STUDY GUIDE FOR 107A MIDTERM 2 EXAM

- Describe the categories of neurotransmitters (NTs), their characteristics and roles. What are the amino acid NTs? biogenic amines? What are the catecholamines? Indoleamine? What are neuropeptides?
- What's the relationship between monoamines and behavioral states
- What is channel permeability and why is it important for cell communication?
- Know the ions, membrane properties and forces that determine membrane potential
- Know the biosynthetic pathways for glutamate, GABA, acetylcholine, dopamine, and NE (know the catalytic enzymes as well)
- Know the difference between first and second messenger systems (what characterizes their function? what are some typical 2nd messenger systems?)
- Define hyperpolarization/depolarization in terms of the probability of firing an action potential.
- How do Na+ channels differ from K+ channels?
- How does myelination improve signal conduction? What other benefits does it have?
- What's the difference between essential and non-essential amino acids?
- Know the criteria for defining a neurotransmitter
- Know the phases (that is, the changes in voltage) of an action potential, including time scale, refractory periods, ionic flows, etc
- What are agonists? antagonists? inverse agonists? indirect antagonists? direct agonists? Competitive agonists/antagonists?
- What are the receptors for Glutamate? GABA? DA? NE? ACh? 5-HT? endorphins?
- Can you draw an equivalent electrical circuit for a cell? How is an ion channel represented in an equivalent electrical circuit? Pumps? Capacitance? Membrane resistance? Axial resistance?
- What is the relationship between equilibrium potential and ionic permeability?
- What are time and length constants?; how are they defined?; What's the relationship between space constant (lambda) and r_i and r_m? How does the size of a dendrite/axon affect the space constant (lambda)? What is the relationship between time constant (tau) and membrane capacitance?
- How do you compute the velocity of an action potential given tau and lambda?
- Know how to use the Nernst and Goldman equations (what distinguishes them?)
- What are sodium-potassium pumps, what is their function, and how does myelin affect this?
- What ions flow during depolarization phase of the action potential? repolarization phase?
- Define firing threshold? where is an action potential typically started?
- What is Ohm's Law?
- How do hormones and neurohormones differ from neurotransmitters?

- What behaviors does serotonin affect? DA? NE? what are the sources of these neurotransmitters
- What's different about neuropeptides (compared to other neurotransmitters)?
- What are some common receptors for opioids?
- What are the benefits of a chemical signaling system?
- What defines a graded potential?
- What is an electrical synapse? What is a gap junction? What are the properties of gap junctions? What are the advantages and disadvantages of electrical synapses? What are some examples of neural circuits that use electrical synapses?
- What is a chemical synapse? What is the synaptic cleft? What is exocytosis?
- What are the two major classes of receptors? What is an ionotropic receptor? How do they operate? What is a metabotropic receptor? How do they operate? What are the similarities and differences between ionotropic and metabotropic receptors?
- What is the NMDA receptor? How does it function? How does this play a role in synaptic plasticity?
- What is a postsynaptic potential (PSP)? What is an EPSP? What is an IPSP? What causes a PSP? What makes a PSP excitatory or inhibitory? What is the reversal potential? What is summation and why is it necessary?