

BIOLOGY 451 - COMPARATIVE PHYSIOLOGY - SYLLABUS

Meeting Times: Spring, 2011, T-Th 11:00-12:15, 107 Wilson Hall

Instructors: Dr. William M. Kier, 313 Wilson Hall, billkier@bio.unc.edu

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Kier Office Hours: 12:15-1:15 Thursday; *Hedrick Office Hours:* 12:15-1:15 Tuesday

Kurth Office Hours: 11:00-12:00 Wednesday

Textbook: Schmidt-Nielsen, K. (1997) *Animal Physiology: Adaptation and Environment*.
5TH Ed. Cambridge: Cambridge University Press.

Week of	Topics	Chap
January 10	course introduction, composition of air, water vapor in air, solubility of gases, respiration in water, gills, countercurrent exchange, boundary layers, respiration in air, mammalian lungs	1
January 17	air-breathing fish, bird respiration, insect respiration, cyclic respiration, oxygen transport in blood, respiratory pigments, oxygen dissociation curves, facilitated diffusion	1, 2
January 24	carbon dioxide transport, pumps and channels, water compartments, circulation patterns, cardiac output, blood vessels, physics of pipe flow, blood pressure, capillaries, exercise, invertebrate circulation, clotting	2, 3
January 31	feeding, food types and mechanisms, hydrothermal springs, digestion, enzymes, wood and cellulose digestion, ruminants, nutrition, vitamins, minerals, trace elements, chemical defense, metabolic rate, energy storage, oxygen	4, 5
February 7	diving mammals and birds, metabolic rate and body size, size and scaling	5
	EXAM 1 - THURSDAY, FEBRUARY 10 (30% of course grade)	
February 14	energy cost of locomotion, running, swimming and flying, physiological time, temperature and Q_{10} , high temperature and heat death, low temperature and freezing, temperature adaptation, acclimation, acclimatization, body temperature of birds and mammals, heat and heat transfer	6, 7
February 21	heat balance, temp regulation in the cold, insulation, huddling, heat exchangers, temp regulation in the heat, evaporation, torpor and hibernation, heterotherms, hot fish, hot insects	7
February 28	aquatic animals, aquatic invertebrates, aquatic vertebrates, amphibians, moist-skinned animals, arthropods, terrestrial vertebrates, marine vertebrates	8
March 7	SPRING BREAK	
March 14	marine mammal osmotic regulation, organs of excretion, invertebrate excretion, vertebrate kidneys, fish, amphibian, and reptile excretion, urine concentration, nitrogen excretion,	9
March 21	ameboid, ciliary, flagellar locomotion, principles of locomotion, muscle structure and function, contractile properties of muscle, fiber types	10
	EXAM 2 - THURSDAY, MARCH 24 (30% of course grade)	

March 28	cardiac muscle, smooth muscle, rigid skeletons, hydrostatic skeletons, muscular hydrostats, locomotion, buoyancy, reduction of density, gas floats, fish swimbladders, secretion of gas	10
April 4	control theory, nerves and nervous systems, nerve cell function, resting potential, action potential, myelination, synapses, synapses continued, PSPs, inhibition, excitation	11, 12
April 11	vertebrate endocrine systems, transmitters, invertebrate endocrine systems, insect endocrinology,	12
April 18	chemical senses, vibration and sound, light and vision, animal electricity,	13
April 25	transmission and sorting of information, information processing	13
	FINAL EXAM - High Noon, Thursday, May 5, 2011 (40% of course grade)	

Textbook and Readings:

The text for the course (Schmidt-Nielsen, K. (1997) *Animal Physiology: Adaptation and Environment*, 5TH Ed. Cambridge: Cambridge University Press) is a spectacular textbook. It is extremely well-written and explains complex concepts with remarkable clarity. If you are accustomed to not doing the reading and relying on lecture only, please break the habit! The book is so well written and fun to read that you will be missing out.

We have found that students do much better in the course if they complete the readings before class. Such an approach allows you to get significantly more out of each lecture. In addition, the pace of the lectures is fast and it will be difficult to keep up if you have not already studied the text. To help you keep up and to allow you to become more easily accustomed to our lecture styles, we have designed the course to follow the sequence and the emphasis of the book. This approach pleases the majority of the students, but a few sometimes feel that it results in too much overlap. If so, then please refer to the handout, *Additional Reading*. The titles are fairly self-explanatory, but please see us if you need recommendations.

Exams and Grading:

The exam dates, including the final, are included on the schedule above. The first exam will cover the first 1/3 of the course and will count for 30% of the course grade. The second exam will cover the second 1/3 of the course and will also count for 30% of the course grade. The final will count 40% of the course grade. One half of the final will cover the final 1/3 of the course and the other half of the final will be cumulative. The weighting is designed to prevent any single exam, especially the final, from carrying too much weight since anyone can have a bad day, particularly during the crowded final exam period.

The exams will be short answer, fill in the blank, short problems and multiple choice. They are designed to explore the depth of your understanding of the material and require that you do more than simply memorize. To excel, you must master the material and in many cases be able to use the information in a new context. **We do not schedule make-up exams.**

Honor Code:

The Chancellor requires that you read the attached statement of the Honor Code. In a perfect world, this is all that should be required. This is, alas, not a perfect world. We want to mention that after we complete the grading of the exams, we will pull a number of them at random and photocopy them. We thus will have a record of what was originally on the exam for comparison if it is handed back for regrading. We apologize if this seems mistrustful. We are confident that the vast majority of students are honest, but we have been forced into this policy by several unpleasant Honor Code violations in the past.

Lecture and Office Hours:

Office hours are listed above. If you have a class conflict with those times please contact us by email and we will set an appointment. The lectures will start promptly at 11:00. It would be helpful if you could be on time since it is disruptive of your colleagues if you arrive late. In return, we will be prompt about finishing up lectures on time and will avoid running over. We have found that students who perform best in this course are those who do not miss class. If you absolutely cannot attend class due to an emergency, please make certain that you get the notes from someone immediately so that you can work through the material in association with the textbook. We recommend that you introduce yourself to several colleagues in the class and exchange phone numbers and email addresses. This will allow you to confirm that they will be in a particular class if you are unable to attend and can thus be assured of getting the notes from them.

As an aid to following our lectures we will put an outline on the board at the beginning of class. We hope that this will help you to follow the lectures and to see their overall structure and goals.