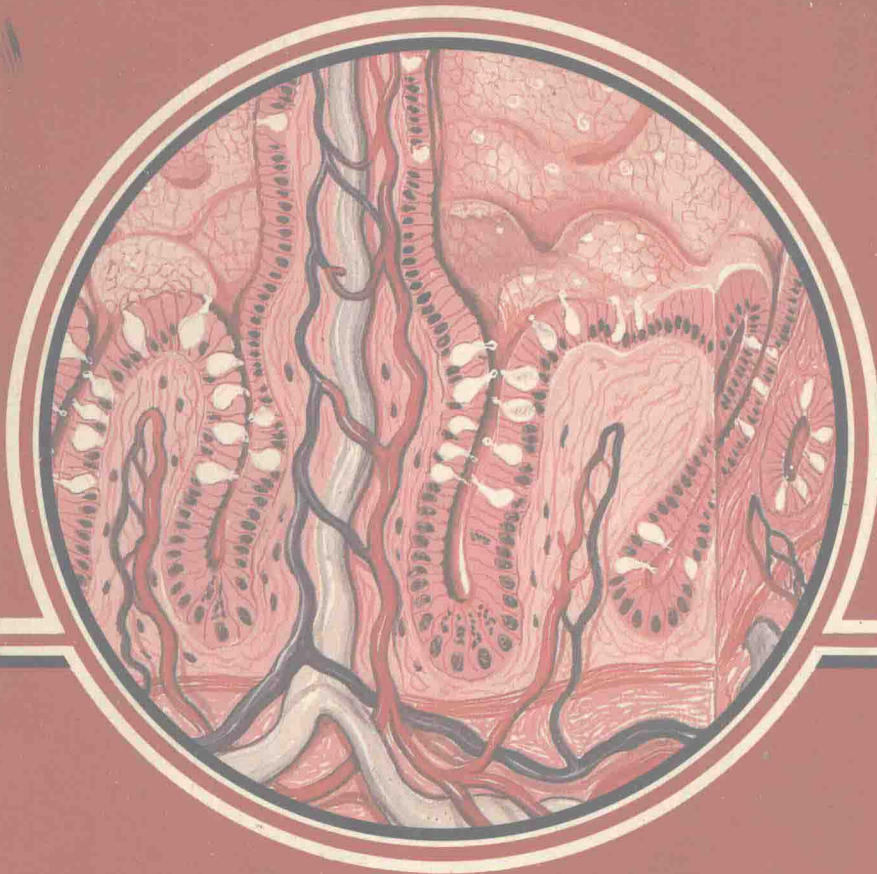


Anatomy and Physiology

LABORATORY MANUAL



TENTH EDITION

ANTHONY AND THIBODEAU

Anatomy and Physiology

LABORATORY MANUAL

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TENTH EDITION

with **169** illustrations

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TENTH EDITION

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Preface

This tenth edition of *Anatomy and Physiology Laboratory Manual*, like the editions preceding it, is designed to help the student correlate the results of direct laboratory work experience with the more generalized knowledge gained from lectures and reading assignments. The need for careful observation, analysis, and practice in applying the scientific method is emphasized.

Measurable objectives are included for each laboratory exercise in this edition and constitute a major change in format. The objectives, coupled with full directions for each procedure, make the manual truly self-directing. Students can proceed independently to explore scientific principles and concepts with a minimum of instructor supervision and assistance. Procedures designed to help students identify and write up conclusions for each procedure have been retained and expanded. In addition, revised unit self-tests serve as an aid to independent study by enabling students to monitor their own progress and comprehension.

Variation in content, course objectives, and level of presentation will influence the selection and sequencing of material covered in the anatomy and physiology laboratory. The addition of over twenty new experiments will increase the flexibility of this edition by allowing instructors

to better select from those areas most suited to local needs.

Several of the new experiments and procedures are designed to help students gain a better understanding of introductory concepts, applied principles, and practical skills. A number of new and more sophisticated procedures have also been added in order to provide students with exposure to more complex physiological mechanisms. Equipment required remains uncomplicated, relatively inexpensive, and readily available.

Examples of new material in Unit one range from procedures introducing the student to anatomical terminology and use of the microscope to experiments demonstrating tonicity and movement of substances through cell membranes. New procedures relating to the sense organs include the Snellen test for visual acuity and the Rinne test for bone conduction of sound. Unit four has been extensively revised and expanded to include over ten new cardiovascular and urinary system experiments. The unit on reproduction has also been expanded and now contains material on mitosis and mammalian semen analysis.

Five new appendices, which include metric conversion factors, formulas, and physical constants; blood and nutrition data; instructions for

solution preparation; the stages of anesthesia; and a current anatomy and physiology media directory, provide a wealth of useful and easily accessible information for both students and instructor.

Catherine Parker Anthony
Gary A. Thibodeau

Outline for 90-hour course

Following is a suggested division of hours for a 90-hour course. The instructor may, of course, vary these hours in many ways. The outline is offered merely as a suggestion of possible time allotment.

Subject	Total hours*	Suggested time allotment			
		With maximum laboratory hours		With minimum laboratory hours	
		Lecture (hr)	Laboratory (hr)	Lecture (hr)	Laboratory (hr)
Unit one					
Organization of the body	2	None	2	None	2
Cells	4	2	2	2	2
Unit two					
The skeletal system	7	2	5	5	2
The muscular system	8	2	6	6	2
Unit three					
The somatic nervous system, the autonomic nervous system, and sense organs	18	6	12	12	6
The endocrine system	3	2	1	2	1
Unit four					
The respiratory system	5	2	3	3	2
The cardiovascular system	17	5	12	12	5
The digestive system and metabolism	13	4	9	9	4
The urinary system	5	2	3	3	2
Unit five					
Reproduction of cells and human reproductive systems	8	3	5	5	3
Total	90	30	60	61	29

*For a 96-hour course, 2 more hours might be allowed for Unit one, 2 more for the muscular system (Unit two), and 2 more for reproduction (Unit five). For a 100-hour course, 2 more hours might be allowed for Unit one, 2 more for the muscular system (Unit two), 2 more for the so-

matic nervous system, the autonomic nervous system, and sense organs (Unit three), 1 more for the cardiovascular system (Unit four), 1 more for the respiratory system (Unit four), and 2 more for reproduction (Unit five).

Suggestions to students

Laboratory work is included in anatomy and physiology courses to help you in your efforts to increase your understanding of the human body. Whether you learn much or little from laboratory sessions depends mainly on the type of mental habits you cultivate. The following suggestions are offered in the hope that they may help you to gain the maximum benefit from your laboratory work.

1 Come to the laboratory with an attitude of expectancy and with a conscious realization that the procedures are designed to serve two purposes—to demonstrate facts and principles discussed in the textbook or lecture and to provide experiences that will help you to learn the most important facts of the course. (In this sense the laboratory period is a planned study period.)

2 When examining fresh or preserved anatomical specimens, think of them as materials

from which you can learn, at first hand, facts about which you have read or heard. Do not think of them as parts of a person's or an animal's body. In other words, cultivate an attitude of intellectual curiosity and suppress attitudes of morbid curiosity. If you conscientiously cultivate this scientific method of approach to dissection and demonstrations, you will never be distressed by any specimens that you may be called on to handle or witness. It is of paramount importance for a student to develop this professional attitude of intellectual curiosity about things that she or he sees.

3 Be quiet in manner and orderly in your habits in the laboratory. Always leave your laboratory unit clean and neat.

4 Handle equipment very carefully, since it is costly and often difficult to replace.

Laboratory equipment

General

- 1 Dissectible torso model of human body
- 2 Model of eye
- 3 Model of ear
- 4 Model of section of spinal cord
- 5 Articulated skeleton
- 6 Dissectible skull
- 7 Disarticulated bones
- 8 Prepared tissue and membrane slides
- 9 Artificial cells (parchment or collodion)
- 10 Hemocytometer, counting slide, and mixing pipettes
- 11 Tallqvist scale for hemoglobin estimation
- 12 Set of standard anatomical charts
- 13 Covered glass specimen jar
- 14 Absorbent cotton
- 15 Beakers and test tubes
- 16 Ring stands
- 17 Stethoscope
- 18 Sphygmomanometer
- 19 Recording system equipment

Preserved specimens (if available)

- 1 Human brain
- 2 Human spinal cord
- 3 Human stomach
- 4 Human gallbladder
- 5 Human heart
- 6 Human kidney
- 7 Human uterus, tubes, and ovary

- 8 Human embryos

- 9 Embalmed rat

Fresh materials

- 1 Beef joint sawed longitudinally
- 2 Two long beef bones—one sawed longitudinally and one sawed horizontally
- 3 Yellow or white onion
- 4 Sheep brains
- 5 Sheep pluck
- 6 Sheep hearts
- 7 Sheep spinal cords
- 8 Sheep kidneys
- 9 Two chicken legs
- 10 Beef eyes
- 11 Several live rats, frogs, or guinea pigs
- 12 Sheep liver and gallbladder

Solutions (see also Appendix C)

- 1 10% glucose
- 2 5% or 2% glucose
- 3 10% formalin
- 4 Methylene blue
- 5 3% acetic acid
- 6 10% urethane
- 7 Ether
- 8 Thin, cooked starch
- 9 Benedict's solution
- 10 Tincture of iodine
- 11 Tincture of cantharides

- 12 10% and 25% sucrose
- 13 Collodion
- 14 Lugol's iodine solution
- 15 Silver nitrate solution
- 16 0.2%, 0.9%, and 2.0% NaCl
- 17 70% alcohol
- 18 Wright's stain
- 19 Wright's buffer
- 20 0.1 N HCl
- 21 3% chloramine (Chlorazene)

Equipment for each two students

- 1 Dissecting kit containing the following:
 - a Scalpel
 - b Scissors
 - c Thumb forceps
 - d Medicine dropper
 - e Blunt probe
 - f Dissecting needle
- 2 Shallow dissecting pan
- 3 Microscope

Equipment to be provided by each student

- 1 Box of colored pencils
- 2 Hard lead (4H) drawing pencil for labeling and shading (does not smear)
- 3 Eraser
- 4 Ruler

Reference books for use in laboratory

- 1 Atlases on anatomy
- 2 Textbooks of anatomy and physiology
- 3 Textbooks of histology
- 4 Textbooks of neuroanatomy
- 5 Textbooks of embryology

Sources from which laboratory supplies may be secured

- 1 Models of torso, eye, ear, etc. (also skeleton)—any biological supply house, such as Clay-Adams Co., Inc., 141 E. 25th St., New York, N.Y. 10010
- 2 Preserved human specimens—your hospital department of pathology
- 3 Fresh materials, such as sheep brains and beef joints—your local slaughterhouse or butcher
- 4 Live rats and frogs and embalmed animals—any biological supply house
- 5 Solutions—your hospital pharmacy
- 6 Dissecting kits, beakers, test tubes, and bell jar—any chemical supply house
- 7 Recording systems and teaching kits—Harvard Apparatus Co., Inc., Smith St., Dover, Mass. 02030 or NARCO Bio-Systems, Inc., 7651 Airport Blvd., P.O. Box 12511, Houston, Texas 77017
- 8 Blood typing—Lab-Aids, Inc., 160 Rome St., Farmingdale, N.Y. 11735

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unit one

The body as a whole

chapter 1

Organization of the body

Structural organization of body

Procedure A—Examination of human torso model

Procedure B—Anatomical terms

Procedure C—Microscope

Procedure D—Dissection of small animal

Procedure E—Films

Self-test

Structural organization of body

Procedure A—Examination of human torso model

Measurable objectives

At the completion of this laboratory procedure the student will be able to do the following:

- 1 Locate the four main body cavities.
- 2 List the organs found in each of the nine regions of the abdomen.
- 3 Describe the three notable characteristics of the human body's architectural plan.

Equipment

- 1 Human torso model
- 2 Anatomical charts and illustrations
- 3 Textbooks of anatomy and physiology

Problems

- 1 Where are the four main body cavities located?
- 2 What organs are located in the thoracic cavity (exclusive of blood vessels, lymphatic vessels, and nerves)?
- 3 What organs are located in each of the nine regions of the abdominal portion of the abdominopelvic cavity?

Collection of data

- 1 Consult a textbook to find the names and locations of the four main body cavities.
- 2 Remove the organs from the torso model. As you do so, check the name of each organ in the textbook. Note the location, size, and shape of each organ as you remove it from the model. After you have removed all organs from the model, return them to their proper locations.

Conclusions

- 1 Label Fig. 1-1 as directed.
- 2 Label Fig. 1-2 as directed.
- 3 Of the following organs, which ones are located in the right hypochondriacal region of the abdominal cavity?

Appendix	Liver
Ascending colon	Pancreas
Descending colon	Spleen
Gallbladder	Stomach

-
- 4 Which, if any, of the preceding organs are located in the epigastrium?

-
- 5 Which, if any, are located in the right iliac region?

-
- 6 Which, if any, are located in the hypogastric region?

-
- 7 In which region is the spleen located?

-
- 8 Which, if any, of the preceding organs are located in the left iliac region?
-

- 9 Notable characteristics of the human body's architectural plan are a backbone, bisymmetry, and, as you have observed, cavities containing numerous organs.

- a The diaphragm muscle forms the floor of a cavity located inside the rib cage. The name of this cavity is the

- b The large cavity below the diaphragm is named the

- c What organ occupies almost all of the space in the cranial cavity?

- d In what cavity is the spinal cord located?

- e Where are the internal reproductive organs located?

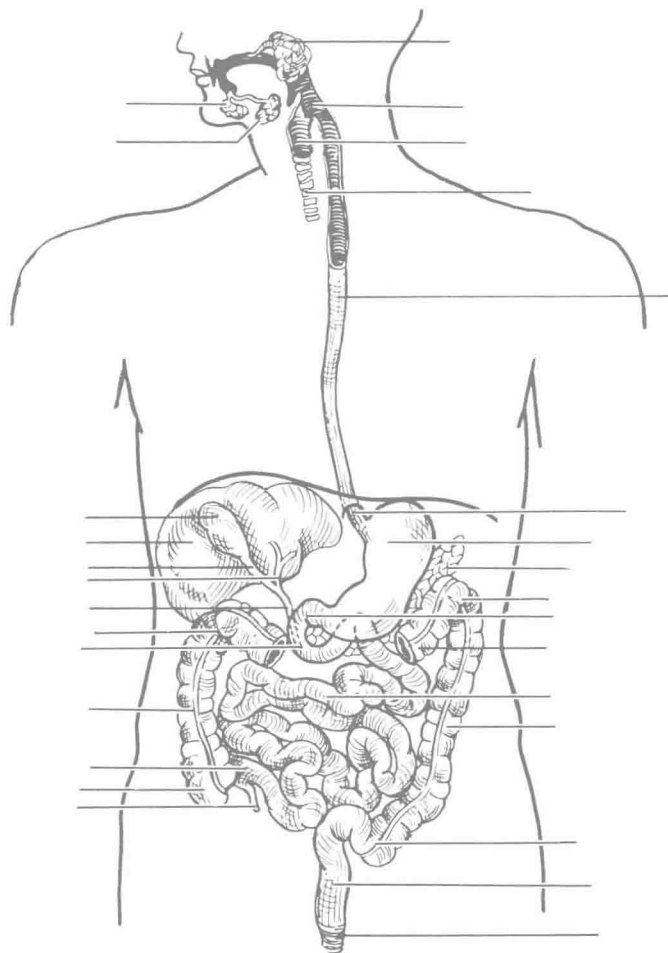


Fig. 1-1 Gastrointestinal tract.

Place each of the following terms opposite the appropriate label line after first identifying each structure on the torso model of the body:

Anus	Ileum	Region of ileocecal sphincter
Ascending colon	Jejunum	Region of pyloric sphincter
Cecum	Larynx	Sigmoid colon
Common bile duct	Liver	Splenic flexure
Cystic duct	Pancreas	Stomach
Descending colon	Parotid gland and duct	Sublingual gland
Duodenum	Pharynx	Submaxillary gland
Esophagus	Rectum	Trachea
Gallbladder	Region of cardiac sphincter	Transverse colon
Hepatic duct		Vermiform appendix
Hepatic flexure		