

1. Epithelial cells form coherent cell sheets called epithelia, which line the inner and outer surfaces of the body. When a piece of tissue is properly processed and placed in the electron microscope, distinct organelles can be seen. Please draw a typical epithelial cell with all the organelles included and labeled. (10%) Briefly define what they are and what function they provide for cells. (15%)
2. The reversible protein phosphorylation controls the activity of many different types of protein in eucaryotic cells. Please explain how phosphorylation or the binding of a nucleotide can be used to regulate protein activity. (10%)
3. "Signal peptides are essential for transport of newly synthesized secretory proteins out of the cell." Describe in detail using experimental evidence, the validity of the preceding statement. (15%)
4. Cancer is a disease of abnormal cell proliferation. It is well known that most people do not become cancer patients until they get older, yet some people contract cancer while they are still young, e.g. in the 30's or even 20's. Could you apply your concept on cell cycle control to highlight (or explain) these two phenomena. (15%)
5. A lot of experimental methods are applied to study cell biology. If you are interested in answering a question regarding how cells move, grow, die or interact with one another etc, what methods would you use to answer the question? Please 1) give a question of your choice (not limited to those listed above), and 2) propose your methods with rationale. (20%)
6. Cell communication is mediated by a complex network. Different cell types use similar signals to achieve completely different outcomes, for example, norepinephrine stimulates hormone secretion by cells of adrenal medulla and increases the contraction amplitude by heart muscle. How do you explain these phenomena? (15%)