Intrinsic or integral membrane proteins biology essay

Science, Biology

(1 point) For each of the following sentences, fill in the blanks with the best word or phrase selected from the list below. Not all words or phrases will be used; each word or phrase should be used only once. There are several ways that membrane proteins can associate with the cell membrane. Membrane proteins that extend through the lipid bilayer are called transmembrane proteins and have hydrophobic regions that are exposed to the interior of the bilayer. On the other hand, membrane-associated proteins do not span the bilayer and instead associate with the membrane through an α helix that is amphipathic. Other proteins are covalently attached to lipid molecules that are inserted in the membrane. Peripheral membrane proteins are linked to the membrane through noncovalent interactions with other membrane-bound proteins.

amphipathichydrophilicnoncovalentlycorticalhydrophobicperipheralcovalentlyintegraltransmembranedetergentmicelleunfolded(2 Points) What is the difference between an intrinsic (integral) membrane protein and a peripheral (extrinsic) membrane protein? Intrinsic or integral membrane proteins, lie within the plasma membrane of the cell. These proteins are transmembrane protein, which amphipathic, allowing them to penetrate through the lipid bilayer of the plasma membrane. These proteins usually contain multiple transmembrane regions which allows the protein enter the plasma membrane multiple times (multi-pass), where the hydrophilic regions towards the cytoplasm of the cell and the extracellular environment. Extrinsic or peripheral proteins, are membrane proteins, but are unable to penetrate the plasma membrane. These proteins are usually found bonded non-covalently to integral proteins, or are an anchored protein which

penetrates the plasma membrane very slightly to anchor the protein.(2 Points) Proteins that span the membrane as an alpha helix have a characteristic structure in the region of the bilayer. Which of the following 20 amino acid sequences listed below is a candidate for such a transmembrane sequence? Please explain the reason for your choice. I T L I Y F G V M A G V I G T I L L I SI T P I Y F G P M A G V I G T P L L I SI T E I Y F G R M A G V I G T DLL I SPeptide C contains charged amino acids which is not compatible with the transmembrane region of the protein which is hydrophobic. Peptide B Proline, which breaks alpha helixes and beta sheet structures. Peptide A doesn't have any charged amino acids and the majority of them are nonpolar making it the ideal sequence. (Peptide A)(2 Points) What is the function of bacteriorhodopsin? Bacteriorhodopsin is a purple light detecting pigment found in Halobacterium in environments with reduced O2 levels. It acts as a proton pump with allows hydrogen ions to be ejected creating a hydrogen gradient, which is used in the production of ATP.(1 Point) The cDNA of a gene coding for an interesting membrane protein has been cloned, amplified and sequenced, and the amino acid sequence of its probable translation product inferred from the nucleotide sequence. The protein contains 240 amino acids and exhibits an apparent molecular weight in SDS-PAGE of approximately 30 kDa. A hydropathy plot of the protein's primary structure is presented in the figure below, numbering the amino acids from the amino terminal end to the carboxy terminal as is customary (designated " N" and " C" respectively). A3_2Why is the protein likely to be an intrinsic membrane protein? How many time will it span the membrane (explain your answer); assume a criterion level of 1. 0. It is likely that this protein is an intrinsic membrane

protein, because based on the hydropathy plot, this protein contain both hydrophobic (positive) values as well as hydrophilic (negative) values. Intrinsic membrane proteins need hydrophobic and hydrophilic areas because the cytoplasm and the extracellular space are both watery environments, and the inside of the bilayer is hydrophobic. It spans the membrane 7 times,(2 points) Trypsin is an enzyme that can digest the hydrophilic portions of membrane proteins, but is unable to penetrate the lipid bilayer and enter a cell. Because of these properties, trypsin has been used in conjunction with SDS-PAGE to determine which proteins have an extracellular domain. Describe an experiment using trypsin to determine the sidedness of RBC membrane proteins. The sidedness of a plasma membrane has been determined by various experiments. Using SDS polyacrylamide gel to separate the proteins, according to their relative sizes, and not their physical structure. This gel will act as the control, and allows the researcher to determine the relative sizes of the proteins compared to each other and sidedness or orientation of the protein. Trypsin is unable to penetrate the lipid bilayer. When trypsin is added, any protein which lies on the outside of the plasma membrane will be in a different location on the SDS polyacrylamide gel compared to the control because those proteins are transmembrane and oriented outside of the cell. Next use a plasma membrane permeating agent, in addition to trypsin to cleave any proteins on the inside of the plasma membrane. Using these proteins run another SDS polyacrylamide gel. All of the proteins should have run to the end of the gel because trypsin is able to cleave both sides of the bilayer in a permeated cell. Peripheral and lipid anchored proteins stayed in the same relative

position before the membrane was permeated, but moved closer to the bottom of the gel when the cell was permeated.