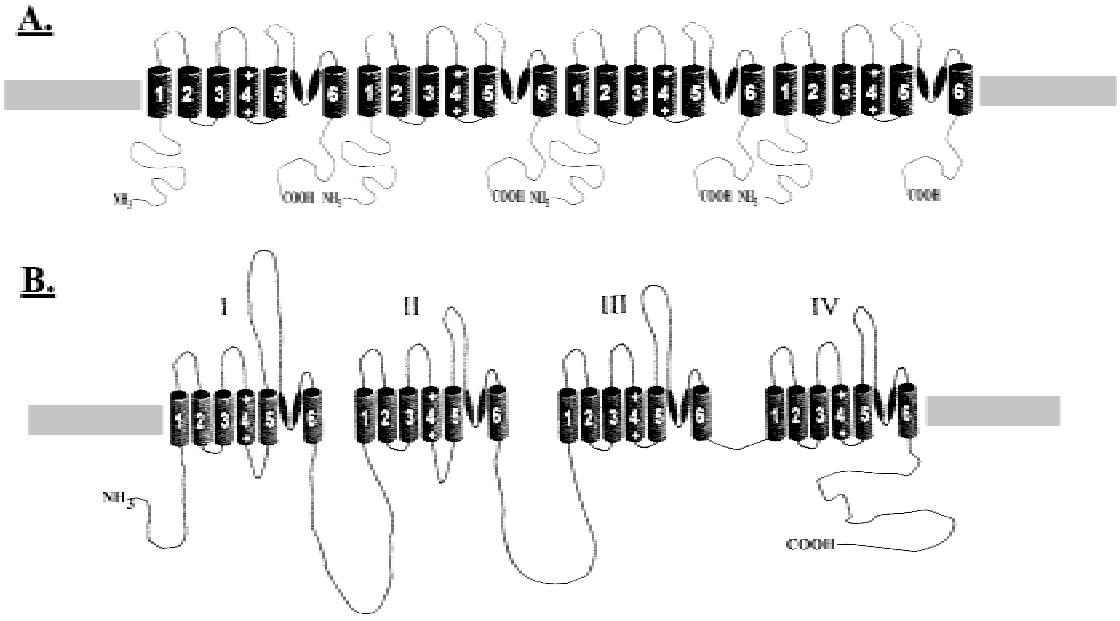
9. Pictured below are typical cartoons of two monovalent cation channels that are found in the plasma membrane of different nerve and muscle cells.



One can imagine a variety of questions being asked about these channels (at different levels of difficulty); here are some examples: (Can you think of others?)

A. Being integral membrane proteins, these channels are very hydrophobic molecules and not easily assessed by most biochemical techniques. How then were the structures depicted in the figures determined?

B. How do these channels function? Draw their likely three-dimensional structures and briefly describe, with appropriate labels, how the various domains and regions are thought to operate .

C. Which cartoon represents the Na^+ channel, the K^+ channel?

D. Relatively speaking, K+ channels are highly diversified in terms of structure and function, while Na+ channels are a more close knit family. Many cells, for example, exhibit one Na+ channel and several different K+ channels, and the variation in the latter may be even greater when different tissues are examined. Briefly describe *at least two* different types of K+ channels and speculate *how* such variety might be generated mechanistically and *why* it might have arisen in the course of evolution.