

ANP1105D

ANATOMY & PHYSIOLOGY I: Basic Cellular Physiology & the Anatomy and Physiology of the Cardiovascular, Lymphatic & Respiratory Systems Course Outline: January – April, 2020

This is the first of three ANP courses offered within the University, a 3-credit course, with 3 hours of lectures per week during the winter term. This course provides an introduction to tissue and cell morphology, biochemistry of the cell and physiological concepts including diffusion, osmosis, membrane transport and homeostasis. The physiology of nerve and muscle cells will be examined followed by in-depth study of the anatomy and physiology of blood and the cardiovascular, lymphatic and respiratory systems.

Would you like to determine your best way of learning? Check out the VARK site (<http://www.vark-learn.com>). You can also follow links within the site to find helpful study advice.

There will be three exams through the duration of the course, as indicated in the detailed outline. Please note that **Exam 1** will deal with all material from the Structural Organization of the Human Body (*Topic 1*) up through the Introduction to Nerve & Muscle (*Topic 2*). **Exam 2** will deal with Homeostasis (*Topic 3*), Blood & the Heart (*Topic 4.1 - 4.2*). The **Final Exam** will concentrate on and Blood Vessels & Hemodynamics (*Topic 4.3*) as well as the Lymphatic (*Topic 5*) and Respiratory systems (*Topic 6*). In addition, **15-20%** of the final exam will be composed of questions dealing with material covered in the first two sections of the course (*Topics 1 - 4.2*).

If you have to miss any exam due to illness, you must obtain the appropriate documentation from your doctor (dated the day of the exam) in order to have permission to write a deferred exam. You must contact us within 5 working days of missing the exam and provide us with the medical documentation as soon as possible after that.

If you do not write the regular exam or the deferred exam, you will obtain a zero for that section of the course.

Supplemental exams are now available for those students who fail an ANP course but do well enough to obtain an **E**. Students who fail with an **F** are not eligible for a supplemental exam and must repeat the course. The supplemental exam mark will replace the original final exam mark in the new calculation of the student's final grade. While both final grades will appear on the student's transcript, only the supplemental mark will be used for grade point calculations. The supplemental exam for ANP1105D will take place in June and the regulations regarding illness on exam day indicated in the preceding paragraph also apply to this exam.

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TEXTBOOK: **Human Anatomy & Physiology** (11th edition, E.N. Marieb & K. Hoehn)
The textbook is available at the main bookstore at the downtown campus (UCU bldg).
You will need the online access code for Mastering A&P to be able to do the Mastering A&P Online assignments. The online access code comes with the purchase of a new text book, but it may also be purchased as a standalone product from the bookstore.

Course Website: Go to "Virtual Campus" @ uOttawa, login and select "ANP1105D" from a list of courses for which you have access.

LECTURES: **Mondays** 11:30 - 12:50 CRX C140
Thursdays 13:00 - 14:20 CRX C140

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|--|------------------------------------|----------------|
| Exam 1 (Topics 1 & 2) | Thursday, January 30 th | 25% final mark |
| Exam 2 (Topic 3 - 4.2) | Monday, March 9 th | 25% final mark |
| Mastering A&P Online Assignments Course ID: li33956 Course Name: ANP1105D2020 | Throughout the term | 10% final mark |
| Final Exam (80-85% of questions on Topics 4.3 - 6) (15-20% of questions on Topics 1 – 4.2) | TBD (April 7-24) | 40% final mark |
| Total | | 100% |

Late submissions penalty: 2% for each hour late, automation through the Mastering A&P website

| Assignment Number | Available @18:00 h | Due always @ 22:00 h |
|--|------------------------|-------------------------|
| 1) Cells and Tissues_QL | January 6 (Monday) | January 15 (Wednesday) |
| 2) Membrane Transport and the Neuron_JS | January 16 (Thursday) | January 22 (Wednesday) |
| 3) Muscle_JS | January 23 (Thursday) | January 29 (Wednesday) |
| 4) Homeostasis_QL | February 6 (Thursday) | February 12 (Wednesday) |
| 5) Blood_JS | February 13 (Thursday) | February 26 (Wednesday) |
| 6) Heart_JS | February 27 (Thursday) | March 4 (Wednesday) |
| 7) Blood Vessels_JS | March 12 (Thursday) | March 18 (Wednesday) |
| 8) Lymphatic System & Respiratory Anatomy_QL | March 26 (Thursday) | April 1 (Wednesday) |
| 9) Respiratory Physiology_QL | April 2 (Thursday) | April 8 (Wednesday) |

All assignments are available as study aids until the end of the final exam period

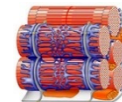
1. Structural Organization of the Human Body (Jan. 6, 9, Q. Li)

- 1.1. Describe the levels of structural organization that make up the human body
- 1.2. Cells: summarize the major organelles and structures found in body cells
- 1.3. Tissues: describe the different tissues of the human body



Assignment #1 (Cells and Tissues) is due January 15th

2. Cellular Physiology of Nerve and Muscle (Jan. 13, 16, 20, 23, 27, J. Savory)



- 2.1. Membrane Transport:
 - 2.1.1. Describe the structure of the plasma membrane
 - 2.1.2. Describe and differentiate among the various types of transport across the plasma membrane
 - 2.1.3. Describe osmosis and explain its role in fluid homeostasis
- 2.2. Neurons:
 - 2.2.1. Identify the different regions of the neuron and associate each region with the functions of reception, propagation and transmission of nerve impulses
 - 2.2.2. Explain the phenomena (diffusion of ions, types of ion channels) that are responsible for the electrical activity of neurons (resting membrane potential and action potential)
 - 2.2.3. Describe the factors that influence propagation of the action potential along an axon
 - 2.2.4. Explain the mechanisms of synaptic transmission (synapse, post-synaptic potentials, synaptic integration)

Assignment #2 (Membrane Transport & Neuron) is due January 22nd

- 2.3. Muscles:
 - 2.3.1. Describe the microscopic structure of skeletal muscle fibers and explain the cellular mechanisms of excitation-contraction coupling
 - 2.3.2. Describe the neuromuscular junction
 - 2.3.3. Describe the contractile properties of skeletal muscle (motor unit, isotonic & isometric contractions, spatial & temporal summation, etc)
 - 2.3.4. Associate various muscle types with their metabolism and their speed of contraction and rate of fatigue
 - 2.3.5. Compare the properties of smooth muscle with those of skeletal muscle

Assignment #3 (Muscle) is due January 29th

Midterm #1: January 30th during class

3. **Homeostasis: Introduction to the Autonomic Nervous System and Endocrine System** (Feb. 3, 6, Q. Li)

3.1. Define and identify the main characteristics of homeostasis

3.2. Nervous system:

3.2.1. Compare somatic and autonomic nervous systems

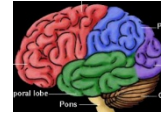
3.2.2. Compare the functional differences between the sympathetic and parasympathetic divisions of the ANS

3.3. Endocrine system:

3.3.1. Distinguish between exocrine and endocrine glands, and localize the major endocrine glands

3.3.2. Describe the different structural classes of hormones and their mechanisms of action

3.3.3. Describe the functional organization of the hypothalamic-pituitary axis



Assignment #4 (Homeostasis) is due February 12th

4. **Cardiovascular System** (Feb, 10, 13, 24, 27, Mar. 2, 4, 12, 16, J. Savory)



4.1. Blood:

4.1.1. Describe the composition of blood (plasma & formed elements)

4.1.2. Erythrocytes:

4.1.2.1. Describe the structure and function of RBCs; structure and properties of hemoglobin

4.1.2.2. Describe erythropoiesis, mechanisms of control, and life cycle of erythrocytes

4.1.3. Hemostasis:

4.1.3.1. Explain the principal steps and justify the role of platelets and clotting factors in this process

4.1.3.2. Explain the fibrinolytic system and recognize the action of the major anticoagulants

4.1.4. Differentiate among the various blood types and explain the basis of transfusion reactions

Assignment #5 (Blood) is due February, 26th

4.2. The Heart:

4.2.1. Describe the internal and external anatomy of the heart

4.2.2. Trace the pathway followed by blood in both the pulmonary and systemic circuits

4.2.3. Describe the organization of the coronary circulation

4.2.4. Compare the physiological properties of cardiac muscle cells with those of skeletal muscle cells

4.2.5. Compare the electrical properties of contractile cardiac muscle cells with those of autorhythmic cardiac muscle cells

4.2.6. Explain how the intrinsic conduction system of the heart allows it to function as a pump.

4.2.7. Explain what is an ECG tracing and the nature of the information it is providing

4.2.8. Explain the events occurring during each phase of the cardiac cycle

4.2.9. Define cardiac output in terms of heart rate and stroke volume

4.2.10. Describe in detail the mechanisms for the regulation of heart rate & stroke volume

Assignment #6 (The Heart) is due March 4th

Midterm #2: March 9th during class

4.3. Blood vessels and hemodynamics:

4.3.1. Compare and contrast the structure of the walls of arteries, capillaries and veins

4.3.2. Compare the 3 types of arterial vessels

4.3.3. Define microcirculation and compare the three types of capillaries

4.3.4. Describe the structure and functions of the venules and veins

4.3.5. Define blood flow, blood pressure, resistance, peripheral resistance

4.3.6. Illustrate the changes in blood pressure throughout the various vessels of the circulatory system

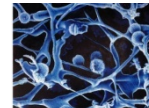
4.3.7. Explain the factors that affect resistance and justify the importance of arterioles in the control of peripheral resistance

- 4.3.8. Define systolic and diastolic arterial pressure, pulse pressure and mean arterial pressure
- 4.3.9. Identify and justify the value for mean capillary blood pressure
- 4.3.10. Express blood pressure in terms of cardiac output and peripheral resistance
- 4.3.11. Describe the short-term neural and chemical mechanisms for the regulation of blood pressure
- 4.3.12. Describe the role of the kidneys in the long-term regulation of blood pressure
- 4.3.13. Define and explain the mechanisms of autoregulation with regard to local blood flow
- 4.3.14. Explain the forces that act to influence capillary exchange
- 4.3.15. Identify the principal arteries and veins of the cardiovascular system: *You will be responsible for arteries and veins up to the level of the wrist and ankle, to each organ and to the brain (to and including the circle of Willis). If you begin early and review often, then you will find it is not as daunting as it looks. However, there will be little "learning time" during the lectures, so it will be up to you to put in the time.*

Assignment #7 (Blood Vessels) is due March 18th

5. The Lymphatic System (Mar. 19, Q. Li)

- 5.1. Describe the structure and main functions of the vessels and organs of the lymphatic
- 5.2. Explain the origin of lymph as well as its transport



system

6. The Respiratory System (Mar. 23, 26, 30, Apr. 2, Q. Li)

- 6.1. Describe the structures of each one of the components of the conduction and respiratory zones
- 6.2. Describe the gross structure of the lungs & the pleural coverings



Assignment #8 (Lymphatic System & Respiratory Anatomy) is due April 1st

- 6.3. Define & explain the following: intrapulmonary, intrapleural & transpleural pressures
- 6.4. Explain the roles of the diaphragm & accessory muscles during inspiration & expiration (quiet & forced)
- 6.5. Explain the 3 factors that influence pulmonary ventilation
- 6.6. Describe how lung volumes & capacities are measured; indicate their physiological significance
- 6.7. Define dead space and indicate its importance in minute and alveolar ventilation
- 6.8. Explain the mechanisms underlying the non-respiratory air movements
- 6.9. State Dalton's Law and use it to describe the composition of atmospheric and alveolar air
- 6.10. Explain the factors that influence the movement of gases at the air-liquid interface
- 6.11. List and describe 3 factors that influence the exchange of air and carbon dioxide (lungs)
- 6.12. Describe the partial pressure gradients that drive oxygen and carbon dioxide movement (tissues)
- 6.13. Describe completely the transport of oxygen in the blood
- 6.14. Explain the sigmoidal nature of the oxygen-hemoglobin dissociation curve
- 6.15. Describe completely the 3 ways in which carbon dioxide is transported in the blood
- 6.16. Explain the Bohr and Haldane effects
- 6.17. Associate carbon dioxide levels with blood pH; explain how respiration can regulate blood pH
- 6.18. Describe how respiration is controlled by the nervous system
- 6.19. Indicate the effects of the following factors on respiration: Hering Breuer reflex, hypothalamus, cortex
- 6.20. List the 3 principal chemical factors that influence respiration and explain their mechanisms of action
- 6.21. Discuss the mechanisms controlling respiration during intense exercise

Assignment #9 (Respiratory Physiology) is due April 8th

