

***Gunstream's Anatomy & Physiology Laboratory
Textbook Essentials Version 7th edition LaPres
Solutions Manual***

SKU: 9780078097270-SOLUTIONS



Virtual Labs

Guided Exercises for Anatomy and Physiology Virtual Labs

CONTENTS

Applying the Scientific Method: Pillbug Preference.....	A-11
Blood – Blood Typing.....	A-13
Blood – Differential White Blood Cell Count.....	A-15
Blood – Hematocrit.....	A-17
Blood – Hemoglobin Content.....	A-19
Cardiovascular Physiology – Blood Pressure.....	A-21
Cardiovascular Physiology – Electrocardiography.....	A-23
Cardiovascular Physiology – Heart Auscultation.....	A-25
Cardiovascular Physiology – Pulse Rate.....	A-27
Cell Division – Examining Meiosis.....	A-29
Cell Division – Examining Mitosis.....	A-31
Chemical Composition of Cells – Test for Fat.....	A-33
Chemical Composition of Cells – Test for Proteins.....	A-35
Chemical Composition of Cells – Test for Starch.....	A-37
Diffusion – Diffusion Across a Selectively Permeable Membrane.....	A-39
Diffusion – Effect of Concentration on the Rate of Diffusion in a Semisolid.....	A-41
Digestive System – Enzymes and Digestion.....	A-43
Electromyography – Motor Unit Recruitment.....	A-45
Electromyography – Time to Fatigue.....	A-47

Endocrine System – Effects of Blood Glucose Level	A-49
Endocrine System – Influence of Thyroid Hormone on Temperature Regulation.....	A-51
Eye and Vision – Accommodation of the Lens.....	A-53
Eye and Vision – Astigmatism Test.....	A-55
Eye and Vision – Blind Spot Determination.....	A-57
Eye and Vision – Color Vision Test.....	A-59
Eye and Vision – Convergence Reflex Test.....	A-61
Eye and Vision – Eye Dissection.....	A-63
Eye and Vision – Pupillary Reflex Test.....	A-65
Eye and Vision – Visual Acuity Test.....	A-67
Human Genetics – Chromosomal Inheritance During Meiosis.....	A-69
Human Genetics – Genetic Inheritance.....	A-71
Microscopy – Animal Cells (Human Epidermal Cells)	A-73
Microscopy – Connective Tissue Histology.....	A-75
Microscopy – Epithelial Tissue Histology.....	A-77
Microscopy – Muscle Tissue Histology.....	A-79
Microscopy – Nervous Tissue Histology.....	A-81
Microscopy – Operation of a Brightfield Microscope.....	A-83
Nervous System – Demonstrate Monosynaptic Reflexes.....	A-85
Osmosis – Movement of Water Across a Selectively Permeable Membrane.....	A-87
Osmosis – Tonicity in Red Blood Cells.....	A-89
pH Balance – Antacids as Buffers.....	A-91
Respiratory System – Mechanism of Breathing.....	A-93
Respiratory System – Pulmonary Function Tests.....	A-95
Skeletal Muscle – Electrical Stimulation.....	A-97
Skeletal Muscle – Shoulder and Elbow Movement Exercise.....	A-99
Urinary System – Urinalysis.....	A-101

The purpose of this laboratory simulation is to practice using the steps of the scientific method. Students will design and analyze a controlled experiment using pillbugs. A hypothesis will be developed, a strategy will be established to test the hypothesis, experimental and control setups will be determined and conducted, and a conclusion will be drawn.

As you follow these steps, answer the corresponding questions:

1. Click the link to this *Virtual Lab* assignment that was set up by your instructor.
2. Read the Key Concepts.
 - a. What are the four main steps in the scientific method process?
(1) _____ (3) _____
(2) _____ (4) _____
 - b. What is the difference between a control group and a test (experimental) group?

 - c. What step in the scientific method provides a discussion to confirm or reject the original hypothesis?

 - d. If a hypothesis is confirmed, what do you think might be the next steps?

 - e. If a hypothesis is rejected, what do you think might be the next steps?

3. Read the Overview and watch the short animation.
4. Read Before you begin to receive background information about pillbugs.
5. Continue to the Laboratory Simulation.
6. Complete Phase 1: Hypothesis & Strategy. Each step needs to be completed before moving on to the next step. (Click the bottom tabs to review the Methods, Reset the experiment, add observations in My Notes, record Lab Data, or Show Labels.)
 - a. What is your hypothesis for this experiment? _____

 - b. What is your strategy? _____

7. Complete Phase 2: Experiment.
 - a. What is the variable being tested in the experimental group?

8. Complete Phase 3: Graph and analyze data. Identify the x-axis and y-axis, select line graph from the graph type drop down menu. Click to “CREATE” and “SAVE” the graph. Answer the following questions:

a. Where was the greatest difference in the number of pillbugs at the end of the 12 minutes?

b. Was this greatest difference found in the experimental setup or the control setup or in a combination of both?

9. Complete Phase 4: Conclusion.

a. Did the experiment results confirm or reject your original hypothesis? Explain.

10. Complete Phase 5: Save Lab Data. Look for the “Congratulations” message that the finished lab has been automatically submitted. Read the options to save the lab data.

CRITICAL THINKING ASSESSMENT – Virtual Lab

Develop a different hypothesis that you could test using pillbugs.

Share your strategy for testing your hypothesis.

What is your experimental group setup?

What is your control group setup?

The purpose of this laboratory simulation is to determine and evaluate the ABO and Rh blood types of the samples.

As you follow these steps, answer the corresponding questions:

1. Click the link to this *Virtual Lab* assignment that was set up by your instructor.

2. Read the Key Concepts.

a. Where are antigens that determine ABO and Rh blood types located?

b. If present, where are antibodies for blood typing located? _____

c. Complete the table:

Blood type	Antigen	Antibodies	Can donate to	Can receive from
A				
B				
AB				
O				
Rh positive				
Rh negative				

3. Read the Overview.

a. Why do you think it is critical to know a person's blood type prior to a blood transfusion?

4. Read Before you begin and make sure you are familiar with the terms.

a. What type of organic compound is an antigen? _____

b. What do antibodies do? _____

c. When agglutinins bind to agglutinogens, the agglutinogens clump together. What is the clumping of red blood cells in blood typing called? _____

d. What is the fluid containing antibodies called? _____

e. What does "anti-A" mean? _____

f. What does "anti-B" mean? _____

g. What does "anti-D" mean? _____

h. The blood samples that _____ determine the blood type.

5. Continue to the Laboratory Simulation.

6. Complete Phase 1: Blood lab equipment. Each step needs to be completed before moving on to the next step. (Click the bottom tabs to review the Methods, Reset the experiment, add observations in My Notes, record Lab Data, or Show Labels.)

7. Complete Phase 2: Blood Sample 1.

a. What would happen if the same toothpick were used on each blood sample?

b. What is the blood type (ABO and Rh) of Sample 1? _____

8. Complete Phase 3: Blood Sample 2.

a. What is the blood type (ABO and Rh) of Sample 2? _____

9. Complete Phase 4: Blood Sample 3.

a. What is the blood type (ABO and Rh) of Sample 3? _____

10. Complete Phase 5: Determine transfusion compatibility.

a. Can Rh⁻ individuals receive blood from Rh⁺ individuals? Why or why not?

b. The results of this chart show that blood type _____ is a universal recipient.

11. Complete Phase 6: Save Lab Data. Look for the “Congratulations” message that the finished lab has been automatically submitted. Read the options to save the lab data.

CRITICAL THINKING ASSESSMENT – Virtual Lab

An individual has blood type AB⁺. What blood type(s) can this individual donate to?

An individual has blood type O⁺. What blood type(s) can this individual donate to?

An individual has blood type B⁻. What blood type(s) can this individual donate to?

What should be removed from the blood of blood type A⁻ before donating it to an individual with AB⁺ blood?



Blood – Differential White Blood Cell Count

The purpose of this laboratory simulation is to use a brightfield microscope to conduct a differential white blood cell count (DIFF) to distinguish the types and amount of each type of white blood cells in a prepared slide of whole blood.

As you follow these steps, answer the corresponding questions:

1. Click the link to this *Virtual Lab* assignment that was set up by your instructor.
2. Read the Key Concepts.
 - a. What is another name for a white blood cell (WBC)? _____
 - b. What does a DIFF measure? _____
 - c. Why might a DIFF be done? _____

 - d. The most abundant of the granulocytes are _____
 - e. The most abundant of the agranulocytes are _____
3. Read the Overview.
 - a. What magnification will be used to distinguish the WBCs? _____
4. Read Before you begin.
 - a. How should the microscope slide be moved through one field of view at a time?

 - b. If you count 10 lymphocytes, what is the percentage of lymphocytes in your DIFF? _____ Is this a normal count for lymphocytes? _____
5. Continue to the Laboratory Simulation.
6. Complete Phase 1: WBC identification. Each step needs to be completed before moving on to the next step. (Click the bottom tabs to review the Methods, Reset the experiment, add observations in My Notes, record Lab Data, or Show Labels.)
 - a. Which WBC has bright red granules? _____
 - b. Which WBC has a bean-shaped nucleus? _____
7. Complete Phase 2: Lab equipment.
8. Complete Phase 3: Preparation of blood smear.
 - a. What stain was used on the blood smear slide? _____
9. Complete Phase 4: Microscope differential count.
 - a. What is the most common WBC? _____
 - b. Which WBC has a multilobed nucleus and pink granules? _____
 - c. Which WBC is typically the largest in size? _____
10. Complete Phase 5: Lab wrap-up.
 - a. Which type of leukocyte (WBC) is the least numerous agranulocyte in the blood? _____
 - b. Which type of leukocyte (WBC) is the least numerous granulocyte in the blood? _____

11. Complete Phase 6: Save Lab Data. Look for the “Congratulations” message that the finished lab has been automatically submitted. Read the options to save the lab data.

CRITICAL THINKING ASSESSMENT – Virtual Lab

A cancer patient being treated using chemotherapy has a DIFF that shows a lower than normal number of neutrophils. What is this called? _____

Why might chemotherapy cause this condition? _____

What is a concern in having this condition? _____

This patient is given Neulasta[®], a drug that stimulates myeloid growth factors. What is the target and effect of this drug? _____

The purpose of this laboratory simulation is to measure and evaluate the hematocrit (HCT) of blood samples from three athletes to determine if any of them have blood doped.

As you follow these steps, answer the corresponding questions:

1. Click the link to this *Virtual Lab* assignment that was set up by your instructor.
2. Read the Key Concepts.
 - a. Define *hematocrit (HCT)*. _____
 - b. What is the normal HCT range for adult males? _____ Females? _____
 - c. What might cause an abnormal elevation in HCT? _____

 - d. What is “blood doping”? _____
3. Read the Overview.
 - a. A blood sample that is doped is the _____ control.
 - b. A blood sample that is not doped is the _____ control.
4. Read Before you begin.
 - a. What do you think the centrifuge does to the blood sample? _____

5. Continue to the Laboratory Simulation.
6. Complete Phase 1: Identify lab equipment. Each step needs to be completed before moving on to the next step. (Click the bottom tabs to review the Methods, Reset the experiment, add observations in My Notes, record Lab Data, or Show Labels.)
 - a. Notice that the capillary tubes are heparinized. What do you think this means?

7. Complete Phase 2: Positive control sample.
 - a. Is the clay end of the capillary tube facing the outside or center of the centrifuge? _____
8. Complete Phase 3: Negative control sample.
 - a. Why is the negative control sample capillary tube placed directly across from the positive control sample capillary tube?

9. Complete Phase 4: Sample A.
10. Complete Phase 5: Sample B.
11. Complete Phase 6: Sample C.
12. Complete Phase 7: Balance and run the centrifuge.
 - a. Based upon your lab data, which sample shows that the athlete has blood doped? _____
Explain your reasoning. _____

13. Complete Phase 8: Lab wrap-up.

- a. What is the relationship between hematocrit and oxygen-carrying capacity of the blood?

14. Complete Phase 9: Apply what you have learned.

- a. What blood sample represented a person likely to have been blood doping?

- b. There is a blood sample that had a higher hematocrit than the negative control but was not likely a person to have been blood doping? Why? _____

15. Complete Phase 10: Save Lab Data. Look for the “Congratulations” message that the finished lab has been automatically submitted. Read the options to save the lab data.

CRITICAL THINKING ASSESSMENT – Virtual Lab

Injection of erythropoietin (EPO) is a blood doping method that an athlete may use to give a competitive edge; therefore, EPO is used as a performance-enhancing drug. What does EPO do? _____

Provide a convincing argument as to the risks associated with taking this drug and why the athlete should refrain from blood doping. _____

The purpose of this laboratory simulation is to measure the hemoglobin (Hb) content of blood samples from three athletes to determine if any of them have blood doped.

As you follow these steps, answer the corresponding questions:

1. Click the link to this *Virtual Lab* assignment that was set up by your instructor.
2. Read the Key Concepts.
 - a. Define *hemoglobin (Hb)*. _____
 - b. About how much of a red blood cell consists of hemoglobin? _____
 - c. What is the normal Hb range for adult males? _____ Females? _____
 - d. “Blood doping” will raise or lower hemoglobin content. _____
 - e. If hemoglobin content increases, so does blood _____.
3. Read the Overview.
 - a. A blood sample that is doped is the _____ control.
 - b. A blood sample that is not doped is the _____ control.
4. Read Before you begin.
 - a. What does a hemoglobinometer do? _____

 - b. Hb is measured in g Hb/100 mL or g Hb/dL. How many milliliters (mL) are in 1 deciliter (dL)? _____
5. Continue to the Laboratory Simulation.
6. Complete Phase 1: Identify lab equipment. Each step needs to be completed before moving on to the next step. (Click the bottom tabs to review the Methods, Reset the experiment, add observations in My Notes, record Lab Data, or Show Labels.)
 - a. What does the word *hemolysis* mean? _____

7. Complete Phase 2: Positive control sample.
 - a. Is the hemoglobin (Hb) content below or above or within normal range? _____
8. Complete Phase 3: Negative control sample.
 - a. Is the hemoglobin (Hb) content below or above or within normal range? _____
9. Complete Phase 4: Sample A.
 - a. Is the hemoglobin (Hb) content below or above or within normal range? _____
10. Complete Phase 5: Sample B.
 - a. Is the hemoglobin (Hb) content below or above or within normal range? _____
11. Complete Phase 6: Sample C.
 - a. Is the hemoglobin (Hb) content below or above or within normal range? _____
12. Complete Phase 7: Lab wrap-up.
 - a. Which athlete likely blood doped? _____

13. Complete Phase 9: Apply what you have learned.

- a. What characteristic of blood does Hb content measure? _____
- b. What other blood test can also be used to measure this characteristic? Explain.
- _____

14. Complete Phase 10: Save Lab Data. Look for the “Congratulations” message that the finished lab has been automatically submitted. Read the options to save the lab data.

CRITICAL THINKING ASSESSMENT – Virtual Lab

A prevalent nutritional deficiency is iron deficiency. How would this affect hemoglobin content and the relative size of red blood cells (mean corpuscular volume, MCV)? Explain.

Some of the symptoms an individual with iron deficiency might experience is general weakness, lack of energy, and shortness of breath. Explain why. _____

CONTENTS

Preface 3

Section I

Major Suppliers 4
 Equipment and Supplies 6
 Supplies and Glassware 7
 Chemicals, Reagents, and Biologicals 7
 Prepared Microscope Slides 8
 Living, Preserved, and Fresh Slaughterhouse Materials 8
 Solution Preparations 9
 Microscopic Study 11
 Infection Control 11

Section II

Section III

*Operational
Suggestions*

*Laboratory
Reports*

Exercise

Unit 1: Introduction to Anatomy

1. Introduction to Human Anatomy and Body Organization	12	18
2. Microscopes	12	25

Unit 2: The Skeletal System

3. Cellular Anatomy and Mitosis	12	28
4. Membrane Transport	13	33
5. Histology	13	36

Unit 3: Protection, Support, and Movement

6. The Integumentary System	13	40
7. Skeletal Overview	14	43
8. The Axial Skeleton	14	47
9. The Appendicular Skeleton	14	53
10. Articulations and Body Movements	14	56
11. Muscle Organization and Contractions	14	59
12. Axial Muscles	14	62
13. Appendicular Muscles	15	64

Unit 4: Control and Integration

14. The Spinal Cord and Reflex Arcs	15	72
15. The Brain	15	74
16. Senses	15	79
17. The Endocrine System	15	85

<i>Exercise</i>	<i>Operational Suggestions</i>	<i>Laboratory Reports</i>
Unit 5: Internal Transport and Gas Exchange		
18. Blood Tests	15	89
19. The Heart	16	91
20. Blood Vessels	16	94
21. The Lymphoid System	16	98
22. The Respiratory System	16	99
Unit 6: Nutrient Absorption and Water Balance		
23. The Digestive System	17	103
24. The Urinary System	17	109
Unit 7: Reproduction		
25. The Reproductive System	17	113

PREFACE

This Instructor's Manual is provided to facilitate the preparation, setup, and operation of the laboratory exercises, including grading or checking students' responses to items on the laboratory reports. It is divided into three sections: I, II, and III.

Section I contains information pertaining to the procurement of equipment and supplies and the preparation of the laboratory exercise. A list of major suppliers of equipment and supplies is included to facilitate contacting vendors. Separate lists of equipment, supplies and glassware, chemicals, prepared slides, living material, preserved material, and slaughterhouse specimens are provided.

Section II provides operational suggestions for the successful setup and operation of each exercise. Lists of equipment and materials are not included here since they are provided at the beginning of each exercise in the laboratory textbook.

Section III contains copies of the Laboratory Reports to which the answers to the questions and problems have been added. Instructors may use the answers to grade students' Laboratory Reports and assess student understanding, or the answers may be posted to provide quick feedback to the students.

We hope that you find this Instructor's Manual helpful in the operations of the laboratory sessions. If you have specific suggestions or encounter difficulties in the laboratory exercises, please contact the authors in care of McGraw-Hill Higher Education, 501 Bell Street, Dubuque, IA, 52001.

Section I

Major Suppliers

Equipment

Clay Adams

Becton, Dickinson and Co.
1 Becton Drive
Franklin Lakes, NJ 07417
(201) 847-6800
www.bd.com

Harvard Apparatus Co.

84 October Hill Road
Holliston, MA 01746
(800) 272-2775
www.harvardapparatus.com

Phipps and Bird

P.O. Box 27324
8741 Landmark Road
Richmond, VA 23261
(800) 955-7621
www.phippsbird.com

Propper Manufacturing Co., Inc.

3604 Skillman Avenue
Long Island City, NY 11101
(800) 832-4300
www.proppermfg.com

VWR Science Education

VWR Scientific Products
P.O. Box 5229
Buffalo Grove, IL 60089
(800) 727-4368
www.vwr.com

General Supplies

Carolina Biological Supply Co.

2700 York Road
Burlington, NC 27215
(800) 334-5551
www.carolina.com

Central Scientific Co.

911 Commerce Court
Buffalo Grove, IL 60089
(847) 451-0110
www.cenco.com

Fisher Scientific Co.

(Home Office)
585 Alpha Drive
Pittsburgh, PA 15238
(800) 766-7000
www.fishersci.com

Wards Natural Science Establishment, Inc.

P.O. Box 1712
Rochester, NY 14603
(800) 962-2660
www.wardsci.com

Biochemicals

Calbiochem-Novabiochem Corp.

10394 Pacific Center Court
San Diego, CA 92121
(800) 854-3417
www.calbiochem.com

Becton-Dickinson and Company

(Microbiology products)
1 Becton Drive
Franklin Lakes, NJ 07417
(410) 316-4200
www.bd.com

Sigma Chemical Co.

3300 S. Second Street
St. Louis, MO 63118
www.sigma.com

MAJOR SUPPLIERS

Surgical Instruments

Central Scientific Co.

911 Commerce Court
Buffalo Grove, IL 60089
(847) 451-0110
www.cenco.com

Fisher Scientific Co.

(Home Office)
585 Alpha Drive
Pittsburgh, PA 15238
(800) 766-7000
www.fishersci.com

Propper Manufacturing Co., Inc.

3604 Skillman Avenue
Long Island City, NY 11101
(800) 832-4300
www.proppermfg.com

Animal Cages

Lab Products, Inc.

742 Sussex Avenue
P.O. Box 639
Seaford, DE 19973 (800)
526-0469
www.labproductsinc.com

EQUIPMENT AND SUPPLIES

The equipment and supplies used in exercises of the Anatomy and Physiology Laboratory Textbook, Essentials Version are noted in the cumulative lists below.

Equipment

anatomical wall charts	pipetting devices
boards, frog	ring stands
centrifuge, microhematocrit (Clay Adams)	skeleton, adult human, articulated
clamps	skeleton, adult human, disarticulated
dissecting pans, wax	skeleton, fetal human, articulated
bottom femur, human,	skulls, adult human with removable top of cranium
split hammers, reflex	slide warming box (blood typing)
testing	Snellen eye charts
hot plates, electric	sphygmomanometers
Ishihara's Test Plates for Color	spirometers, Propper
Blindness knife, butcher	stethoscopes, flat diaphragm
lamps, laboratory	stopwatches or watches with second hands
type meter sticks	syringes, hypodermic (1, 5, 10 ml)
microscopes,	test tube holders
compound	test tube racks, Wasserman type
microscopes,	thermometer, glass, F/C
dissecting Models:	tube reader for hematocrit
brain, with removable parts	tuning forks
ear, with removable parts	vertebral column, wired together
eye, with removable parts	water baths
cell, generalized	
head, sagittal section	
heart	
joints: knee; shoulder	
lungs, corrosion preparation of	
airways	
reproductive organs, male and	
female	
skin	
spinal cord, x.s.	
torso with removable organs	
urinary system	
pelves, male and female	

Supplies and Glassware

alcohol wipes
 bags, biohazard
 bags, paper, for hyperventilation
 baskets, wire, 6"
 beakers, 50, 150, 250, 1,000 ml
 bottles, cropping
 brushes, test tube
 capillary tubes, plain, .5 ml diam.
 Checkstix (Ames) for urine unknowns
 cotton, absorbent and nonabsorbant
 cover glasses, cotton
 cups, paper
 cups, plastic with cover, 4 oz. for urine collection
 dialysis sheets (for osmometers)
 dissecting instruments
 files, 3-cornered, 6-8" long
 flasks, Erlenmeyer, 125, 250 ml
 frog boards with wrapping cloths
 Kimwipes
 lancets, sterile, disposable
 medicine droppers
 microscope slides, depression type
 microscope slides, plain
 microscope slides, plain with polished edges
 mouthpieces for Propper spirometers, sterile,
 disposable

Multistix, 10SG urinalysis test strips
 needles, hypodermic syringe, 22 gauge
 paper, bibulous
 paper, filter
 paper, lens
 paper, pH indicator
 Parafilm pencils,
 colored pens, glass
 marking
 Petri dishes, plastic disposable
 pins, common
 pins, dissecting pipe
 cleaners pipettes, 1,
 5, 10 ml rubber
 bands
 rulers, clear plastic, metric, 6"
 Seal-Ease (Clay Adams)
 straws, plastic drinking
 string
 tape, masking
 tape, Scotch
 test tubes, 13, 16 mm diameter
 thistle tubes (for osmometers)
 thread, cotton
 toothpick
 towels, paper
 wash bottles, plastic

Chemicals, Reagents, and Biologicals

acetylcholine
 agar-agar
 alcohol, isopropyl
 alpha amylase
 Amphyl solution
 blood, fresh sheep
 blood typing antisera (anti A, B, D)
 buffer solutions, pH 5, 7, 9
 electrode gel
 epinephrine (bitartrate salt)
 glucose
 histamine
 household bleach or Lysol disinfectant

India ink
 iodine solution (IKI)
 maltose
 methylene blue granules
 methylene blue stock solution
 petroleum jelly
 potassium permanganate granules
 Ringer's solution, frog
 sodium chloride
 starch, soluble
 Wright's blood stain
 xylene

Prepared Microscope Slides

adrenal gland	letter e
artery, atherosclerotic, x.s.	liver
artery and vein, x.s.	lung, emphysematous
blood, human, Wright's stain	lung, normal
cochlea, x.s.	lymph node, x.s.
connective tissues proper	mitosis:
adipose	<i>Ascaris</i> mitosis
bone, l.s., x.s.	whitefish blastula
dense fibrous	muscle tissues
loose (areolar)	cardiac, teased and unteased
reticular	smooth, teased and unteased
connective tissues special	skeletal, teased and unteased
bone, compact, l.s., x.s.	nasal septum
cartilage	neuron smears, multipolar
elastic	ovary, corpus luteum
fibrocartilage	ovary, mature follicles
hyaline	pancreas
epithelial tissues	parathyroid gland
simple	pineal gland
ciliated columnar	pituitary gland
cuboidal	retina through fovea centralis
nonciliated columnar	salivary gland
squamous	skin, human keratinized
pseudostratified ciliated	skin, human, nonkeratinized
columnar nonciliated	sperm, human
columnar	spinal cord, rat, x.s.
stratified	stomach
columnar	wall, fundus, x.s.
squamous	taste buds
transitional	on vallate papillae testis,
hair follicle	human
ileum	thymus gland
wall, x.s.	thyroid gland
jejunum	trachea, human, x.s.
wall, x.s.	trachea, rat, x.s.
kidney	

Preserved Materials

brain, human	kidneys, sheep, triple injected
brains, sheep	rats

Fresh Slaughterhouse (or Preserved) Materials

beef eyes	sheep hearts
beef femurs, split	sheep kidneys
beef knee joints, split	sheep plucks, minus livers

SOLUTION PREPARATIONS

Recipes for preparing the solutions used in the exercises are listed below in alphabetical order.

Buffer Solution, pH 5 (Ex. 34)

Make up 1 liter each of the following solutions:

M/10 potassium acid phthalate

20.418 gm. $\text{KHC}_8\text{H}_4\text{O}_4$ to distilled water to make one liter

M/10 sodium hydroxide

4.0 gm. sodium hydroxide to distilled water to make one liter.

Use 50 ml. of the first solution and 23.9 ml. of the second solution to make 73.9 ml. of pH 5 buffer solution.

Buffer Solution, pH 7 (Ex. 34)

Make up 1 liter each of the following solutions:

M/15 potassium acid phosphate

9.08 gm. KH_2PO_4 to distilled water to make one liter.

M/15 disodium phosphate

9.47 gm. Na_2HPO_4 (anhydrous) to distilled water to make one liter.

Use 38.9 ml. of the first solution and 61.1 ml. of the second solution to make 100 ml. of pH 7 buffer solution.

Buffer Solution, pH 9 (Ex. 34)

Make up 1 liter each of the following solutions:

.2M boric acid

5.96 gm. H_3BO_3 to distilled water to make one liter.

.2M potassium chloride

14.89 gm. KCl to distilled water to make one liter.

.2M sodium hydroxide

8 mg. NaOH to distilled water to make one liter.

Use 50 ml. each of the first two solutions, 21.5 ml. of the third solution and dilute to 200 ml. of distilled water.

This solution is used with most amphibian muscle and nerve preparations. Frog skin and toad bladder preparations can also be handled with this saline solution.

NaCl 6.02 gm.

KCl 0.22 gm.

CaCl_2 0.22 gm.

NaHCO_3 2.00 gm.

Glucose 1.00 gm.

Distilled water to make 1 liter

Iodine (IKI) Solution (Ex. 34)

Potassium iodide	20 gm
Iodine crystals	4 gm
Distilled water	1 liter

Dissolve the potassium iodide in 1 liter of distilled water and add the iodine crystals, stirring to dissolve. Store in dark bottles.

Salivary Amylase Solution, 10% (Ex. 34)*Materials*

Beaker, 250 ml

Dropping bottles

Graduated cylinder, 50 ml

Paraffin

1. After rinsing your mouth with water, place a small piece of paraffin under your tongue to soften it prior to chewing to stimulate saliva flow.
2. Expectorate into a 50-ml graduated cylinder until you have collected 10 ml of saliva not counting the foam.
3. Add distilled water, adjusted to pH 7, to the 50-ml mark and pour the mixture into the beaker.
4. Refill the graduate with distilled water, agitate gently to mix, and pour it into the beaker. Stir the contents in the beaker thoroughly.
5. Dispense the 10% saliva solution into labeled dropping bottles.

Soluble Starch Solution, 1% (Ex. 34)

Add 10 g cornstarch to 1 liter of distilled water. Stir to mix. Heat just to boiling, cool, and filter. Keep refrigerated until used.

MICROSCOPIC STUDY

Several of the exercises involve microscopic study of prepared slides. However, some students may tend to consider observation of the photomicrographs sufficient rather than studying the microscope slides. Students should be warned that this behavior will not prepare them for laboratory practicums. Making labeled drawings of microscopic observations is still a good learning technique.

INFECTION CONTROL

Safety procedures for infection control should be carefully followed to prevent the transmission of infectious agents. Exercises where infection control is especially important are: 4 Membrane Transport; 18 Blood Tests; 22 The Respiratory System; 23 The Digestive System; and 24 The Urinary System. Instructors are urged to consider infection control when using these techniques. The safeguards for blood tests listed at the beginning of Exercise 18 are also applicable to the use of saliva and urine in laboratory experiments. Advise students of the procedures that you wish to have followed.

Alcohol swabs are widely used for cleansing the skin or objects, but they are only fair sanitizing agents. Disinfection requires using a suitable disinfectant, such as 10% household chlorine bleach or 0.5% Amphyl. Disposable items in contact with body fluids should be placed immediately after use in a biohazard bag or sharps container and autoclaved before disposal. Nondisposable items should be disinfected chemically or autoclaved prior to cleaning.

SECTION II

Operational Suggestions

1. INTRODUCTION TO HUMAN ANATOMY AND BODY ORGANIZATION

During the first lab session, it is helpful to review the “To The Student” section with the class in order to set the stage for productive laboratory activity. At this time you should emphasize the student behaviors that you want to encourage and identify your expectations of the students.

The first laboratory period usually involves the orientation session plus Exercise 1. Students will not have had time to label the figures prior to the lab session, so the entire exercise will be completed in the lab. This exercise causes no difficulty for students. The use of wall charts and a torso model helps students visualize the body regions and cavities.

The portion of this exercise that summarizes the organ systems of the body, including the Laboratory Report, should be completed prior to the lab session so that students are prepared for the dissection of a freshly-killed rat. The purpose of this dissection is to provide an overview of mammalian anatomy, observation of fresh tissues and organs, and location of the major organs of the ventral cavity. It is not intended as a detailed dissection, such as when using a cat or fetal pig as a dissection animal.

We use young mature rats, 50% male and 50% female. This allows all students to observe the anatomy of urinary and reproductive organs by exchanging specimens. If using fresh-killed rats, the rats are killed just prior to the lab session by placing them in a large crock containing chloroform-soaked cotton. The lid is sealed with masking tape. Allow 45 minutes for killing.

This is a good time to explain to students the importance of using disposable protective gloves when doing dissections and handling body fluids. Students have little trouble with the dissection if they follow the directions carefully. They should be reminded that the purpose of dissection is to expose tissues and organs for study and that tissue damage should be kept to a minimum. It is necessary to pry open the mouth to examine the teeth. Cutting a cheek on one side helps to expose the molars.

Time allotment: 2 to 2.5 hours

2. MICROSCOPES

It is helpful if students complete sections A through C on the Laboratory Report prior to the lab session. The required microscopic observations provide additional opportunities for students to improve their microscopy skills as well as observing cellular structures. If you have a microscope video system available, it can be used to good advantage in this exercise and others involving microscopic study.

Some students may need assistance in comprehending depth of field and in learning how to focus through the depth of a hair.

Time allotment: 1 to 2 hours

3. CELLULAR ANATOMY AND MITOSIS

Students should study this exercise and complete sections A through D on the Laboratory Report prior to the lab session. The required microscopic observations provide additional opportunities for students to improve their microscopy skills as well as observing cellular structures. If you have a microscope video system available, it can be used to good advantage in this exercise and others involving microscopic study.

Whitefish blastula slides are used for study because they clearly show the pattern of chromosome movement. Students may need to be reminded to make drawings of the stages as they discover them on the slide and not to search for them in the order of the mitotic sequence.

Time allotment: 1 to 1.5 hours