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PREFACE

This manual is designed to assist those instructors who use the *Laboratory Guide to Human Physiology*, eleventh edition, by Stuart Ira Fox, in their human physiology courses. Each exercise is briefly introduced with important information provided to ensure the adequate planning and execution of important laboratory procedures in physiology.

Each exercise in the Instructor's Manual is formatted in the following manner:

- 1) Approximate time - Approximate time for completion of the exercise;
- 2) Introduction - Exercise introduction with helpful comments;
- 3) Materials - A detailed list of materials needed for each laboratory exercise;
- 4) Textbook Correlations - Correlations between the exercise and chapter sections from the text;
- 5) Answers to Questions - Answers to the questions found in the laboratory reports;

A correlation chart is also provided in this Instructor's Manual that will link each laboratory exercise to the corresponding textbook chapter(s) and to pertinent topics. The appendices at the end of the manual include a list of vendors of biological supply companies, a set of recipes for making commonly used solutions, and a collection of various multimedia opportunities that bear important concepts that correlate to themes presented in various exercises of this manual.

CORRELATION OF LABORATORY AND LECTURE

Textbook Chapter	Laboratory Exercise	Laboratory Exercise Title
1	1.1	Microscopic Examination of Cells
1	1.2	Microscopic Examination of Tissues and Organs
1	1.3	Homeostasis and Negative Feedback
2	2.1	Measurements of Plasma Glucose, Cholesterol, and Protein
2	2.2	Thin-Layer Chromatography of Amino Acids
2	2.3	Electrophoresis of Serum Proteins
4	2.4	Measurements of Enzyme Activity
3	2.5	Genetic Control of Metabolism
6	2.6	Diffusion, Osmosis, and Tonicity
6	3.1	Recording the Nerve Action Potential
8	3.2	Electroencephalogram (EEG)
10	3.3	Reflex Arc
10	3.4	Cutaneous Receptors and Referred Pain
10	3.5	Eyes and Vision
10	3.6	Ears: Cochlea and Hearing
10	3.7	Ears: Vestibular Apparatus - Balance and Equilibrium
10	3.8	Taste Perception
11	4.1	Histology of the Endocrine Glands
11, 20	4.2	Thin-Layer Chromatography of Steroid Hormones
11, 19	4.3	Insulin Shock
12, 7	5.1	Neural Control of Muscle Contraction
12	5.2	Summation, Tetanus, and Fatigue
12	5.3	Electromyogram (EMG)
13, 16	6.1	Red Blood Cell Count, Hemoglobin, and Oxygen Transport
13	6.2	White Blood Cell Count, Differential, and Immunity
13	6.3	Blood Types
13	6.4	Blood Clotting System
13, 7	7.1	Effects of Drugs on the Frog Heart
13	7.2	Electrocardiogram (ECG)
13, 12	7.3	Effects of Exercise on the Electrocardiogram
13	7.4	Mean Electrical Axis of the Ventricles
13	7.5	Heart Sounds
14	7.6	Measurements of Blood Pressure
14, 12	7.7	Cardiovascular System and Physical Fitness
16	8.1	Measurements of Pulmonary Function
16, 12	8.2	Effect of Exercise on the Respiratory System
16	8.3	Oxyhemoglobin Saturation
16, 17	8.4	Respiration and Acid-Base Balance
17	9.1	Renal Regulation of Fluid and Electrolyte Balance
17	9.2	Renal Plasma Clearance of Urea
17	9.3	Clinical Examination of the Urine
18	10.1	Histology of the Gastrointestinal Tract, Liver, and Pancreas
18	10.2	Digestion of Carbohydrate, Protein, and Fat
19	10.3	Nutrient Assessment, BMR, and Body Composition
20	11.1	Ovarian Cycle as Studied by a Vaginal Smear of a Rat
20	11.2	Human Chorionic Gonadotropin and the Pregnancy Test
20	11.3	Patterns of Heredity

CORRELATION OF LABORATORY AND TEXT FIGURES

There are many figures in this laboratory guide that correspond to full-color figures in the text *Human Physiology*, ninth edition, by Stuart Ira Fox. This correspondence helps to tie the laboratory experience closely to the subjects studied in the lecture and textbook. Laboratory instructors can demonstrate full-color versions of these figures by projecting the corresponding textbook figures. All of the figures in the textbook are available on a CD that is freely available to users of this laboratory guide. The CD is the Digital Content Manager (DCM) for the text *Human Physiology*, by Stuart Ira Fox, available from McGraw-Hill.

Lab Guide Figure	Textbook Figure	Brief Laboratory Guide Legend
1.2	3.1	A generalized human cell.
1.3	3.29, 3.33	Cell division.
1.8	13.1	Bone and blood.
1.11	1.21	Diagram of the skin.
1.12	1.1, 1.2	Homeostasis is maintained by negative feedback loops.
1.13	1.6	Negative feedback control of blood glucose.
2.3	14.9	Circulation of fluid between blood plasma and tissues.
2.8	4.2	Lock and key model of enzyme activity.
2.9	6.24	Concentration of ions in the intracellular and extracellular fluids.
2.10	3.2	Structure of the plasma membrane.
2.11	6.5	A model of osmosis.
2.13	6.11	Red blood cells in isotonic, hypotonic, and hypertonic solutions.
3.1	7.1, 7.2	Neuron structure.
3.2	7.13	Depolarization of an axon affects Na ⁺ and K ⁺ diffusion.
3.4	7.18	Conduction of action potentials in an unmyelinated axon.
3.7	7.22	Release of neurotransmitter.
3.8	7.31, 7.32	Synaptic integration.
3.12	12.27	Knee-jerk reflex.
3.13	12.30	Crossed extensor reflex.
3.15	10.4	Diagram of the skin.
3.16	8.7	Motor and sensory areas of the cerebral cortex.
3.19	10.26	Gross structure of the eye.
3.20	10.30	Image is inverted on the retina.
3.21	10.33	Changes in the shape of the lens permit accommodation.
3.23	10.29	View of the retina as seen with an ophthalmoscope.
3.24	10.43	Convergence in the retina and light sensitivity.
3.26	10.41	Three types of cones.
3.27	10.17	Outer, middle, and inner ear.
3.28	10.22	Organ of Corti.
3.31	10.11	Inner ear.
3.32	10.15	Cupula and hair cells within the semicircular canals.
3.34	10.8	Four major categories of taste.
4.1	1.14	Formation of exocrine and endocrine glands.
4.2	20.27	Ovarian follicles.
4.3	20.12	Structure of the testis.
4.5	11.18	Adrenal gland.
4.6	11.22, 11.23	Histology of the thyroid gland.
4.7	11.13	Hypothalamic control of the posterior pituitary.
4.8	11.15	Hypothalamic control of the anterior pituitary.
4.9	11.17	Hypothalamus-pituitary-gonad control system.

4.11	11.2	Simplified biosynthetic pathway for steroid hormones.
4.12	1.5	Homeostasis of blood glucose concentration.
5.11	12.16	Excitation-contraction coupling in skeletal muscles.
5.12	12.14	Role of Ca^{++} in muscle contraction.
5.17	12.4	Motor units.
6.1	13.11, 16.33	Composition of blood.
6.8	13.5	Agglutination reaction.
6.9	13.7	Platelet aggregation.
6.10	13.9	Extrinsic and intrinsic clotting pathways.
7.1	13.10	Diagram of the circulatory system.
7.7	13.20	Conduction system of the heart.
7.8	13.23	Electrocardiograph leads.
7.10	13.24	Relationship between impulse conduction and the ECG.
7.14	13.25	Relationship between intraventricular pressure and the ECG.
7.20	13.14	Relationship between heart sounds and intraventricular pressure.
7.21	13.15	Stethoscope positions for listening to heart sounds.
7.23	14.28, 14.30	Use of a stethoscope and sphygmomanometer.
7.24	14.31	Five phases of blood pressure measurement.
8.5	16.14	Muscles of respiration.
8.12	16.23	Partial pressures of gases in blood.
8.14	16.26	Sensory input from aortic and carotid bodies.
8.15	16.30	How blood CO_2 affects chemoreceptors in the medulla.
8.16	16.29	Chemoreceptor control of breathing.
8.18	16.49	Maintenance of acid-base balance.
8.19	16.28	Relationship between total minute volume and arterial P_{CO_2} .
9.1	17.4, 17.5	Structure of the kidney.
9.2	17.21	Homeostasis of plasma concentration is maintained by ADH.
9.3	17.27	Homeostasis of plasma Na^+ .
9.5	17.22	Filtration, reabsorption, and secretion by the nephron.
9.6	17.23	Renal clearance of inulin.
10.1	18.2	Organs of the digestive system.
10.2	18.3	Layers of the digestive tract.
10.5	18.7	Gastric pits and gastric glands.
10.8	18.20	Microscopic structure of the liver.
10.9	18.21	Flow of blood and bile in a liver lobule.
10.10	18.26	Exocrine and endocrine structure of the pancreas.
10.11	18.28	The pancreas is both an exocrine and an endocrine gland.
10.12	18.33	Action of amylase.
10.14	18.8	Secretion of gastric acid by parietal cells.
10.16	18.36, 18.37	Fat digestion and absorption.
10.17	18.35	Digestion of triglycerides.
10.19	19.2	Flowchart of energy pathways in the body.
10.20	19.4	Regulation of metabolic balance.
11.1	20.25	Organs of the female reproductive system.
11.2	20.20	Organs of the male reproductive system.
11.3	20.34	Cycle of ovulation and menstruation.
11.5	20.45	Secretion of human chorionic gonadotropin.