

## **BIOLOGY 3P03 (Cell Physiology)**

Term I 2015-2016

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### TAs:

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This three-unit course will examine several basic concepts in Cell Physiology and will illustrate general physico-chemical principles using examples from vertebrate, invertebrate, or plant systems. There will be emphasis on the electrical properties of cells, membrane proteins involved in ion transport functions, chemical signalling via second messengers, and regulation of cell homeostasis (intracellular Ca<sup>2+</sup>, pH). The course will consist of two lectures per week plus one tutorial. Course material, including lecture notes (*sometimes in abbreviated form*), will be posted on Avenue. ***It is advisable to take additional notes during lecture, as material discussed in lectures may appear on exams/tests (though it may not be posted on Avenue).***

### Prerequisite:

One of BIOLOGY 2A03, PNB 2XB3 or PSYCH 2F03, or both BIOLOGY 1A03 (or ISCI 1A24 A/B) and six units from KINESIOL 1A03, KINESIOL 1AA3, KINESIOL 1Y03, KINESIOL 1YY3, KINESIOL 2Y03, KINESIOL 2YY3; and credit or registration in one of BIOCHEM 2BB3, BIOCHEM 3G03; or ISCI 2A18 A/B

### Course grade:

***The final grade will be determined as follows:***

A two-hour final exam worth 50 - 55%; two ~50 min quizzes worth 40-45% (combined); and a tutorial mark worth 5%. Quizzes will be written in the class period (3:30 pm – 4:20 pm) on **Tuesday October 25<sup>th</sup> and Friday November 25<sup>th</sup>, 2016**. Note that the tests are not written in the usual location for the lectures: both of these tests will be written in ITB 137.

### **NOTE:**

If you submit MSAF documentation for either **Quiz #1 or Quiz #2** ***your final exam will be weighted more heavily at the discretion of the instructor. The MAXIMUM contribution of the December final exam to the overall course grade is 75%. There will be no 'make up' quizzes.***

**The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.**

Text:

The required text “Cellular Physiology of Nerve and Muscle” by G.G. Matthews (3rd or 4th Edition) will be used primarily during the first part of the course, approximately the first 17 lectures. The main focus will be on Chapters 1 to 9 inclusive. Other useful texts and references include “*Molecular Cell Biology*” by Lodish et al. or “*Molecular Biology of the Cell*” by Alberts et al. The texts “*Ionic Channels of Excitable Membranes*” by B. Hille and “*Medical Physiology*” by W.F. Boron and E.L. Boulpaep are more advanced and expand on material covered in this course.

Topics and Schedule:

<b>Lecture #</b>	<b>Dates</b>	<b>Topic</b>	<b>Tutorial</b>
1	<b>Sept. 6</b>	Introduction	
2	Sept. 9	Membrane potential: Ionic equilibrium I	<b>None-</b> Sept. 5,6, 8
3	Sept. 13	Membrane potential: Ionic equilibrium II	
4	Sept. 16	Membrane potential: Ionic steady state I	<b>None-</b> Sept. 12, 13,15
5	Sept. 20	Membrane potential: Ionic steady state II	#1 Sept. 19, 20, 22
6	Sept. 23	Action potential I	
7, 8	Sept. 27, 30	Action potential II, III	#2 Sept. 26, 27, 29
9	Oct. 4	Voltage Clamp I	#3 Oct. 3, 4, 7
	<b>Oct. 11<sup>th</sup>, 14<sup>th</sup></b>	<b>Mid-term Recess (no lectures)</b>	
10, 11	Oct. 18, 21	Voltage Clamp II, III	#4 Oct. 17, 18, 20
	<b>Tues. Oct 25</b>	<b>QUIZ #1</b>	<b>None</b> – Oct. 24, 25, 27
12	Oct. 27	Single Channel recording I	
13, 14	Nov. 1, 4	Single channel recording II, III	#5 Oct. 31, Nov.1, 3

15, 16	Nov. 8, 11	Ligand-gated ion channels I, II	#6 Nov. 7, 8, 10
17	Nov. 15	Intracellular messengers I ( $\text{Ca}^{2+}$ , cAMP, G-proteins)	
18	Nov. 18	Intracellular messengers II (G-proteins, $\text{Ca}^{2+}$ , $\text{IP}_3$ , DAG, NO)	#7 Nov. 17, 18, 20
19	Nov. 22	Homeostasis I (regulation of intracellular $\text{Ca}^{2+}$ and pH)	<b>None-</b> Nov. 21, 22, 24
	<b>Friday Nov. 25</b>	<b><i>QUIZ #2</i></b>	
20	Nov. 29	Homeostasis II (regulation of intracellular $\text{Ca}^{2+}$ and pH)	#8 Nov, 28, 29, Dec. 1
21, 22	Dec. 2, Dec. 6	Epithelial transport	
		Classes end Wednesday, December 7th	