

BIOL 4340 – Integrated Human Physiology II

Michael Chen, Ph.D.

Fall, 2018

Lecture (01): Tues/Thurs, 10:00 – 10:50 am, BIOS 244

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Lab (02): Tues, 11:00 am – 1:30 pm, LKH-ASCL 343

Office: BIOS 235

Office Hours: Mon, 11 am – 1 pm; Tues, Thurs, 8:30 – 9:30 am; Wed, 10 – 11 am;
or by appointment.

BIOL 4340 is the second course in the upper division animal physiology series that is designed for students interested in pursuing graduate training in research, medicine, veterinary medicine, dentistry or pharmacy. This course takes a **systems perspective** and covers cardiovascular, respiratory, renal and digestive physiology using lectures, laboratory exercises and reading assignments. Students will learn the basic physiology of each of these organ systems and integrate this knowledge to understand whole animal physiology. For example, students will understand how renal function influences cardiovascular physiology. Students will need to interpret and generate scientific data in graphical form, perform basic calculations and effectively communicate research results. For this course, it is important that students have successfully completed the prerequisite Cell Biology. BIOL 4340 builds on many of the concepts covered in the basic BIOL 1010 series and the majors' core courses BIOL 300, 320 and 380. It will also be helpful (but not required) to have completed BIOL 4330.

COURSE ALIGNMENT WITH DEPT. OF BIOLOGICAL SCIENCES UNDERGRADUATE

STUDENT LEARNING OUTCOMES: BIOL 4340 is designed to help students meet the following undergraduate degree learning outcomes:

1. The student will acquire the following attitudes:
 - 1.1 Learning about both living micro and macro systems is relevant and essential for understanding life.
2. The student will be able to demonstrate that (s)he is skilled at:
 - 2.1. Applying the processes and methods of scientific inquiry, including the search and retrieval of scientific information, the formulation of scientific hypotheses, the design and implementation of experiments, and the analysis and interpretation of data.
 - 2.2. Understanding and critically evaluating the scientific work of others.
 - 2.3. Communicating scientific information effectively using oral presentations and written reports.
 - 2.4. Performing laboratory techniques that are appropriate to the major, with an understanding of the principles of laboratory safety.
 - 2.5. Working collaboratively on group projects.
3. The Biology student will be able to demonstrate knowledge of the following:
 - 3.1. Molecular and cellular structure and function.
 - 3.2. Basic principles of anatomy and **physiology**, and development.

Textbook: Hall, J.E., *Guyton and Hall Textbook of Medical Physiology*, 12th Edition, Philadelphia: Elsevier, Inc. (2011). This textbook was also used for BIOL 4330.

As Instructor, I reserve the right to slightly alter the following **Schedule**:

Schedule

Week	Date	Topic	Chapters from Guyton
1	8/21/18	General Introduction to the Course – Syllabus The heart as a pump and how its valves function	9
1	8/23/18	The heart as a pump and how its valves function	9
2	8/28/18	Electrical activity of the heart	10, 11
2	8/30/18	Electrical activity of the heart and the electrocardiogram	11, 12, 13
3	9/4/18	Lecture Quiz 1 – Last 30 min of class.	
3	9/6/18	Circulation: Microcirculation; biophysics of pressure, flow and resistance, vascular distensibility and functions of arterial and venous systems.	14, 15
4	9/11/18	Circulation: Microcirculation and lymphatic: Capillary fluid exchange, interstitial fluid and lymph flow.	16
4	9/13/18	Circulation: Local and humoral control of tissue blood flow, nervous regulation of the circulation and rapid control of arterial pressure.	17, 18
5	9/18/18	Circulation: Role of the kidneys in long-term control of arterial pressure and in hypertension: The integrated system for arterial pressure regulation, cardiac output, venous return and their regulation, muscle blood flow and cardiac output during exercise.	19, 20, 21
5	9/20/18	Blood cells and blood coagulation: Red blood cells, anemia and polycythemia; hemostasis and blood coagulation.	33
6	9/25/18	Midterm Exam 1 – Covers up to and including “Circulation”	
6	9/27/18	Lecture Quiz 2 – This quiz will be taken online.	
7	10/2/18	Innate Immunity: Leukocytes, granulocytes, monocytes, macrophages, inflammation.	34
7	10/4/18	Adaptive immunity: T and B lymphocytes, antibodies, allergies.	35
8	10/9/18	Blood: Blood types, transfusions, tissue and organ transplantation.	36
8	10/11/18	Lecture Quiz 3 - Last 30 min of class.	

9	10/16/18	Body fluids and kidneys: Body fluid compartments: Extracellular and Intracellular fluids, edema, urinary system: Functional anatomy and urine formation.	25, 26
9	10/18/18	Body fluids and kidneys: GFR, RBF and their control. Renal tubular reabsorption and secretion, urine concentration and dilution.	27, 28, 29
10	10/23/18	Body fluids and kidneys: Regulation of extracellular fluid osmolarity and Na^+ , K^+ , Ca^{2+} , PO_4^{3-} , Mg^{2+} , acid-base regulation and diuretics.	29, 30, 31, 32
10	10/25/18	Lecture Quiz 4 - Last 30 min of class.	
11	10/30/18	Midterm 2	
11	11/1/18	Respiration: Pulmonary ventilation, circulation and edema, pleural fluid.	37, 38, 39
12	11/6/18	Respiration: Principles of gas exchange, diffusion of O_2 and CO_2 through the respiratory membrane, transport of O_2 and CO_2 in blood and tissues.	40, 41
12	11/8/18	Respiration: Regulation of respiration, respiratory insufficiency.	42, 43
13	11/13/18	Lecture Quiz 5 - Last 30 min of class.	
13	11/15/18	Gastrointestinal Tract: General principles of GI function – motility, nervous system control and blood circulation.	62, 63
	11/20/18	Fall Recess – No classes held.	
	11/22/18	Thanksgiving – No classes held.	
14	11/27/18	Gastrointestinal Tract: Propulsion and mixing of food in the alimentary tract.	63
14	11/29/18	Gastrointestinal Tract: Secretory functions of the alimentary tract, digestion and absorption in the GIT. Liver.	64, 65
15	12/4/18	Lecture Quiz 6 - Last 30 min of class.	
15	12/6/18	Midterm 3	
16	12/11/18	Final Exam: Final Time and Place to be announced.	

All of the above lectures can be found on Canvas.

Grading

Lecture:

Three midterms: 100 points each = 300
 Six lecture quizzes 25 points each = 150
 Final: 150 points (cumulative) = 150
 Attendance: 2 points/class period, not counting 1st day and exam days ~ 54
 Total ~ 650 points

Lab:

Two laboratory reports: 50 points each = 100
 Ten lab exercises (20 points for each lab session) = 200
 Lab attendance (5 points per lab session) = 65
 Total = 365 points

Final grades will be based on the following distribution:

A = 92-100%
 A- = 90-91.9%
 B+ = 88-89.9%
 B = 82-87.9%
 B- = 80-81.9%
 C+ = 78-79.9%
 C = 72-77.9%
 C- = 70-71.9%
 D+ = 68-69.9%
 D = 60-67.9%
 F = <59.9%

Exam Policy

Exams will be composed of multiple choice, graphical interpretation, physiological calculations and short-answer questions. If you miss an exam for a legitimate and documented excuse (*e.g.*, a signed doctor's note), you *may* make the exam up with perhaps a slightly altered version of the original exam. If evidence of emergency can be provided for a missed final, an Incomplete will be given until the final exam the following quarter provided that you are passing at the time.

Only ***your*** medical emergency or illness or jury duty will excuse you from an exam. Medical emergencies of relatives, friends, relatives of friends, friends of relatives, weddings, anniversaries, parties, *etc.* are not valid reasons for missing an exam. Nor are they valid reasons for asking me to allow you to take an exam during a time other than the scheduled time.

Attendance: To help ensure that people attend the lectures, I take attendance (2 points/class period) by passing around a "sign-in" sheet. You ***must*** print your name on this sheet ***during*** class; please do not come up to me at some later time after class to tell me that you were not absent, but did not place your name on the sheet because you forgot, arrived late, *etc.* I do not have a photographic memory and will probably not remember if you indeed were really present.

Drop Policy

No exceptions will be made to the established University deadlines and policies

Academic Honesty Policy

Students are expected to read and abide by the University's Academic Honesty Policy, which can be found at <http://www.calstatela.edu/univ/stuaffrs/jao/doc/ah.pdf>. Students who violate this policy will be subject to disciplinary action, and may receive a failing grade in the course for a single violation.

BIOL 4340 Integrated Human Physiology II Laboratory

Laboratory Exercises: Will be posted on Canvas before the labs.

Students will work in pairs or threes, preferably the same pairs (or threes) throughout the semester, and work together to complete the experiments and analyze the data.

Grading:

Lab:

Two laboratory reports: 50 points each = 100

Ten lab exercises (20 points for each lab session) = 200

Lab attendance (5 points per lab session) = 65

Total = 365 points

Laboratory reports: Must be written in a scientific journal format complete with an abstract, background, objectives and hypotheses, materials, results (with text, figures, and figure legends) and a discussion section. Due 2 weeks after the lab. Minus 5 pts/day late.

These are completed individually (not in teams). Each report should have the following sections:

- * Abstract: Brief summary of Introduction, methods, results and conclusions.
- * Introduction: Brief half-page stating the problem, concepts and current state of knowledge in the field. *Hypothesis must be stated here.*
- Results: analyze and present the results as graphs or tables. Perform statistical analysis where needed. Summarize the results in one or two paragraphs.
- Discussion: discuss the meaning of the results and compare the values you obtained to published values. Properly cite the published values. Explain why or why not the experiment produced the expected values.
- References – List must include all citations used in the report.

Lab attendance: Based on active participation and completion of lab exercises.

Lab exercises: End-of-the-chapter worksheets – Due the **following** week. Minus 5 pts/day late.

<u>Date</u>	<u>Lab Topic</u>	<u>Due Date</u>
Week 1 8/21	No Lab	
Week 2 8/28	Lab safety training and biohazard training workshop.	
Week 3 9/4	BIOPAC – Lesson 5 & 6: Elektrokardiographie I and II. Ex1	9/11
Week 4 9/11	BIOPAC – Lesson 7: EKG and Pulse. Ex2	9/18
Week 5 9/18	BIOPAC – Lesson 16: Blood pressure. Ex3	9/25
Week 6 9/25	BIOPAC – Lesson 17: Heart sounds. Ex4	10/2
Week 7 10/2	Simulation – Frog cardiovascular physiology. R1	10/16
Week 8 10/9	THARP – Exercise 19: Erythrocyte function. Ex5	10/16
Week 9 10/16	THARP – Exercise 20: Leukocytes, blood types and hemostasis. Ex6	10/23
Week 10 10/23	THARP – Exercise 3: Renal physiology. Ex7	10/30
Week 11 10/30	BIOPAC – Lesson 8: Respiratory cycle 1. Ex8	11/6
Week 12 11/6	BIOPAC – Lessons 12 & 13: Pulmonary functions I and II. Ex9	11/13
Week 13 11/13	BIOPAC – Lesson 15: Aerobic exercise physiology. R2	11/27
	FALL RECESS	
Week 14 11/27	THARP Exercise 10: Digestion. Ex10	12/4
Week 15 12/4	No lab.	