

STUDY GUIDE FOR EXAM 2

**A NOTE ABOUT THE STUDY GUIDE:** Be aware that although the study guide helps review concepts, it is not all inclusive and other items emphasized in class and the readings and NOT in the study guide may appear on the exam. The study guide is therefore a good place to BEGIN exam preparation.

**General approach**

- Review the study guide
- Study your notes and all the relevant chapters. Know the meaning of all words in the boxes, and italicized.
- Think about what you have learned, talk about it in a study group.
- Review figures FIRST.

**A. SYNAPSES**

- **Chapter 5, 6**
- be able to contrast the chemical and electrical synapses: morphology, speed of transmission, chemicals, etc.
- what are gap junctions and how are they formed? where are they found?
- contrast Gray I vs. Gray II synapses.
- what is meant by spatial/temporal integration of signals (say at the axon hillock)?
- what is the ionic basis of EPSP's? IPSP's?
- What is posttetanic potentiation? Presynaptic inhibition? Presynaptic facilitation?
- discuss the cellular and molecular processes that take place during chemical transmission IN DETAIL.
  - *what happens in the presynaptic cell?*
  - *the postsynaptic cell?*
  - *in the cleft?*
  - *what is the role of calcium?*
  - *what is the MEPP?*
  - *why is neurotransmission quantal?*
  - *What happens during vesicle fusion?*
- what are the basic neurotransmitters? Where are they synthesized? What is the precursor molecule for each of the NTs discussed in class? what are some important differences between small molecular weight neurotransmitters and neuropeptides?
- contrast the NMDA receptor and the non NMDA (AMPA) receptor. how do both work together to contribute to an EPSP? what is needed to activate the NMDA receptor? What is a kainate receptor?
- contrast the muscarinic and nicotinic Ach receptor. Give examples of where these are found in the NS.
- what are some difference between ionotropic and metabotropic receptors. give examples of each.
- what is a G protein? what is its basic structure? how is it activated? how does GTP vs. GDP binding affect G protein function? how do G proteins affect proteins in both inhibitory and excitatory ways? how do G proteins cause phosphorylation events? elevation of cAMP levels? elevation of Ca levels?
- Where are PKC, PKA, PLC involved in signal transduction pathways?
- In vesicle fusion, how do toxins like tetanus toxin work? How does calcium affect NT release? What are the three basic processes underlying vesicle fusion? In general terms, what are the VAMPS? SNARES? SNAPS?

## B. CHEMICAL CONTROL OF BRAIN AND BEHAVIOR

- **Chapter 15 pp 512-517**
- What are the diffuse modulatory systems? (DMS). What behaviors are they associated with and where do they originate? How do LSD, cocaine, and amphetamines affect the nervous system? What transmitters are important in the ANS?

## C.. SENSORY SYSTEMS

- For the retina in the visual system, what aspects of stimulus encoding are examples of
  - *a receptor potential*
  - *parallel processing*
  - *organized mapping of stimuli (retinotopicity)*
  - *convergence*
  - *“distortion” of sensory fields in “neural (CNS) space”*
- **Chapter 9**
- what are the main parts of the eye?
- how do lenses correct your vision?
- Know the retina and its parts; understand the structure of the retina and how its laminar organization assists its function.
- what are the key points of phototransduction in PRs? What is rhodopsin? What are the roles of GTP, GDP, cGMP, CMP? PDE the dark current?
- Be able to explain the cellular mechanisms by which BP cells encode light and dark as ON or OFF cells in DETAIL
- how does the concept of center-surround apply to bipolar cells? to ganglion cells? Ie what is the best stimulus for an OFF BP cell? An ON GC cell?
- understand color vision. how is color encoded? What causes color-blindness?
- contrast M-type and P-type ganglion cells.
- What are color opponent cells and what are the best stimuli for the different tyoes?
- Why do we say that PRs in the fovea are overrepresented in *neural space* relative to the peripheral PRs?