

Biochemistry Cumulative Examination
February, 2016, Total 100 points

1. Cellular signal transduction usually proceeds through the following steps: (a) Signal recognition; (b) Signal conversion; (c) Signal relay and processing; (d) Cellular responses. Briefly describe the molecular events during each of these four steps (20 points).

2. There are three major types of molecular perturbation approaches for modulating signaling events on a systems level: functional genomics, chemical genomics, and functional protein perturbation.

(1) Briefly describe these methodologies and their advantages and disadvantages (20 points).

(2) It was recently discovered that many PDZ domains, a prototypal protein interaction domain, bind lipids and that this lipid-PDZ domain interaction is important for diverse cell signaling. Which of the above methods would you employ to demonstrate the physiological significance of the lipid-PDZ domain interaction and why? (30 points)

3. Briefly describe the general principles of protein fragment complementation (PCA) assays and propose how you would use an PCA assay to determine which proteins interact with the trans-membrane Frizzled receptor when it is stimulated by an extracellular Wnt ligand in Wnt signaling. (30 points)