CELL AND SYSTEMS PHYSIOLOGY – GS12 0254
Course Schedule, Spring 2013
1:00 – 2:50 P.M., Tuesdays and Thursdays
R.649 Medical School Extension (MSE)
Course Director: Edgar T. Walters, Ph.D.

I. CELL PHYSIOLOGY

Tu 8 January  INTRODUCTION TO PHYSIOLOGY  Walters
1:00–1:30  Function, homeostasis, systems integration

1:30–2:50 P.M.  STRUCTURE AND FUNCTION OF CELL MEMBRANES I  Gorfe
Fluid compartments and homeostasis
Cell membrane composition and structure
Transmembrane transport

Th 10 January  STRUCTURE AND FUNCTION OF CELL MEMBRANES II  Gorfe
1:00–2:50 P.M.  Structure and function of epithelia
Epithelial solute and water transport

II. INTERCELLULAR COMMUNICATION AND COORDINATION

Tu 15 January  DISCUSSION: PHYSIOLOGICAL DYSFUNCTION  Gorfe
1:00–2:00 P.M.  Alex's choice of membrane pathophysiology

2:00–2:50 P.M.  INTRODUCTION TO ENDOCRINE CONTROL  Lichtenberger
Organization of the endocrine control system
Types of hormonal communication

Th 17 January  RESTING MEMBRANE POTENTIAL  Walters
1:00–2:50 P.M.  Electrolyte diffusion and diffusion potentials
Electrochemical equilibrium and the Nernst Equation
Genesis of resting membrane potential

Tu 22 January  ACTION POTENTIAL  Yang and Walters
1:00–2:50 P.M.  Ionic basis
Conduction
Regulation of excitability

Th 24 January  SYNAPTIC TRANSMISSION  Walters
1:00–2:50 P.M.  Postsynaptic mechanisms
Presynaptic mechanisms
Regulation of synaptic function and memory

Tu 29 January  SENSORY PHYSIOLOGY  Walters
1:00–2:50 P.M.  General features
Specialized senses
III. MUSCLE SYSTEMS AND CONTRACTION

Th 7 February  
1:00–2:50 P.M.  
OVERVIEW OF MUSCLE SYSTEM  
SKELETAL MUSCLE I  
Berdeaux  
Molecular basis of contraction  
Skeletal muscle mechanics

Tu 12 February  
1:00–2:50 P.M.  
SKELETAL MUSCLE II AND SMOOTH MUSCLE  
Berdeaux, Li  
Skeletal muscle control and plasticity  
Smooth muscle and hollow organs

Th 14 February  
1:00–2:50 P.M.  
CARDIAC MUSCLE  
Walters  
Cardiac muscle function and mechanics  
Cardiac muscle electrophysiology

IV. THE CARDIOVASCULAR SYSTEM AND REGULATION OF BLOOD FLOW/PRESSURE

Tu 19 February  
1:00–2:50 P.M.  
HEMODYNAMICS  
Morris  
Flow, pressure, and velocity  
Resistance, viscosity, and capacitance

Th 21 February  
1:00–2:50 P.M.  
THE CARDIAC PUMP  
Weems  
Morphology and function of the heart  
Determinants of cardiac performance

Tu 26 February  
1:00–2:50 P.M.  
CARDIAC OUTPUT  
Weems  
Cardiac function curves  
Venous return and mean circulatory filling pressure

Th 28 February  
1:00–2:50 P.M.  
REGULATION OF ARTERIAL PRESSURE AND REGIONAL BLOOD FLOW  
Weems  
Regulation of arterial blood pressure

Tu 5 March  
1:00–2:50 P.M.  
CAPILLARY EXCHANGE & PATHOPHYSIOLOGY  
Morris  
The microcirculation  
Capillary-interstitial fluid exchange  
Regulation of regional circulations

Th 7 March  
1:00–2:50 P.M  
EXAMINATION II  
Staff
11–15 March  

**SPRING BREAK!**

V. THE RENAL SYSTEM AND REGULATION OF FLUID/ELECTROLYTE BALANCE

**Tu 19 March**  
1:00–2:50 P.M.  
**ELEMENTS OF RENAL FUNCTION**  
O'Neil  
Gross morphology and special structural/functional relations  
Glomerular filtration and renal blood flow

**Th 21 March**  
1:00–2:50 P.M.  
**MECHANISMS OF ELECTROLYTE AND WATER TRANSPORT**  
O'Neil  
Cellular mechanisms of NaCl and water transport  
The counter-current multiplier system

**Tu 26 March**  
1:00–2:50 P.M.  
**REGULATION OF FLUID AND ELECTROLYTE BALANCE**  
O'Neil  
Regulation of extracellular fluid osmolality  
Regulation of NaCl reabsorption and extracellular fluid volume  
Regulation of K balance

VI. THE RESPIRATORY SYSTEM AND REGULATION OF GAS BALANCE

**Th 28 March**  
1:00–2:50 P.M.  
**PULMONARY VENTILATION AND GAS TRANSPORT**  
Johnston  
Mechanics of ventilation  
Alveolar ventilation

**Tu 2 April**  
1:00–2:50 P.M.  
**CONTROL OF VENTILATION AND REGULATION OF O₂ AND CO₂ BALANCE**  
Johnston  
Pulmonary circulation and gas transport  
Regulation of ventilation

**Th 4 April**  
**DISCUSSION: PHYSIOLOGICAL DYSFUNCTION**  
Johnston  
Respiratory pathophysiology

**Tu 9 April**  
1:00–2:50 P.M.  
**EXAMINATION III**  
Staff

**Th 11 April**  
No class (Cell & Regulatory Biology Program Retreat, potential members welcome)

VII. PHYSIOLOGY OF DIGESTION, ABSORPTION, AND METABOLISM

**Tu 16 April**  
1:00–2:50 P.M.  
**GASTROINTESTINAL ENDOCRINOLOGY**  
Lichtenberger  
GI hormones and control of GI function

**GASTROINTESTINAL SECRETION I**  
Regulation of gastric secretion  
Gastric ulcers and gut barrier malfunction

**Th 18 April**  
1:00–2:00 P.M.  
**GASTROINTESTINAL SECRETION II**  
Lichtenberger  
Regulation of biliary and pancreatic secretion
2:00–2:50 P.M.  **DIGESTION AND ABSORPTION OF NUTRIENTS**  Morris
Structural/functional relations in the intestine
Regulation of digestion and absorption of specific nutrients

Tu 23 April  **THE ENTERIC NERVOUS SYSTEM AND MOTILITY**  Hu
1:00–2:50 P.M.  Enteric nervous system organization and function
Motility and GI function

Th 25 April  **NEURAL REGULATION OF METABOLISM**  Venkatachalam
1:00–2:50 P.M.  Neural control of energy intake and energy expenditure

Tu 30 April  **ENDOCRINE REGULATION OF METABOLISM**  Berdeaux
1:00–2:50 P.M.  Endocrine control systems controlling metabolic function

Th 2 May  **DISCUSSION: PHYSIOLOGICAL DYSFUNCTION**  Morris, Berdeaux
1:00–2:45 P.M.  Integrative physiology related to metabolic syndrome
Venkatachalam, Walters

2:45-2:50 P.M.  **COURSE FEEDBACK**  Walters

**EXAMINATION IV: TAKE-HOME, COMPREHENSIVE**  Staff
Textbooks:

**Recommended but not required**


**Useful**


**Lending Policy**
The above textbooks (and others) can be checked out from Dr. Walters in room MSB 4.118. Each book can be kept overnight or over the weekend, but must be returned by noon the following workday. If Dr. Walters is not available, the book can be returned to Patricia McFarland in MSB 4.124. We have only 1 or 2 copies of some of the textbooks to lend, so please be considerate to your classmates and return the book promptly.
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<thead>
<tr>
<th>Lecturer</th>
<th>Office</th>
<th>Phone Extension</th>
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<tbody>
<tr>
<td>Dr. Rebecca Berdeaux</td>
<td>R366 MSE</td>
<td>5653</td>
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<tr>
<td>Dr. Alemayehu Gorfe (Abebe)</td>
<td>4.108 MSB</td>
<td>7538</td>
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<tr>
<td>Dr. Hongzhen Hu</td>
<td>4.124 MSB</td>
<td>7525</td>
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<td>Dr. Richard A. Johnston</td>
<td>3.125 MSB</td>
<td>6485</td>
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<tr>
<td>Dr. Yi-Ping Li</td>
<td>R376 MSE</td>
<td>6498</td>
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<tr>
<td>Dr. Lenard M. Lichtenberger</td>
<td>4.214 MSB</td>
<td>6320</td>
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<td>Dr. Andrew Morris</td>
<td>4.126 MSB</td>
<td>6514</td>
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<td>Dr. Roger G. O'Neil</td>
<td>4.132 MSB</td>
<td>6316</td>
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<td>Dr. Kartik Venkatachalam</td>
<td>4.214</td>
<td>7504</td>
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<tr>
<td>Dr. Edgar T. Walters</td>
<td>4.118 MSB</td>
<td>6314</td>
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<tr>
<td>Dr. William A. Weems</td>
<td>G.520/G.500D MSB</td>
<td>5224/3503</td>
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<tr>
<td>Dr. Qing Yang</td>
<td>4.113</td>
<td>7592</td>
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**EXAMS:**

1 to 3: 22% each in-class, closed-book, short essay
4: 34% take-home, open-book, essay

Exams cover discussion materials as well as lectures.

**CLASS PARTICIPATION**

An important part of a scientist's training is learning how to participate in active discussions about scientific subjects. We expect all students to interact with each faculty member during both the lectures and the discussion sessions, orally answering questions posed by the lecturer and asking questions of the lecturer and other discussants. To facilitate interactions and learning within the classroom, students are expected to show attentive, respectful behavior (e.g., no eating or chewing gum, no texting, no listening to MP3 players, etc.).

At the end of each block the lecturer will record whether each student participated actively in class discussions during that block. Demonstration of active class participation will contribute to the final grades as indicated below.

**GRADING:**

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<thead>
<tr>
<th>Grade</th>
<th>Without class participation</th>
<th>With participation</th>
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<tr>
<td>A</td>
<td>91.5 – 100%</td>
<td>89.5 – 100%</td>
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<tr>
<td>B</td>
<td>81.5 – 91.4%</td>
<td>79.5 – 89.4%</td>
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<tr>
<td>C</td>
<td>66.5 – 81.4%</td>
<td>64.5 – 79.4%</td>
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<tr>
<td>F</td>
<td>Less than 66.5%</td>
<td>Less than 64.5%</td>
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