Lectures

April 6 9:00-10:00 Alan Stephenson, Ph.D. Overview of the Cardiovascular System

- Components of the Cardiovascular System
- Functions of the circulatory system
- Organization of the circuitry
- Determinants of blood flow
  - vascular diameter
  - wall thickness
  - lumen cross-sectional area
  - velocity of flow
- Understanding how Poiseuille’s Law defines the determinants of blood flow

Assigned Readings: Berne and Levy, Cardiovascular Physiology 7th Edition, Mosby, Chapter 1 (pp 1-6); Chapter 5 (pp 113-131)

Additional Source Material: Guyton and Hall, Medical Physiology, 11th Edition, Saunders, Chapter 14 (pp 161-170)
April 6 10:00-11:00 Alan Stephenson, Ph.D.  The Heart and its Function
  • The structure of the heart in relation to its function
  • The Cardiac Cycle
  • Pressure-volume loops
  • The Frank-Starling relationship and how it relates to Cardiac Output
  • Determinants of Blood Pressure

Assigned Reading: Berne and Levy, Cardiovascular Physiology 7th Edition, Mosby, Chapter 3 (pp 73-75); Chapter 6 (pp 140-147)
Additional Source Material: Guyton and Hall, Medical Physiology, 11th Edition, Saunders, Chapter 9 (pp 103-114)

April 7 9:00 – 10:00 Thomas Westfall, Ph.D.  The Autonomic Nervous System: Anatomical and Physiological Considerations
  • Anatomy of the Autonomic Nervous System
  • Neurochemical Considerations
  • Physiological Considerations


April 8 9:00 – 10:00 Thomas Westfall, Ph.D.  Cholinergic Neurotransmission
  • Synthesis
  • Storage
  • Release
  • Inactivation
  • Receptor Activation


April 8 10:00 – 11:00 Thomas Westfall, Ph.D.  Adrenergic Neurotransmission
  • Synthesis
  • Storage
  • Release
  • Inactivation
  • Receptor Activation

April 9 9:00-10:00 Alan Stephenson, Ph.D.  
Renal Perfusion and Filtration  
- Know the anatomy of the kidney and nephron  
- Understand the processes of filtration, reabsorption, and secretion  
- Know the determinants of Glomerular filtration rate (GFR)  
- Know the determinants of renal blood flow (RBF)  
- Know how to determine renal clearance.  
Assigned Reading: Guyton and Hall, 11th ed.  
Chapter 26: Urine formation by the kidneys I

Friday April 10 NO CLASS (Good Friday)  
Monday April 13 NO CLASS (Easter Monday)  

April 14 9:00-10:00 Alan Stephenson, Ph.D. Renal Tubular Function  
- Identify the mechanisms of tubular reabsorption  
- Detail the physical and hormonal factors that regulate reabsorption  
- Understand the countercurrent mechanism for urine concentration.  
Assigned Reading: Guyton and Hall, 11th ed. Chapter 27: Urine formation by the kidneys II and Chapter 28: Regulation of Extracellular fluid osmolarity and sodium concentration.

April 15 9:00-10:00 W.K. Samson, Ph.D. Cardiovascular Reflexes and Hormonal Control  
- Role of local factors in control of regional blood flow  
- Humoral factors that control blood flow  
- CNS control of circulation/neural reflexes  
- High and low pressure baroreceptors  
Assigned Reading: Guyton and Hall, 11th ed. Chapter 17, p. 195-203; Chapter 18: p. 204-211.

April 16 9:00 -10:00 Randy Sprague, M.D. Regulation of pH: Physiological Buffering  
- Characteristics of buffer systems  
- The Henderson-Hasselbach equation  
- The buffer system of humans and other mammals  
- The regulation of pH by the kidney
• The regulation of pH by the lung

Assigned Reading; Medical Physiology, Guyton & Hall 11th ed. Chapter 30, p. 383-400

April 17 9:00-10:00 Randy Sprague, M.D.

Pulmonary Vascular Resistance
• Determinants of Vascular Resistance
• Unique characteristics of the lung
• Recruitment and distension of pulmonary blood vessels
• What mechanisms keep resistance low in the lung?
• Causes of pulmonary hypertension: pre- and post-capillary
• Hypoxic pulmonary vasoconstriction
• Effect of lung volume on vascular resistance
• Vasoactive mediators in the lung

Assigned Reading; Respiratory Physiology, John B. West, Chapter 4

April 17 10:00-11:00 Randy Sprague, M.D. Pulmonary Gas Exchange - Maintenance of Arterial Oxygen Tension
• The "ideal" matching of blood flow with gas flow - the concept of lung zones
• The alveolar gas equation
• Hypoxic pulmonary vasoconstriction
• Venous admixture
• Shunt

Assigned Reading; Respiratory Physiology, John B. West, Chapter 5

April 20 9:00-10:00 J.J. Baldassare, Ph.D. Drug Absorption
• Passage of small molecules through membranes
• Fick's Law, Partition coefficient, pH effects

Required Reading: Lecture handouts

April 21 and 22 9:00-10:00 T.C. Westfall, Ph.D. Biotransformation I & II
• Consequences of biotransformation
• Phase 1 reactions
• Phase 2 reactions
• Induction and inhibition
• Factors influencing drug biotransformation
Excretion of drugs

Required Reading: B.G. Katzung (Ed), *Basic and Clinical Pharmacology*, Lange, 9th Edn, Chapt. 4, pp. 51-63.
http://www.accessmedicine.com/content.aspx?aID=333463

April 23  9:00-10:00 W.K. Samson, Ph.D.  *Endocrinology (Anterior and Posterior Pituitary)*
- The basic components of the endocrine system
- Anatomy of the hypothalamus and pituitary gland
- Anterior pituitary hormones and their basic regulation
- Posterior pituitary hormones: function and regulation

Assigned Reading: Griffin & Ojeda, Textbook of Endocrine Physiology, 5th ed., Chapter 1, p. 1-15

Additional Suggested Reading: Griffin & Ojeda, Chapter 6 (Anterior Pituitary) and Chapter 7 (Posterior Pituitary)

April 24  9:00-11:00 W.K. Samson, Ph.D.  *Adrenal Physiology*
- Anatomy of the adrenal gland
- Hormones of the adrenal cortex: regulation
- Physiology and Pathology of the glucocorticoids
- Physiology of the mineralocorticoids and adrenal androgens
- Adrenal medullary catecholamine production and actions

Assigned Reading: Griffin & Ojeda, Chapter 14 (The Adrenal Glands)

April 27  9:00-10:00 W.K. Samson, Ph.D.  *Thyroid Physiology*
- Synthesis and secretion of thyroid hormones
- Thyroid hormone metabolism
- Regulation of thyroid function
- Actions of thyroid hormones

Assigned Reading: Griffin & Ojeda, Chapter 13 (The Thyroid)
April 28 and 29  9:00-10:00 W.K. Samson, Ph.D.

Regulation of Calcium Homeostasis
- Calcium homeostasis (organs)
- Calcium homeostasis (hormone regulation)
- Disorders of calcium homeostasis
Assigned Reading: Griffin & Ojeda, Chapter 15, p. 349-368. (Calcium Homeostasis)

April 29  10:00-11:00 W.K. Samson, Ph.D. Metabolism of Glucose and Other Fuels
- Anabolism versus catabolism
- Glycogenolysis versus gluconeogenesis
- Lipolysis and ketogenesis
- Proteolysis and gluconeogenesis
Assigned Reading: Griffin & Ojeda, Chapter 16 (Glucose, Lipid and Protein Metabolism)

April 30  Study Day
May 21  Exam