

1. List the signal transduction order of the following molecules during signal transduction of cells: phospholipase C (PLC) 、 phosphatidylinositol 4,5-bisphosphate (PIP₂) 、 calcium ion 、 trimeric G protein 、 diacylglycerol 、 G protein-linked receptor 、 inositol 1,4,5-triphosphate 、 protein kinase C 。 (10%)
2. Membrane composes of phospholipid and protein and its fluidity is vital for organism. Most organisms are able to regulate membrane fluidity. On cold and chilly days, how do cells regulate their membrane fluidity? (10%)
3. Outline the operation principles of transmission electron microscope, scanning electron microscope, and confocal microscope. If you plan to investigate tobacco mosaic virus, which microscope can be used for this purpose? Why? (10%)
4. What are lamins? How are lamins arranged in the nuclear envelope? Do lamins belong to microtubule? What functions are lamins believed to carry out in the nuclear envelope? What happens to lamins during cell division? (10%)
5. How does signaling by hydrophobic molecular like steroid hormones differ from signaling by peptide hormone? (10%)
6. The characteristics of two microscopes are described. One has a magnification of 100X and a numerical aperture (NA) of 1.1. The other has a magnification of 60X and a numerical aperture of 1.3. Which one dose it show better resolution? Why? (10%)
7. Nucleic acids have a net negative charge and can be separated by gel electrophoresis on the basis of their size. In contrast, different proteins have different charges. How can proteins be separated on the basis of size by SDS-PAGE electrophoresis? (5%)
8. Draw and describe the structures and functions of mitochondrion and chloroplast in terms of the localization of electron transport chain, ATPase, and membrane structures. Describe the structures of ATPase in mitochondrion and chloroplast, and also the electron flow resulting in ATP production in these organelles. (15%)
9. What is protein sorting? Describe the signal peptides and mechanisms for protein transporting to endoplasmic reticulum, lysozyme, nucleus, mitochondrion, and chloroplast. (20%)

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