①

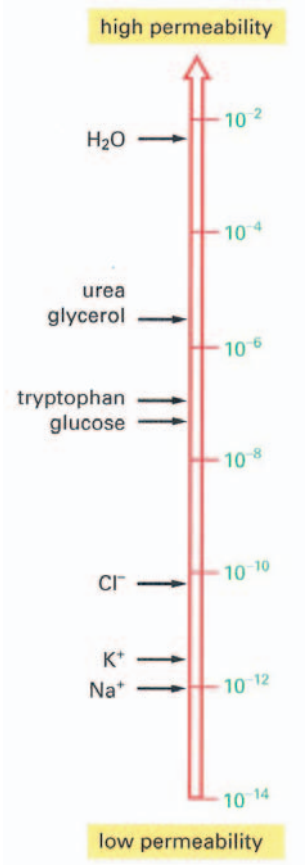


Figure 11-2 Permeability coefficients for the passage of various molecules through synthetic lipid bilayers. The rate of flow of a solute across the bilayer is directly proportional to the difference in its concentration on the two sides of the membrane. Multiplying this concentration difference (in mol/cm^3) by the permeability coefficient (in cm/sec) gives the flow of solute in moles per second per square centimeter of membrane. A concentration difference of tryptophan of 10^{-4} mol/cm^3 (10^{-4}/ 10^{-3} L = 0.1 M), for example, would cause a flow of 10^{-4} mol/cm^3 x 10^{-7} cm/sec = 10^{-11} mol/sec through 1 cm^2 of membrane, or 6 x 10^4 molecules/sec through 1 μm^2 of membrane.

②

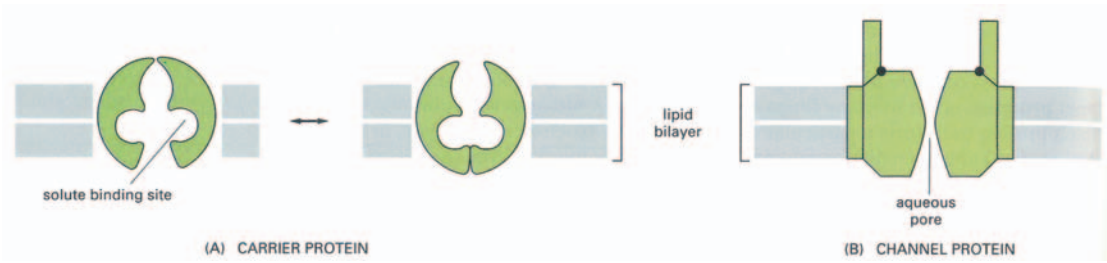


Figure 11-3 A schematic view o f the two classes of membrane transport proteins. A carrier protein is thought to alternate between two conformations, so that the solute binding site is sequentially accessible on one side of the bilayer and then on the other. In contrast, a channel protein is thought to form a water-filled pore across the bilayer through which specific ions can diffuse.

③

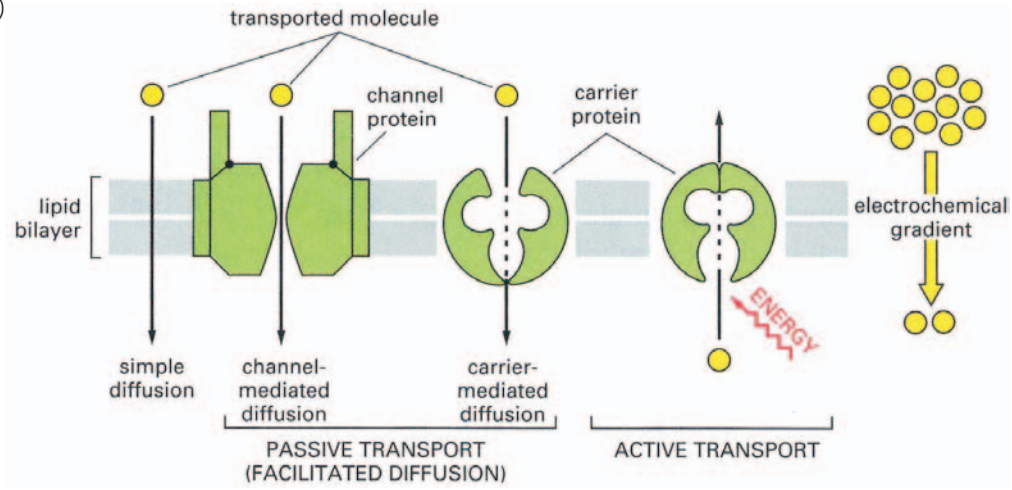
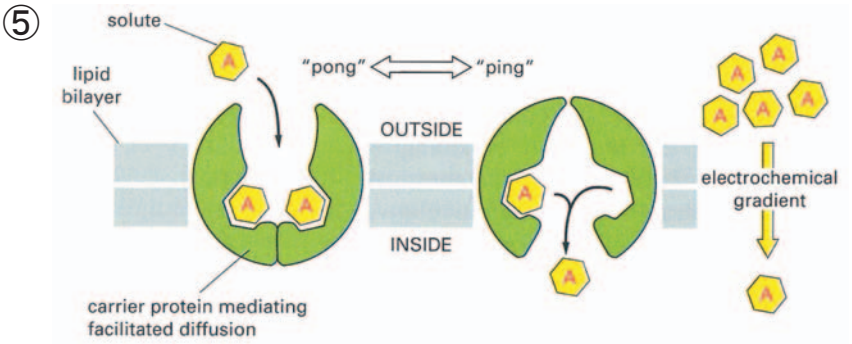


Figure 11-4 Comparison of passive transport down an electrochemical gradient with active transport against an electrochemical gradient. Whereas simple diffusion and passive transport by membrane transport proteins {facilitated diffusion) occur spontaneously, active transport requires an input of metabolic energy. Only carrier proteins can carry out active transport, but both carrier proteins and channel proteins can mediate facilitated diffusion.

⑤



④

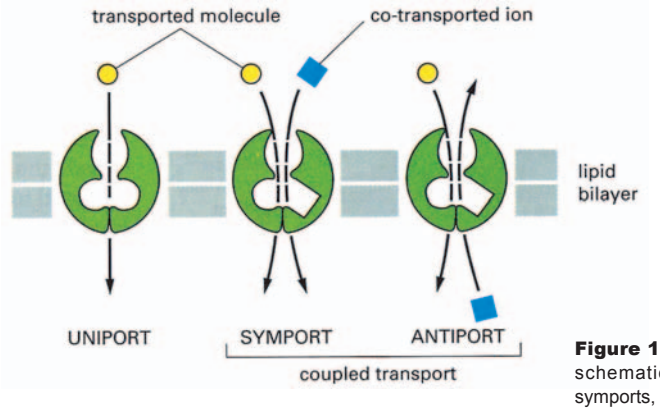


Figure 11-8 A hypothetical model showing how a conformational change in a carrier protein could mediate the facilitated diffusion of a solute. The carrier protein shown can exist in two conformational states: in state "pong" the binding sites for solute A are exposed on the outside of the bilayer; in state "ping" the same sites are exposed on the other side of the bilayer. The transition between the two states is proposed to occur randomly and to be completely reversible. Therefore, if the concentration of A is higher on the outside of the bilayer, more A will bind to the carrier protein in the pong conformation than in the ping conformation, and there will be a net transport of A down its electro chemical gradient.

Figure 11-8 Three types of carrier-mediated transport. The schematic diagram shows carrier proteins functioning as uniports, symports, and antiports.