APPENDIX 1
SOURCES OF EQUIPMENT AND SOLUTIONS

Note: Many of these vendors are undergoing address or telephone changes and closures of satellite offices. Please notice that many of these companies have toll-free telephone and/or FAX numbers for your convenience. Many larger suppliers have internet home pages, complete with catalogs and help features for ordering supplies through websites. Where available, this list includes internet addresses and website information.

Aloe Scientific Company
5655 Kingsburg
St. Louis, MO 63112

Baltimore Biological Lab., Inc.
1640 Grosuch Avenue
Baltimore, MD 21204

Bico Scientific Company
2325 South Michigan
Chicago, IL 60616

Bio-Analytic Laboratories, Inc.
3473 Palm City School Road
P.O. Box 388
Palm City, FL 34991
(772) 287-3340
(800) 327-8282

Biocom, Inc.
9522 West Jefferson Boulevard
Culver City, CA 90230

Calbiochem
10933 North Torrey Pines Road
La Jolla, CA 92037

Carolina Biological Supply Co.
2700 York Road
Burlington, NC 27215
Customer Service: (800) 334-5551
(800) 334-5551 (Main office)
(800) 547-1733 (West Coast)
www.carolina.com

Central Scientific Company
2600 South Kostner Avenue
Chicago, IL 60623

Chembio Diagnostic Systems, Inc.
3661 Horseblock Rd.
Medford, NY 11763
(631) 924-1135

Clay-Adams Company
141 East Twenty-fifth Street
New York, NY 10037

College Biological Supply Company
Box 25017 Northgate Station
Seattle, WA 98125

Curtin Matheson Scientific, Inc.
General Offices
P.O. Box 1546
Houston, TX 77251-1546
(713) 820-9898
(713) 878-2221 FAX

Denoyer-Geppert Company
5235 Ravenswood Avenue
Chicago, IL 60640

E & M Instrument Company, Inc.
150 Endicott Street
Norwood, MA 02062

Faust Scientific Supply Co.
Madison, WI 53713

Fisher General Scientific (SEA)
1232 North Honore Street
Chicago, IL 60622
USA:
(800) 766-7000
(800) 926-1166 FAX
www.fisher1.com
Canada:
(800) 2FISHER, or
(800) 234-7437
www.fishersci.ca

Gilson Medical Electronics
3000 West Beltline Highway
Middleton, WI 53562

Hardy Diagnostics
1430 McCoy Lane
Santa Maria, CA 93455
(800) 266-2222
www.hardydiagnostics.com

Harvard Apparatus Co., Inc.
150 Dover Road
Millis, MA 02054

Lapine Scientific Company
6001 South Knox Avenue
Chicago, IL 60629

Macalaster Scientific Corp.
Waltham Research and Developmental Park
186 Third Avenue
Waltham, MA 02154

Medical Analysis Systems, Inc.
Lincoln Technology Park
542 Flynn Road
Camarillo, CA 93012
(800) 582-3095
(805) 987-7891
www.mas.inc.com

Medical Plastics Laboratory
P.O. Box 38
Gatesville, TX 76528

Merck and Company, Inc.
Rahway, NJ 07065

Narco Bio-Systems, Inc.
7651 Airport Boulevard
Houston, TX 77017

Nasco, Inc.
Fort Atkinson, WI 53538

Niles Biological
9298 Elder Creek Road
Sacramento, CA 95829
(916) 386-2665

Phipps and Bird, Inc.
303 South Sixth Street
Richmond, VA 23205

Sargent-Welch Scientific Co.
P.O. Box 5229
Buffalo Grove, IL 60089
(800) 727-4368

Sigma Chemical Company
P.O. Box 14508
St. Louis, MO 63178
(800) 325-3010
custserv@sial.com Email
www.sigma-aldrich.com

Stanbio Laboratory, Inc.
1261 North Main Street
Boene, TX 78006
(830) 249-0772
(800) 531-5535

Turtox/Cambosco
Macmillan Science Company
8200 Hoyne Avenue
Chicago, IL 60620

VWR Scientific Products, Sargent Welch
P.O. Box 5229
Buffalo Grove, IL 60089-5229
(800) 932-5000
(800) 477-4897 FAX
sarwel@sargentwelch.com Email
www.sargentwelch.com
www.vwrsp.com

Ward's Biology
P.O. Box 92912
Rochester, NY 14692-9012
(800) 962-2660
(800) 635-8439 FAX
www.wardsci.com

Warren E. Collins, Inc.
220 Wood Road
Braintree, MA 02184
(800) 225-5157

West Coast Scientific Company
P.O. Box 2947
Oakland, CA 94618

COMMONLY USED SOLUTIONS

Benedict's Reagent

1. Dissolve 50 g sodium carbonate, 85.0 g sodium citrate, and 8.5 g copper sulfate in 5.0 liters of water.

Biuret Reagent

1. Add 45 g of sodium potassium tartate and 15 g of $CuSO_4$-$5H_20$ to a 1.0 liter volumetric flask.
2. Fill the flask three quarters full with 0.2 N NaOH and shake to dissolve.
3. Add 5.0 g of potassium iodide, and fill to 1.0 L volume with 0.2 N NaOH.

Developing Solvent for Thin-layer Chromatography

Exercise 2.2 - Amino Acids:

1. 20 ml 17% NH_4OH (dilute concentrated NH_4OH with an equal amount of water), 40 ml ethyl acetate, and 40 ml methanol per developing chamber. Final mixture ratio is 1:2:2

Exercise 4.2 - Steroid hormones:

1. The developing solvent should be mixed in a 6:1:1 volume ratio of toluene, ethyl acetate, and acetone in whatever volume is appropriate for your class size. For example: 60 ml: 10 ml: 10 ml

Ringer's Solution

1. Dissolve 6 g NaCl, 0.075 g KCl, 0.10 g $CaCl_2$, and 0.10 g $NaHCO_3$ in 1.0 liter of water.

Other solutions used in the lab are mixed to molar, molal, normal, or g/dl concentrations, and those concentrations are listed in the exercises themselves.

APPENDIX 2
MULTIMEDIA CORRELATIONS

The laboratory experience may be enriched with the use of computers that can receive data from the ongoing exercise, store and collate this data, and help students to analyze it. Computer-assisted data acquisition and analysis can be performed, for example, using equipment made available from *Biopac Systems, Inc*. and *Intelitool* from Phipps & Bird/Intelitool. Where appropriate, instructions for the use of this equipment is included with the individual exercises in this laboratory guide. However, for the convenience of planning the laboratory curriculum, the use of this equipment for all of the laboratory exercises is summarized here.

The laboratory may also be a good time to incorporate supplementary computer-assisted instruction into the physiology curriculum. For example, there are computer programs that include instruction and animations that supplement more theoretical information. Two such programs are *A.D.A.M. InterActive Physiology*, from A.D.A.M. and Benjamin Cummings, Publishers, and *MediaPhys 2.0* from McGraw-Hill Publishers. The exercises that correlate with these programs are listed below.

SECTION 1

Exercise 1.3: Homeostasis and Negative Feedback

- *MediaPhys 2.0*: Topics 1.3–1.6

SECTION 2

Exercise 2.6: Diffusion, Osmosis, and Tonicity

- *MediaPhys 2.0*: Topics 3.9–3.24

SECTION 3

Exercise 3.1: Recording the Nerve Action Potential

- *A.D.A.M. InterActive Physiology* (Nervous System I): The Action Potential (orientation, anatomy review)
- *MediaPhys 2.0:* Topics 3.27–3.34; Topics 4.4–4.22

Exercise 3.2: Electroencephalogram (EEG)

- *Biopac* Student Lab lessons 3 and 4
- *A.D.A.M. InterActive Physiology* (Nervous System I): Ion Channels; The Membrane Potential

Exercise 3.3: Reflex Arc

- *Intelitool*: *Flexicomp*

SECTION 4

Exercise 4.1: Histology of the Endocrine Glands

- *MediaPhys 2.0*: Topics 12.17–12.51

SECTION 5

Exercise 5.1: Neural Control of Muscle Contraction

- *A.D.A.M. InterActive Physiology* (Muscular System): The Neuromuscular Junction
- *MediaPhys 2.0*: Topic 5.10
- *Physiology Interactive Lab Simulations: Skeletal Msucle Functionl* (exercises 1, 2, and 3).

Exercise 5.2: Summation, Tetanus, and Fatigue

- *Intelitool*: *Physiogrip*
- *A.D.A.M. InterActive Physiology* (Muscular System): Contraction of Motor Units; Contraction of Whole Muscle
- *MediaPhys 2.0*: Topics 5.16–5.18
- *Physiology Interactive Lab Simulations: Skeletal Msucle Functionl* (exercises 1, 2, and 3).

Exercise 5.3: Electromyogram (EMG)

- *Biopac*: Student Lab lessons 1 and 2
- *Intelitool*: *Flexicomp*
- *A.D.A.M. InterActive Physiology* (Muscular System): The Neuromuscular Junction; Contraction of Motor Units
- *Physiology Interactive Lab Simulations: Skeletal Msucle Functionl* (exercises 1, 2, and 3).

SECTION 6

Exercise 6.1: Red Blood Cell Count, Hemoglobin, and Oxygen Transport

- *MediaPhys 2.0*: Topics 10.37–10.44

SECTION 7

Exercise 7.1: Effects of Drugs on the Frog Heart

- *A.D.A.M. InterActive Physiology* (Cardiovascular System): Cardiac Cycle

Exercise 7.2: Electrocardiogram (ECG)

- *Biopac*: Student Lab lessons 5 and 6
- *Intelitool*: *Cardiocomp*
- *A.D.A.M InterActive Physiology* (Cardiovascular System): Cardiac Action Potential
- *MediaPhys 2.0*: Topics 8.17 and 8.18
- *Physiology Interactive Lab Simulations: Electrocardiogram and Heart Function* (exercises 4 and 6).

Exercise 7.3: Effects of Exercise on the Electrocardiogram

- *Biopac*: Student Lab lesson 7
- *Intelitool*: *Cardiocomp*
- *A.D.A.M. InterActive Physiology* (Cardiovascular System): Cardiac Output
- *Physiology Interactive Lab Simulations: Electrocardiogram and Heart Function* (exercises 4 and 6).

Exercise 7.4: Mean Electrical Axis of the Ventricles

- *Biopac*: Student lesson 6
- *Intelitool*: *Cardiocomp*
- *Physiology Interactive Lab Simulations: Electrocardiogram and Heart Function* (exercises 4 and 6).

Exercise 7.5: Heart Sounds

- *Biopac*: Student Lab lesson 17
- *A.D.A.M. InterActive Physiology* (Cardiovascular System): Cardiac Cycle
- *MediaPhys 2.0*: Topics 8.19–8.23
- *Physiology Interactive Lab Simulations: Electrocardiogram and Heart Function* (exercise 5).

Exercise 7.6: Measurements of Blood Pressure

- *Biopac*: Student Lab lesson 16
- *A.D.A.M InterActive Physiology* (Cardiovascular System): Measuring Blood Pressure; Factors that Affect Blood Pressure; Blood Pressure Regulation
- *MediaPhys 2.0*: Topics 9.15, 9.16; Topics 9.39–9.42

SECTION 8

Exercise 8.1: Measurements of Pulmonary Function

- *Biopac*: Student Lab lessons 12 and 13
- *Intelitool*: *Spirocomp*
- *A.D.A.M. InterActive Physiology* (Respiratory System): Pulmonary Ventilation; Gas Exchange
- *MediaPhys 2.0*: Topics 10.10–10.13; Topics 10.22–10.26
- *Physiology Interactive Lab Simulations: Respiration* (exercises 7, 8, 9, and 10).

Exercise 8.2: Effect of Exercise on the Respiratory System

- *Intelitool*: *Spirocomp*
- *A.D.A.M. InterActive Physiology* (Respiratory System): Control of Respiration
- *Physiology Interactive Lab Simulations: Respiration* (exercises 7, 8, 9, and 10).

Exercise 8.3: Oxyhemoglobin Saturation

- *A.D.A.M. InterActive Physiology* (Respiratory System): Gas Transport; Gas Exchange; Control of Respiration
- *Physiology Interactive Lab Simulations: Respiration* (exercises 7, 8, 9, and 10).

Exercise 8.4: Respiration and Acid-Base Balance

- *A.D.A.M. InterActive Physiology* (Respiratory System): Gas Transport; Gas Exchange; Control of Respiration
- *MediaPhys 2.0*: Topics 10.48 and 10.49
- *Physiology Interactive Lab Simulations: Respiration* (exercises 7, 8, 9, and 10).

SECTION 9

Exercise 9.1: Renal Regulation of Fluid and Electrolyte Balance

- *A.D.A.M. InterActive Physiology*: Glomerular Filtration
- *MediaPhys 2.0*: Topics 11.34–11.46

Exercise 9.2: Renal Plasma Clearance of Urea

- *A.D.A.M. InterActive Physiology*: Early Filtrate Processing; Late Filtrate Processing

SECTION 10

Exercise 10.1: Histology of the Gastrointestinal Tract, Liver, and Pancreas

- *MediaPhys 2.0*: Topics 14.9–14.55

Exercise 10.2: Digestion of Carbohydrates, Protein, and Fat

- *MediaPhys 2.0*: Topics 14.9–14.55

Exercise 10.3 Nutrition Assessment, BMR, and Body Composition

- *Physiology Interactive Lab Simulations: Basal Metabolic Rate and Body Size* (exercise 11).

SECTION 11

Exercise 11.1: Ovarian Cycle as Studied by a Vaginal Smear of a Rat

- *MediaPhys 2.0*: Topics 13.17–13.24