

(10 % each)

1. Why is it important that the components of the oxidative phosphorylation pathway in mitochondria and the photo-phosphorylation pathway in chloroplasts are imbedded in membranes? (The inner mitochondrial membrane and the thylakoid membrane, respectively.) In other words, why are these proteins imbedded in membranes instead of floating freely in the cytoplasm, matrix or stroma? Give 2 important reasons.
2. After very small viruses infect a plant cell by crossing its membrane, the viruses often spread rapidly throughout the entire plant without crossing additional membranes. Explain how this occurs.
3. What effect would the addition of a lysosome-targeting signal have on the subcellular localization of a protein that is normally cytosolic? How would it affect localization of a protein that is normally secreted?
4. In vitro mutagenesis of cloned lamin cDNAs has been used to generate mutants that cannot be phosphorylated by MPF (maturation promoting factor). How would expression of these mutant lamins affect nuclear envelope breakdown at the end of prophase?
5. What effect would overexpression of the *INK4* tumor suppressor gene product be expected to have on tumor cells in which *Rb* has been inactivated by mutation?
6. Briefly describe the three kinds of junctions between animal cells, and compare their functions.
7. A mutation in a single gene may cause a major change in the body of a fruit fly, such as an extra pair of legs or wings. Yet it probably takes the combined action of hundreds or thousands of genes to produce a wing or leg. How can a change in just one gene cause a big change in the body?
8. A biochemist hopes to find a gene in human liver cells that codes for an important blood-clotting protein. She knows that the nucleotide sequence of a small part of the gene is CTGGACTGACA. Briefly explain how to obtain the desired gene.
9. Jone just started a new job as night watchman at a plant nursery. His boss told him to stay out of a room where chrysanthemums (which are short-day plants) were about to flower. Around midnight, looking for the restroom, Jon accidentally opened the door to the chrysanthemum room and turned on the lights for a moment. How might this affect the chrysanthemums? What could Jon do to correct his mistake?
10. Yeasts have been used as a model for the study of many aspects of the biology of eukaryotic cells. Why are they not a suitable model for analysis of animal cell movements?