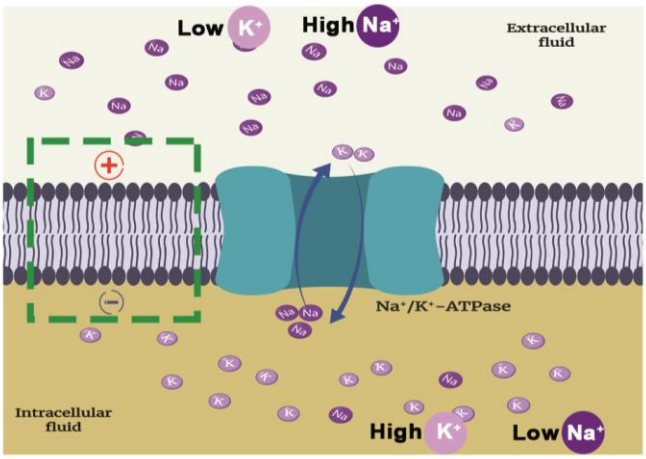
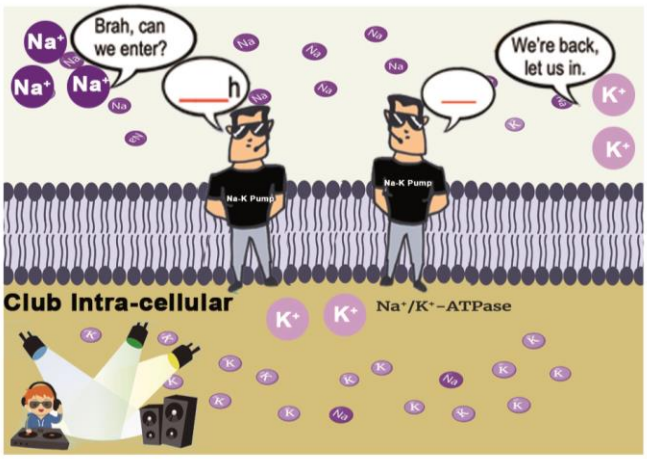
CONCEPT: SODIUM-POTASSIUM ION PUMP

●Recall: *inside* of cells are more _____ with respect to the outside, which dictates the *electrical* gradient.

●Most cells maintain an *opposite chemical* gradient of sodium (_____) & potassium (_____) ions:

□ Inside cell: ↓ [Na^+] & ↑ [K^+].





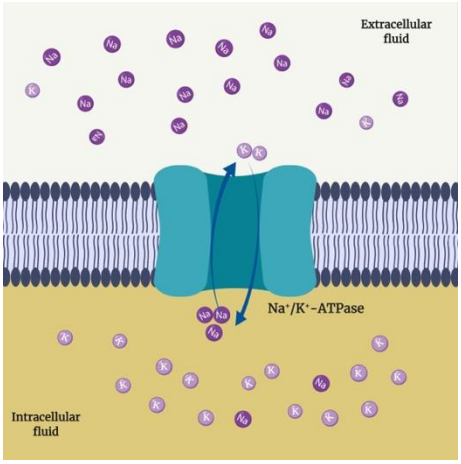
Sodium-Potassium Ion Pump: a P-Type ATPase

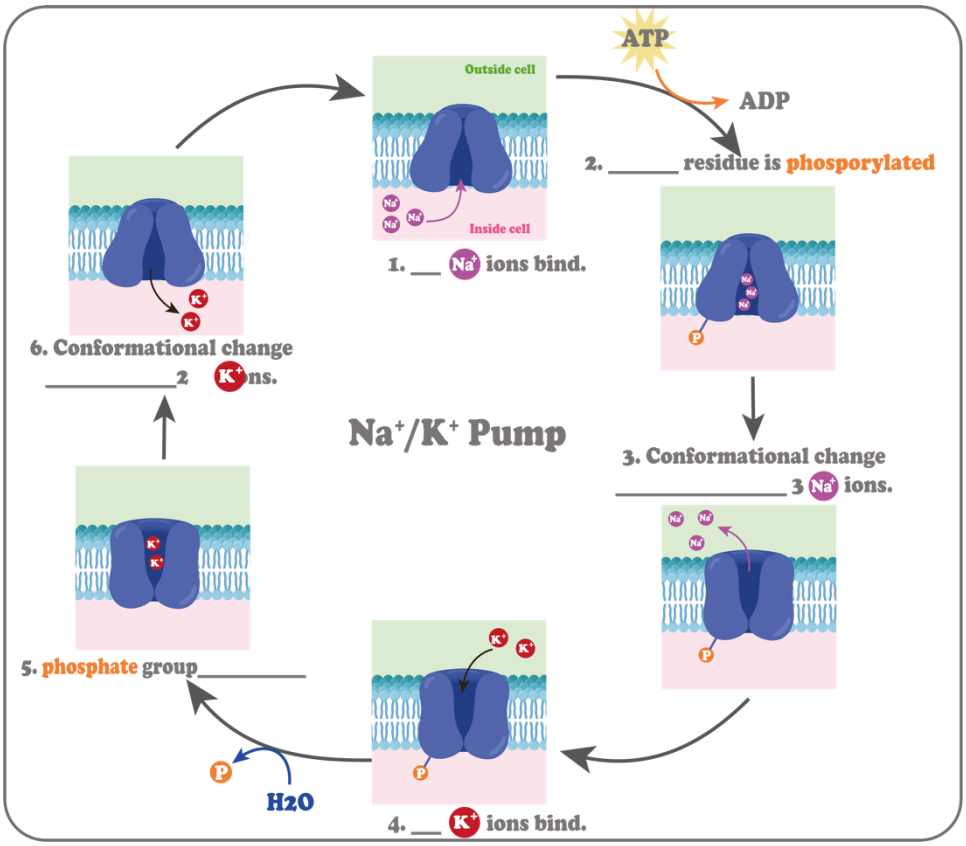
●*Na^+/K^+ Pump*: a _____*-type ATPase* that transports Na^+ & K^+ cations in *opposite* directions (antiport).

□ ____ _____ ions are _____; while ____ _____ ions are _____ (pump-K^+-in).

□ *ATP-dependent process*: ATP-hydrolysis *phosphorylates* _____ residue on pump, causing a *conformational* shift.

EXAMPLE: Sodium-Potassium Ion Pump.





CONCEPT: SODIUM-POTASSIUM ION PUMP

PRACTICE: Which of the following defines the type of transport by the sodium-potassium ATPase?

a) Active transport through a symporter.
b) Passive transport through a symporter.
c) Active transport through an antiporter.
d) Passive transport through a symporter.
e) Facilitated diffusion through a symporter.

PRACTICE: Which of the following statements about the mechanism of the sodium-potassium ATPase is FALSE?

a) It helps to create a transmembrane potential that is more negative on the inside and more positive on the outside.
b) It pumps 3 Na^+ ions out of the cell.
c) It pumps 2 K^+ ions into the cell.
d) The ATPase is phosphorylated by ATP to transport of Na^+ into the cell.
e) All of the statements above are correct.

PRACTICE: Which of the following shows the correct order of steps for the mechanism of the sodium-potassium ATPase?

a) II, I, V, III, IV, VI.
b) IV, II, III, I, V, VI.
c) I, II, III, IV, V, VI.
d) IV, II, I, III, V, VI.
e) IV, III, I, II, VI, V.

I. 2 K^+ Ions bind.
II. Phosphorylation of an Asp residue.
III. Conformational change releasing 3 Na^+ ions outside the cell.
IV. 3 Na^+ ions bind.
V. Release of the phosphate group.
VI. Conformational change releasing 2 K^+ ions inside the cell.