

PHM/PSL/ZOL/NEU 827

Fall 2013

Physiology and Pharmacology of Excitable Cells

Coordinator: Peter Cobbett (cobbett@msu.edu)

10.20am-11.45am Monday, Wednesday, Friday

B448 Life Sciences Building

Lecture Schedule

I. Electrical Properties of Excitable Cells: Part A

08/28	Introduction; Neuronal membrane structure, channel proteins	Atchison
08/30	Channel proteins and ions, electrochemical equilibria	Atchison
09/02	Labor Day: No class	
09/03*	Nernst equation, Hodgkin-Huxley-Goldman equation	Atchison
09/04	Ion pumps and exchangers: Elemental ions	Galligan
09/06	Membrane resistance and capacitance	Cobbett
09/09	Cable properties and equivalent circuits	Cobbett
09/11	Gating of voltage independent and voltage dependent channels	Cobbett
Online	Principles of electrical measurements from cells	Cobbett

II. Electrical Properties of Excitable Cells: Part B

09/13	Sodium channels I	Dong
09/16	Sodium channels II	Dong
09/18	Potassium channels I	Cobbett
09/20	Potassium channels II	Cobbett
09/23	Calcium channels I	Cobbett
09/25	Calcium channels II	Cobbett
09/27	G protein coupled channels	Cobbett
09/30	Maintenance of intracellular Ca homeostasis I	Jackson
10/02	Maintenance of intracellular Ca homeostasis II	Jackson

III. Intercellular Communication

10/04	Overview of synaptic transmission	Hegg
10/07	Mechanisms of synaptic excitation: Nicotinic cholinergic receptors	Cobbett
10/09	Mechanisms of synaptic excitation: Glutamate receptors	Cobbett
10/11	Mechanisms of synaptic inhibition: GABAergic receptors	Cobbett
10/14	Synaptic integration	Cobbett
10/16	Synaptic plasticity: long term potentiation and depression	Cobbett
10/18	Regulated secretion of stored chemicals: Principles I	Hegg

10/21	Regulated secretion of stored chemicals: Principles II	Hegg
10/23	Regulated secretion of stored chemicals: Transmitters I	Hegg
10/25	Regulated secretion of stored chemicals: Transmitters II	Hegg
10/28	Mechanisms of synaptic excitation: ATP and 5-HT gated channels	Galligan
11/30	Mechanisms of slow synaptic excitation	Galligan
11/01	Ion pumps and exchangers: Neurotransmitters	Galligan

IV. Cell Structure and Motility

11/04	Early neuronal development: from neural tube to polarized neurons	Miller
11/06	The neuronal cytoskeleton: small, medium, and large filaments	Miller
11/08	Actin-based motility in neurons	Miller
11/11	The growth cone: steering and pathfinding	Miller
11/13	Axonal transport and other microtubule-based growth functions	Miller
11/15	The endomembrane system: nucleus to synaptic vesicle	Miller

V. Sensory Receptors and Muscle Biology

11/18	Principles of sensory transduction	Schneider
11/20	Somatic senses	Schneider
11/22	Vision	Weber
11/25	Hearing	Weber
11/26*	Muscle proteins and mechanics	Meyer
11/27	E-C coupling, ryanodine receptors and modulation	Meyer
11/29	Thanksgiving Friday: No Class	
12/02	Muscle metabolism and diversity; muscle development & adaptation	Meyer
12/04	Smooth muscle physiology	Jackson
12/06	Cardiac muscle and pacemakers	Jackson

Evaluation

Exams

There will be five exams. Exams 1-4 will be held out of class time at times arranged by Dr Cobbett and the students. Exam 5 will be held in Finals Week at a time arranged by Dr Cobbett and the students.

Each exam is worth 100 points and is scheduled for 3.5 hours; each exam is weighted (as indicated below) in calculation of the final grades. For each exam, the product of the % weight and a student's raw score (points out of 100) gives the weighted score counting toward the final grade.

Exam 1	Electrical Properties of Excitable Cells: Part A	Weighted 18%
Exam 2	Electrical Properties of Excitable Cells: Part B	Weighted 20%
Exam 3	Intercellular Communication	Weighted 29%
Exam 4	Cell Structure and Motility	Weighted 13%
Exam 5	Sensory Receptors and Muscle Biology	Weighted 20%

Course Grades

The final grade for each student is determined after the weighted score for all five exams are added together; this summed score is out of 100, i.e, it is percentage score.

The following grade scale will be used.

91-100%	4.0
81-90%	3.5
71-80%	3.0
61-70%	2.5
51-60%	2.0
41-50%	1.0
<41%	0.0

Teaching Faculty

Bill Atchison
Professor
Pharmacology & Toxicology
atchiso1@msu.edu

Peter Cobbett
Associate Professor
Pharmacology & Toxicology
cobbett@msu.edu

Ke Dong
Professor
Entomology
dongk@msu.edu

Jim Galligan
Professor
Pharmacology & Toxicology
galliga1@msu.edu

Colleen Hegg
Associate Professor
hegg@msu.edu

Bill Jackson
Professor
Pharmacology & Toxicology
jacks783@msu.edu

Ron Meyer
Professor
Physiology
meyerr@msu.edu

Kyle Miller
Assistant Professor
Zoology
kmiller@msu.edu

Steve Schneider
Professor
Physiology

schnei98@msu.edu

Art Weber
Professor
Physiology
weberar@msu.edu