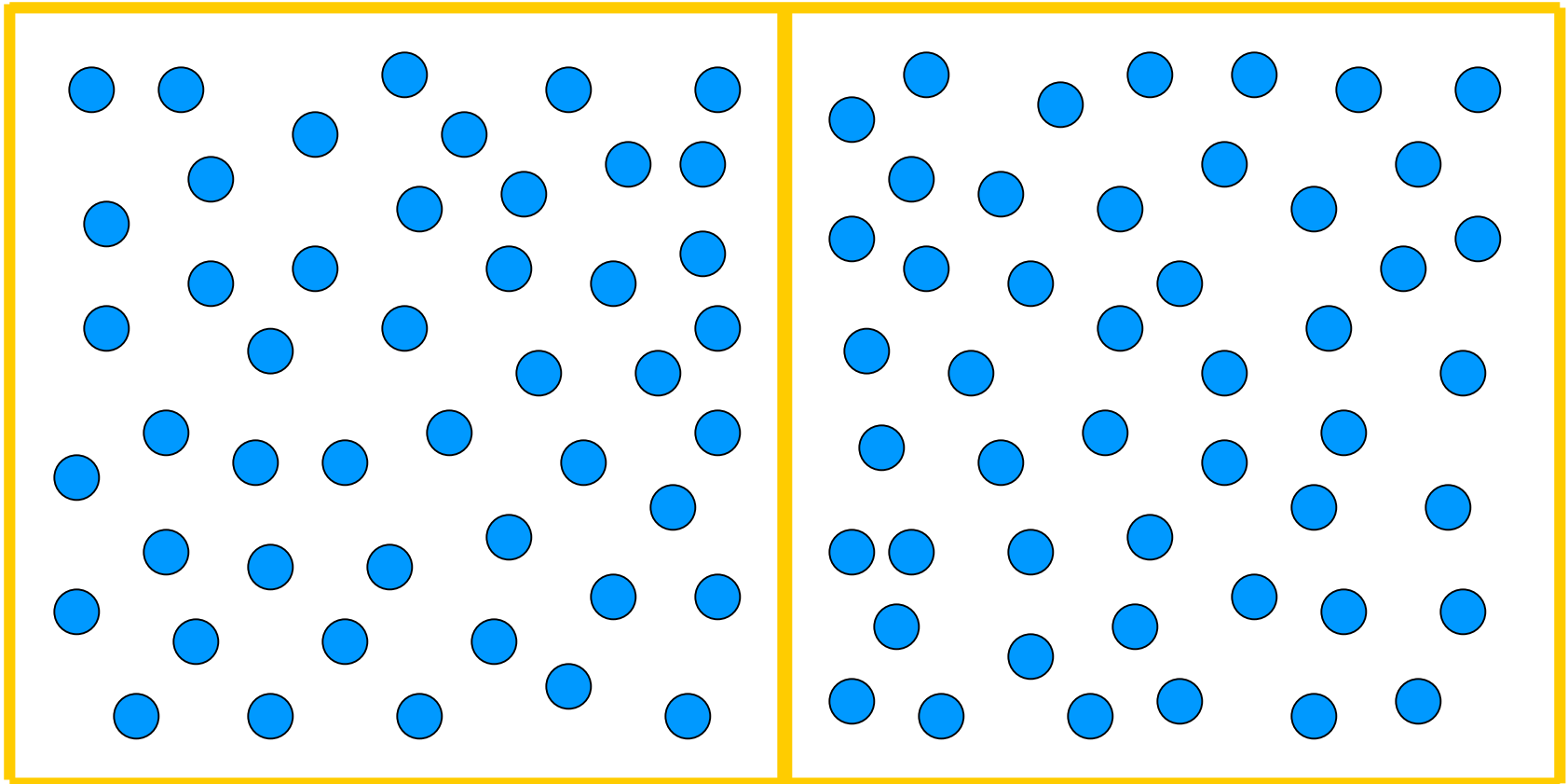




TONICITY

CELL A

CELL B



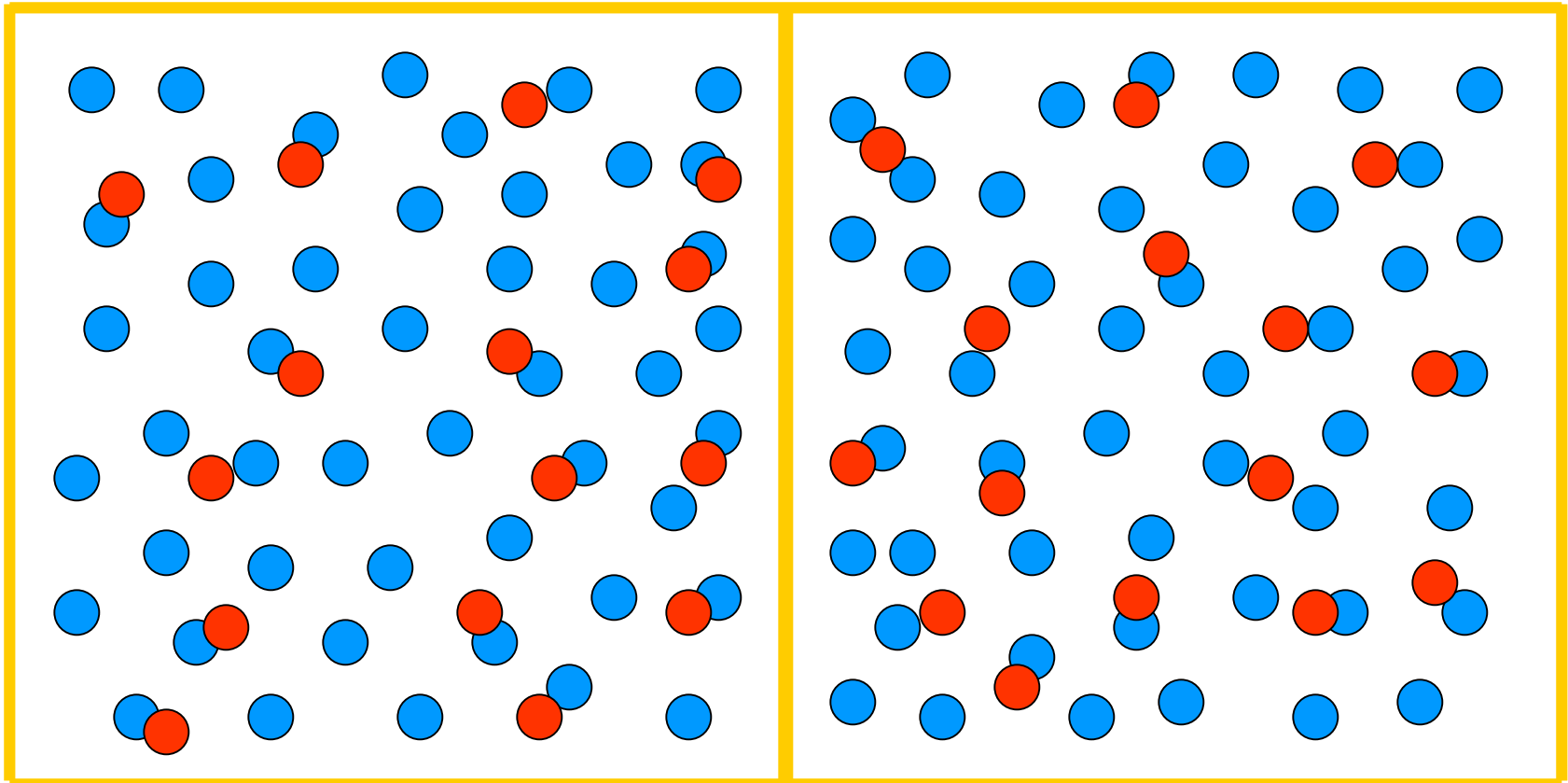
 = WATER MOLECULE

 = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

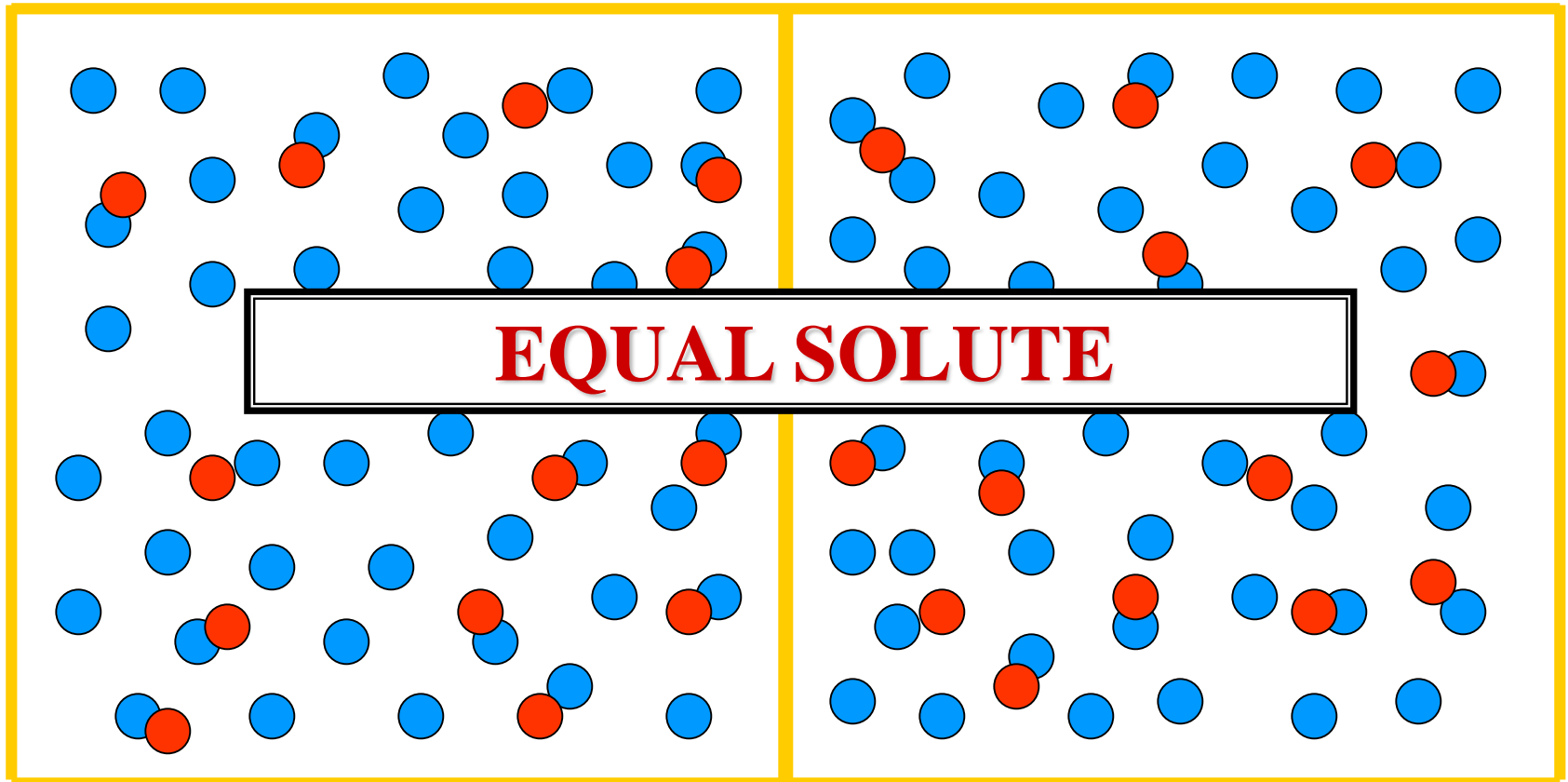
● = POLAR SOLUTE MOLECULE

— = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

● = POLAR SOLUTE MOLECULE

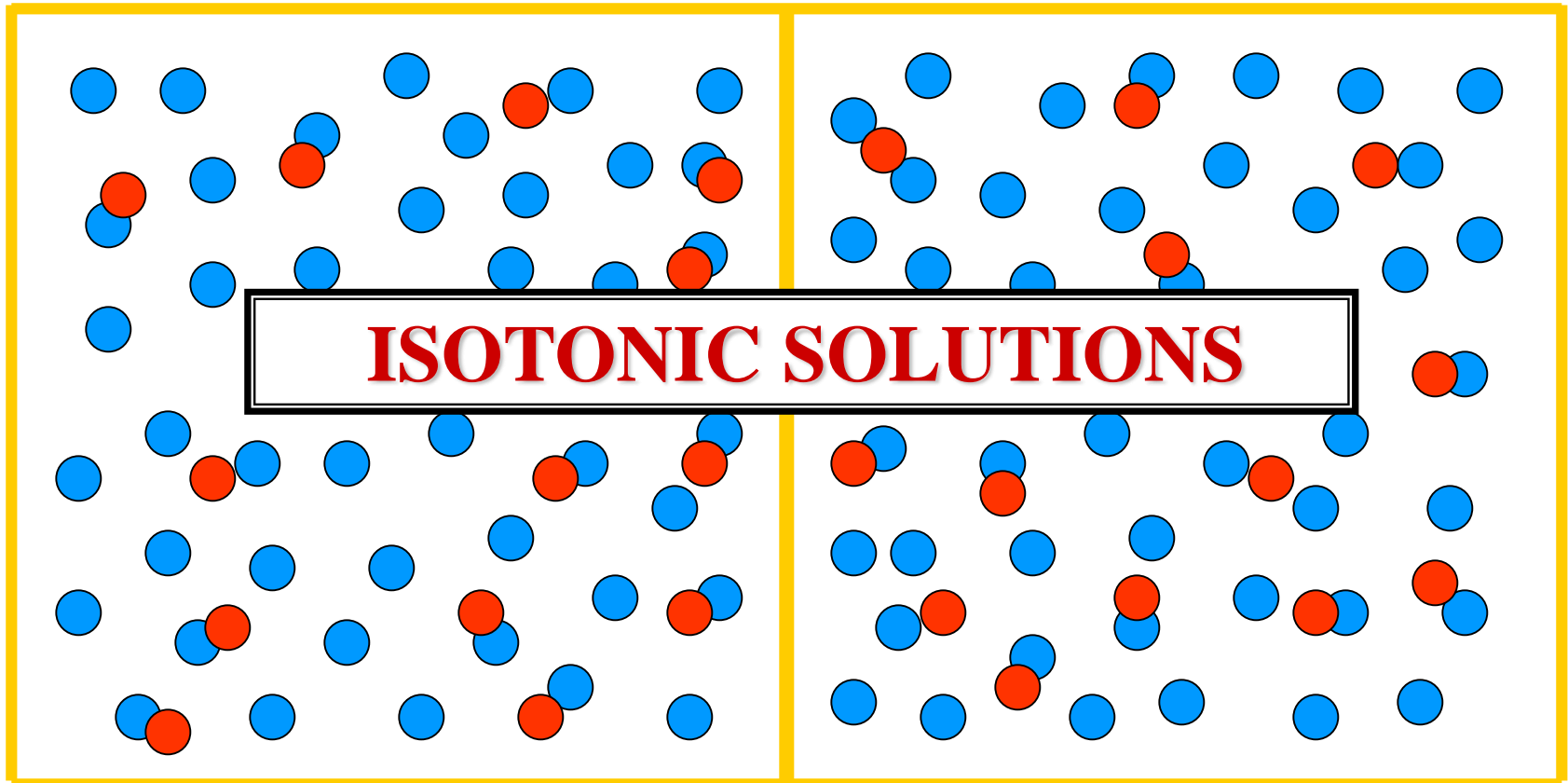
— = MEMBRANE



TONICITY

CELL A

CELL B



● = WATER MOLECULE

● = POLAR SOLUTE MOLECULE

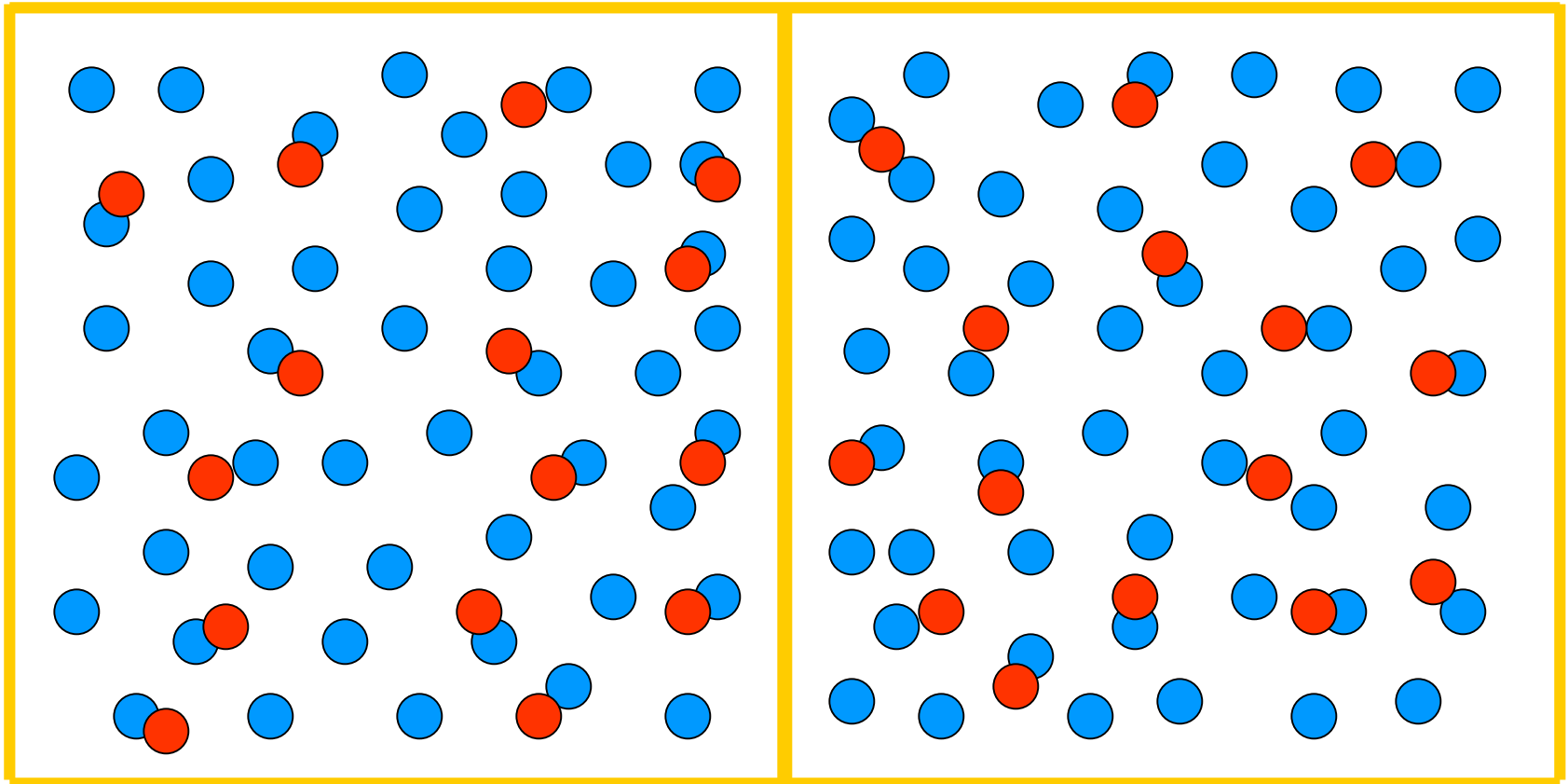
— = MEMBRANE



TONICITY

CELL A

CELL B



 = WATER MOLECULE

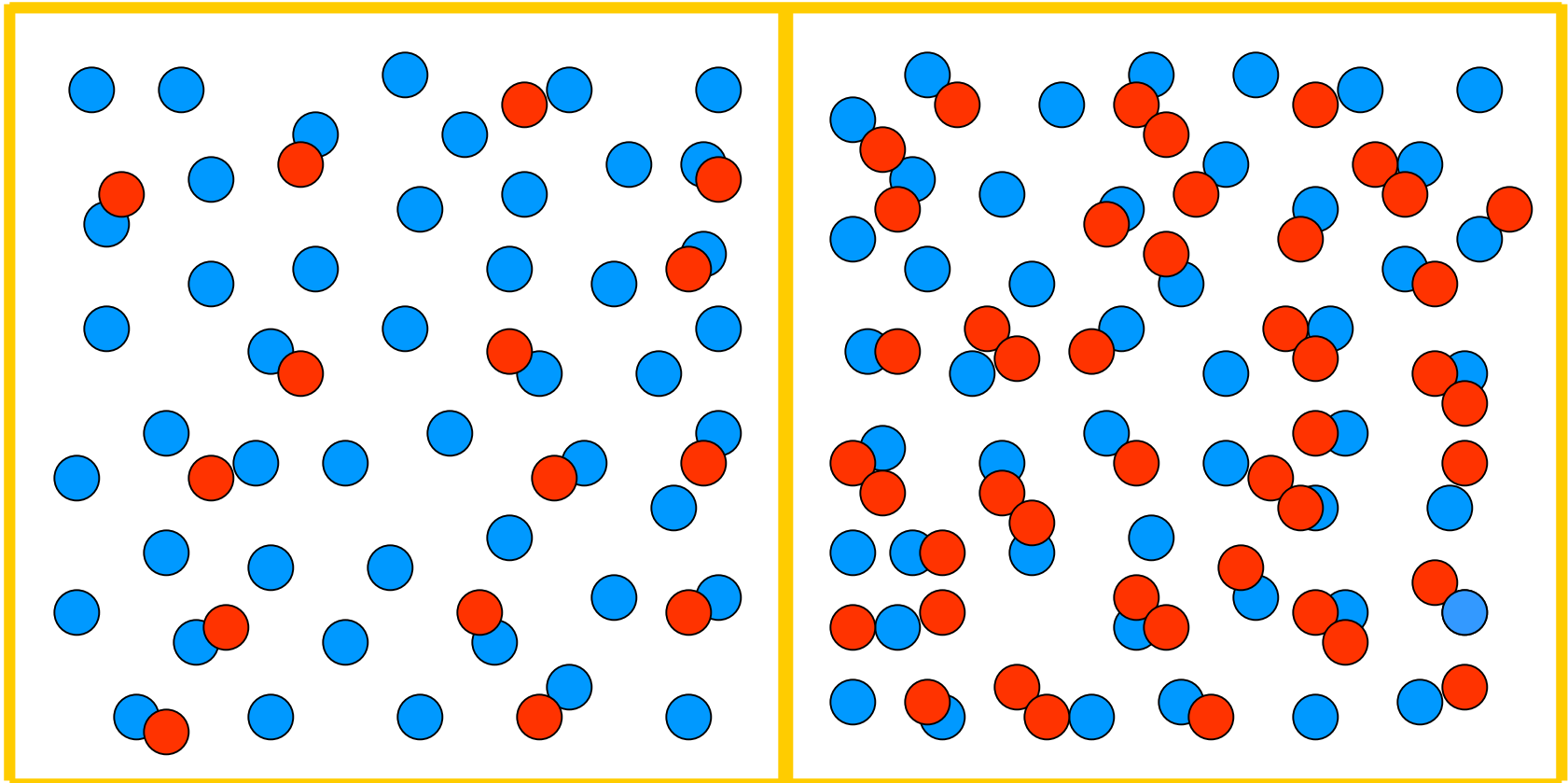
 = POLAR SOLUTE MOLECULE

 = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

● = POLAR SOLUTE MOLECULE

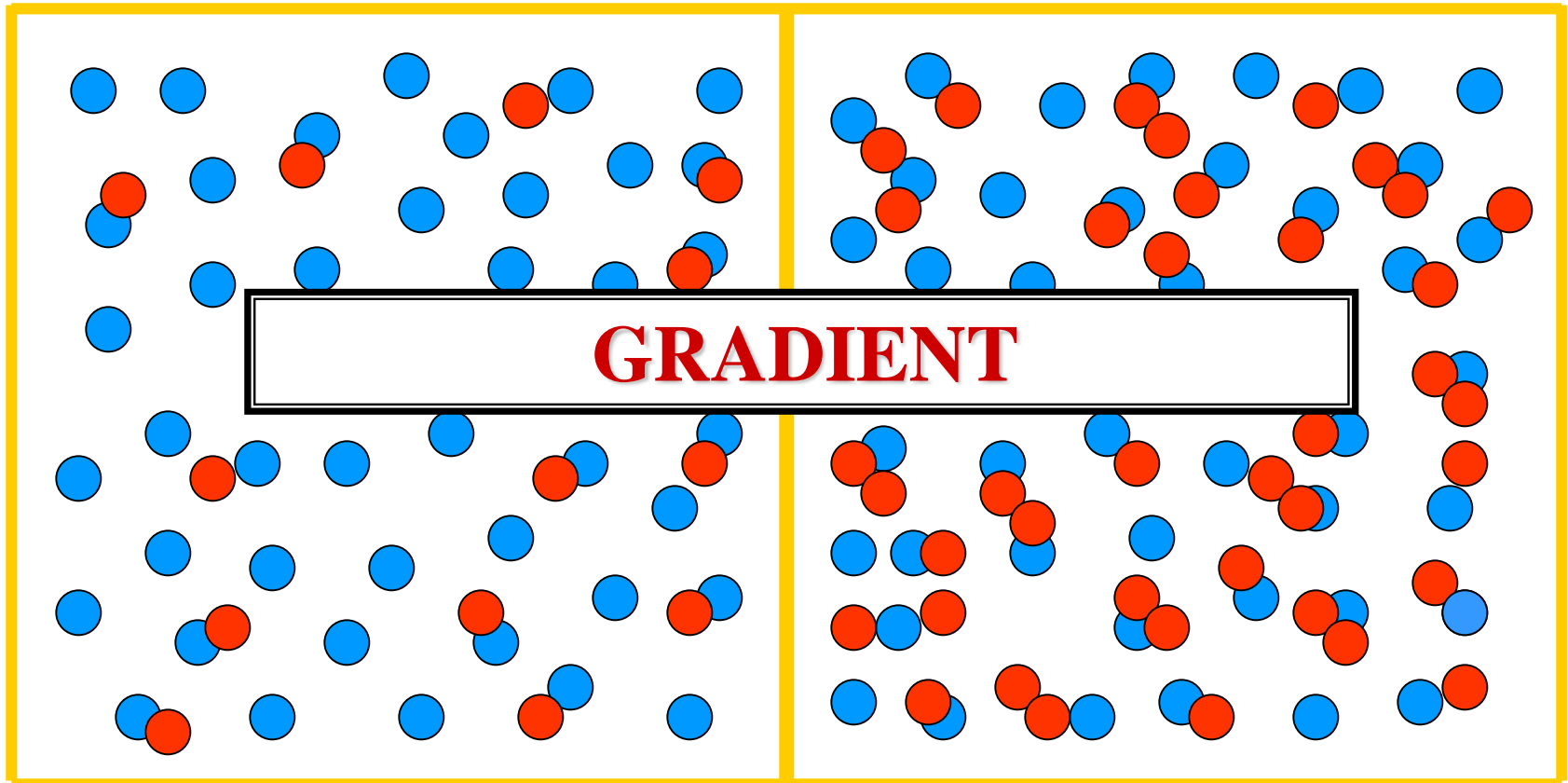
— = MEMBRANE

TONICITY



CELL A

CELL B



● = WATER MOLECULE

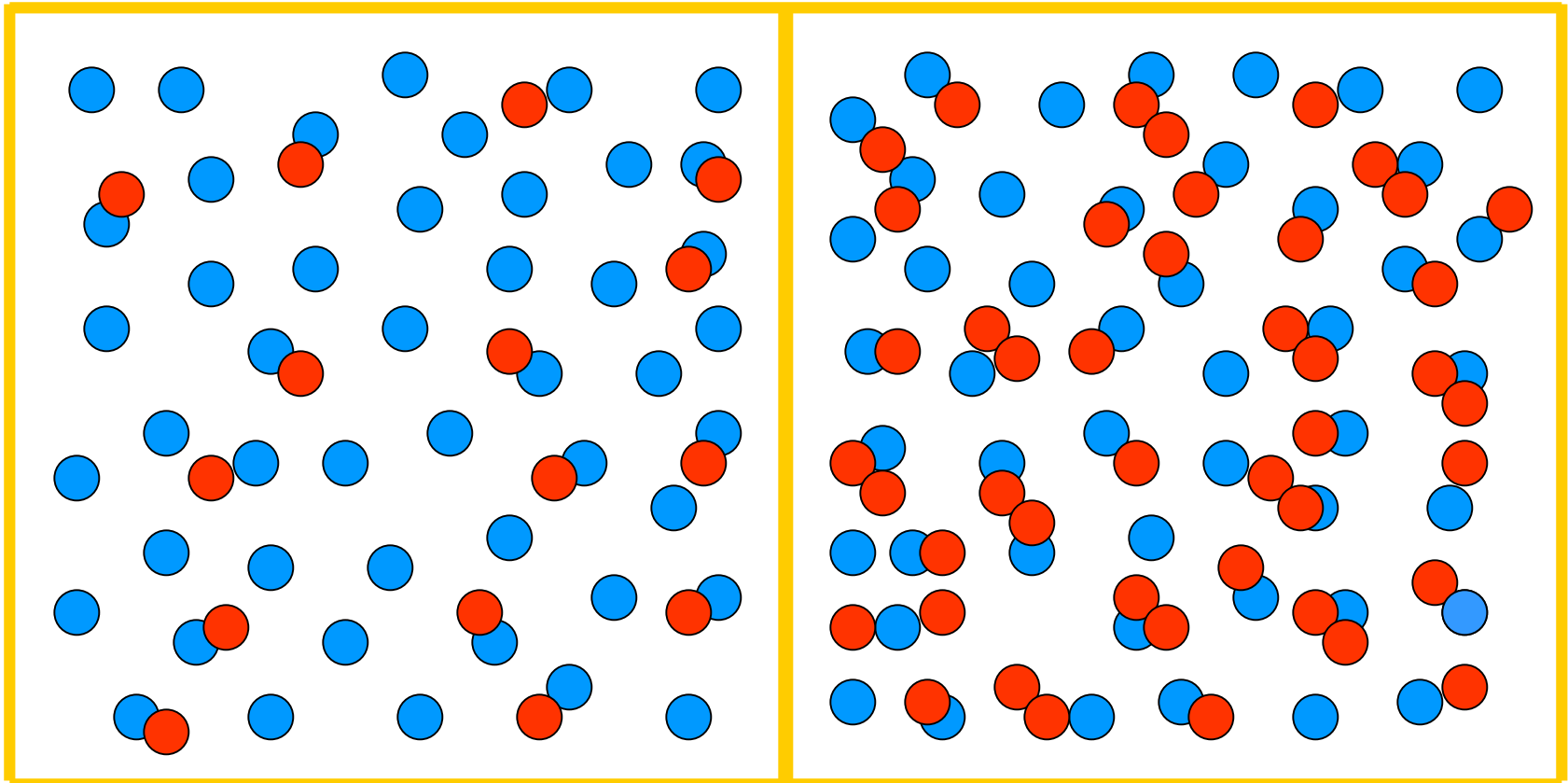
● = POLAR SOLUTE MOLECULE

— = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

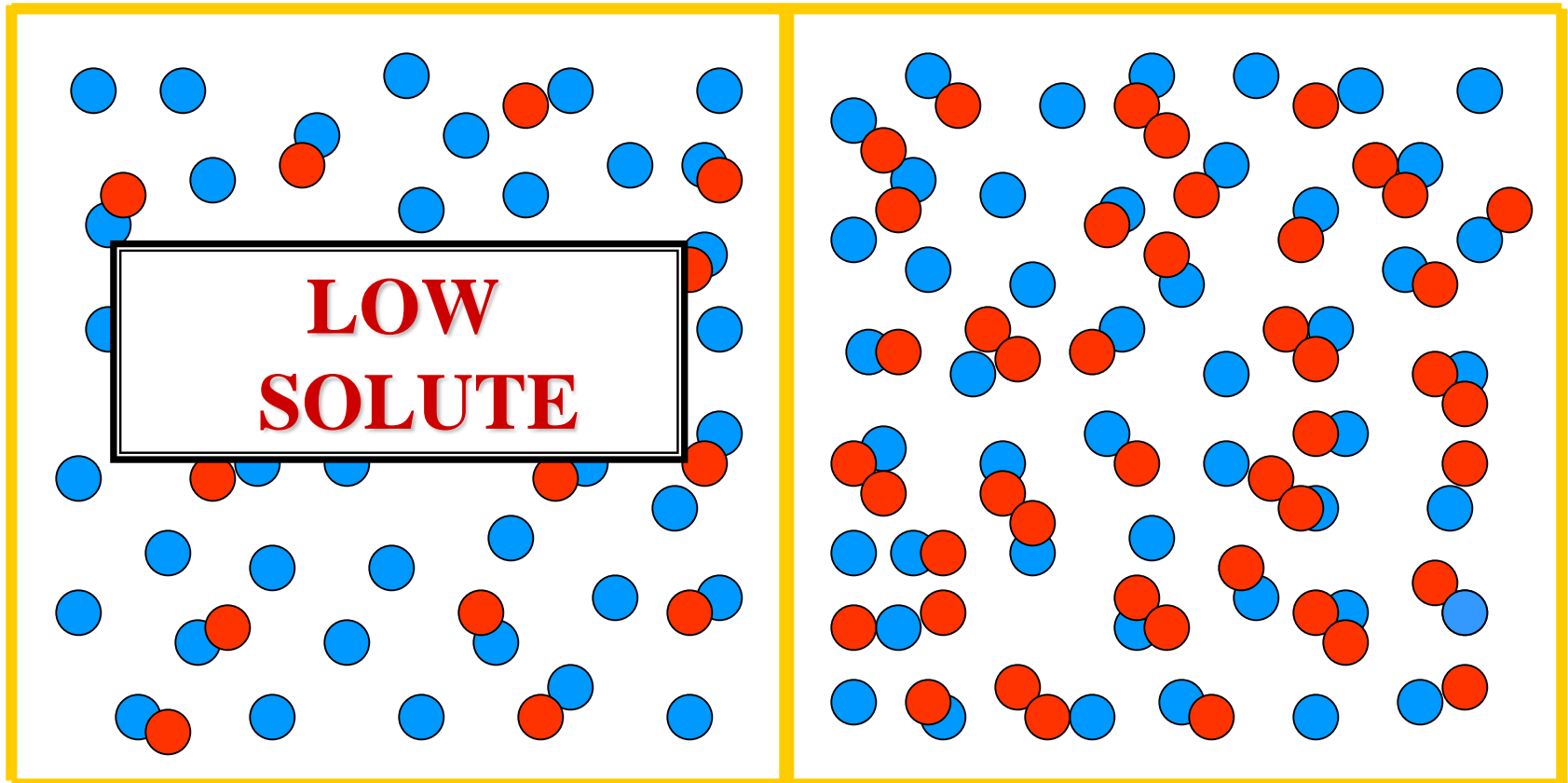
● = POLAR SOLUTE MOLECULE

— = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

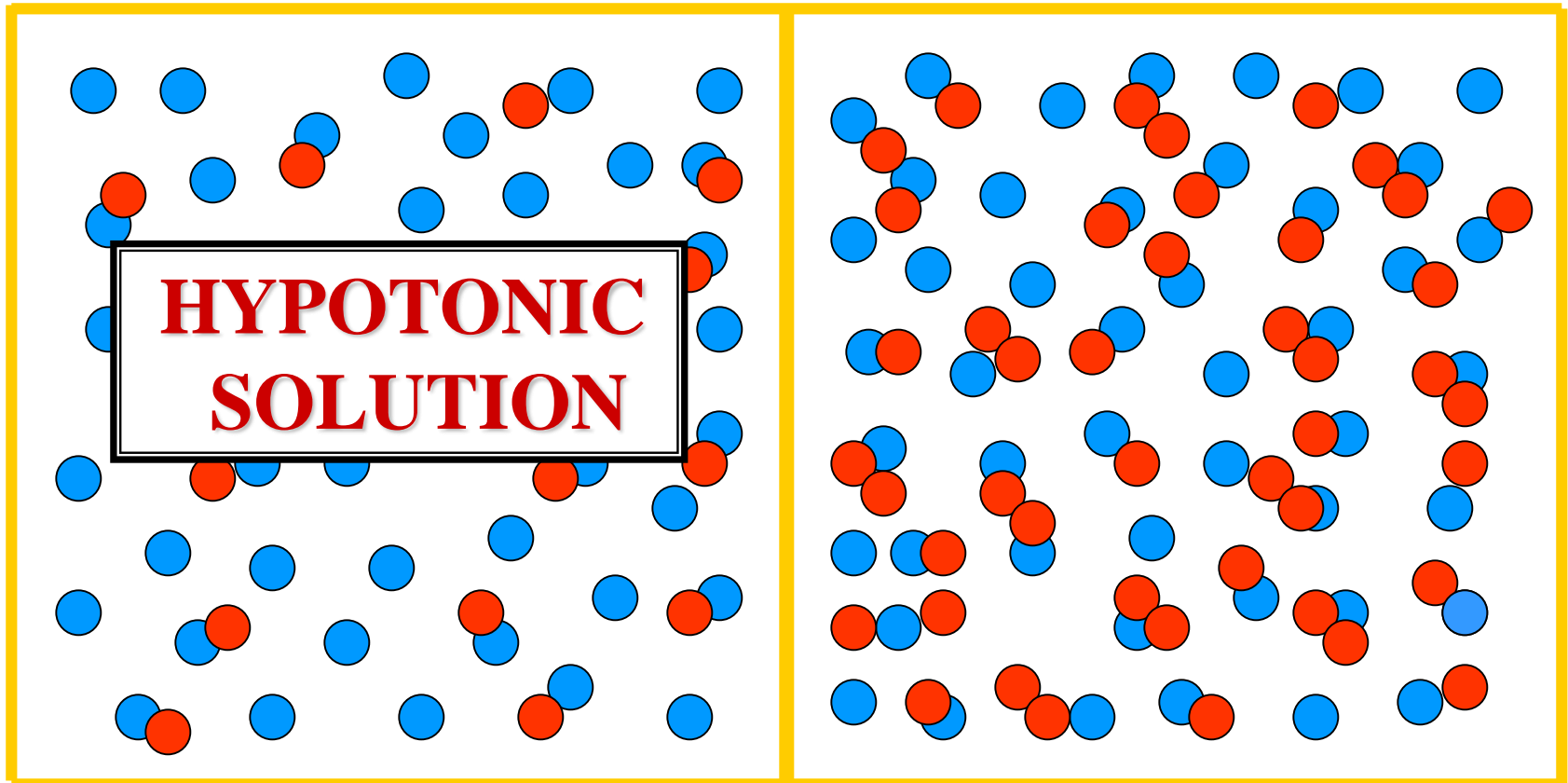
● = POLAR SOLUTE MOLECULE

— = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

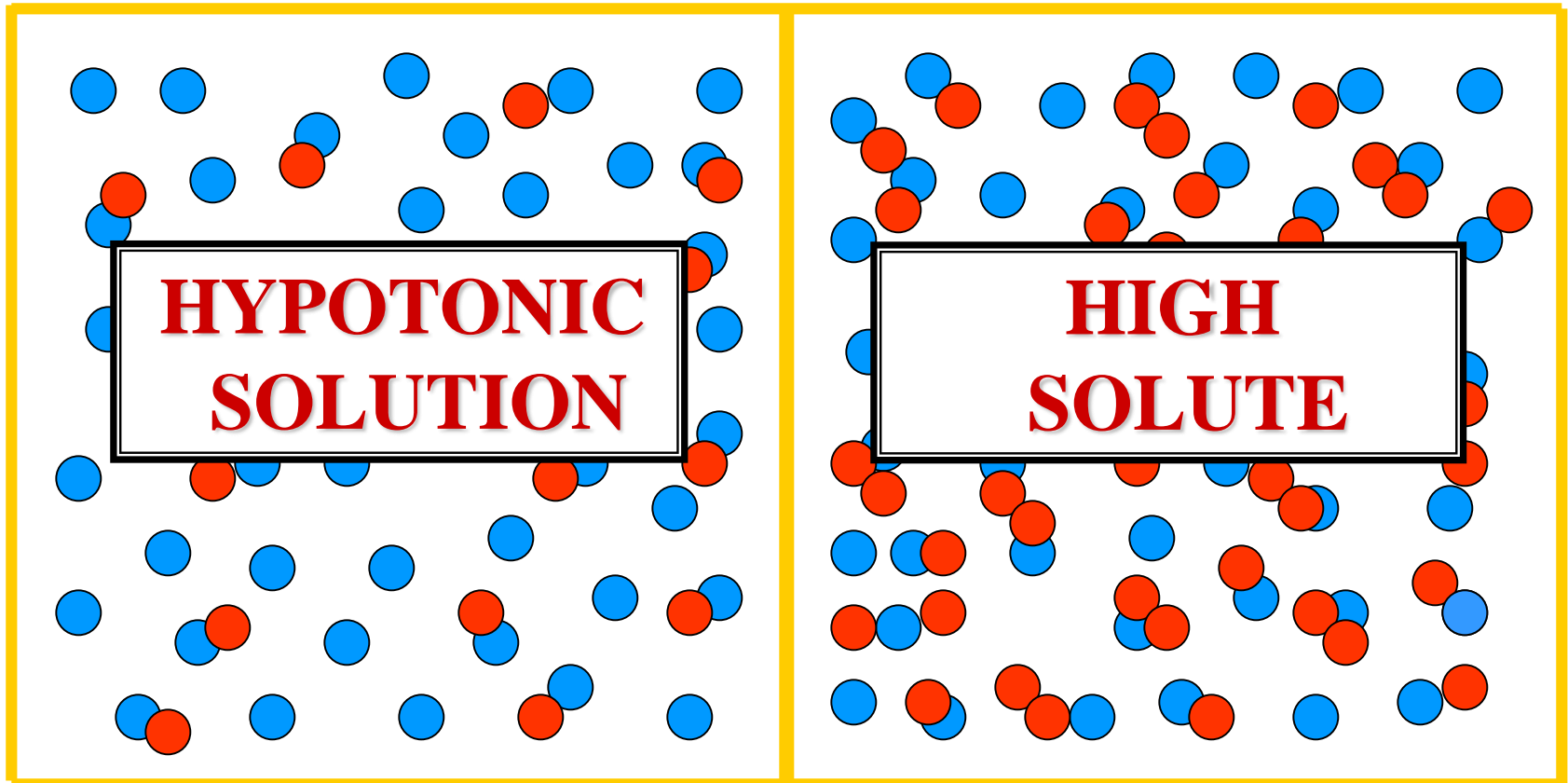
● = POLAR SOLUTE MOLECULE

— = MEMBRANE

TONICITY

CELL A

CELL B



● = WATER MOLECULE

● = POLAR SOLUTE MOLECULE

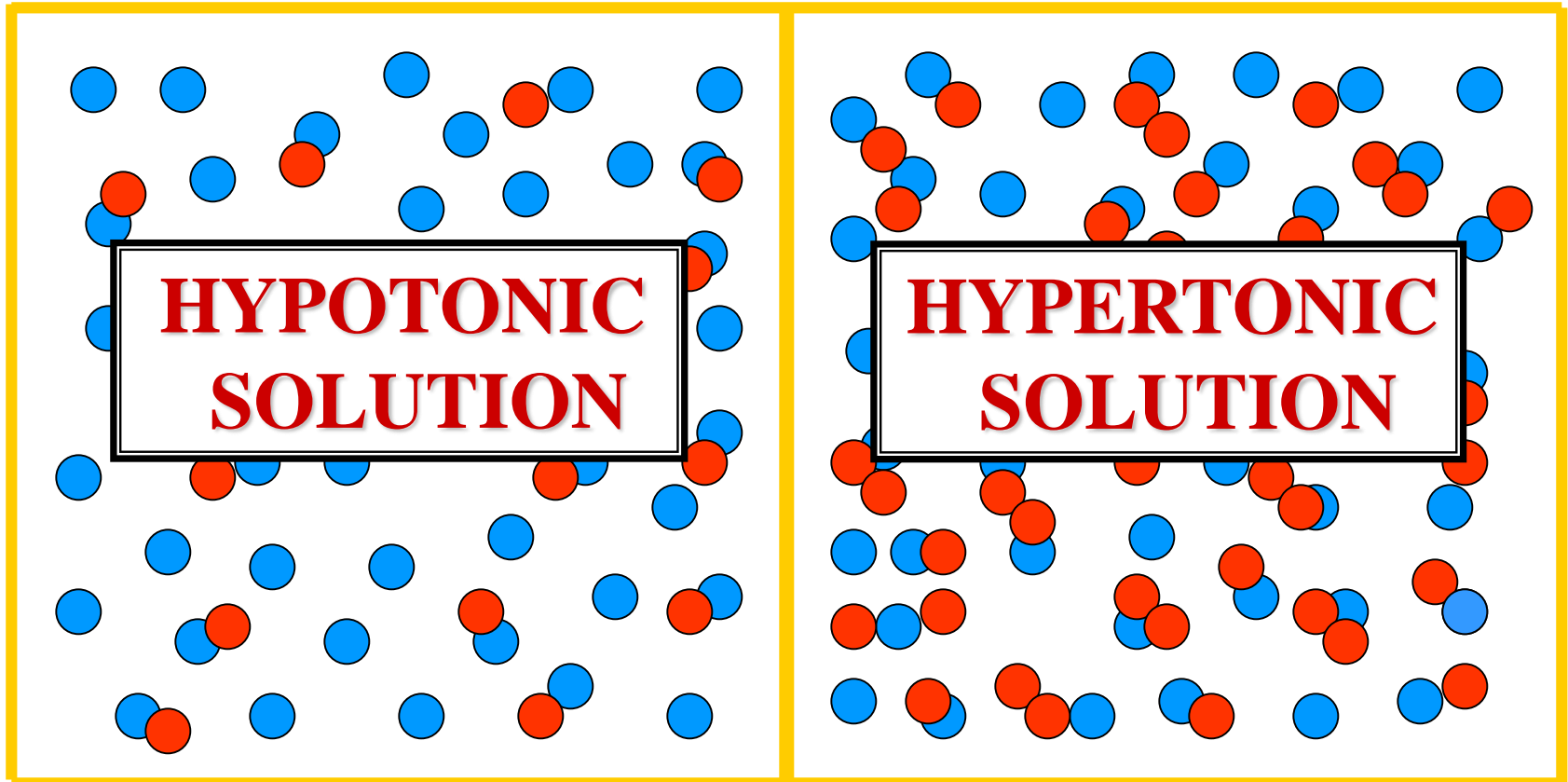
— = MEMBRANE

TONICITY



CELL A

CELL B



 = WATER MOLECULE

 = POLAR SOLUTE MOLECULE

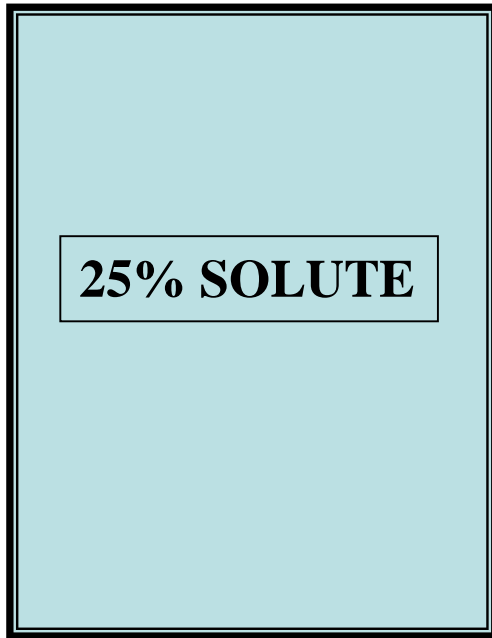
 = MEMBRANE

A grayscale electron micrograph of a cell, showing various organelles such as mitochondria, endoplasmic reticulum, and a nucleus. The text is overlaid in red. In the top right corner, there are two small icons: a right-pointing chevron and a percentage sign.

**HYPOTONIC
SOLUTIONS
&
HYPERTONIC
SOLUTIONS**

RELATIVE TERMS

HYPOTONIC & HYPERTONIC RELATIVE TERMS



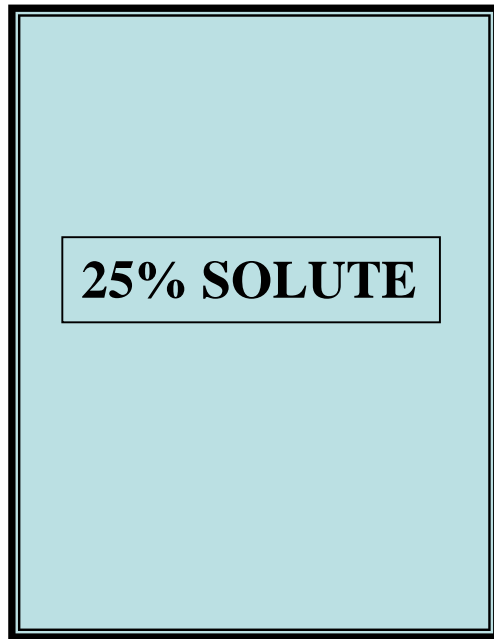
CELL A

HYPOTONIC & HYPERTONIC RELATIVE TERMS

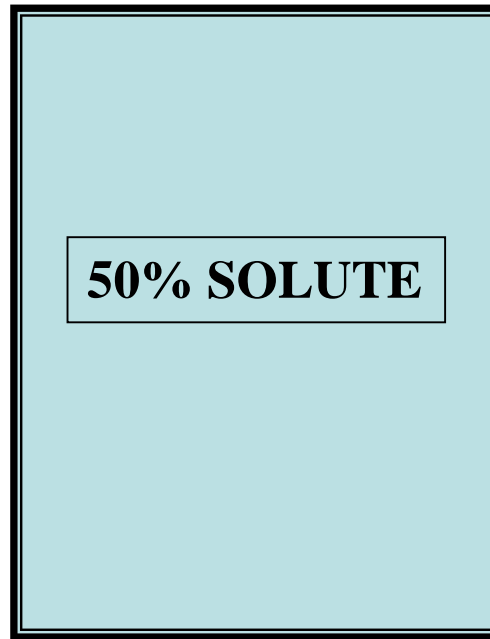
A

?

HY

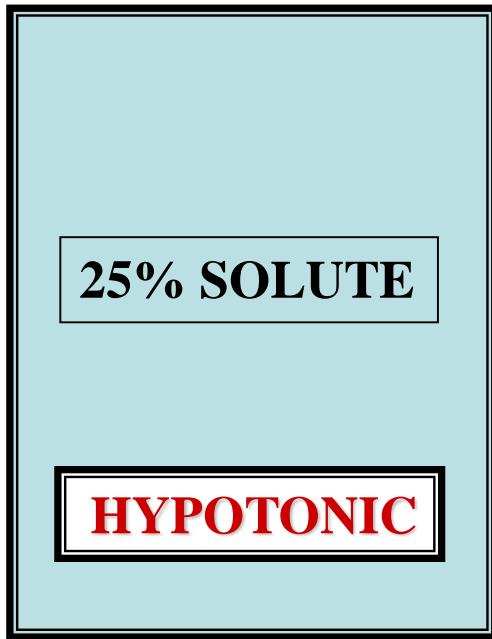


CELL A

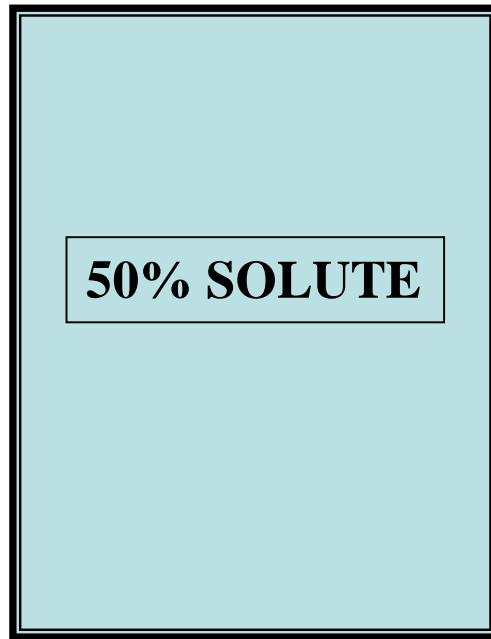


CELL B

HYPOTONIC & HYPERTONIC RELATIVE TERMS

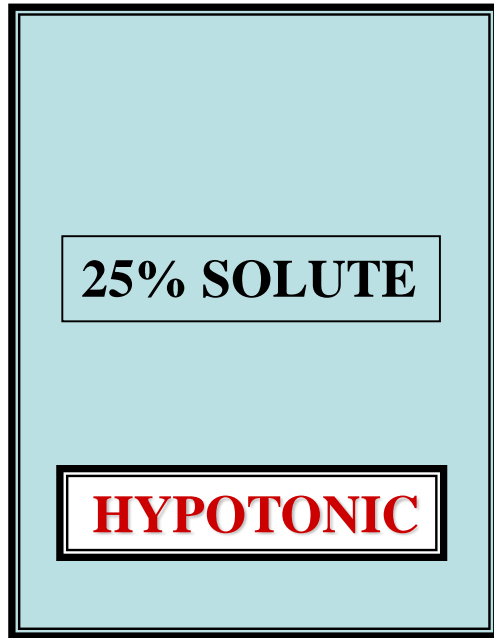


CELL A

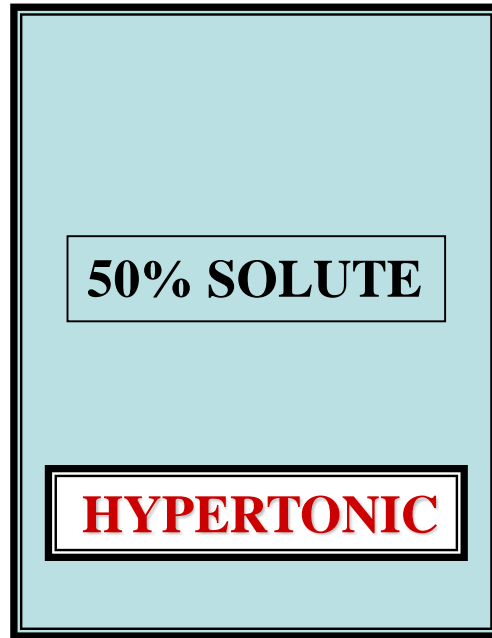


CELL B

HYPOTONIC & HYPERTONIC RELATIVE TERMS



CELL A



CELL B

HYPOTONIC & HYPERTONIC RELATIVE TERMS

?

B

HY

25% SOLUTE

50% SOLUTE

75% SOLUTE

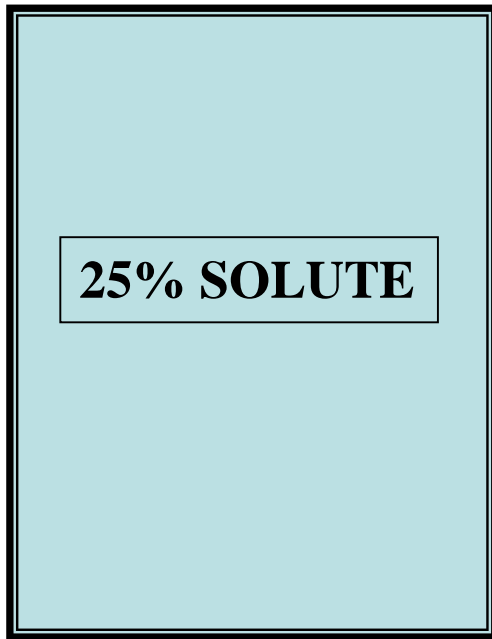
HYPERTONIC

CELL A

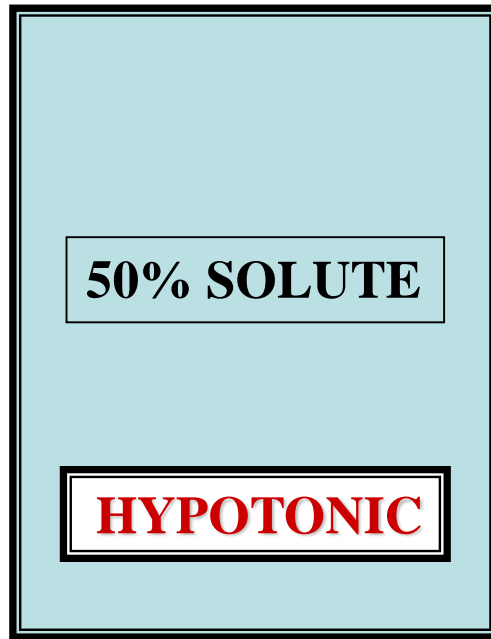
CELL B

CELL C

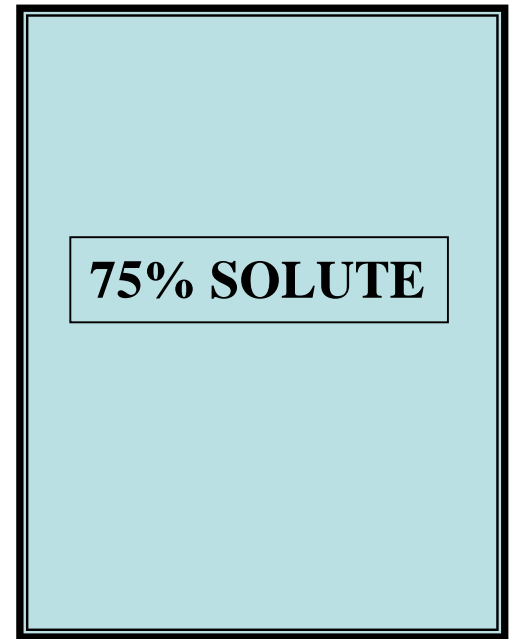
HYPOTONIC & HYPERTONIC RELATIVE TERMS



CELL A



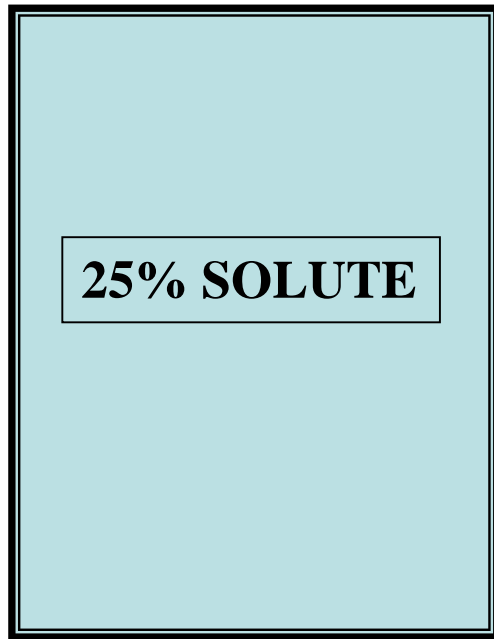
CELL B



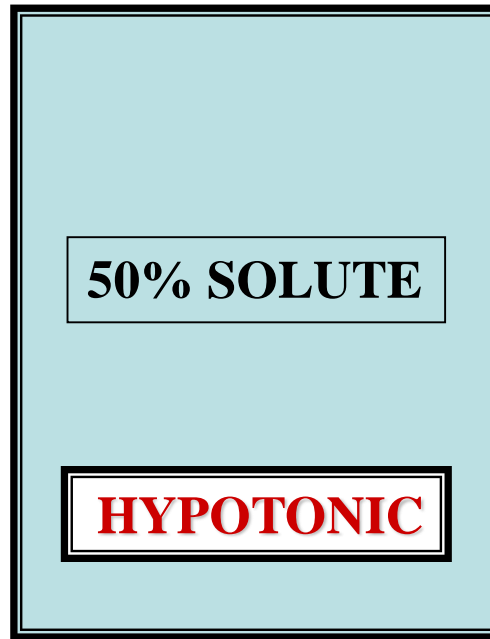
CELL C



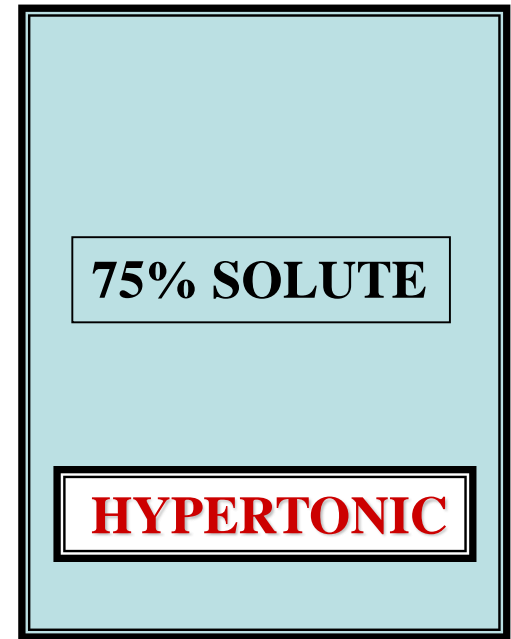
HYPOTONIC & HYPERTONIC RELATIVE TERMS



CELL A

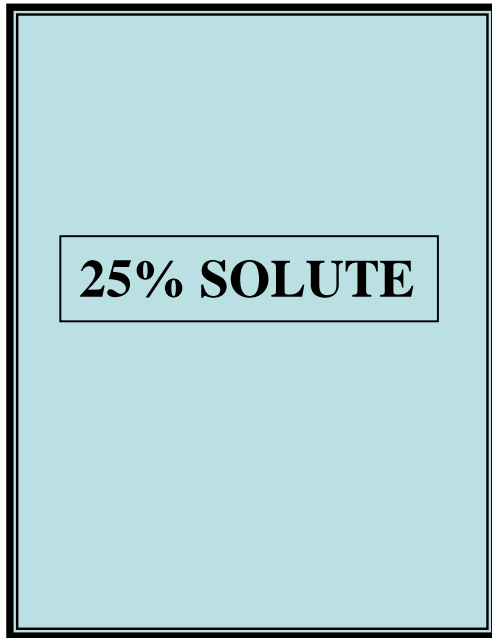


CELL B

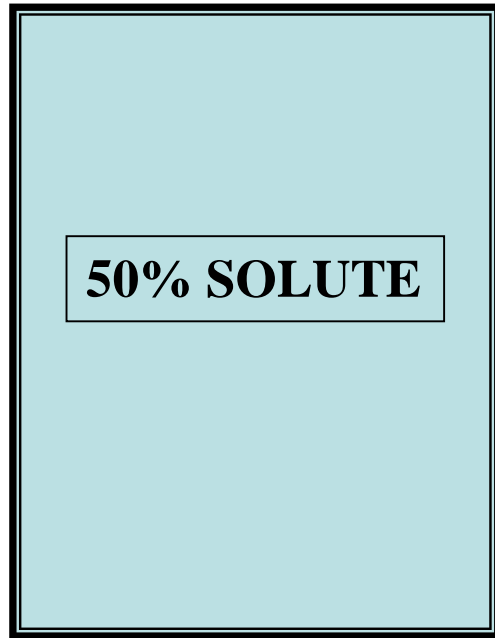


CELL C

HYPOTONIC & HYPERTONIC RELATIVE TERMS

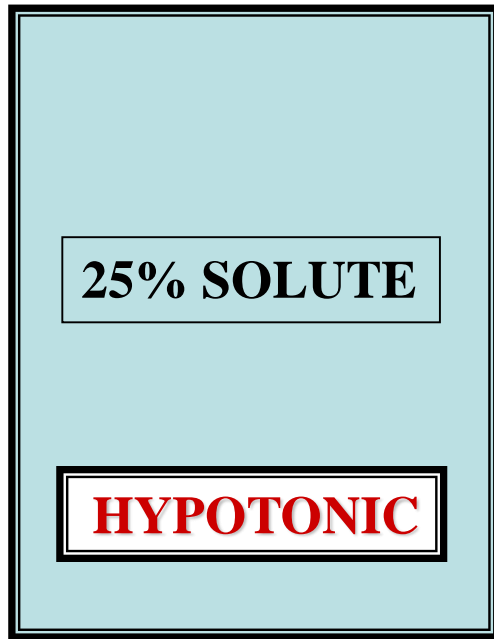


CELL A

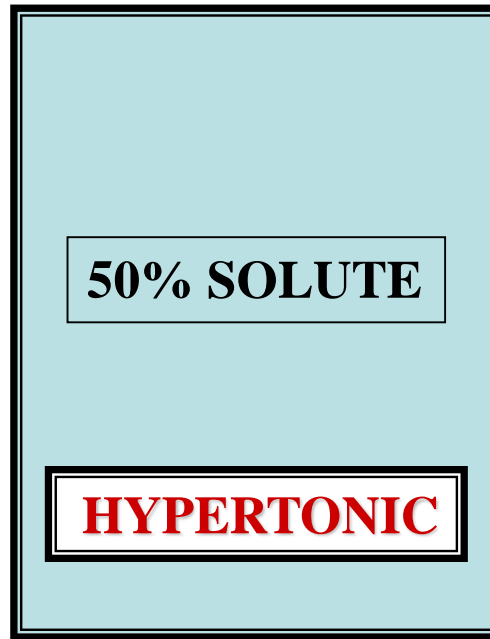


CELL B

HYPOTONIC & HYPERTONIC RELATIVE TERMS



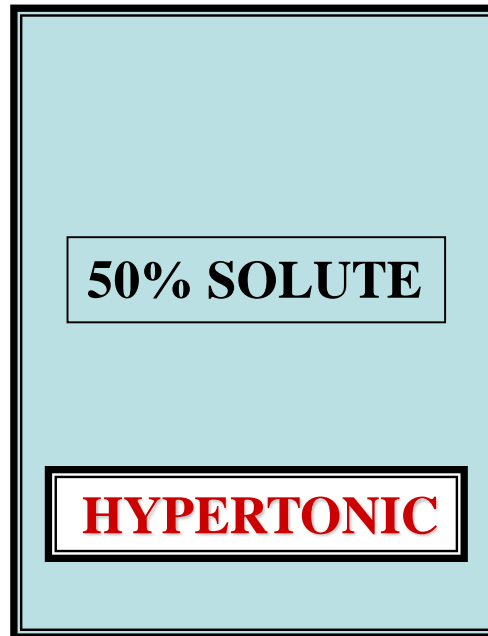
CELL A



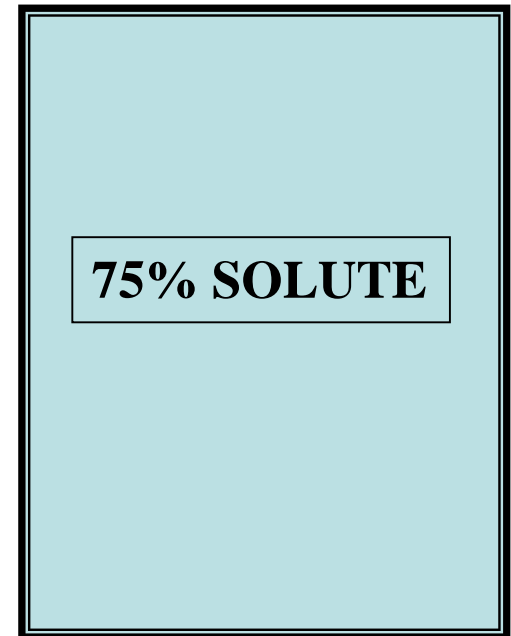
CELL B

HYPOTONIC & HYPERTONIC RELATIVE TERMS

B
HY



CELL B

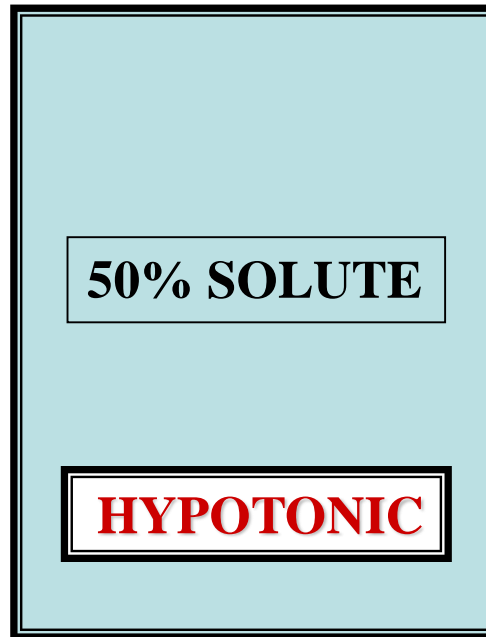


CELL C

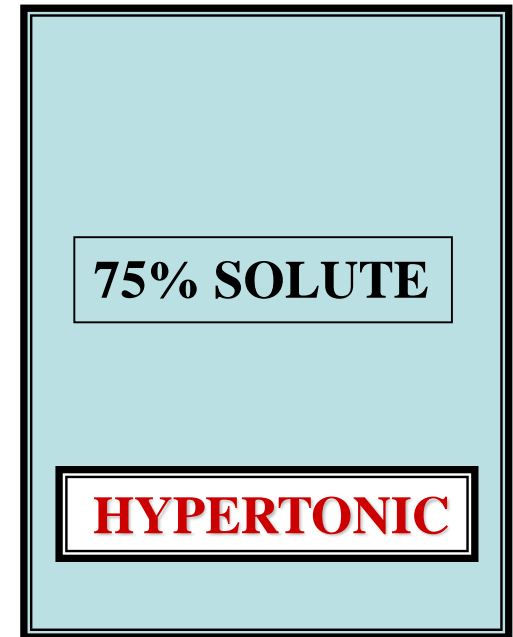
HYPOTONIC & HYPERTONIC RELATIVE TERMS



2



CELL B



CELL C

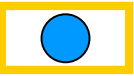


**HYPOTONIC
SOLUTIONS
&
HYPERTONIC
SOLUTIONS

RELATIVE TERMS**



OSMOSIS
BONDED WATER
VS
OSMOSIS
FREE WATER



OSMOSIS

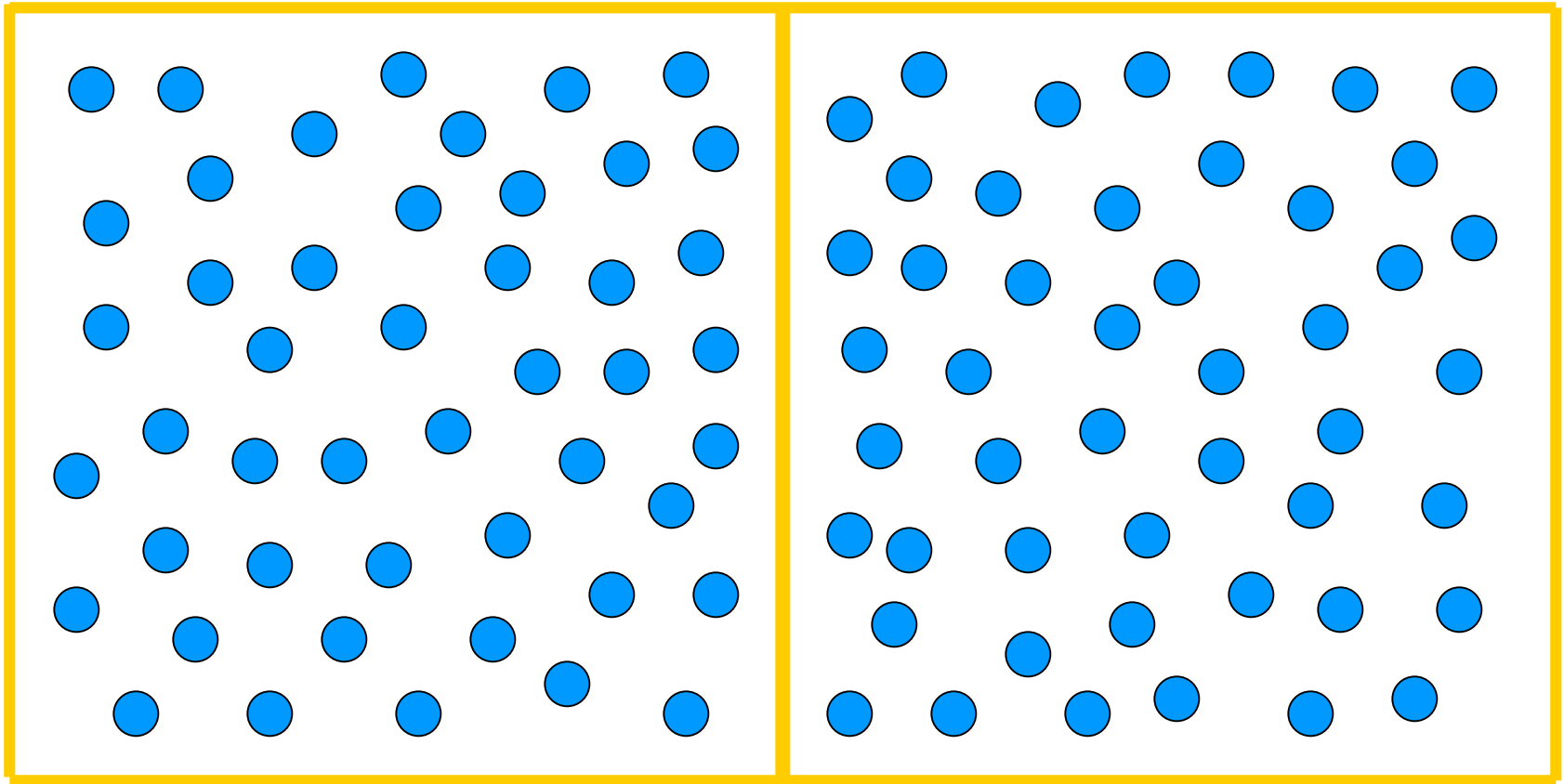
BONDED WATER



OSMOSIS

CELL A

CELL B



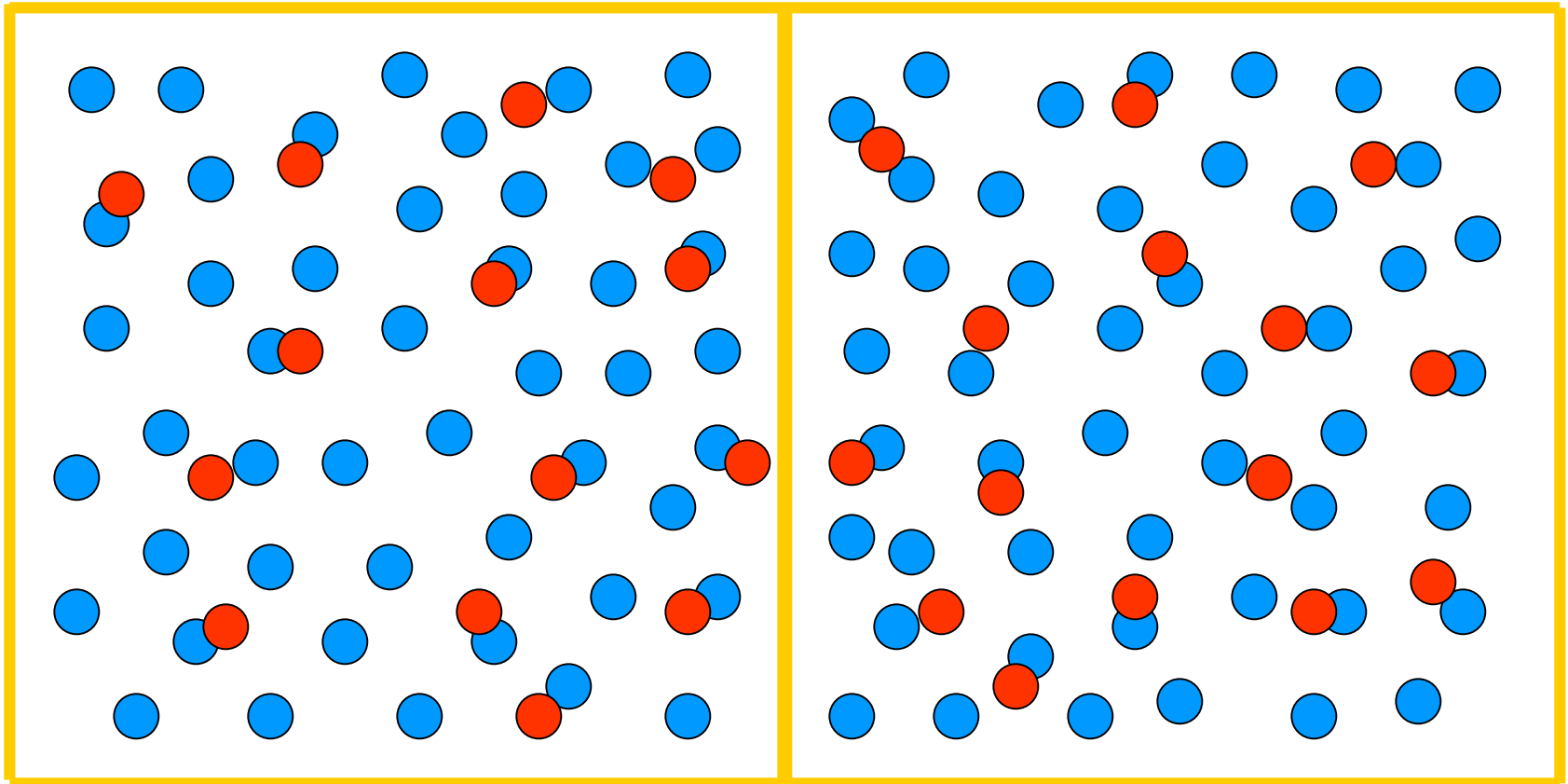
 = WATER MOLECULE POLAR

 = MEMBRANE

OSMOSIS

CELL A

CELL B

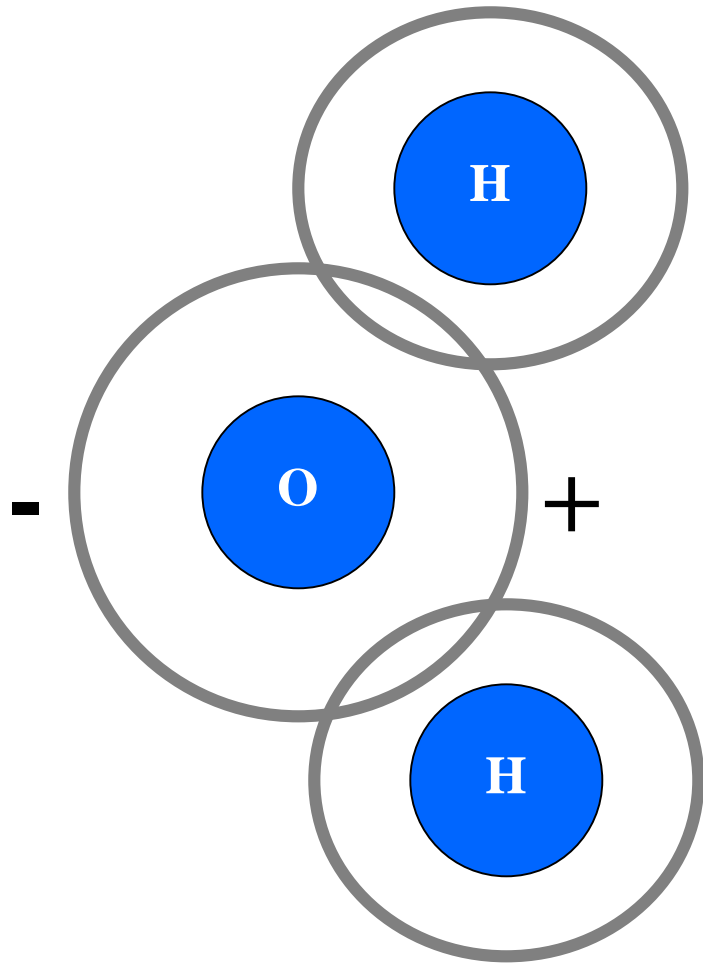


● = WATER MOLECULE POLAR

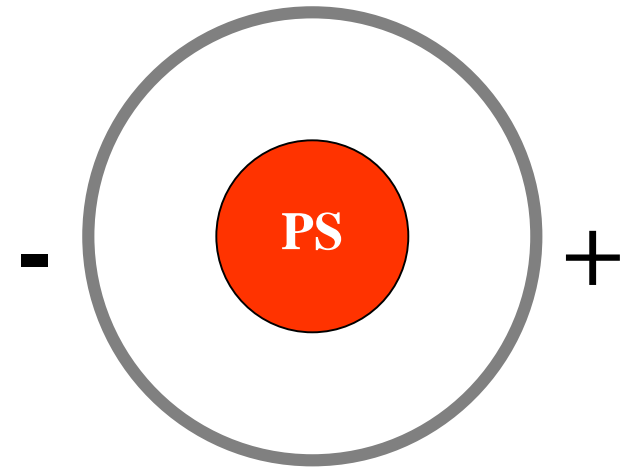
● = SOLUTE MOLECULE POLAR

— = MEMBRANE

BONDED WATER

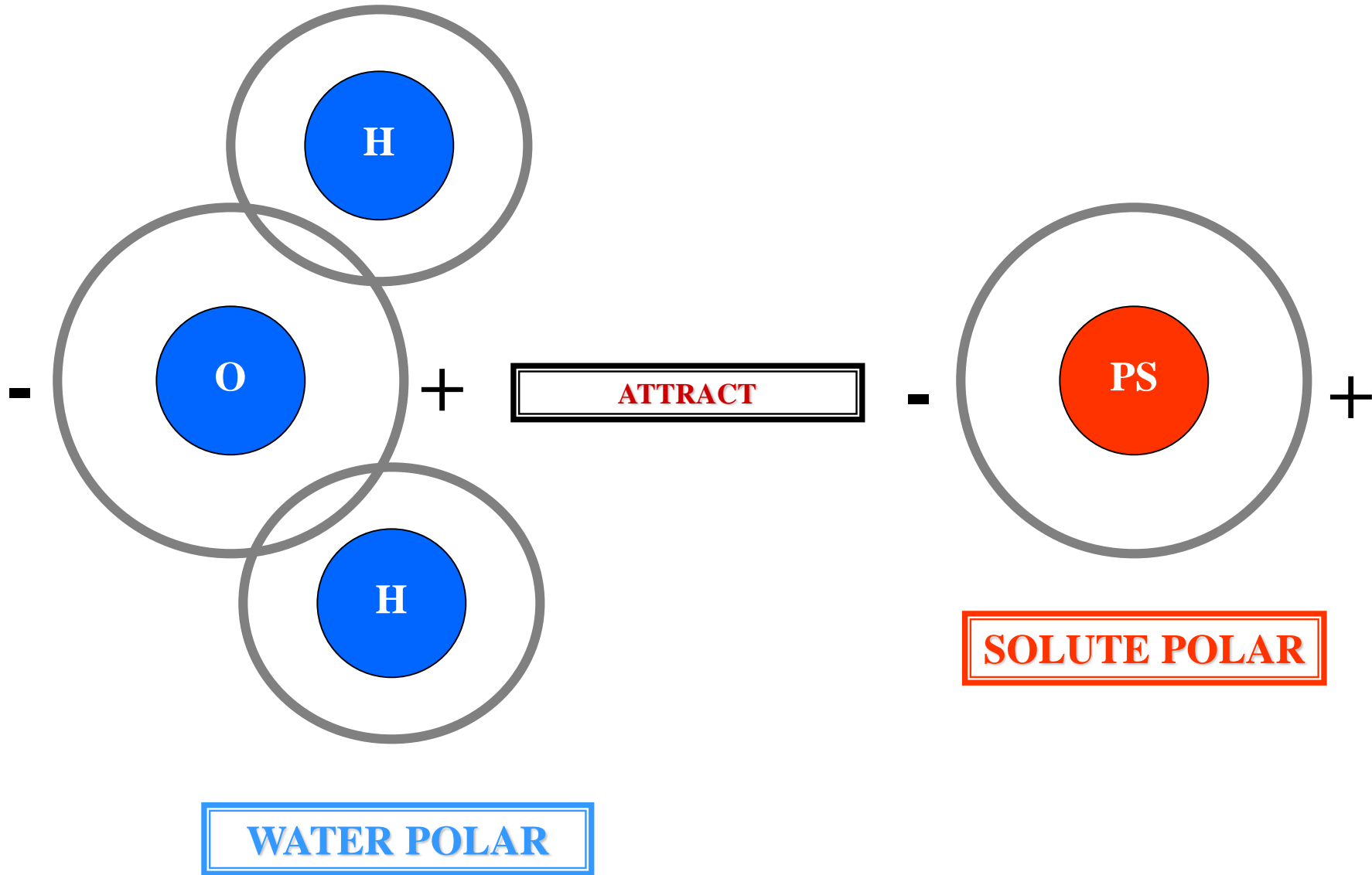


WATER POLAR

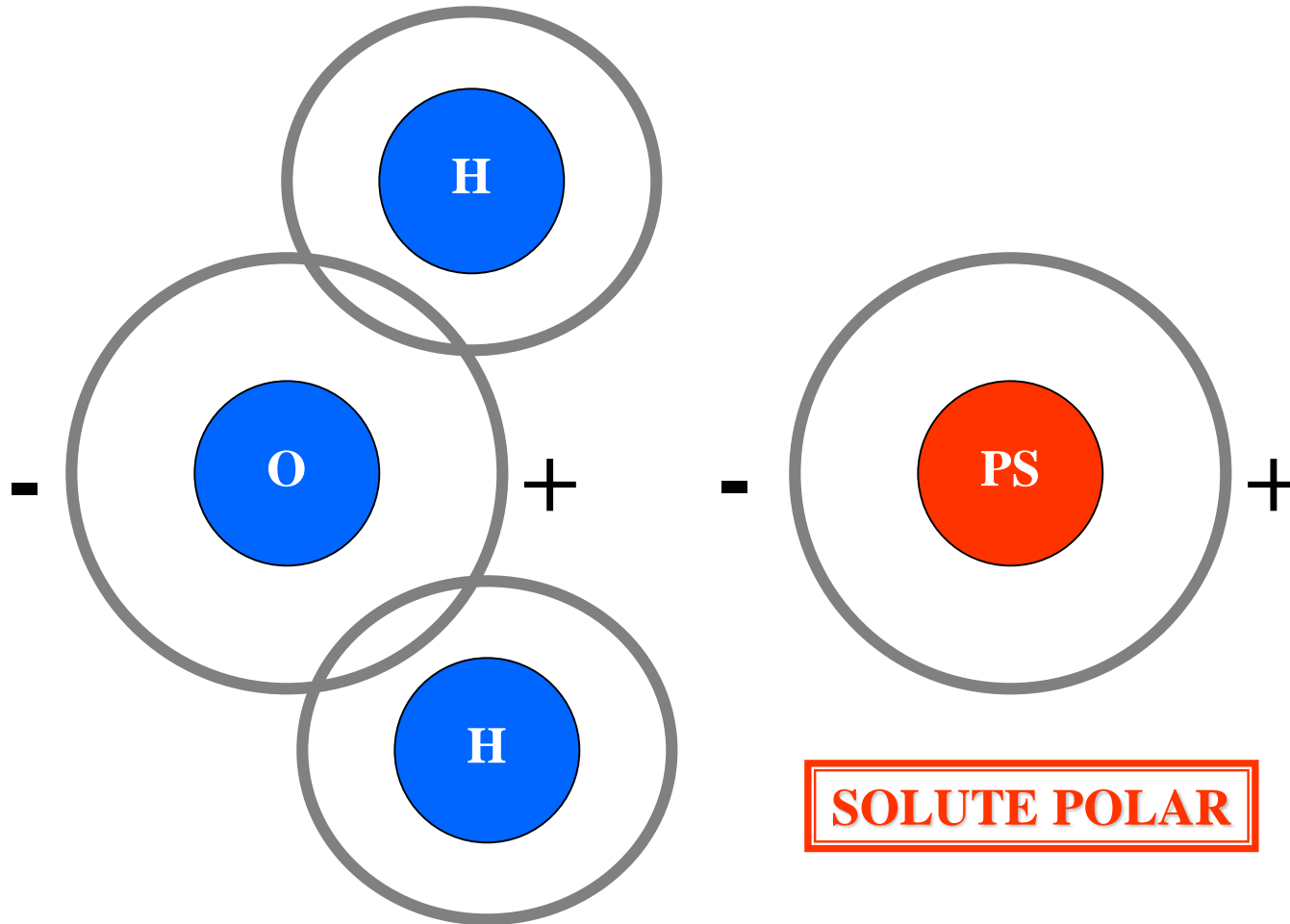


SOLUTE POLAR

BONDED WATER



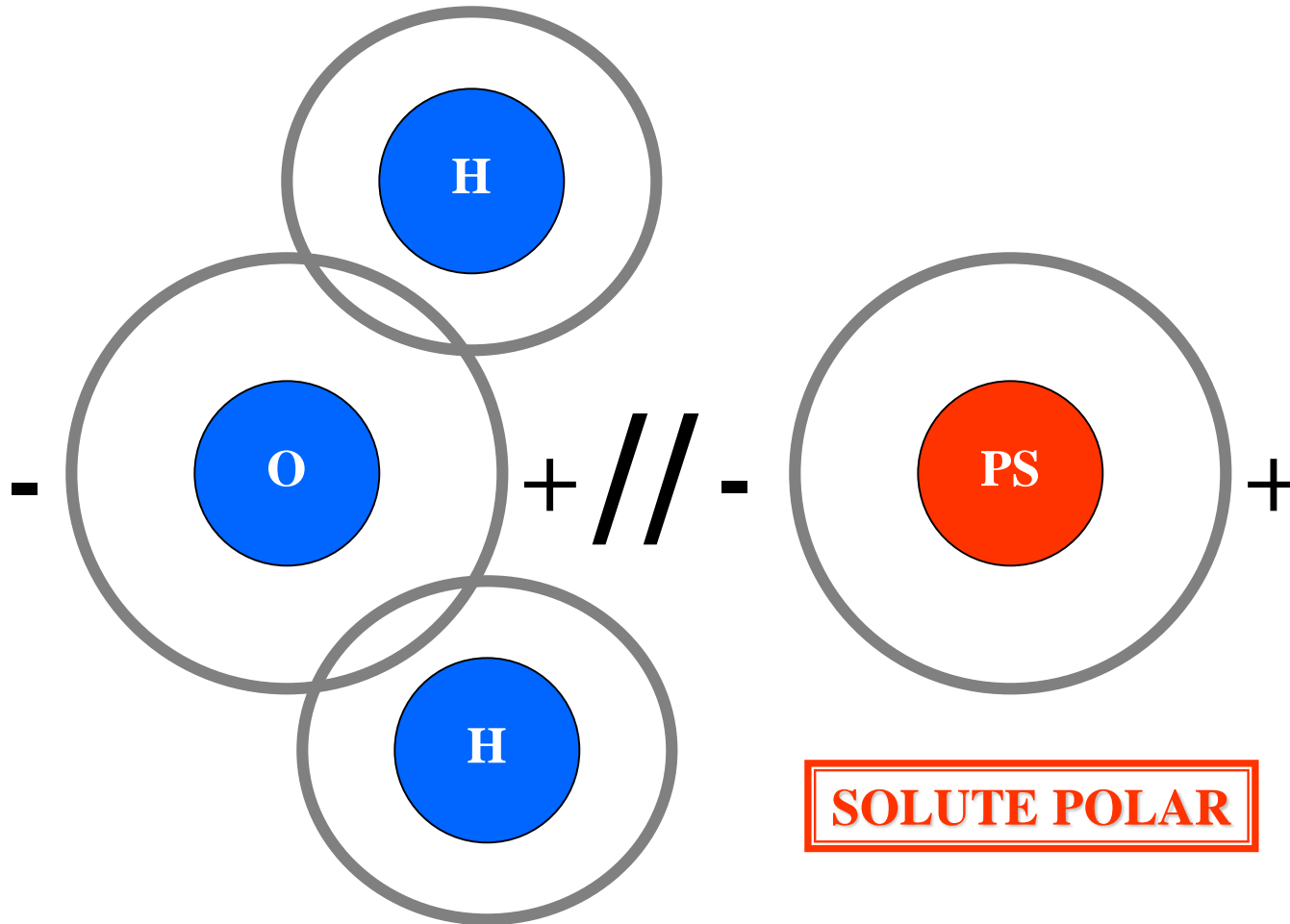
BONDED WATER



WATER POLAR

SOLUTE POLAR

BONDED WATER

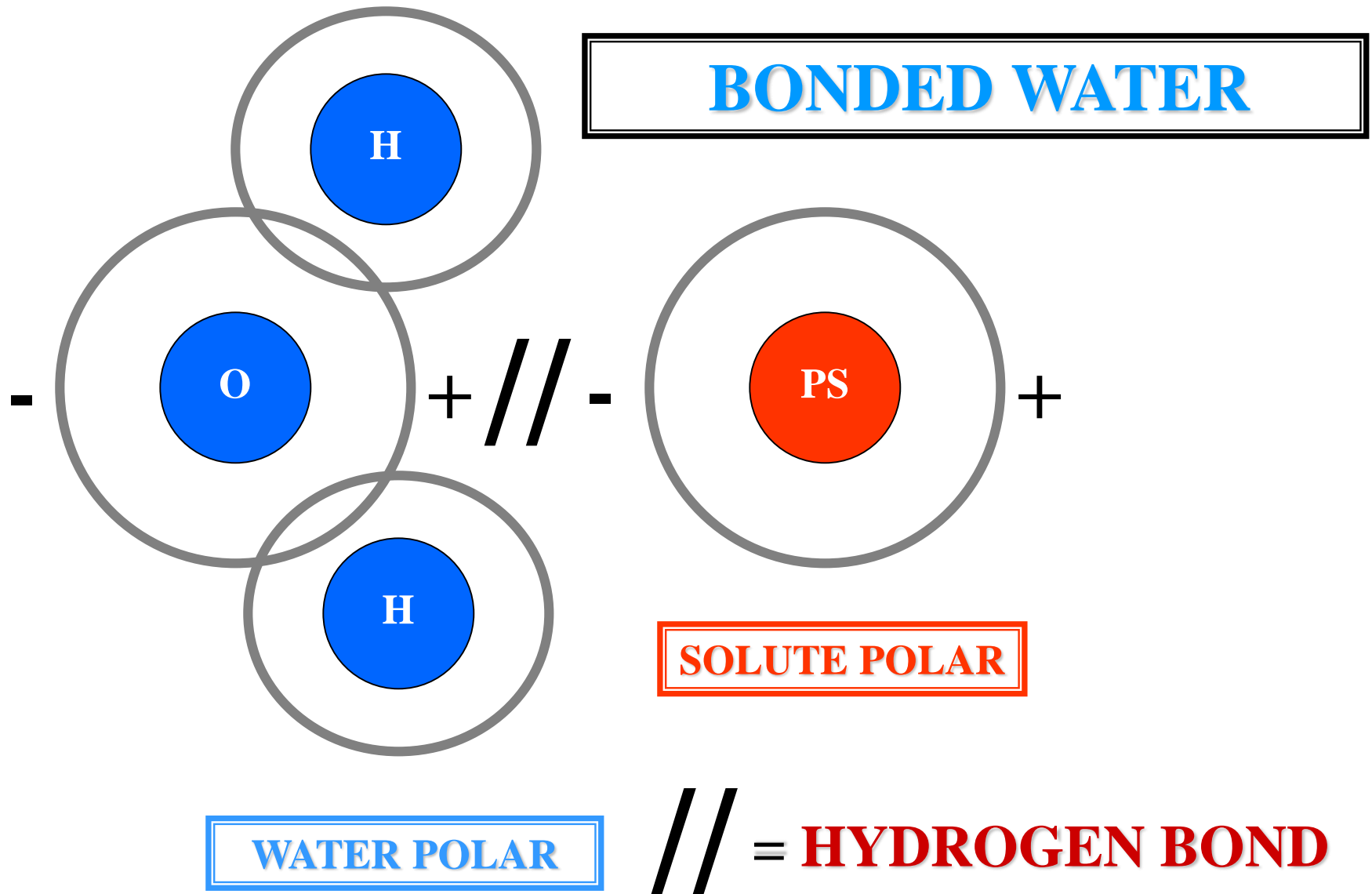


WATER POLAR

// = HYDROGEN BOND



BONDED WATER



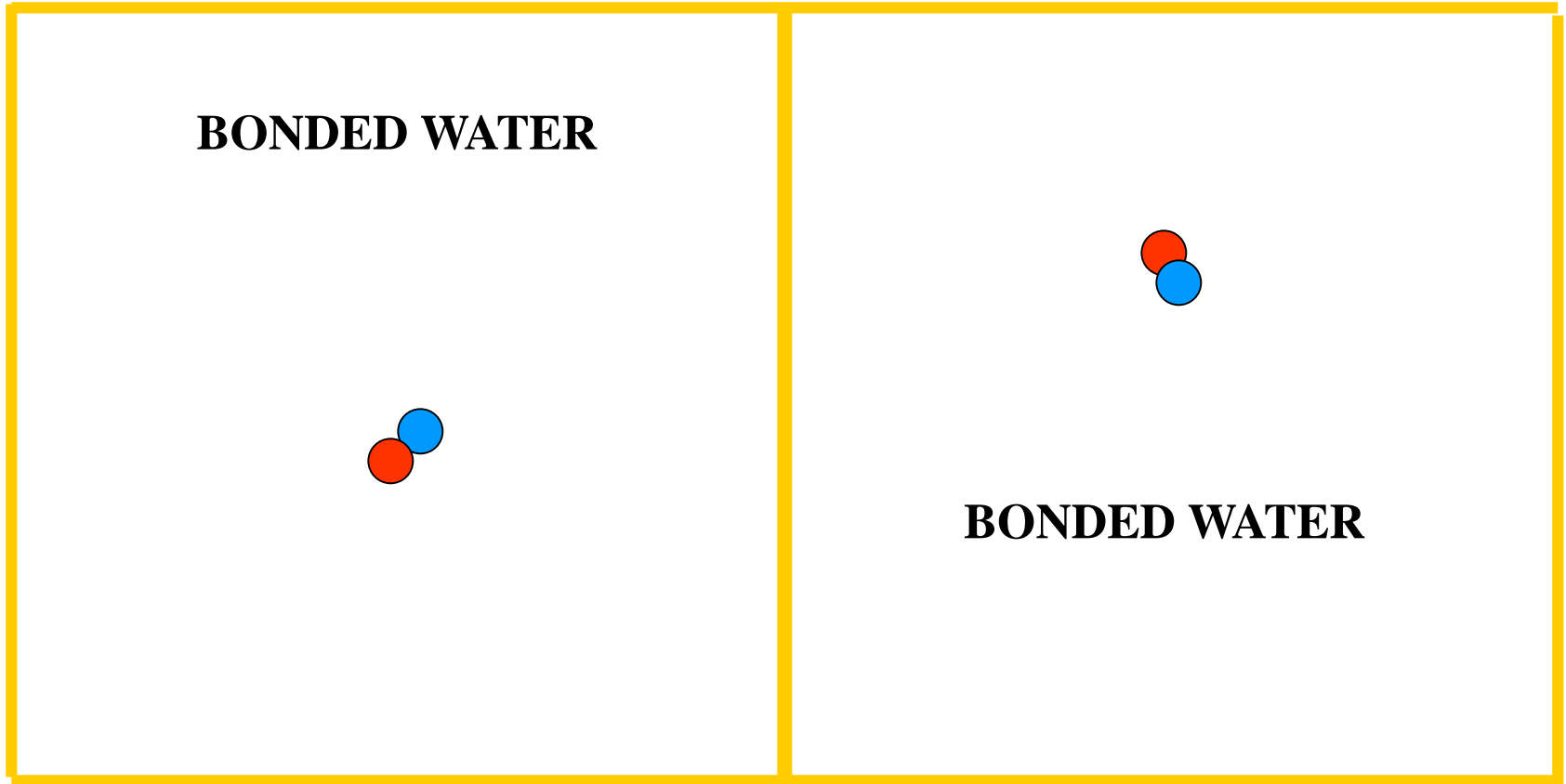


OSMOSIS

CELL A

BONDED WATER

CELL B



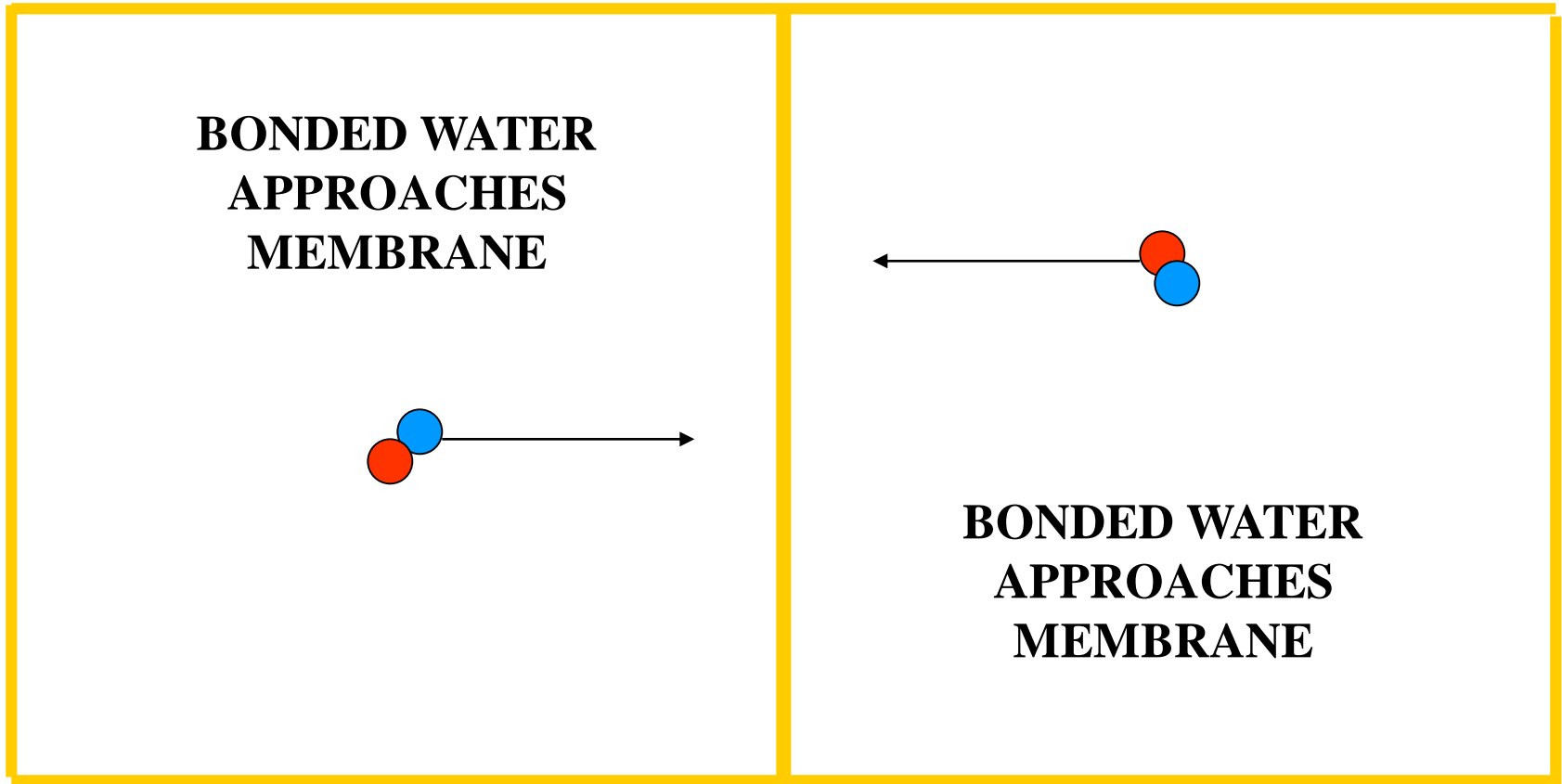
 = WATER MOLECULE POLAR

 = SOLUTE MOLECULE POLAR

 = MEMBRANE

OSMOSIS

CELL A **BONDED WATER** CELL B



● = WATER MOLECULE POLAR

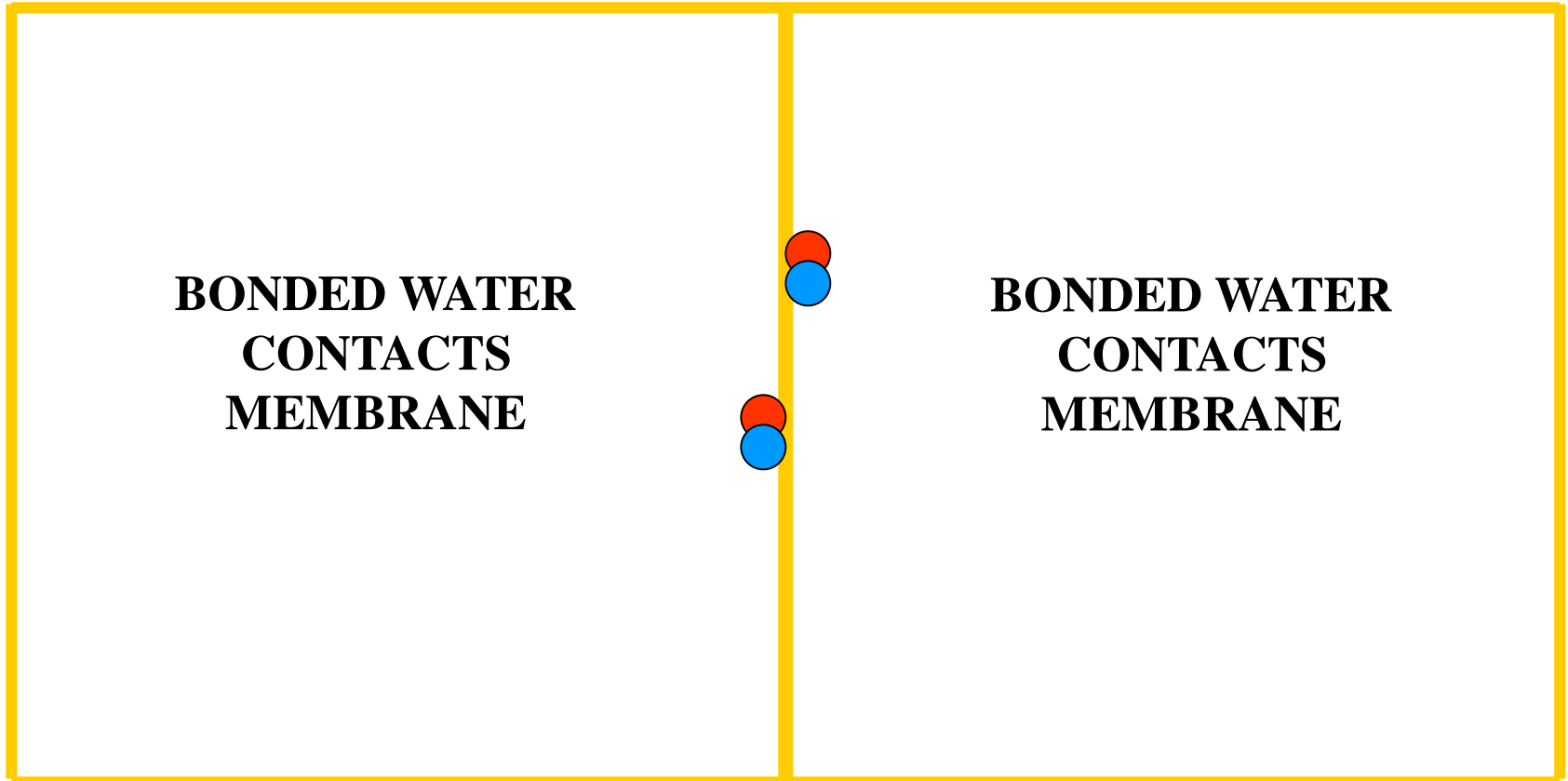
● = SOLUTE MOLECULE POLAR

— = MEMBRANE



OSMOSIS

CELL A **BONDED WATER** **CELL B**



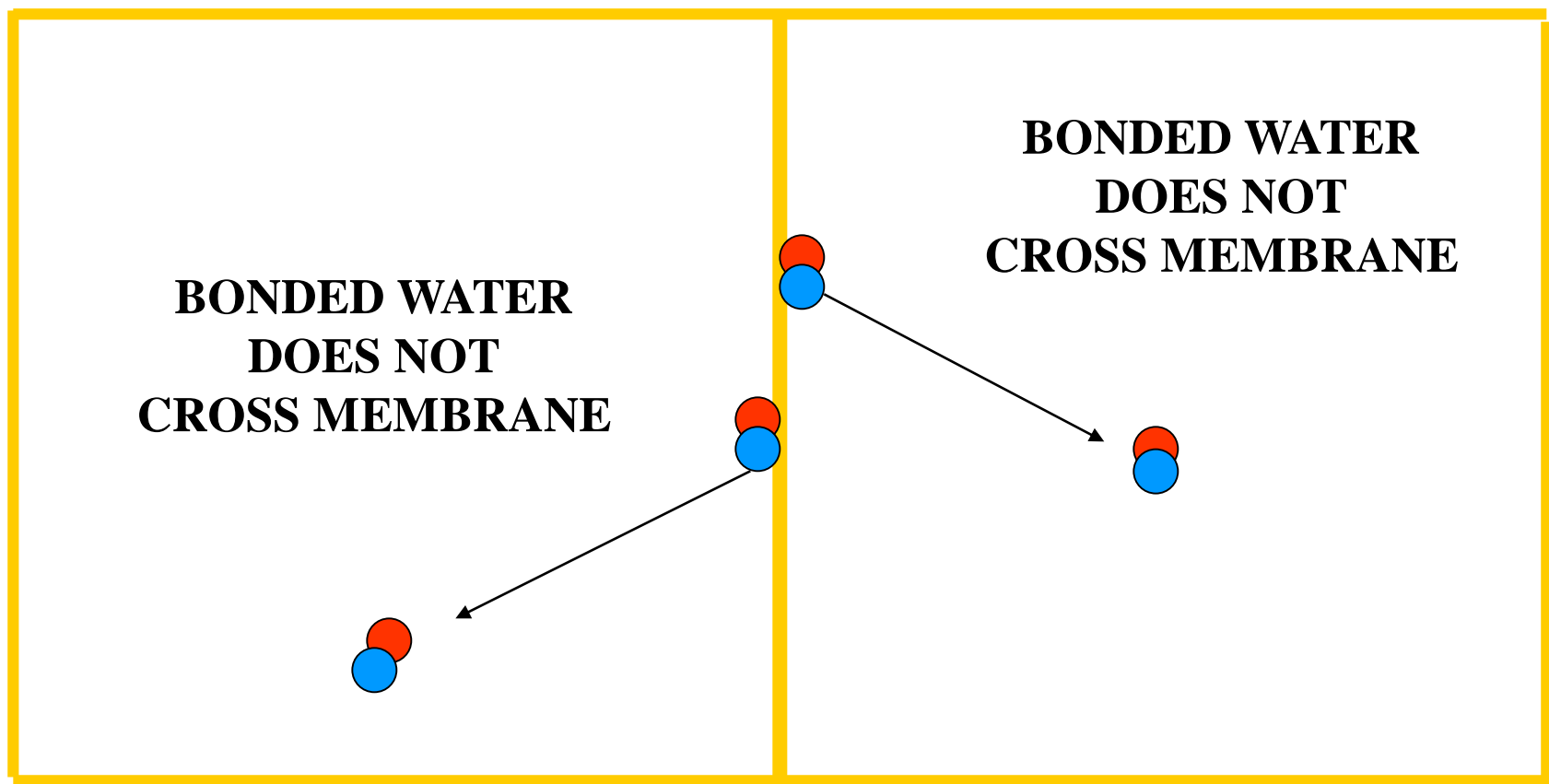
 = WATER MOLECULE POLAR

 = SOLUTE MOLECULE POLAR

 = MEMBRANE

OSMOSIS

CELL A **BONDED WATER** **CELL B**



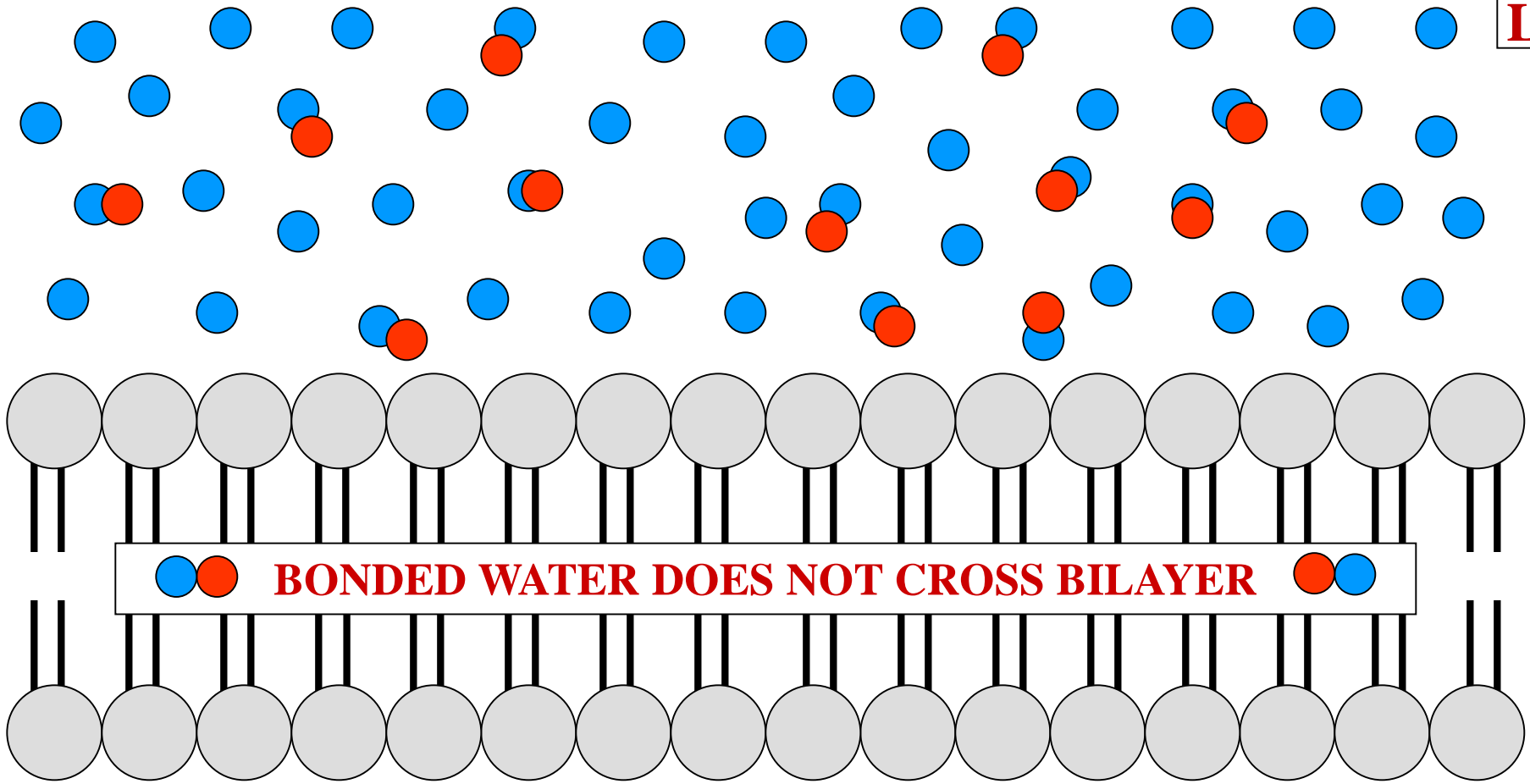
-  = WATER MOLECULE POLAR
-  = SOLUTE MOLECULE POLAR
-  = MEMBRANE

QUESTION

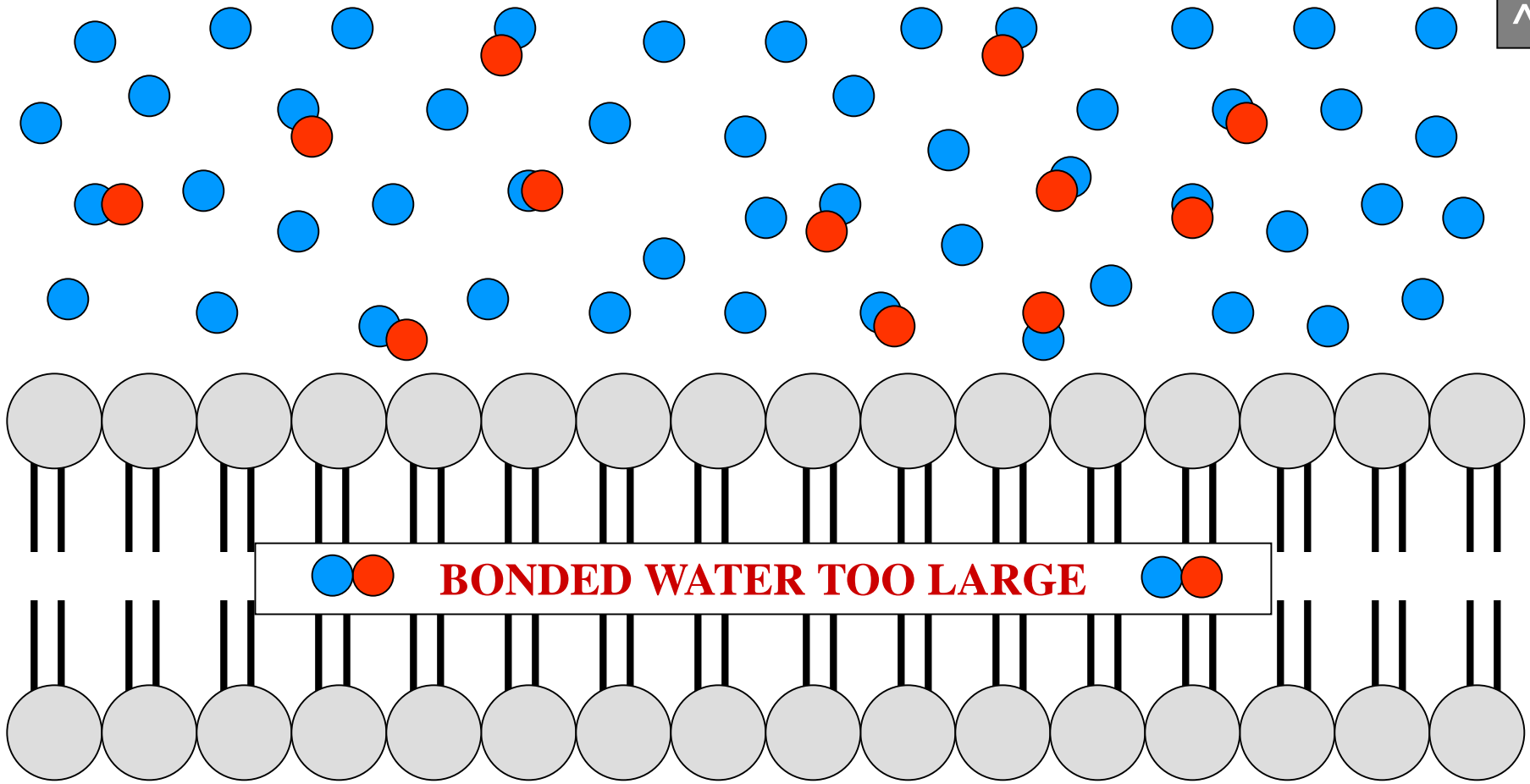


**WHY DOES BONDED
WATER NOT CROSS
THE BIO-MEMBRANE?**

QUESTION



● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR

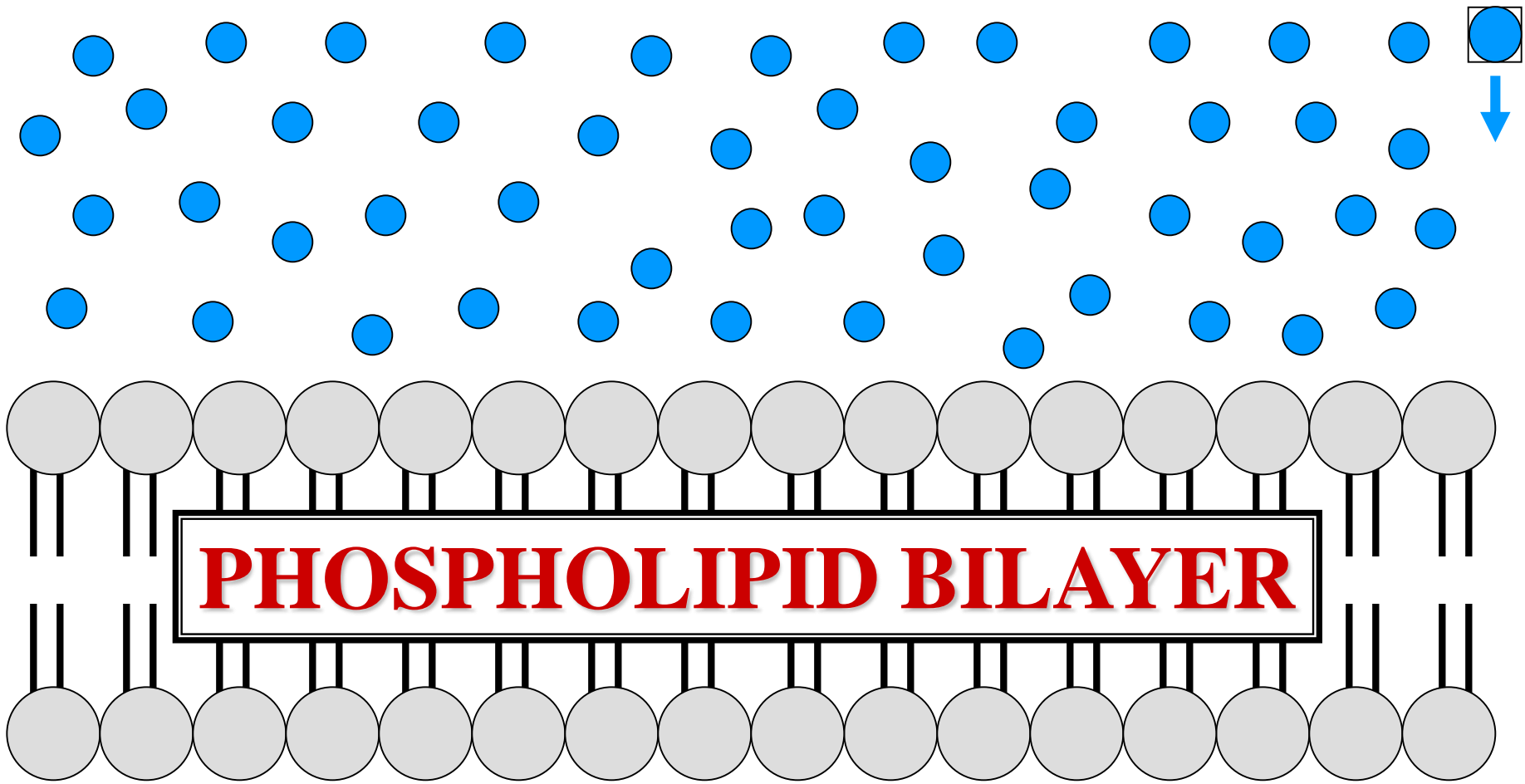


● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR

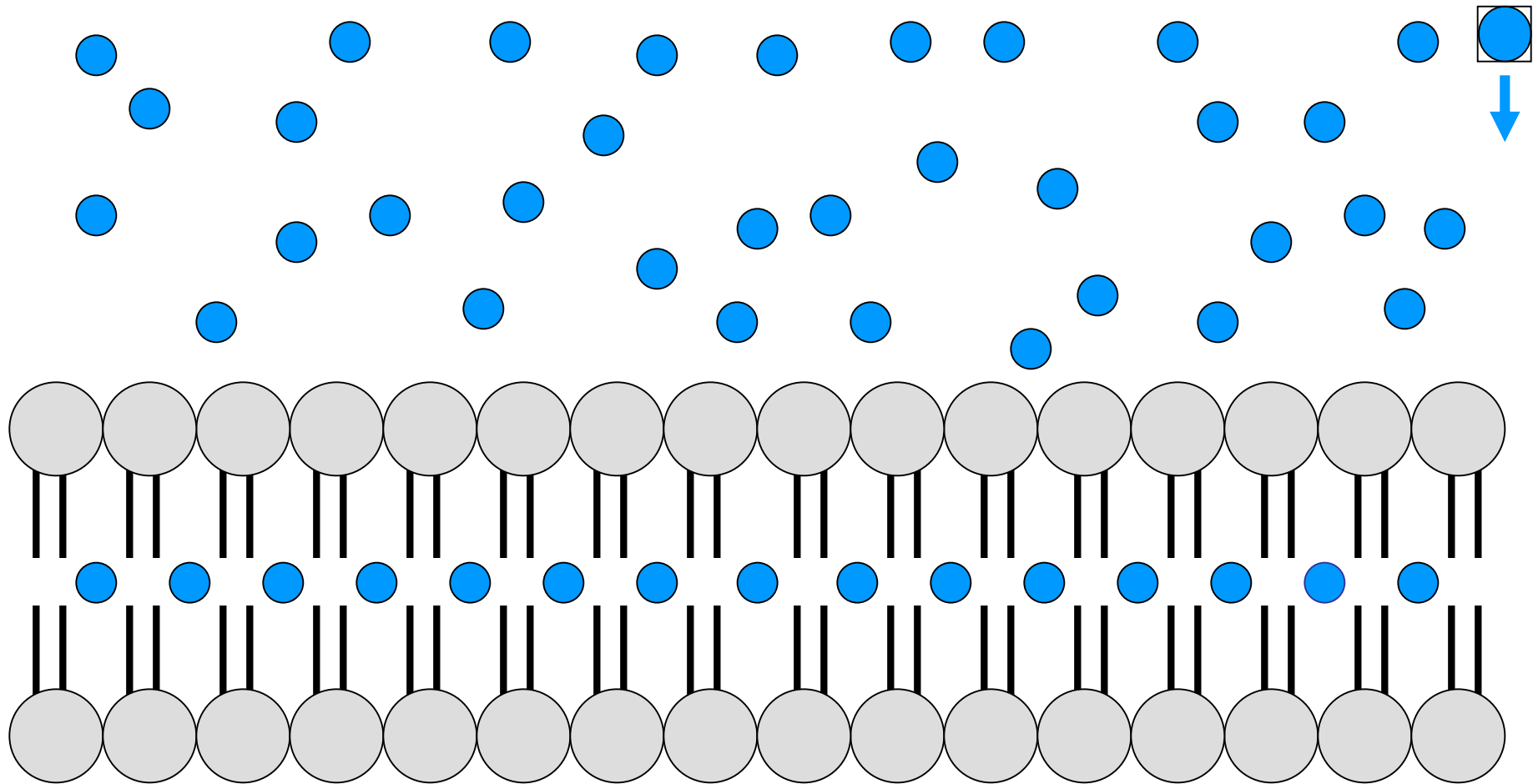


OSMOSIS
BONDED WATER

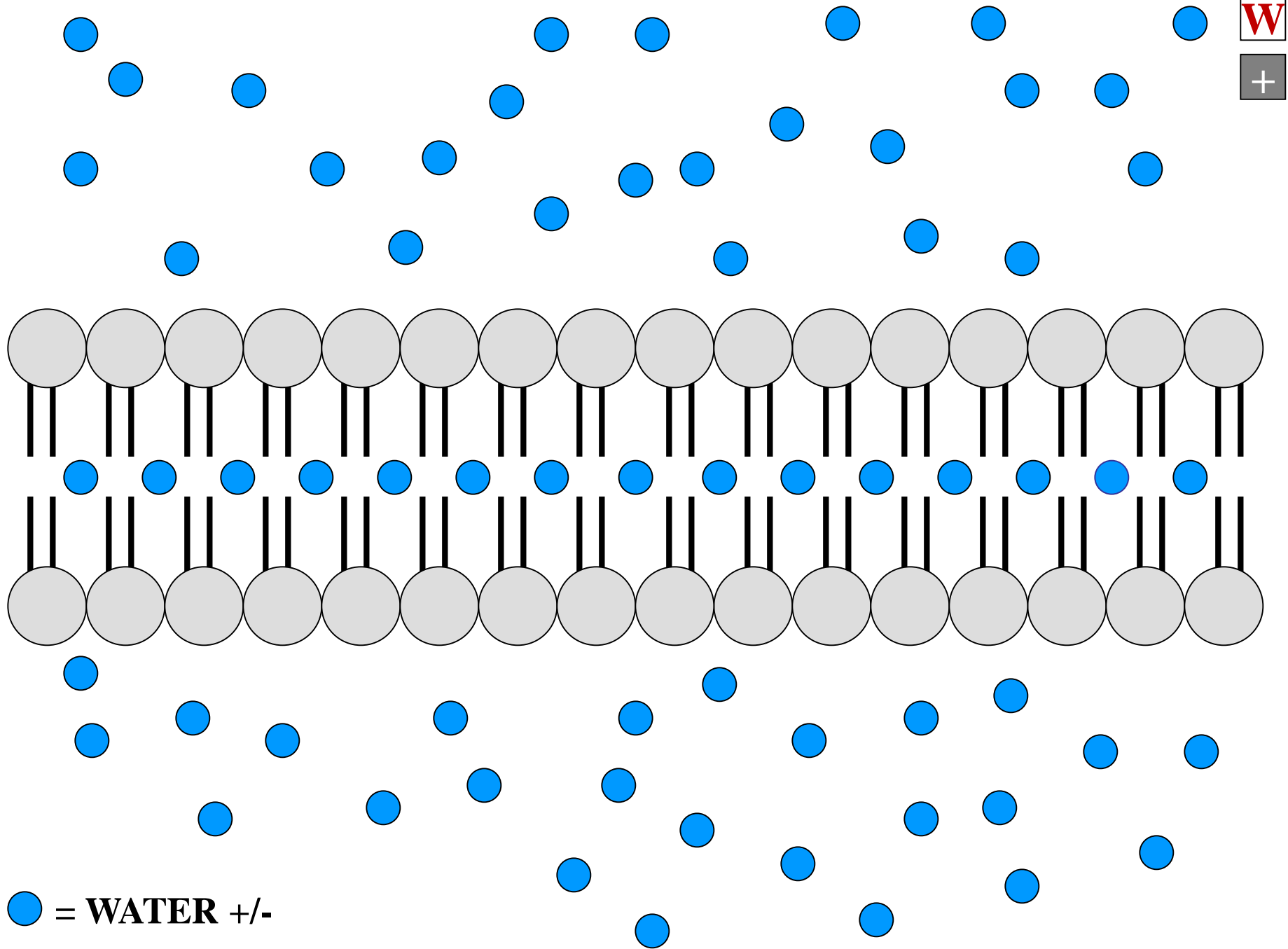
PHOSPHOLIPID
BILAYER



● = WATER +/-



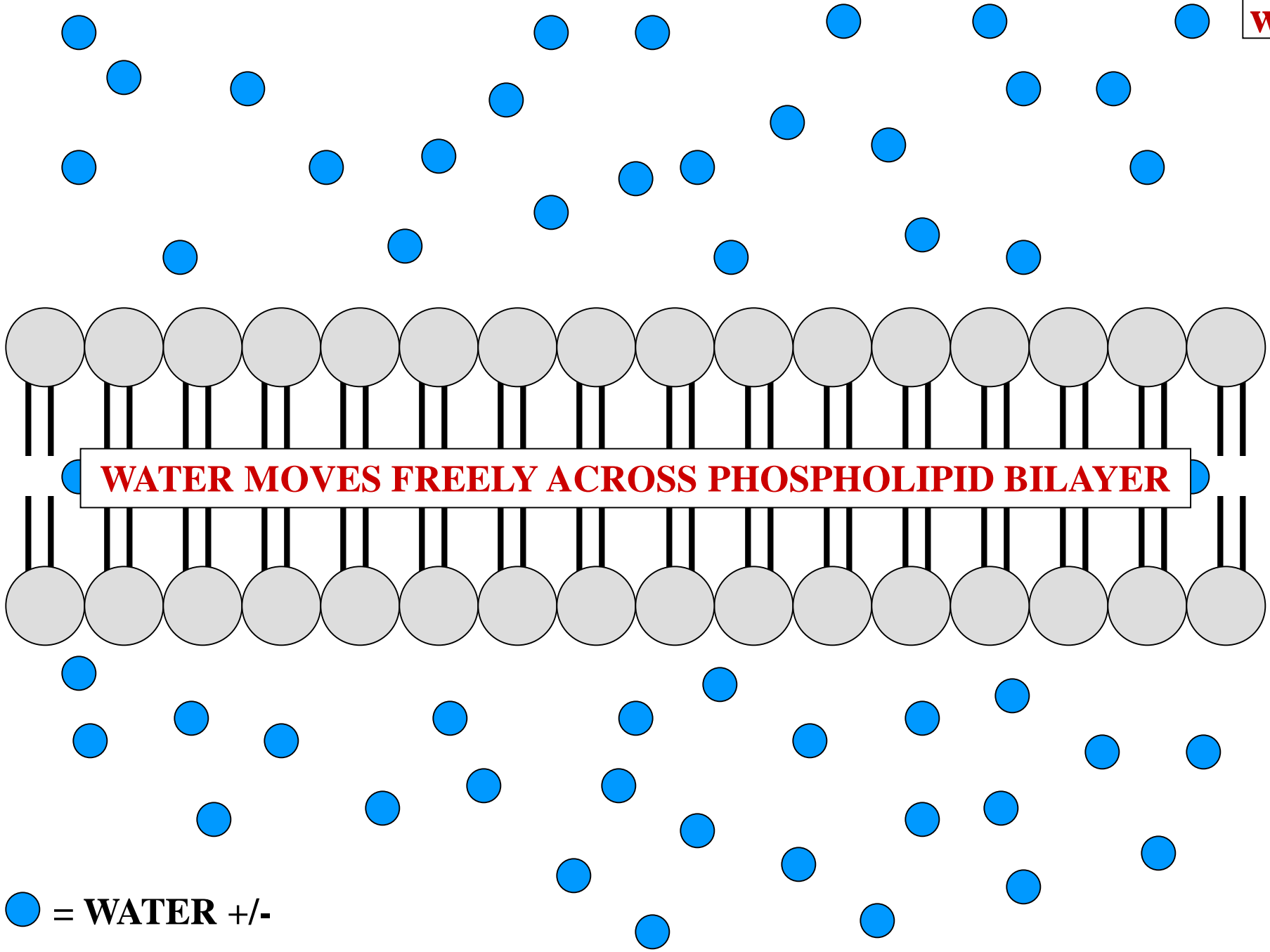
● = WATER +/-



W

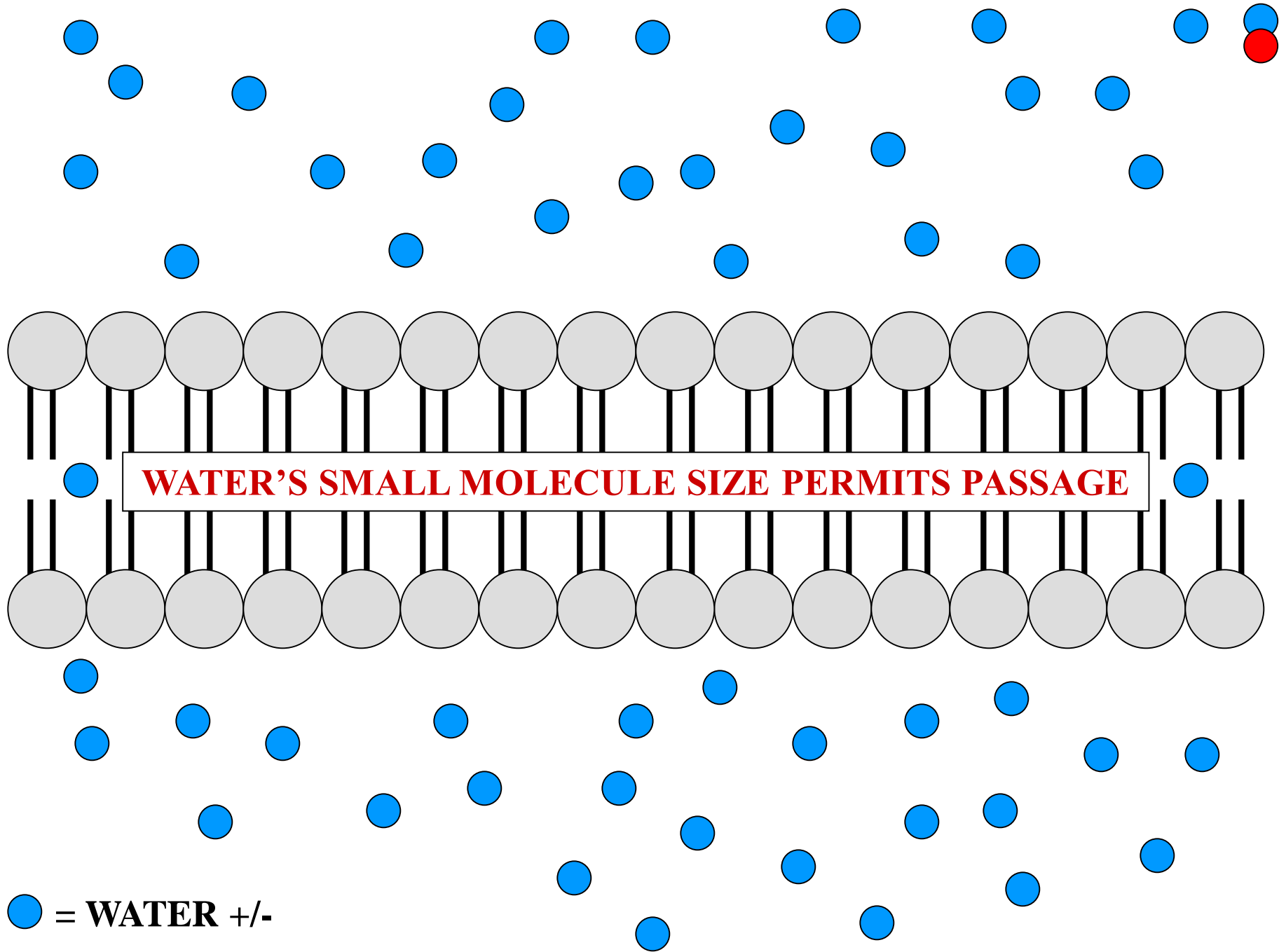
+

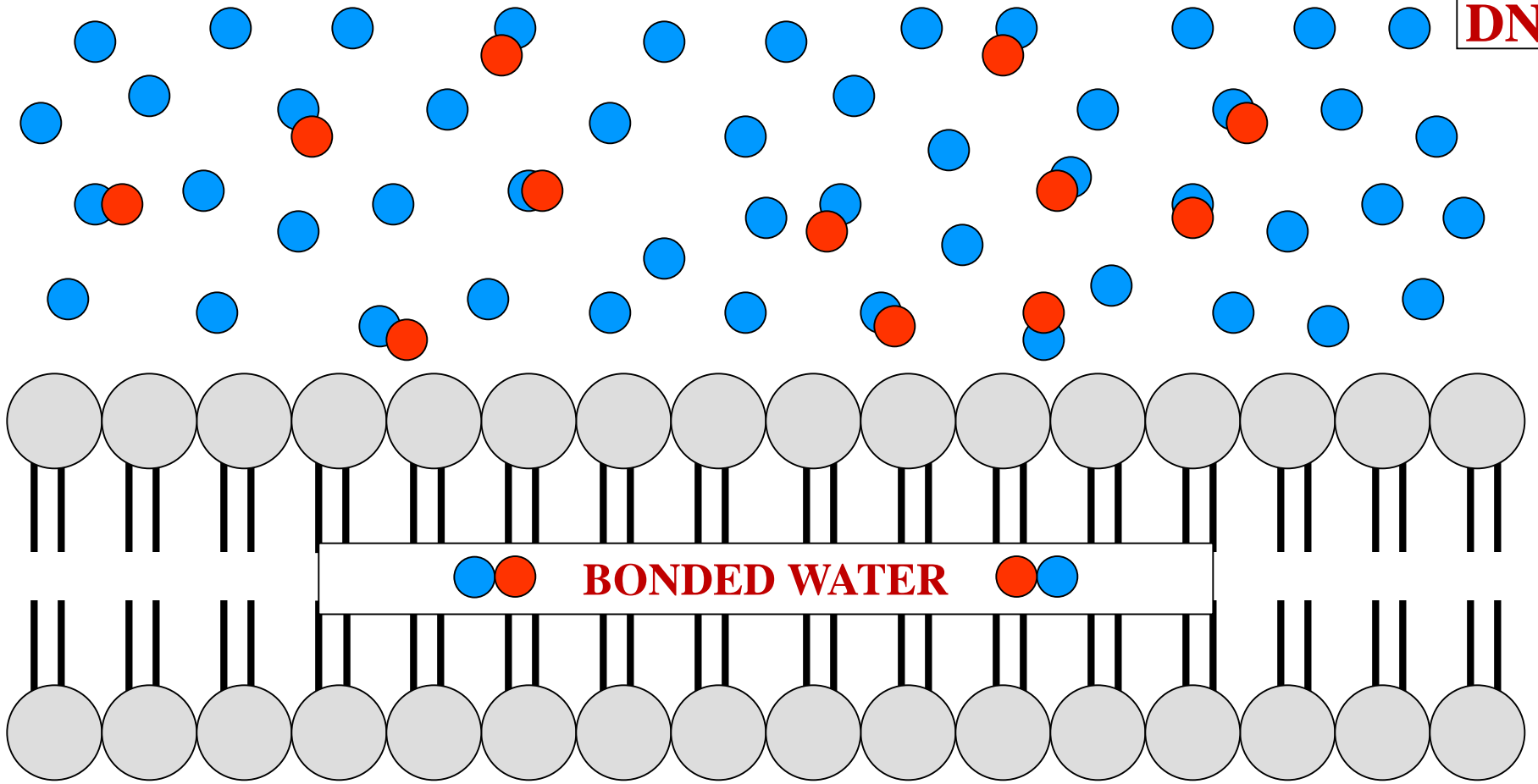
● = WATER +/-



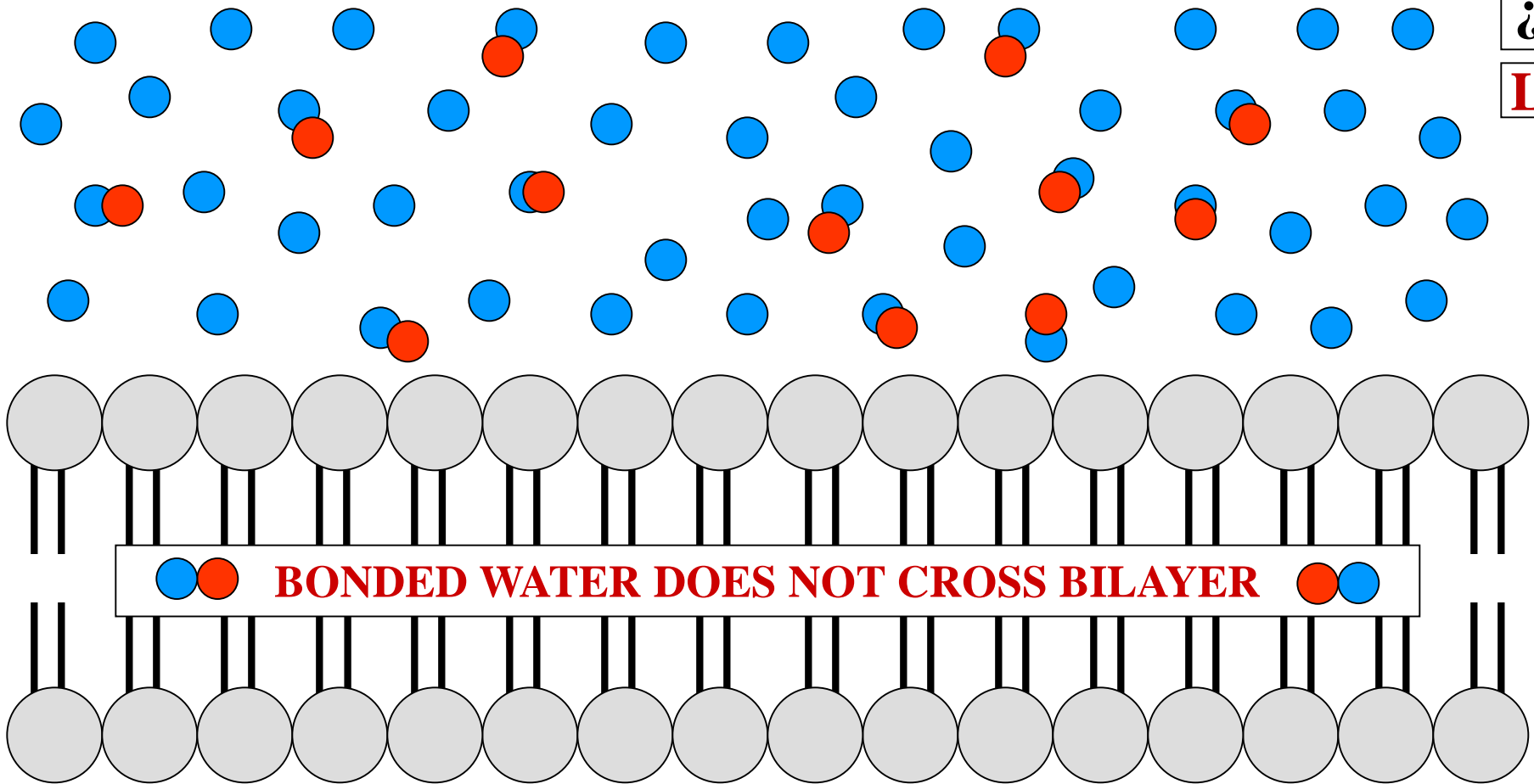
WATER MOVES FREELY ACROSS PHOSPHOLIPID BILAYER

● = WATER +/-

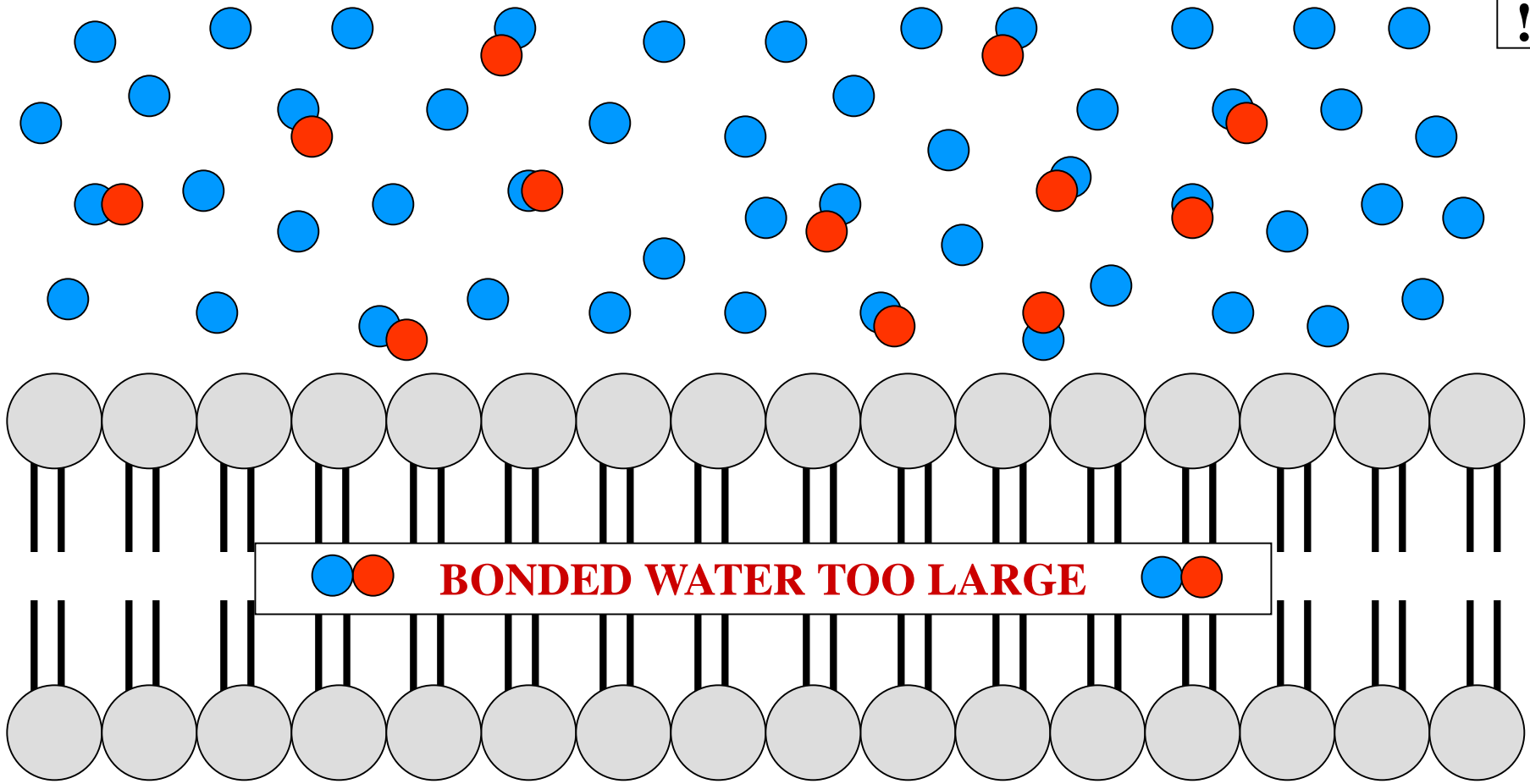




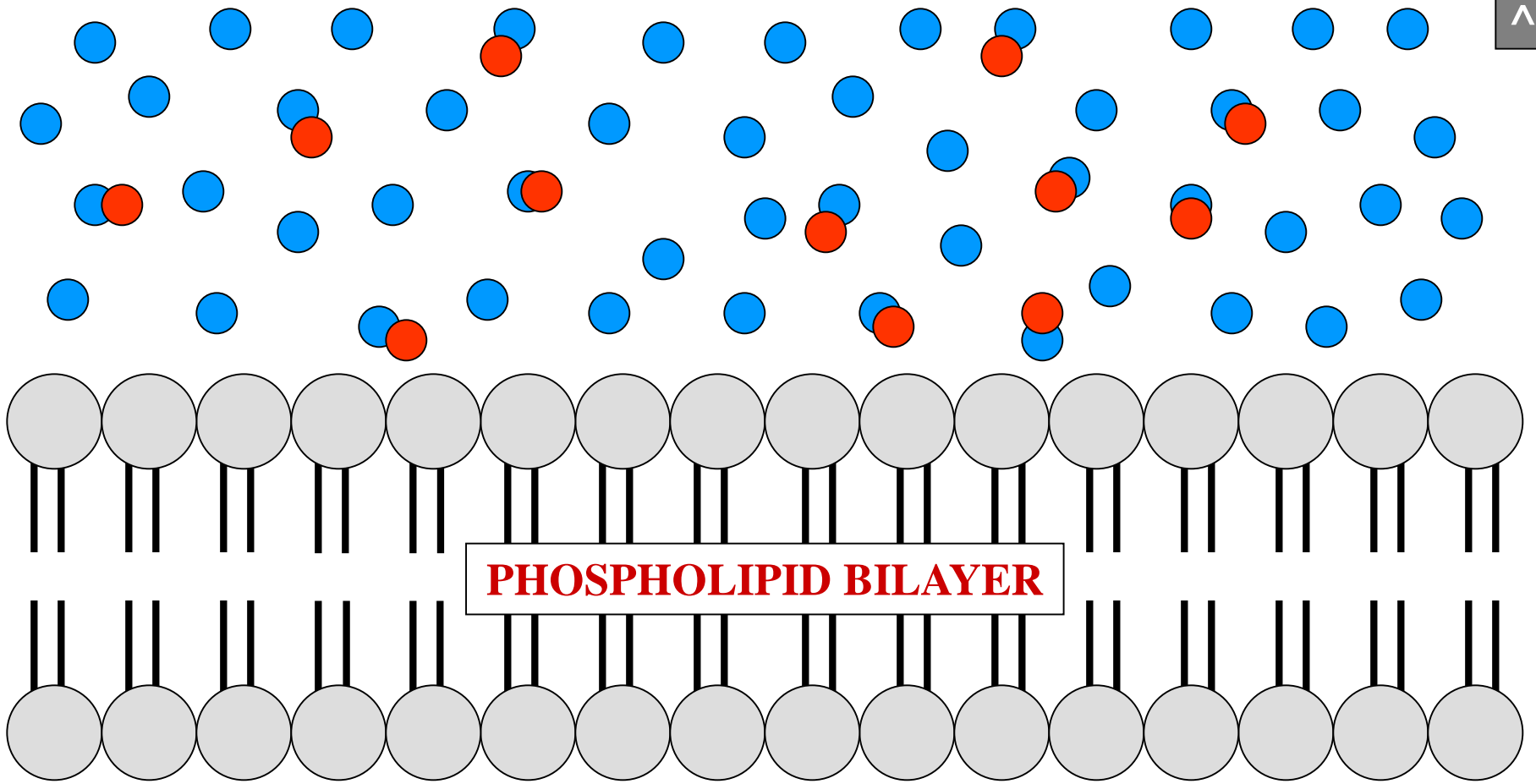
● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



PHOSPHOLIPID BILAYER

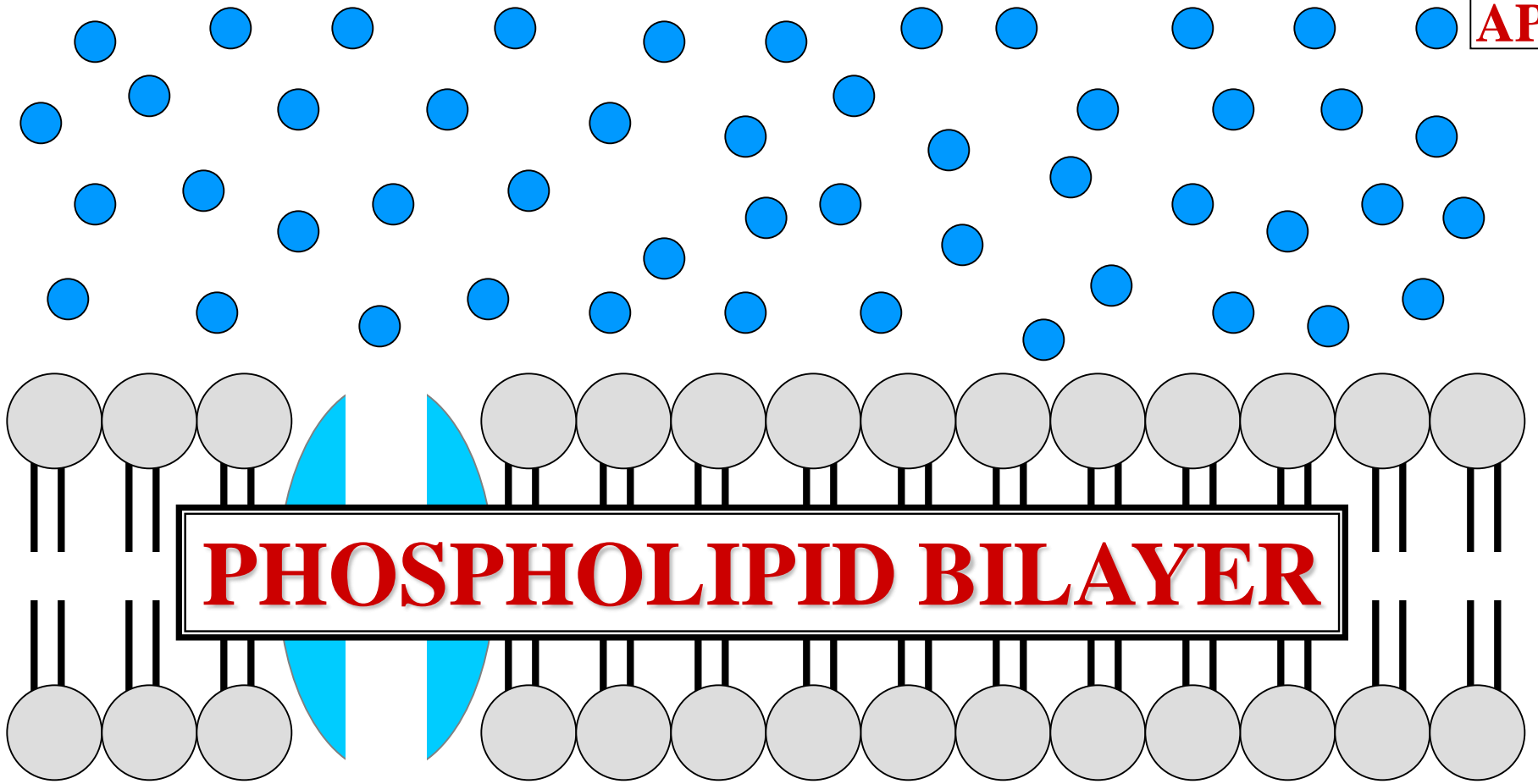
BONDED WATER: DOES NOT CROSS BILAYER

-  = WATER MOLECULE POLAR
-  = SOLUTE MOLECULE POLAR

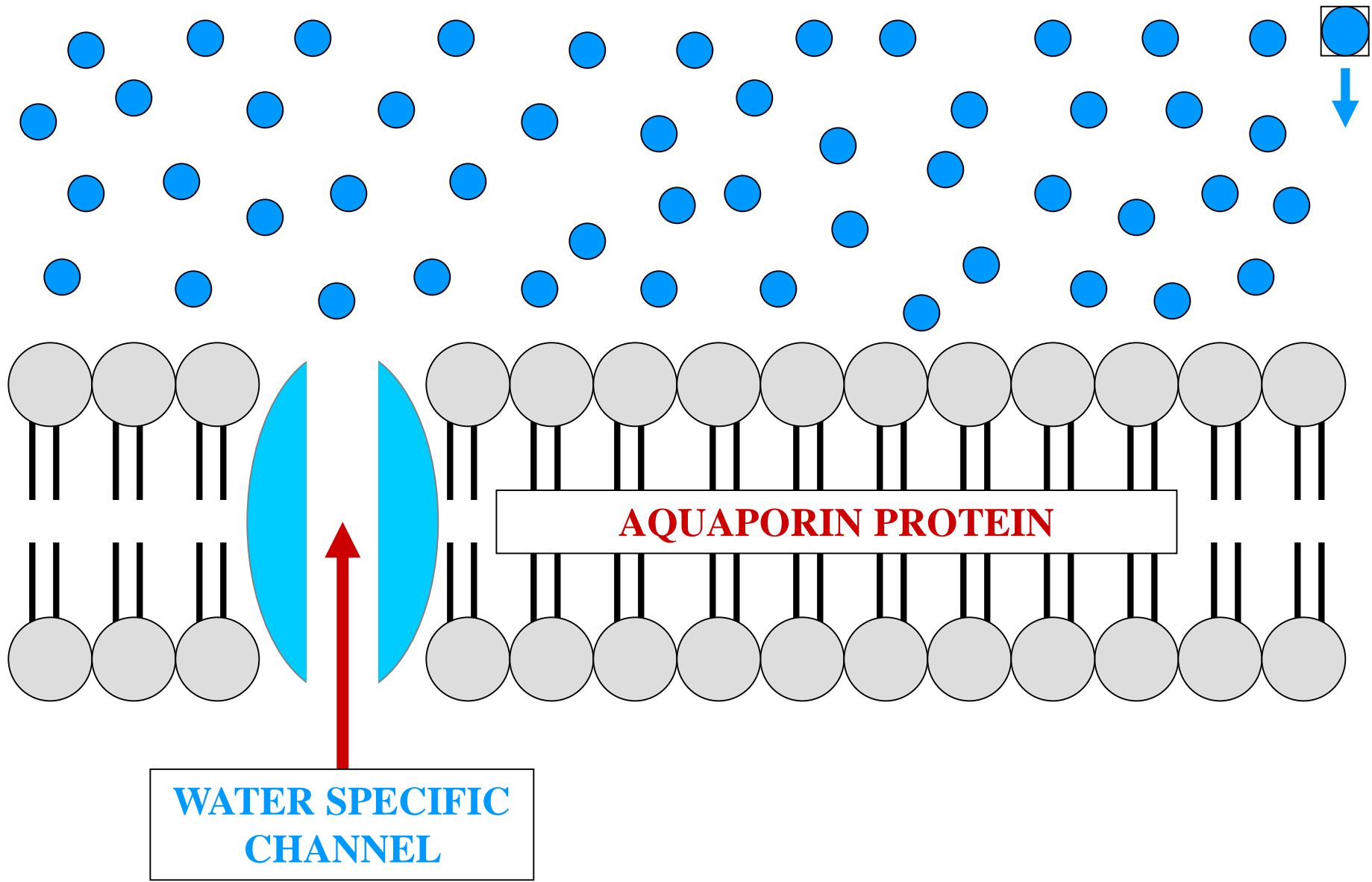


OSMOSIS BONDED WATER

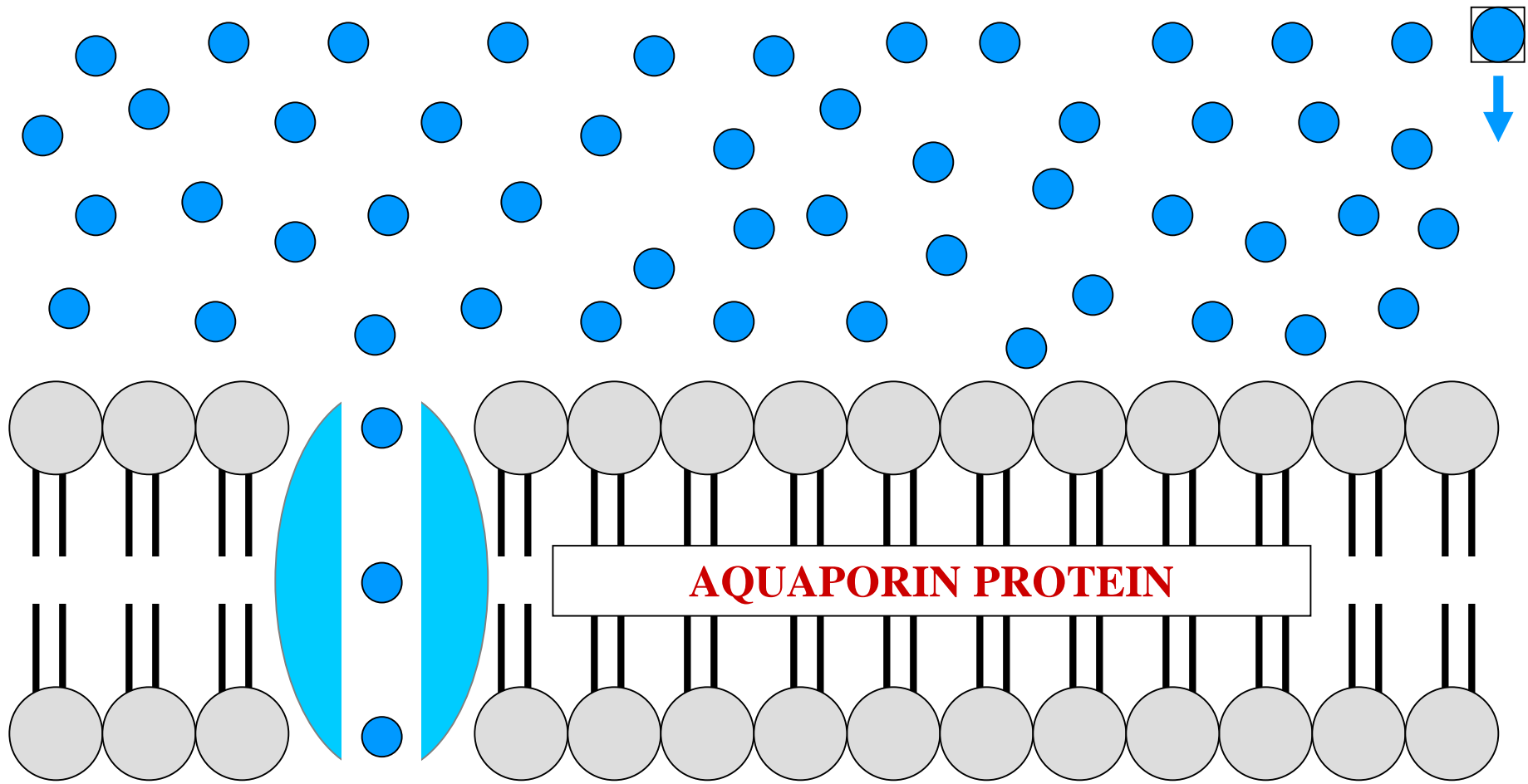
AQUAPORIN PROTEIN



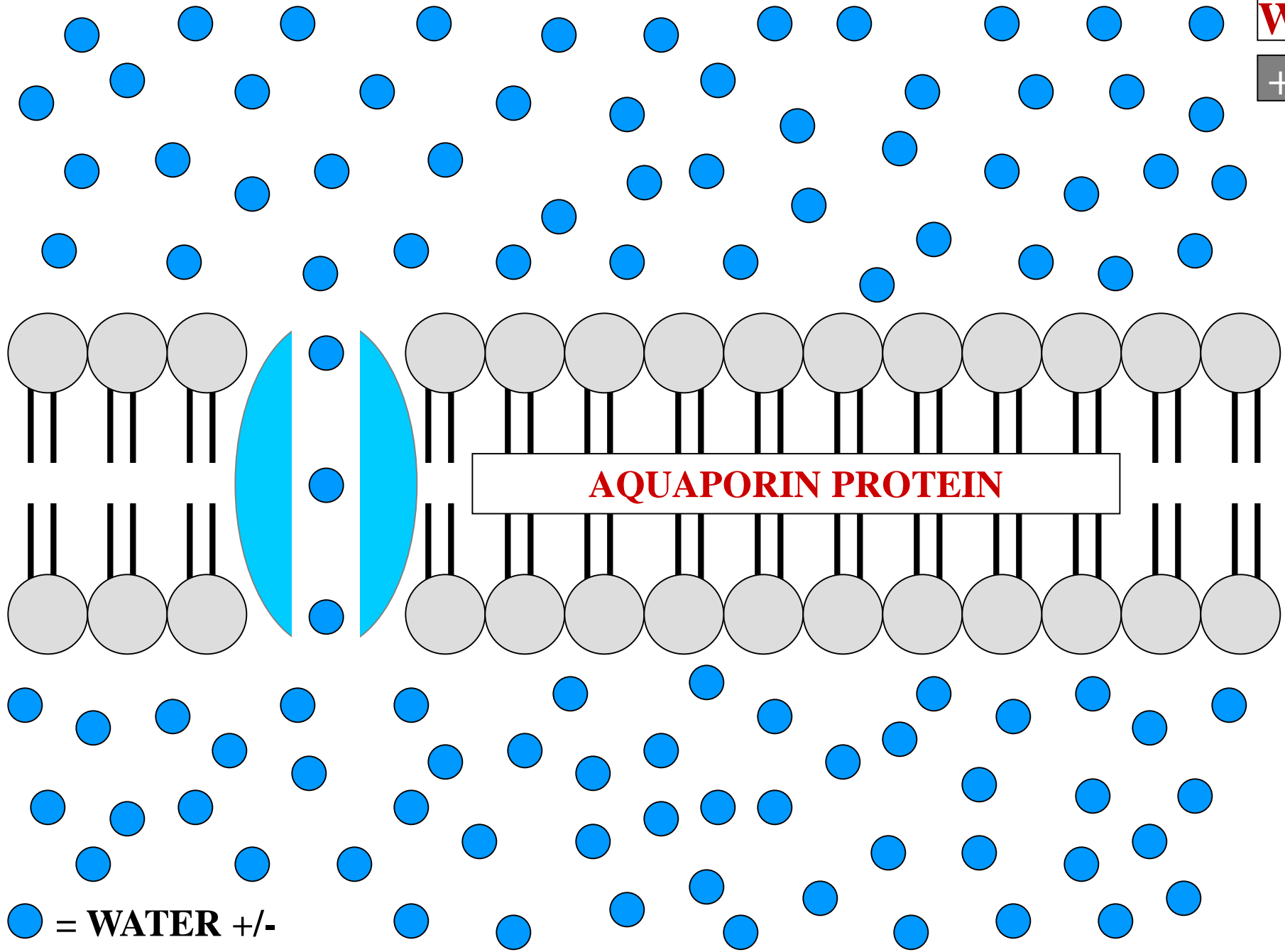
● = WATER +/-



● = WATER +/-

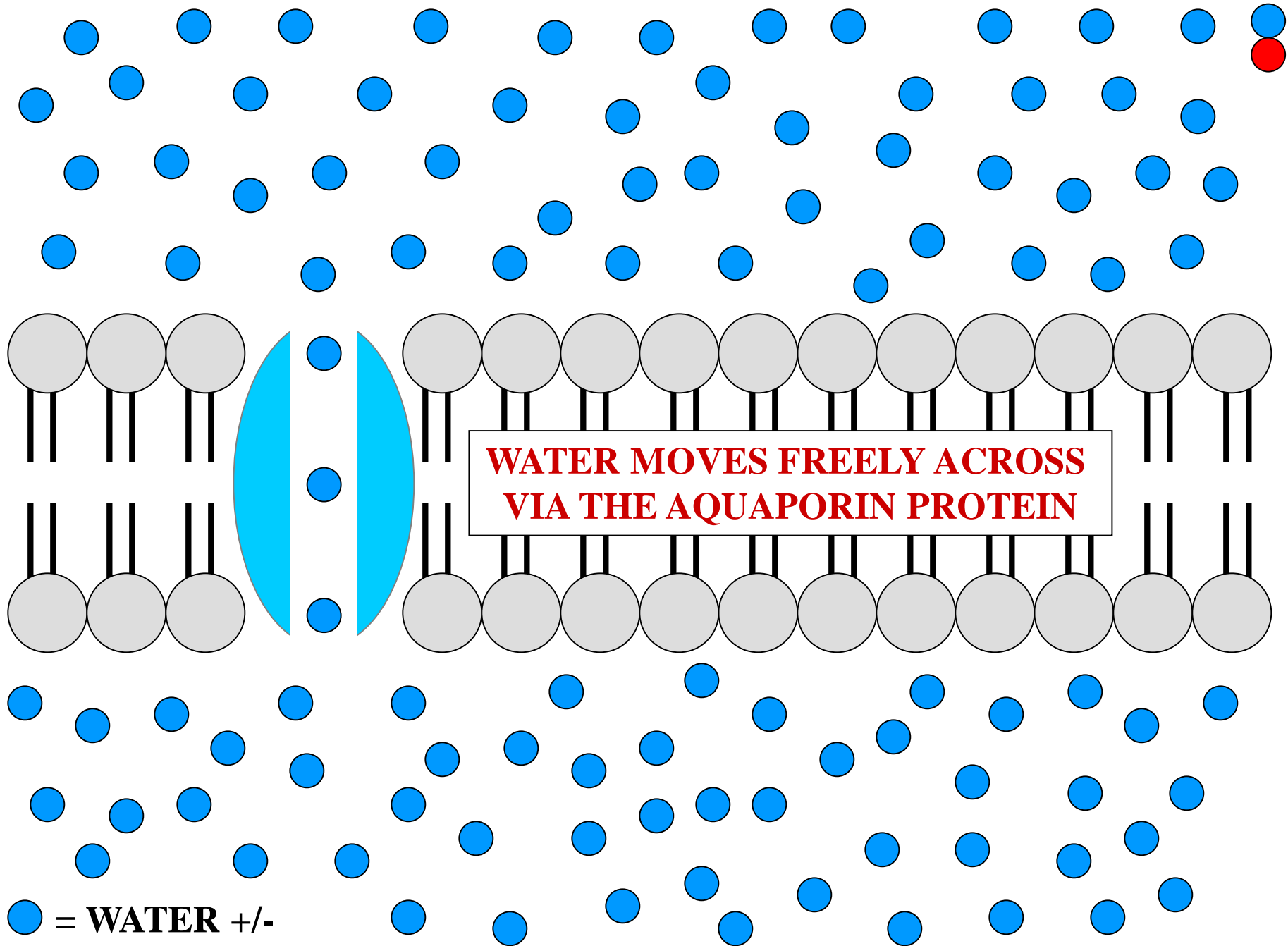


● = WATER +/-

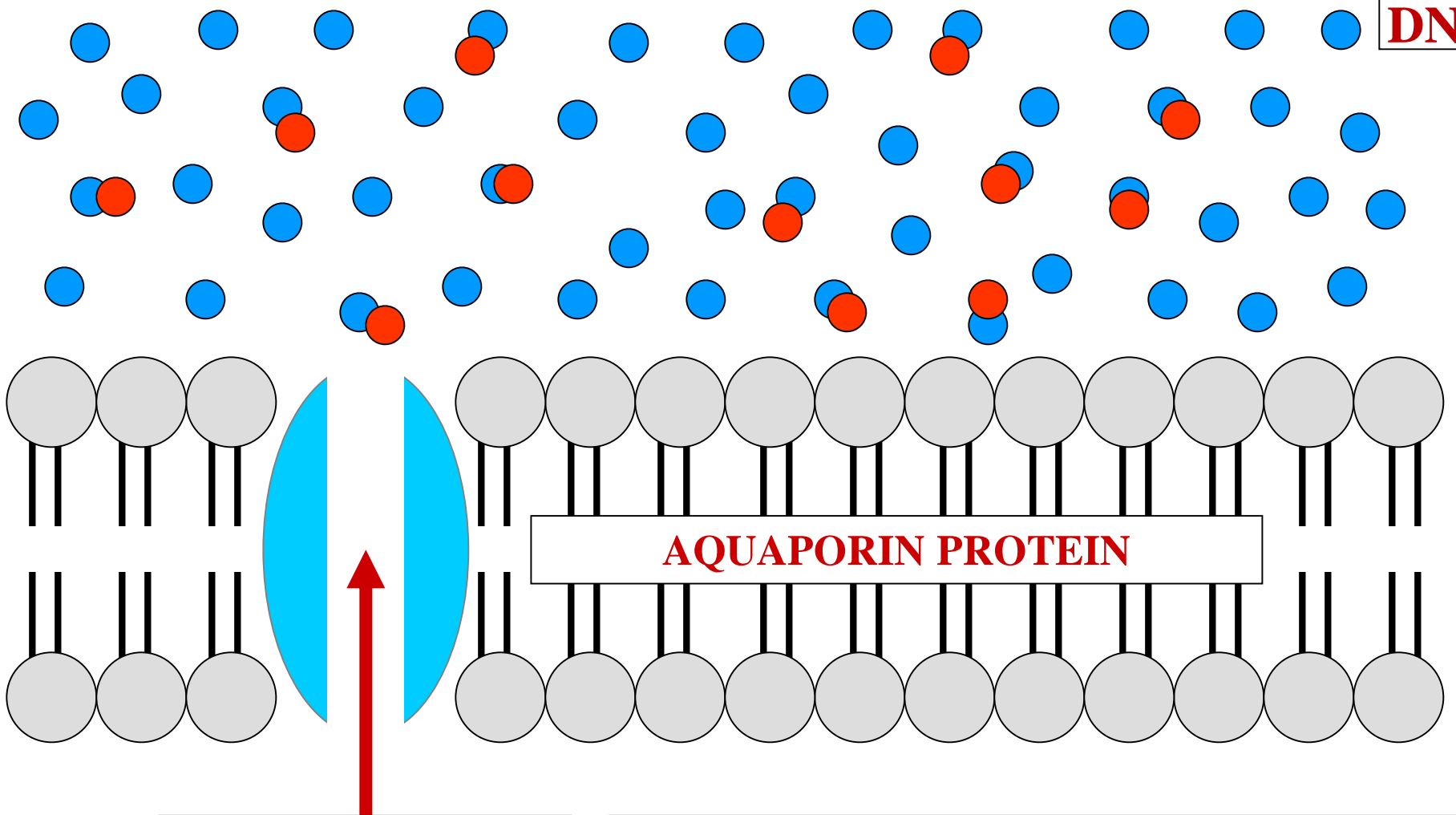


AQUAPORIN PROTEIN

● = WATER +/-



DN

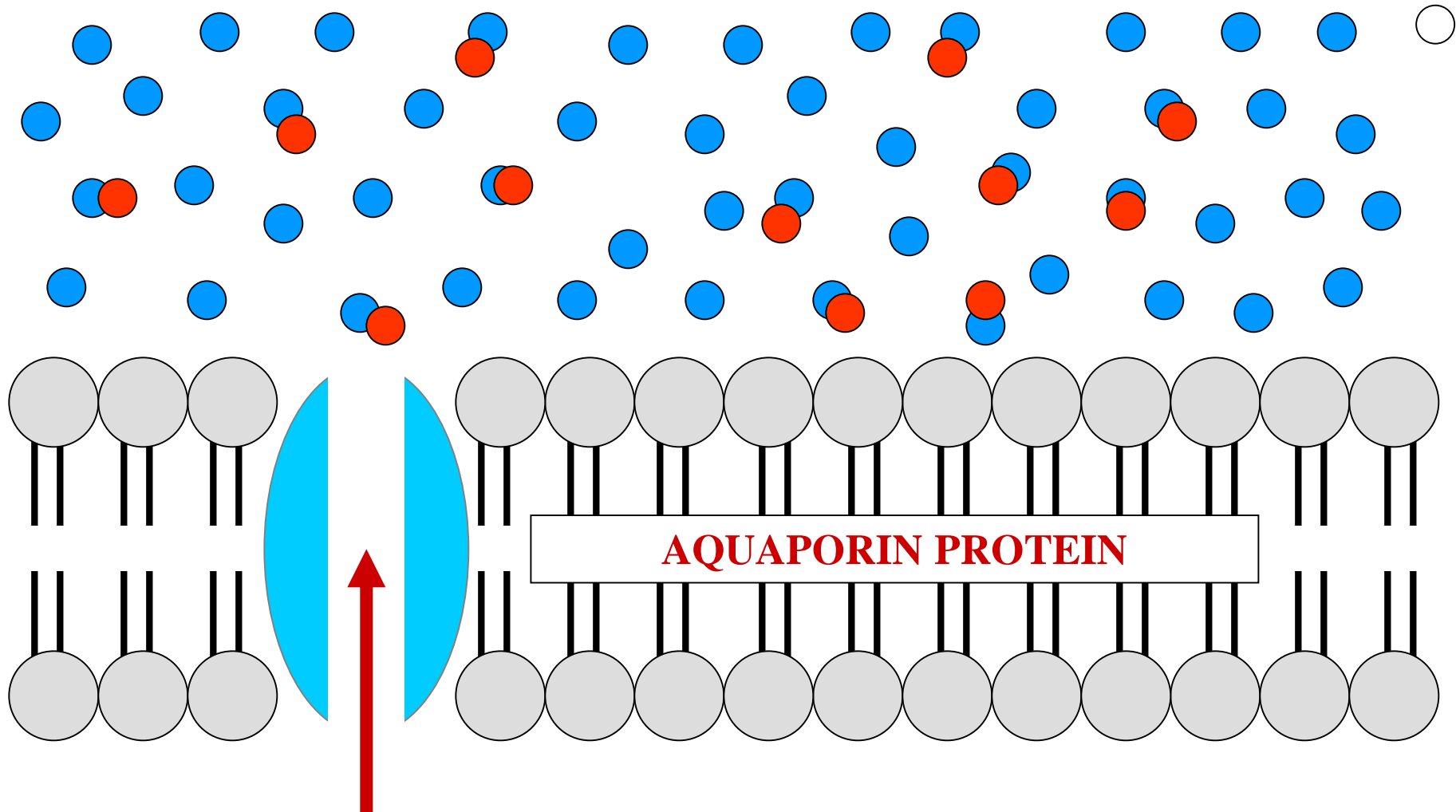


AQUAPORIN PROTEIN

WATER SPECIFIC CHANNEL

BONDED WATER

● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR

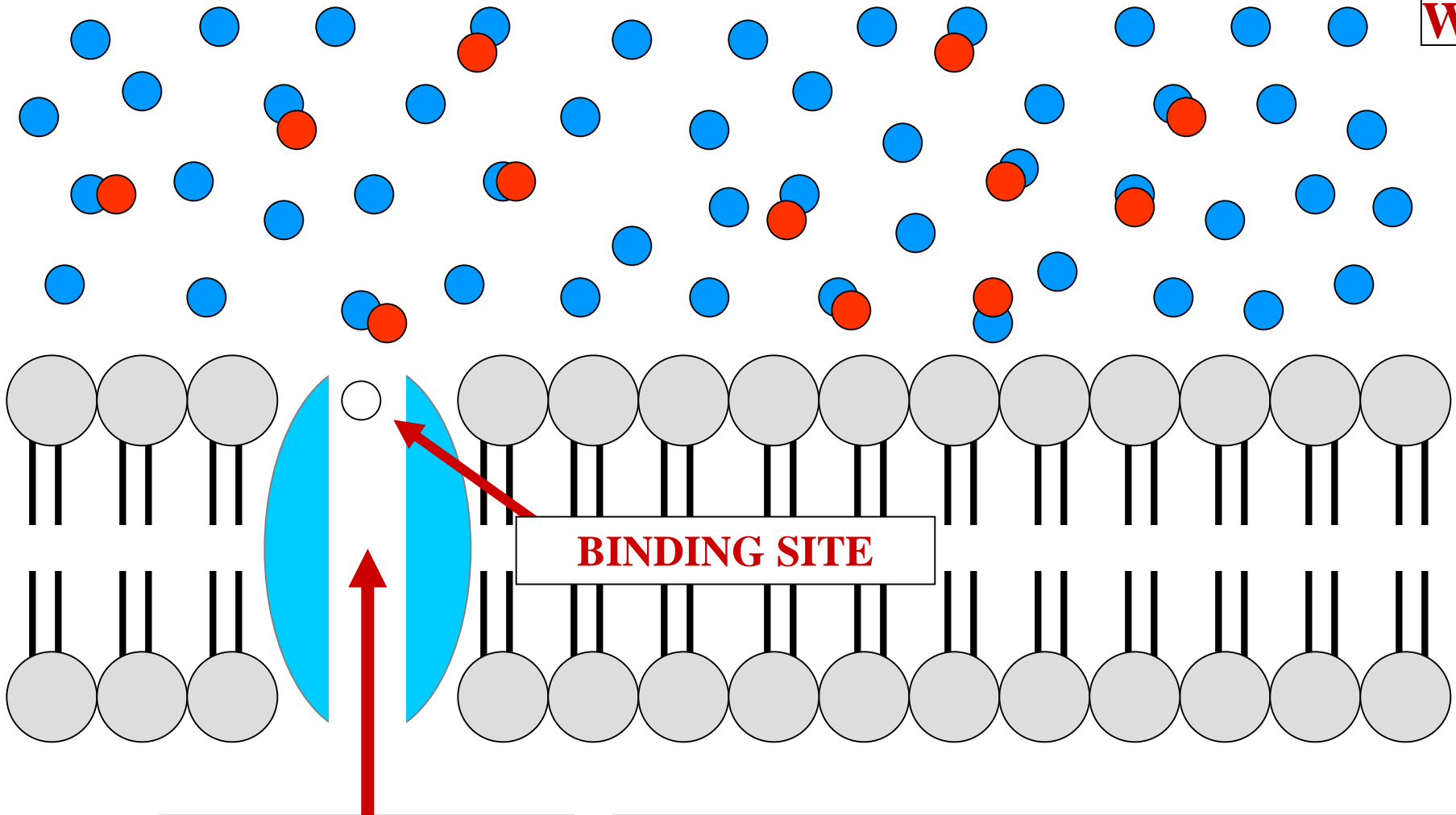


WATER SPECIFIC CHANNEL

AQUAPORIN PROTEIN

●● BONDDED WATER ●●
DOES NOT CROSS VIA THE
AQUAPORIN PROTEIN

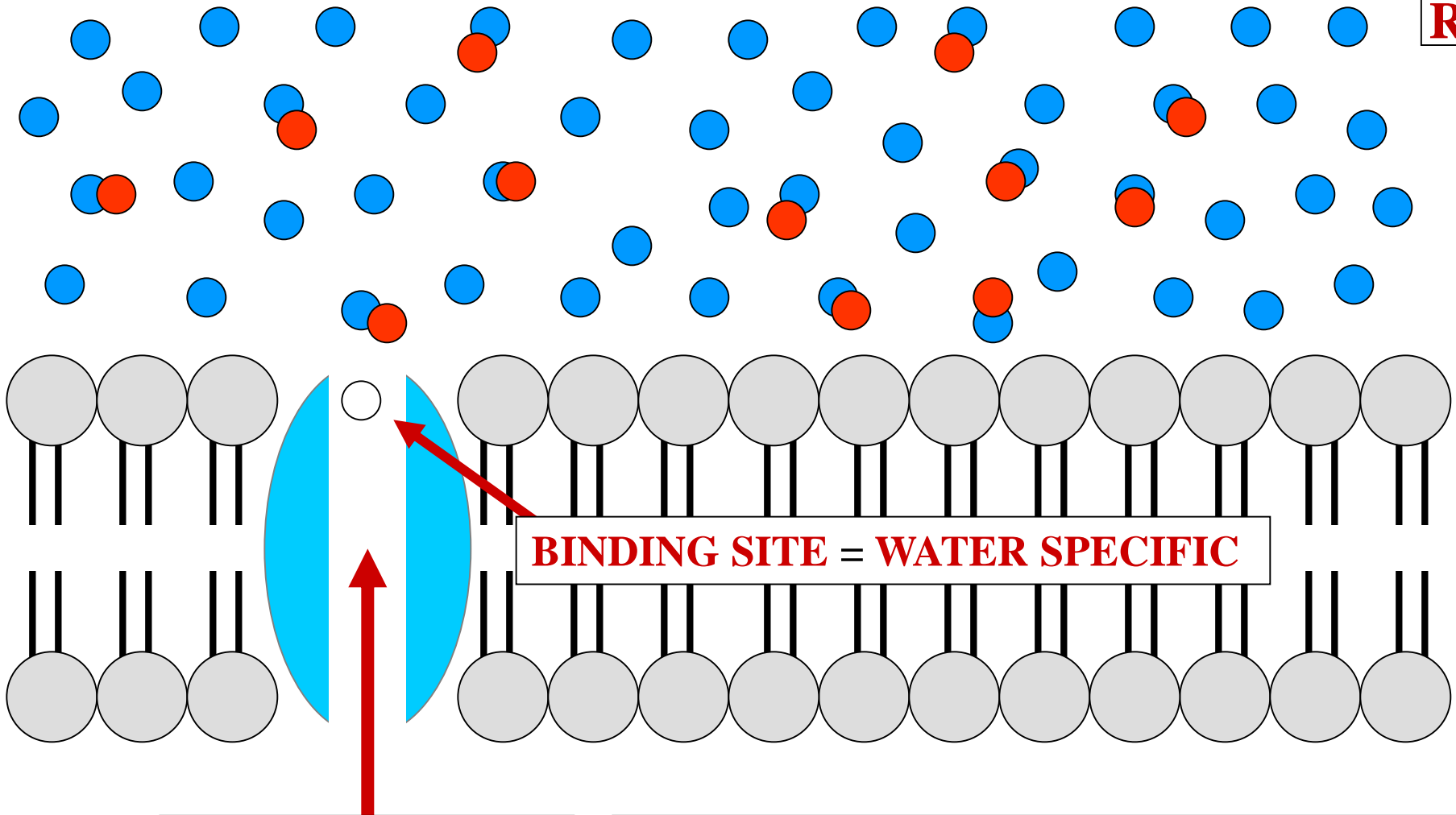
● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



WATER SPECIFIC CHANNEL

BONDED WATER DOES NOT CROSS VIA THE AQUAPORIN PROTEIN

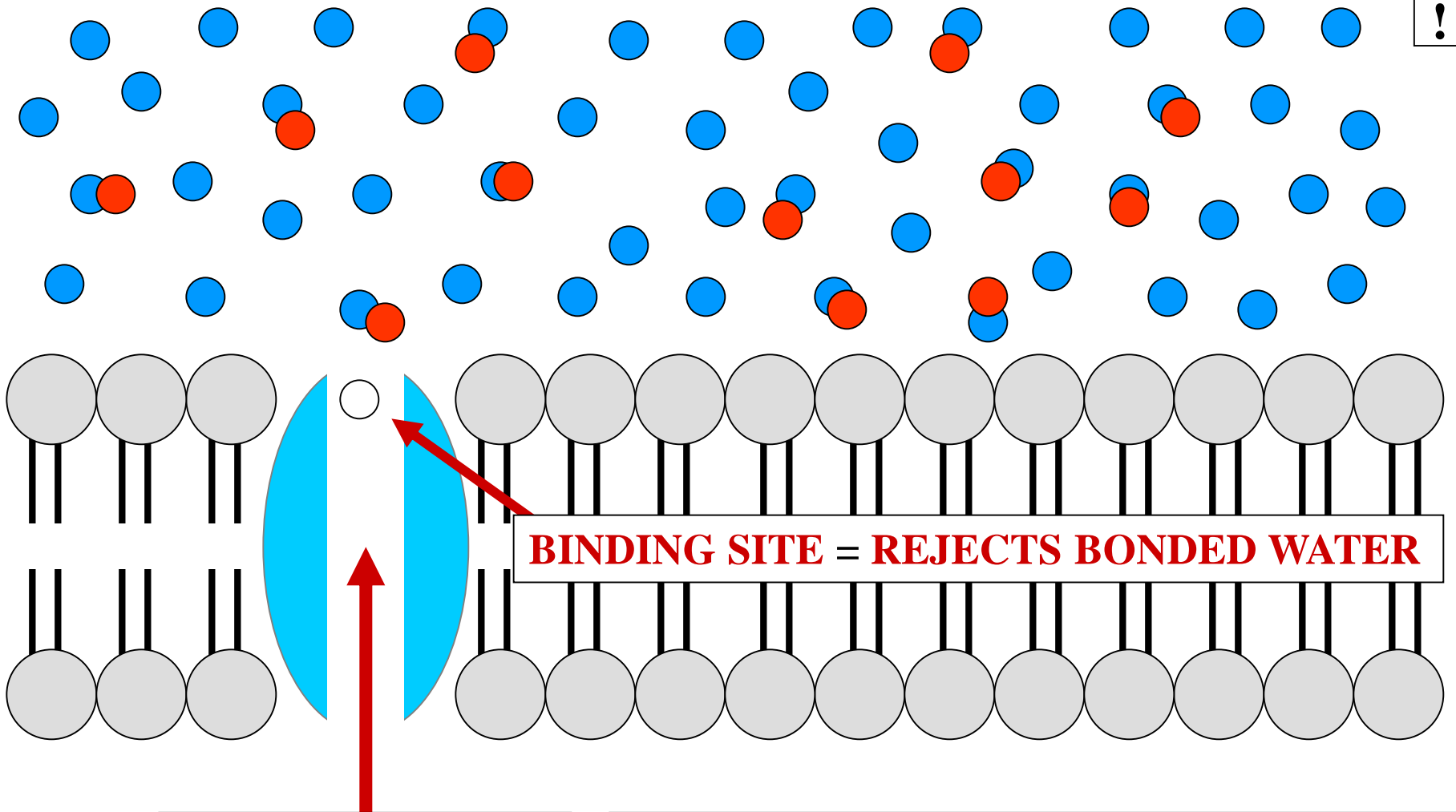
● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



WATER SPECIFIC CHANNEL

●● BONDED WATER ●●
DOES NOT CROSS VIA THE AQUAPORIN PROTEIN

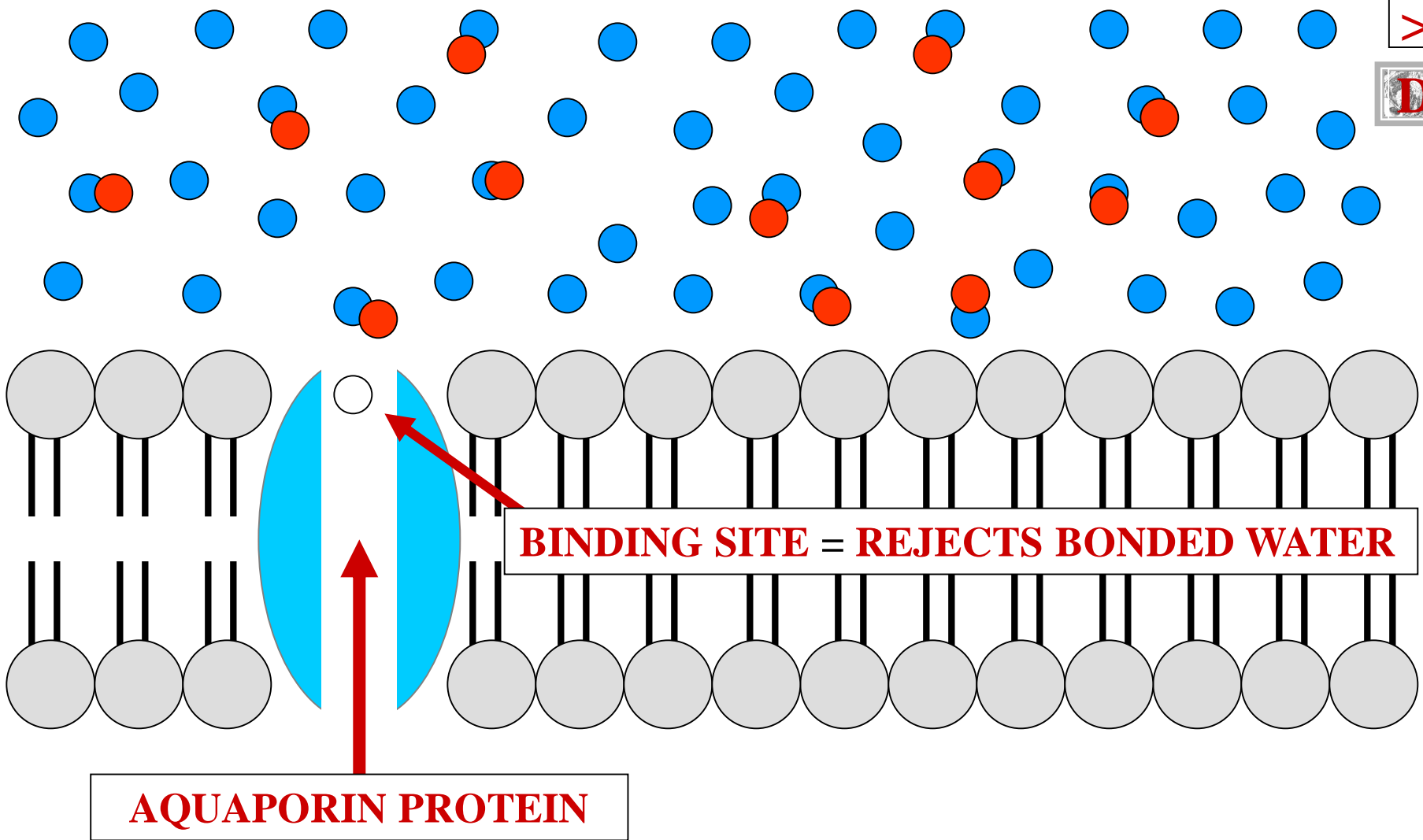
● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR



WATER SPECIFIC CHANNEL

●● BONDED WATER ●●
DOES NOT CROSS VIA THE AQUAPORIN PROTEIN

● = WATER MOLECULE POLAR
● = SOLUTE MOLECULE POLAR

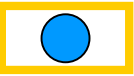


BONDED WATER: DOES NOT CROSS AQUAPORIN PROTEIN

- = WATER MOLECULE POLAR
- = SOLUTE MOLECULE POLAR



**DURING OSMOSIS
BONDED WATER
DOES NOT CROSS
MEMBRANE**



OSMOSIS

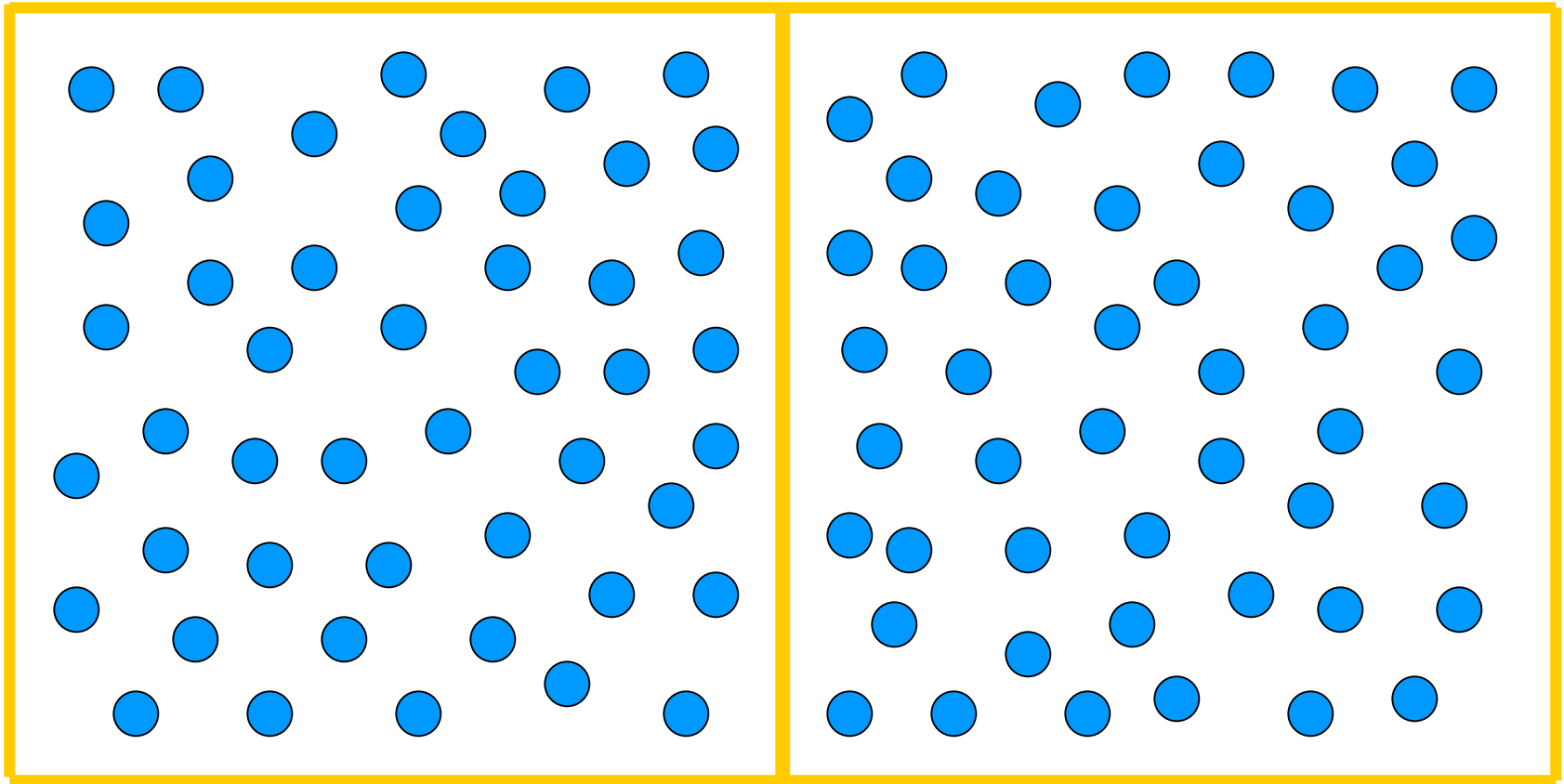
FREE WATER



OSMOSIS

CELL A

CELL B



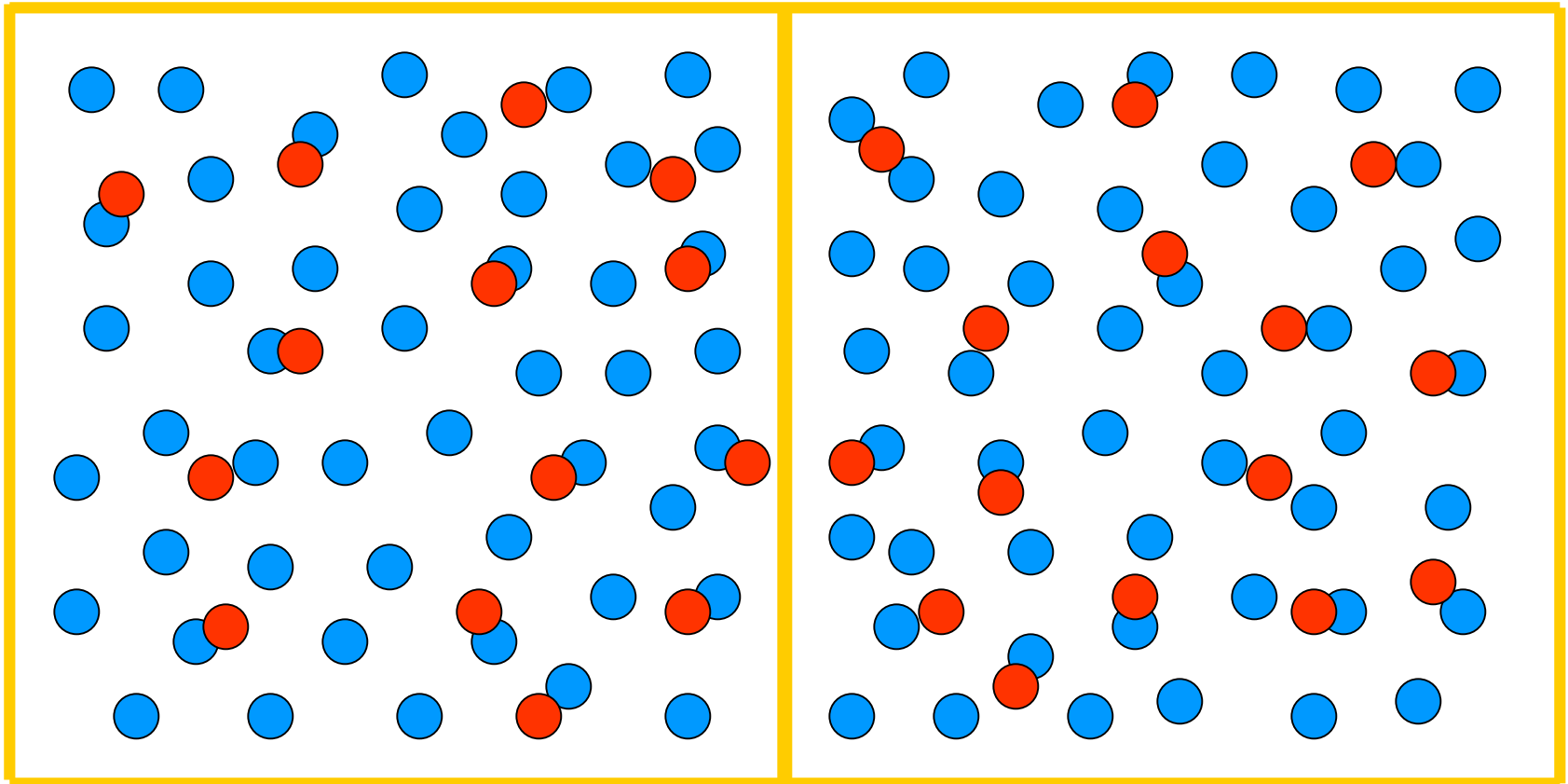
 = WATER MOLECULE POLAR

 = MEMBRANE

OSMOSIS

CELL A

CELL B

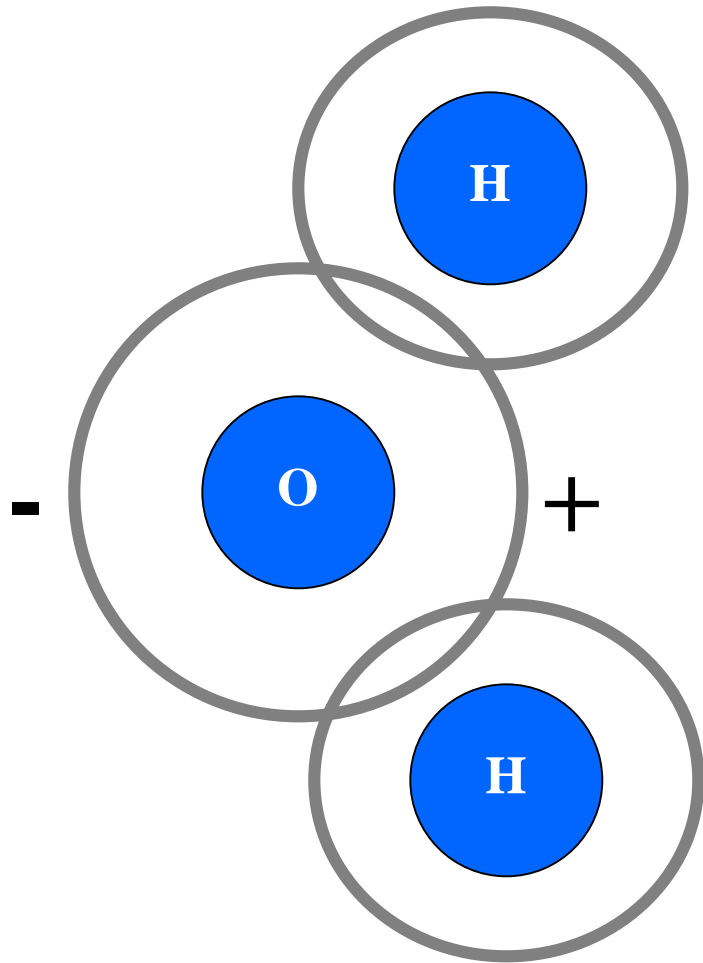


● = WATER MOLECULE POLAR

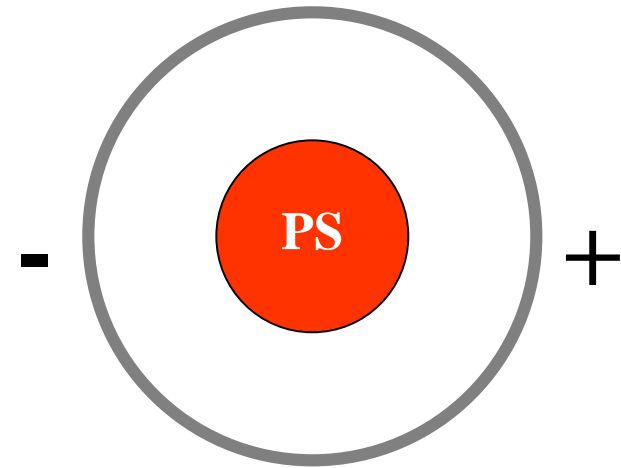
● = SOLUTE MOLECULE POLAR

— = MEMBRANE

BONDED WATER

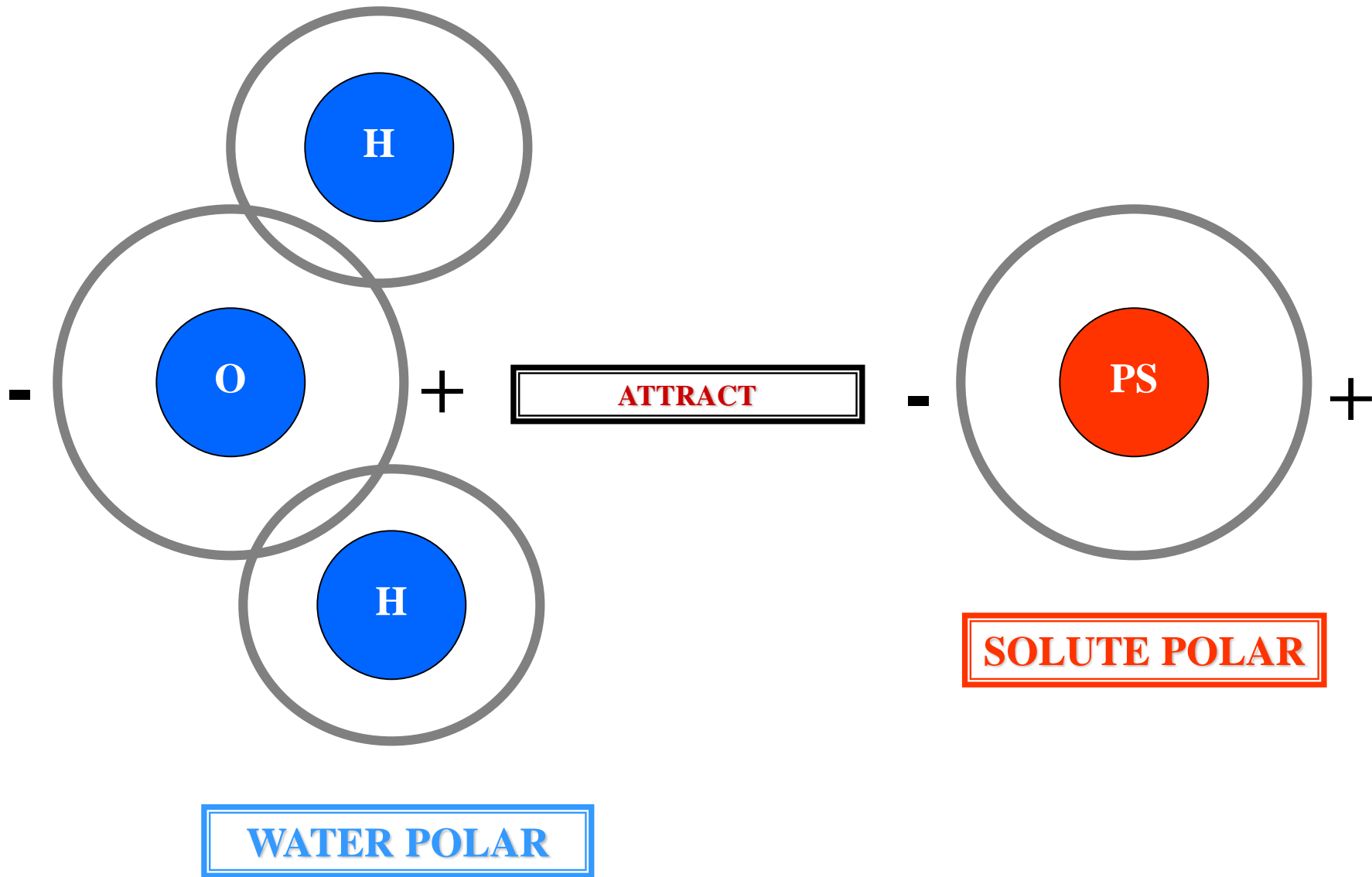


WATER POLAR

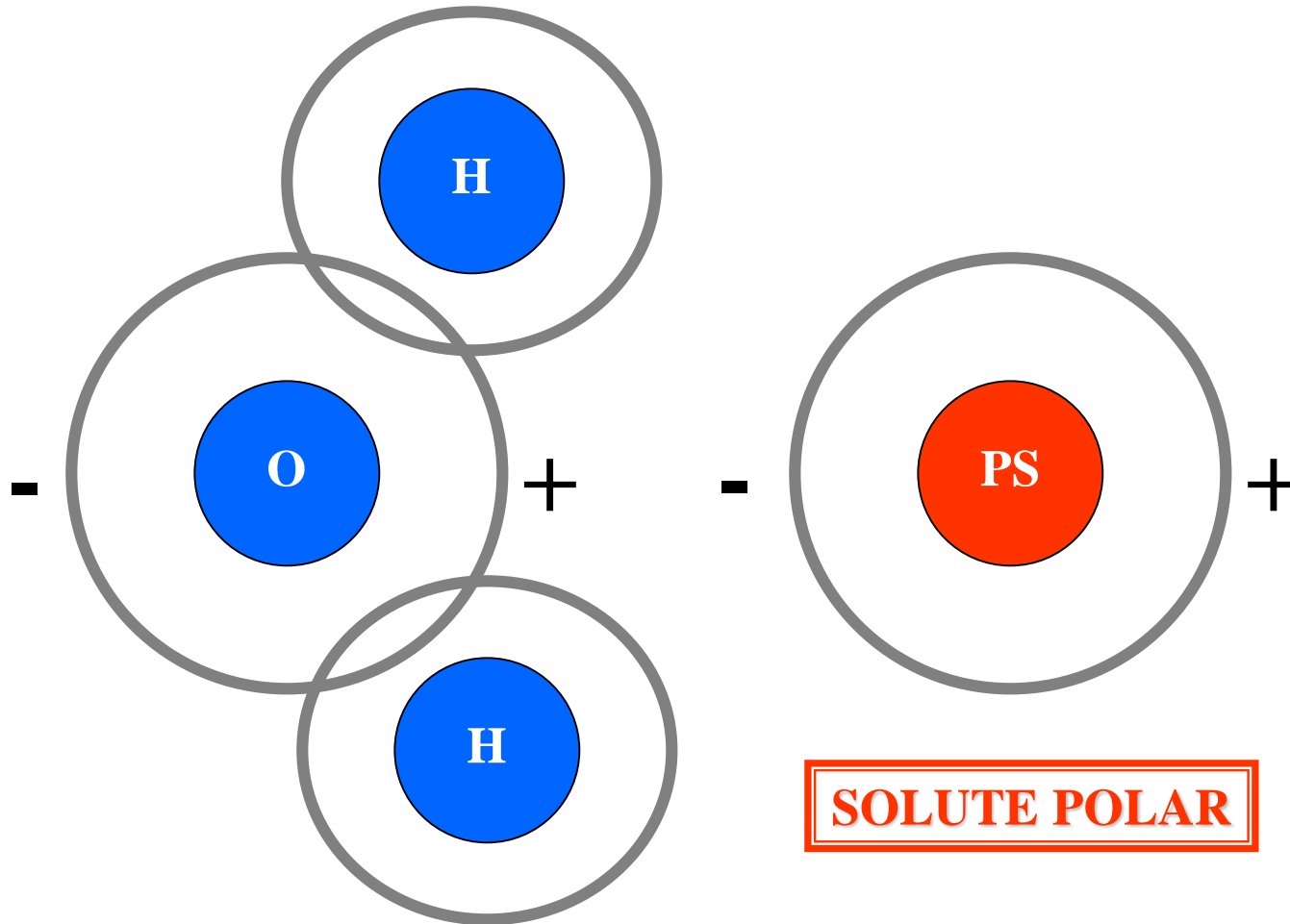


SOLUTE POLAR

BONDED WATER



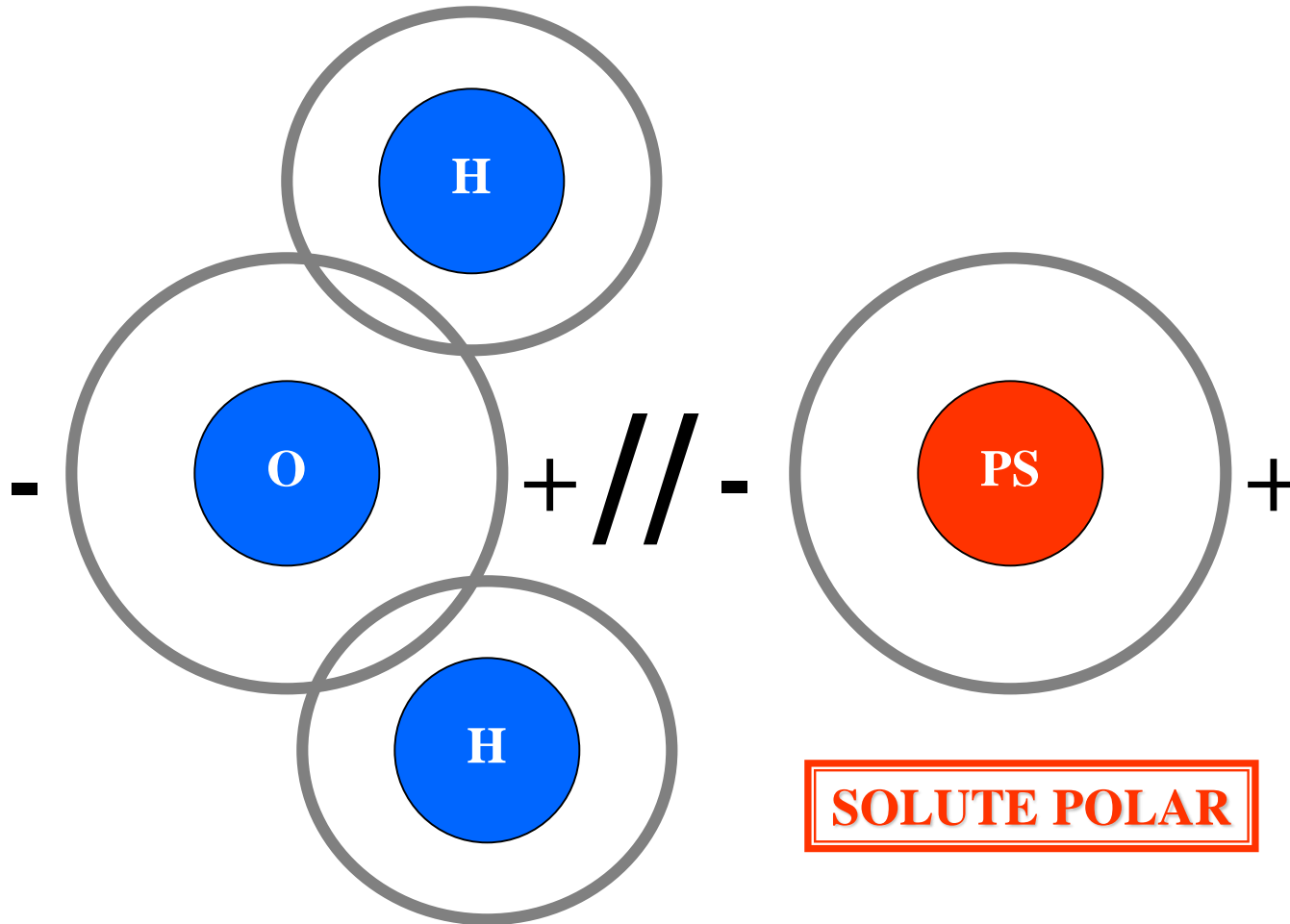
BONDED WATER



WATER POLAR

SOLUTE POLAR

BONDED WATER

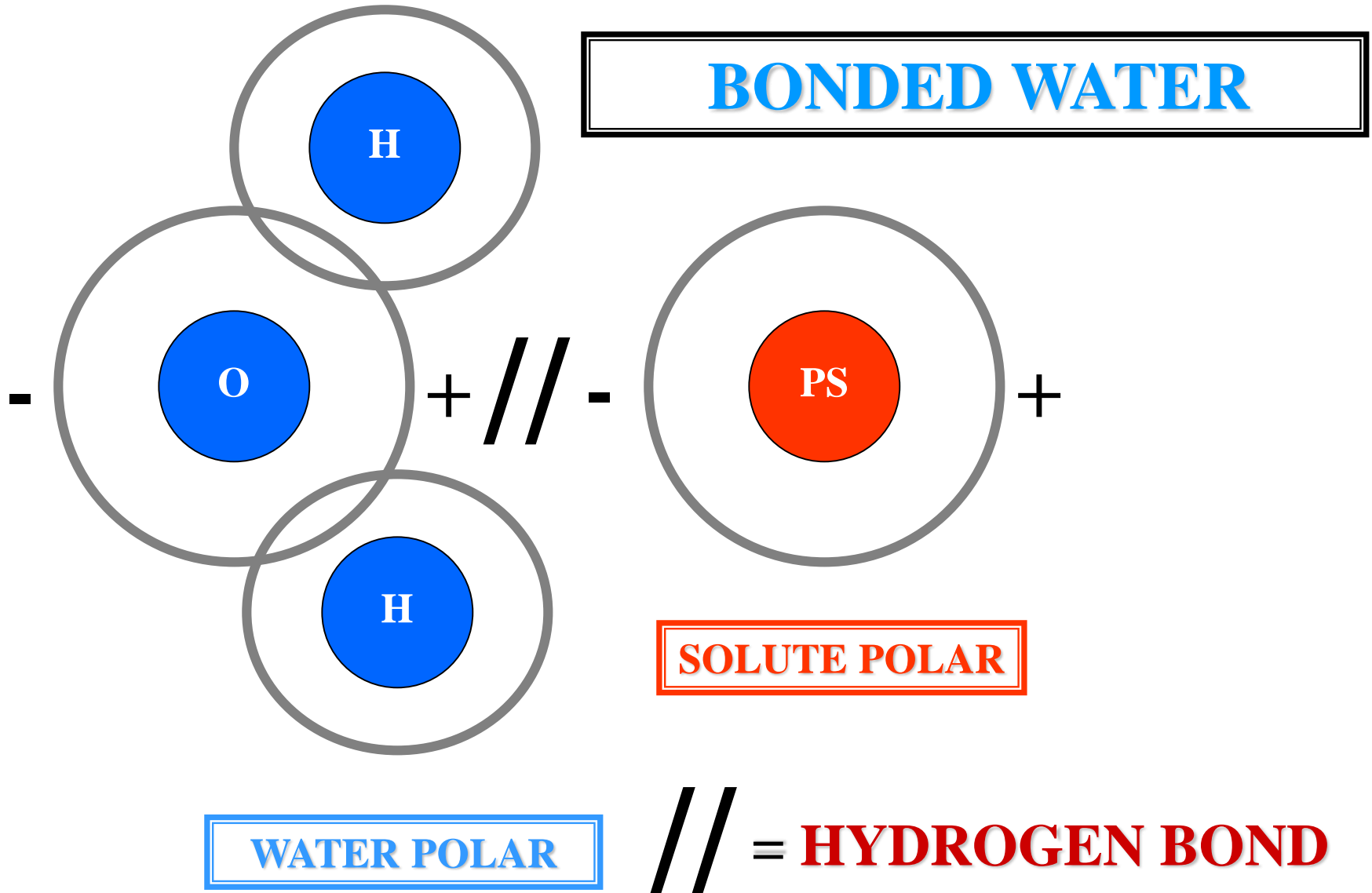


SOLUTE POLAR

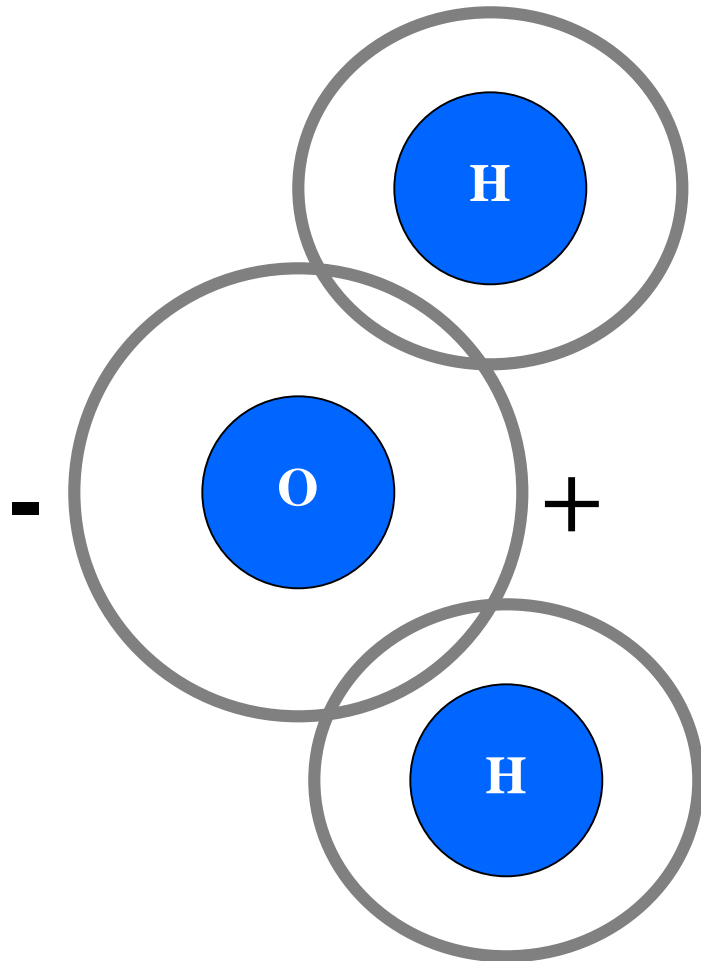
WATER POLAR

// = **HYDROGEN BOND**

BONDED WATER



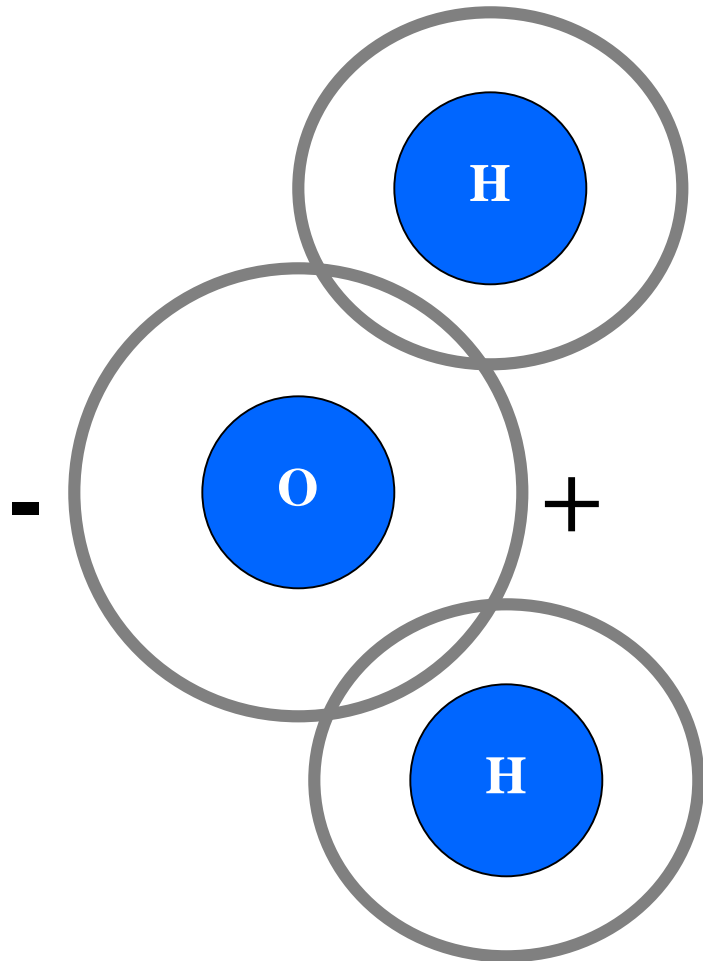
FREE WATER



**SOME WATER
DOES NOT
FORM
HYDROGEN BONDS
WITH POLAR SOLUTE**

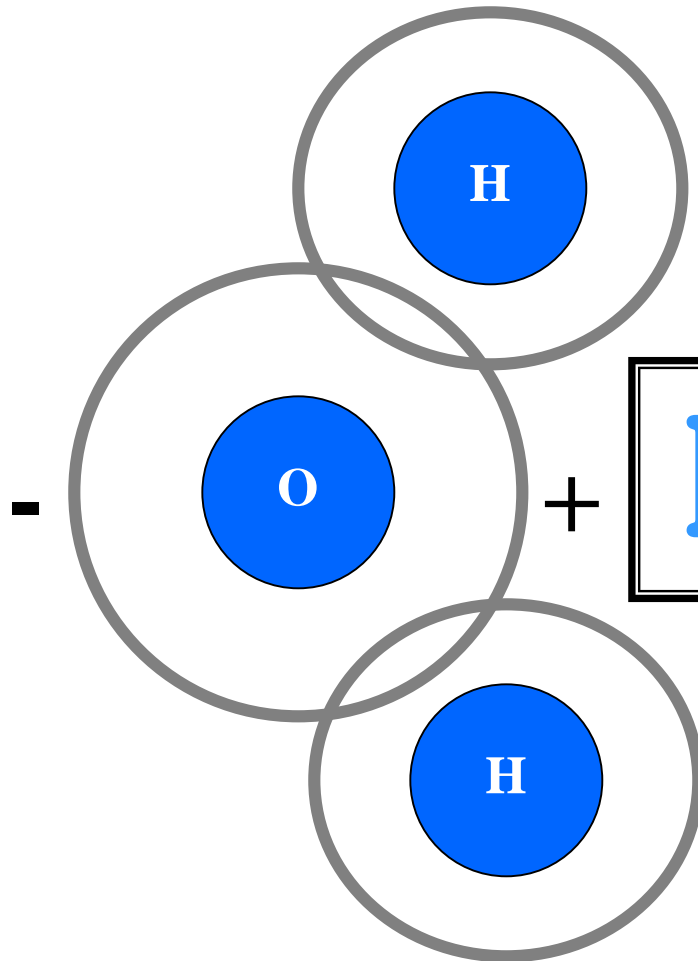
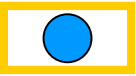
WATER POLAR

FREE WATER



WATER POLAR

FREE WATER



+

FREE WATER

WATER POLAR

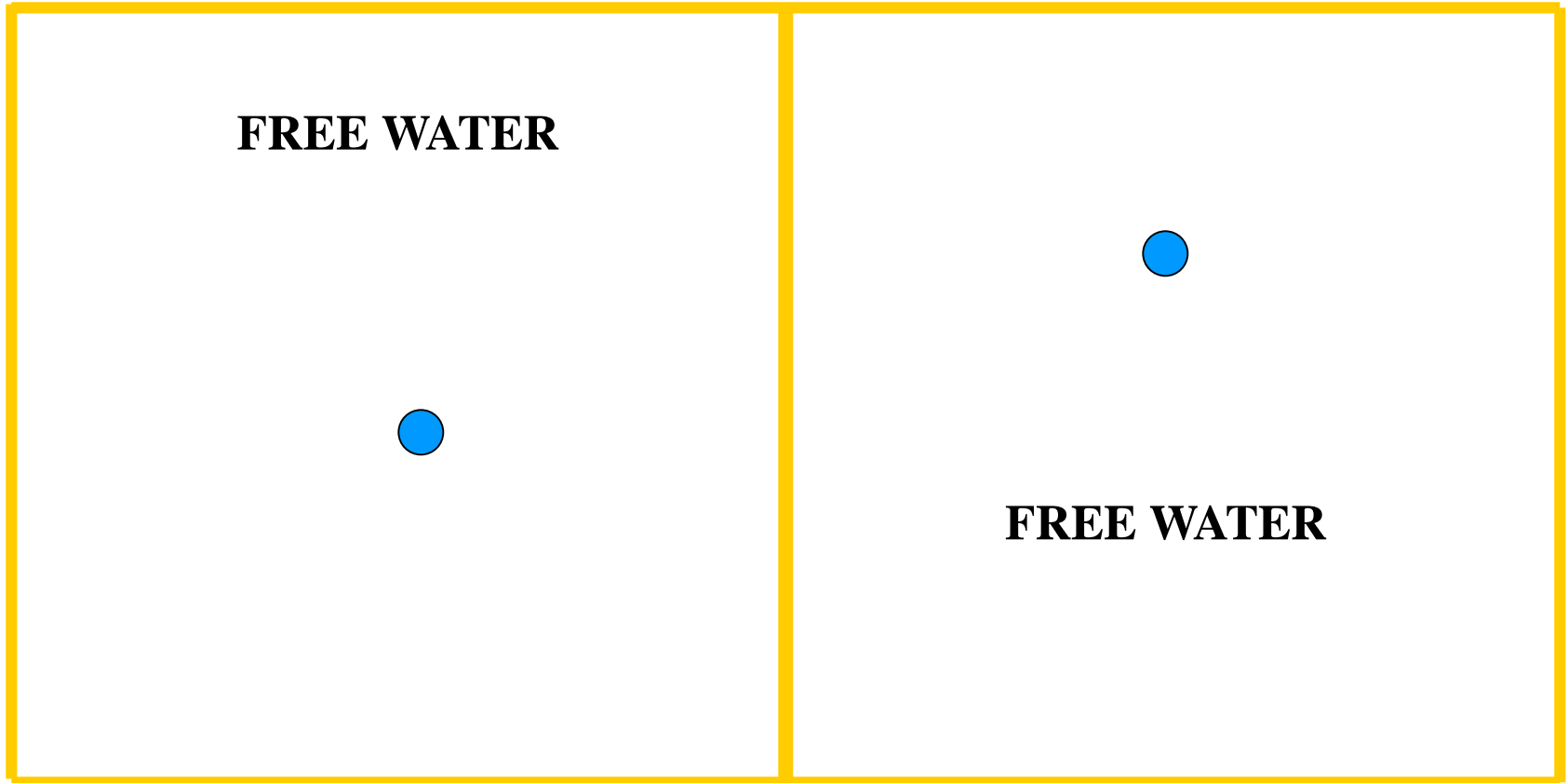


OSMOSIS

FREE WATER

CELL A

CELL B



FREE WATER



FREE WATER

 = WATER MOLECULE

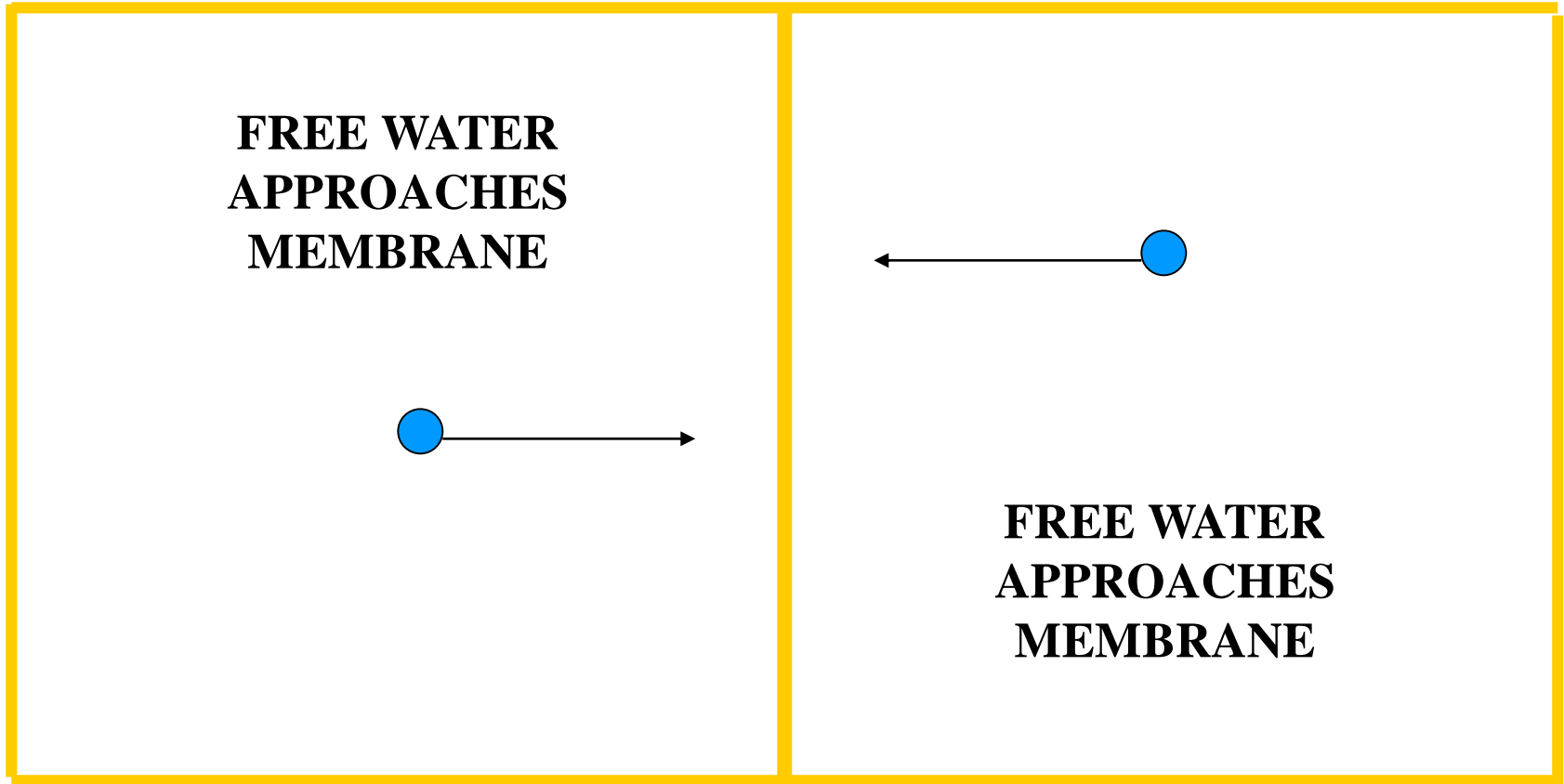
 = MEMBRANE

OSMOSIS

CELL A

FREE WATER

CELL B



● = WATER MOLECULE

— = MEMBRANE

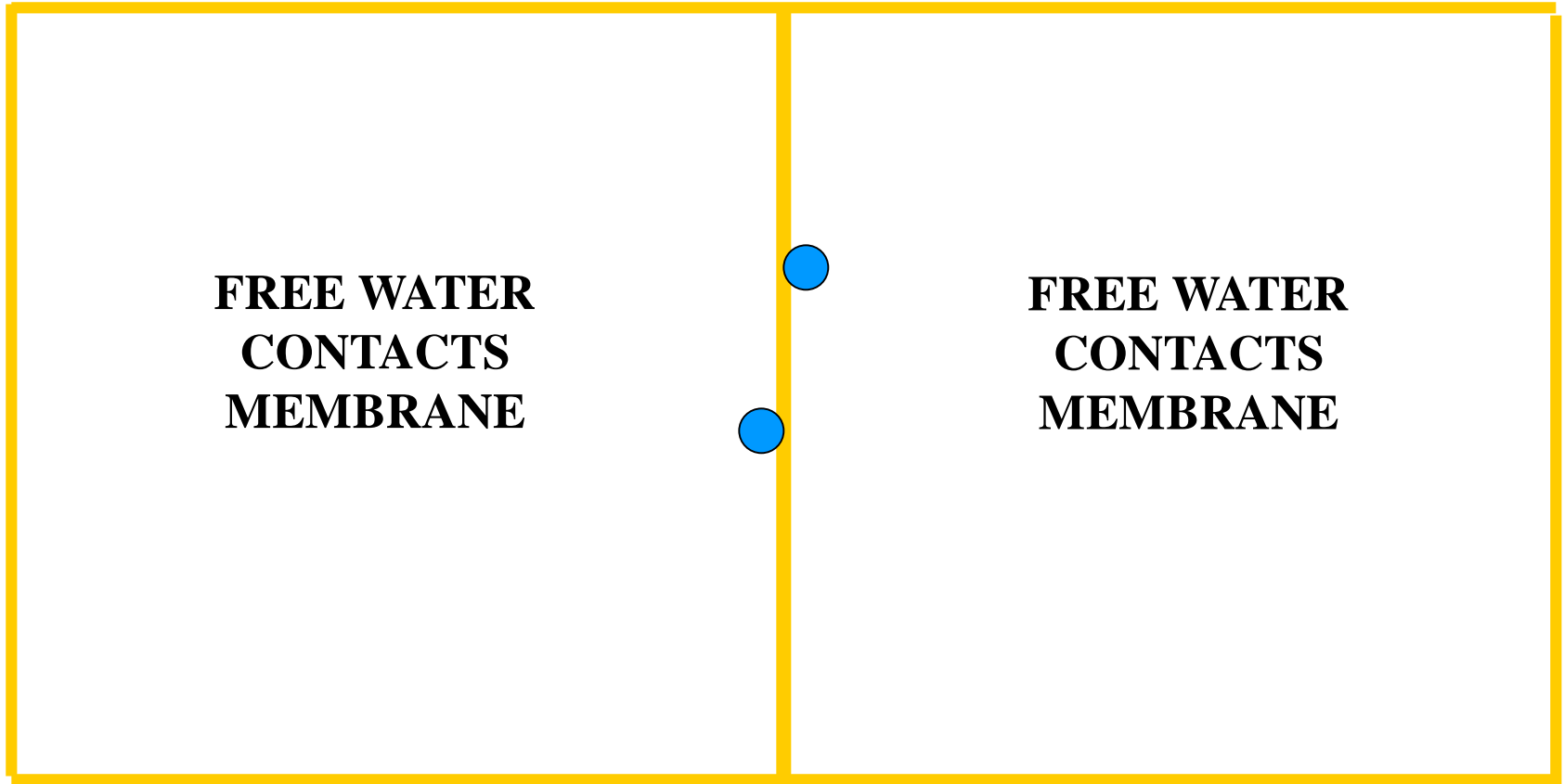


OSMOSIS

CELL A

FREE WATER

CELL B



 = WATER MOLECULE

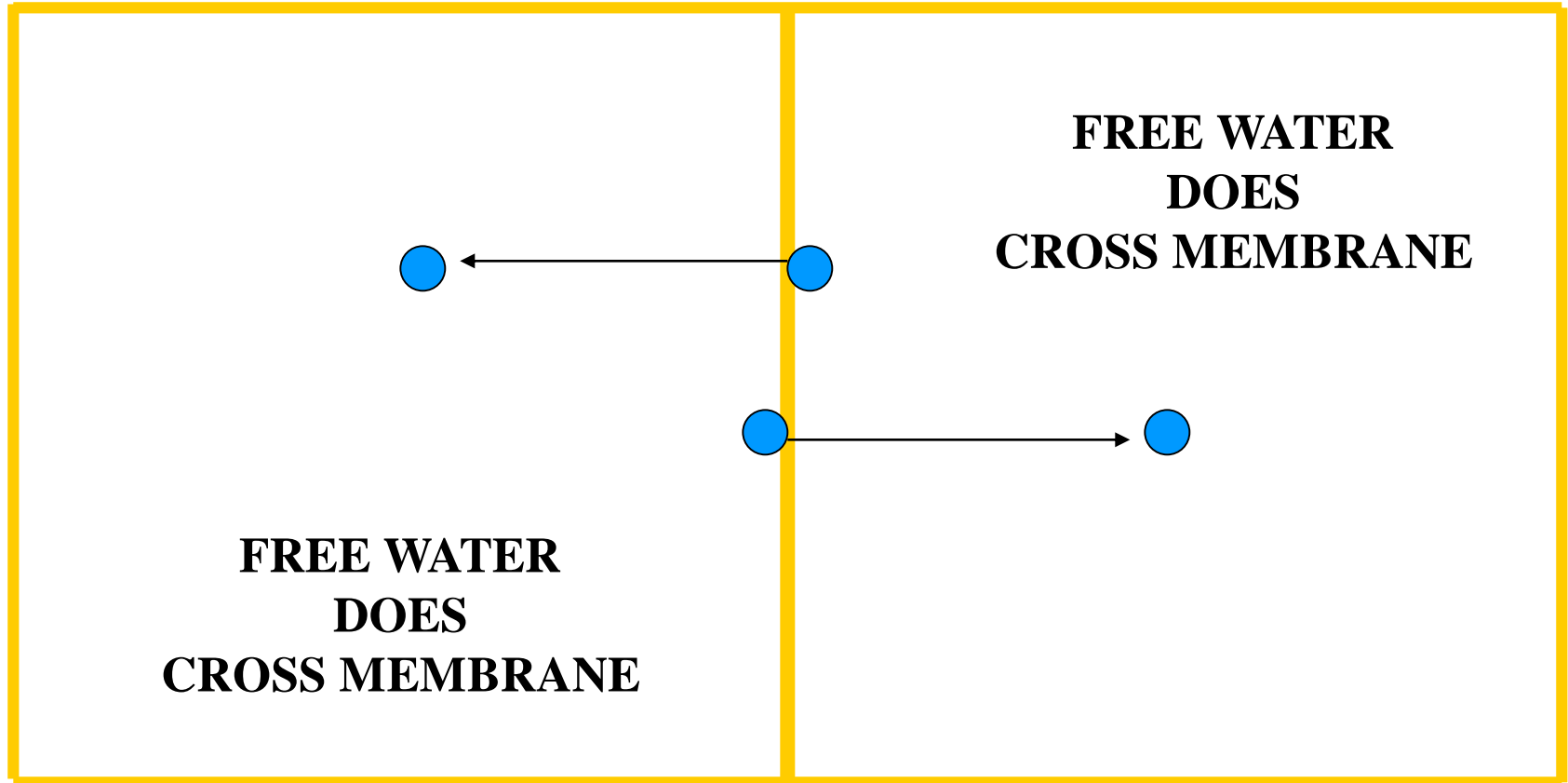
 = MEMBRANE

OSMOSIS

CELL A

FREE WATER

CELL B



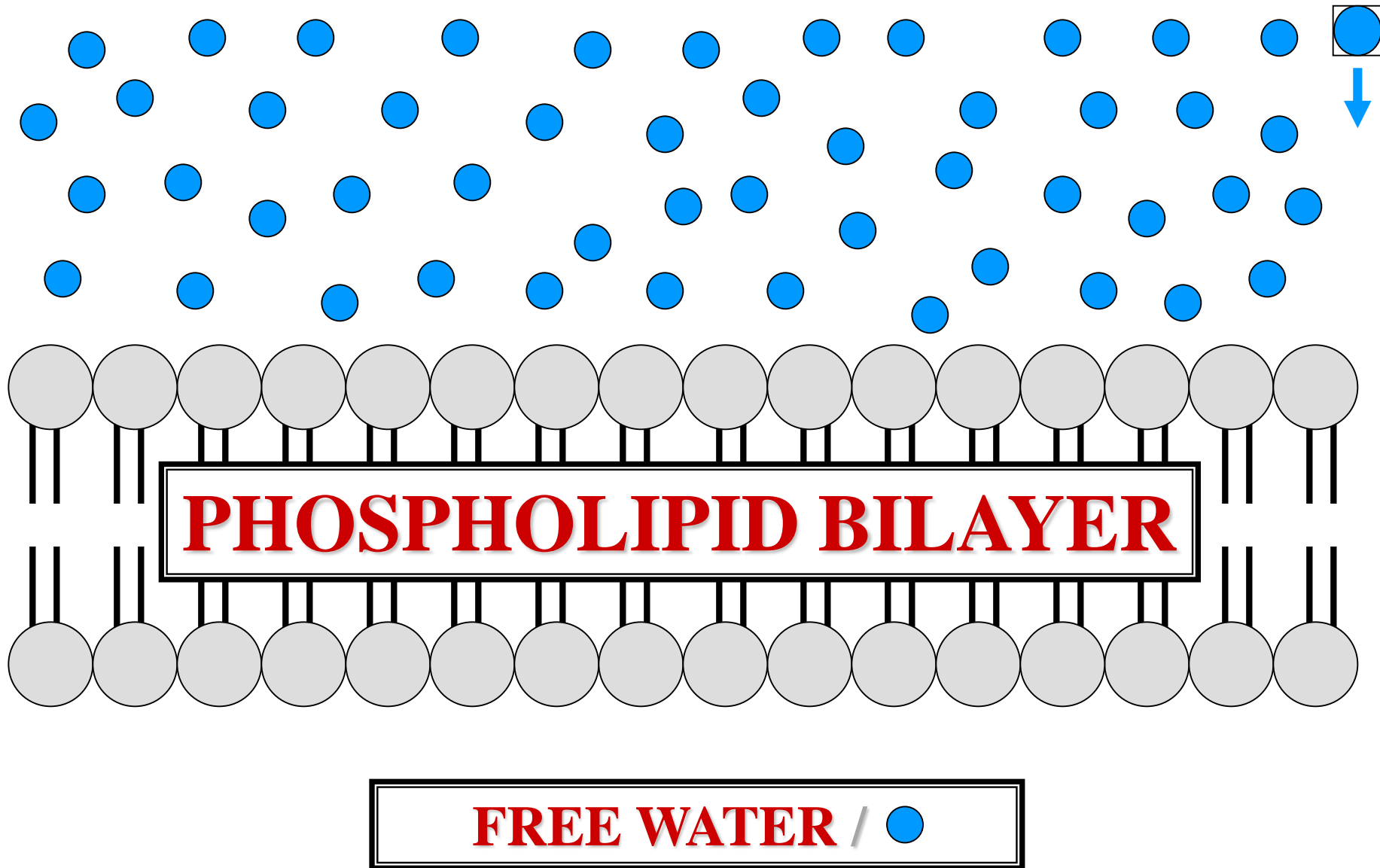
● = WATER MOLECULE

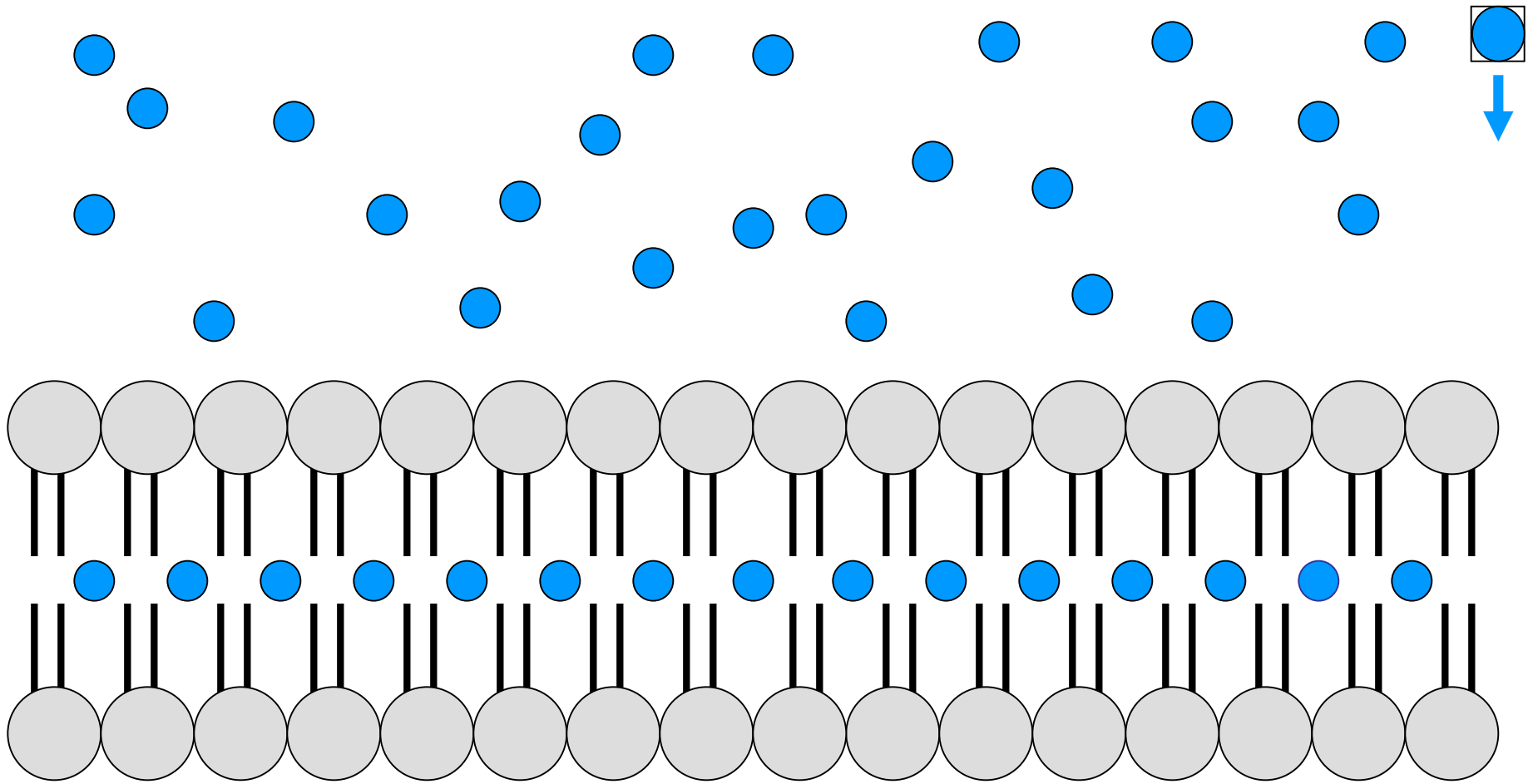
— = MEMBRANE



OSMOSIS
FREE WATER

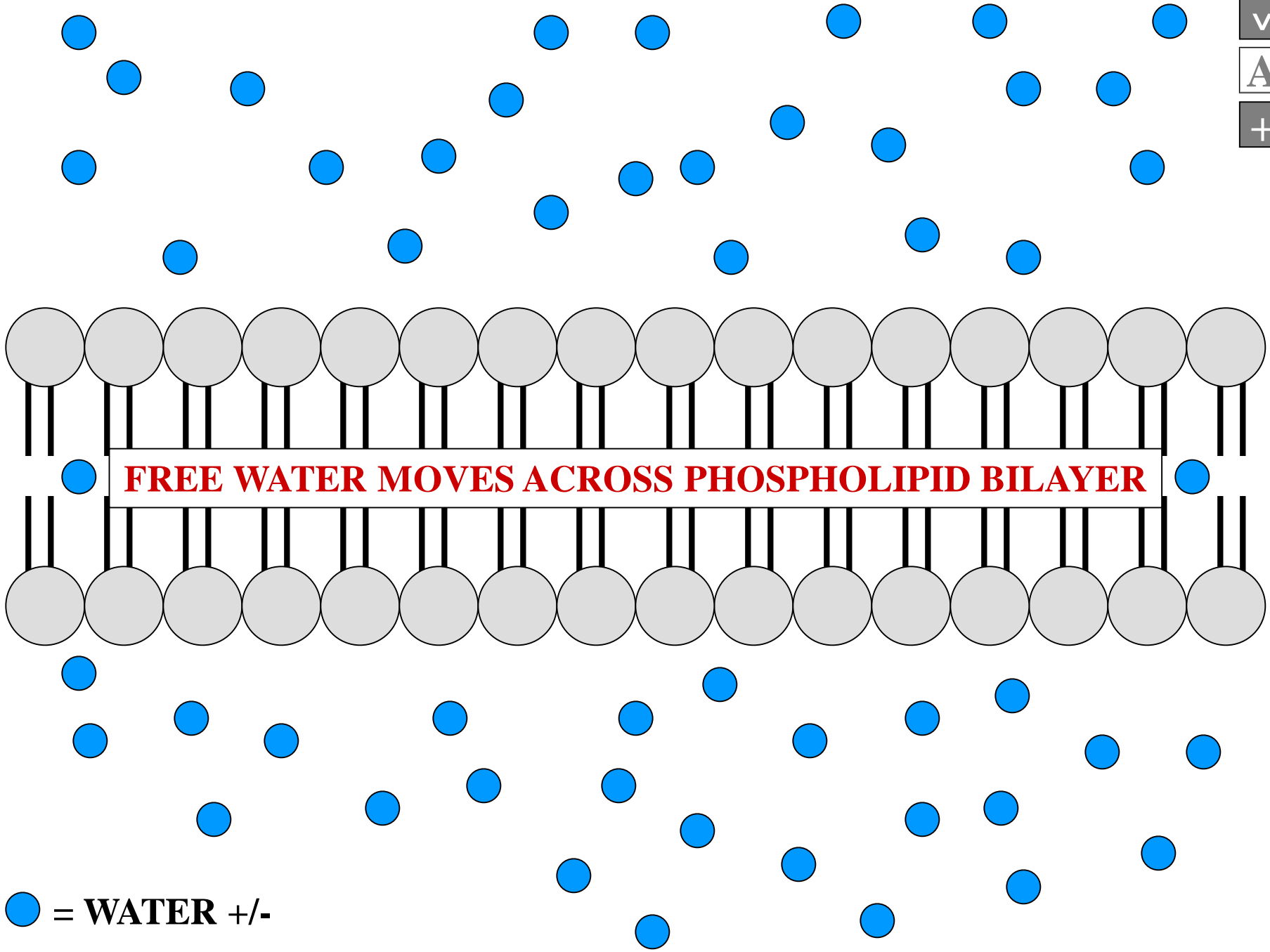
PHOSPHOLIPID
BILAYER





FREE WATER / ●

● = WATER +/-



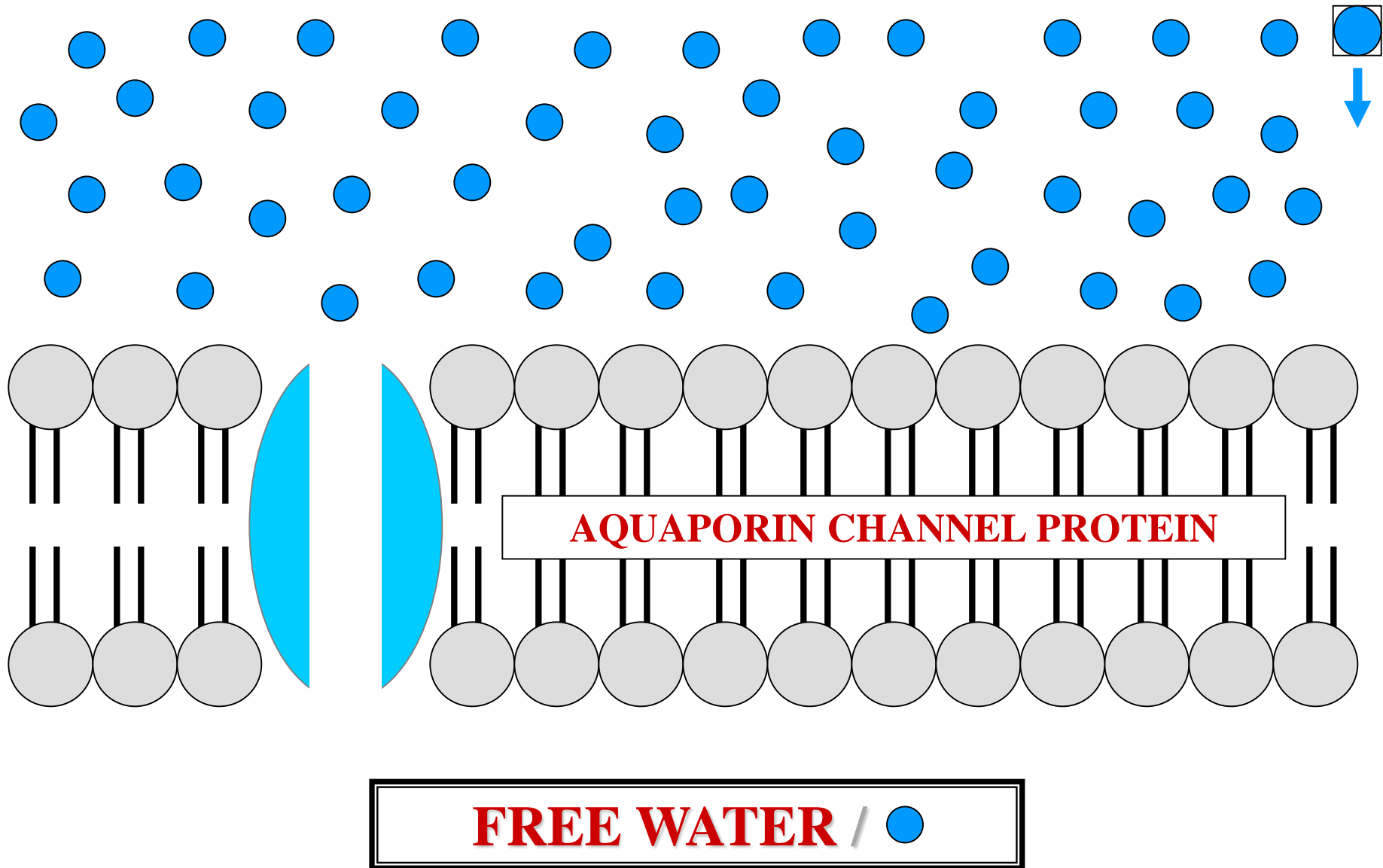
FREE WATER MOVES ACROSS PHOSPHOLIPID BILAYER

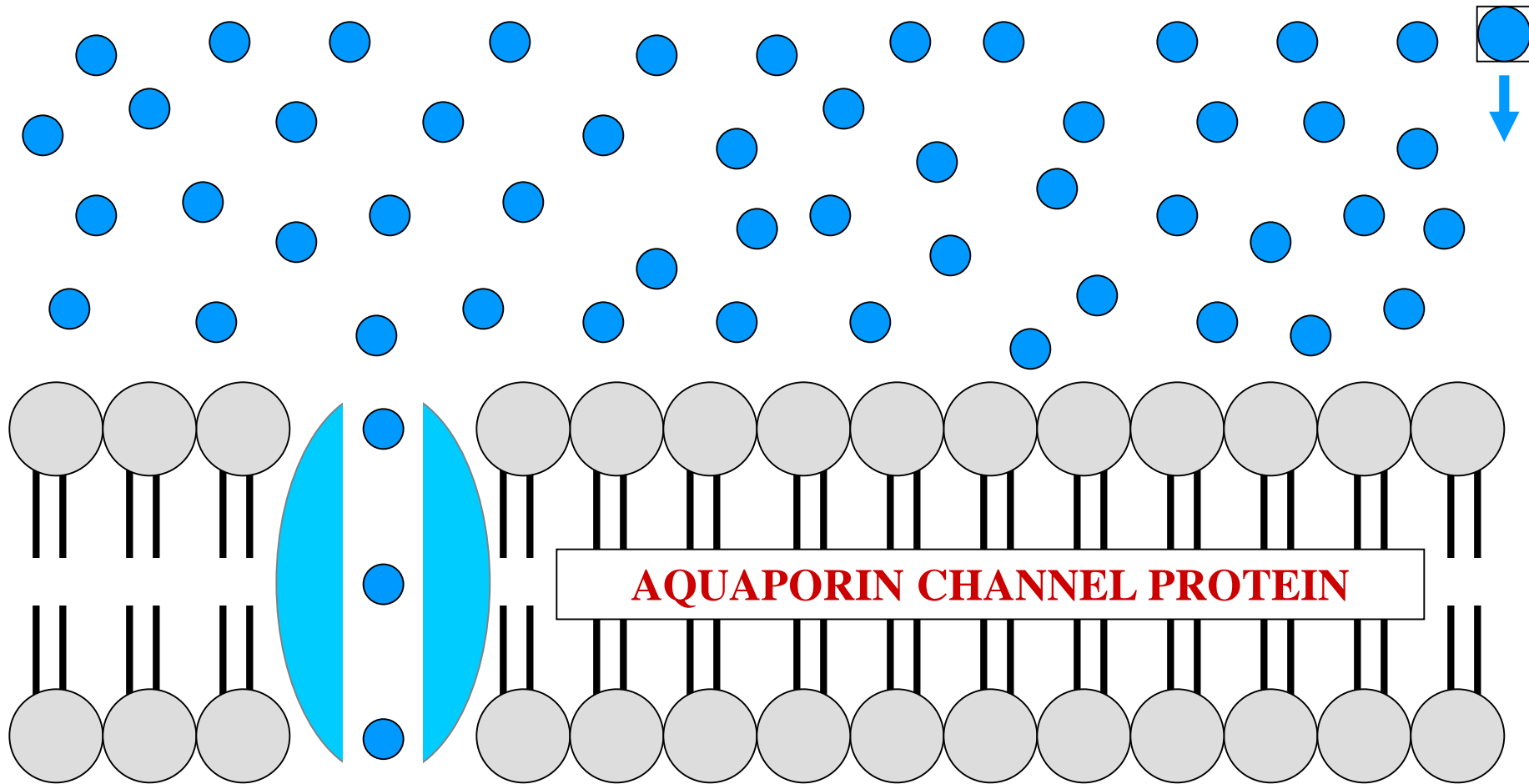
● = WATER +/-



**OSMOSIS
FREE WATER**

**AQUAPORIN
PROTEIN**

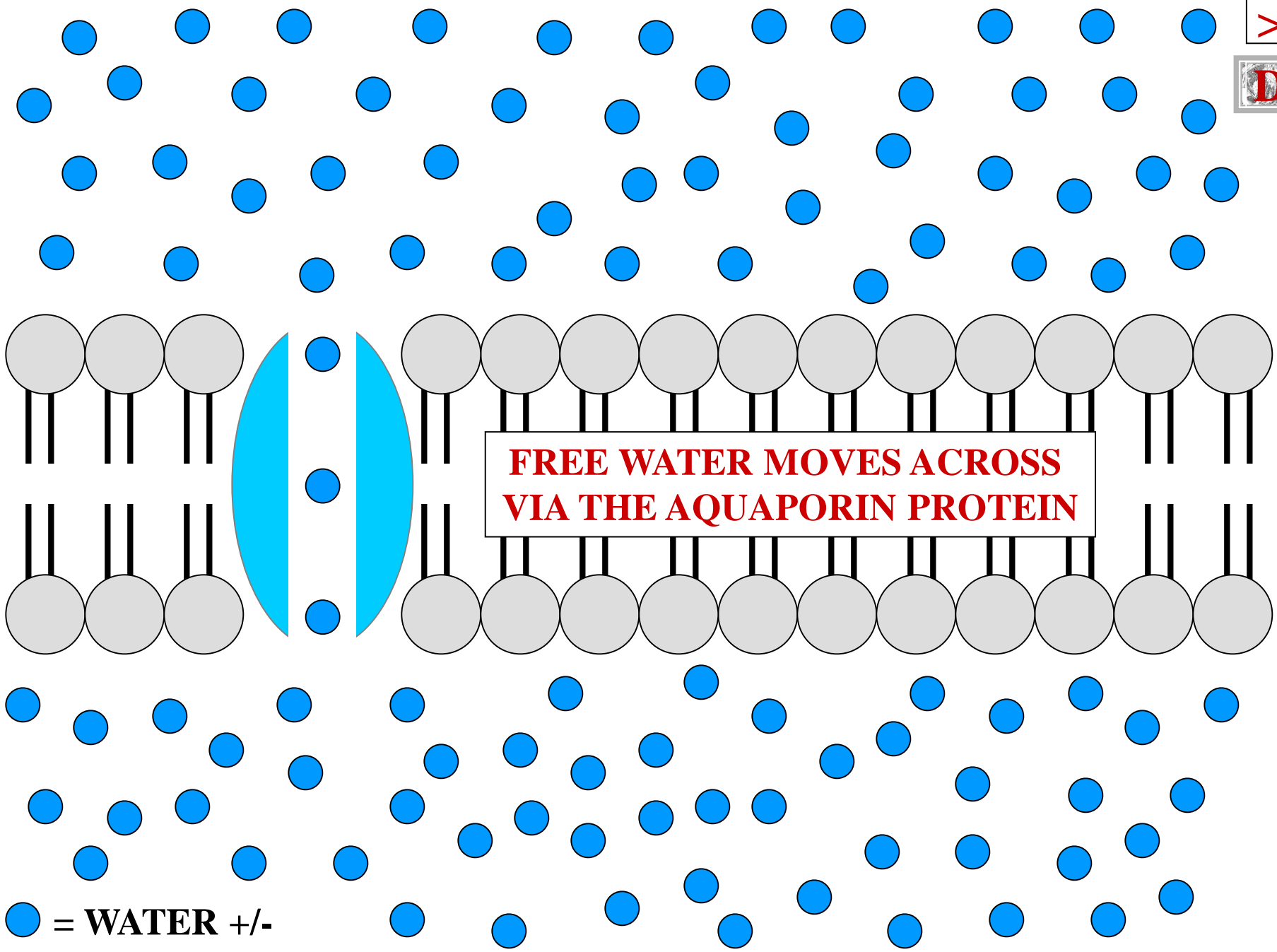




AQUAPORIN CHANNEL PROTEIN

FREE WATER / ●

● = WATER +/-



**FREE WATER MOVES ACROSS
VIA THE AQUAPORIN PROTEIN**

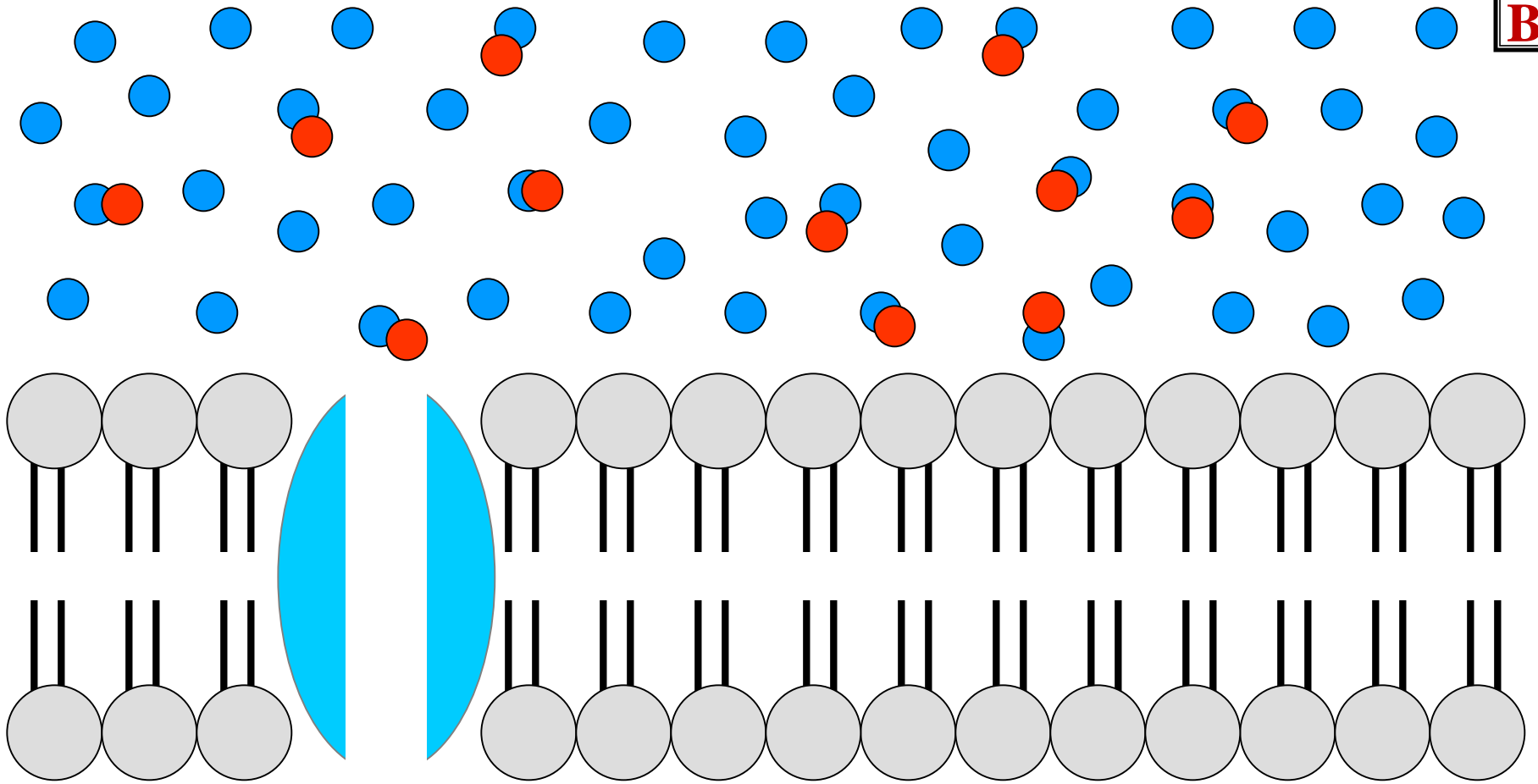
● = WATER +/-



**DURING OSMOSIS
FREE WATER
DOES CROSS
MEMBRANE**

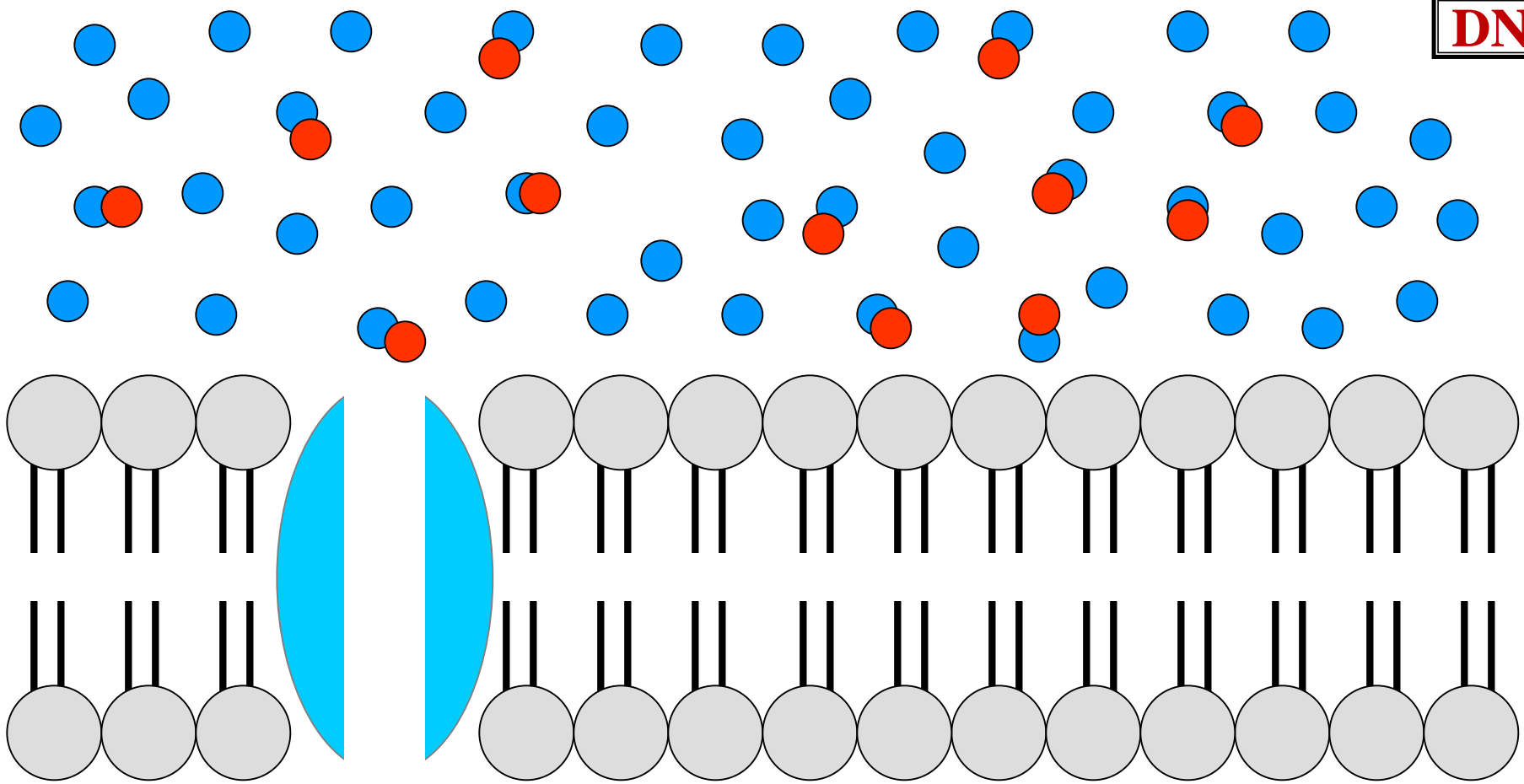


OSMOSIS
BONDED WATER
VS
FREE WATER
SUMMARY



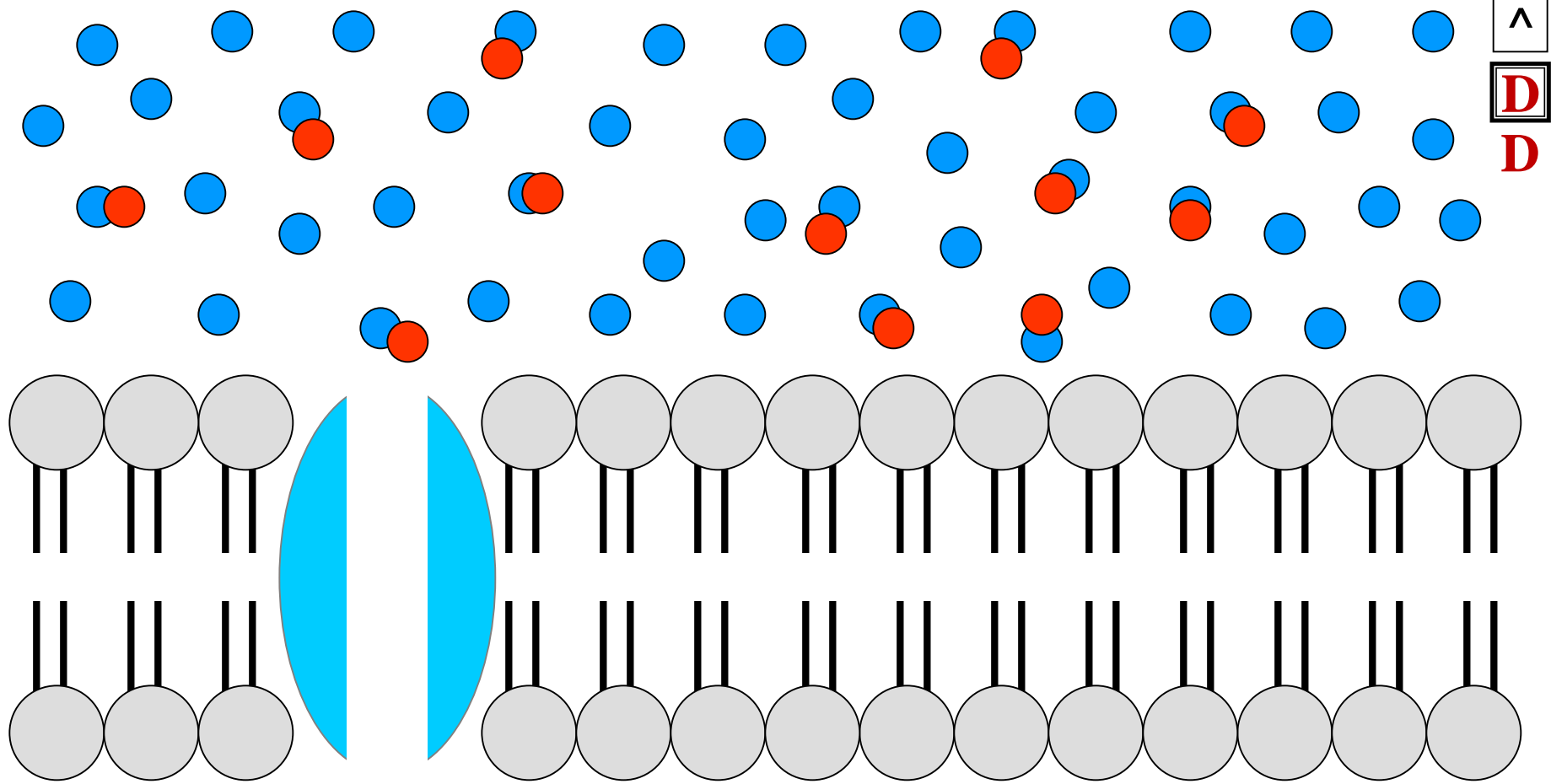
DURING OSMOSIS

● = FREE WATER
●● = BONDED WATER



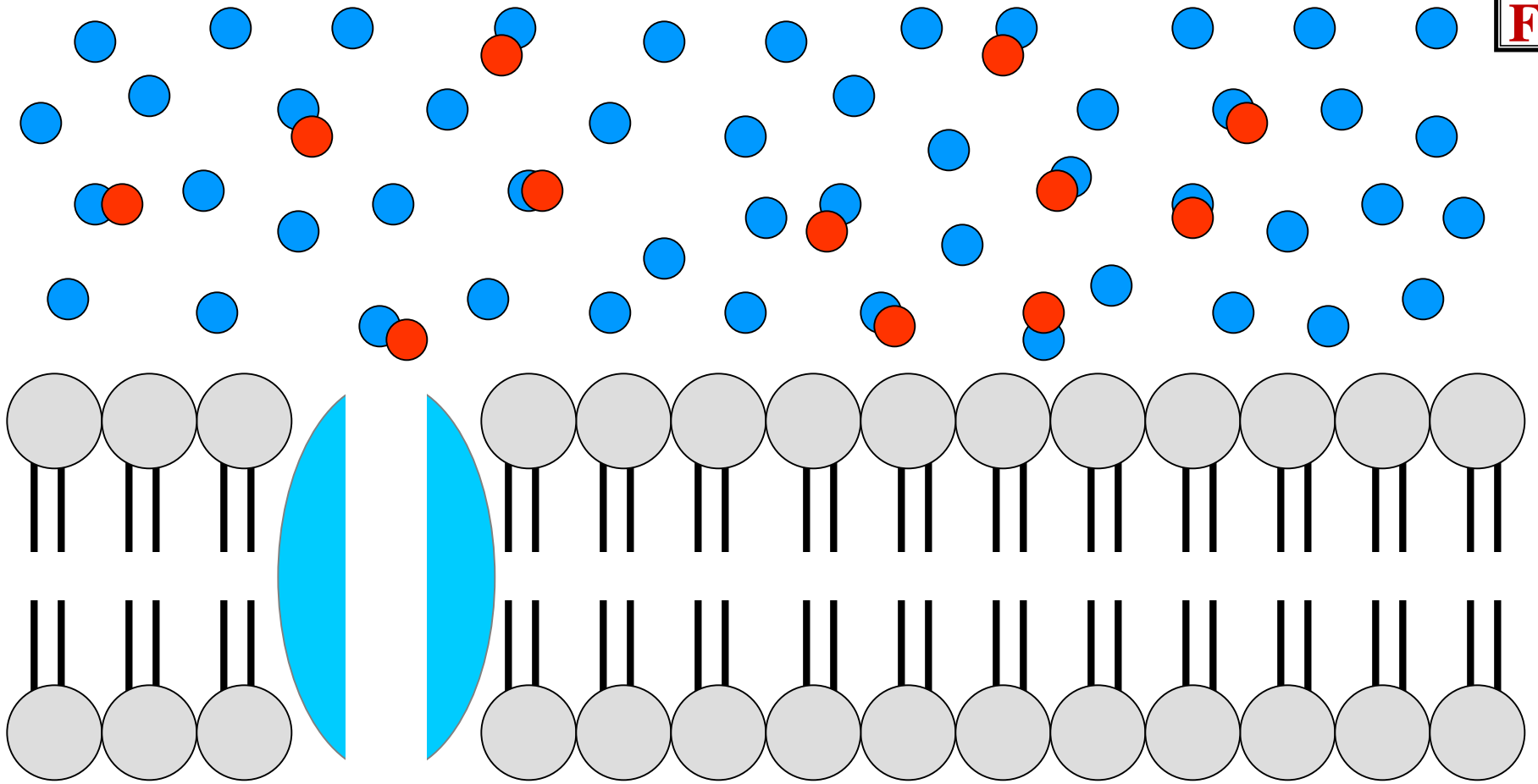
BONDED WATER / 

 = **FREE WATER**
 = **BONDED WATER**



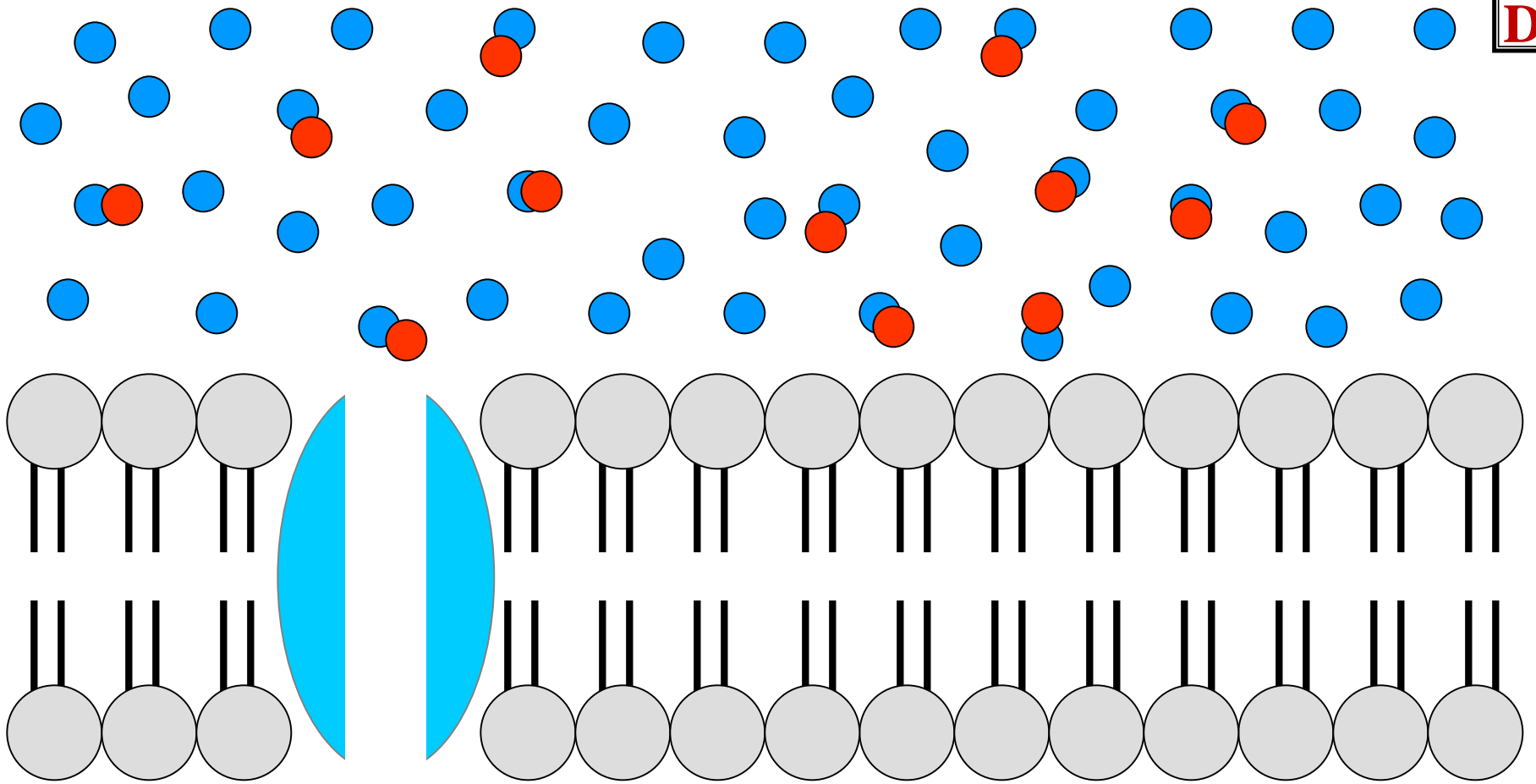
BONDED WATER: DOES NOT CROSS MEMBRANE

-  = FREE WATER
-  = BONDED WATER



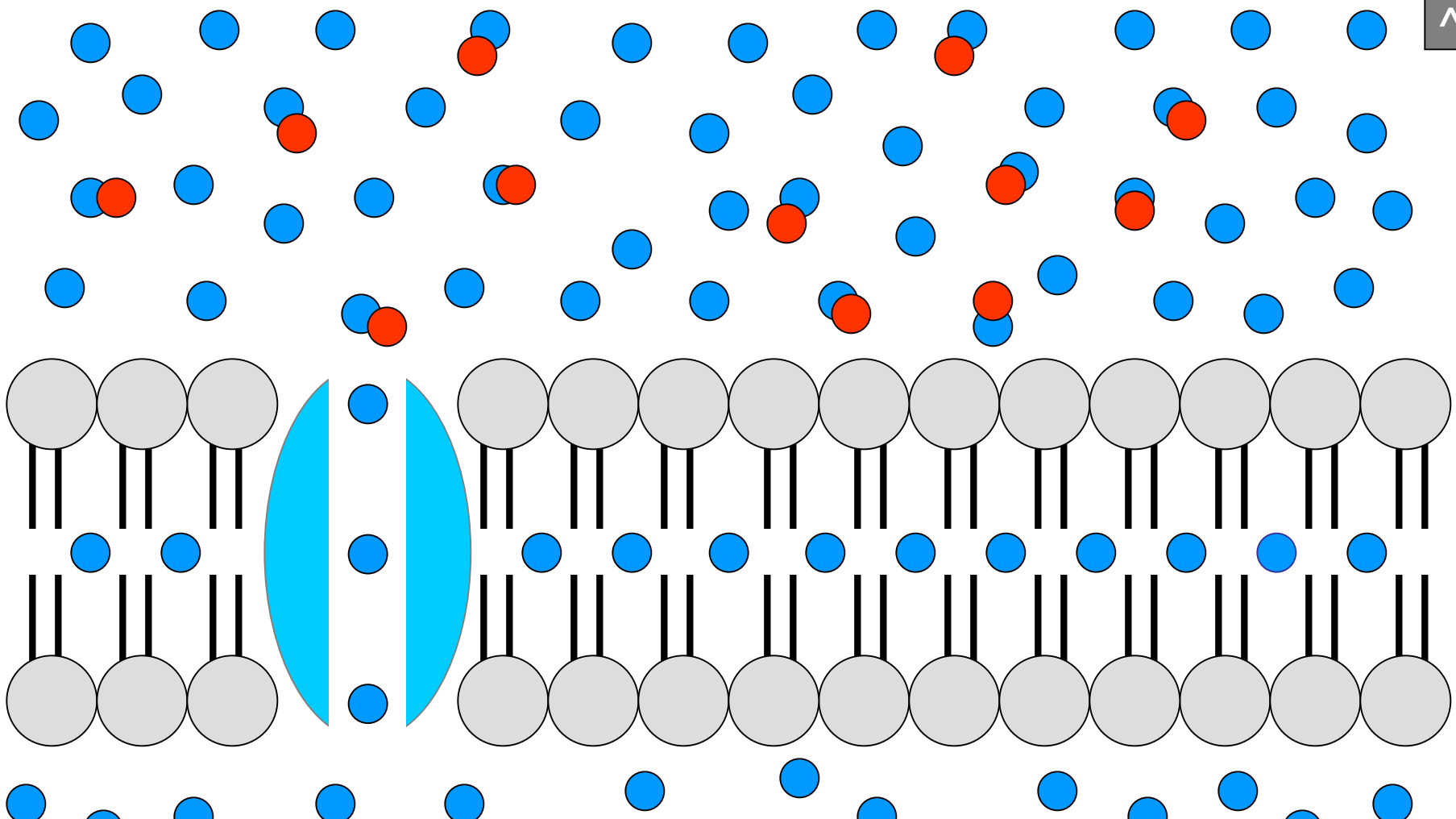
DURING OSMOSIS

● = FREE WATER
●● = BONDED WATER



FREE WATER / ●

● = **FREE WATER**
●● = **BONDED WATER**



FREE WATER: DOES CROSS MEMBRANE

● = FREE WATER
●● = BONDED WATER



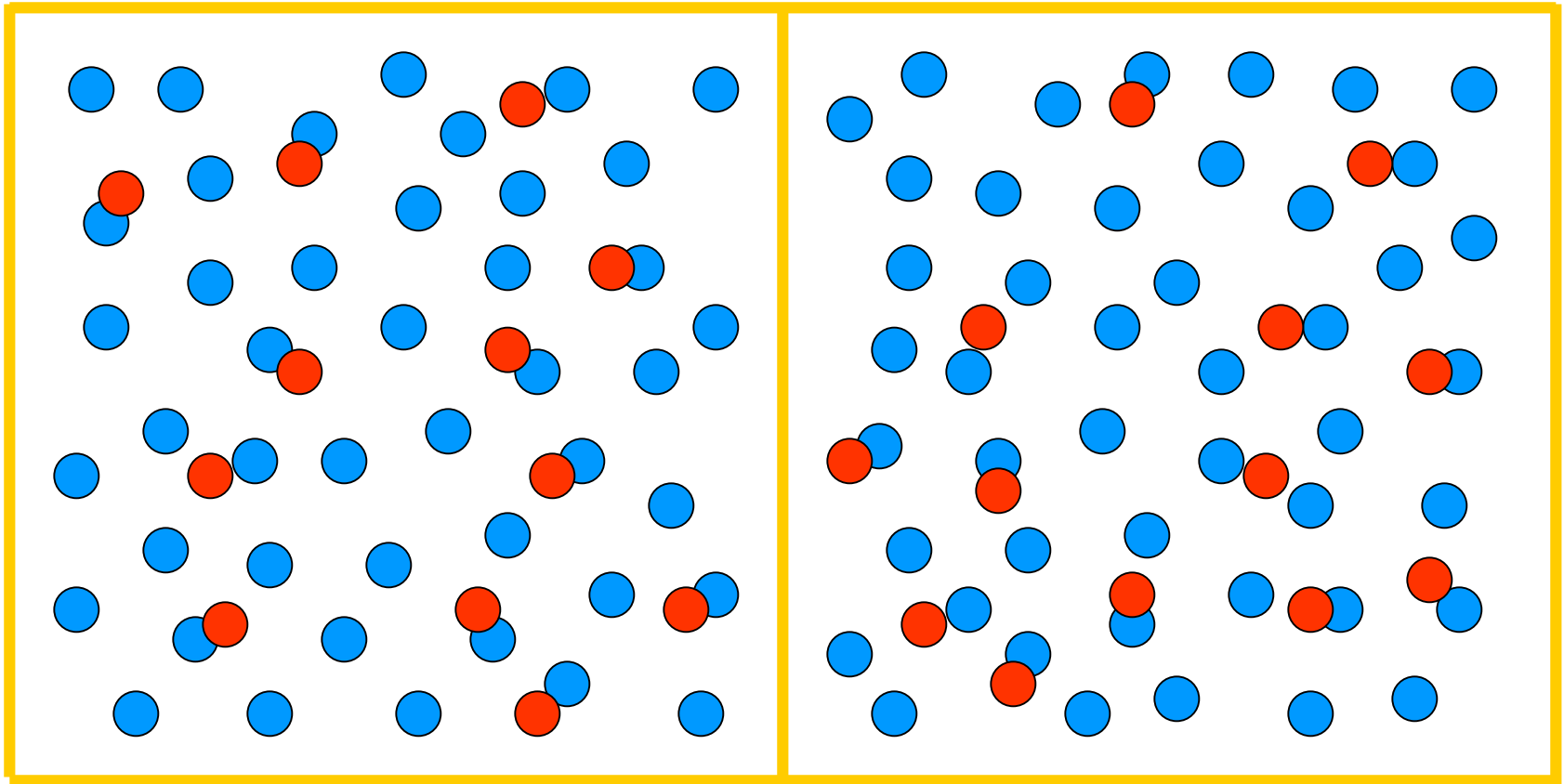
OSMOSIS: APPLIED

OSMOSIS



CELL A

CELL B



 = WATER MOLECULE

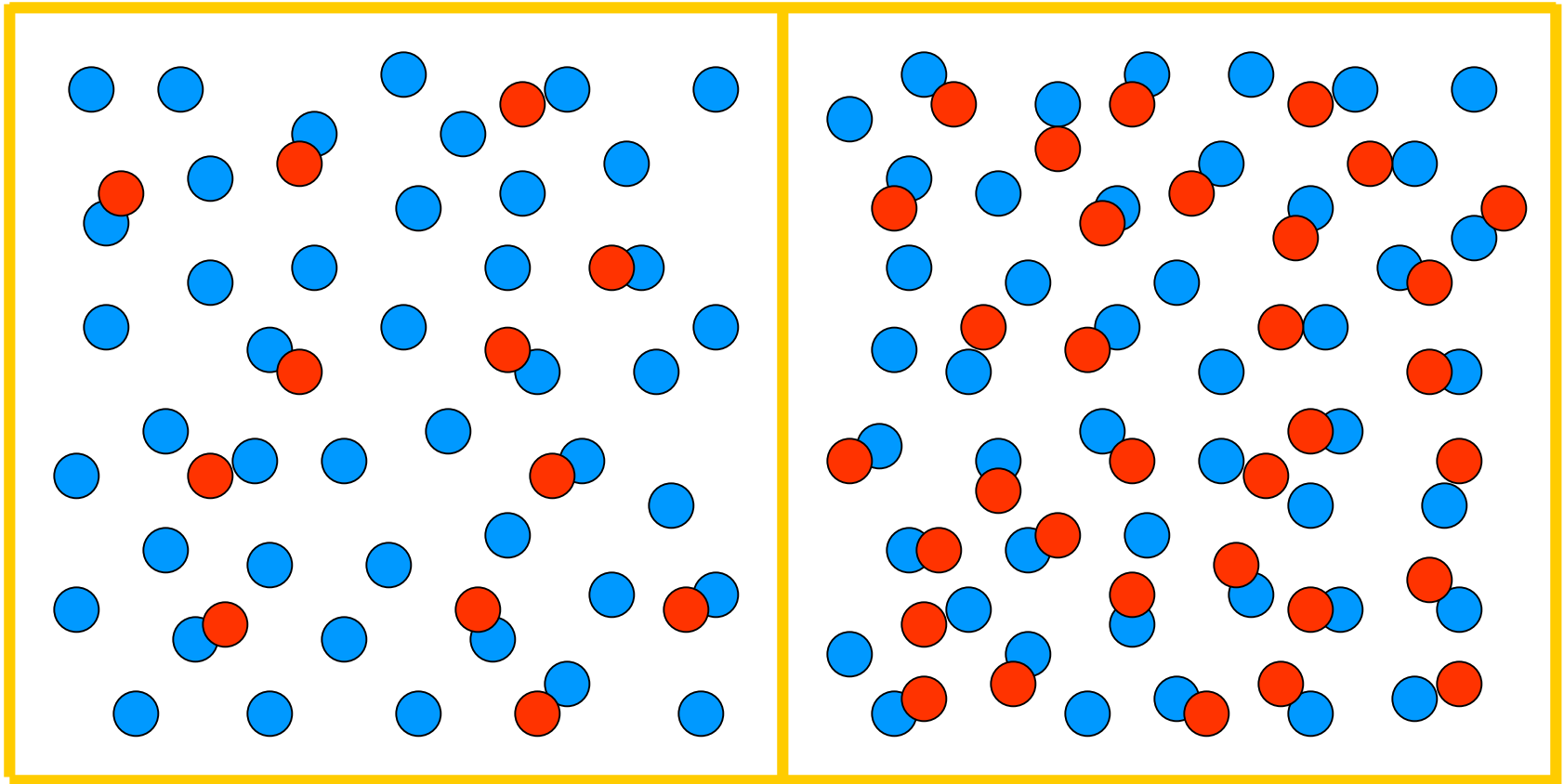
 = POLAR SOLUTE MOLECULE

 = MEMBRANE

OSMOSIS

CELL A

CELL B



● = WATER MOLECULE

● = POLAR SOLUTE MOLECULE

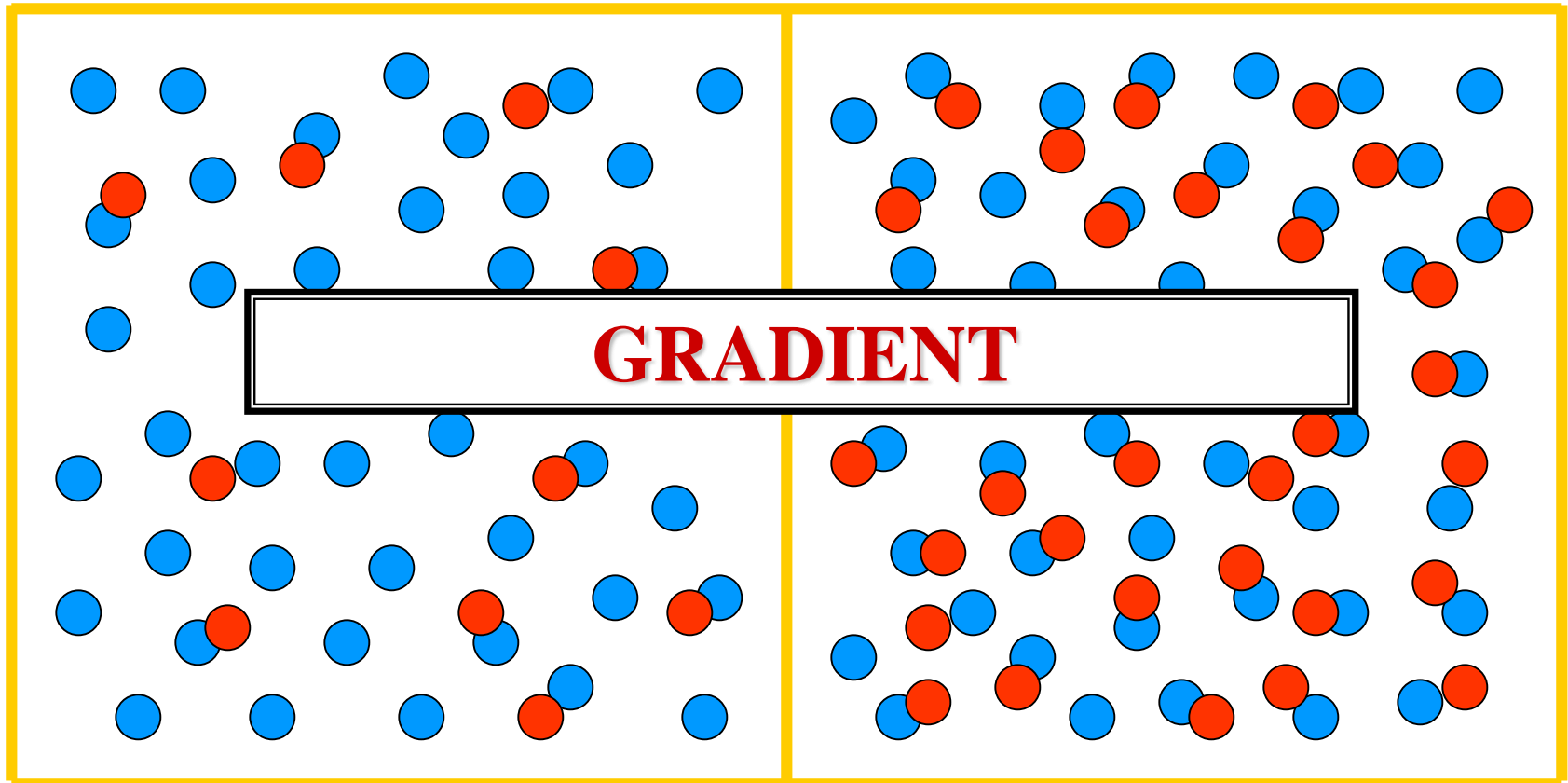
— = MEMBRANE



OSMOSIS

CELL A

CELL B



 = WATER MOLECULE

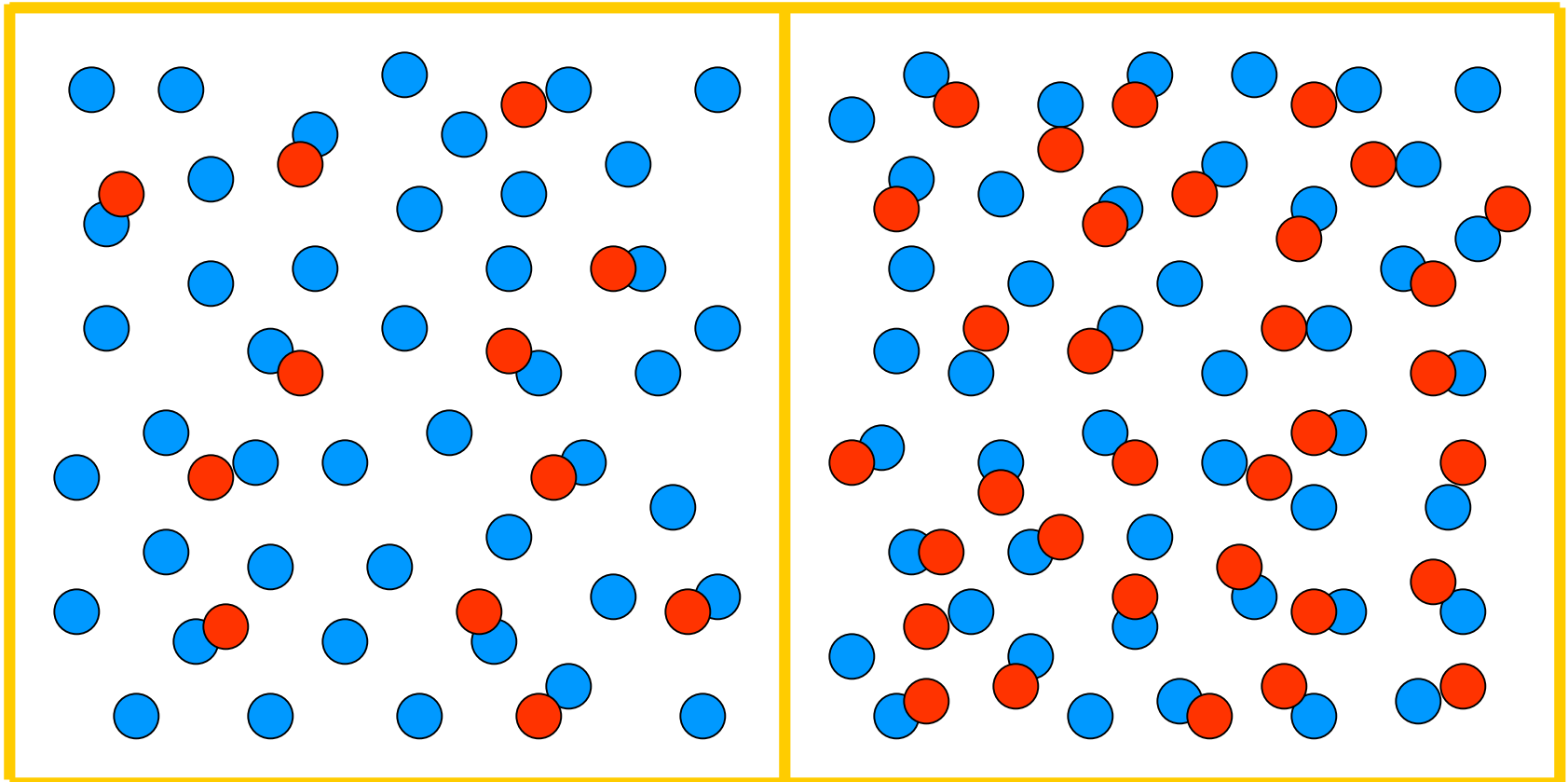
 = POLAR SOLUTE MOLECULE

 = MEMBRANE

OSMOSIS

CELL A

CELL B



 = WATER MOLECULE

 = POLAR SOLUTE MOLECULE

 = MEMBRANE