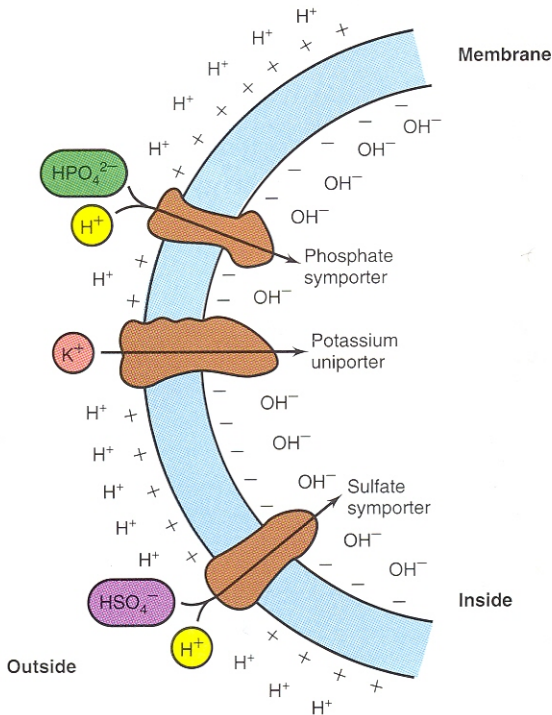
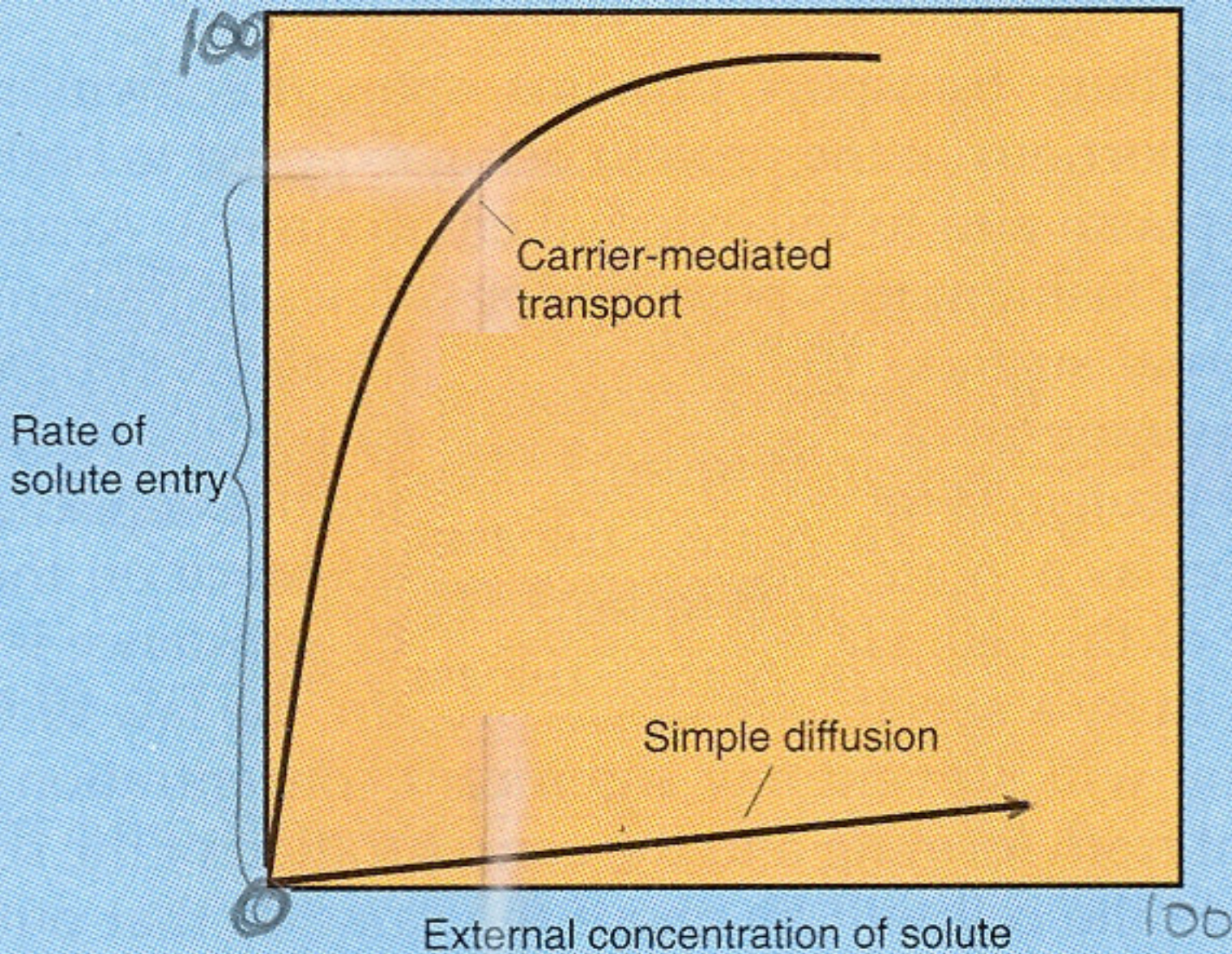


**FIGURE 3.25** Transport of metabolites linked to the Na<sup>+</sup>/K<sup>+</sup> pump in the membranes of animal cells. The ATPase pumps Na<sup>+</sup> out of the cell while K<sup>+</sup> is pumped in, and the transport reactions are driven by the energy released from the reaction  $\text{ATP} \rightarrow \text{ADP} + \text{P}_i$ .



**FIGURE 3.24** Use of ion separation in the proton motive force, in this case the separation of protons from hydroxyl ions across the membrane, to transport inorganic ions by specific transport proteins. Note that there is both a separation of protons and of electrical charge.





**FIGURE 3.20** Relationship between uptake rate and external concentration in passive uptake and active transport. Note that in the carrier-mediated process the uptake rate shows saturation at relatively low external concentrations.