

(10% each)

1. From an evolutionary point of view, what's the significance of the constitutive expression of certain proteins?
2. How would you show whether or not a phage-encoded gene product is required throughout the infectious cycle or only at a unique time?
3. What are the advantages and disadvantages of using mouse gene knock-outs for assaying gene and/or protein functions?
4. What do you suppose happens in mutant cells that ...
 - A. cannot degrade cyclins?
 - B. Always express high levels of p21?
 - C. Cannot phosphorylate Rb?
5. If membrane proteins are integrated into the ER membrane by means of the ER protein translocation channel (which is itself composed of membrane proteins), how do the first protein translocation channels become incorporated into the ER membrane?
6. In the past few years, a number of genomes from various organisms have been completely sequenced. With the publishing of the human genome, the question in many peoples minds is "What can we do with this wealth of information?" Do you have an opinion about how genomics is currently impacting or is likely to impact signal transduction research in the future?
7. An enzyme isolated from a mutant bacterium grown at 20°C works when it is tested at 20°C but not at 37°C (37°C is the temperature of the gut, where this bacterium normally lives). Furthermore, once the enzyme has been exposed to the higher temperature, it no longer works at the lower one. Can you suggest what happens at the molecular level to this enzyme as the temperature increases?
8. How would overexpression of protein phosphatase 1 affect the induction of cAMP-inducible genes in response to hormone stimulation of appropriate target cells? Would protein phosphatase 1 affect the function of cAMP-gated ion channels involved in odorant reception? (Explain your answers)
9. Why are the transit peptides of chloroplast proteins, in contrast to the presequences of mitochondrial proteins, not positively charged?
10. Why are YAC vectors useful for analysis of complex genomes? What is the role of telomeres in these vectors?