

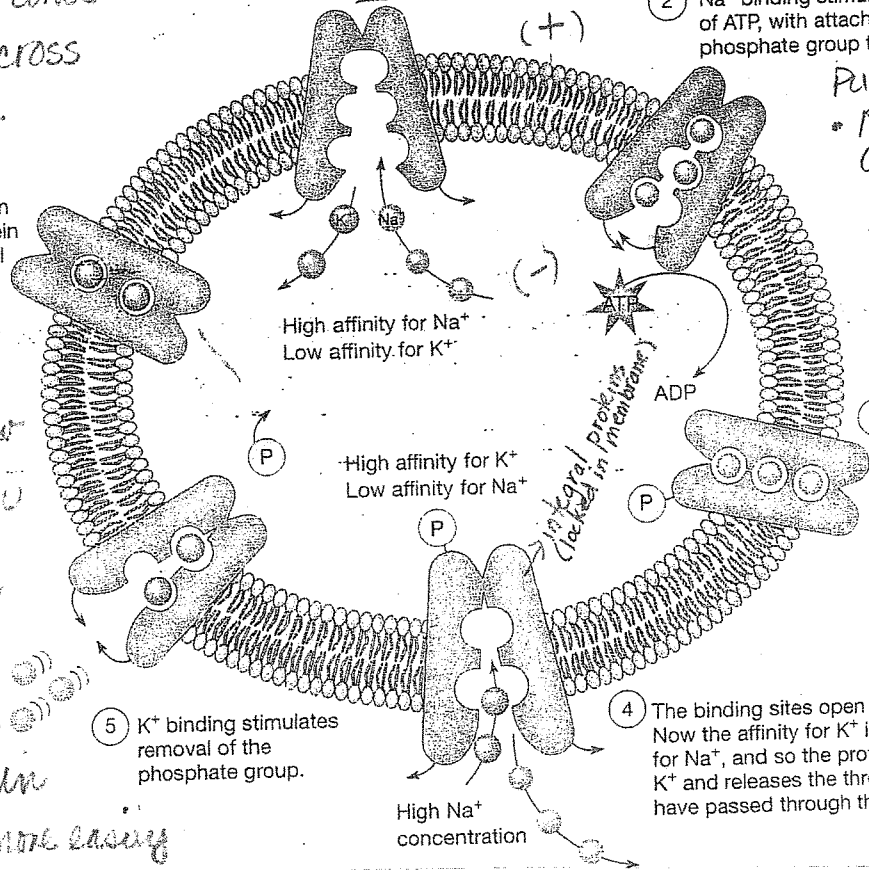
# Sodium-Potassium Pump

uses ATP to transfer  $\text{Na}^+$  out of cell and  $\text{K}^+$  in, both ions against concentration gradient

(Ea) time  $\text{Na}^+ - \text{K}^+$  pump cycles, 3  $\text{Na}^+$  ions and 2  $\text{K}^+$  ions move across plasma membrane

more  $\text{Na}^+$  outside cell than inside

6 Dephosphorylation changes the protein back to its original shape.



2  $\text{Na}^+$  binding stimulates hydrolysis of ATP, with attachment of its third phosphate group to the protein.

PURPOSE:

- maintain electrically charged membrane

- concentration of ions outside is diff from inside, by doing that allows work to be done so

3 This phosphorylation makes the protein change shape.

- substances can go in/out of cell via membrane

4 The binding sites open to the exterior. Now the affinity for  $\text{K}^+$  is higher than for  $\text{Na}^+$ , and so the protein binds two  $\text{K}^+$  and releases the three  $\text{Na}^+$ , which have passed through the membrane.

5  $\text{K}^+$  binding stimulates removal of the phosphate group.

to set up electrical differences to allow proteins to function

sets up electrical gradient

more work to pump  $\text{Na}^+$  is pumped out/in

$\text{K}^+$  can go in/out more easily

- $\text{K}^+$  (potassium ions) are pumped from outside to inside cell
- $\text{Na}^+$  (sodium ions) binds stimulating production of ATP via hydrolysis (splitting of  $\text{H}_2\text{O}$  to make ATP)
- Loses phosphate group (ADP) which makes protein change shape
- Binding site opens to outside cell releasing  $\text{Na}^+$  and taking in 2  $\text{K}^+$
- $\text{K}^+$  stimulates removal of a phosphate group
- Loss of phosphate changes protein back to original shape