

PHYSIOLOGY (Level 4) Bioscience Entry Course

Title: **Physiology (Bioscience Entry)**

Level: **4**

Credit Points Equivalency: **20**

Module Tutor: **Michail Rizos**

Prerequisite **Biology 'A' level or equivalent, or CNELM Level 3 Human Biology**

Aims

This module aims to build on foundation knowledge of anatomy and physiology by focusing on how body systems are controlled and integrated so that students can demonstrate a coherent understanding of the mechanisms that keep the body alive and functioning. This module will be taught from a Systems Biology and Functional Medicine perspective with a focus on purpose and design, major body processes and supporting organ reserve. Imbalance in many body processes can lead to changes in various physiological systems that lead to signs and symptoms of disease. This module will apply nutritional concepts from a functional perspective to aid the student's ability to understand the multiple roles a nutrient/s might play to support the normal function of major physiological processes and enable them to begin to review a range of factors involved in pathophysiological processes.

Syllabus

- Introduction to module and physiological concepts, Systems Biology, the Functional Medicine Model, reinforce the scientific method
- Complex systems, principles of homeostasis, positive and negative feedback mechanisms, allostasis and allostatic load
- Endocrine and nervous system interaction, limbic system, acute & chronic stress responses, hypothalamic responses & effects on target tissue
- Neuronal regulation, review of resting potential and action potential, synapses and postsynaptic receptors, neurotransmitters, cutaneous mechanoreceptors
- Endocrine and neuronal regulation of heart rate and blood pressure, anatomy of the cardiovascular system
- Calcium homeostasis; activity of parathormone, calcitonin, calcitriol and effects on bone metabolism
- Blood composition, blood homeostasis, blood clotting and fibrinolysis, action of aspirin, warfarin and heparin
- Hormones of the reproductive system and changes at various life stages
- Gut structure and function, mechanism of and regulation of gastric secretion, the enteric nervous system, hormonal control of appetite
- Muscle structure, nervous system control of muscle activity, molecular events in muscle contraction, signalling pathways, calmodulin and Ca²⁺

- Cells of the immune system, the lymphatic system and lymphoid tissue, innate and adaptive immune responses, role of the integumentary system, complement cascade
- Regulation of pH, acid-base balance, nutrients involved in maintaining balance, acidosis and alkalosis, effect of respiratory and renal systems on pH balance. Regulation of water balance
- Nutritional influences on a range of physiological processes

Learning Outcomes

On completion of the module, the successful student will be able to:

1. Explain the basis of Systems Biology and Functional Medicine as applied to human physiological processes integrating concepts of homeostasis, allostasis and allostatic load
2. Identify factors in the control of digestive function and elimination
3. Explain the interaction of hormonal and nutritional factors in the control of bone metabolism
4. Demonstrate an understanding of how the body defends itself from pathogens in terms of physiology and nutrition, including the role of the integumentary system
5. Describe major homeostatic mechanisms in the cardiovascular system, including the role of nutrients in cardiovascular function
6. Describe the role of the nervous system - including autonomic nervous system, major neurotransmitter balance and nutritional factors as building blocks and cofactors, the nervous system control of muscle activity and molecular events in muscle contraction
7. Discuss a range of integrated hormonal and neuronal changes that occur in response to both imminent and long-term stress, demonstrating the potential impact on nutritional status
8. Describe pH regulation and acid-base balance, explain the roles of the nutrients involved in maintaining balance, acidosis and alkalosis; regulation of water balance

Learning, Teaching and Assessment Strategy

- Lectures will be used to extend the theoretical material incorporating group and practical exercises and problem-based learning
- Self-study will be used for prior reading and preparation for group work and problem-based tasks
- Tutorials will be available for students needing additional support with their studies
- Ongoing coursework throughout the module will be used to encourage students to consolidate learning and demonstrate an adequate recall of physiological principles

Assessment Weighting

Coursework (no examination) 100%

60% - short answer questions based on the first 10 Activity Content Blocks (ACBs)

40% - 2 essay questions worth 20% each covering key learning across all ACBs

Assignment Deadline Dates

Assessment deadlines are on going, flexible and based on meeting a student's preferred entry points for the degree level programmes.

Reading List

You will receive access via the Royal Society of Medicine (RSM) and ScienceDirect (SD) to the following eBooks:

- Hall J (2011) Guyton and Hall Textbook of Medical Physiology, 12th Edn. [ISBN: 978-1-4160- 4574-8] RSM e-book A-Z
- Carroll R (2007) Elsevier's Integrated Physiology, Mosby Elsevier [ISBN-13: 978-0-323- 04318-2] RSM e-book A-Z
- Carroll R (2010) Problem-Based Physiology, Saunders Elsevier [ISBN 978-1-4160-4217-4] (pbk.) RSM e-book A-Z
- Hall J (2011) Pocket Companion to Guyton and Hall Textbook of Medical Physiology, 12th Edn. [ISBN: 978-1-4160-4574-8] RSM e-book A-Z
- Mulroney S and Myers A (2009) Netter's Essential Physiology, Saunders Elsevier [ISBN: 978-1-4160-4196-2] RSM e-book A-Z