

Chemical Biology and Biochemistry Cumulative Exam

Topic: Chemical Biology

March 7, 2019

Study Reference: W. Wang, C.K. Kim, A.Y. Ting "Molecular tools for imaging and recording neuronal activity." *Nature Chem. Biol.* (2019) 15, 101-110.

- 1) Please explain what "depolarization" means in the context of neurobiology.
- 2) Please describe neuronal activation. Briefly explain each step of the process in the order that they occur. Give some sense of the time scale of each event. You may use illustrations if you prefer, but it is not necessary.
- 3) Now, provide a description of a molecular tool that permits real-time visualization of each stage of the neuronal activation process. Explain how at least one of each type of tool works in detail. Discuss advantages and limitations.
- 4) Describe the type of information that can be obtained with neuronal activity integrating tools and why tools of this type are needed for studying neurons. Give an example of a so-called molecular integrator, explain how it works, and indicate advantages and limitations.
- 5) Discuss two (2) challenges and/or future directions in the design of molecular tools for studying neuronal activity.