



CCNM

Canadian College of
Naturopathic Medicine

COURSE OUTLINE WINTER 2019

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| Course: | Physiology |
| Course Code: | SPH101 |
| Times & Location: | Online Tutorial: Thursdays 7:30 – 9:00 pm EST |
| Course Coordinator: | Dr. Maria Shapoval, ND |
| Instructors/Teaching Assistants: | Dr. Maria Shapoval, ND |
| E-mail: | |
| Office Hours: | By appointment |
| Office Location: | Online |

Evaluation:

| | PERCENT | TEST DATE / DUE DATE |
|---|----------------|-----------------------------|
| Tutorial Participation/ Attendance | 5% | Weekly tutorial |
| Module Quizzes | 20% | 16 Weekly Quizzes |
| Assignment | 5% | Assignment due TBA |
| Midterm Test | 30% | TBA |
| Final Exam | 40% | TBA |

Plagiarism and cheating are academic offenses and will be treated seriously by the College. Students should refer to the College's policies on academic misconduct posted on in the [Academic Calendar](#). Students may seek guidance from a number of style manuals located in the CCNM library.

Required Texts:

Dee Unqlaub Silverthorne *Human Physiology: An Integrated Approach (7th Edition)*.
Published by Pearson.

Course Description:

Physiology (SPH100) is a three-credit, 8-week introductory course that will provide students with a solid core foundation in basic and applied physiology. The course will emphasize clinical physiology including mechanisms by which cells and tissues of the body operate to maintain homeostasis, and the integrative functions of the major systems of the human body in health and disease.

The application of physiology fundamentals to naturopathic medicine is integrated throughout the course, providing students with a unique opportunity to learn physiology within the context of naturopathic medicine.

Course Outcomes:

On completion of the course the student will be expected to:

- Demonstrate knowledge of organ systems function
- Demonstrate knowledge of cellular function
- Demonstrate the ability to integrate physiology from the cellular and molecular level to the organ system
- Effectively read and communicate scientific information
- Apply understanding of physiological processes in the clinical setting

Pedagogy:

The course is delivered in a blended learning style which combines online self-study modules with weekly live interactive online tutorial sessions from 7:30 - 9 p.m. EST (one evening per week) with the course instructor.

Evaluation:

The passing grade is 60%, and evaluations/assessments will consist of tutorial attendance/participation (5%), one quiz per module (20%), one assignment (5%), one midterm test (30%), and a final exam (40%). Both midterm and final exams will be invigilated at CCNM's testing centre as part of the course, or under the guidance of a suitable invigilator (college/university or secondary school academic professional, librarian, or testing centre) in your local area, costs of which will be the responsibility of the student.

Lecture Schedule

| Classes | Date | Topic | Modules |
|---------|------------|-----------------------------------|--|
| 1 | TBA | Introduction to course & Module 1 | Basic Cell Processes |
| 2 | TBA | Modules 2 | Intro to Endocrine System |
| 3 | TBA | Module 3 & 4 | Neurons & Central Nervous System |
| 4 | TBA | Modules 5 | Sensory Physiology |
| 5 | TBA | Midterm Exam Week | |
| 6 | TBA | Module 6 | Autonomic and Motor Control |
| 7 | TBA | Modules 7 & Review | Muscle Physiology Assignment #1 - deadline |
| 8 | TBA | Final Exam Week | |

SPH100 - Physiology Session Learning Outcomes

Tutorial 1

Date: TBA

Introduction to SPH100 Physiology Course & Basic Cell Processes

By the end of this session, the student will be able to:

- Navigate Moodle SPH100 course shell, GoogleDocs and GoToWebinar programs
- Discuss plagiarism
- Understand course requirement, including textbook readings, evaluations and deadlines
- Begin completion of Modules 1 and Module 2
 - Compare and contrast the composition, structure, and functions of the four major groups of biomolecules.
 - Describe and compare the different types of covalent and noncovalent bonds.
 - Contrast the structure and solubility of polar and nonpolar molecules.
 - Describe the covalent and noncovalent interactions that contribute to molecular shape and explain how molecular shape is related to molecular function.
 - Define pH in words and mathematically, and explain the differences between acids, bases, and buffers.
 - List seven important functions of soluble proteins in the body.

Deadline: Post a brief introduction on "Please introduce yourself" forum before the start of the tutorial.

Tutorial 2

Date: TBA

Introduction to the Endocrine System

By the end of this session, the student will be able to:

- Explain the four criteria that make a chemical signal a hormone.
- Explain what the cellular mechanism of action of a hormone is.
- List three chemical classes of hormones and give an example of each.
- Compare endocrine cells' synthesis, storage, and release of peptide and steroid hormones.
- Compare the location of hormone receptors and the cellular mechanisms of action of peptide and steroid hormones.
- Compare the three main groups of amine hormones.
- Describe the role of the nervous system in endocrine reflexes.
- Compare the structure and function of the anterior and posterior pituitaries.
- List the six anterior pituitary hormones, the hormones that control their release, and their primary targets.
- Compare long-loop negative feedback for anterior pituitary hormones to the negative feedback loops for insulin and parathyroid hormone.
- Explain permissiveness, synergism, and functional antagonism as they apply to hormones.
- Name the three most common types of endocrine pathologies.
- Explain how negative feedback can be used to determine the location of a problem with one gland in a two- or three-gland pathway.
- Explain how comparative endocrinology is useful for understanding human physiology.

Deadline: Complete Modules 1 and 2 before the start of the tutorial.

Tutorial 3

Date: TBA

Neurons: Cellular and Network Properties & The Central Nervous System

By the end of this session, the student will be able to:

- Map the organization of the nervous system in detail.
- Draw and describe the parts of a neuron and give their functions.
- Describe the parts of a synapse and their functions.
- Name the types and functions of glial cells.
- Explain in words how the Goldman-Hodgkin-Katz equation relates to the membrane potential of a cell.
- Explain the relationships between the following terms: current flow, conductance, resistance, Ohm's law.
- Compare and contrast graded potentials and action potentials.
- Explain the changes in ion permeability and ion flow that take place during an action potential.
- Describe and compare absolute and relative refractory periods.
- Explain the role of myelin in the conduction of action potentials.
- Distinguish between electrical and chemical synapses.
- List and give examples of the seven groups of neurocrine secretions.
- Describe different patterns for neurotransmitter synthesis, recycling, release, and termination of action.
- Describe the role of the following in synaptic communication: ionotropic and metabotropic receptors, neurotransmitters and neuromodulators, fast and

- slow synaptic potentials, excitatory and inhibitory postsynaptic potentials.
- Compare temporal and spatial summation.
- Compare presynaptic and postsynaptic inhibition.
- Explain the mechanism of long-term potentiation mediated by AMPA and NMDA receptors.
- Explain and give examples of emergent properties of neural systems in humans and other organisms.
- Describe how nervous systems increase in complexity from Cnidarians to mammals.
- Describe how a hollow neural tube develops into the ventricles and seven major divisions of the CNS.
- Define grey matter, white matter, tracts, and nuclei in the CNS.
- Starting at the skull and moving inward, name the membranes and other structures that enclose the brain.
- Explain the formation, distribution, and functions of cerebrospinal fluid.
- Describe the structure and functions of the blood-brain barrier.
- Explain how the following structures are organized in the spinal cord: ascending and descending tracts, columns, dorsal root ganglia, dorsal and ventral horns, dorsal and ventral roots, propriospinal tracts, spinal nerves
- Name the major subdivisions of the cerebrum, cerebellum, diencephalon, and brain stem, and give their major functions.
- Name the four lobes of the cerebral cortex and explain which sensory, motor, or association areas are associated with each lobe.
- Explain the behavioral state system and how it is related to the diffuse modulatory systems and the reticular activating system.
- Describe the stages of sleep.
- Describe motivation and emotion and how they are related to brain function.
- Explain the role of the following in learning and memory: short-term memory, memory traces, working memory, associative and non-associative learning, and habituation and sensitization.
- Explain the roles of Wernicke's area and Broca's area in written and spoken language.

*Deadline: Complete Modules 3 and 4 before the start of the tutorial. Deadline: Quiz 1 and 2 – **TBA***

Tutorial 4

Date: TBA

Sensory Physiology

By the end of this session, the student will be able to:

- Describe the different types of receptors for somatic and special senses.
- Explain how receptors convert physical stimuli into electrical signals using the following terms: transduction, threshold, adequate stimulus, receptive field, receptor potential.
- Explain how the central nervous system is able to determine modality, location, intensity, and duration of a stimulus.
- Explain how tonic and phasic receptors adapt to a continuous stimulus.
- Trace the pathways for somatic sensation from receptor to the somatosensory cortex.
- Describe the different types of somatosensory receptors.
- Explain how pain and itch are mediated by nociceptors and describe the neural pathways for pain.
- Describe the receptors, sensory transduction, and neural pathways for olfaction.

- Describe the receptors, sensory transduction, and neural pathways for the five primary taste sensations.
- Trace the anatomical pathway sound energy follows from the air until it becomes an action potential in a primary sensory neuron.
- Describe the anatomical pathway for sound transmission from the cochlea to the auditory cortex.
- Explain how hair cells convert sound energy into an action potential.
- Explain how otoliths and the cupula convey information about movement and head position to the vestibular nerve.
- Describe the structures of the eye and the role of each structure in vision.
- Trace the pathway for vision from the retina to the visual cortex.
- Explain how photoreceptors convert light energy into action potentials.
- Explain signal processing in the retina and in the visual cortex.

*Deadline: Complete Modules 5 before the start of the tutorial. Deadline: Quiz 3 & 4 – **TBA***

Tutorial 5

Date: TBA

Midterm Test

The midterm test

*Deadline: Quiz 5 – **TBA***

Tutorial 6

Date: TBA

Efferent Division: Autonomic and Somatic Motor Control

By the end of this session, the student will be able to:

- Describe the physiological role of the autonomic division and its branches.
- Compare and contrast the anatomy and chemical communication of the sympathetic and parasympathetic branches.
- Describe the synthesis and breakdown of autonomic neurotransmitters.
- Describe the structure and secretions of the adrenal medulla.
- Describe the structure of the neuromuscular junction.
- Compare the anatomy, neurotransmitters and receptors of the somatic motor, sympathetic, and parasympathetic divisions.

Deadline: Complete Modules 6 before the start of the tutorial.

Tutorial 7

Date: TBA

Muscles

By the end of this session, the student will be able to:

- Draw and label a series of diagrams to show the different levels of organization of skeletal muscle.
- Diagram the sliding filament theory of contraction.
- Diagram the molecular events of excitation-contraction coupling and the contractile cycle.
- Discuss the different possible causes for muscle fatigue.
- Discuss the differences between slow-twitch fibers, fast-twitch oxidative-glycolytic fibers, and fast-twitch glycolytic fibers.

- Explain how muscle length influences force of contraction.
- Distinguish between summation and the different types of tetanus.
- Define a motor unit and explain how skeletal muscles use them to create graded contractions.
- Compare and contrast isometric and isotonic contractions.
- Describe and give examples of how bones and muscles form fulcrums and levers.
- Diagram smooth muscle anatomy.
- Diagram smooth muscle contraction and relaxation.
- Explain slow wave potentials, pacemaker potentials, and pharmacomechanical coupling.
- Compare and contrast cardiac muscle with skeletal and smooth muscle.

*Deadline: Complete Modules 7 before the start of the tutorial. Deadline: Quiz 6 – **TBA***

*Deadline: **Assignment – due by midnight of **TBA*****

*Deadline: Quiz 7 – **TBA***