

More Study Questions:

True/False:

Lipid bilayers are largely impermeant to ionic and polar substrates.

Lipid bilayers are not appreciably permeable to water.

A glycolipid on the surface of a mammalian cell line is labeled by covalent reaction with a membrane impermeant fluorophore that reacts specifically with it. You are trying to understand the behavior of this glycolipid using FRAP. You bleach a square region of the cell, away from the nucleus, and follow the return of fluorescence over time. Explain what you would expect to see under each of the following conditions and why:

Cells kept at 37°C

Cells kept at 4°C

Cells kept at 37°C in the presence of a metabolic inhibitor

Cholesterol is a major component of animal cell plasma membranes; compare the effects of cholesterol on membrane structure to those of phospholipids.

Some 30% of the proteins in the human genome “look like” they are transmembrane proteins. What sequence motifs would you expect to find in these proteins? What are the ways that proteins seem to use to span membranes?

Lipid bilayers are important permeability barriers. Compare their permeability to water, K<sup>+</sup> and glycerol:

Which of these three substances is MOST permeable?

Which is LEAST permeable?

You are interested in thyroid hormones and how they get into their target cells to bind to their receptors. You develop a functional assay for the uptake of radioactive thyroid hormone and think you have cloned a cDNA encoding the plasma membrane thyroid hormone transporter. Based on what is known about other transporter proteins, can you make a guess about what type of protein this cDNA will encode?

Coupled carriers bring about the uphill transport of one solute along with the downhill transport of another. Explain the difference between a symporter and an antiporter.

Describe the way in which glucose is transported across the intestinal epithelium. Include a diagram and identify key features of this system. What would happen to the system if the epithelium were treated with an inhibitor of the Na<sup>+</sup>K<sup>+</sup>ATPase?

The energy for the Na<sup>+</sup>K<sup>+</sup>ATPase comes from ATP; how is the use of ATP coupled to the binding of Na<sup>+</sup> and K<sup>+</sup>?

A P-type ATPase is, by definition, phosphorylated by ATP. How would you identify the ATP binding site in your favorite P-type ATPase?

What are the key features of ABC transporters?

Action potentials involve ion fluxes across plasma membranes and occur very rapidly. Would you expect these fluxes to be mediated by ion channels (pores) or by ion carriers? Explain.

Do you think you could convert your favorite  $K^+$  channel into a  $Cl^-$  channel by mutagenesis? What specific features would you try to alter and why?

True/false: The membranes of the ER are much more prevalent than the plasma membrane.

Membrane proteins can be reconstituted into liposomes or lipid bilayers. Would you expect the proteins to adopt a polarized distribution? Why or why not? How could you tell whether or not they did?

Where are transmembrane proteins synthesized?

The number of SRP receptors is less than the number of translocons. What is the job of the SRP receptor? What is the job of the translocon? Does this stoichiometry mean that translocons must sit around idle?

Describe the experiments used to estimate the size of the pore in the translocon.

Sketch the hydrophobicity plot you might expect to see for your favorite ABC transporter protein.

Calnexin and calreticulin are ER proteins that bind N-linked sugars with a single glucose moiety. Glucosyl transferase adds glucose residues onto the N-linked sugars of incompletely folded glycoproteins. Why do cells engage in this seemingly futile cycle of trimming and growing sugar chains?

Receptors functioning in which type of signaling pathway need to be of the highest affinity? Explain your answer.

- Synaptic
- Paracrine
- Endocrine
- Contact-dependent