in the title of the laboratories because they all have a human orientation.

Scientific Process. This manual provides opportunities for students to gain an appreciation of the scientific method. The first laboratory of the manual explicitly explains the steps of the scientific method and gives students an opportunity to use them.

Student Activities. Sequentially numbered steps guide students as they perform each activity. Color bars are used to designate whether an activity is an Observation or whether it is an Experimental Procedure. A boxed statement with a clock icon is added at the start of the day's work to call attention to any exercises that require more time than other exercises. A clock also appears within the procedure whenever time is required for the results to occur.

Application for Daily Living. Relevancy is of primary importance in the *Human Biology Lab Manual*. Relevancy is particularly apparent due to a feature called *Application for Daily Living*. These short boxes at the end of the lab tell students how the day's work applies in a practical way to a current health or environmental concern.

Laboratory Safety. Laboratory safety is of prime importance, and the listing now online at <http://connect.mheducation.com>, will assist instructors in making the laboratory experience a safe one. Warning notices occur throughout the manual as is appropriate to the particular procedure.

The Fifteenth Edition

Each Laboratory Review section is completely new for this edition. Fourteen short answer questions now help students identify key vocabulary and basic concepts critical to the topic of the exercise. Questions are organized to match the exercise's order of presentation, facilitating students' ability to identify an appropriate response. Each Laboratory Review also contains three new critical thinking questions that challenge students to make connections between the concepts presented, or to apply information from the exercise to real world examples.

Each laboratory exercise was carefully revised to ensure that directions to students are clear and follow common laboratory standards and practices. For example, the manual now directs students to use inexpensive plastic transfer pipets to measure volume rather than marking off test tubes and filling to a cm.

Lab 4: Chemical Composition of Cells

This laboratory was reorganized and written for added clarity and to matching learning objectives.

Lab 6: Body Tissues

A section was added to this lab to provide an overview of body tissues and a summary activity was added to review each type of body tissue.

Lab 8: Organization of the Body

Anatomy of the human torso was moved to the end of the lab after dissection of the fetal pig. Greater detail was added to dissection of the fetal pig and art showing internal anatomy has been added to supplement and clarify pictures.

Customized Editions

The 19 laboratories in this manual are now available as individual "lab separates," so instructors can custom-tailor the manual to their particular course needs. Find more information at <http://create.mheducation.com>.

Laboratory Resource Guide

The *Laboratory Resource Guide*, an essential aid for instructors and laboratory assistants, free to adopters of the *Laboratory Manual*, is online at <http://connect.mheducation.com>. The answers to all the laboratory questions are in the *Resource Guide*.

To the Student

Special care has been taken in preparing *Human Biology Laboratory Manual* so that you will **enjoy** the laboratory experience as you **learn** from it. The instructions and discussions are written clearly so that you can understand the concepts presented and the procedures you are doing. Student learning aids discussed next are designed to help you focus on important aspects of each exercise.

Student Learning Aids

Students will want to be aware of these learning aids:

Learning Outcomes set the goals for each laboratory session. The major sections of each laboratory are numbered, and the Learning Outcomes are grouped according to these topics. The Learning Outcomes will help you review the material for a laboratory practical or any other kind of exam.

Prelab Questions are a part of the Learning Outcomes; when you can answer the Prelab Questions, you are prepared for a meaningful laboratory experience. These questions will guide your study of the concepts and the student activities in a meaningful way.

The Introduction on the same page as the Learning Outcomes reviews background information necessary for comprehending the upcoming experiments.

Color bars call out exercises that require your active participation. Different colors are used to highlight Observations and Experimental Procedures. If you see a clock in an experimental procedure, it means that a certain amount of time is required before you can observe your results.

Icons are used to get your attention. A safety icon tells you when to be particularly careful about the use of a chemical; a clock icon at the start of the day's work tells you when you might want to set up a procedure ahead of time.

Tables and fill-in-the-blanks allow you to record the results of investigations and experiments. Be sure to answer each question carefully. These allow you to understand the procedure. In addition, each laboratory ends with a set of review questions covering the day's work.

Laboratory Preparation

Read the Learning Outcomes and be sure to answer the Prelab Questions. Also **study** the introductory material and the procedures before the day you have lab. To obtain an even better understanding of a topic, consult your text.

Explanations and Conclusions

Throughout a laboratory, you are often asked to formulate explanations or conclusions. To do so, you will need to synthesize information from a variety of sources, including the following:

1. Your experimental results and/or the results of other groups in the class. If your data are different from those of other groups in your class, do not erase your answer; add the other answers in parentheses.
2. Your knowledge of underlying principles. Obtain this information from the laboratory Introduction or the appropriate section of the laboratory and from the corresponding chapter of your text.
3. Your understanding of how the experiment was conducted and/or the materials used. **Note:** Ingredients can be contaminated or procedures incorrectly followed, resulting in reactions that seem inappropriate. If this occurs, consult with other students and your instructor to see if you should repeat the experiment.

In the end, be sure you are truly writing an explanation or conclusion and not just restating the observations made.

Color Bar and Icon

Throughout each laboratory, a color bar designates either an Observation or an Experimental Procedure.

 **Observation:** An activity in which models, slides, and preserved or live organisms are observed to achieve a learning outcome.

 **Experimental Procedure:** An activity in which a series of steps uses laboratory equipment to gather data and come to a conclusion.

 **Time:** An icon is used to designate when time is needed before you can determine your results. A boxed statement at the beginning of the laboratory calls attention to any experimental procedure requiring a considerable amount of time. Start these activities at the beginning of the laboratory, proceed to other activities, and return to this experimental procedure when appropriate.

 **Safety:** An icon is used to designate when particular caution is needed. Your health and safety are of utmost concern, and you should follow the directive.

A boxed statement at the beginning of the laboratory calls attention to any experimental procedure requiring a considerable amount of time. Start these activities at the beginning of the laboratory, proceed to other activities. An icon is used to designate when time is needed before you can determine your results.

Laboratory Review

Each laboratory ends with a number of short-answer questions that will help you determine whether you have accomplished the outcomes for the laboratory.