Final Study Guide CS107A

- 1. Be familiar and able to draw the thalamus, basal ganglia, cerebellum and hippocampus (trisynaptic and more modern views) circuits.
- 2. What are the functions of these circuits?
- 3. What happens when they are damaged?
- 4. Describe three levels of control in motor behavior, brain areas primarily responsible for them, and type of networks they resemble.

THALAMUS

- 5. What is the function of the thalamus? How is this revealed in the sleep-wake cycle?
- 6. What role does behavioral state play in thalamic function?
- 7. What are some specific relay thalamic nuclei?
- 8. What's unique about relay cells?
- 9. What is the role of the nRT? What's unique about it? What about the intralaminar nucleus? sensory relay nuclei?
- 10. What's the largest nuclei in the human thalamus?
- 11. Why is olfaction an exception to a thalamic-based theory of consciousness?
- 12. What are some candidates for the neuroanatomical bases for attention, basic "awareness," and stimulus significance?
- 13. What is the role of nucleus basalis neurons in thalamus function?
- 14. What is the relationship between thalamus and consciousness?
- 15. What is the implication of Rall's 3/2 branching rule in thalamic relay cells?
- 16. What is the implication of relay/transfer mode firing and burst firing in thalamic relay cells?

BASAL GANGLIA

- 17. What functions does BG participate in?
- 18. Why is the BG known as a release circuit?
- 19. What are the components of the basal ganglia?
- 20. What's unique about medium spiny neurons?
- 21. What are the main striatal afferents?
- 22. How are the two pathways through the BG different?
- 23. Know the difference between the "Parallel Processing Hypothesis" and "Information Funneling Hypothesis."
- 24. What are the two main consequences of damage to BG? Can you give examples of hyper- and hypokinetic disorders that exemplify these consequences?
- 25. What is akinesia? bradykinesia? dystonia?
- 26. What type of damage to BG causes Parkinson's Disease? Huntington's Disease?
- 27. Can you discuss some treatments for Parkinson's?
- 28. What's the role of patches and matrix in BG? How different are their inputs? CEREBELLUM

- 29. What's the evidence that cerebellum is involved in cognition?
- 30. What other functions is the cerebellum involved in?
- 31. What's unique about Purkinje cells?
- 32. Types of neurons that make up cerebellum circuit and NTs they use
- 33. What information do mossy and climbing fibers carry?
- 34. Why are circuits that control motor and cognitive processes found side by side in areas such as BG and cerebellum?
- 35. What are the 3 peduncles of the cerebellum? Which is the output? The input?
- 36. What are the 3 layers of a folium?
- 37. How are BG and cerebellar circuits similar?
- 38. What role might the collaterals to deep nuclei from mossy and climbing fibers play?
- 39. Why is there a fractured somatotopic map of the body in each of the 3 deep nuclei of cerebellum?
- 40. What are the 3 deep nuclei of the cerebellum? What are the effects of lesions in each of these nuclei?
- 41. What are intention tremors?

HIPPOCAMPUS

- 42. Describe the currently accepted model of memory processing.
- 43. What functions is the hippocampus involved in?
- 44. What's the role of gases in LTP?
- 45. What are place cells? How do they work?
- 46. What are declarative and non-declarative memories?
- 47. Why would depressed individuals show atrophy in the hippocampus?
- 48. What are retro- and anterograde amnesia?
- 49. What is the Morris water maze task used for?
- 50. What brain areas mediate these different types of memories?
- 51. Why do migratory birds have larger hippocampi? What about taxi drivers?
- 52. What are homosynaptic versus heterosynaptic changes in plasticity?
- 53. How is LTP mediated in the hippocampus?
- 54. How does the hippocampus CA3 resemble an autoassociative neural net?