

SERRANO: NEUROBIOLOGY 490 SPRING 2004

STUDY GUIDE FOR EXAM 3 AND CUMULATIVE EXAM

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 guides and exam
- Study your notes and the 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 ppt slides and sensory system handouts (2), including the Thursday May 6 presentation.
- Copies of handouts are in the bio office. The exam will emphasize material in lectures
- For anatomy, review the following. I will select from these diagrams, you will match a list of words with the regions :
- 8.13, 8.16, 8.19, 10.3, 10.4, 10.20, 11.7, 11.8, 11.10, 11.12, 11.18, 11.32, 11.34, 12.1, 12.14, 12.15, 12.24, 12.29, 15.15, 22.5, 24.13

EXAM 3 MATERIAL

A. REVIEW ALL PPT SLIDES SINCE EXAM 2 (Clayton, Morales, Serrano: may 4 Aud/Vest and may 6 Learn/Mem))

B. AXON NEUROBIOLOGY

- what is a retrograde messenger? give example(s)
- What is the difference between retrograde and anterograde transport? What molecules mediate each ie motor proteins, cytoskeleton?
- What molecules travel by slow, intermediate and fast axonal transport?

C. SENSORY SYSTEMS

- For the SENSORY SYSTEMS [light, retina and vision; mechanoreception (somatosensory, auditory, vestibular); taste, olfaction] what aspects of stimulus encoding provide evidence of
 - of *receptor potential*
 - of *parallel processing*
 - of *organized mapping of stimuli (retinotopicity, tonotopicity etc)*
 - of *convergence*
 - *where do the stimuli end up in the brain?*
- **List all the senses (and their respective sensory cells) discussed in class. For each sense**
 - know the structure of all the sensory cells.
 - be able to explain how each sensory cell senses and transduces its modality into a RECEPTOR POTENTIAL.
 - Understand how they are routed to the CNS and what synapses are made with second order neurons if appropriate
 - it may be useful to make a table contrasting sensory cell structure and transduction
 - be able to delineate the pathways to the "higher" brain centers that routes each sense to its destination from the peripheral site of signal reception. be able to identify the different nuclei etc., where the tracts synapse with target cells in the CNS. again, a table or flow chart may be useful here.
 - Study anatomy in figures

- Know the cortical laminar/columnar organization in general terms, if this was covered in class
- Is neural space always a faithful representation of the sensory field? explain with examples.
- **Chapter 8.** be able to explain how taste and olfactory cells transduce their modality into a RECEPTOR POTENTIAL. how are taste and smell routed to the CNS? what synapses are made with second order neurons if any? what is the structure of the tongue? the olfactory epithelia? understand the basic tastes and how they are encoded. why are taste cells said to be broadly tuned? how can the brain distinguish between many complex tastes? what are glomeruli? what is unique about the regenerative capacities of olfactory neurons? what is the connection between smell and memory and how is this related to the ascending pathways of smell? what is known about the structure and genetics of olfactory receptor proteins? what is a G(olf)? What role does G(olf) play in signaling olfaction? how is olfactory info spatially and temporally encoded? how can the brain distinguish between many complex odors?
- **Chapter 10:** understand how the pathways encoding the right and left visual fields are mapped onto the LGN and striate cortex. where are pathways separate? where do they converge? how was radioactive labeling used to study these pathways? understand the **retinotopicity** of the LGN and the striate cortex. how are the LGN and striate cortex organized? why are the LGN and striate cortex also said to have a laminar organization? Know the three parallel paths from the retina to the striate cortex.
- **Chapter 11:** understand the structure of the ear and the cochlea, and how their structure assists their function. understand the **tonotopic organization** of the cochlea and of the auditory cortex. how are frequency and stimulus intensity encoded? what are the subdivisions of the vestibular system? how do hair cells work? what are otolith organs? what is a macula? what are semicircular canals? crista? ampulla?
- **Chapter 12:** know the different receptor subtypes responsible for encoding somatic sensation. contrast the Pacinian corpuscle with the Meissner corpuscle. what is the role of the capsule in Pacinian corpuscle function? why are proprioceptors important? contrast warm and cold receptors. How are primary afferents classified? which afferents convey which sense? what are the ascending pathways for somatic sensation? how is facial somatic sensation conveyed to the brain? what is **somatopy**? what is the sensory homunculus? contrast pain and nociception. how is pain regulated? what is the role of endorphins in pain regulation?