

1. A living cell is a membrane-bound unit filled with a concentrated solution of chemicals. Please discuss the structure and function of cell membranes. (12%)
2. Describe the molecular features of the four hierarchical levels of structure that determine the conformation of a protein. (12%)
3. One of the most common mechanisms for regulating protein activity is “phosphorylation and de-phosphorylation”. Do you agree? Why? (8%)
4. Say you have isolated, purified, cloned, sequenced and made antibodies to an intracellular protein of 79,000 daltons. Please describe ONE technique that would allow you to determine the intracellular localization of this protein. (10%)
5. Please briefly describe the roles of “SIGNAL PEPTIDES” in the transport of newly synthesized secretory proteins out of the cell. (8%)
6. The drug taxol binds tightly to microtubules and stabilize them whereas colchicine prevents the assembly of microtubule. Interestingly, both drugs are effective in treating cancer. Please discuss why both drugs are toxic to dividing cells in spite of their opposite effects. (10%)
7. Proteins which exert completely different cellular functions, such as actin, calmodulin, cyclin, and Sonic hedgehog, were all found to be well-conserved during evolution. Please give your rationale why this is the case. (10%)
8. During the life time of a person, approximately 10^{16} divisions take place in a human body, but an adult human body consists of only 10^{12} cells. Please explain how this occurs and discuss its physiological relevance. (10%)
9. G protein-coupled receptors account for the major receptor type in the cell. Please explain how signals are transmitted in this type of receptors and discuss whether this type of signal transduction provides any advantages. (10%)
10. Cell locomotion (or migration), essential for the development, immunity and wound healing, is a complicated event involving a series of well-coordinated steps. Which and how proteins/structures are involved in this cellular activity? (10%)