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GRANDE PRAIRIE REGIONAL COLLEGE

DEPT. OF SCIENCE & TECHNOLOGY

1998-99

COURSE OUTLINE

ZO 2410

Animal Physiology I - Homeostasis

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Description: Functional biology at the organ system level is explored. A review of the general concepts in animal physiology with an emphasis on structure and function and adaptive significance to the animal in its own environment. This course will cover systems which regulate levels of gases, food, energy, temperature, water and ions. Both invertebrates and vertebrates will be used frequently to illustrate the relevance of basic physiological and biochemical mechanisms governing bodily functions.

Prerequisites: BI 1070 - Cellular Biology

Text-book: 'Animal Physiology'
Randall, Burggren and French
W.H. Freeman and Company, New York

Requirements: Since participation in lectures and completion of assignments are important components of this course, students will serve their best interests by regular attendance at both class and seminar sessions. Those who chose not to attend must assume whatever risks are involved. In this regard, your attention is directed to the Academic Guidelines of Grande Prairie Regional College.

During the course, each student will present two seminars to the rest of the class, one before the mid-term exam and one after. The choice of topic will be of the student's choosing after consultation with the instructor. Each presentation will be approximately 15 minutes in length and evaluated by all other members of the class. Attendance at seminar sessions is compulsory. Each absence without a good excuse will result in the loss of 10% from the seminar mark of the absent student.

<u>Evaluation:</u>	Seminar Presentations	15%
	Quizzes	15%
	Mid-term Exam	30%
	Final Exam	40%

Topic Outline

1. Introduction to Physiology:
 - the discipline of physiology
 - physiological systems
 - homeostasis (negative and positive feedback)
 - general models of equilibrium and balance
2. Enzyme kinetics and cellular metabolism:
 - Free energy and entropy
 - energy transfer by coupled reactions
 - Laws of Thermodynamics
 - enzymes: structure, mechanism of action, catalytic activity, specificity
 - Factors affecting rate (temp., pH, cofactors)
 - Substrate affinity
 - Inhibition (competitive, non-competitive, allosteric)
 - K_m , V_{max} , Michaelis-Menton, Lineweaver-Burk
 - energy carriers (energy-rich phosphates, nucleotides)
 - metabolic pathways (aerobic and anaerobic):
 - Glycolysis, TCA Cycle, Beta-oxidation
3. Energy metabolism and thermal regulation:
 - calorimetry and metabolic rate
 - principle of Q_{10}
 - respiratory quotient
 - factors affecting metabolic rate:
 - Body size, temperature, location
 - ectotherms, endotherms and heterotherms
 - regulation of body temperature:
 - Heat generation/loss (active and passive):
 - metabolic heat production and sites:
 - shivering and non-shivering
 - counter-current heat exchangers
 - vascular shunting
 - insulation and evaporative cooling
 - behavioral adaptations:
 - acclimation, acclimatization
 - torpor, hibernation, aestivation
 - fever
 - control (sensory/integration systems)

4. Osmoregulation and ionoregulation:
 - physiology of organs:
 - vertebrate kidney:
 - epithelial cell types
 - diuresis, natriuresis, pH
 - other regulatory organs:
 - salt glands
 - chloride cells
 - frog skin
 - urinary bladder
5. Respiration:
 - general considerations
 - the Gas Laws
 - gases in the blood:
 - oxygen carriers
 - factors affecting the oxygen dissociation curve
 - transport of CO₂
 - the vertebrate lung
 - the vertebrate gill
 - regulation of gas transfer and respiration
 - regulation of body pH
6. Circulation:
 - the mammalian heart (electrical activity, mechanical action)
 - other vertebrate hearts
 - cardiac output
 - factors affecting heart rate and stroke volume
 - haemodynamics
 - regulation of capillary blood flow
 - cardiovascular control by the CNS