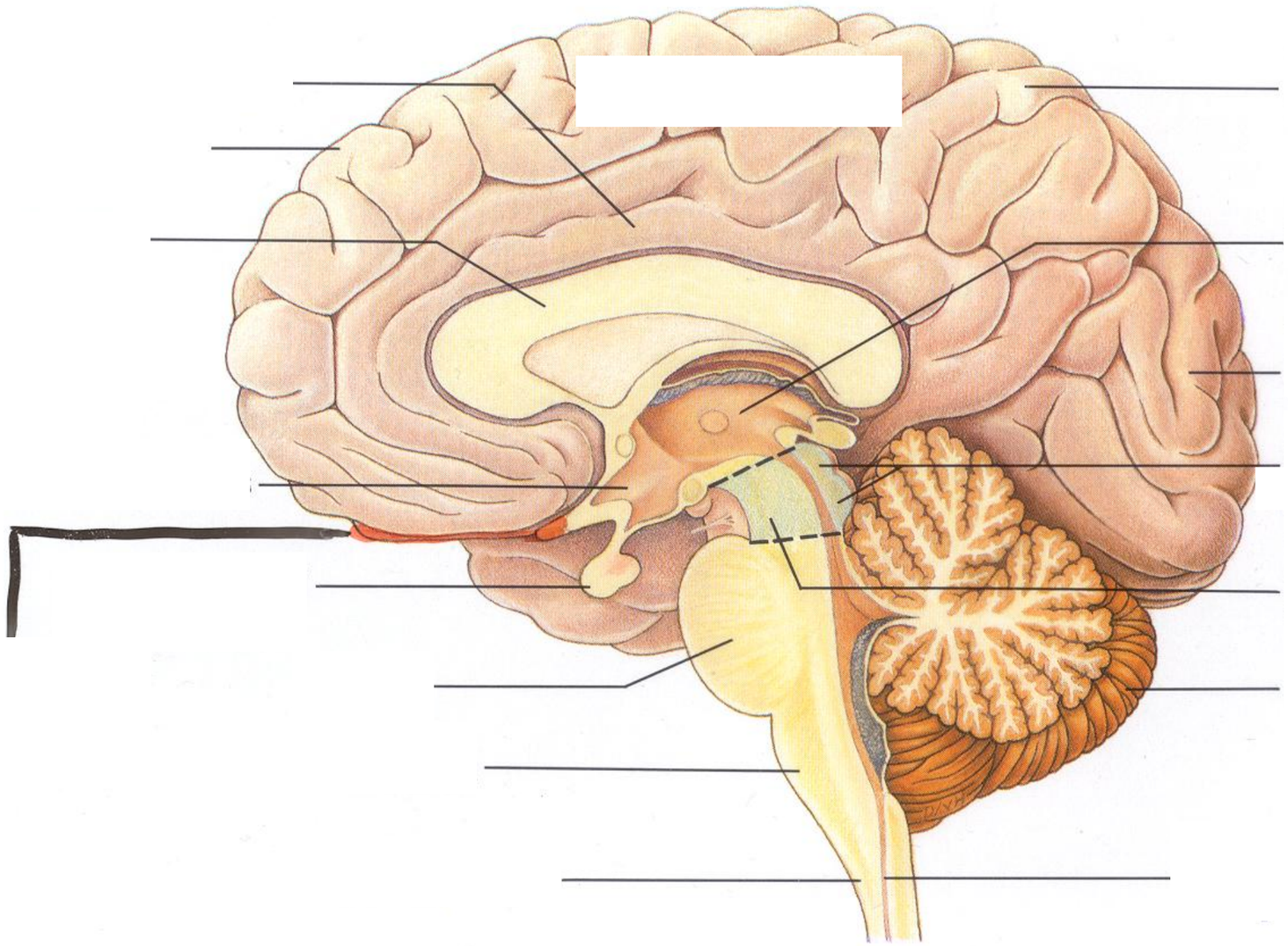
<u>Instructions</u>: number these parts of the Brain

1. Cingulate gyrus
2. Thalamus
3. Corpus callosum
4. Pons
5. Hypothalamus
6. Occipital lobe
7. Olfactory Bulb
8. Spinal Cord
9. Pituitary gland
10. Parietal lobe
11. Medulla
12. Tectum
13. Central canal of spinal cord
14. Frontal lobe
15. Tegmentum
16. Cerebellum
17. Cerebral cortex



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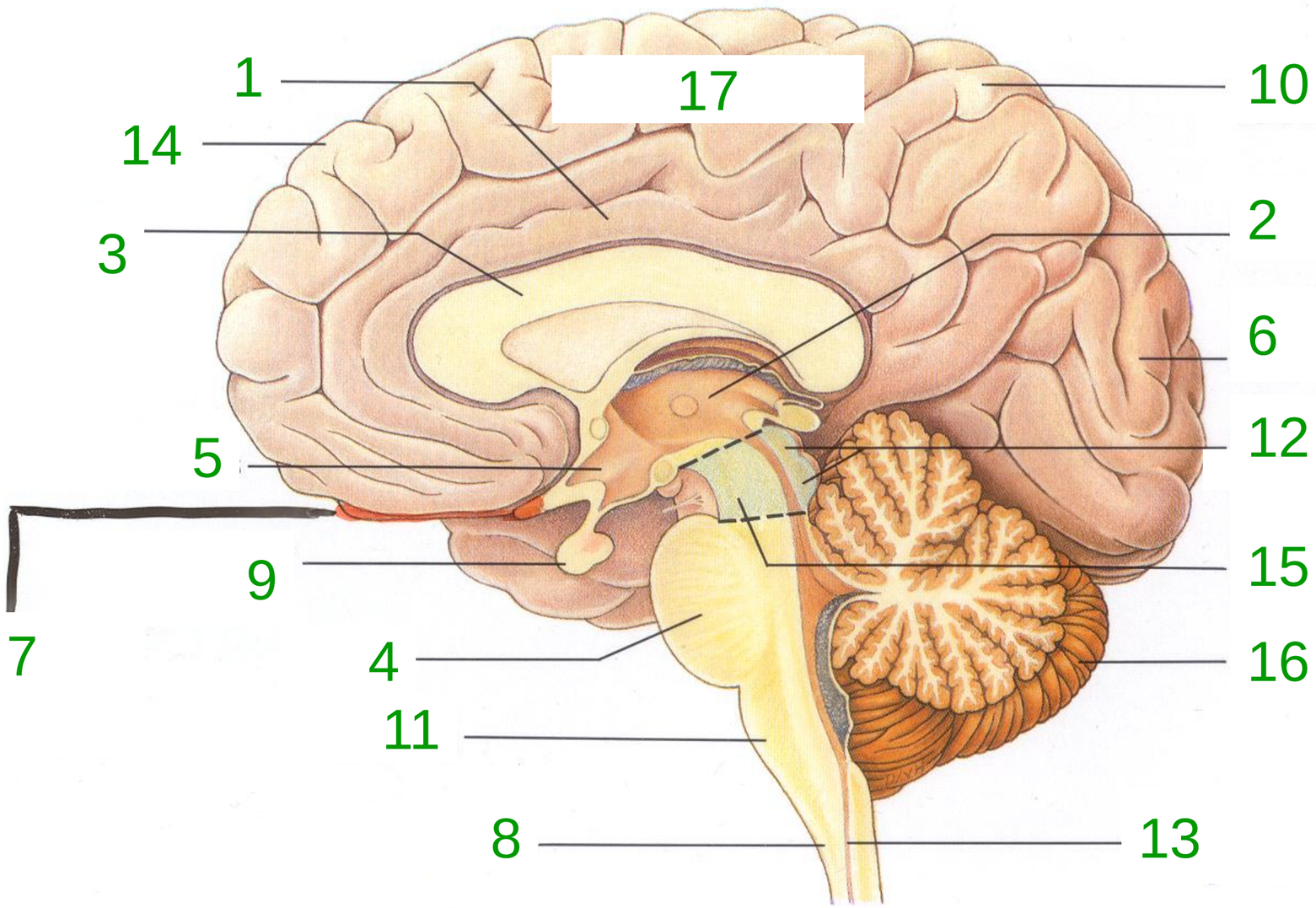
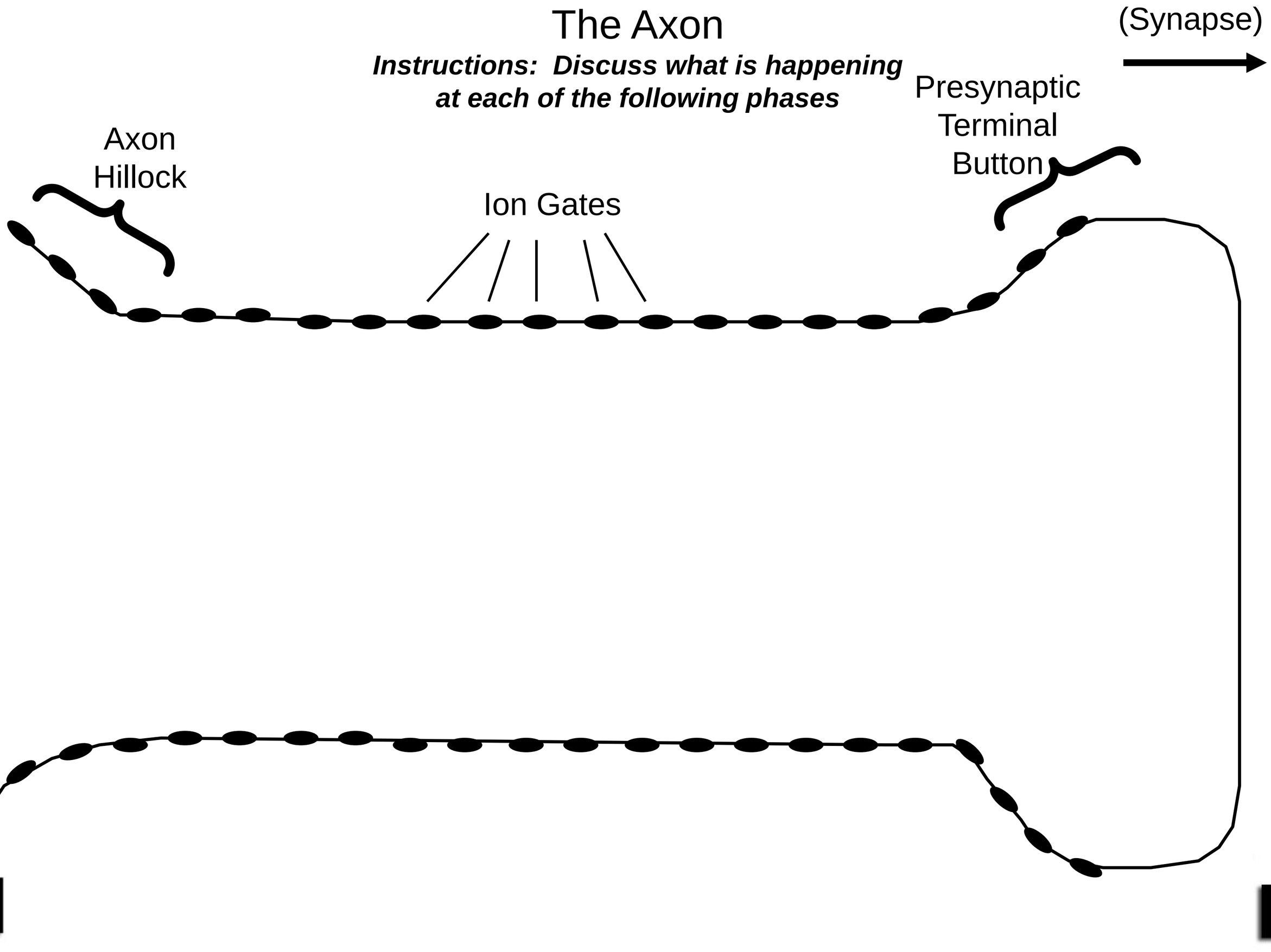


The Axon

Instructions: Discuss what is happening at each of the following phases



“Resting Potential”

More + Outside

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+

K+ K+

K+ K+

K+ K+

K+ K+

Less + Inside

-70mV

All Gates Closed

All Gates Closed

All Gates Closed

All Gates Closed

More +

More +

More +

More +

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+ Na+

K+ K+

K+ K+

K+ K+

K+ K+

Less +

Less +

Less +

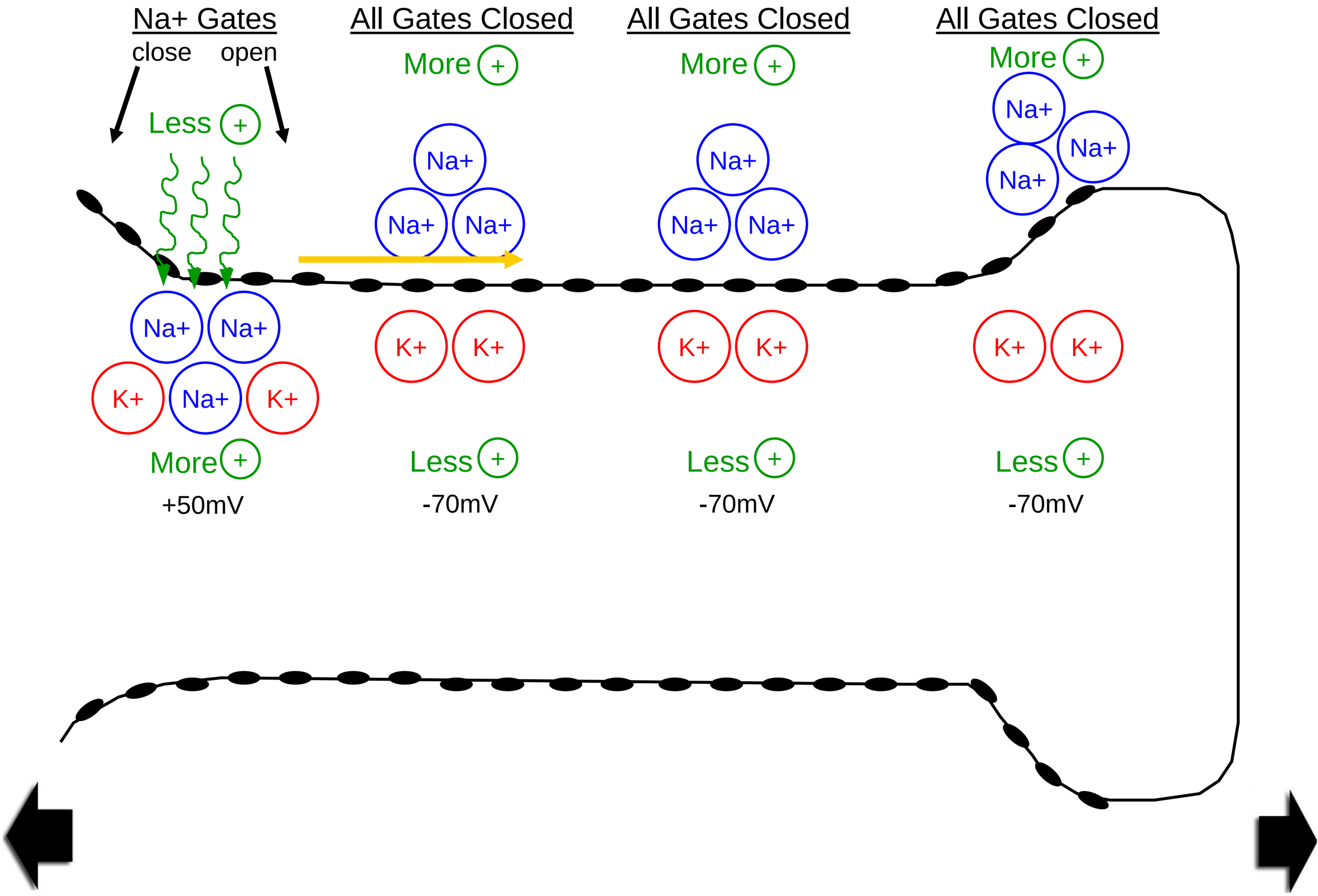
Less +

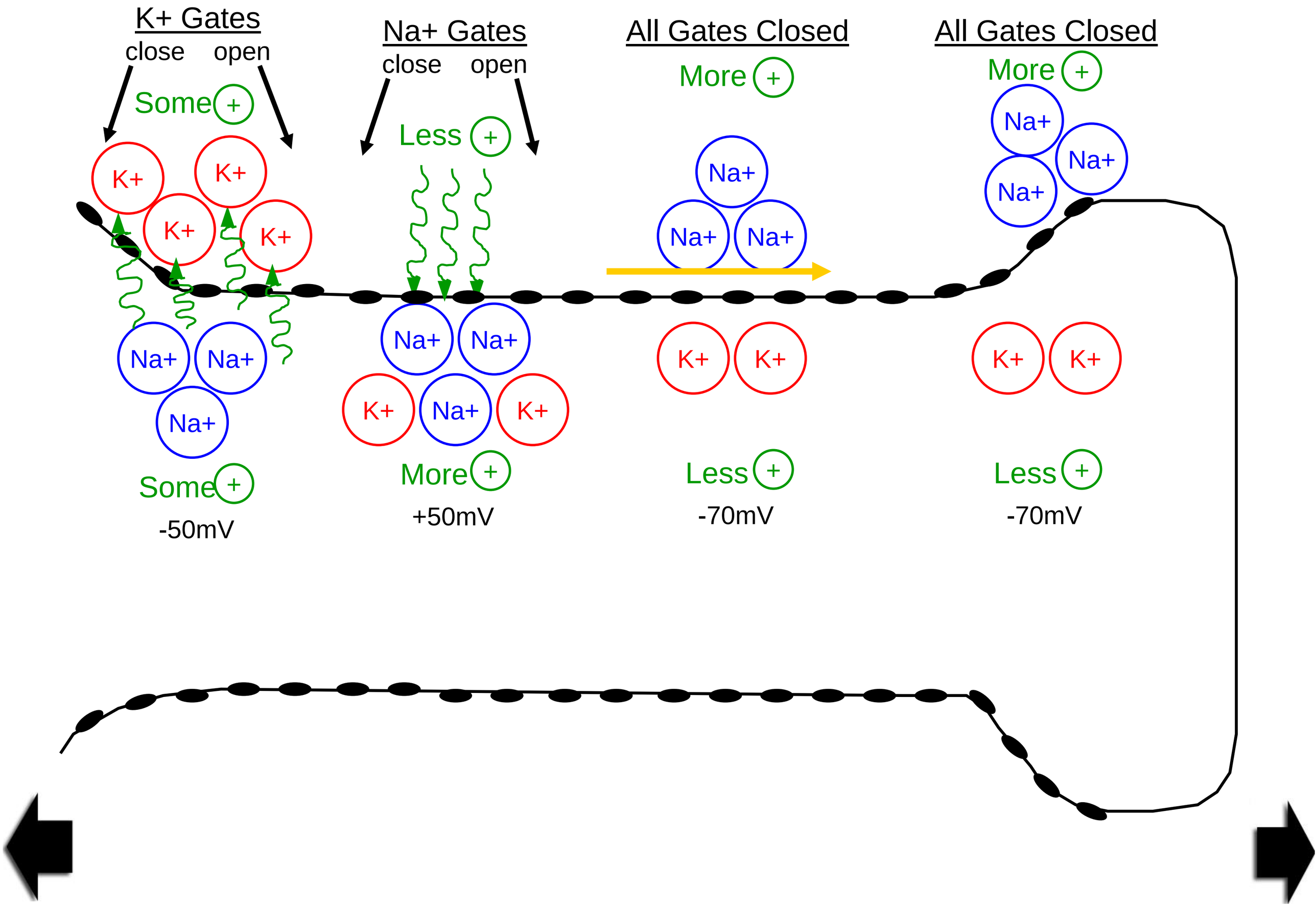
-70mV

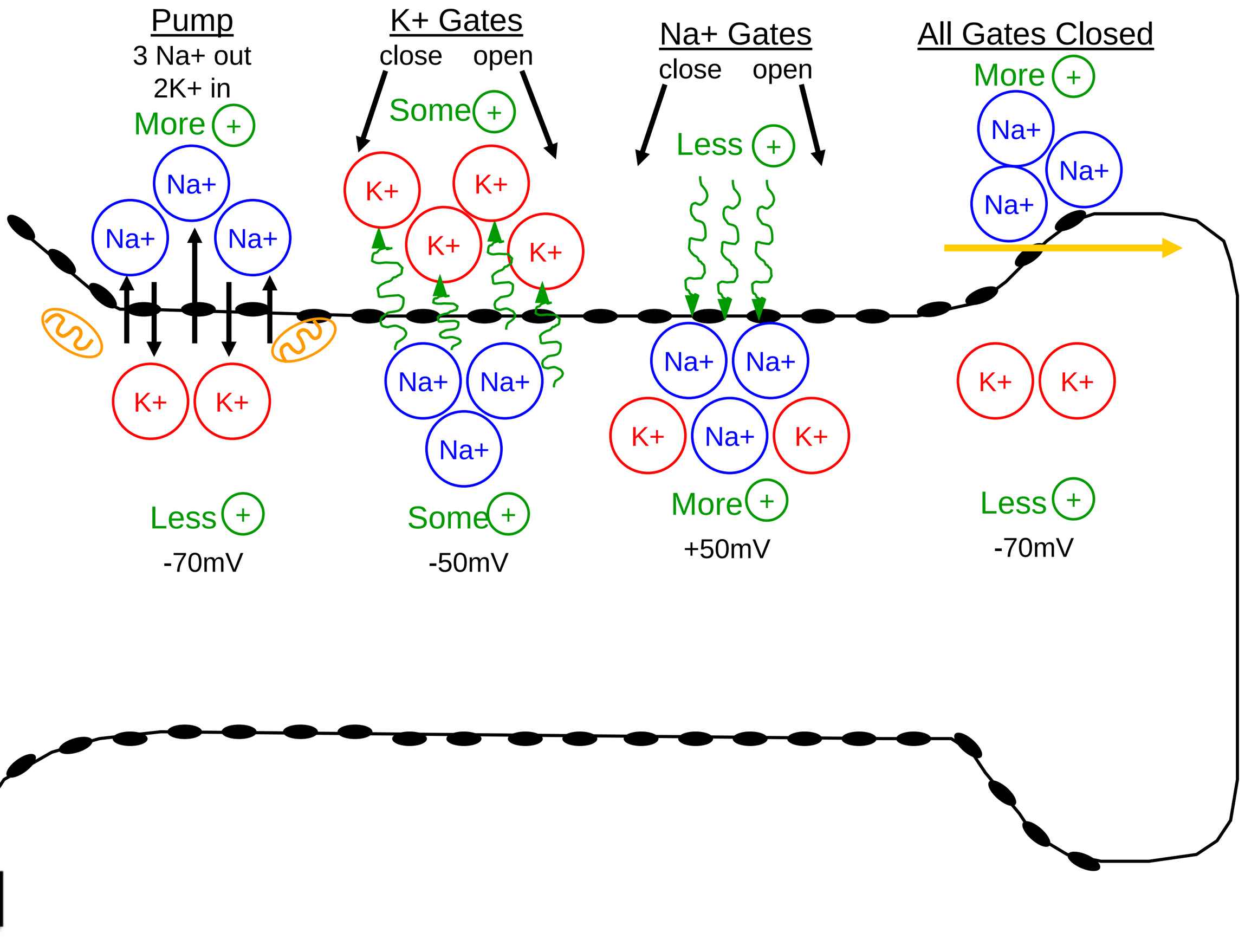
-70mV

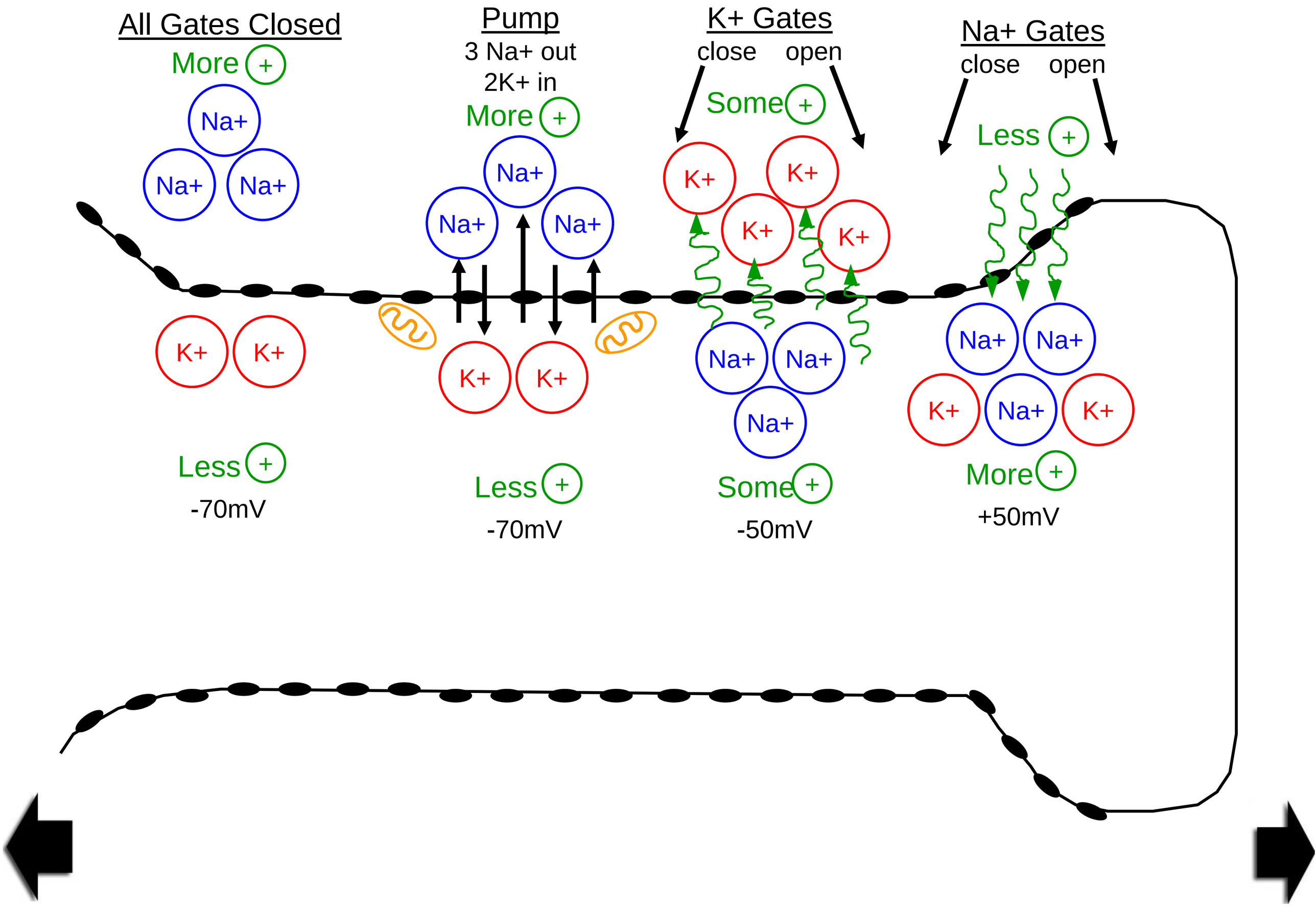
-70mV

-70mV


Na+ Gates
close
open
Less +
Na+
Na+
Na+
K+
Na+
K+
More +
+50mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV


K+ Gates
close open
Some +
Na+ Gates
close open
Less +
All Gates Closed
More +
All Gates Closed
More +
K+
Na+
Some +
-50mV
More +
+50mV
Less +
-70mV
Less +
-70mV


Pump
3 Na+ out
2K+ in
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
K+ Gates
close open
Some +
K+
K+
K+
K+
Na+
Na+
Na+
Some +
-50mV
Na+ Gates
close open
Less +
Na+
Na+
K+
Na+
K+
More +
+50mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV


All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
Pump
3 Na+ out
2K+ in
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
K+ Gates
close
open
Some +
K+
K+
K+
K+
Na+
Na+
Na+
Some +
-50mV
Na+ Gates
close
open
Less +
Na+
Na+
K+
Na+
K+
More +
+50mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

Pump

3 Na+ out

2K+ in

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

K+ Gates

close open

Some +

K+ K+ K+ K+

Na+ Na+ Na+

Some +

-50mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

Pump

3 Na+ out

2K+ in

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

All Gates Closed

All Gates Closed

All Gates Closed

More +

More +

More +

More +

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+ Na+

K+ K+

K+ K+

K+ K+

K+ K+

Less +

Less +

Less +

Less +

-70mV

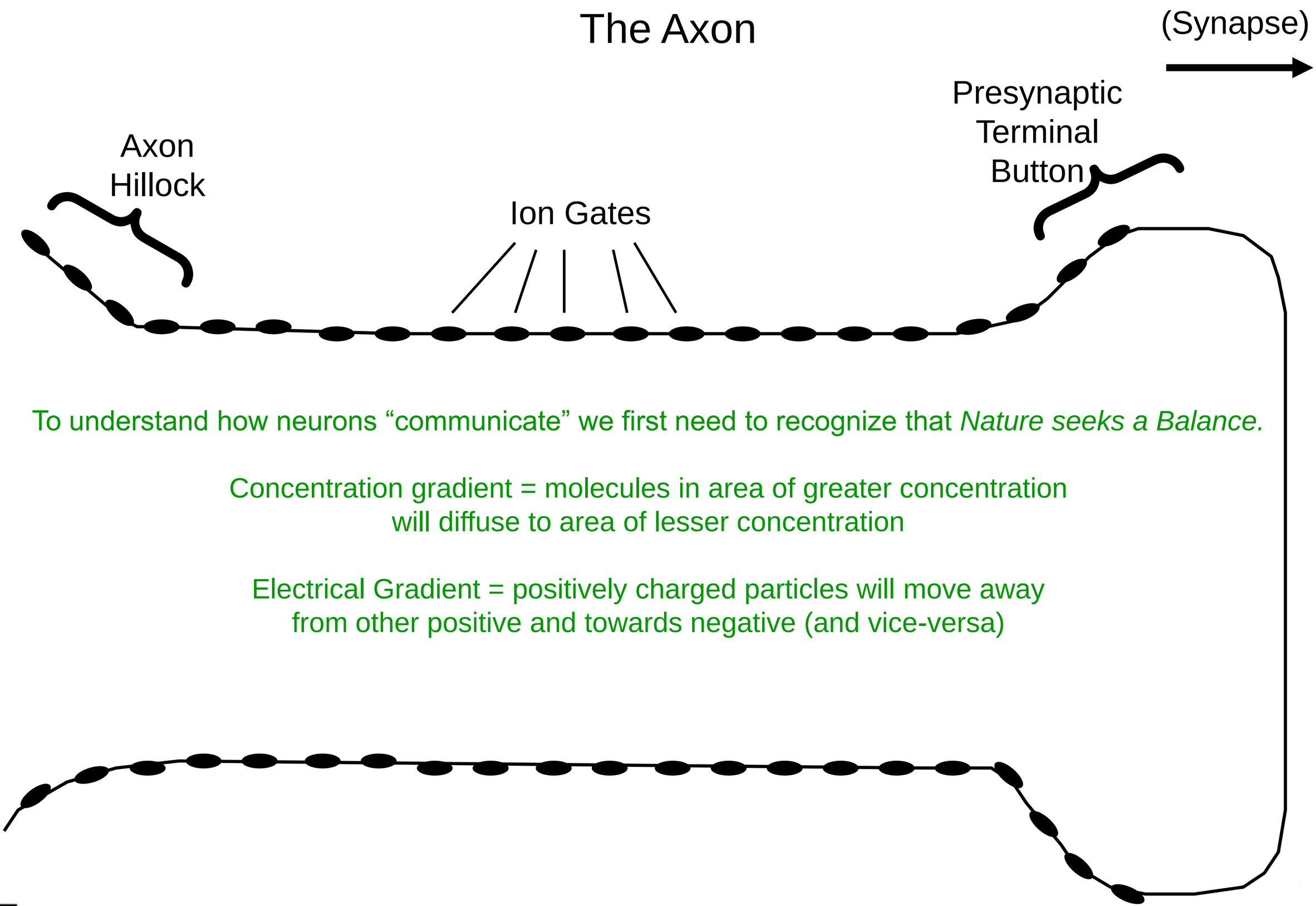
-70mV

-70mV

-70mV

The Axon

(Synapse)



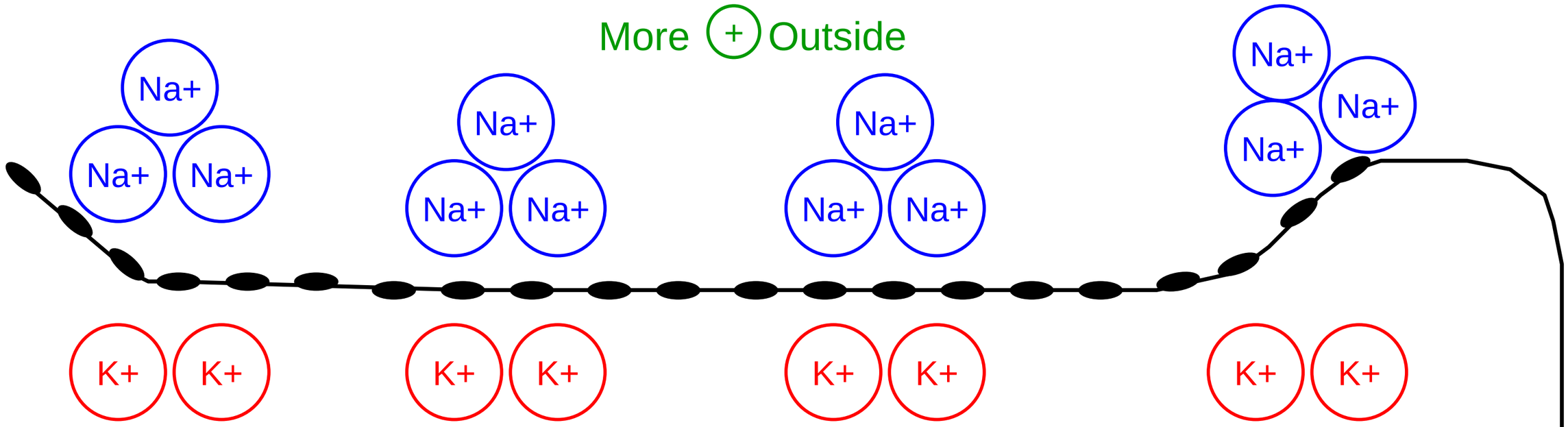
To understand how neurons “communicate” we first need to recognize that *Nature seeks a Balance.*

Concentration gradient = molecules in area of greater concentration
will diffuse to area of lesser concentration

Electrical Gradient = positively charged particles will move away
from other positive and towards negative (and vice-versa)

“Resting Potential”

More + Outside



Less + Inside

-70mV

Resting cell is polarized, which means there is a large electro-chemical difference between outside and inside. It is ready to fire.

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

More +

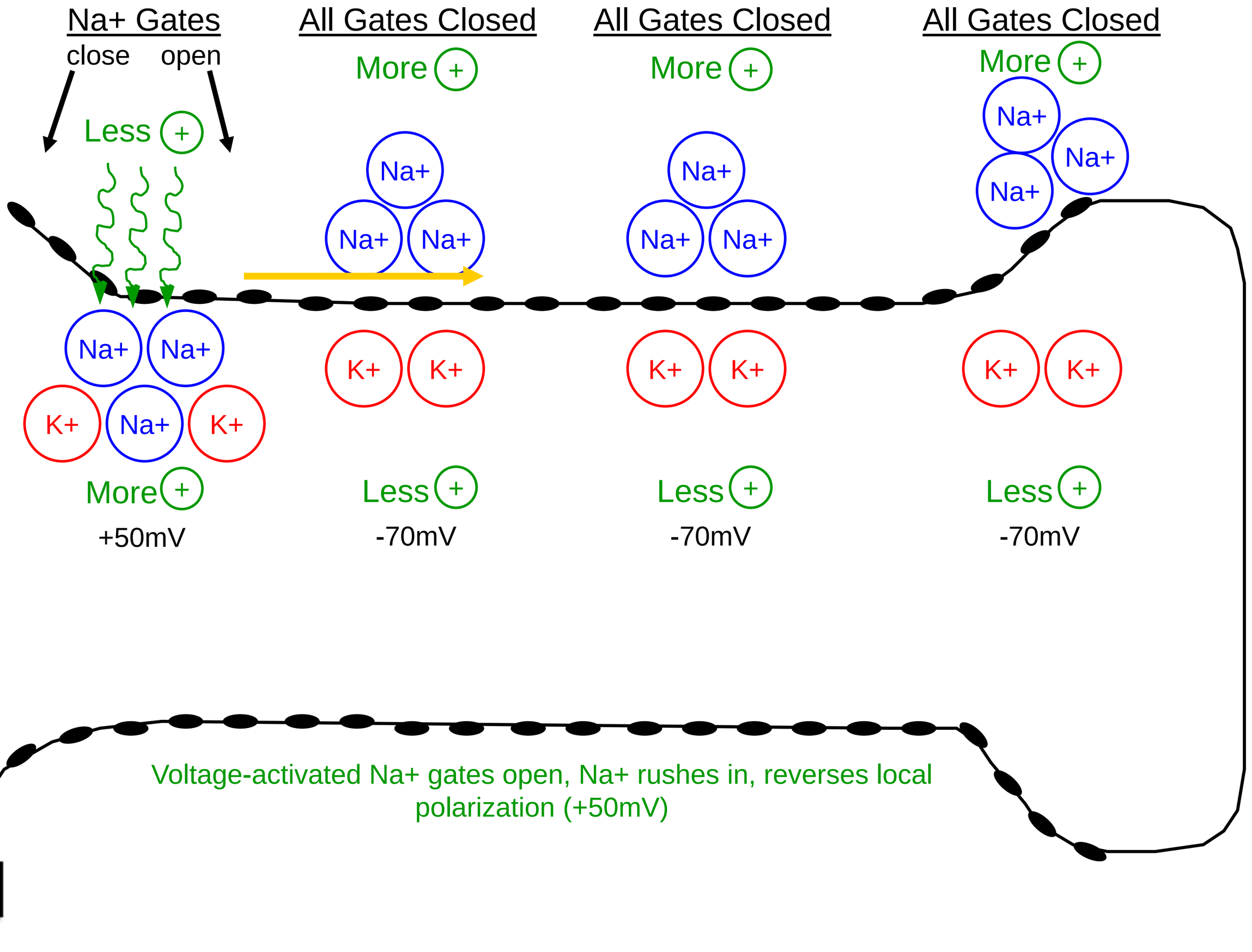
Na+ Na+ Na+ Na+

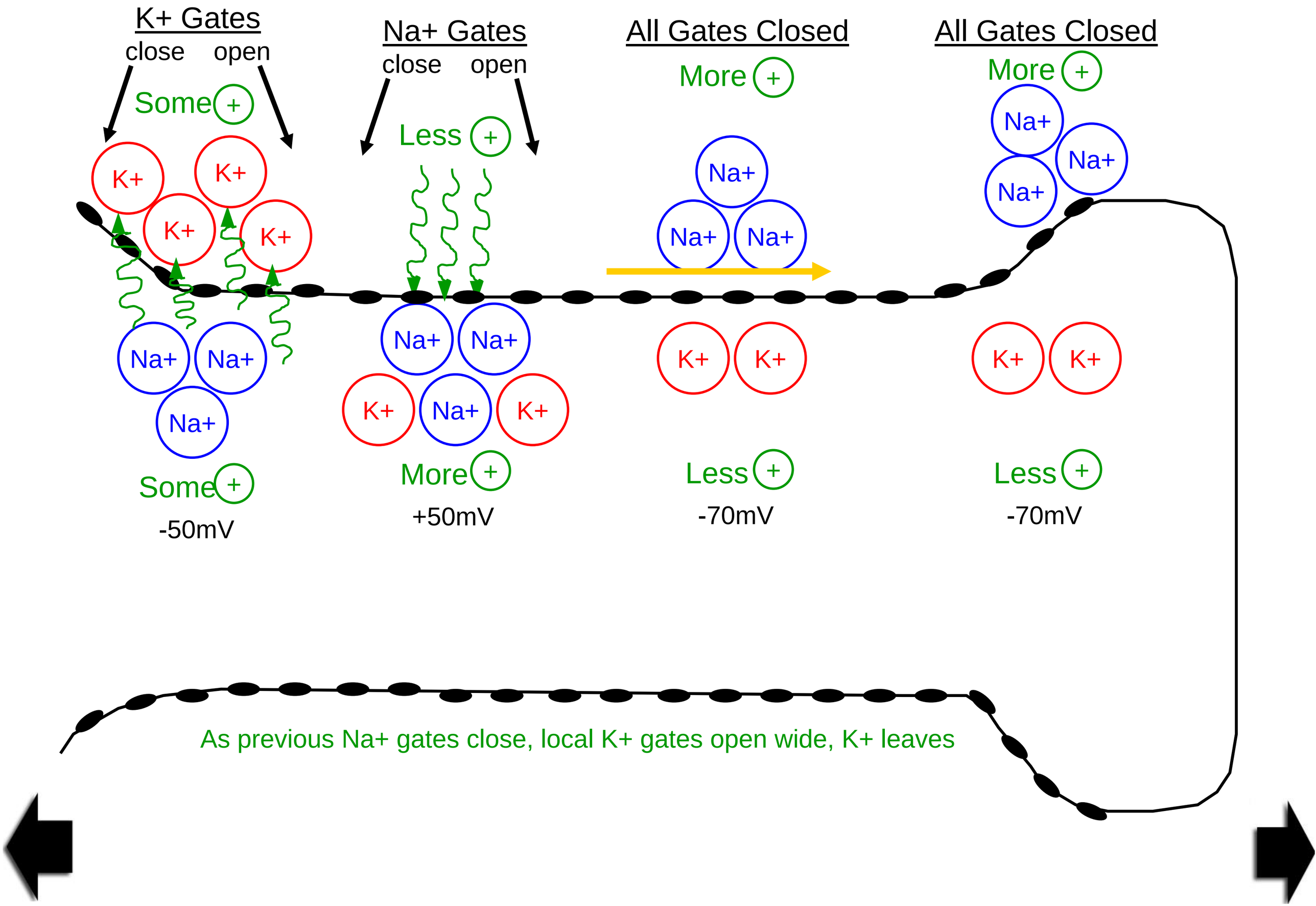
K+ K+

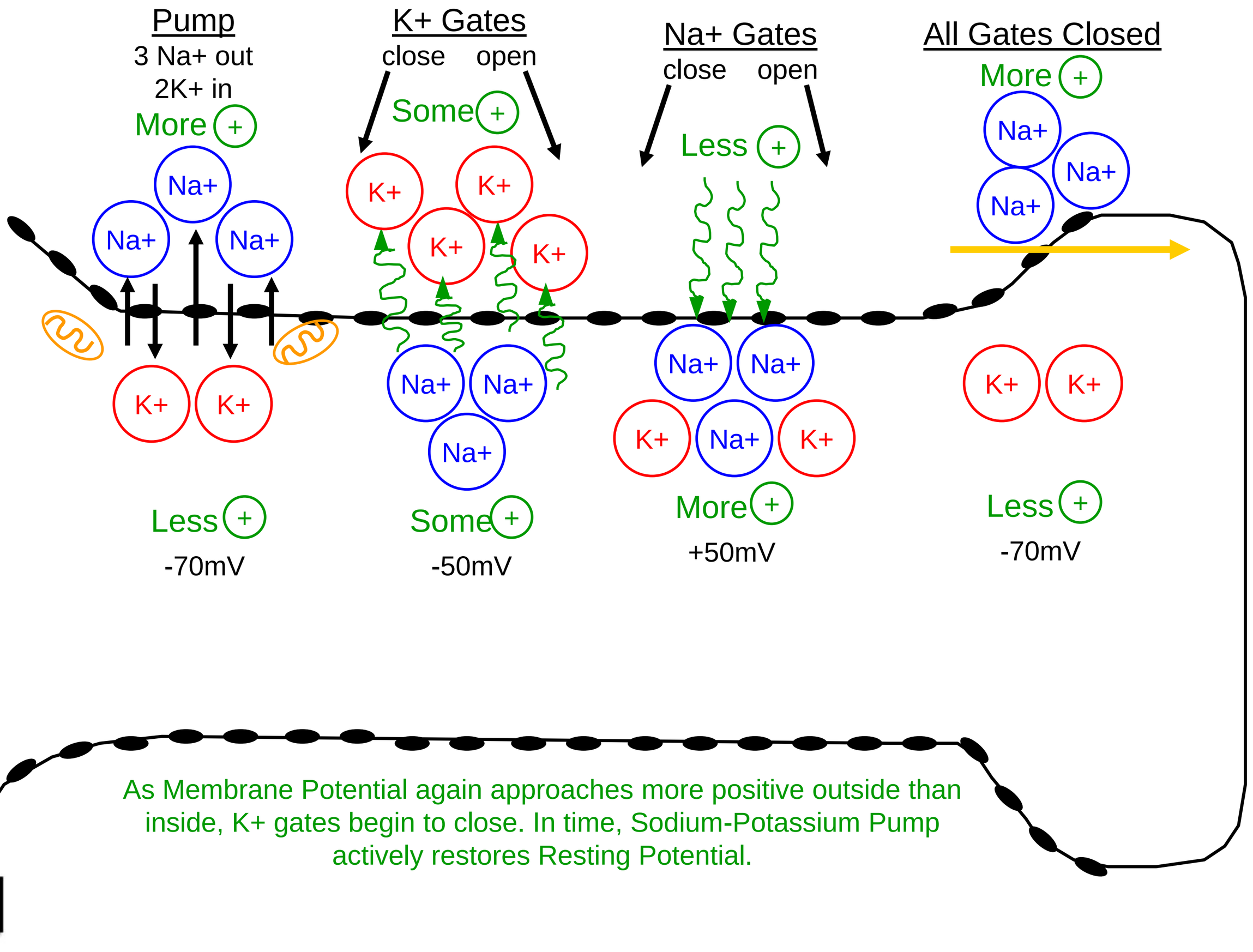
Less +

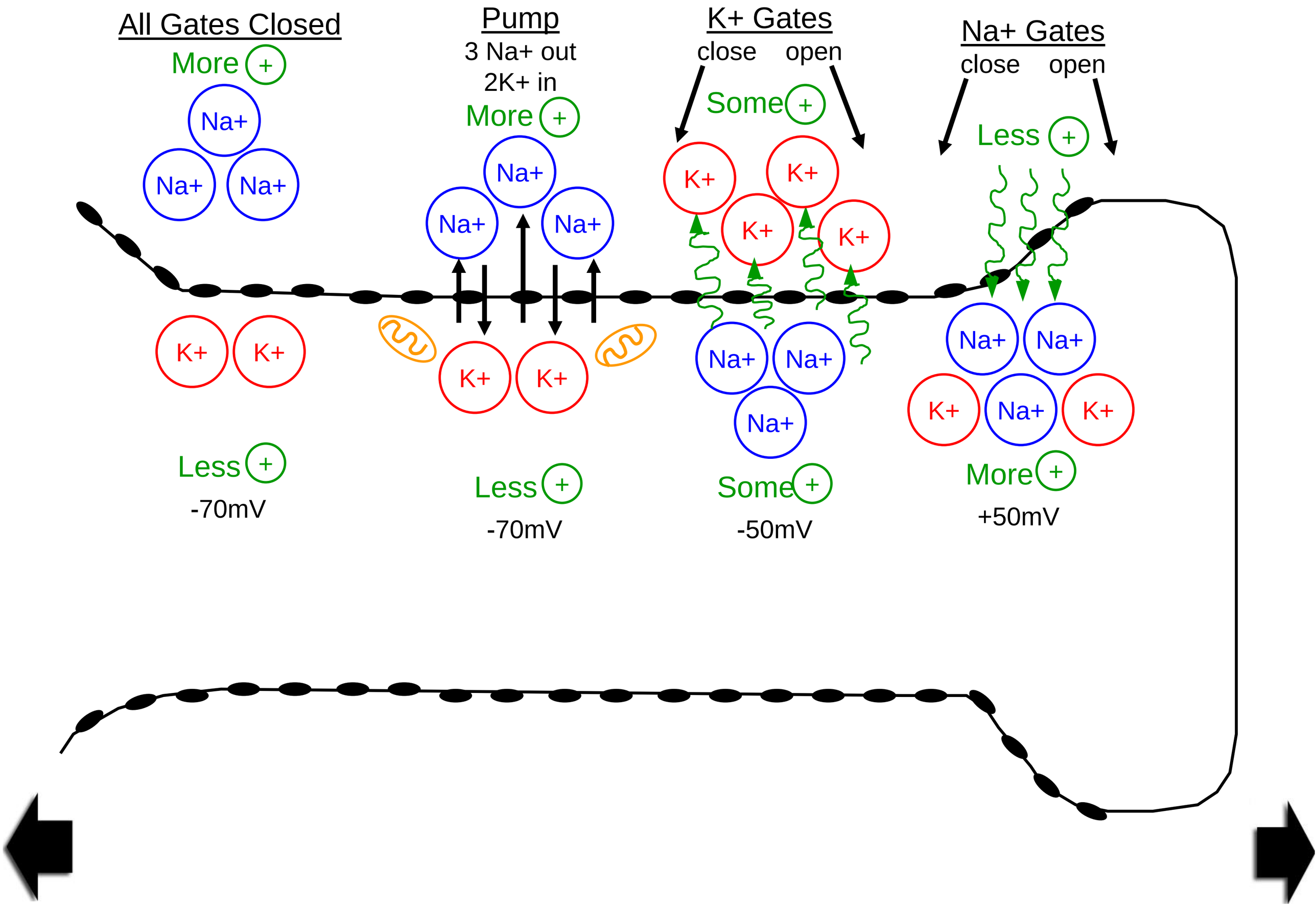
-70mV

Cell fires, starting at Axon Hillock.


Na+ Gates
close
open
Less +
Na+
Na+
K+
Na+
K+
More +
+50mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
Voltage-activated Na+ gates open, Na+ rushes in, reverses local polarization (+50mV)


K+ Gates
close open
Some +
Na+ Gates
close open
Less +
All Gates Closed
More +
All Gates Closed
More +
K+
Na+
Some +
-50mV
More +
+50mV
Less +
-70mV
Less +
-70mV
As previous Na+ gates close, local K+ gates open wide, K+ leaves


Pump
3 Na+ out
2K+ in
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
K+ Gates
close open
Some +
K+
K+
K+
K+
Na+
Na+
Na+
Some +
-50mV
Na+ Gates
close open
Less +
Na+
Na+
K+
Na+
K+
More +
+50mV
All Gates Closed
More +
Na+
Na+
Na+
K+
K+
Less +
-70mV
As Membrane Potential again approaches more positive outside than inside, K+ gates begin to close. In time, Sodium-Potassium Pump actively restores Resting Potential.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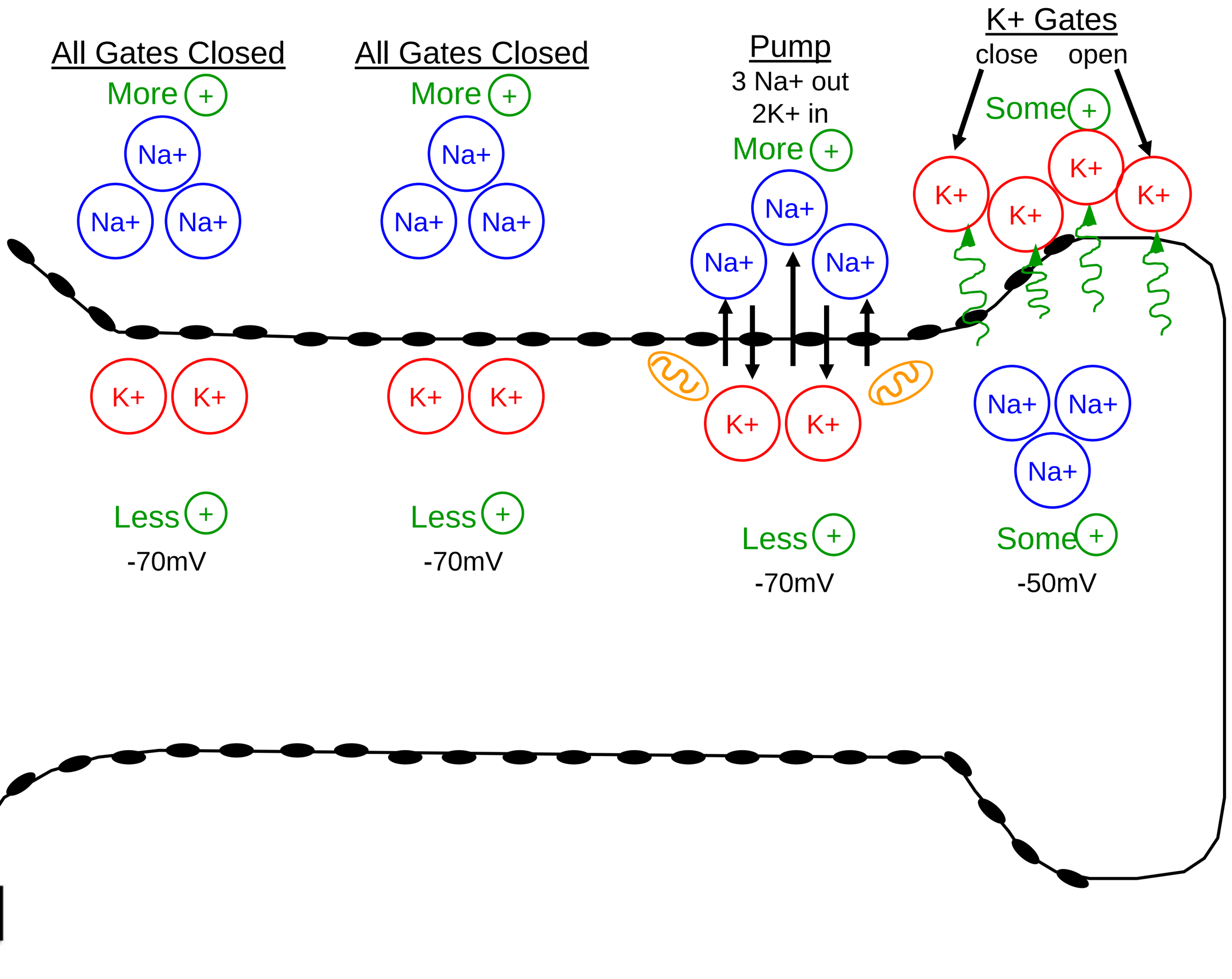
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open
Some +
K+
K+
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Na+ Na+ Na+

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Less +

-70mV

Pump

3 Na+ out

2K+ in

More +

Na+ Na+ Na+

K+ K+

Less +

-70mV

All Gates Closed

All Gates Closed

All Gates Closed

All Gates Closed

More +

More +

More +

More +

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+

Na+ Na+ Na+ Na+

K+ K+

K+ K+

K+ K+

K+ K+

Less +

Less +

Less +

Less +

-70mV

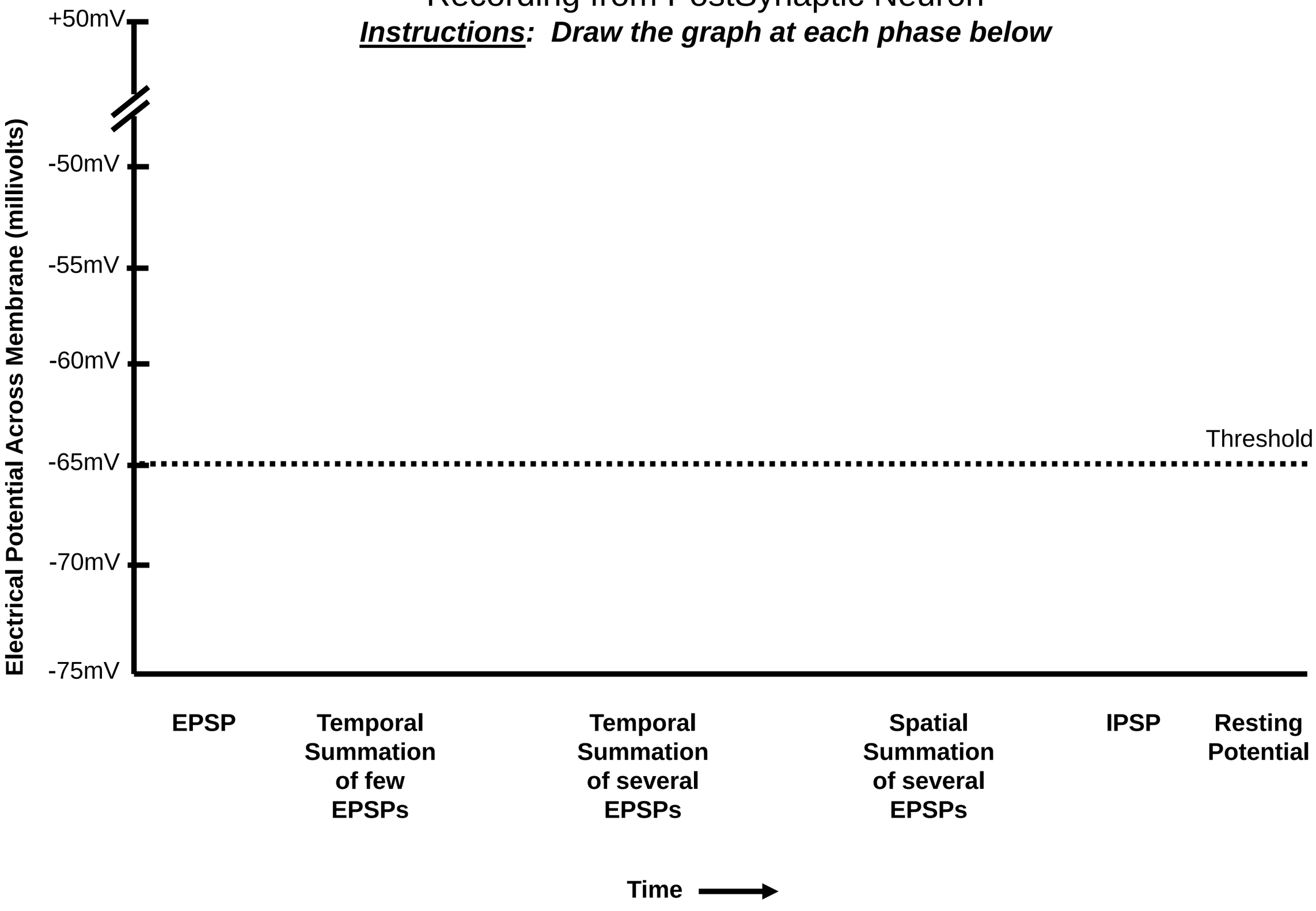
-70mV

-70mV

-70mV

Recording from PostSynaptic Neuron

***Instructions*: Draw the graph at each phase below**



Recording from PostSynaptic Neuron