BIOLOGY 4751 - NEUROBIOLOGY I
2009 Serial

1. Instructor. Dr. Robert J. Omeljaniuk, CB-4013, 343-8236

2. Intent. To provide senior undergraduate students with an opportunity to study selected aspects of neurobiology in a directed study approach.

3. Marking Scheme.

a. Submitted assignments. 7 X 10 marks = 70 final marks.

b. Presentation of answers to class. 3 X 10 marks = 30 final marks.

The intent of this element of evaluation is to stimulate and enhance students' development of presentation skills to cognate colleagues. Throughout the term students will give a total of three brief seminars (15 min presentation + 5 min question period) which answer one (or a part of a large question) of the questions in the weekly assignment. Students will use appropriate audio-visual media but are advised not to devote an inordinate amount of time to technological sophistication. Student presentations will be evaluated on the bases of accuracy, completeness and clarity. The seminar schedule will be defined following confirmation of authorized students at the beginning of the course. ***Please note that students are encouraged to undertake original research topics in lieu of assigned presentations; their content, and academic merit will be comparable with assigned questions. Topics require approval by the course instructor prior to their undertaking and may not include topics covered in Neurobiology II (BIOL 4752), Endocrinology (BIOL 4830), Neurochemistry (BIOL 4850) or Pharmacology (BIOL 4855).***

4. Execution.

a. General.

(1) Students will be assigned specific readings from the course textbook and will be prepared to discuss the subject matter and any difficulties they may have with it in group discussions on a weekly basis.

(2) Students' comprehension and mastery of the material will be evaluated on the basis of assignments submitted no later than one week following discussion of the subject matter. Answers to assigned questions may take any neatly presented format including text, figures and tables submitted as a hard copy; paragraph and short-essay answers supported by diagrams of the student's own design will be most appropriate. Page limits refer to narrative and not to figures or tables; assignment answers exceeding page limits will not be marked. In many cases, the preparation of an answer will require sourcing information from several sections of the textbook.

(3) All assignments must be credibly completed; **class attendance is mandatory**. In the event a student completes the course with a mark between 40 and 49 %, they will be eligible to apply for a Special Exam, which covers all course material, to be arranged with Lakehead University Scheduling. Students' term marks will be prorated to 50% of the course mark; the Special Exam will be valued at 50% of the final mark.

b. Tentative Outline.

Serial	Chapter #	Chapter Title	Discussion Date (week of)	Assignment Deadline (week of)
1	52	Development of the nervous system.	08 Sep	15 Sep
2	53	The generation and survival of nerve cells.	15 Sep	22 Sep
3	54	The guidance of axons to their targets.	22 Sep	29 Sep
4	55	The formation and regeneration of synapses.	29 Sep	06 Oct
5	57	Sexual differentiation of the nervous system.	06 Oct	13 Oct
6	58	Aging of the brain and dementia of the Alzheimer type.	13 Oct	20 Oct
7	17	The anatomical organization of the central nervous system.	20 Oct	27 Oct

c. Class Presentations.

Class presentations will begin the week of September 28. Typically, class time allows for three to five presentations with question periods; classes will continue to be regularly held until all students have completed their presentation requirements. All students are obligated to attend all classes until all presentations have been made. Please see notes above in addition. Students may alternately present their seminars to junior level physiology classes to provide those students with background to neural system development and to provide speakers with a motivated audience.

5. Textbook.

Principles of Neural Science (4th ed). E.R. Kandel, J.H. Schwartz, and T.M. Jessell. McGraw-Hill. New York. 1414 pp. 2000.

Assignment 1.

1. Describe the development of the neural tube from the three-vesicle stage to a point where the cephalic flexure, pontine flexure, and cervical flexure are clearly discernable. (3 marks; 3 pages).

2. Discuss and explain the role of chemical factors in determining dorsal:ventral organization of the spinal cord. (5 pages; 5 marks).

3. Contrast the development of the mid-brain with that of the forebrain. (2 marks; 2 pages).

Assignment 2.

1. Explain how sensory neurons are located in the dorsal aspect of the spinal cord while motor neurons are located in the ventral aspect of the spinal cord. (3 marks; 4 pages).

2. Explain how neural crest cells develop into neural or glial cells. (2 marks; 3 pages).

3. Explain the mechanisms supporting programmed neuronal cell death. (5 marks; 6 pages).

Assignment 3.

1. Describe and contrast the projection of retinal cell axons to target sites in the brain with the projection of motor neuron axons to muscle target cells. (5 marks; 7 pages).

2. In order to rationalize the information presented on chemical cues for axon migration, create a table which describes/lists

a. the specific chemical clue, perhaps grouped according to family;

b. the structure of the chemical under consideration;

c. the biological (or presumed) activity of the chemical under consideration; and

d. a comments column for your observation and conclusions pertaining to each chemical.

Take your time with this one and pick through the data carefully. The intent of this question is to assist you in formulating a document that will assist you to understand and remember the material more easily. (5 marks).

Assignment 4.

1. As logically, clearly, and completely as possible, describe the sequence of events and mechanisms involved in synaptogenesis. (8 marks; 10 pages).

2. Contrast synaptogenesis between central and neuromuscular synapses. (2 marks; 4 pages).

Assignment 5.

1. Describe the genomic- and messenger-determinates of the sexual differentiation of the reproductive system. (2 marks; 3 pages).

2. Discuss hormonal dependency of brain differentiation between males and females. (5 marks; 4 pages).

3. Contrast the specific sex differences in the brain control behaviour. (3 marks; 3 pages).

Assignment 6.

1. Discuss and compare the intracellular and extracellular substrates (indications) of Alzheimer's disease with particular emphasis on the molecular basis for these phenomena. (10 marks; 8 pages).

Assignment 7.

1. Create a table which resolves the central nervous system (CNS) into its' main constituents. Organize the information to highlight the anatomical location, organization, and function of each part of the CNS. Include a column for comments (3 marks).

2. Identify and describe the five principles that govern the organization of the major functional systems. (2 marks; 3 pages).

3. Describe the structural and functional organization of the cerebral cortex and the subcortical regions. (5 marks; 5 pages).