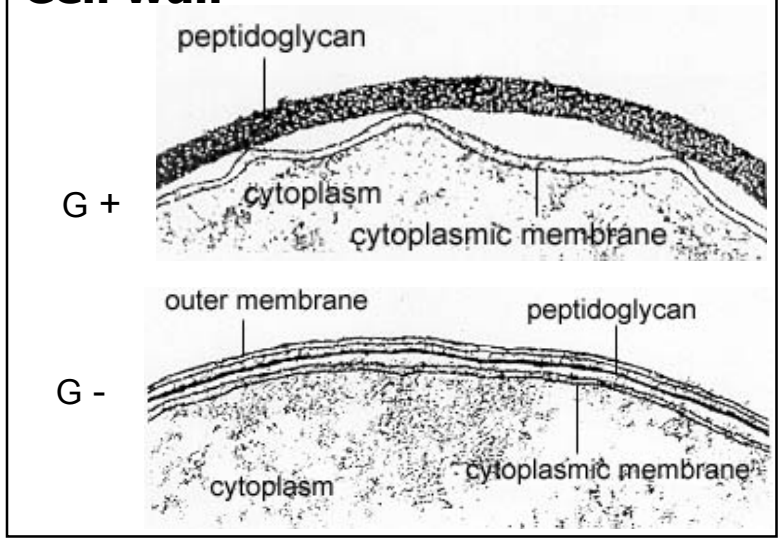
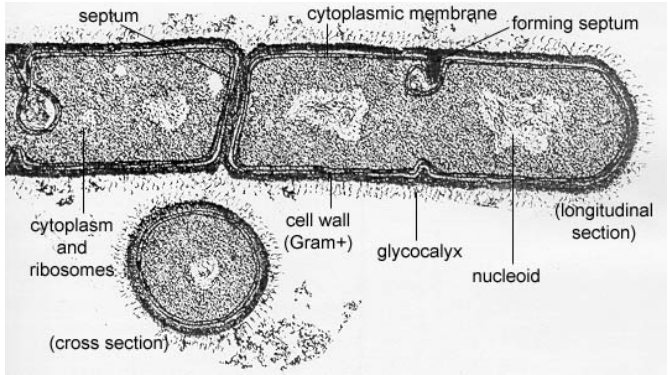
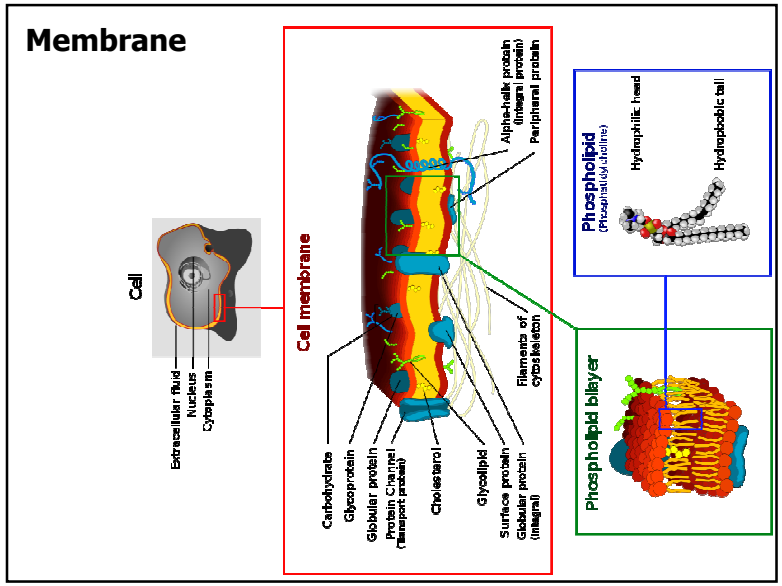
Cell wall

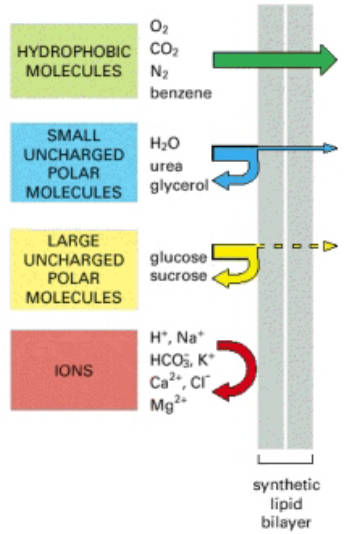


Membrane



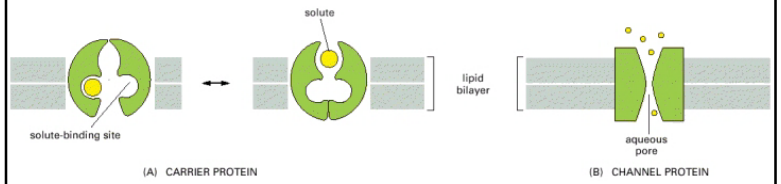
Membrane





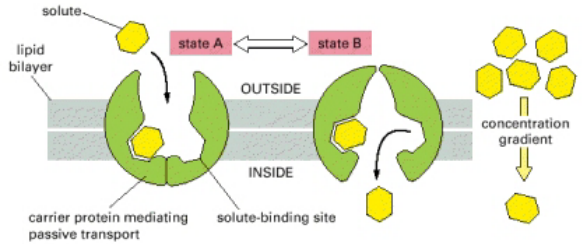
The relative permeability of a synthetic lipid bilayer to different classes of molecules

The smaller the molecule and, more importantly, the less strongly it associates with water, the more rapidly the molecule diffuses across the bilayer.

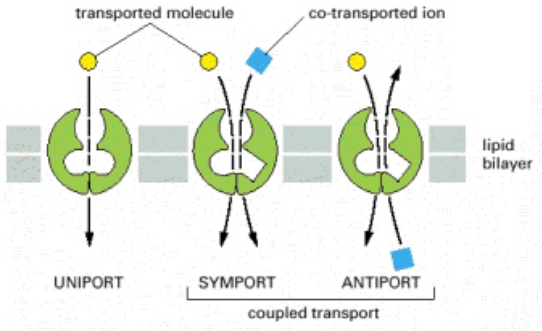


Carrier proteins and channel proteins

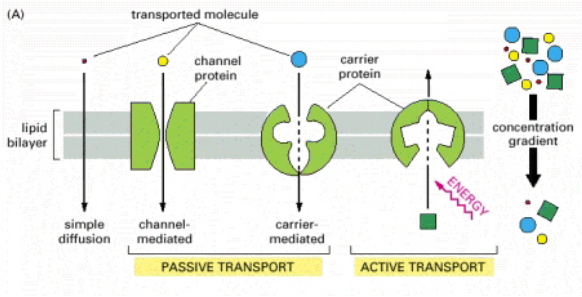
(A) A carrier protein alternates between two conformations, so that the solute-binding site is sequentially accessible on one side of the bilayer and then on the other.
(B) In contrast, a channel protein forms a water-filled pore across the bilayer through which specific solutes can diffuse.



A model of how a conformational change in a carrier protein could mediate the passive transport of a solute
The carrier protein shown can exist in two conformational states: in state A, the binding sites for solute are exposed on the outside of the lipid bilayer; in state B, the same sites are exposed on the other side of the bilayer. The transition between the two states can occur randomly. It is completely reversible and does not depend on whether the solute binding site is occupied. Therefore, if the solute concentration is higher on the outside of the bilayer, more solute binds to the carrier protein in the A conformation than in the B conformation, and there is a net transport of solute down its concentration gradient (or, if the solute is an ion, down its electrochemical gradient).

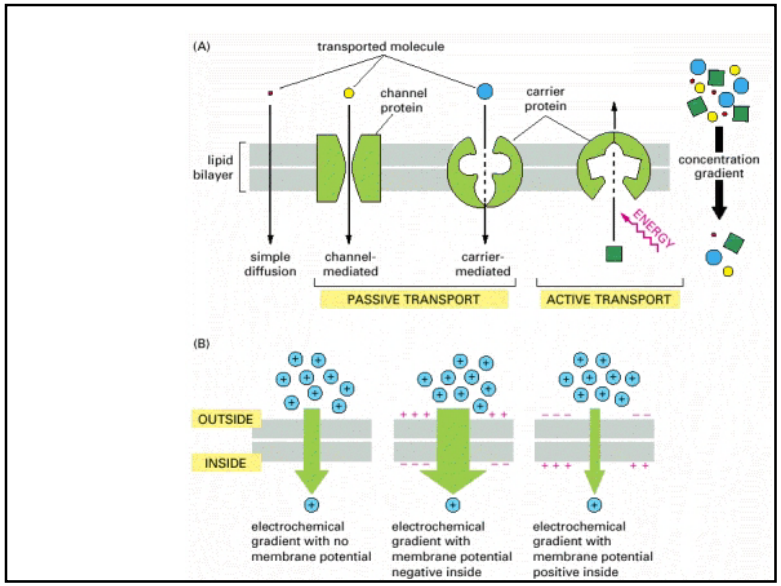


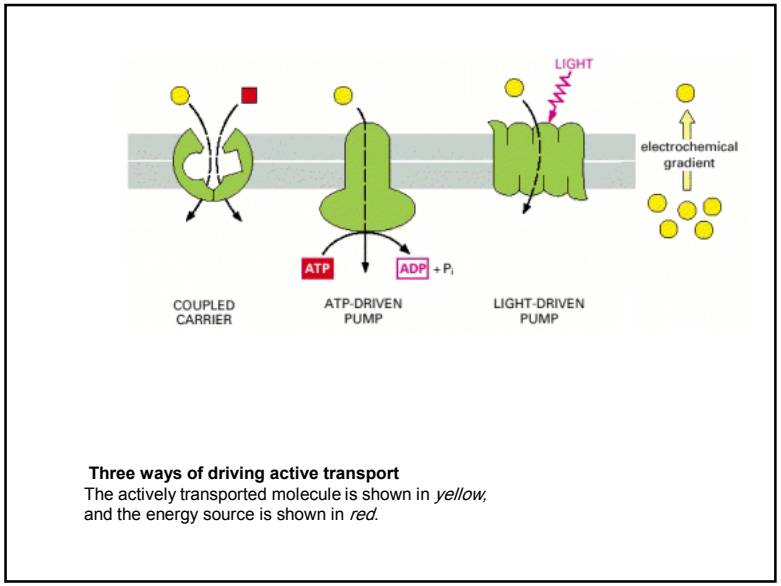
Three types of carrier-mediated transport
This schematic diagram shows carrier proteins functioning as uniporters, symporters, and antiporters



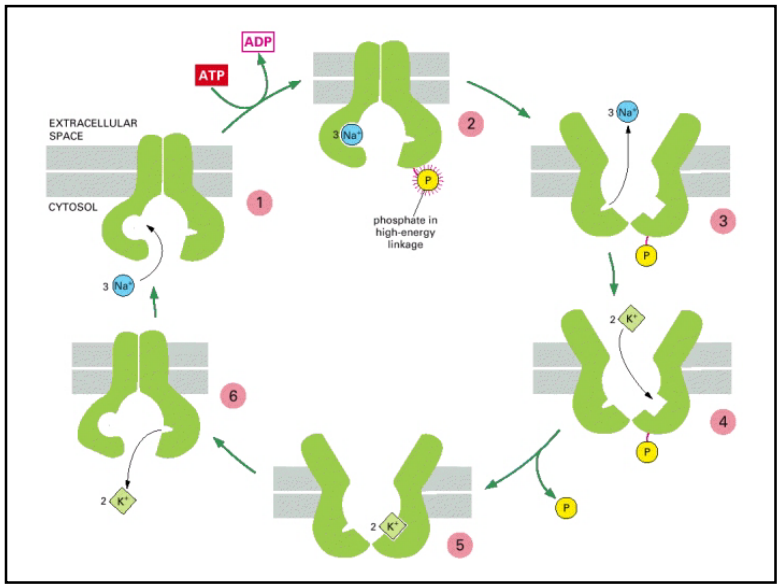
Passive and active transport compared

(A) Passive transport down an electrochemical gradient occurs spontaneously, either by simple diffusion through the lipid bilayer or by facilitated diffusion through channels and passive carriers. By contrast, active transport requires an input of metabolic energy and is always mediated by carriers that harvest metabolic energy to pump the solute against its electrochemical gradient.
(B) An electrochemical gradient combines the membrane potential and the concentration gradient, which can work additively to increase the driving force on an ion across the membrane *(middle)* or can work against each other *(right)*.





Three ways of driving active transport
The actively transported molecule is shown in *yellow,* and the energy source is shown in *red.*

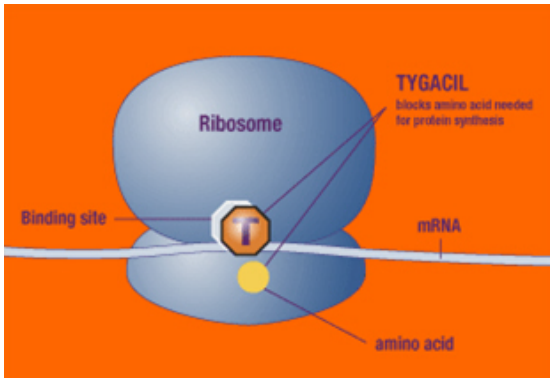


A model of the pumping cycle of the Na^+ -K^+ pump.

(1) The binding of Na^+ and
(2) the subsequent phosphorylation by ATP of the cytoplasmic face of the pump induce the protein to undergo a conformational change that
(3) transfers the Na^+ across the membrane and releases it on the outside.
(4) Then, the binding of K^+ on the extracellular surface and
(5) the subsequent dephosphorylation return the protein to its original conformation, which
(6) transfers the K^+ across the membrane and releases it into the cytosol.

These changes in conformation are analogous to the A ↔ B transitions shown in Figure 11-6, except that here the Na^+ -dependent phosphorylation and the K^+ -dependent dephosphorylation of the protein cause the conformational transitions to occur in an orderly manner, enabling the protein to do useful work. Although for simplicity only one Na^+ - and one K^+ -binding site are shown, in the real pump there are thought to be three Na^+ - and two K^+ -binding sites. Moreover, although the pump is shown as alternating between two conformational states only, there is evidence that it goes through a more complex series of conformational changes during the pumping cycle.

ribosome



Vegetative *vs.* Dormant , non-reproductive