

# Biochemistry CUME May 2015

## Topic: Signal Transduction

### Study reference

Christina Kiel, Eva Yus, and Luis Serrano (2010) Engineering Signal Transduction Pathways. **Cell** 140(1): 33-47.

### Questions

1. **(25 points)** Use 1-2 specific examples with illustration such as two-component signaling pathways (TCS) to discuss the common features of prokaryotic signal transduction pathways.
2. **(25 points)** User illustration and/or examples to discuss the main features of G-protein coupled receptor (GPCR)-mediated signaling transduction pathways in eukaryotic systems.
3. **(25 points)** Describe similarities and differences between prokaryotic and eukaryotic signal transduction mechanisms. You may consider the following aspects in your discussion: 1) types of kinase/phosphatases; 2) chemical nature of second messengers; 3) structure and function modularity of key signaling components; 4) signal relay via homo/hetero protein-protein interactions; 5) regulation via proteolysis and degradation; 6) translocation; 7) control via feedback loops.
4. **(25 points)** Discuss 1-2 engineering or synthetic biology strategies with examples to show how mechanistic understanding of signaling pathways can be used to alter cellular responses and/or gain new functionalities in prokaryotic or eukaryotic systems.