Neuro 103: Neuropharmacology
Fall 2007 Class Schedule

Date	Topic	Reading*/assignments
Sept. 5	Course Intro;	course syllabus; MQpp1-6
Sept. 7	Neurons and Glia	MQ Ch. 2
Sept. 10	Overview: electrical and chemical signaling	MQ Ch3
Sept. 12	Principles of pharmacology	MQ Ch 1
Sept. 14	Principles of pharmacology	MQ Ch 1
Sept. 17	Neurotransmitters: Acetylcholine	MQ Ch 6
Sept. 19	Neurotransmitters: Serotonin	MQ Ch 6
Sept. 21	Discussion: Nicotine	Maskos et al., 2005
Sept. 24	Neurotransmitters: monoamines	MQ Ch 5
Sept. 26	**Quiz;** Neurotransmitters: monoamines	MQ Ch 5; Ch 11
Sept. 28	Discussion: cocaine mech. of action	TBA
Oct. 1	Neurotransmitters: amino acids	MQ Ch. 7
Oct. 3	Neurotransmitters: peptides and purines	MQ Ch. 10
Oct. 5	Discussion: MDMA (Ecstasy)	TBA
Oct. 8	Reward systems and addiction	MQ Ch 8; **Lit review topic due**
Oct. 10	Mechanisms of addiction; alcohol abuse	Hyman et al 2006
Oct. 12	Discussion: mechanisms of addiction	TBA
Oct. 15	Review session	
Oct. 17	**Midterm Exam**	
Oct. 19	Addiction: Alcohol abuse	MQ Ch 9
Oct. 22	Fall Break	
Oct. 24	Pharmacology of Alcohol	MQ Ch 9
Oct 26	Discussion: Alcohol addiction	TBA
Oct. 29	Parkinson's Disease	Dauer and Przedborski, 2003
Oct. 31	Huntington's Disease	Cattaneo et al., 2002; Marx 2005
Nov. 2	Discussion: Parkinson's	TBA
Nov. 5	No Class—Soc. For NS meeting	
Nov. 7	Schizophrenia and Mood Disorders	MQ Ch 8
Nov. 9	Discussion: Huntington's Disease	TBA; **Lit review outlines due**
Nov. 12	Depression	MQ Ch 16
Nov. 14	**Quiz**; Anxiety disorders	MQ Ch 17
Nov. 16	Discussion: Depression	TBA

Date	Topic	Reading*/assignments
Nov. 19	Hallucinogens	MQ Ch 14
Nov. 21	Discuss literature review projects	
Nov. 23	**Thanksgiving break**	
Nov. 26	Cannabinoids	MQ Ch 13
Nov. 28	Nitric oxide	TBA
Nov. 30	Discussion: THC mechanism of action	TBA
Dec. 3	Alzheimer's Disease	TBA; **Literature reviews due**
Dec. 5	Public Policy issues	
Dec. 7	Discussion: Alzheimer's Disease	TBA
Dec. 10	Discussion: Nootropic agents	TBA
Dec. 12	Wrap-up; course evaluations	

***Supplementary reading, e.g. papers from the primary literature or review articles, may be assigned for some lectures or discussions. Text chapters listed may not be covered in their entirety.**

Final Exam Monday Dec. 17th, 9 a.m.

Texts:
Required:
Meyer, J. S. and Quenzer, L.F. (2005) **Psychopharmacology: Drugs, the Brain, and Behavior**, Sinauer Press. (= MQ)

Optional:
(*Available to borrow from KP)*

Nestler, E.J., Hyman, S.E., and Malenka, R.C. (2001) **Molecular Neuropharmacology**, McGraw-Hill (=MHN)

Lambert, K. and Kinsley, C.H. (2005) **Clinical Neuroscience,** Worth Publishers.

Kandel, Eric, Schwartz, James, and Jessell, Thomas. **Principles of Neural Science and Behavior**, Appleton & Lange (= KSJ)

Purves, Dale et al (2004) **Neuroscience,** 3rd Ed., Sinauer Associates, Inc

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Course Description and Goals:

Neuro 103: Neuropharmacology is an advanced lecture- and discussion-based course in which we will focus on molecular mechanisms of drug actions in the nervous system. We will discuss how drugs are used as tools to better understand the nervous system and behavior. Special attention will be given to the biochemical basis of psychiatric and neurodegenerative disorders. By the end of the course students should be adept at critically reading and evaluating papers from the primary literature.

Responsibilities:

I. Examinations

There will be one midterm exam, two quizzes, and a final exam. Quizzes will consist of short-answer questions, and their purpose is to make sure that you don't fall behind in the reading. Exams will consist of short-answer questions (some factual, some conceptual), as well as longer-answer questions. The longer questions will often ask for interpretation of experimental results, or design of an experiment to test a hypothesis, rather than simple recall of facts. Quizzes will be 20 minutes long, and 25 points each. The midterm exam will be 50 minutes long and 100 points. The final exam, on December 17th (9 am), will cover material presented over the entire course.

Conflicts regarding the scheduling of the midterm exam must be discussed and addressed within the first two weeks of class (Sept. 5th-Sept. 14th). There will be no make-up exams for the quizzes, midterm or final. Students seeking exception to this must provide a note from the dean's office or from the health center. Students with undocumented absences for exams will receive a grade of zero for that exam.

II. Literature review

Throughout the semester you will be reading in depth about a topic of interest to you, and you will write a 10-12 page literature review addressing that topic. See "***Neuro 103 Literature Review Guidelines***" for further description of this assignment. By **October 26th,** you need to identify your literature review topic and turn in a 1-paragraph summary identifying the major question(s) in the field and a list of at least 6 relevant references (with complete citations, including all author names) that you have been reading. By **November 16th** you need to turn in an outline of your paper, and the final paper is due **December 5th**.

III. Reading and discussion of the primary literature

The course involves a great deal of reading and discussion of papers from the primary literature. Along with one or two of your classmates, you will be responsible for leading two discussion sessions. This means that you will have read the assigned paper(s) in much greater detail than your fellow classmates, and you will prepare by reading additional papers related to the assigned paper(s) and addressing the following:

1. events leading up to the paper in question (look up and read references cited in the introduction of the paper you're presenting)
2. objectives of the work. Why is it important? What is their hypothesis?
3. methods used by the authors to fulfill those objectives
4. results of the paper (what's in the figures? Is it presented clearly?)
5. the conclusions drawn from these results, and whether they are appropriate conclusions. Are there other plausible explanations for the data?
6. issues/questions that the authors did not address
7. possible controversies surrounding the paper(s)

8. what to do next (what questions are left unanswered?)
You and your fellow discussion leader(s) will probably want to meet with KP before leading your discussion. Additional guidelines and suggestions for these discussions will be provided.

If you are not a leader on any given discussion day, you will need to turn in a 1-page summary (hard copy only!) *before the discussion starts* that addresses the following for each paper to be discussed:
1. What is the central hypothesis that the authors are testing?
2. Describe one important experiment from the paper that tests that hypothesis (include mention of controls, where relevant).
3. Why do you think the experiment you described is a key experiment for this study?
4. Provide two or more questions that you would like to address in our discussion. **Bring a hard copy of the paper to class for discussion, and write down your two questions on the hard copy of the paper.**

Your grade for the course will be determined by the following:
Midterm Exam: 20%
Final Exam: 30%
Literature review: 20%
Leading each paper discussion: 5% x 2
Paper summaries: 5%
Quizzes: 5%
Participation: 10%

In addition, several biology, chemistry, and/or neuroscience seminars will be scheduled throughout the semester. A one-page synopsis of each talk can be submitted for extra credit for this class. These summaries should include a description of the speaker's research goals, the work described, questions that you asked or would have liked to have asked, and your general reaction to the talk. Each summary can boost your grade one percentage point, and you may submit up to 3 summaries. If you are attending a seminar to fulfill a requirement for another course, you cannot receive extra credit for this course (i.e., no double-dipping!).
I will announce upcoming seminars in advance, in class and via email. Summaries are due by 5 pm Dec. 12th (though it's better to submit them shortly after attending a talk, while you remember the content).

Please turn in papers directly to me, or slide them under my office door (Rm 211, Seaver Biology Building) if the door is closed. If my office is open, put the paper on my chair where I will see it. Be sure to label the paper with the ***date of submission, AND send an electronic copy as a Word attachment (to kparfitt@pomona.edu)****. A networked laser printer is available for your use in the Neurobiology lab. It prints double-sided—save paper!*

All written and oral work must be completed in order to pass the course.

Approximate grading scale (i.e., if you achieve at least this score, you will get at least this letter grade):

90% and above – A	70-75%-- B-
85-90% -- A-	65-70%-- C+
80-85% -- B+	60-65%-- C
75-80% -- B	55-60%-- C- etc.

What do I need to know before taking Neuropharmacology?

The prerequisites for this course are Pomona's Bio 40 and Bio 41M (now Bio 41C), or the equivalent. A pre-requisite for those courses are General Chemistry. Familiarity with organic chemistry will be helpful but is not required. In particular, you should be able to answer the following questions:

1. One of the simplifying principles of biology is that all living organisms are made of four principle types of molecules– nucleic acids, polysaccharides, peptides, and phospholipids. Describe these polymers and the monomers from which they are synthesized. Where might these polymers and monomers be found in neurons? What are some examples of each, and functions that they serve in neurons?

2. How is molecular information encoded in cells? Describe the Central Dogma of molecular biology. In addition, discuss the basic structure (primary, secondary, tertiary, quaternary) of proteins, and factors that dictate the structure. Which amino acids are nonpolar, which are polar, and which are polar and charged? Which amino acid can form disulfide bonds, and which amino acids are substrates for phosphorylation? Can you think of any examples in which a change in protein structure results in a change in the protein's function?

3. How do enzymes interact with their substrates? What properties of the enzyme and substrate dictate the specificity of these interactions? How are enzyme-substrate kinetics affected by the presence of a competitive inhibitor? How are they affected by the presence of a non-competitive inhibitor?

4. Discuss how newly-synthesized and processed membrane proteins are trafficked in non-neural cells and in neurons. How is vesicle trafficking different in neurons? How is it the same? How could you investigate whether a substance is transported down axons, and the rate of this transport?

5. What are some important molecules that neurons require for (1) electrical signaling and (2) chemical communication with other cells? What categories discussed in question 1 do these special molecules fall into?

6. Discuss the various ways that a chemical signal acting upon a cell (e.g., a neuron) is "transduced" by molecules in the cell membrane, cytosol, and cellular organelles. For starters, how would you categorize the receptors that perceive the presence of the chemical signal?

If you need a review session to discuss these questions, I would be happy to help you organize one.