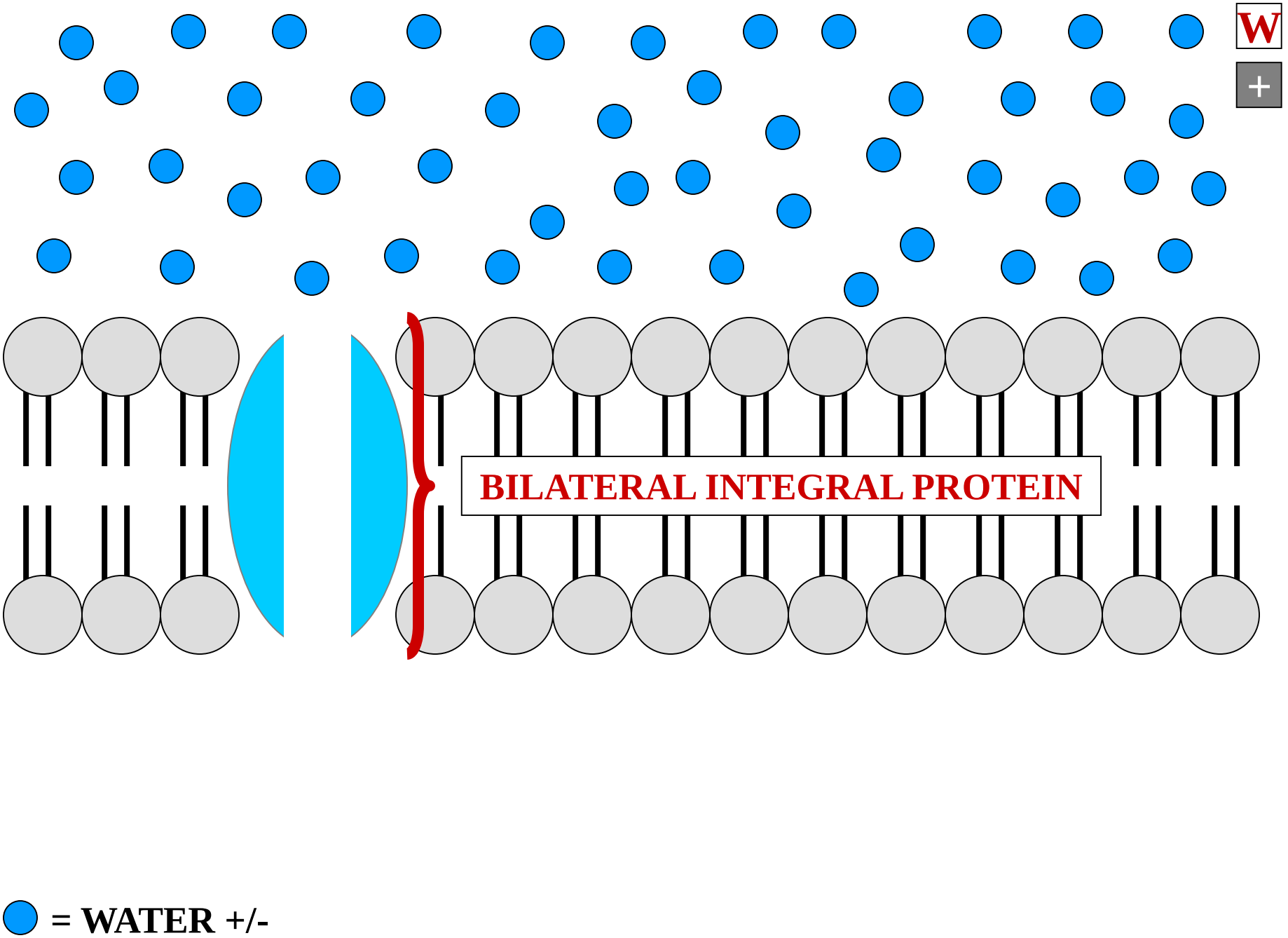
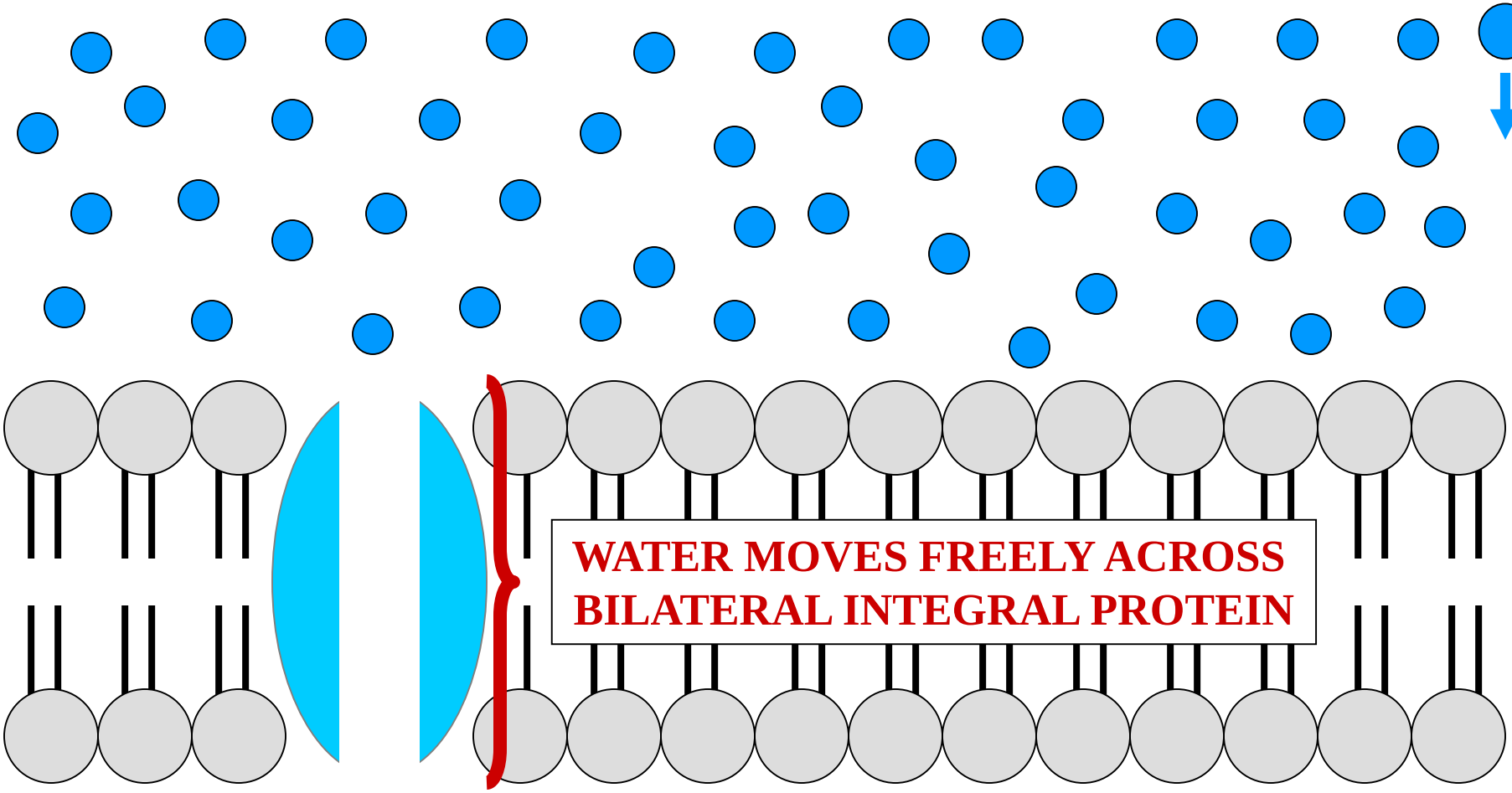
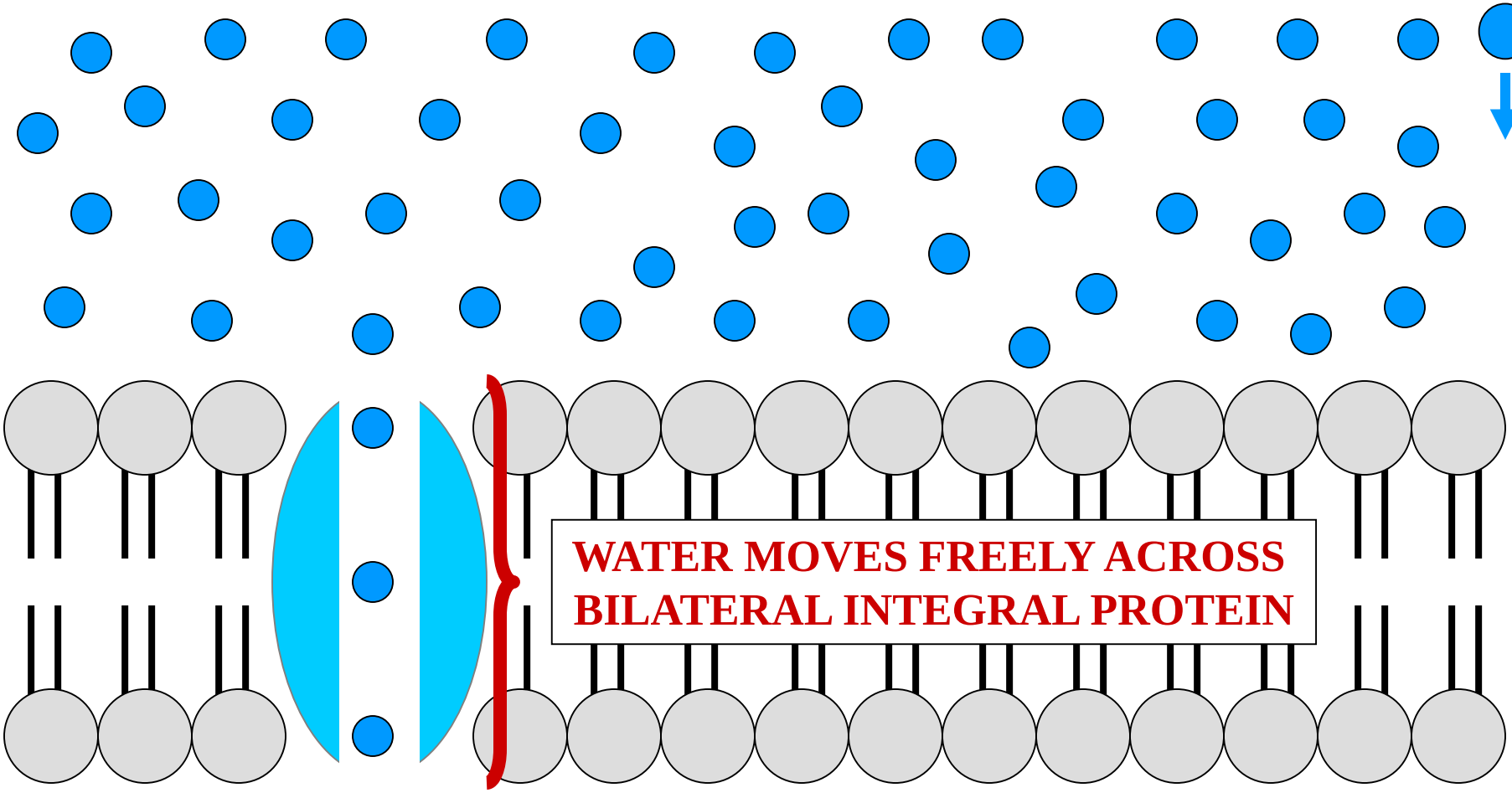
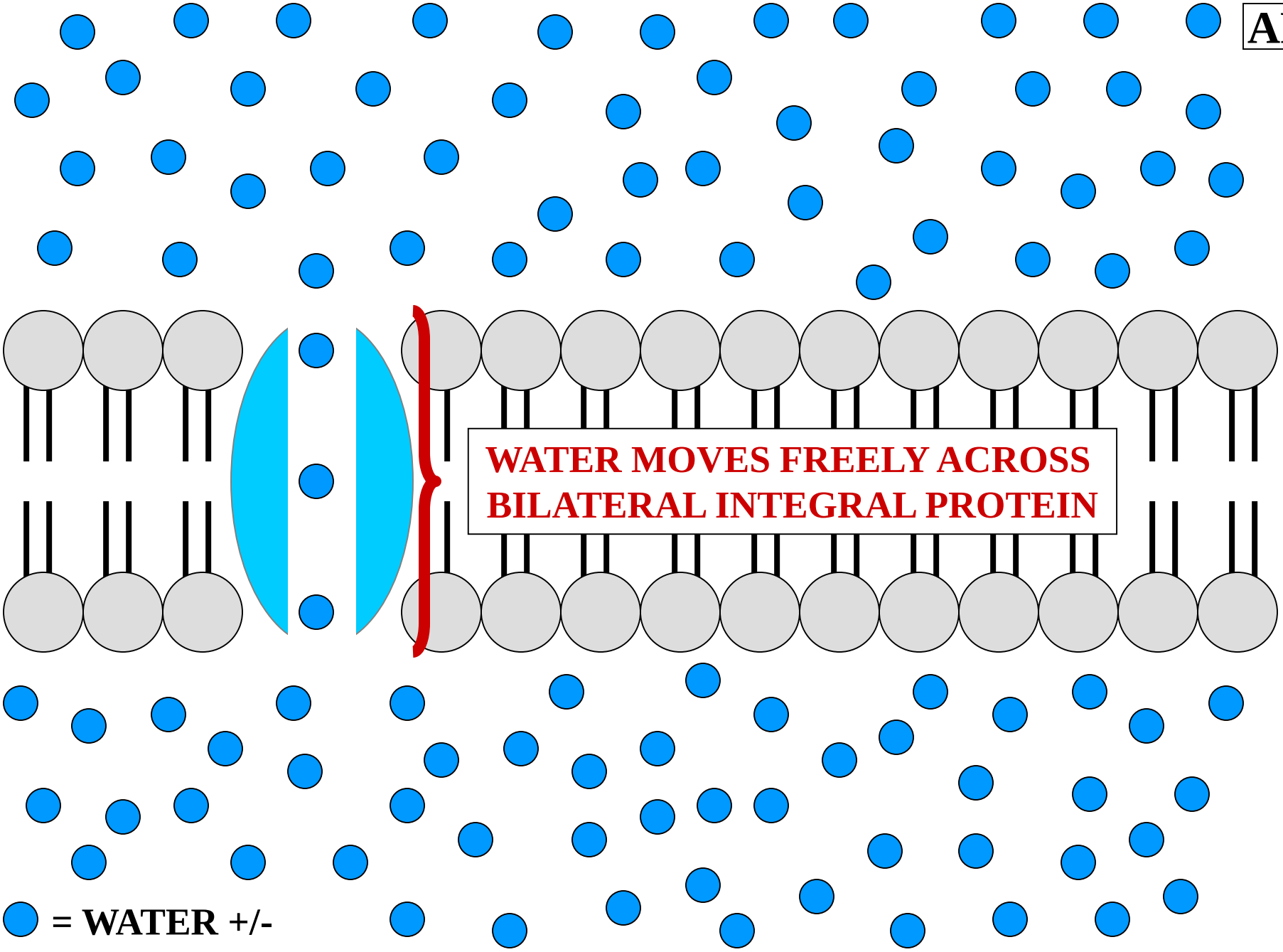

W
+
BILATERAL INTEGRAL PROTEIN
= WATER +/-



= WATER +/-

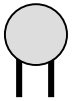


= WATER +/-


AP
WATER MOVES FREELY ACROSS
BILATERAL INTEGRAL PROTEIN
= WATER +/-

AQUAPORIN PROTEIN

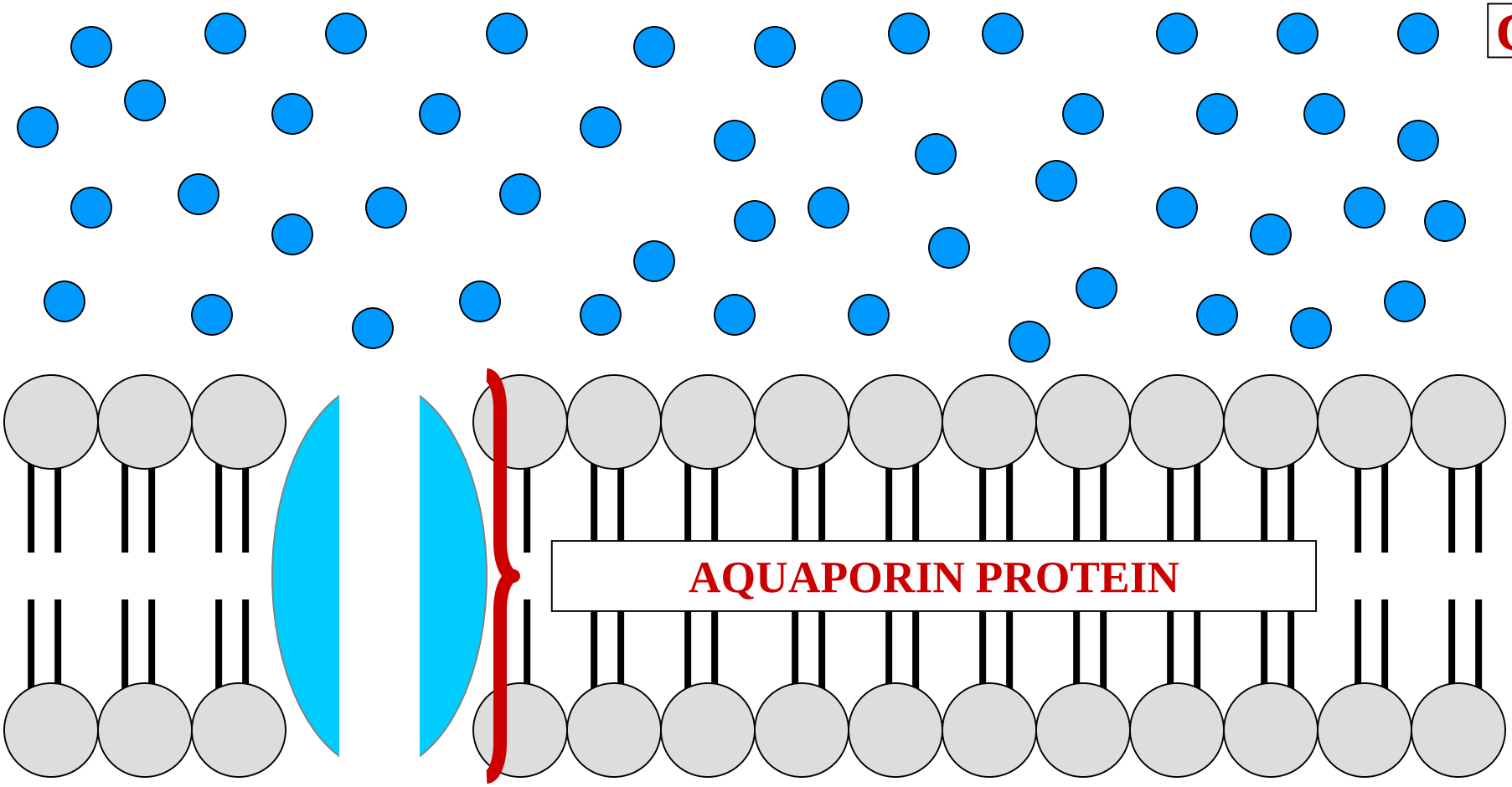
AQUAPORIN PROTEIN



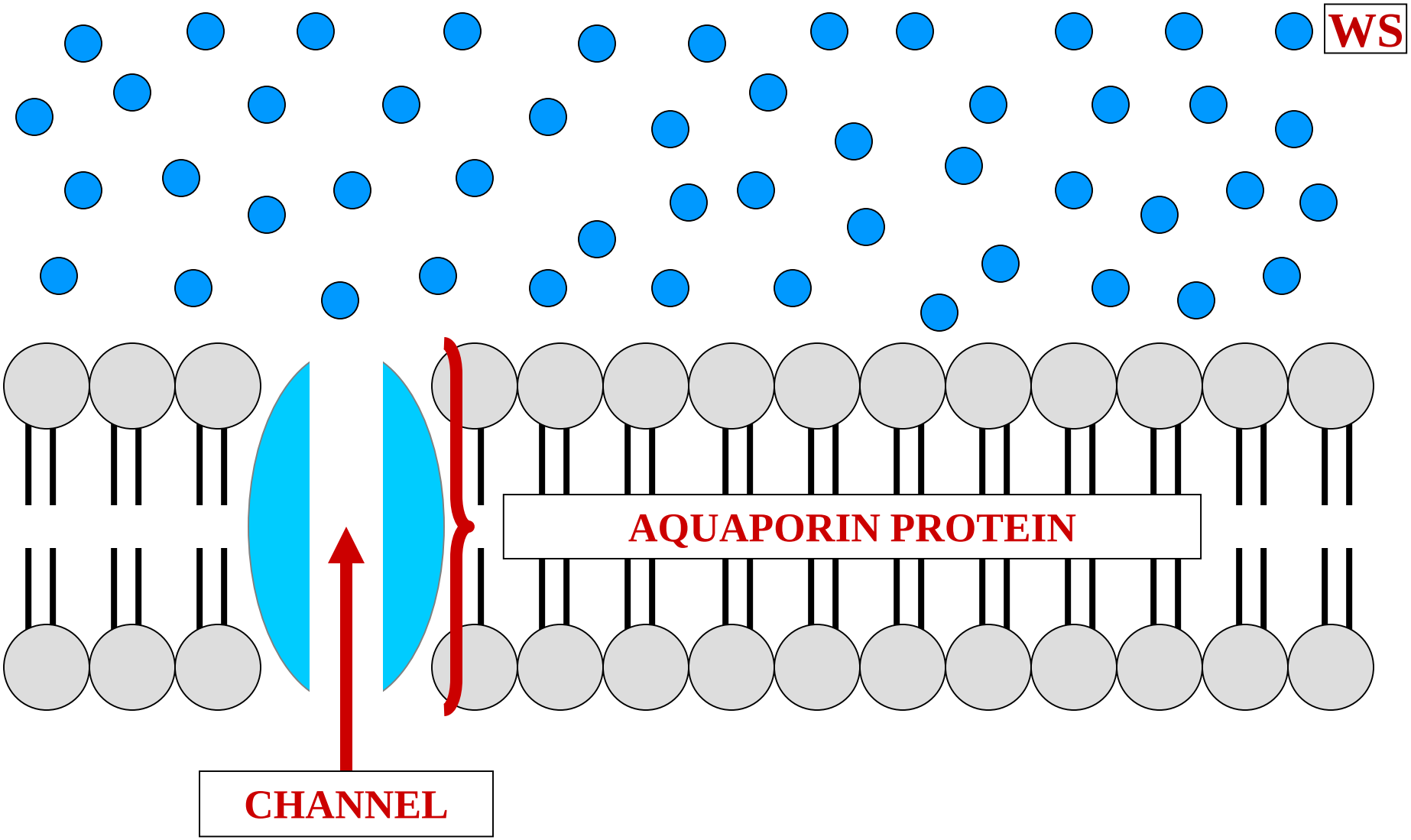
BILATERAL INTEGRAL CHANNEL PROTEIN WATER SPECIFIC

AQUAPORIN PROTEIN

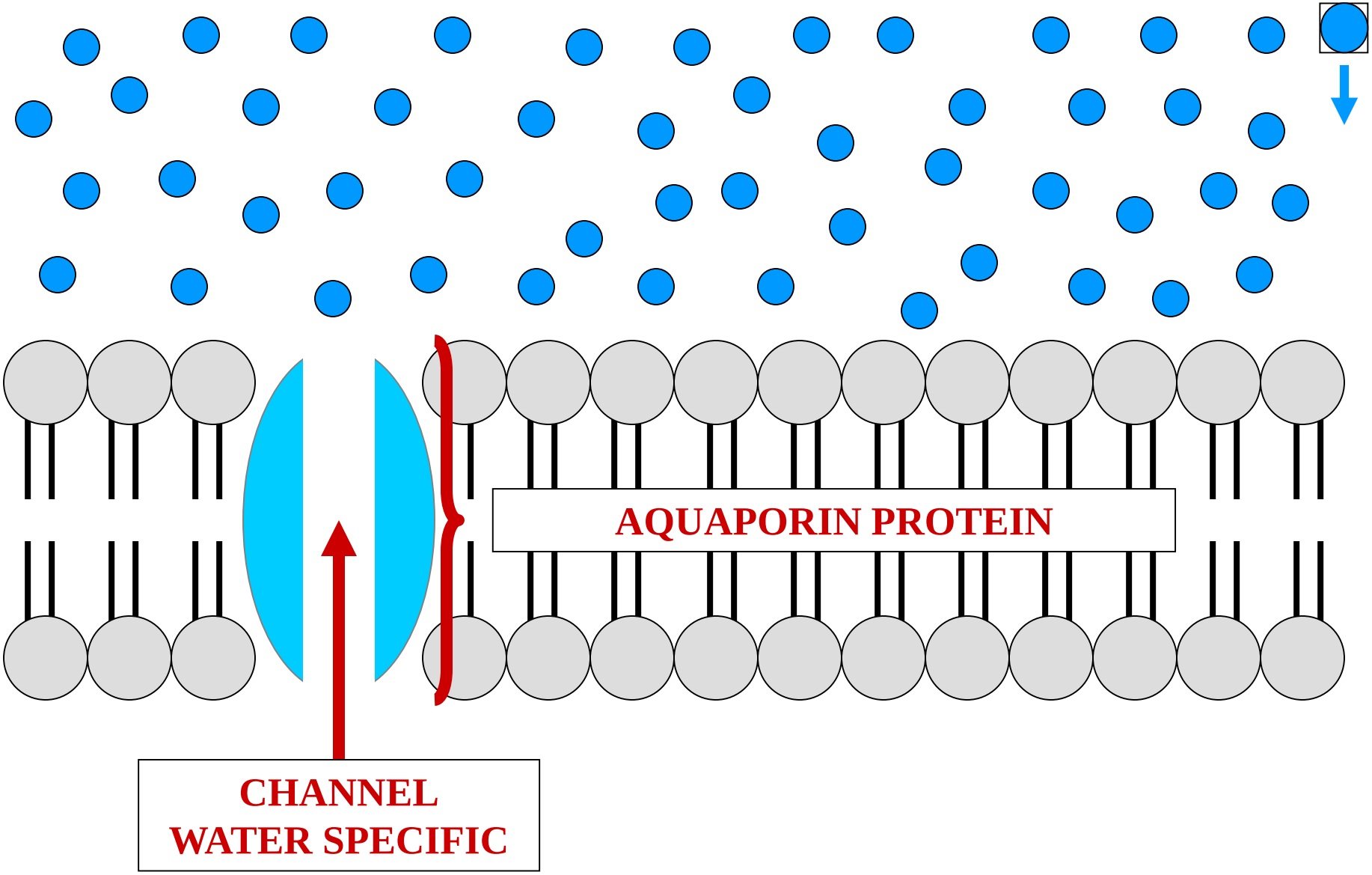
C



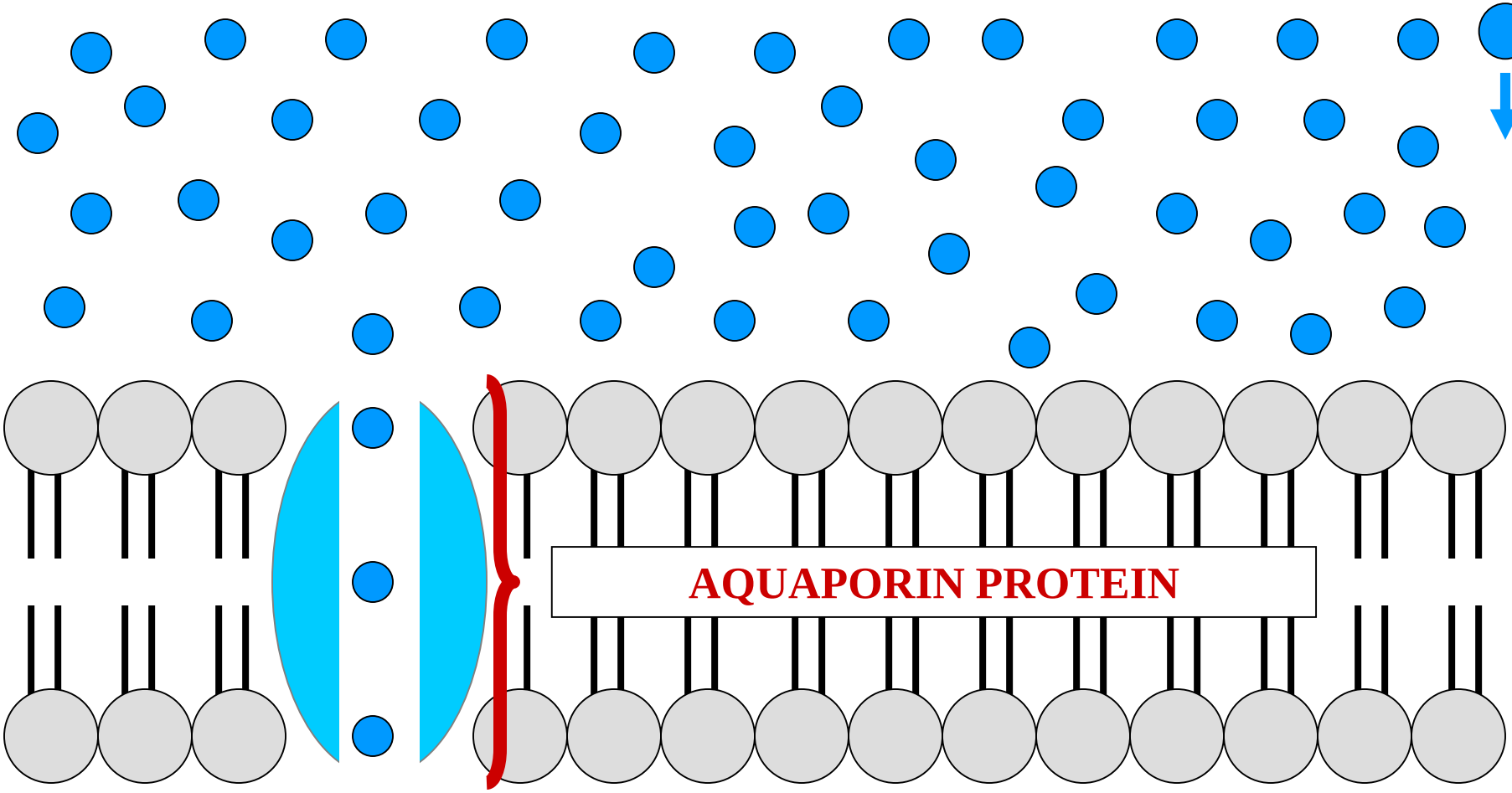
= WATER +/-



= WATER +/-

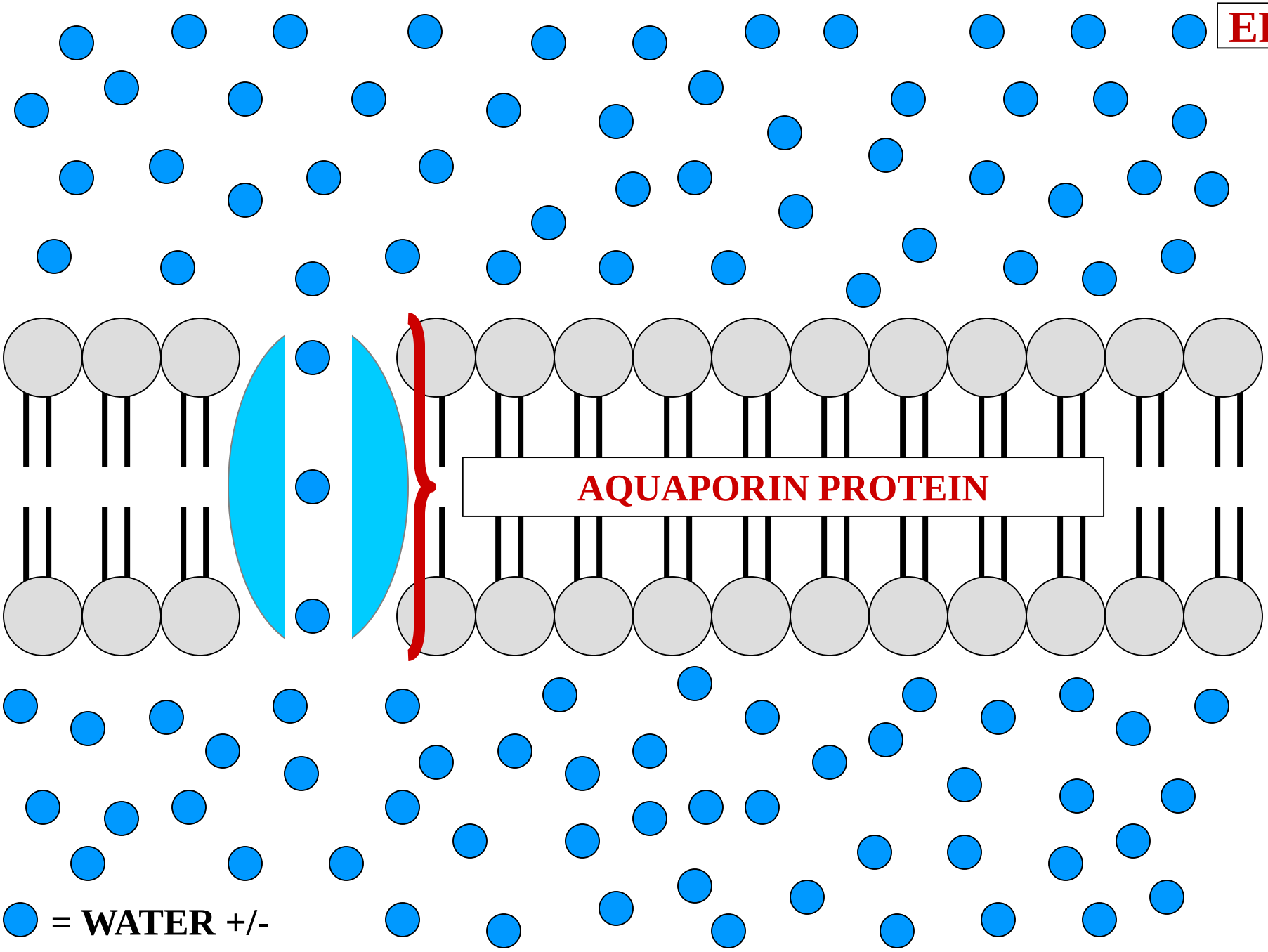


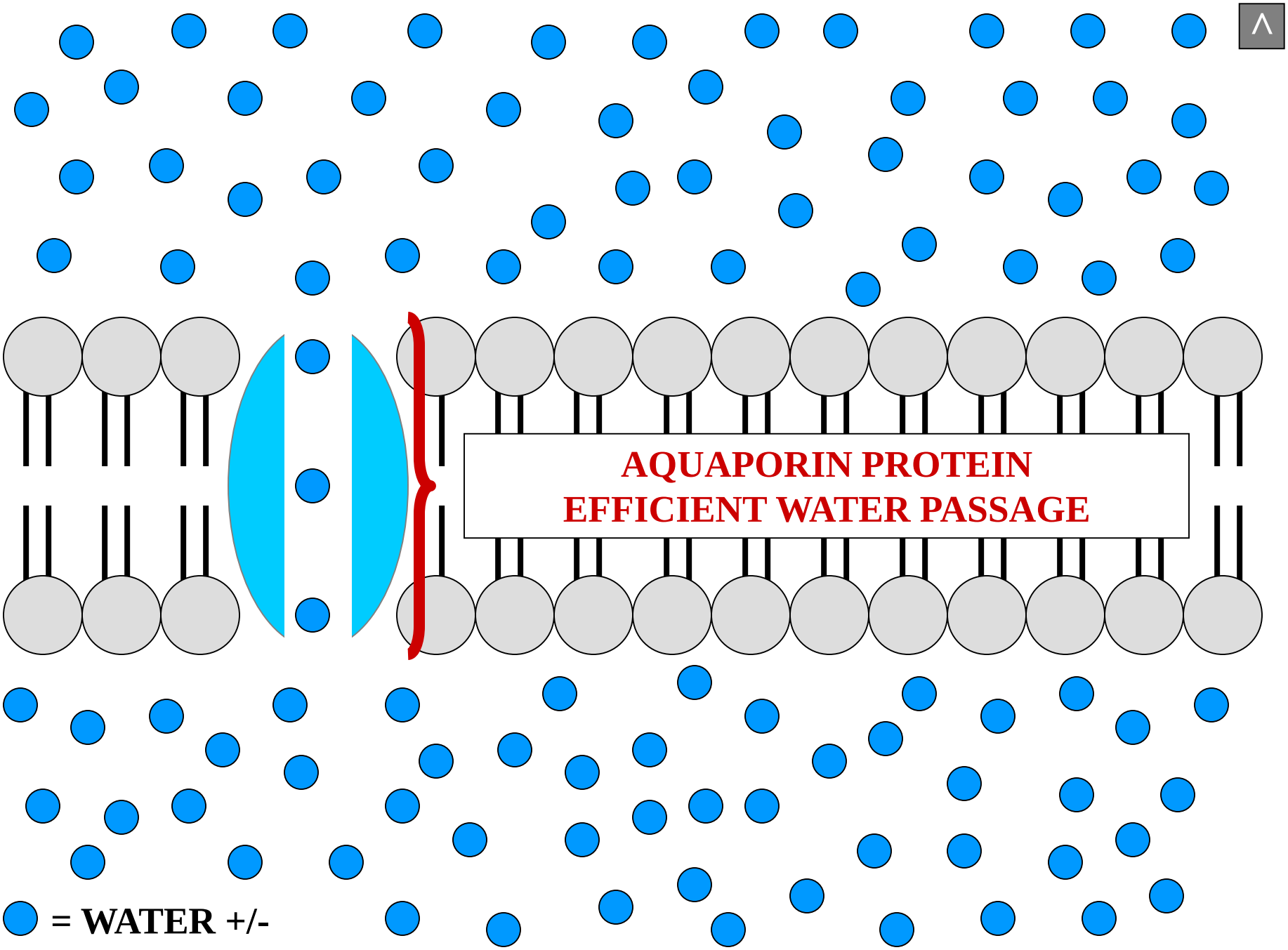
= WATER +/-



= WATER +/-

EF



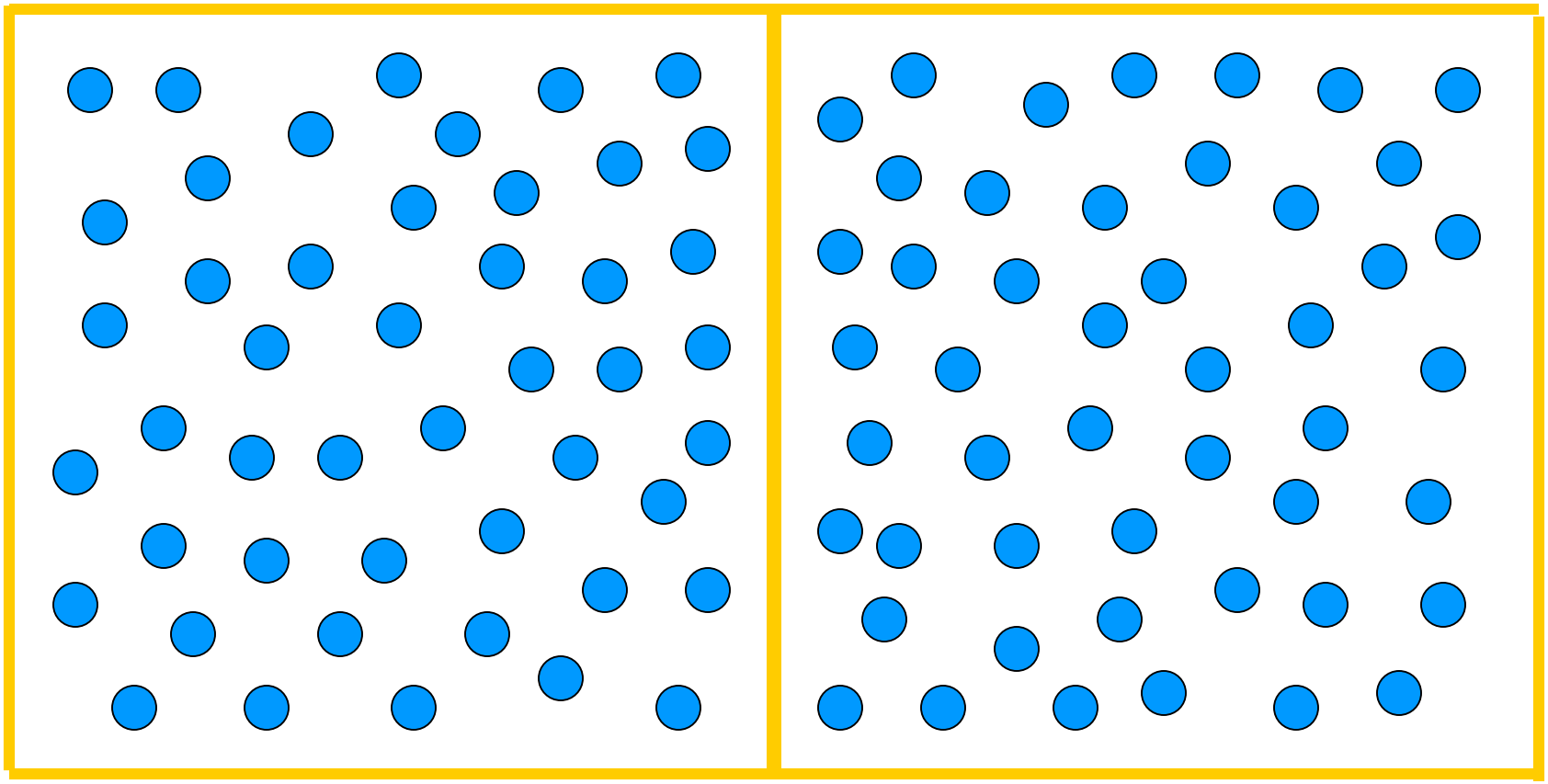

AQUAPORIN PROTEIN
EFFICIENT WATER PASSAGE
= WATER +/-

OSMOSIS
BONDED WATER
VS
OSMOSIS
FREE WATER

OSMOSIS
BONDED WATER

OSMOSIS

CELL A **CELL B**



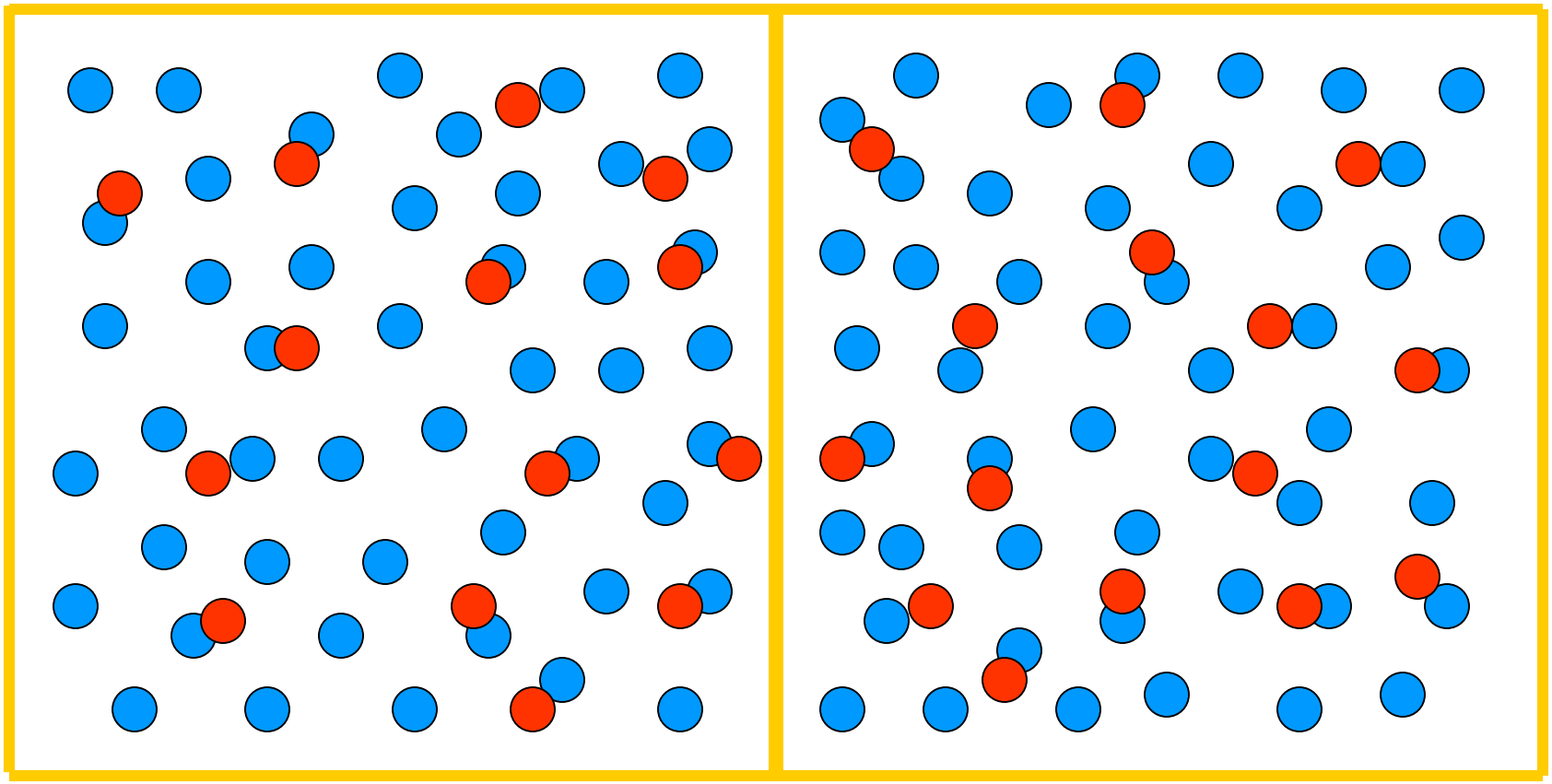
= **WATER MOLECULE POLAR**

= **MEMBRANE**

OSMOSIS

CELL A

CELL B



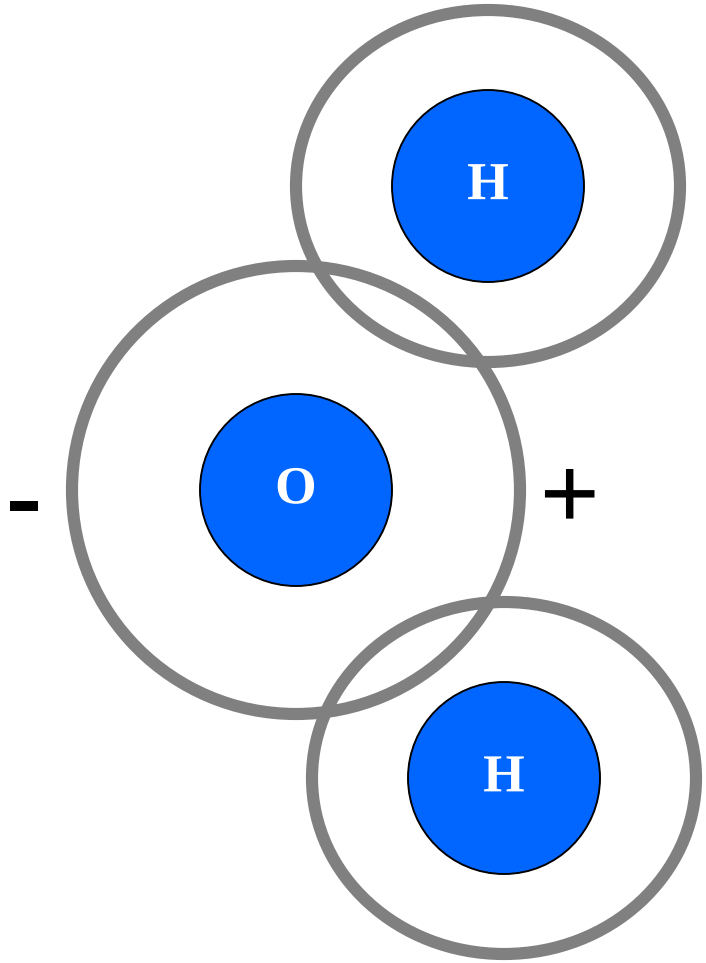
= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

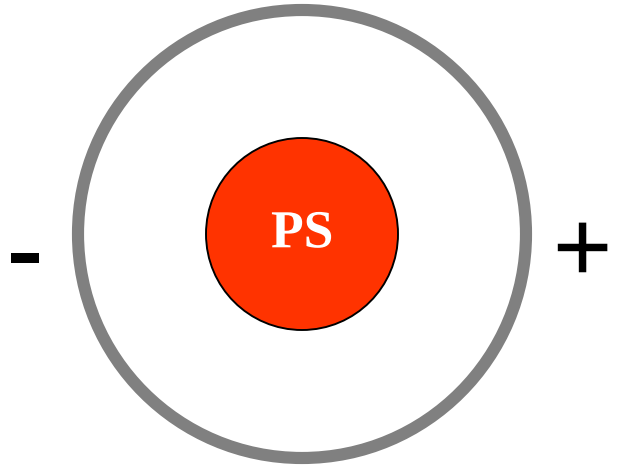
= MEMBRANE

BONDED WATER

AT

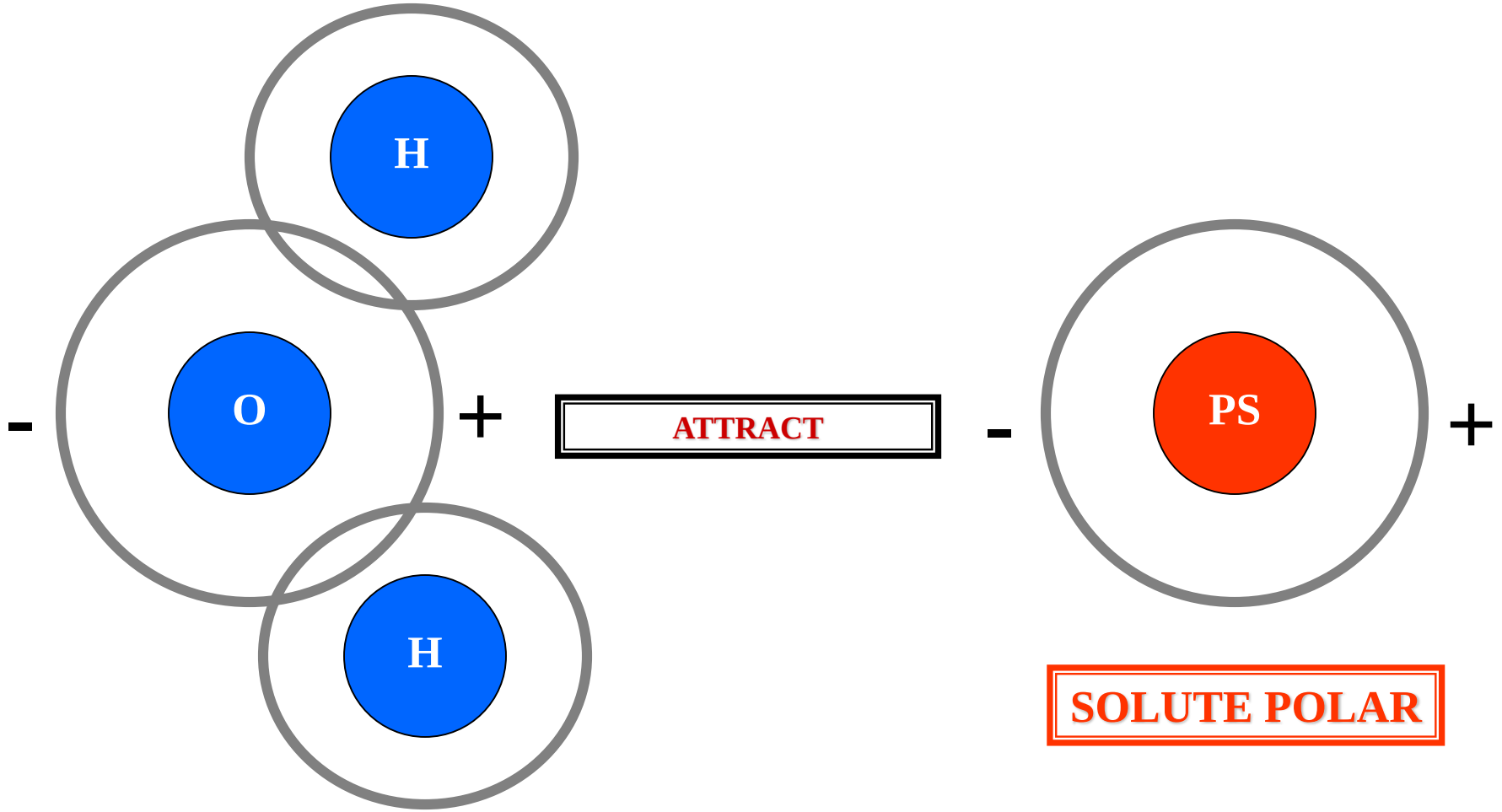


WATER POLAR

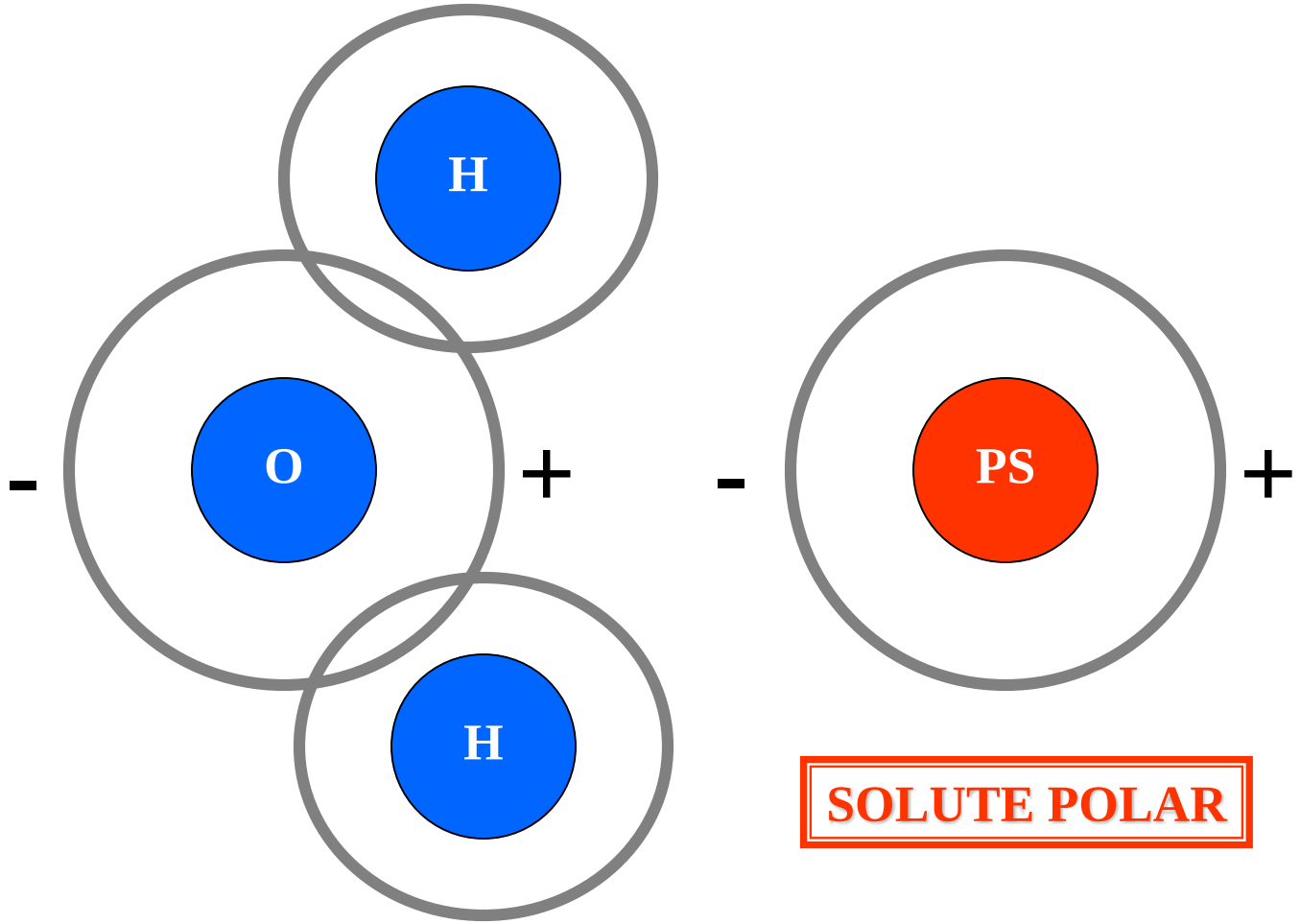


SOLUTE POLAR

BONDED WATER



BONDED WATER

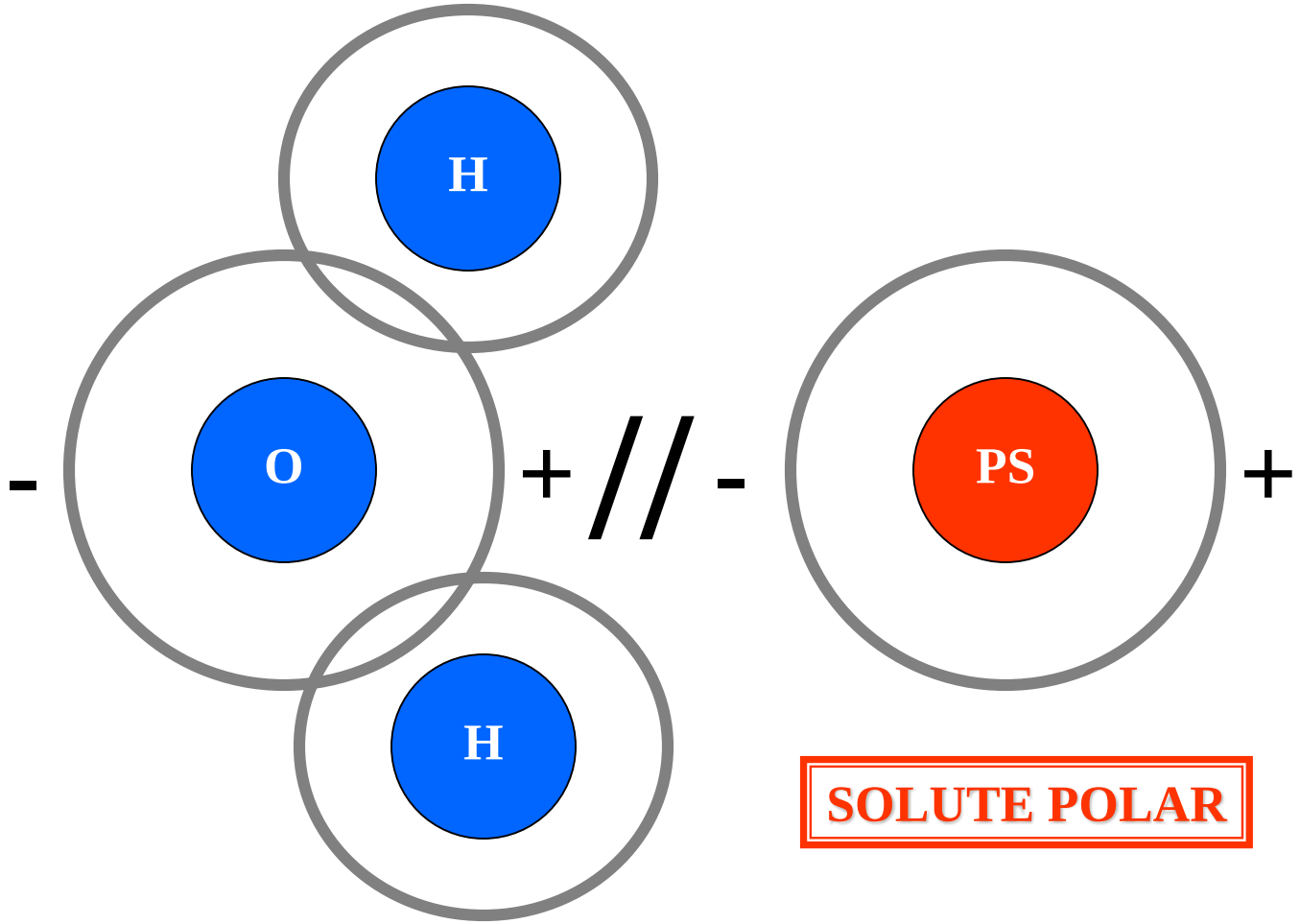


SOLUTE POLAR

WATER POLAR

BONDED WATER

BW

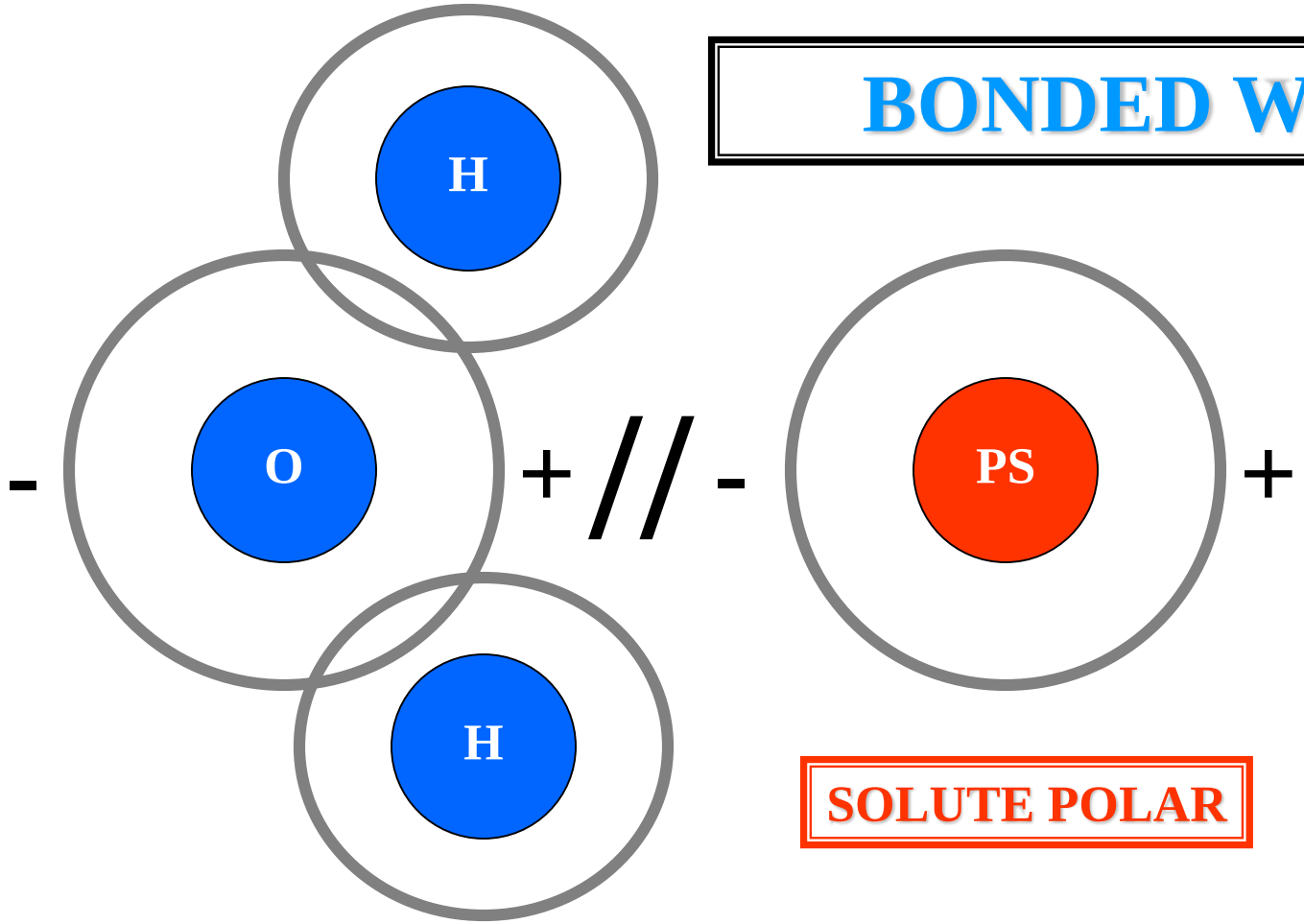


SOLUTE POLAR

WATER POLAR

// = HYDROGEN BOND

BONDED WATER



BONDED WATER

SOLUTE POLAR

WATER POLAR

// = **HYDROGEN BOND**

OSMOSIS

BONDED WATER

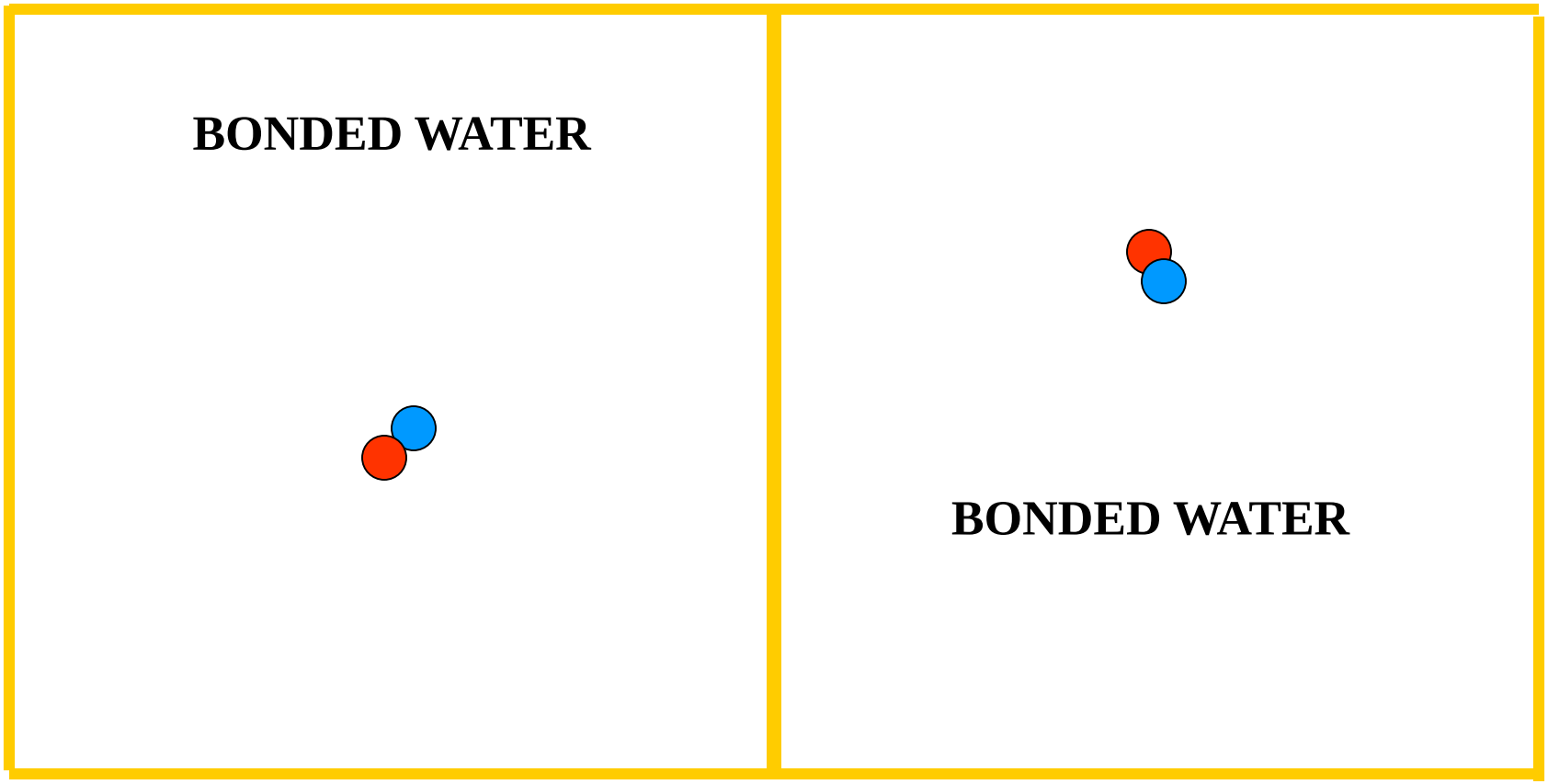
PHOSPHOLIPID BILAYER

OSMOSIS

BONDED WATER

CELL A

CELL B



= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

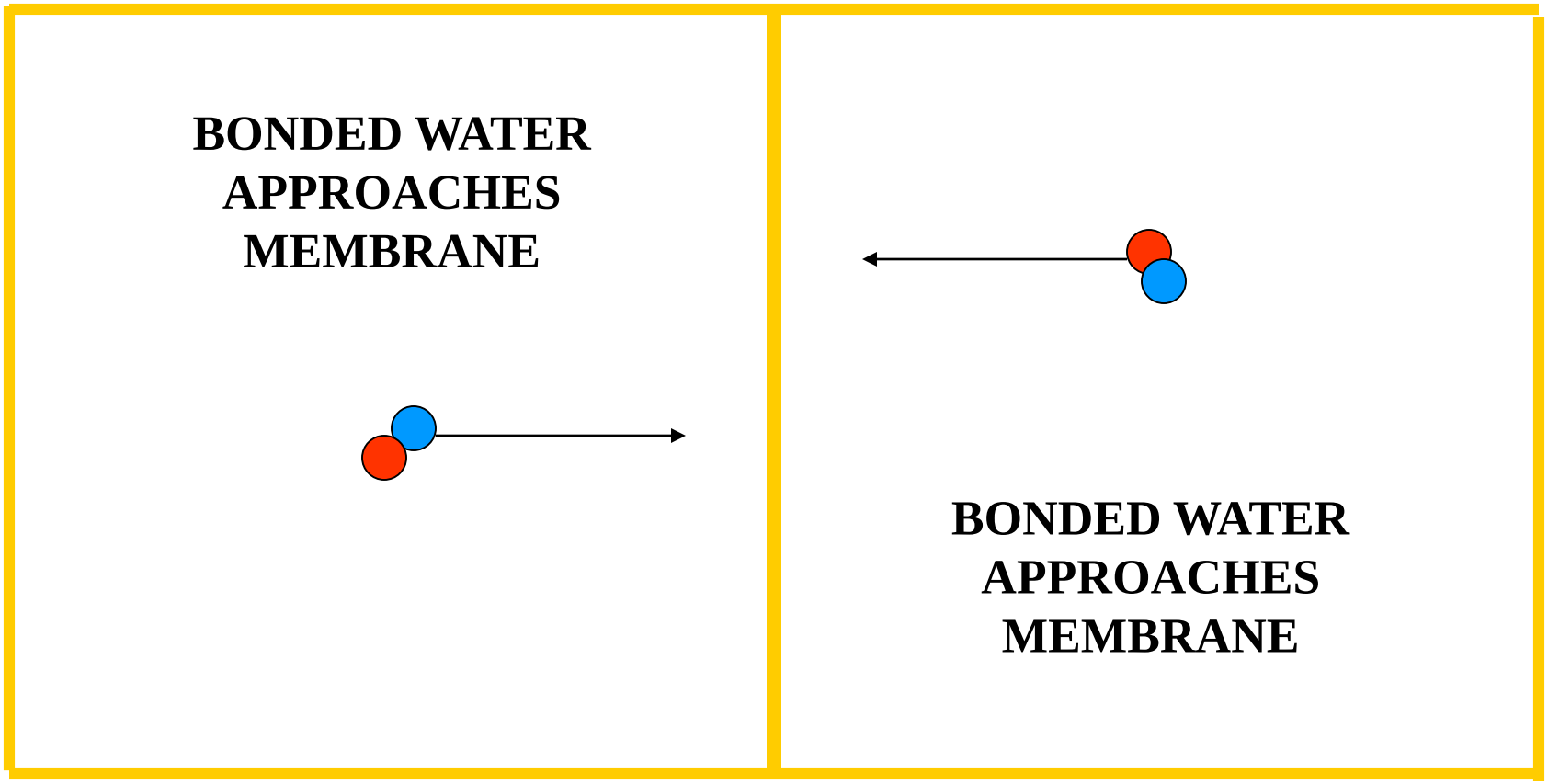
= MEMBRANE

OSMOSIS

BONDED WATER

CELL A

CELL B



= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

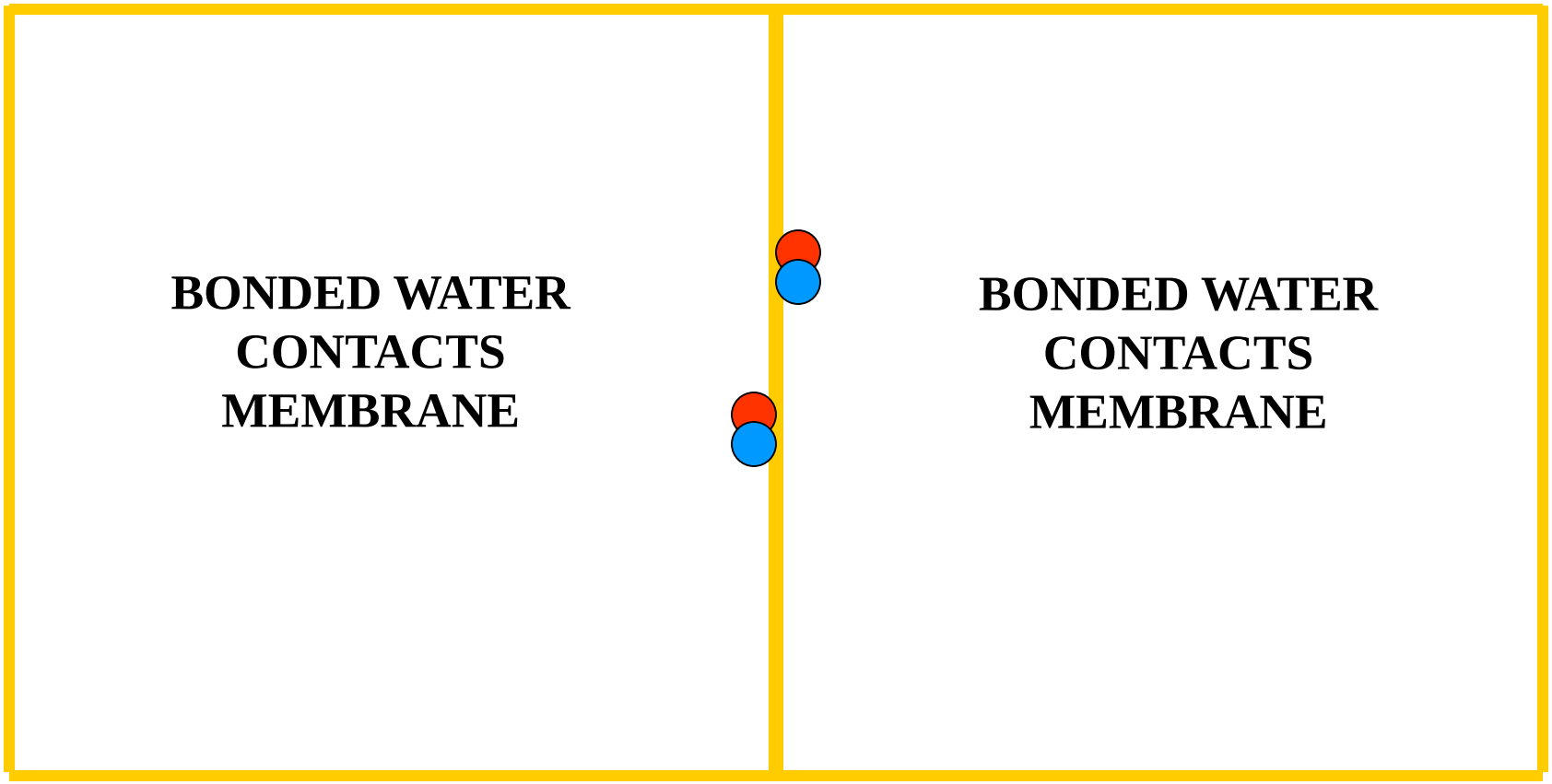
= MEMBRANE

OSMOSIS

BONDED WATER

CELL A

CELL B



= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

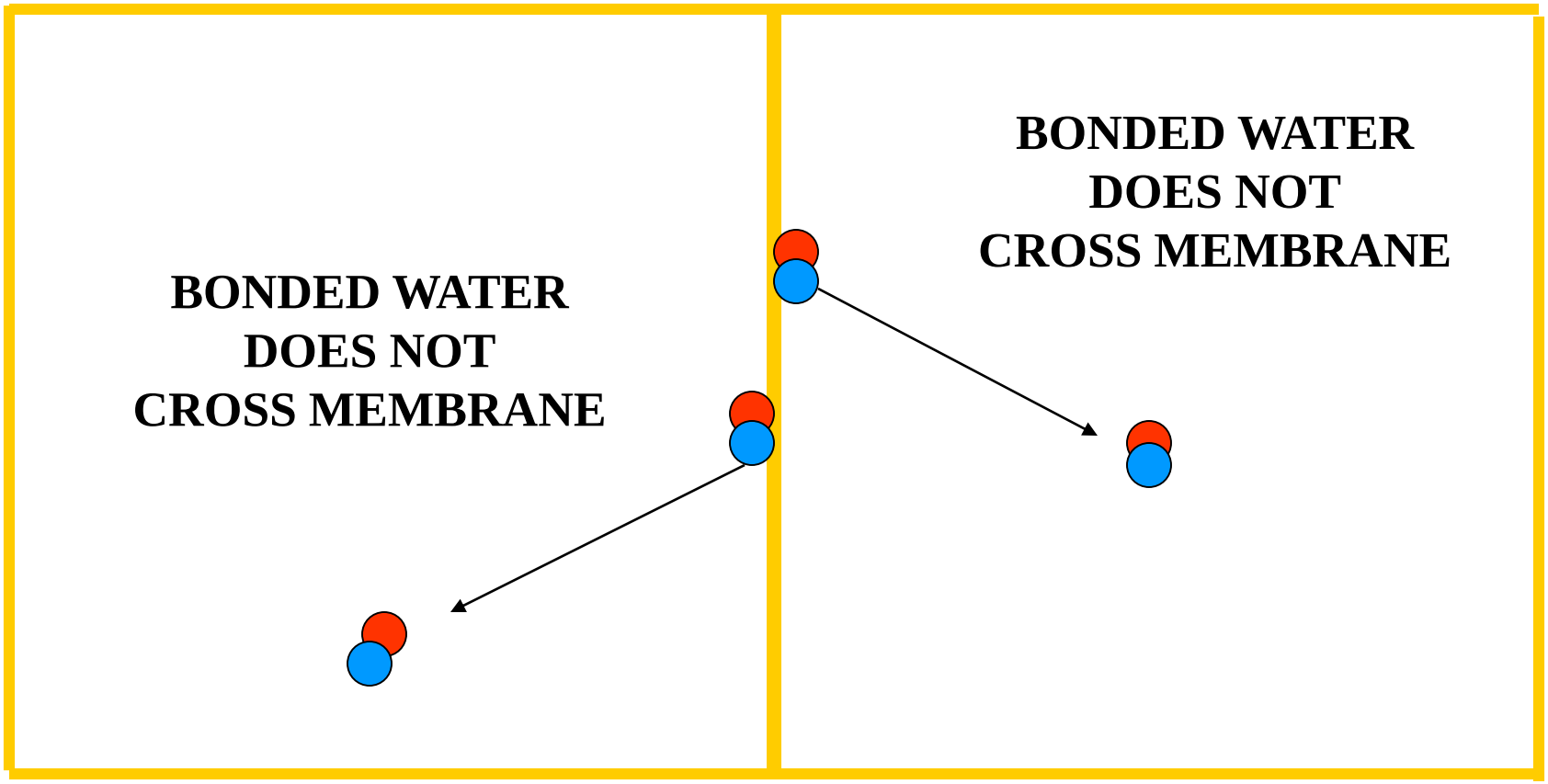
= MEMBRANE

OSMOSIS

BONDED WATER

CELL A

CELL B



= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

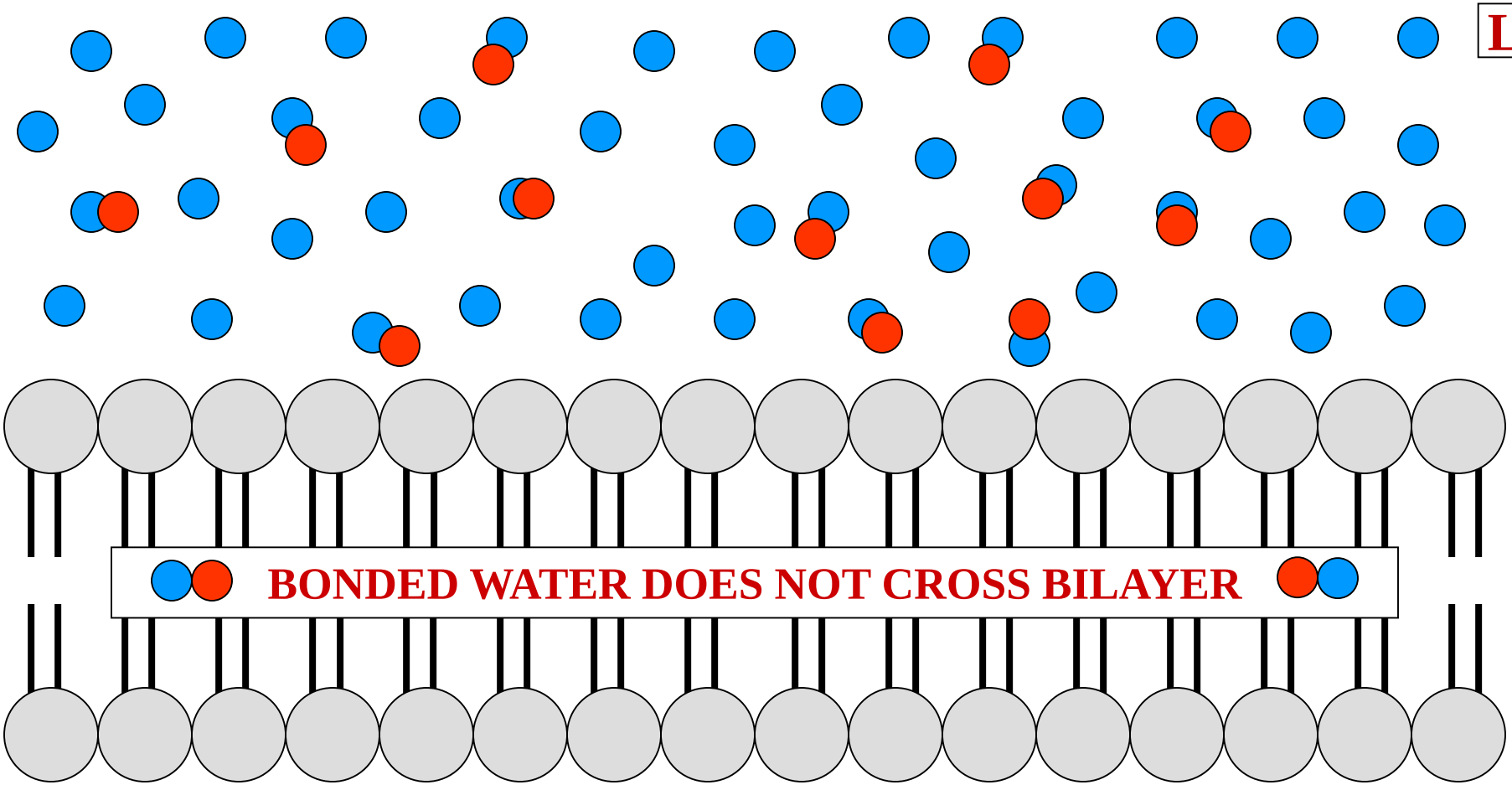
= MEMBRANE

QUESTION

WHY DOES BONDED WATER NOT CROSS THE BIO-MEMBRANE?

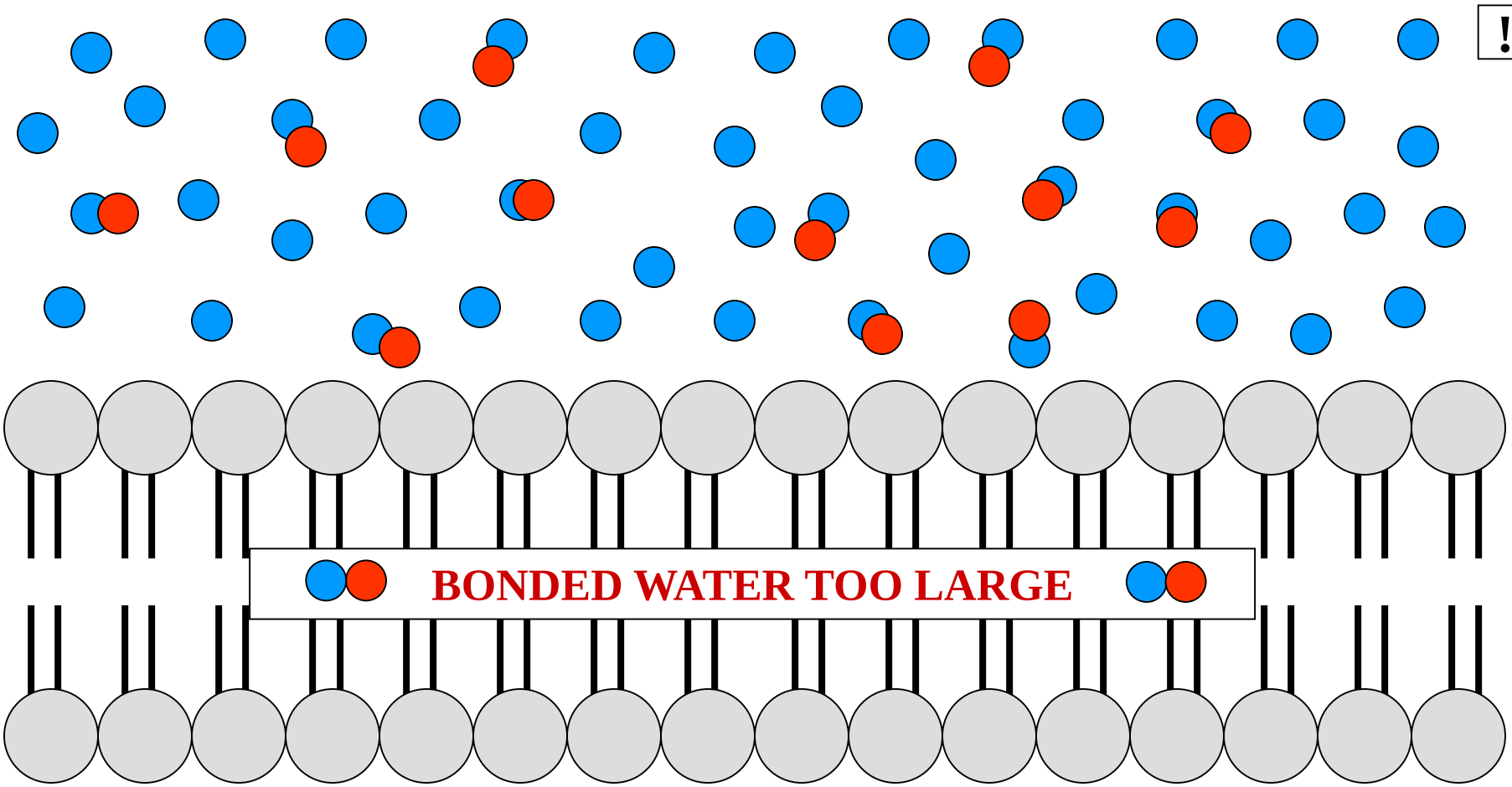
QUESTION

L



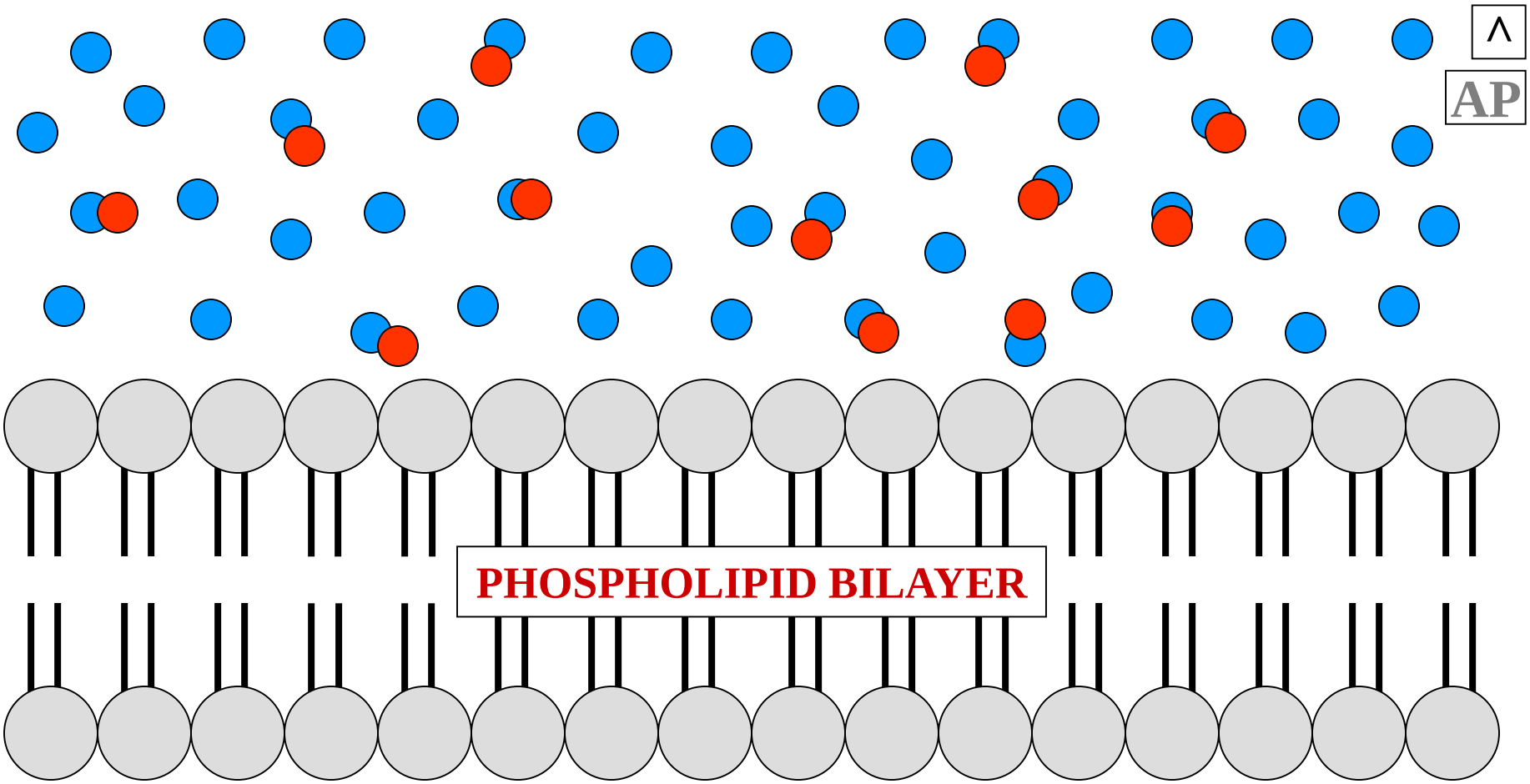
= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR



= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR



BONDED WATER DOES NOT CROSS MEMBRANE

= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

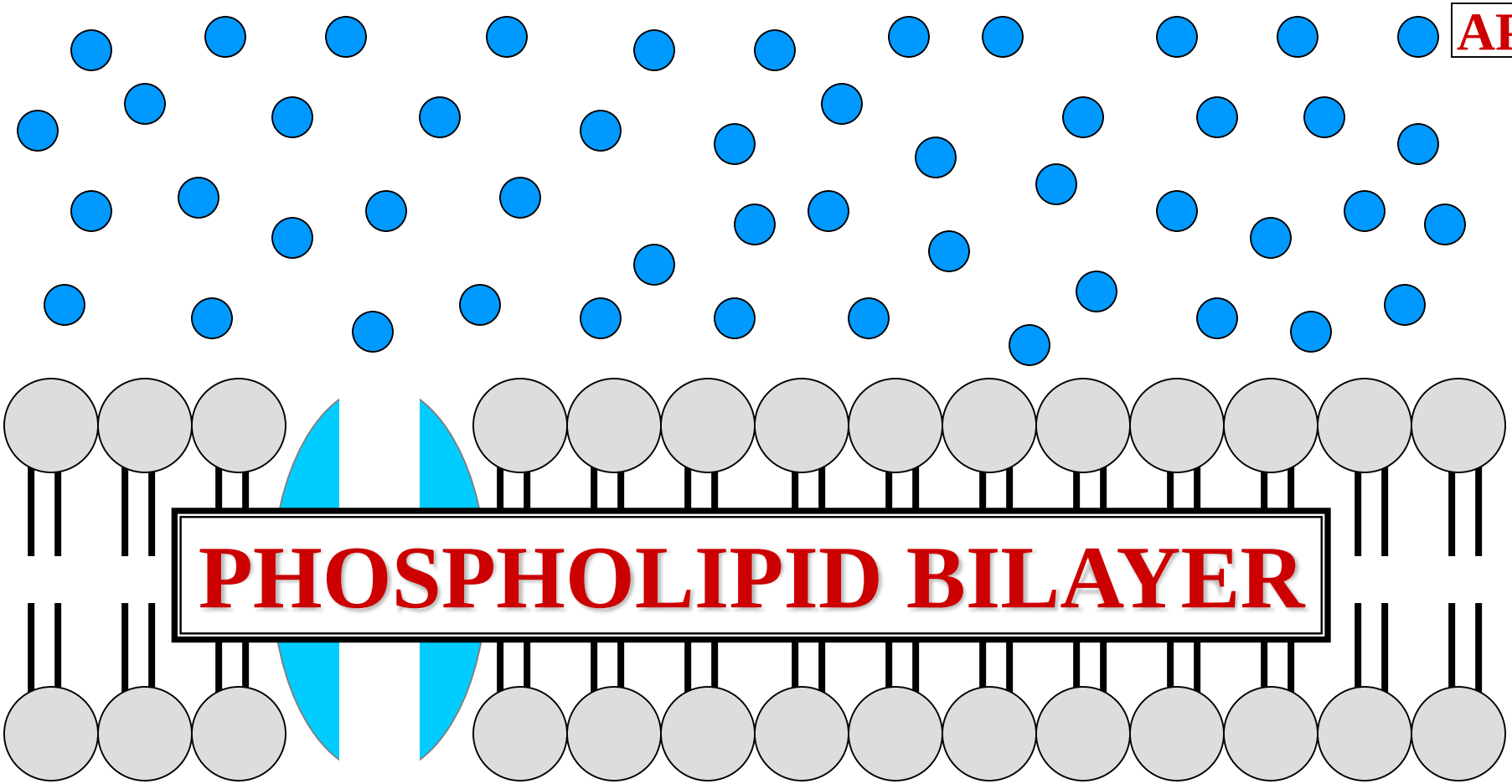
OSMOSIS

BONDED WATER

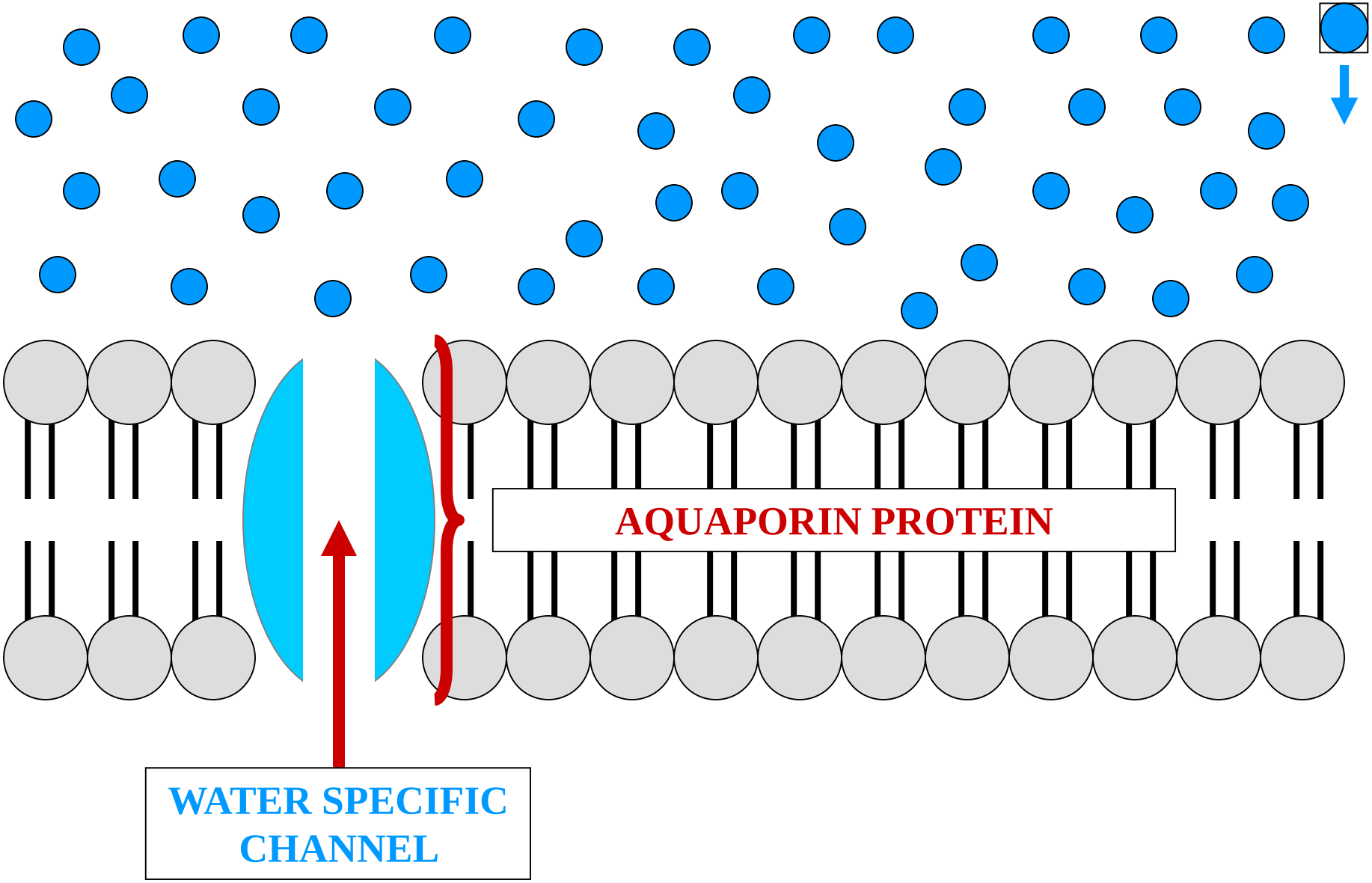
AQUAPORIN

PROTEIN

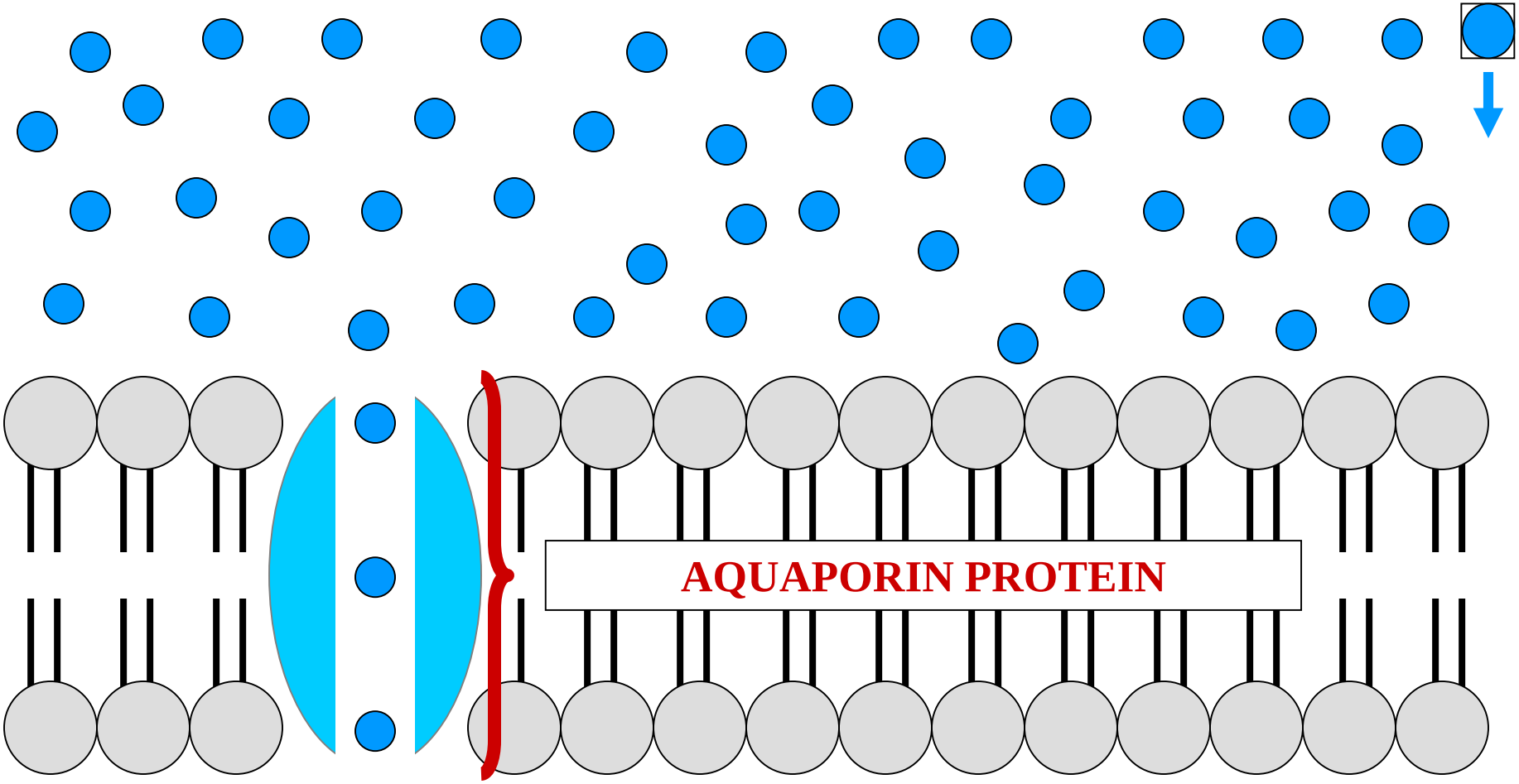
AP



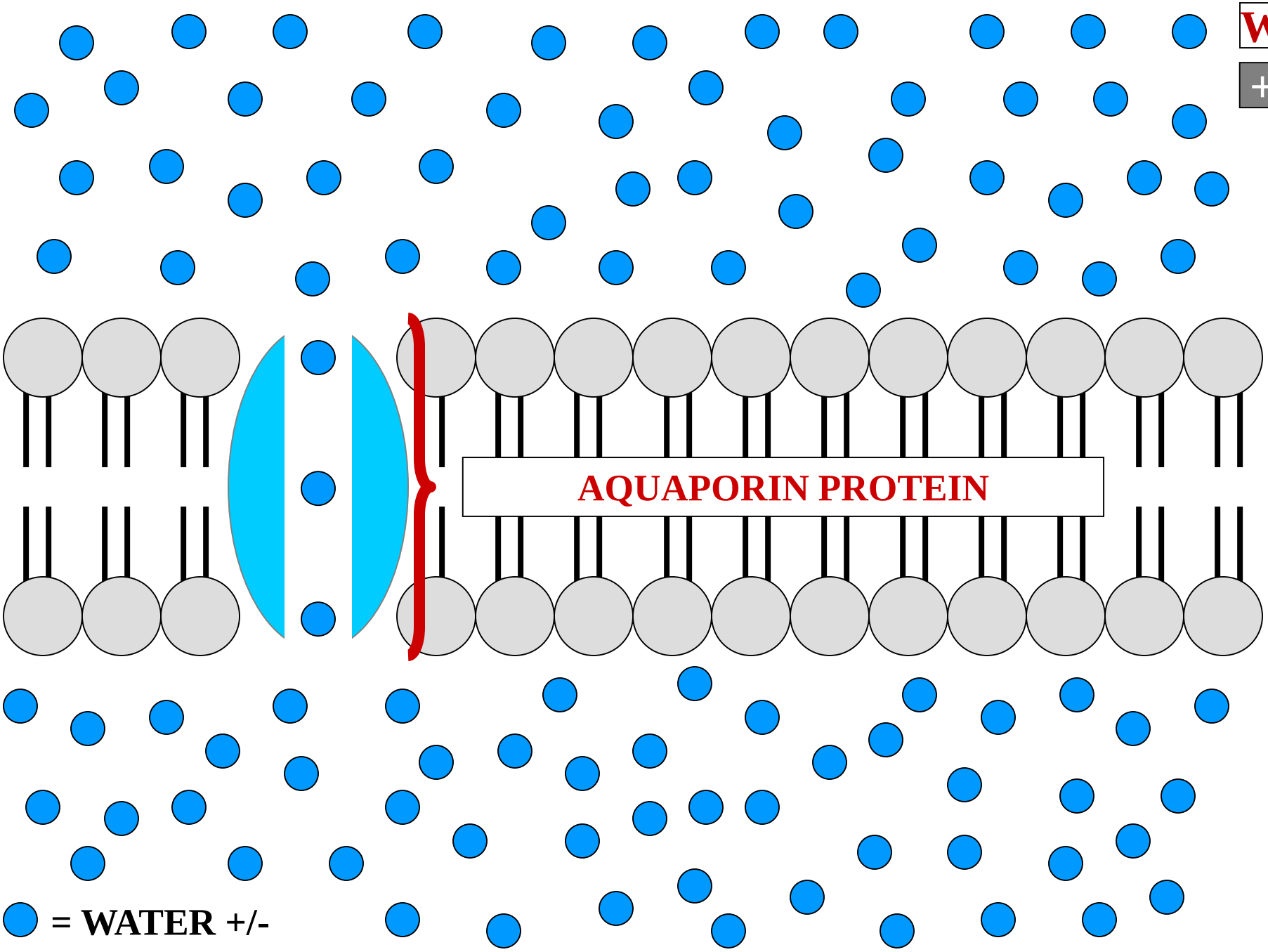
= WATER +/-

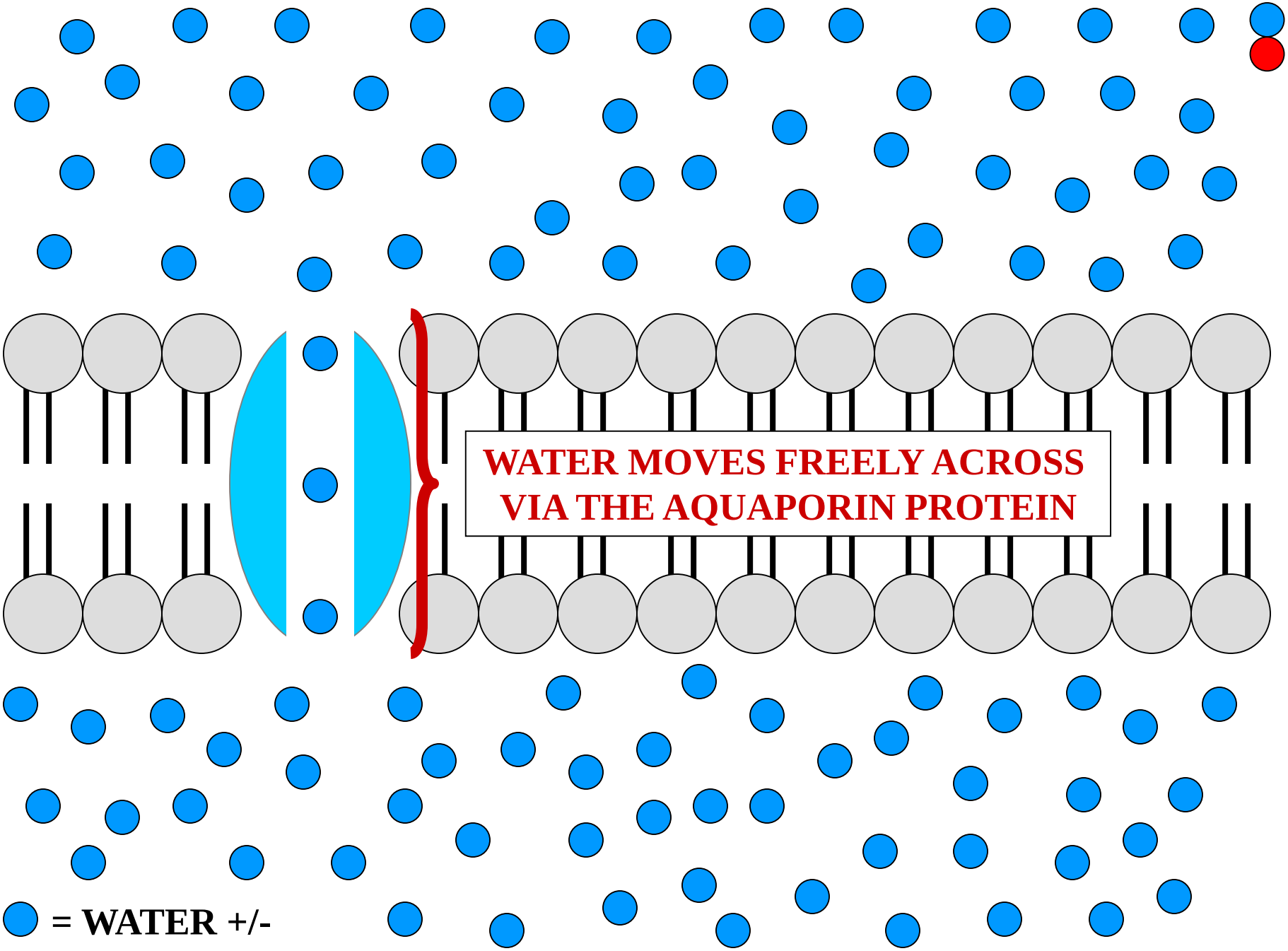


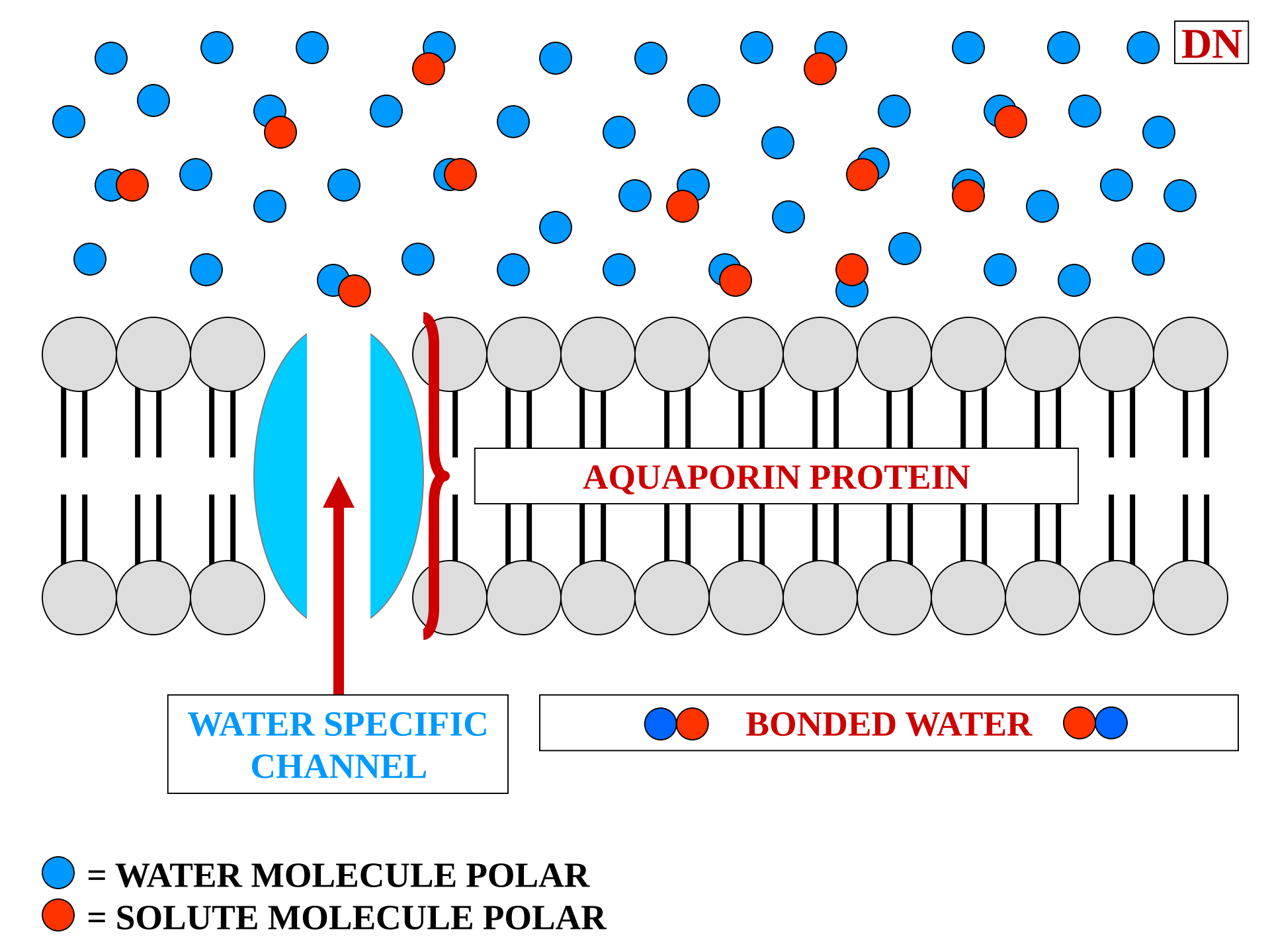
= WATER +/-

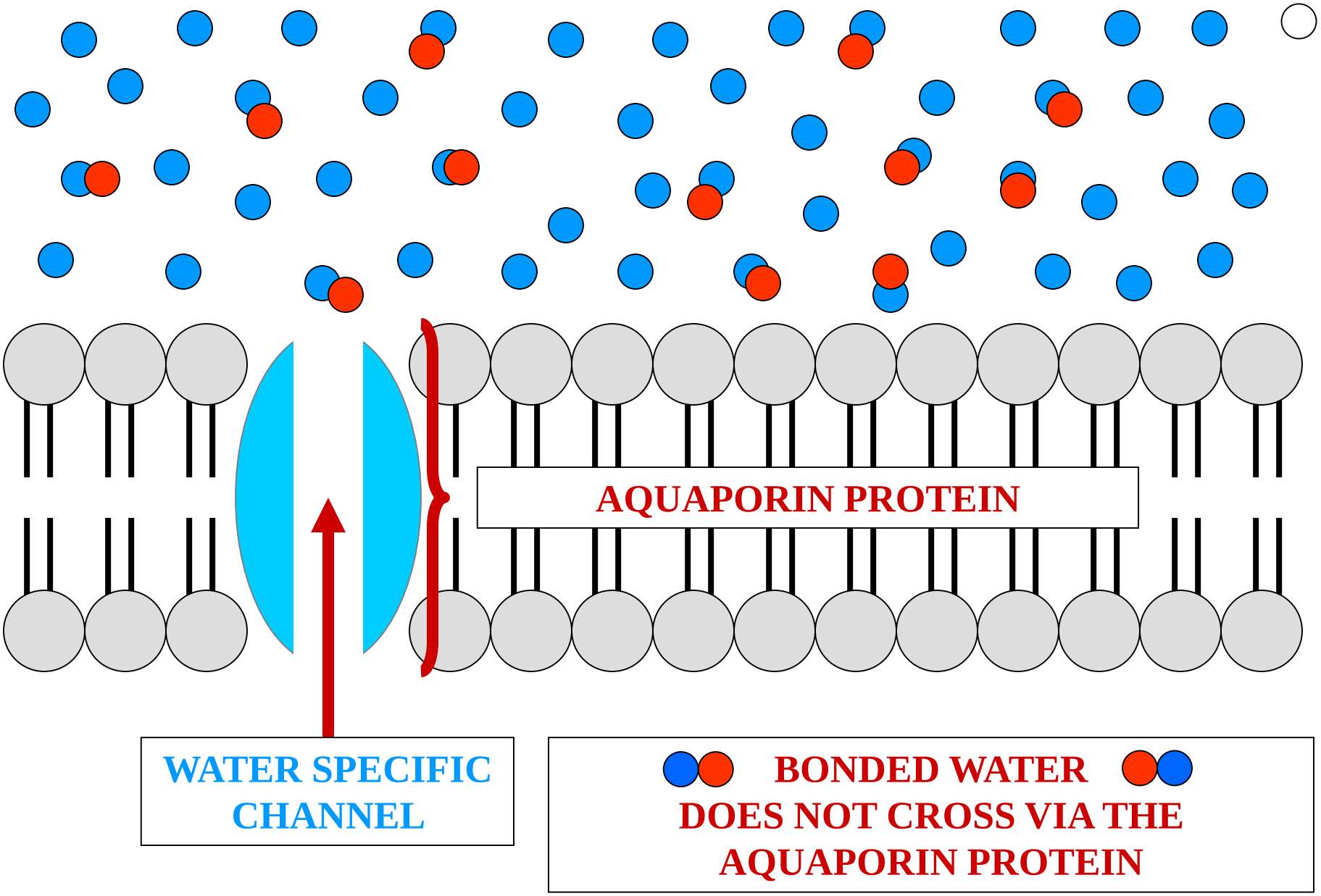


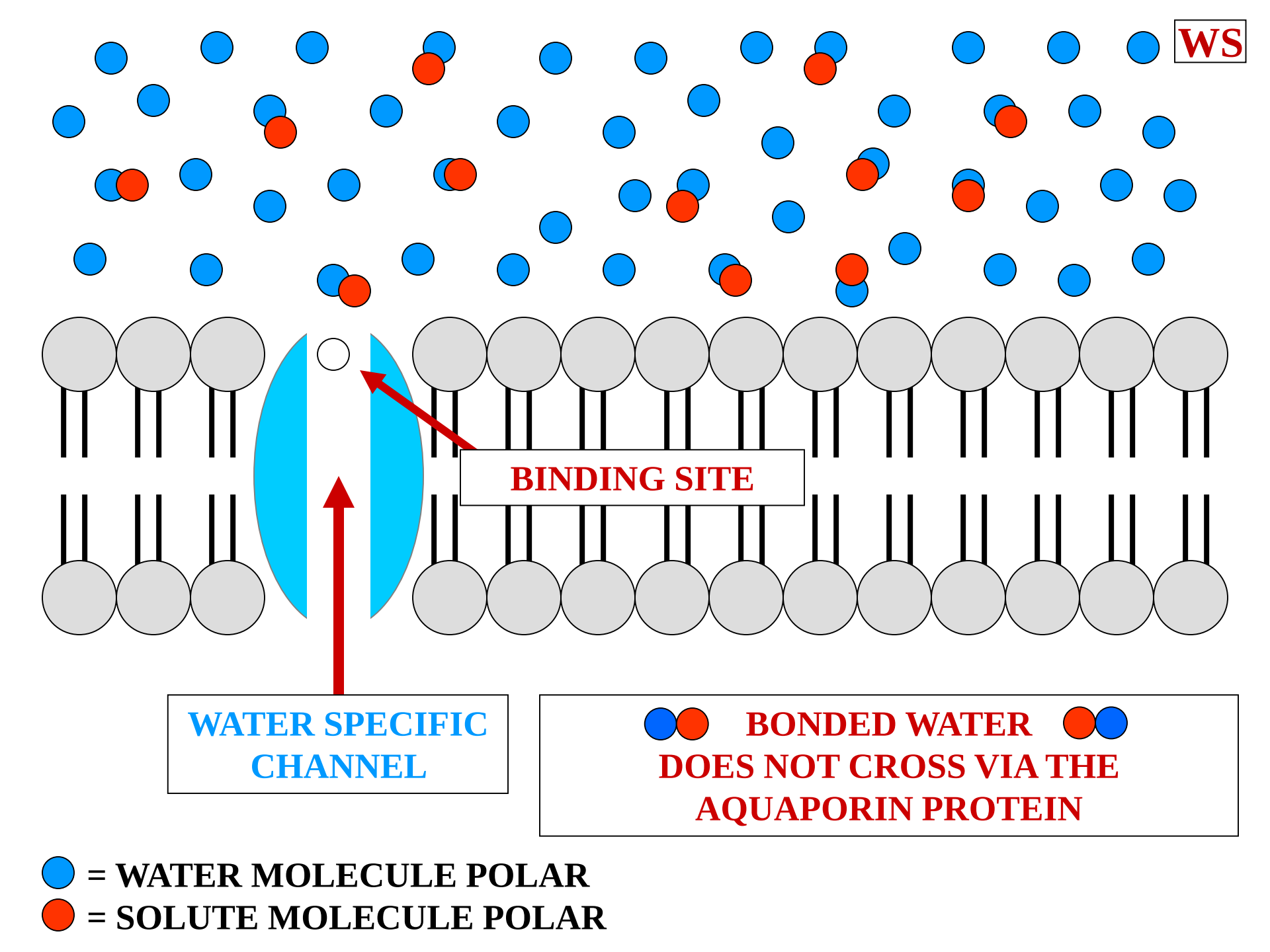
= WATER +/-

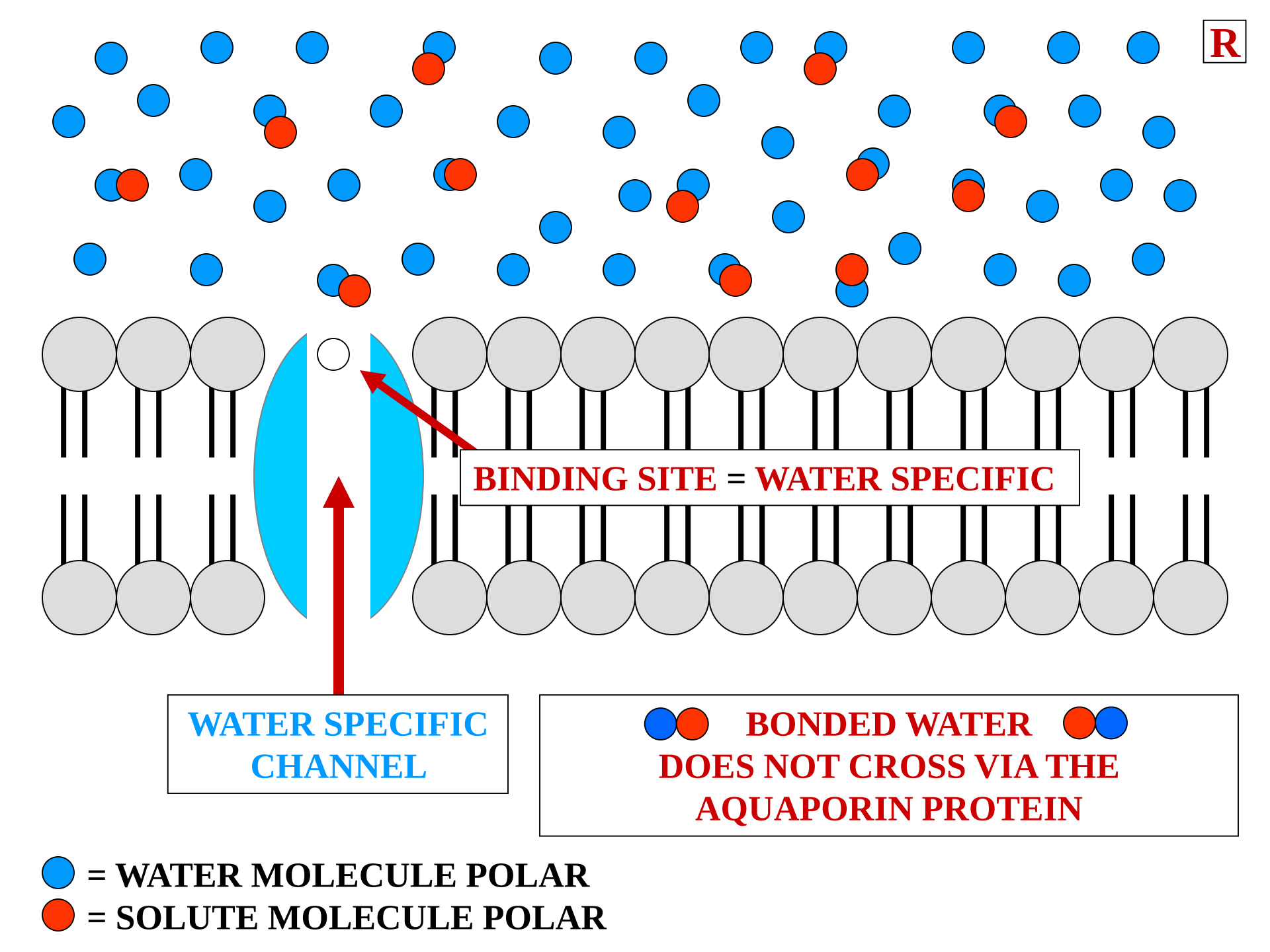

W
+
AQUAPORIN PROTEIN
= WATER +/-

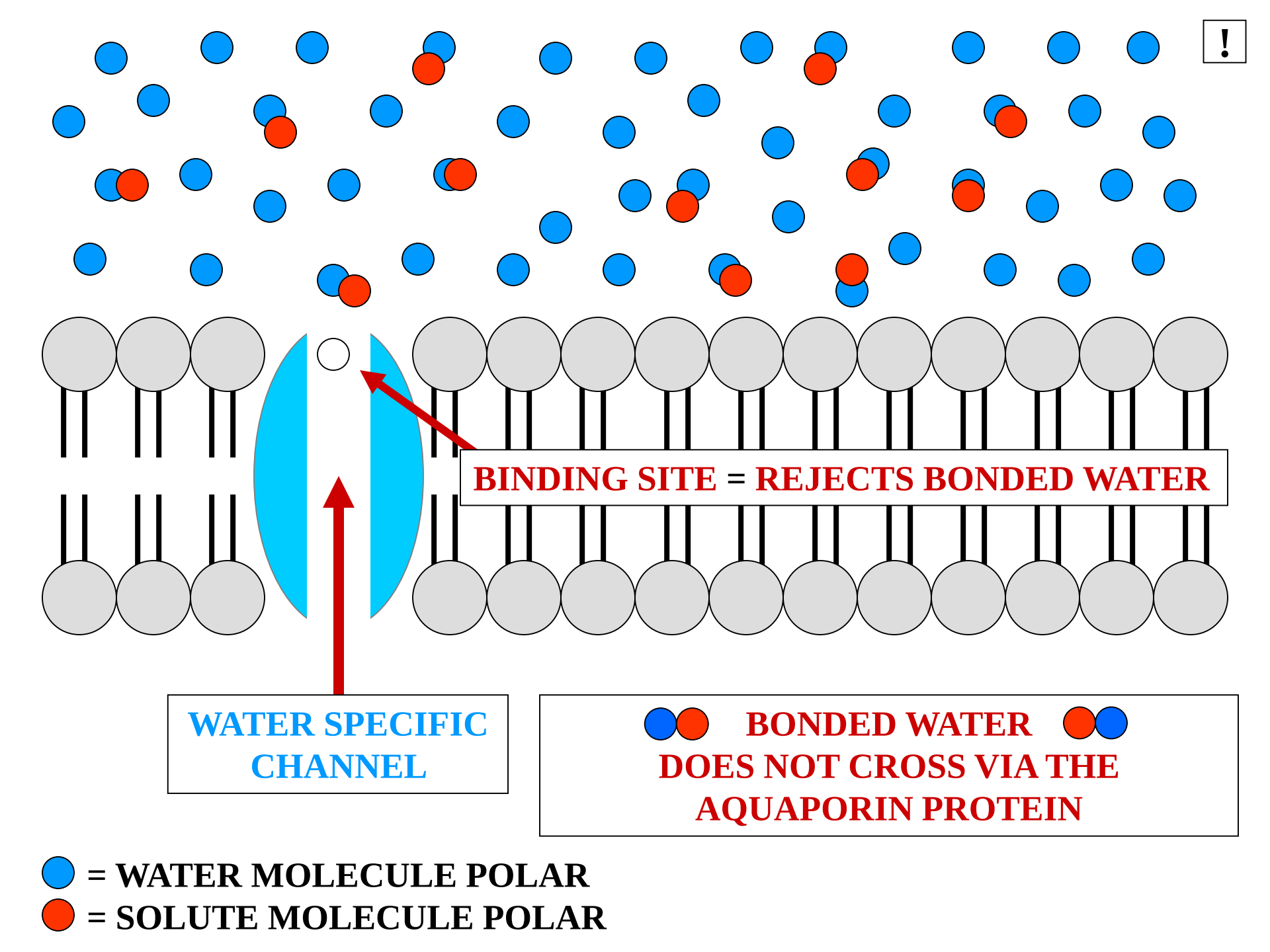

WATER MOVES FREELY ACROSS
VIA THE AQUAPORIN PROTEIN
= WATER +/-

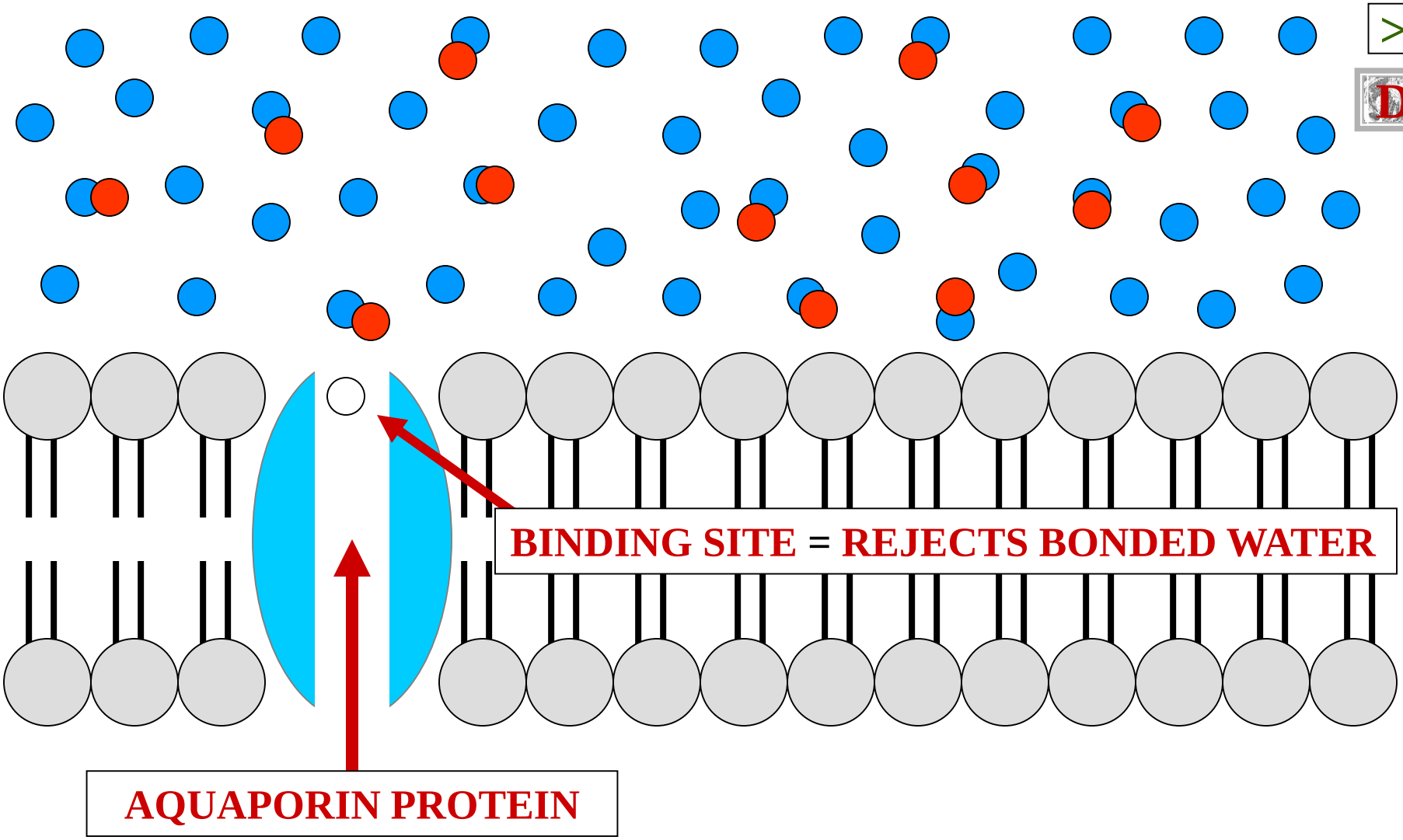

DN
AQUAPORIN PROTEIN
WATER SPECIFIC CHANNEL
BONDED WATER
= WATER MOLECULE POLAR
= SOLUTE MOLECULE POLAR


AQUAPORIN PROTEIN
WATER SPECIFIC CHANNEL
BONDED WATER
DOES NOT CROSS VIA THE AQUAPORIN PROTEIN
= WATER MOLECULE POLAR
= SOLUTE MOLECULE POLAR


WS
BINDING SITE
WATER SPECIFIC CHANNEL
BONDED WATER DOES NOT CROSS VIA THE AQUAPORIN PROTEIN
= WATER MOLECULE POLAR
= SOLUTE MOLECULE POLAR


R
BINDING SITE = WATER SPECIFIC
WATER SPECIFIC CHANNEL
BONDED WATER
DOES NOT CROSS VIA THE AQUAPORIN PROTEIN
= WATER MOLECULE POLAR
= SOLUTE MOLECULE POLAR


!
BINDING SITE = REJECTS BONDED WATER
WATER SPECIFIC CHANNEL
BONDED WATER
DOES NOT CROSS VIA THE AQUAPORIN PROTEIN
= WATER MOLECULE POLAR
= SOLUTE MOLECULE POLAR



BONDED WATER: DOES NOT CROSS AQUPORIN PROTEIN

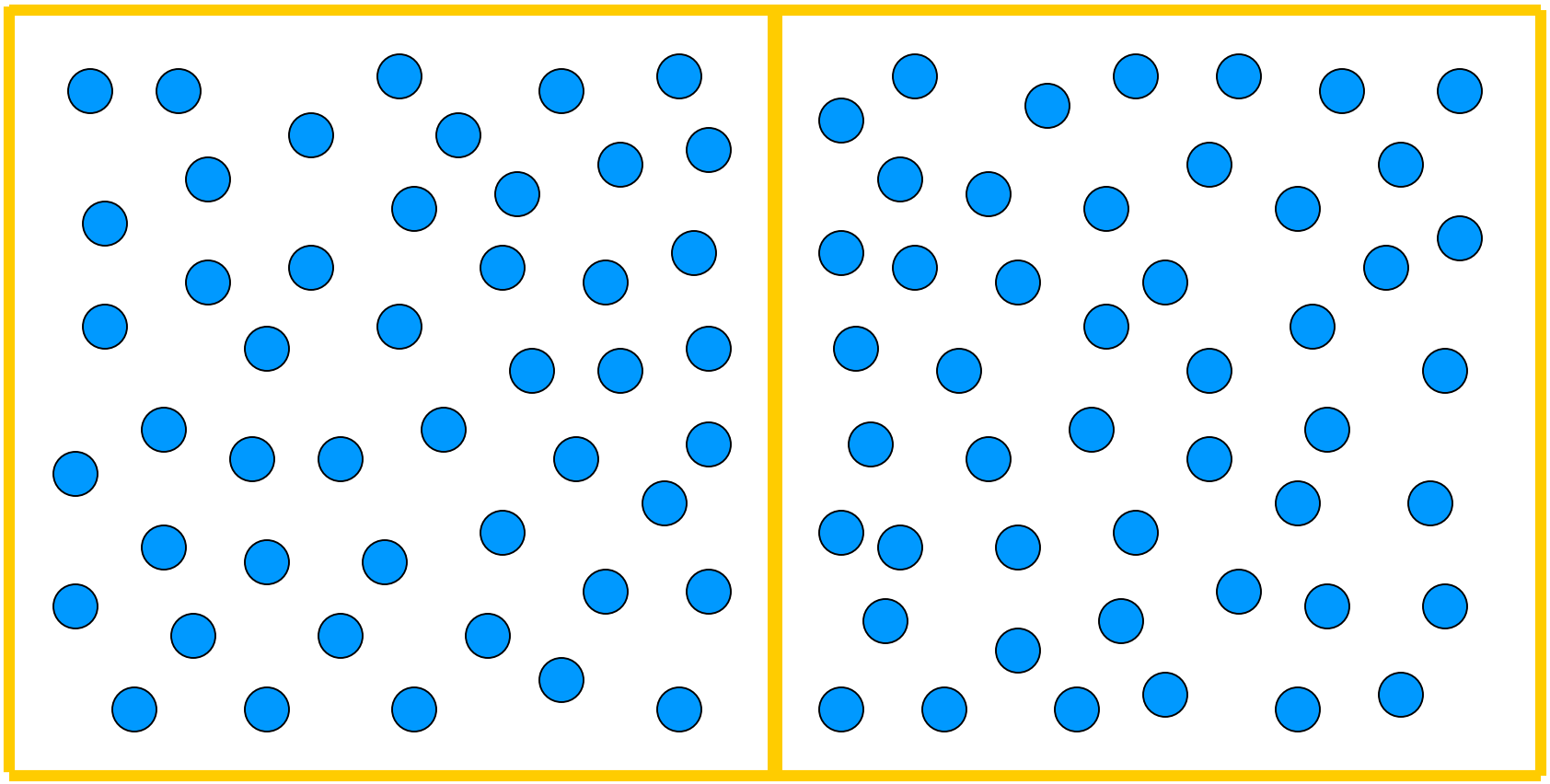
= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

DURING OSMOSIS
BONDED WATER
DOES NOT CROSS
MEMBRANE

OSMOSIS
FREE WATER

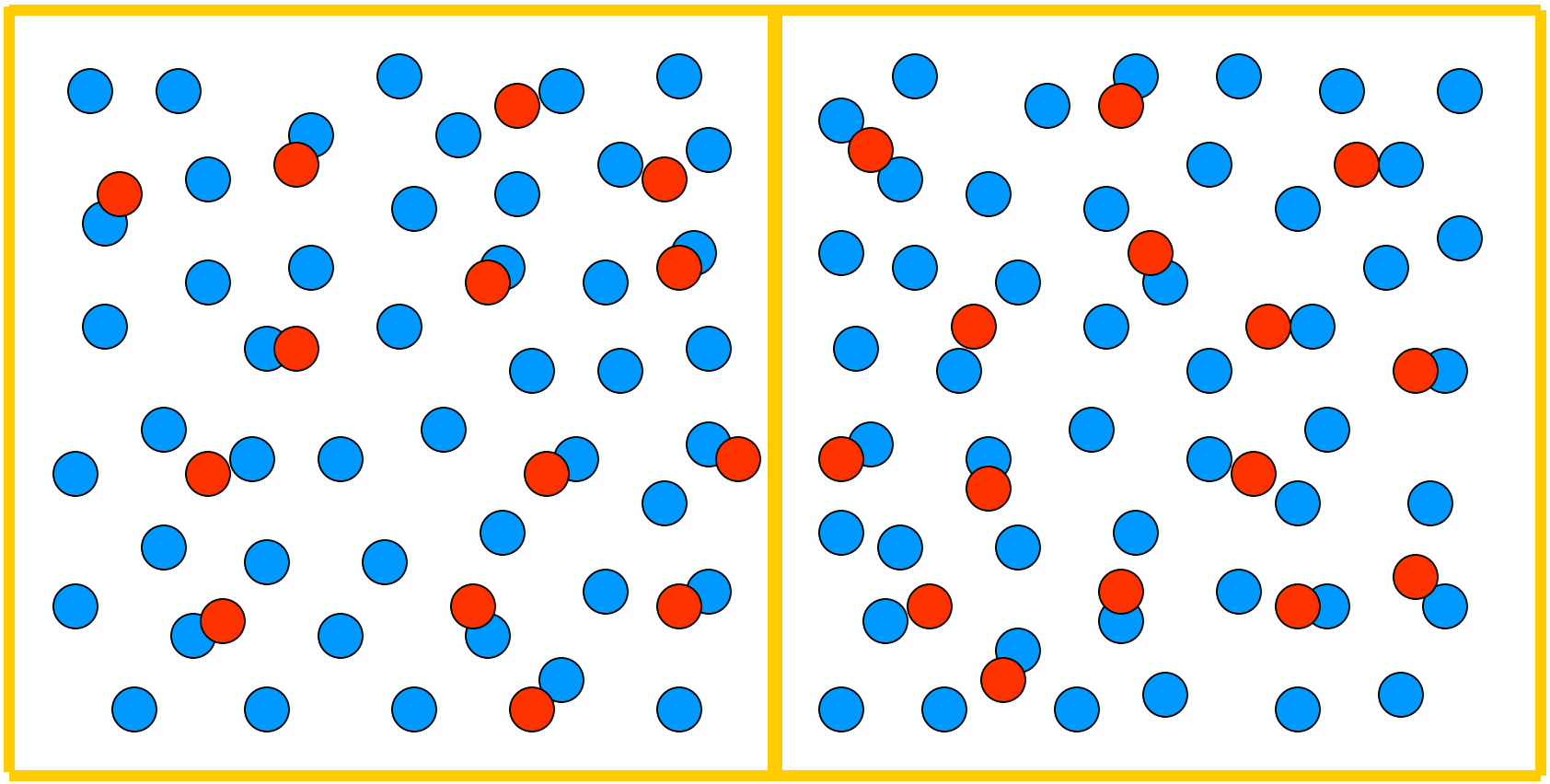
OSMOSIS



= WATER MOLECULE POLAR

= MEMBRANE

OSMOSIS

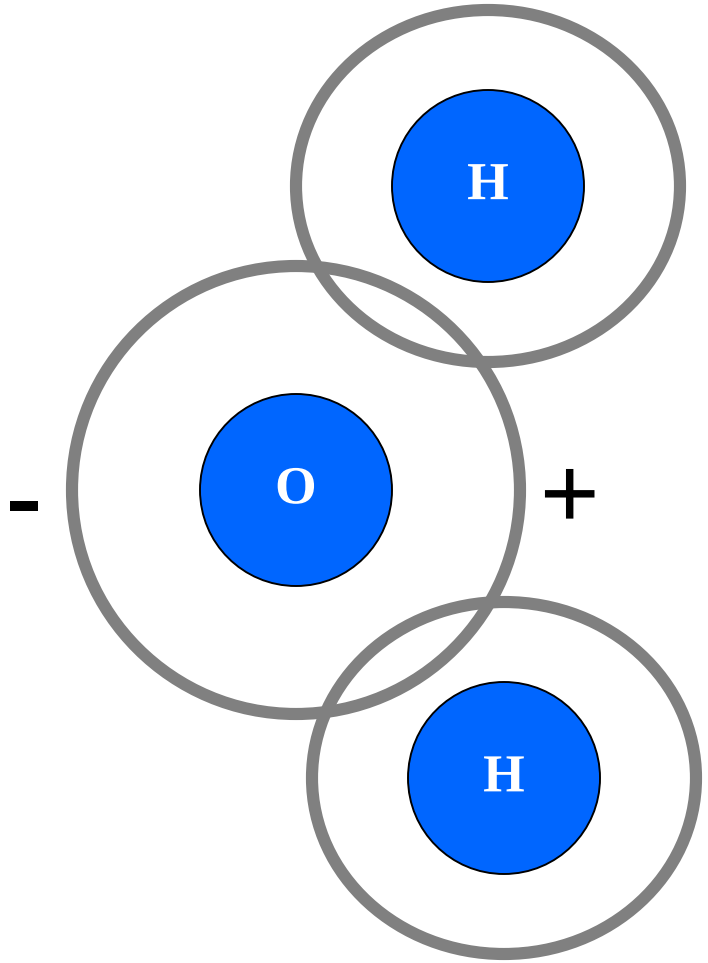


= WATER MOLECULE POLAR

= SOLUTE MOLECULE POLAR

= MEMBRANE

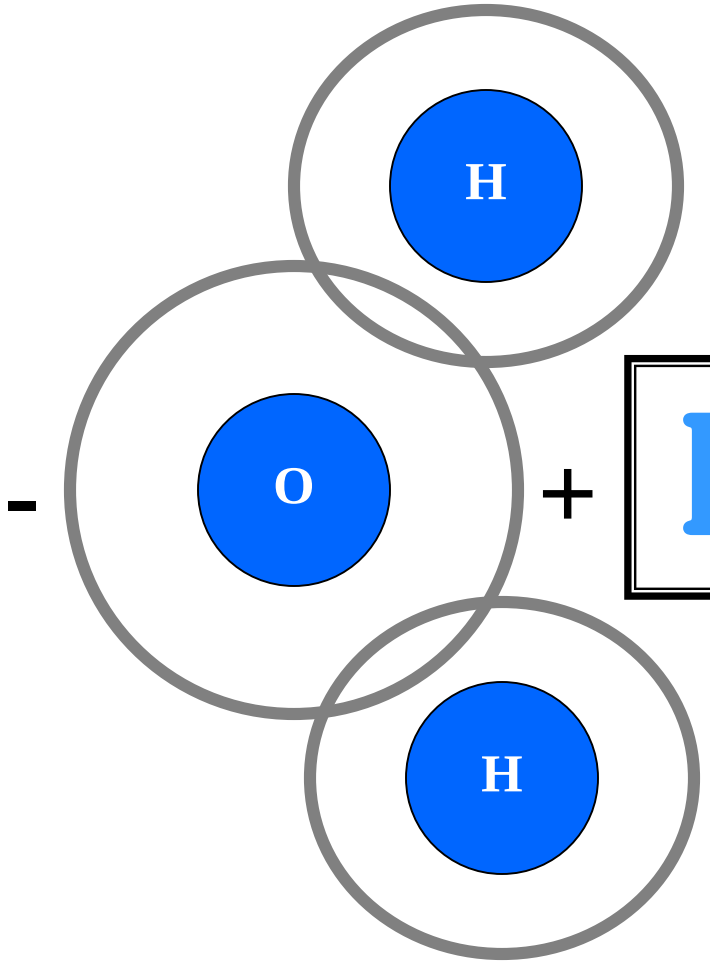
WATER MOLECULE



SOME WATER MOLECULES DO NOT BOND WITH A SOLUTE MOLECULE

WATER POLAR

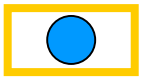
WATER MOLECULE



FREE WATER

NON-SOLUTE BONDED WATER MOLECULE

WATER POLAR



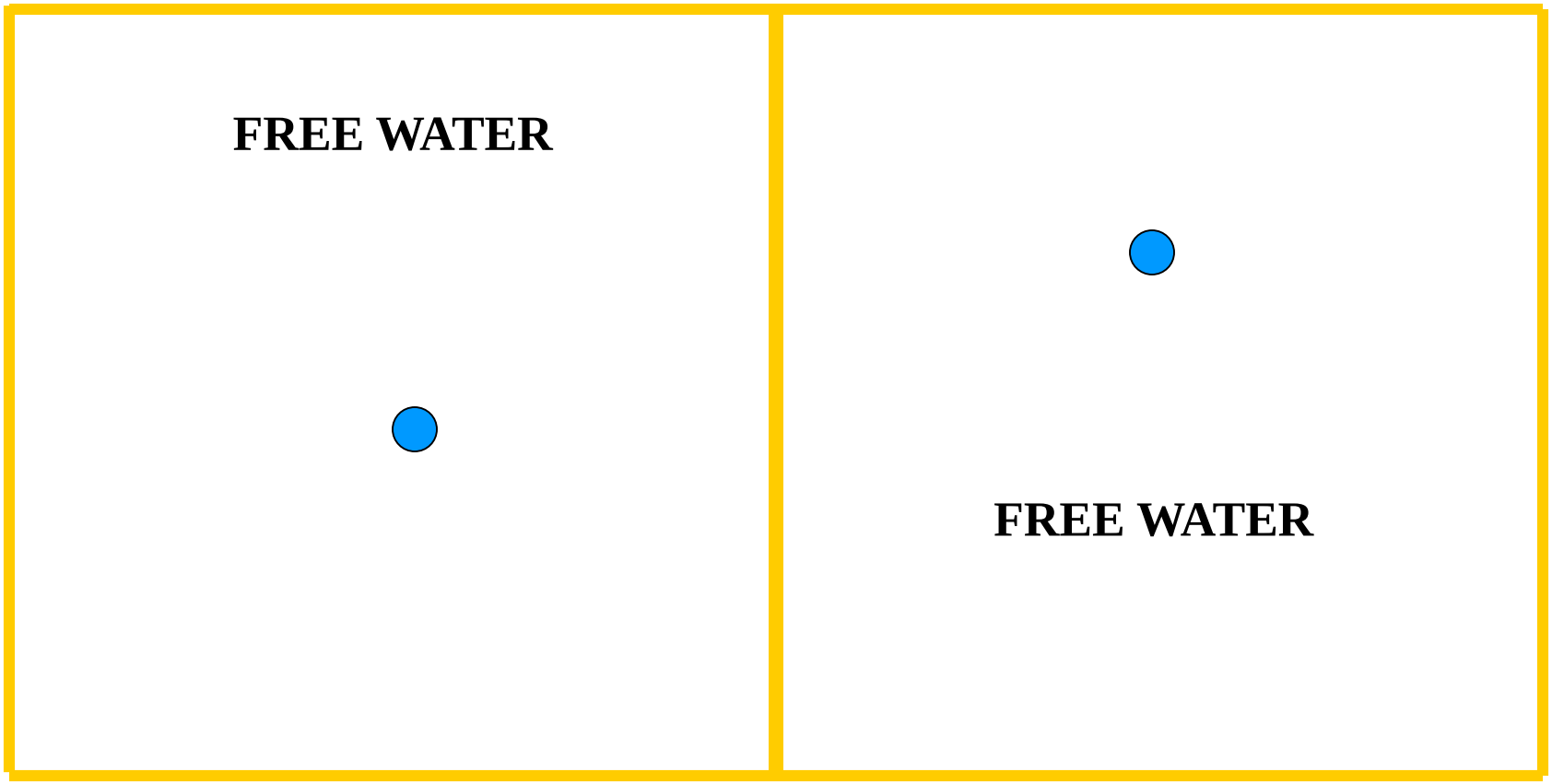
OSMOSIS

FREE WATER

PHOSPHOLIPID BILAYER

OSMOSIS
FREE WATER

CELL A **CELL B**

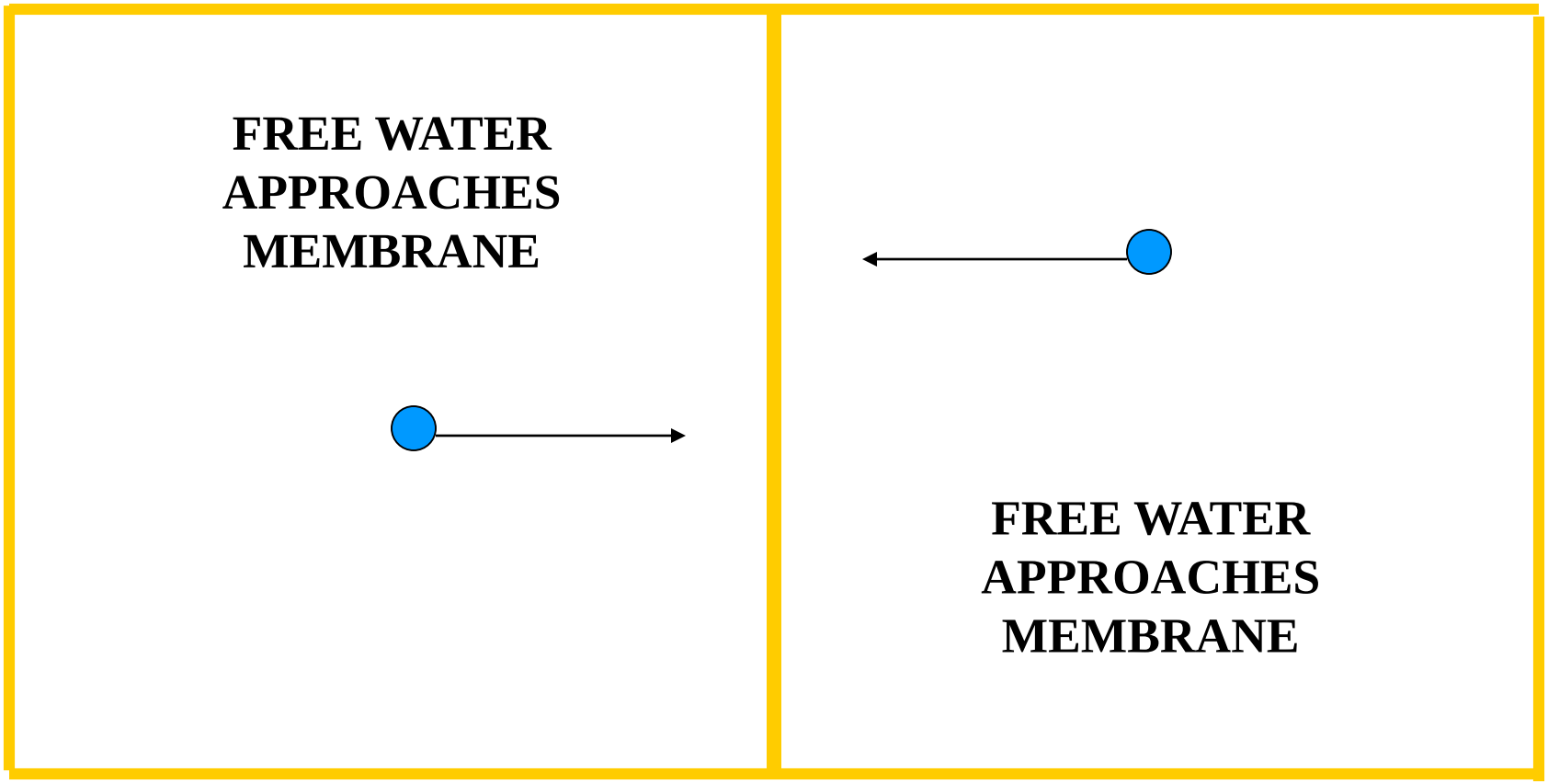


= WATER MOLECULE

= MEMBRANE

OSMOSIS
FREE WATER

CELL A **CELL B**

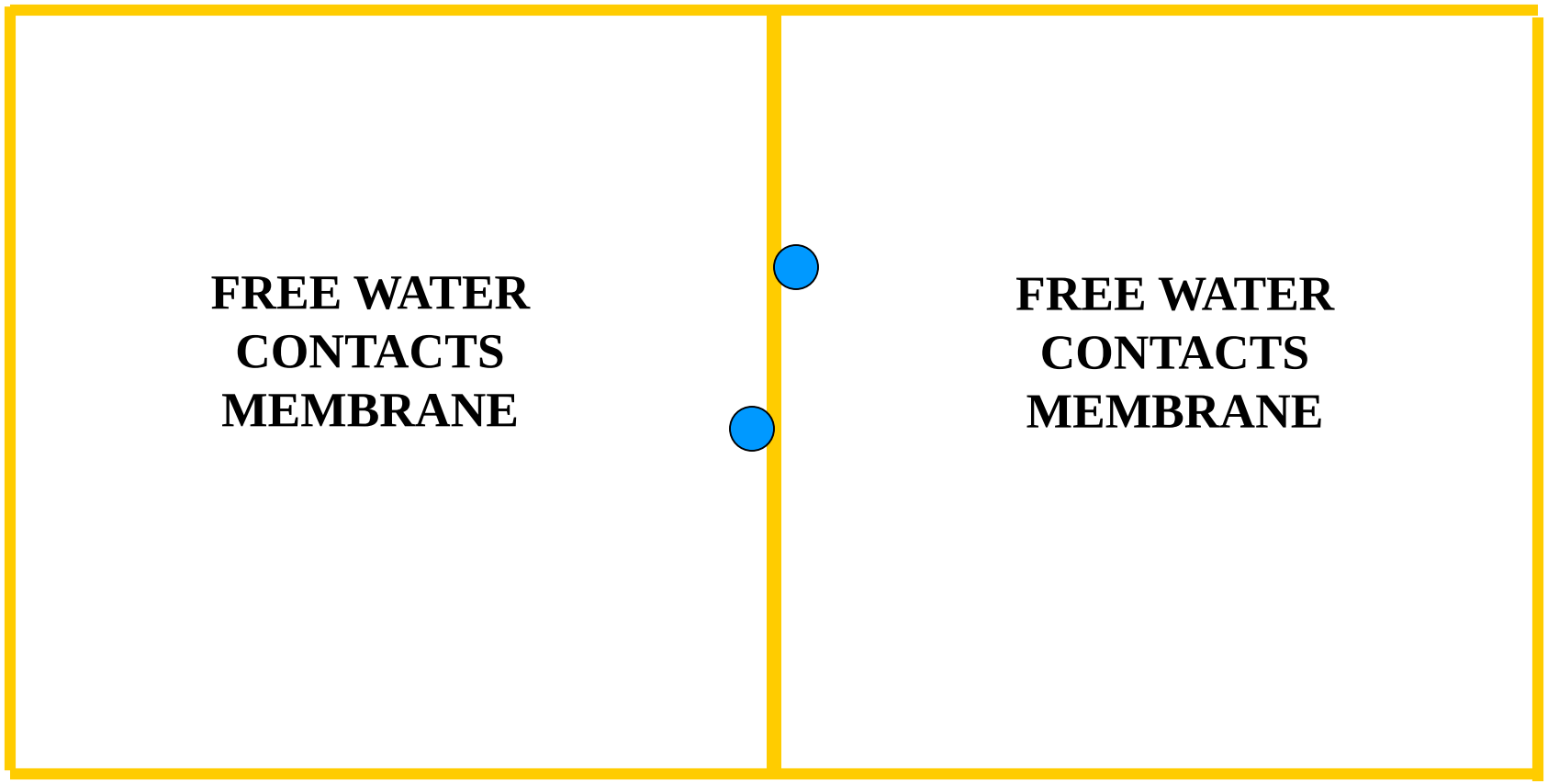


= WATER MOLECULE

= MEMBRANE

OSMOSIS
FREE WATER

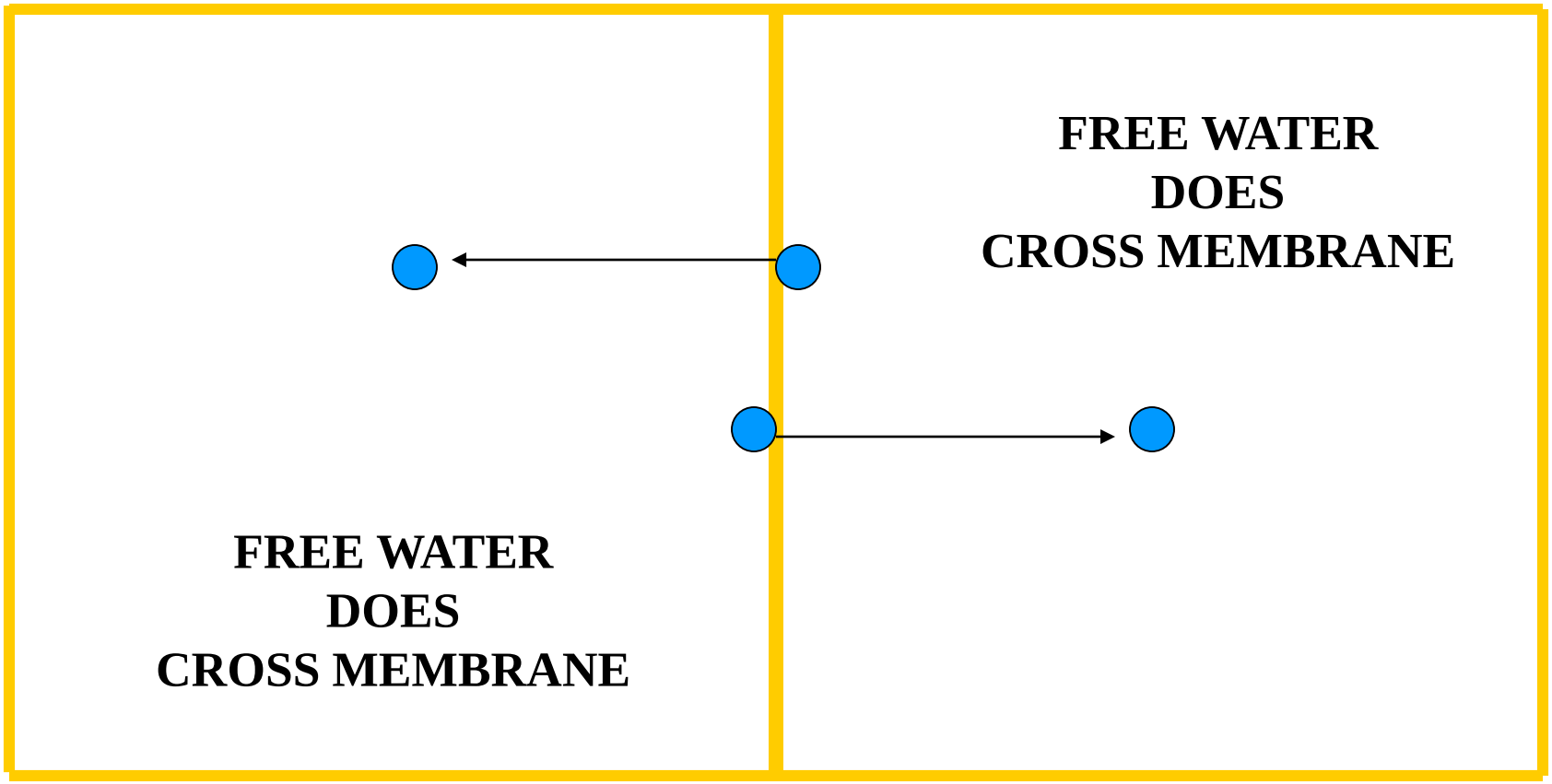
CELL A **CELL B**



= WATER MOLECULE

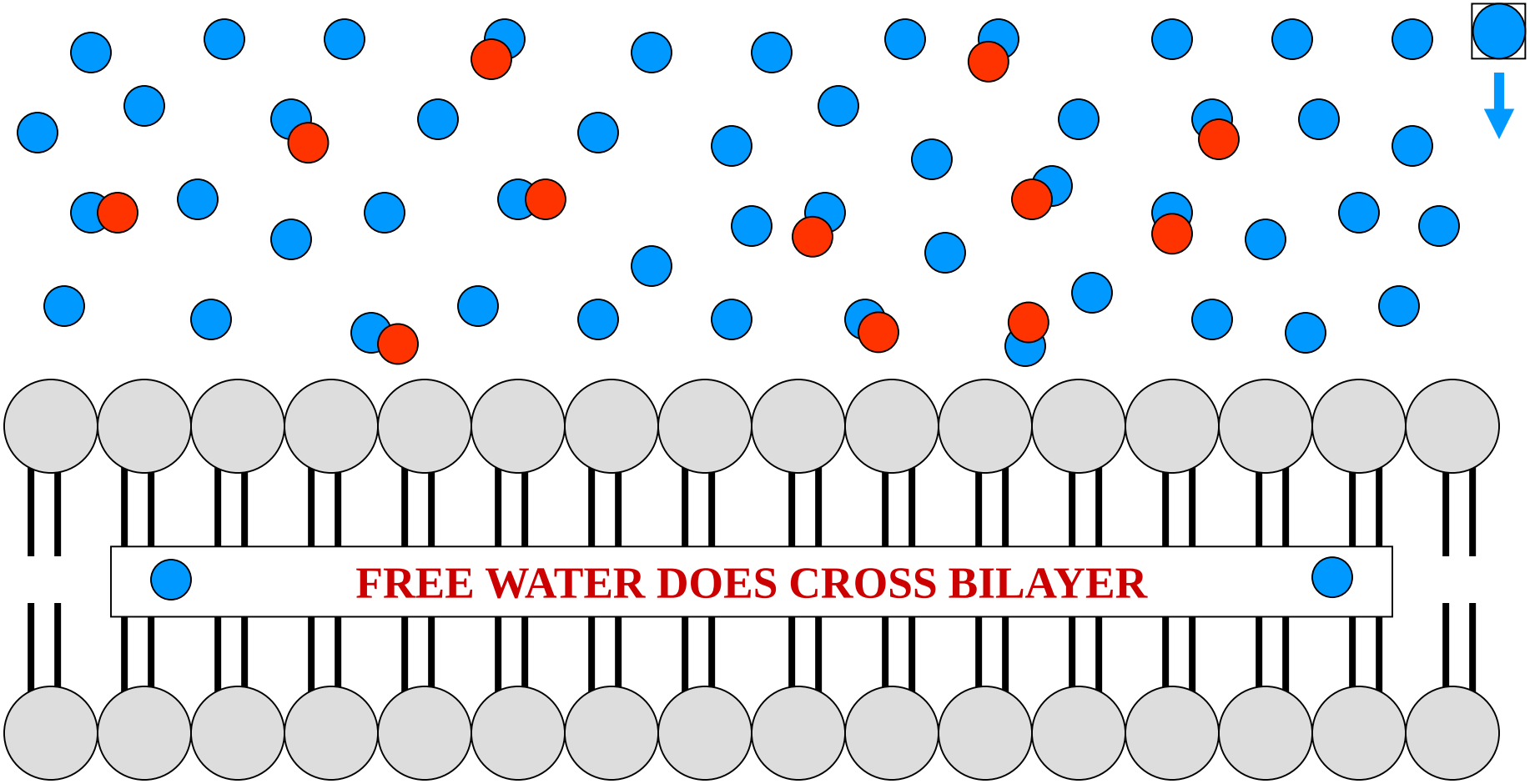
= MEMBRANE

OSMOSIS
FREE WATER



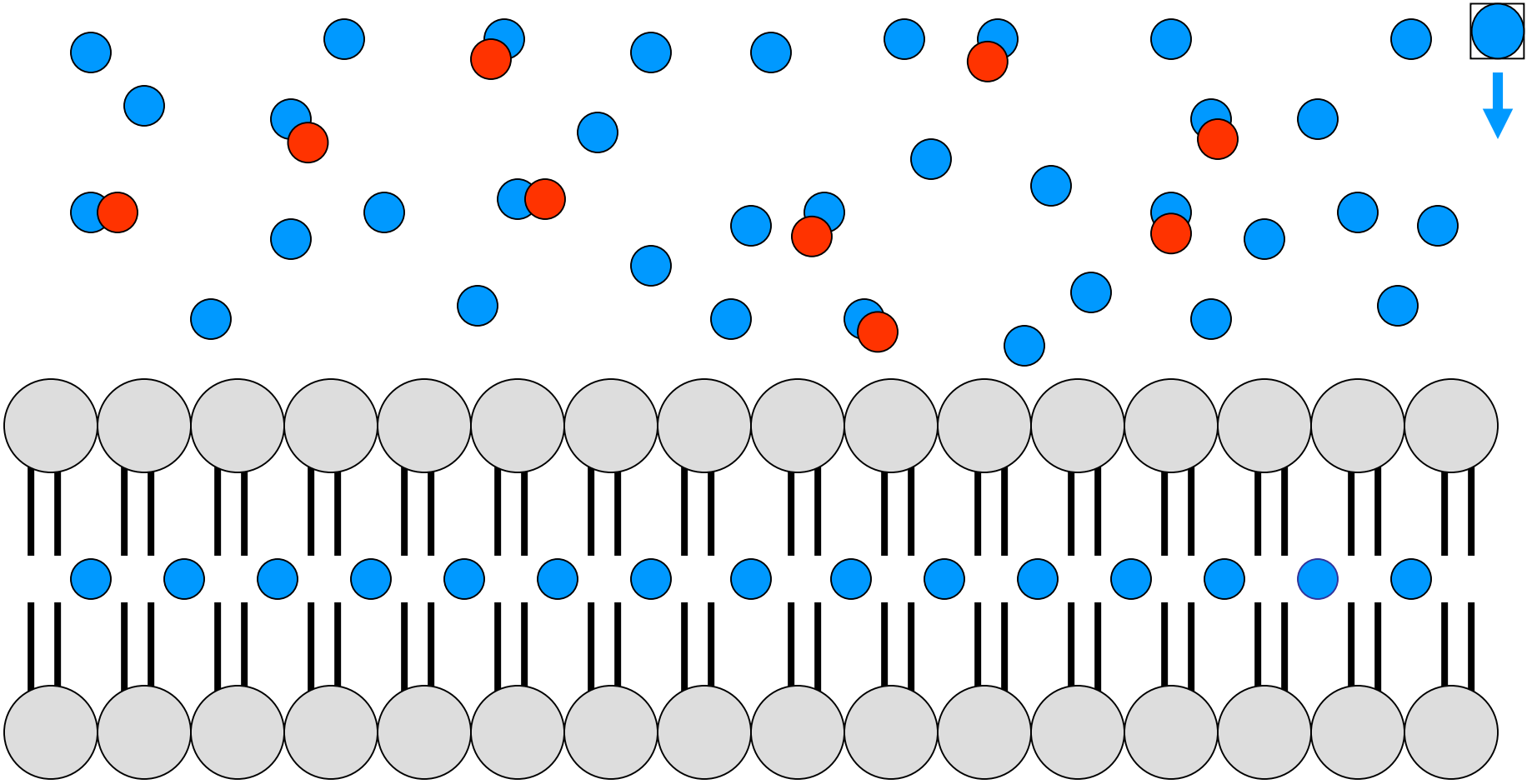
= WATER MOLECULE

= MEMBRANE



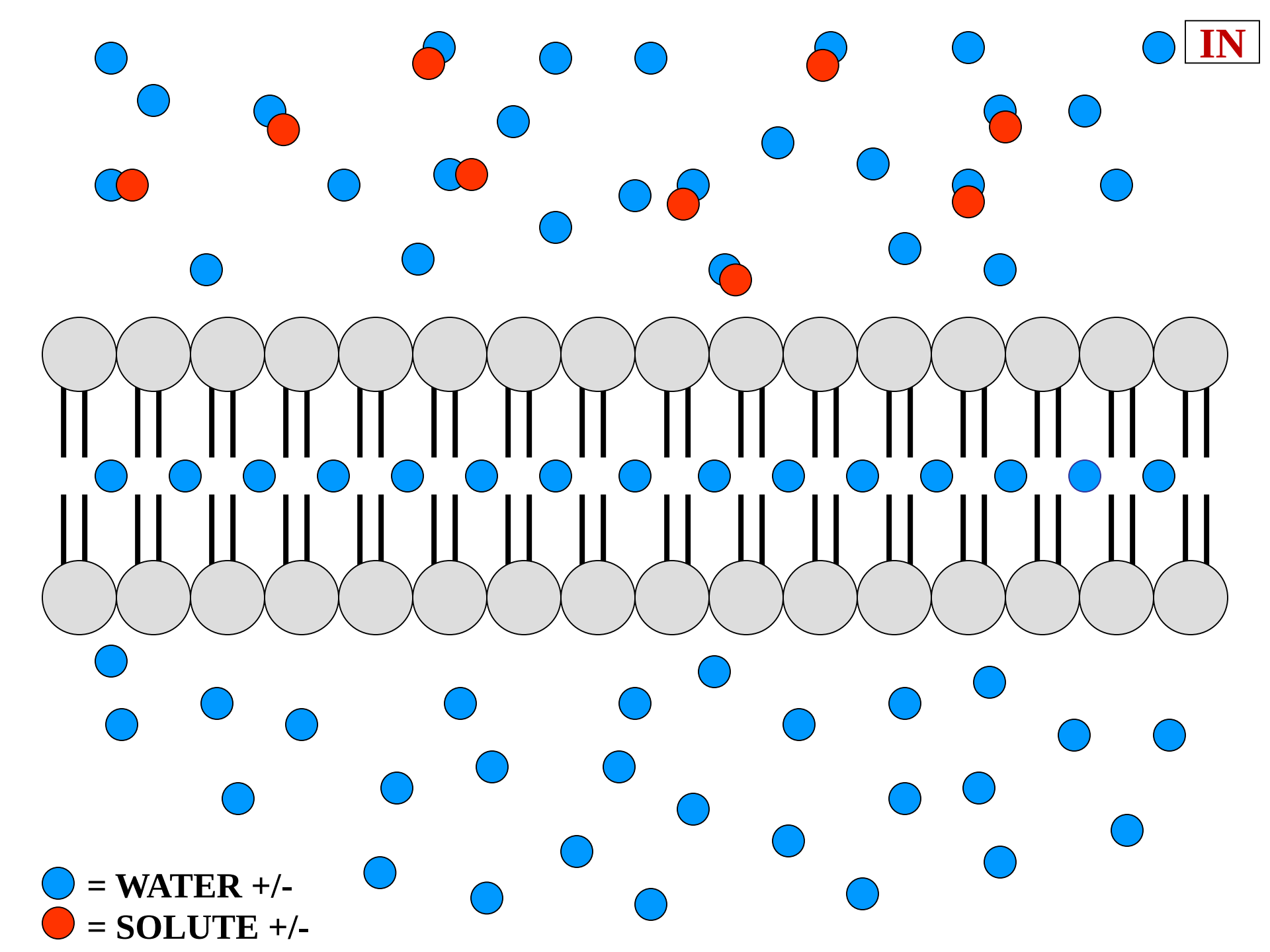
= WATER +/-

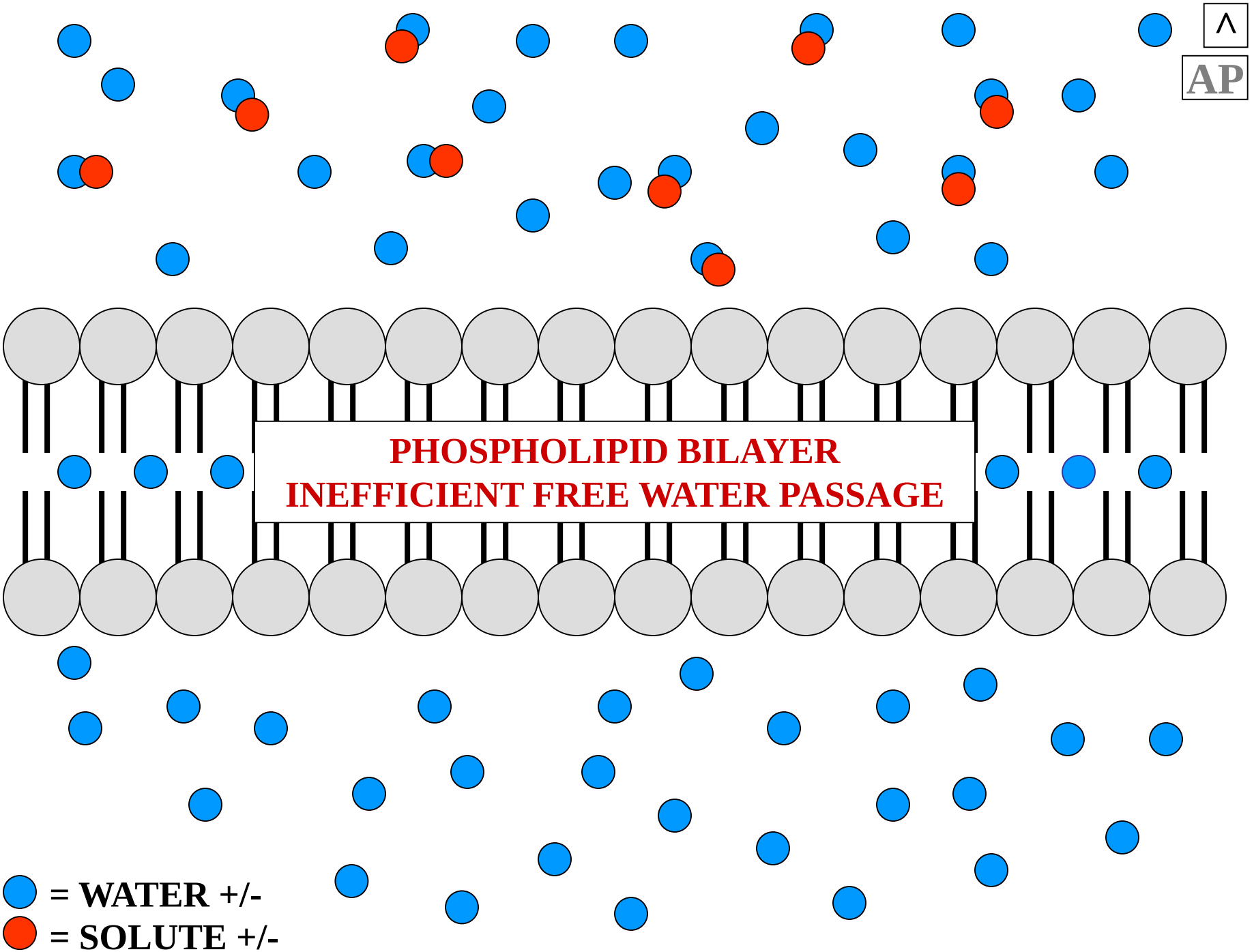
= SOLUTE +/-



= **WATER +/-**

= **SOLUTE +/-**


IN
= WATER +/-
= SOLUTE +/-

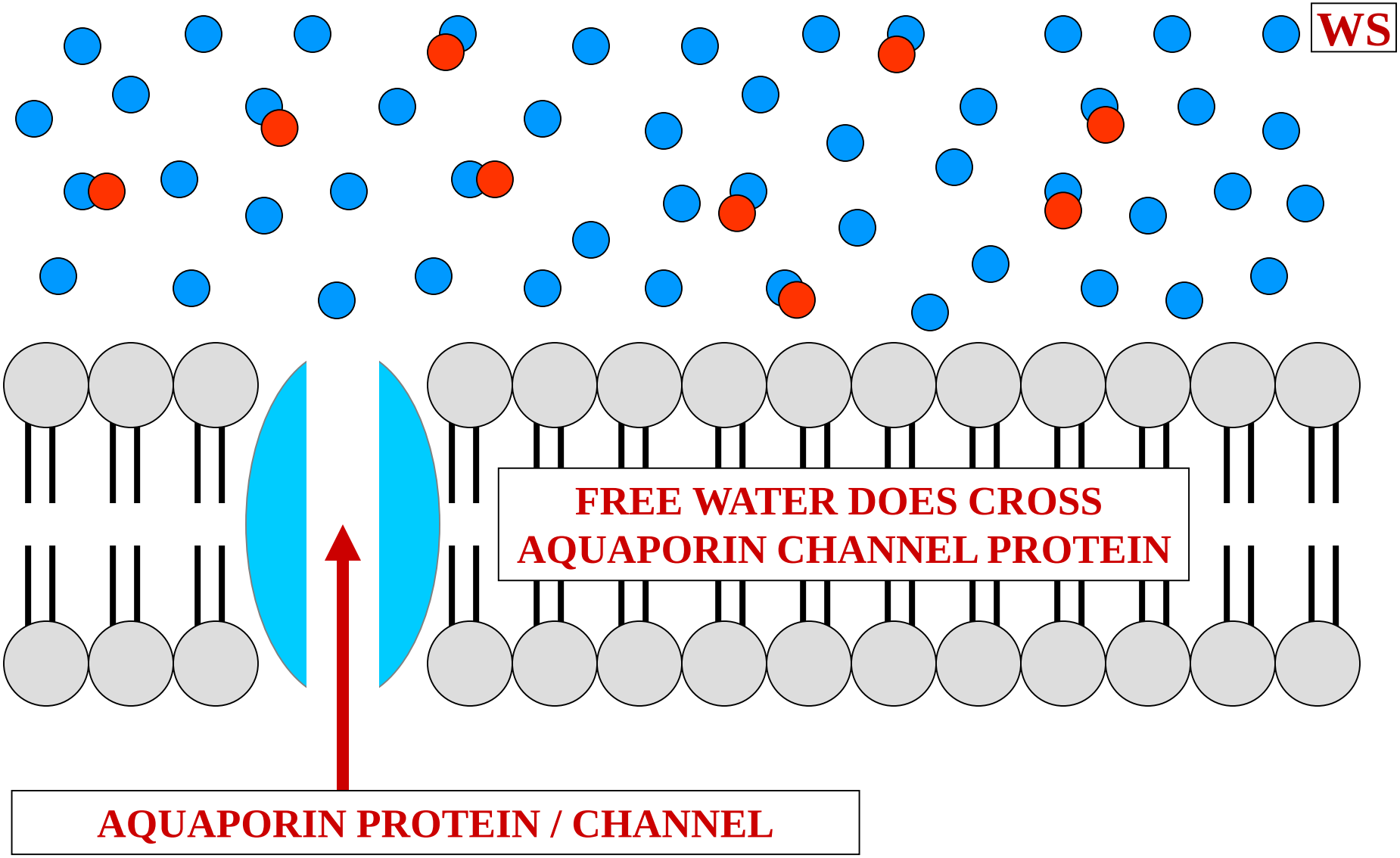

^
AP
PHOSPHOLIPID BILAYER
INEFFICIENT FREE WATER PASSAGE
= WATER +/-
= SOLUTE +/-

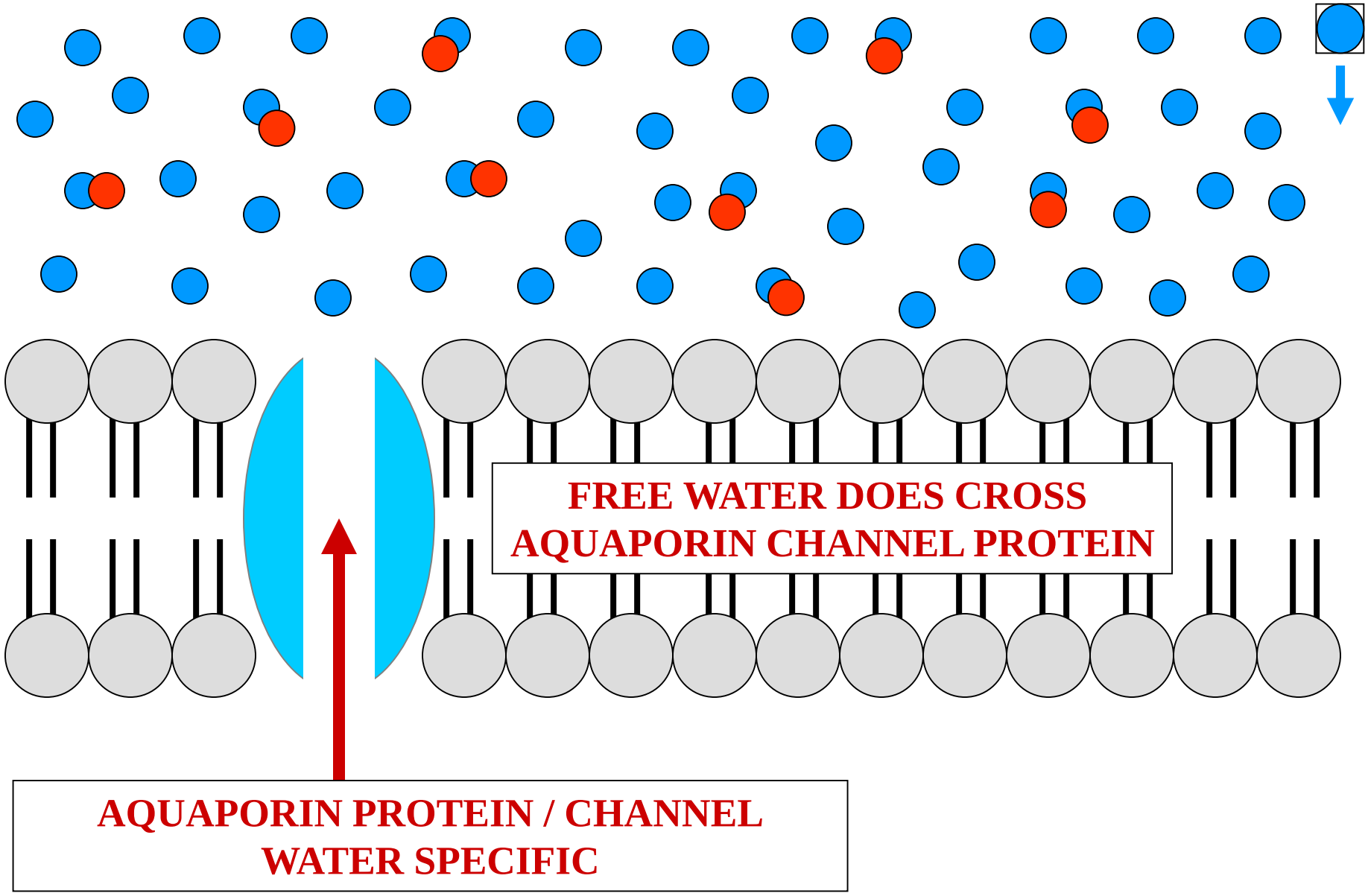
OSMOSIS

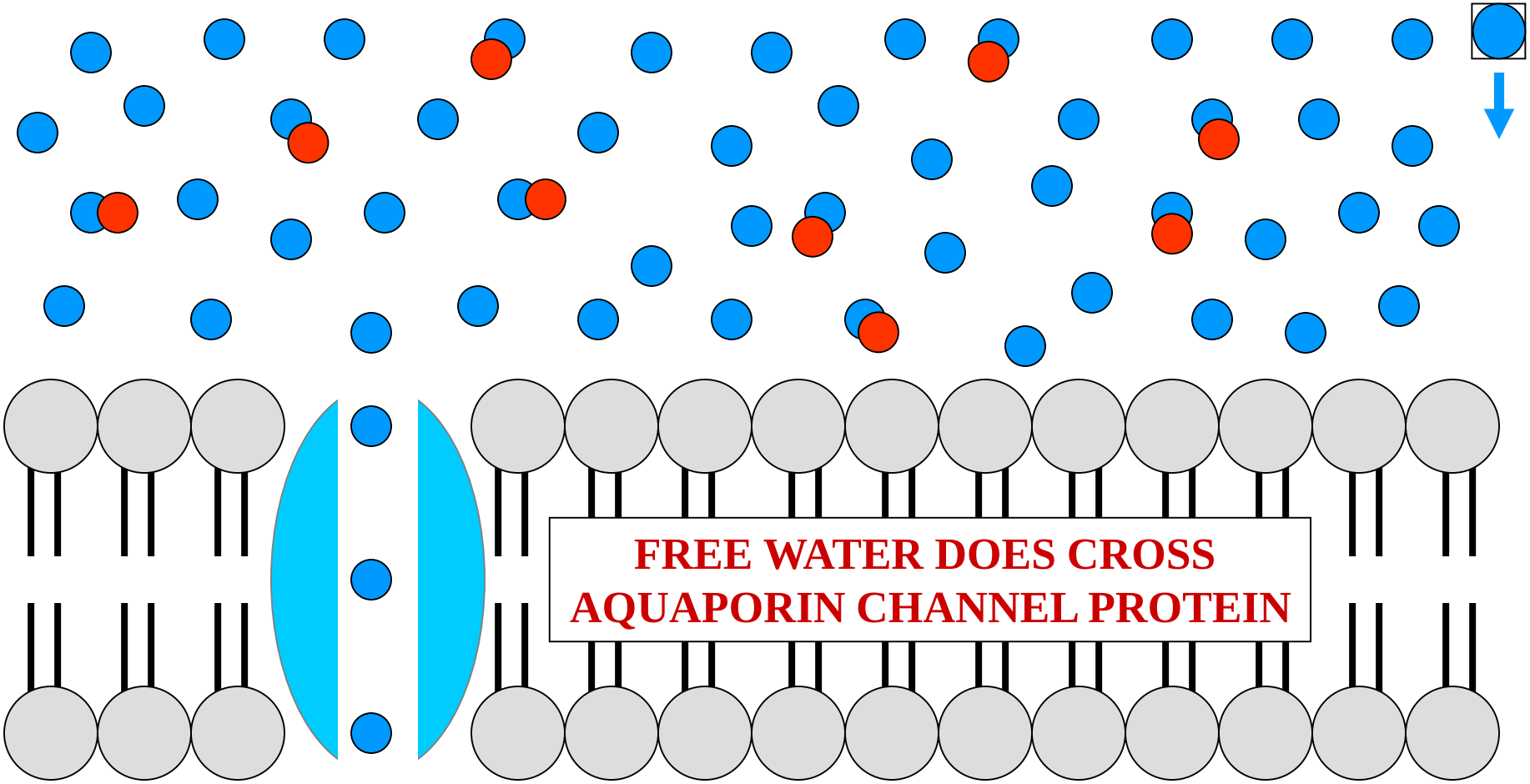
FREE WATER

AQUAPORIN

PROTEIN


WS
FREE WATER DOES CROSS
AQUAPORIN CHANNEL PROTEIN
AQUAPORIN PROTEIN / CHANNEL
= WATER +/-
= SOLUTE +/-

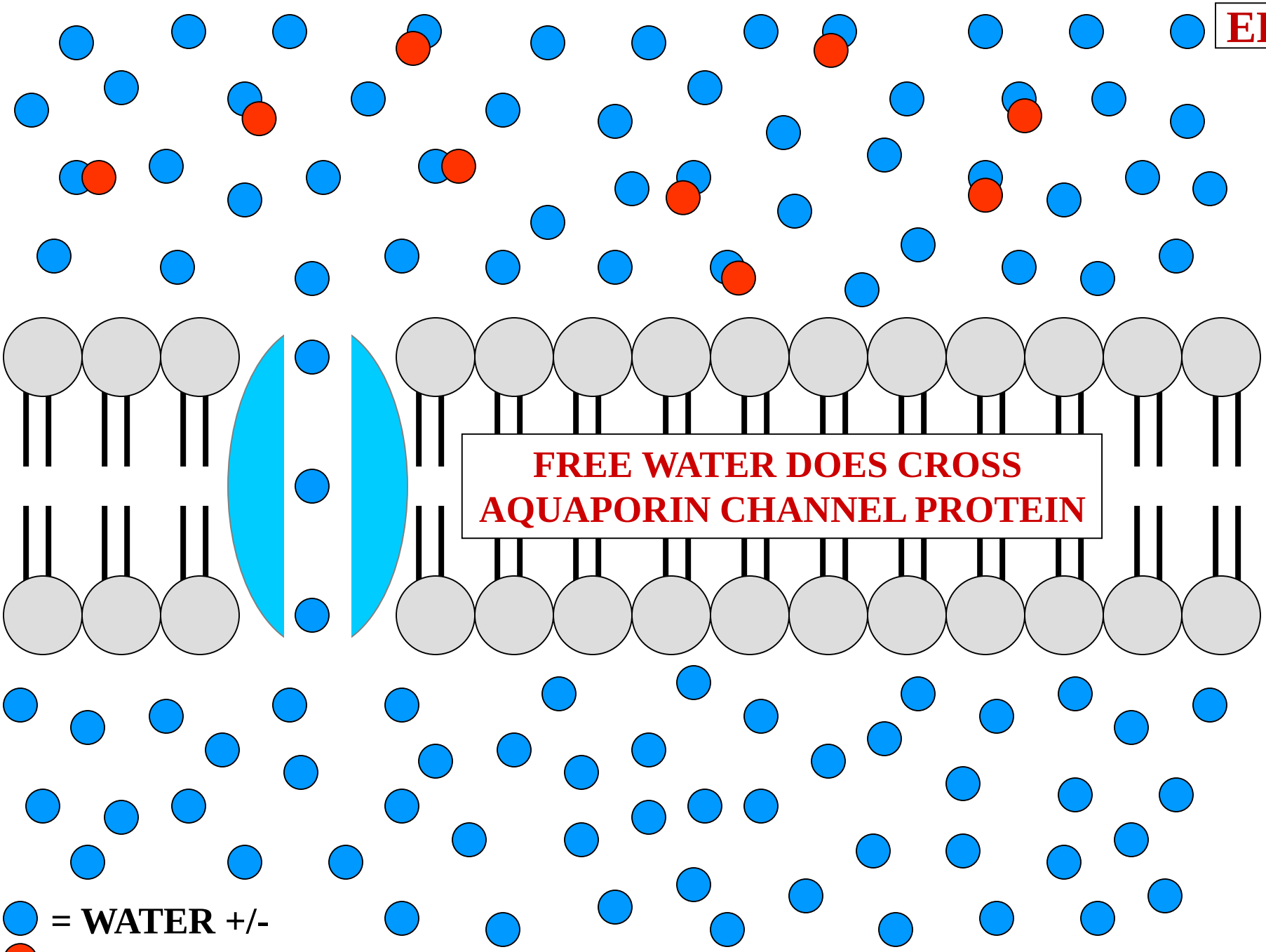

FREE WATER DOES CROSS
AQUAPORIN CHANNEL PROTEIN
AQUAPORIN PROTEIN / CHANNEL
WATER SPECIFIC
= WATER +/-
= SOLUTE +/-

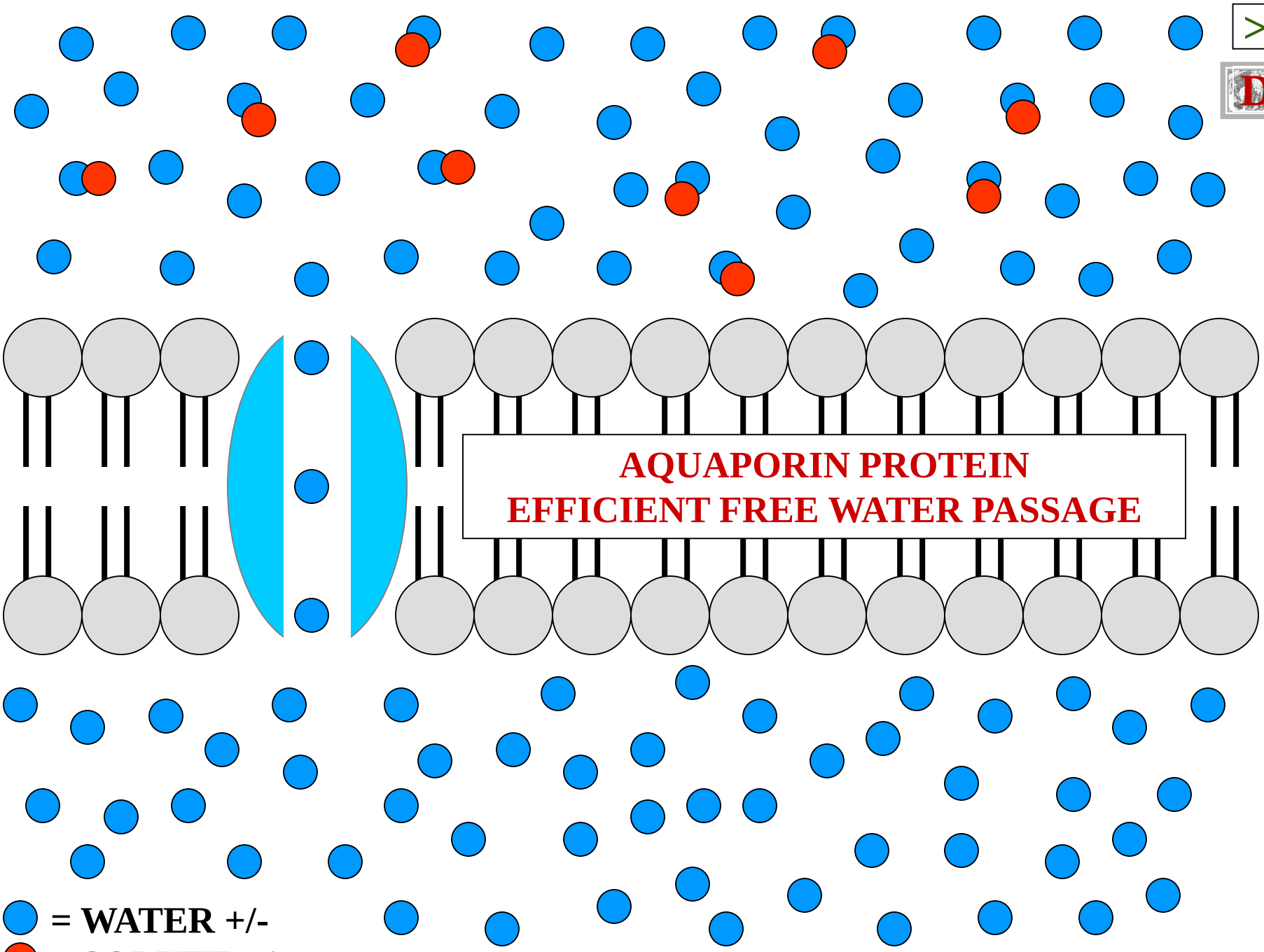


= WATER +/-

= SOLUTE +/-

EF


FREE WATER DOES CROSS
AQUAPORIN CHANNEL PROTEIN
= WATER +/-
= SOLUTE +/-

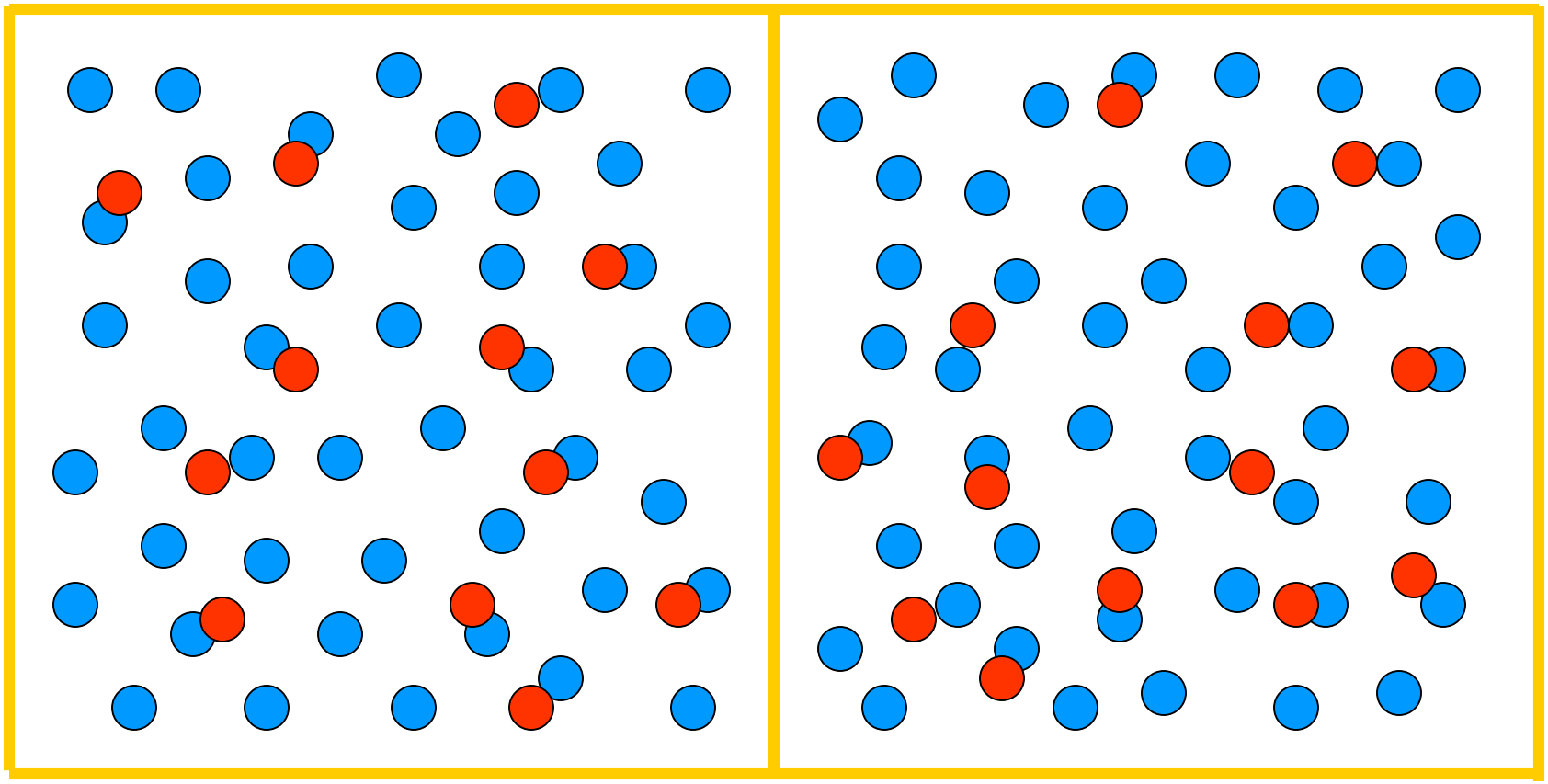

AQUAPORIN PROTEIN
EFFICIENT FREE WATER PASSAGE
= WATER +/-
= SOLUTE +/-

DURING OSMOSIS
FREE WATER
DOES CROSS
MEMBRANE

OSMOSIS: APPLIED

OSMOSIS

CELL A **CELL B**



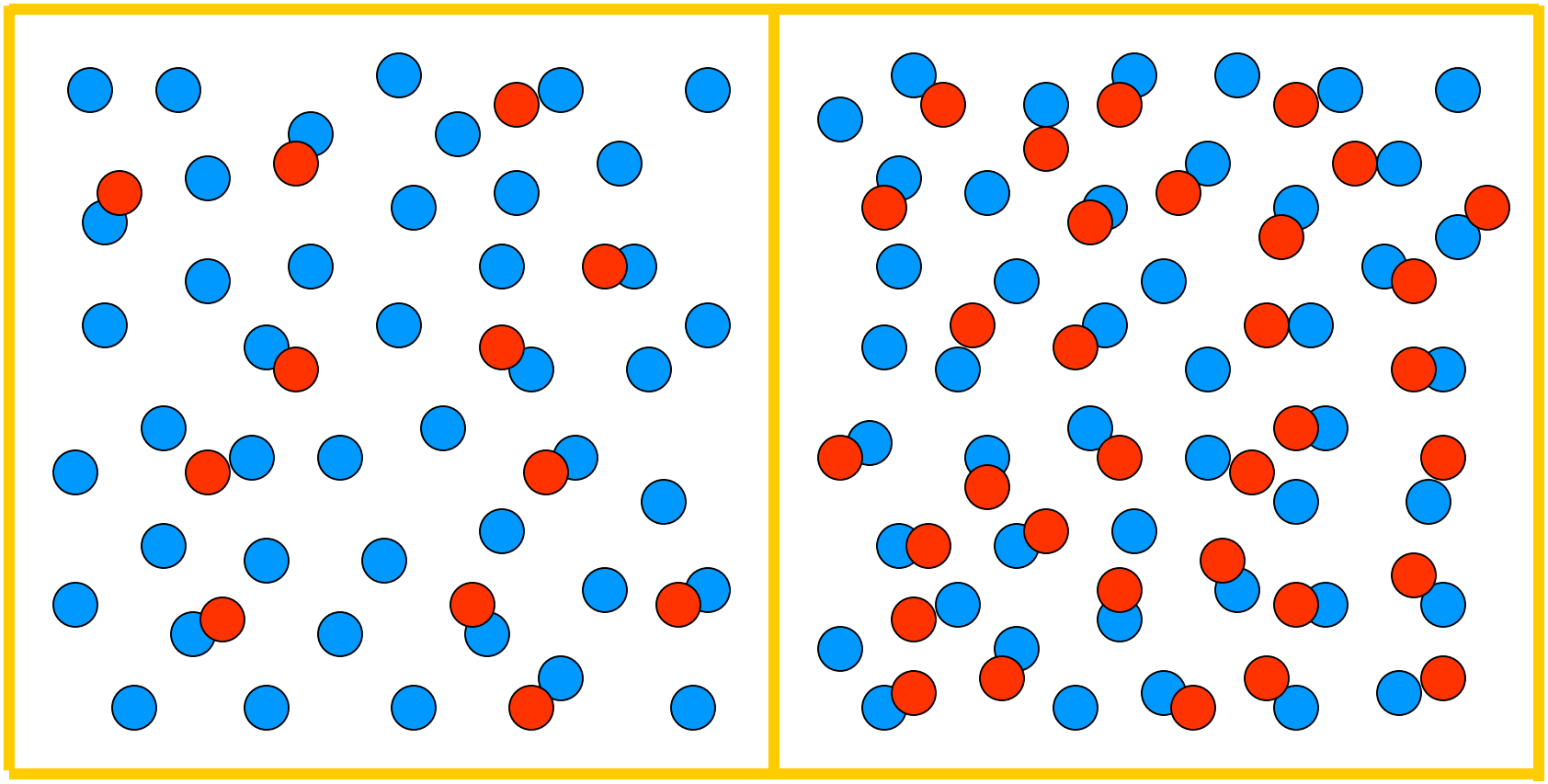
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

CELL A **CELL B**

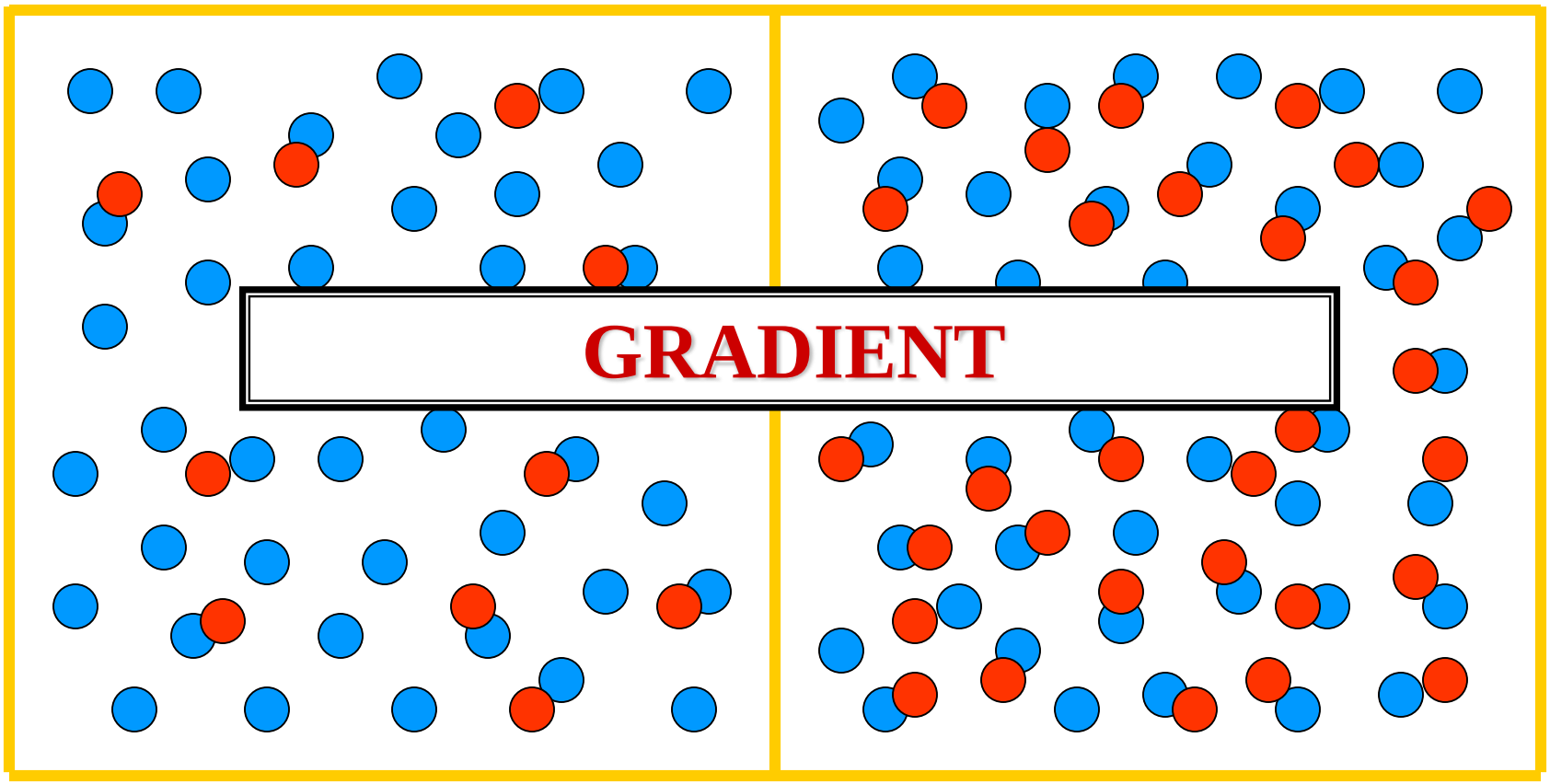


= WATER MOLECULE

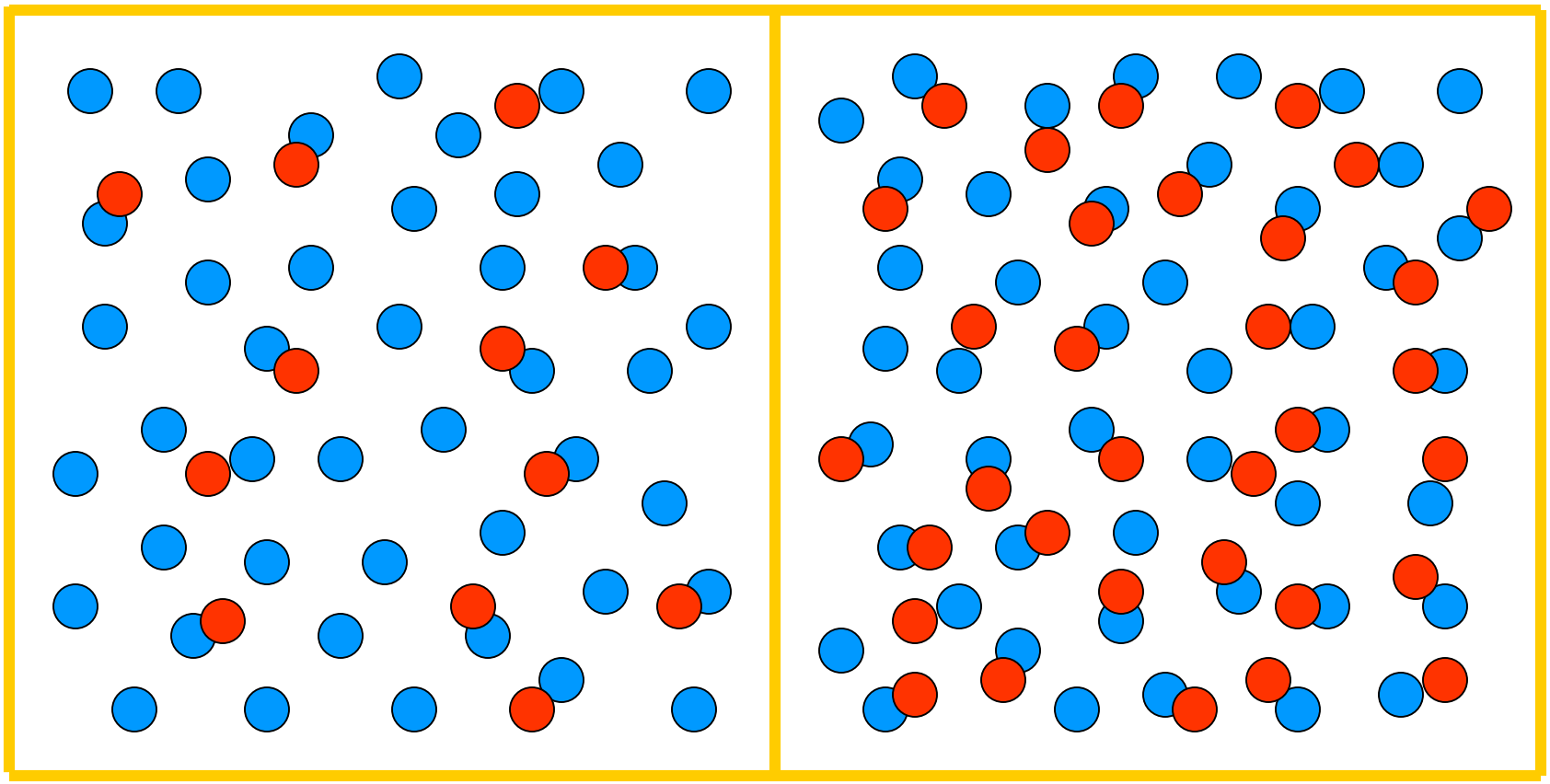
= POLAR SOLUTE MOLECULE

= MEMBRANE

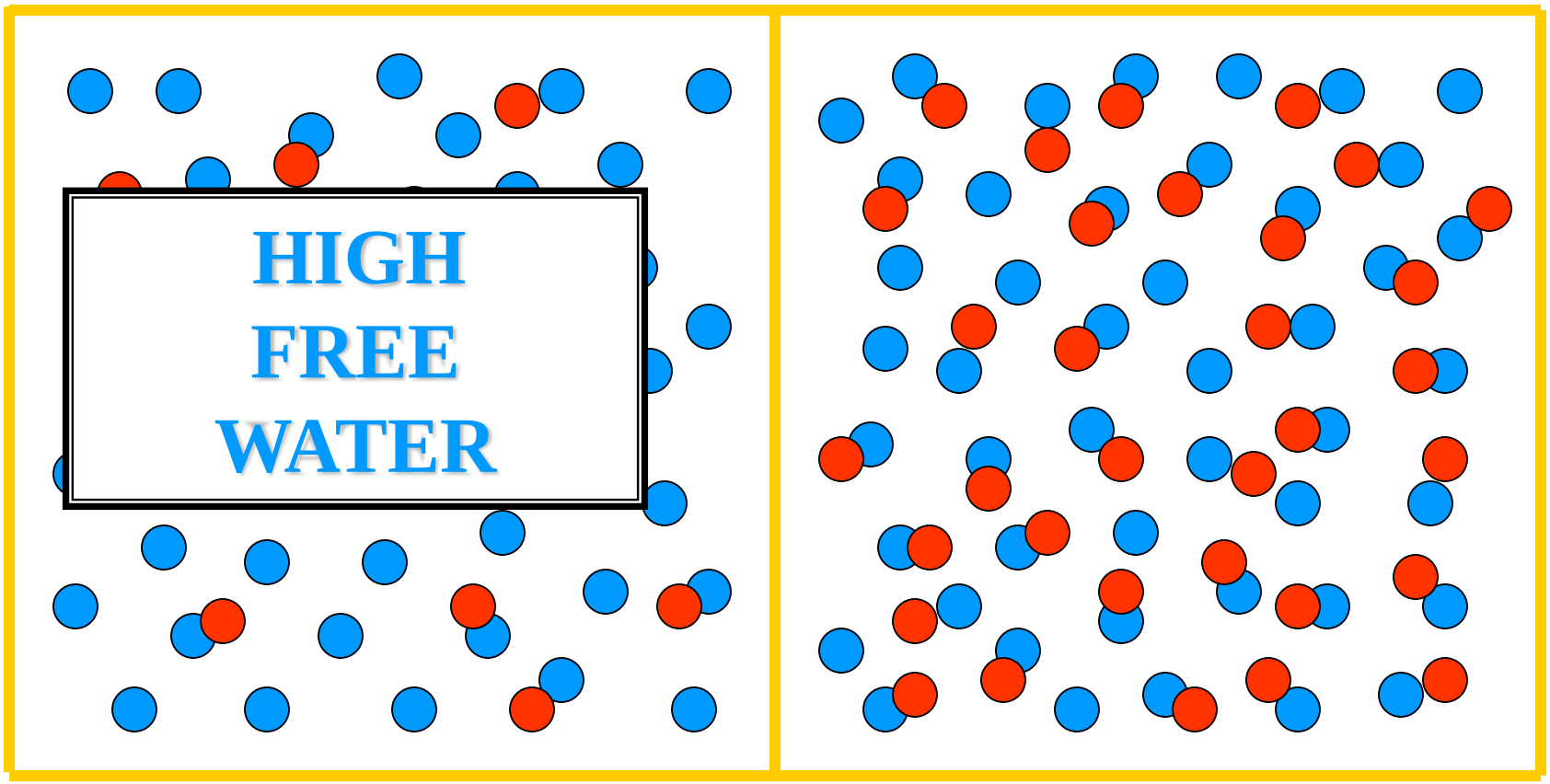
OSMOSIS


CELL A
CELL B
GRADIENT
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

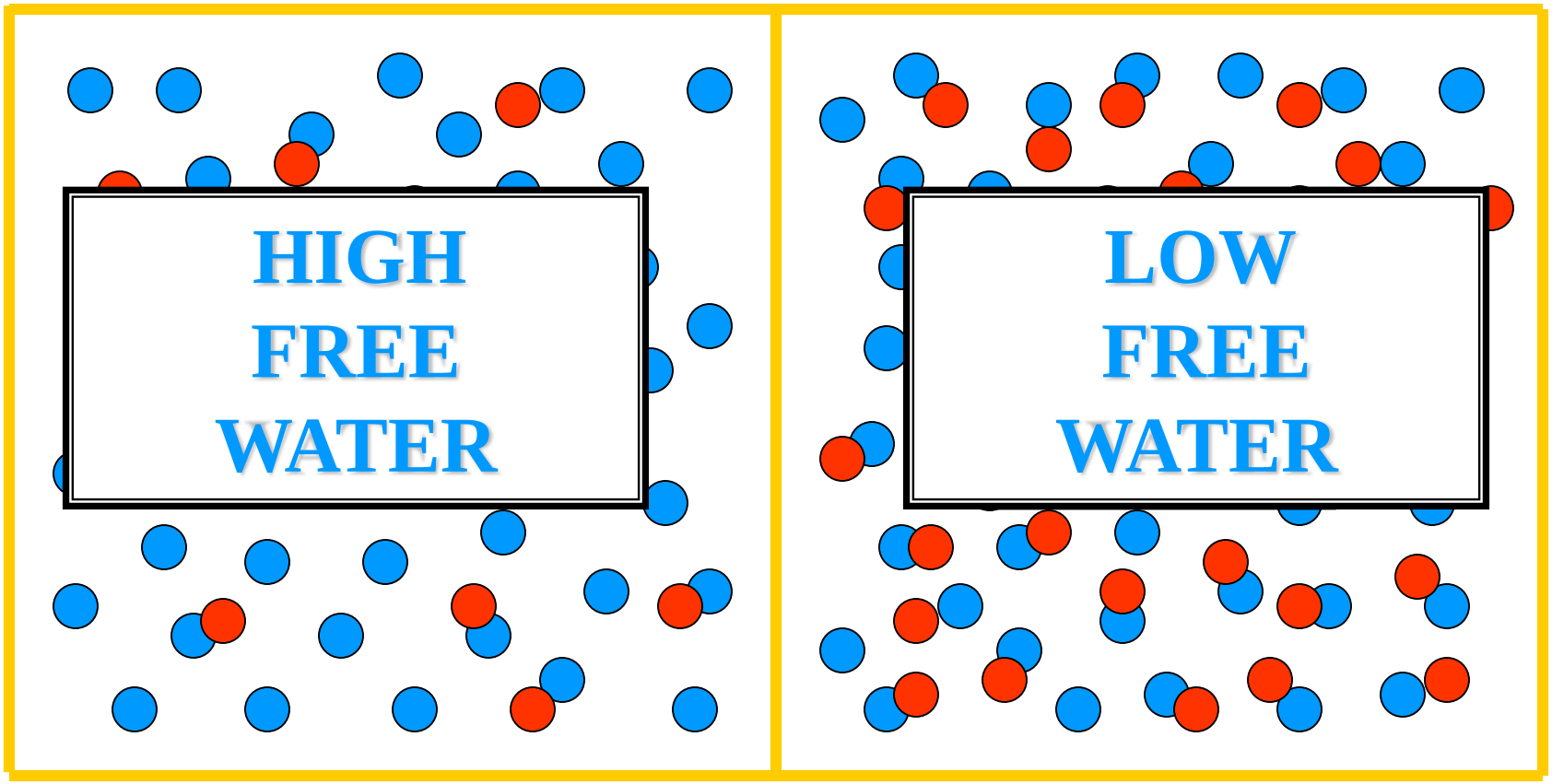
OSMOSIS


CELL A
CELL B
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

OSMOSIS

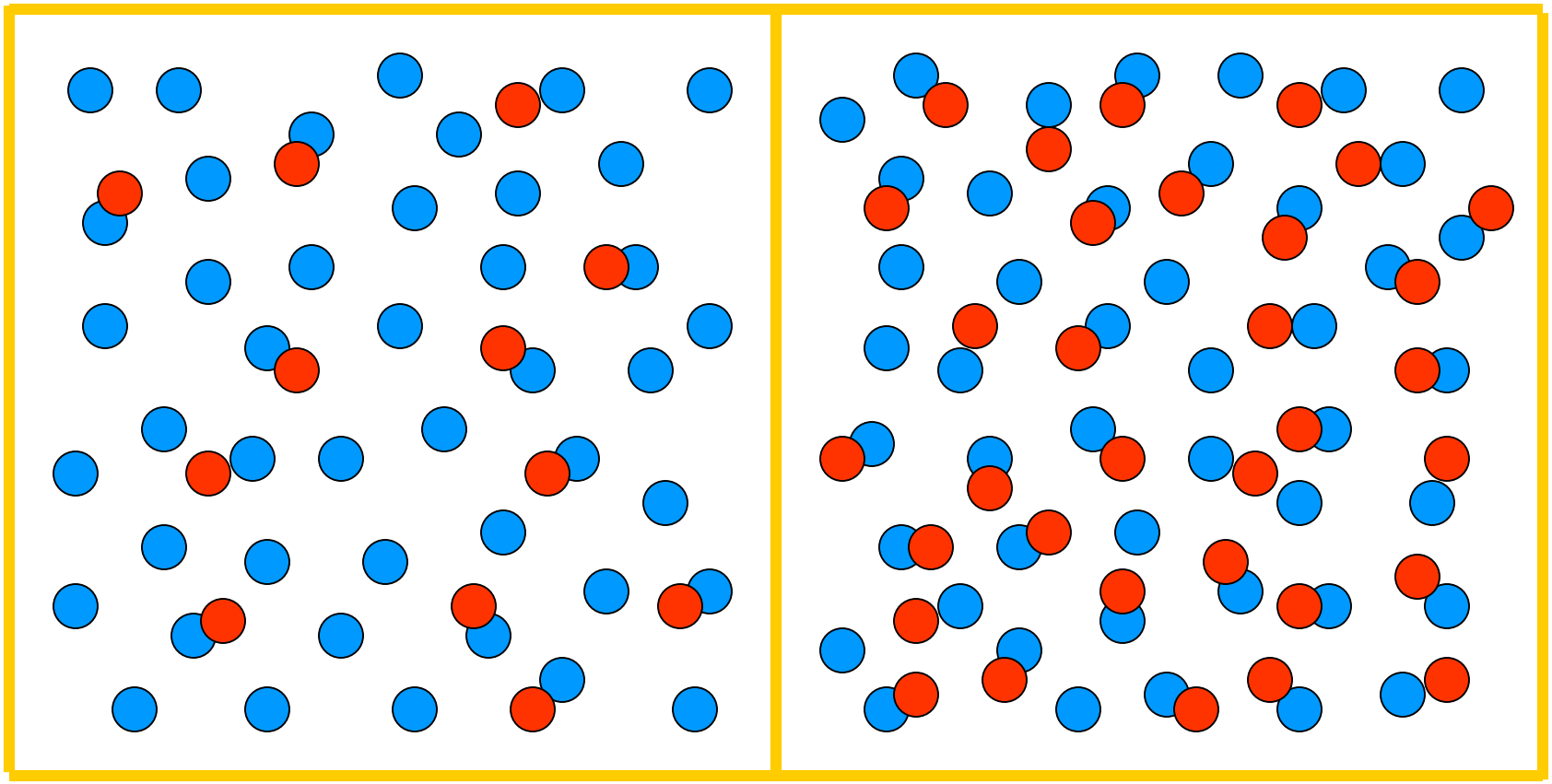

CELL A
CELL B
HIGH
FREE
WATER
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

OSMOSIS


CELL A
CELL B
HIGH FREE WATER
LOW FREE WATER
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

OSMOSIS

CELL A — OSMOSIS — CELL B



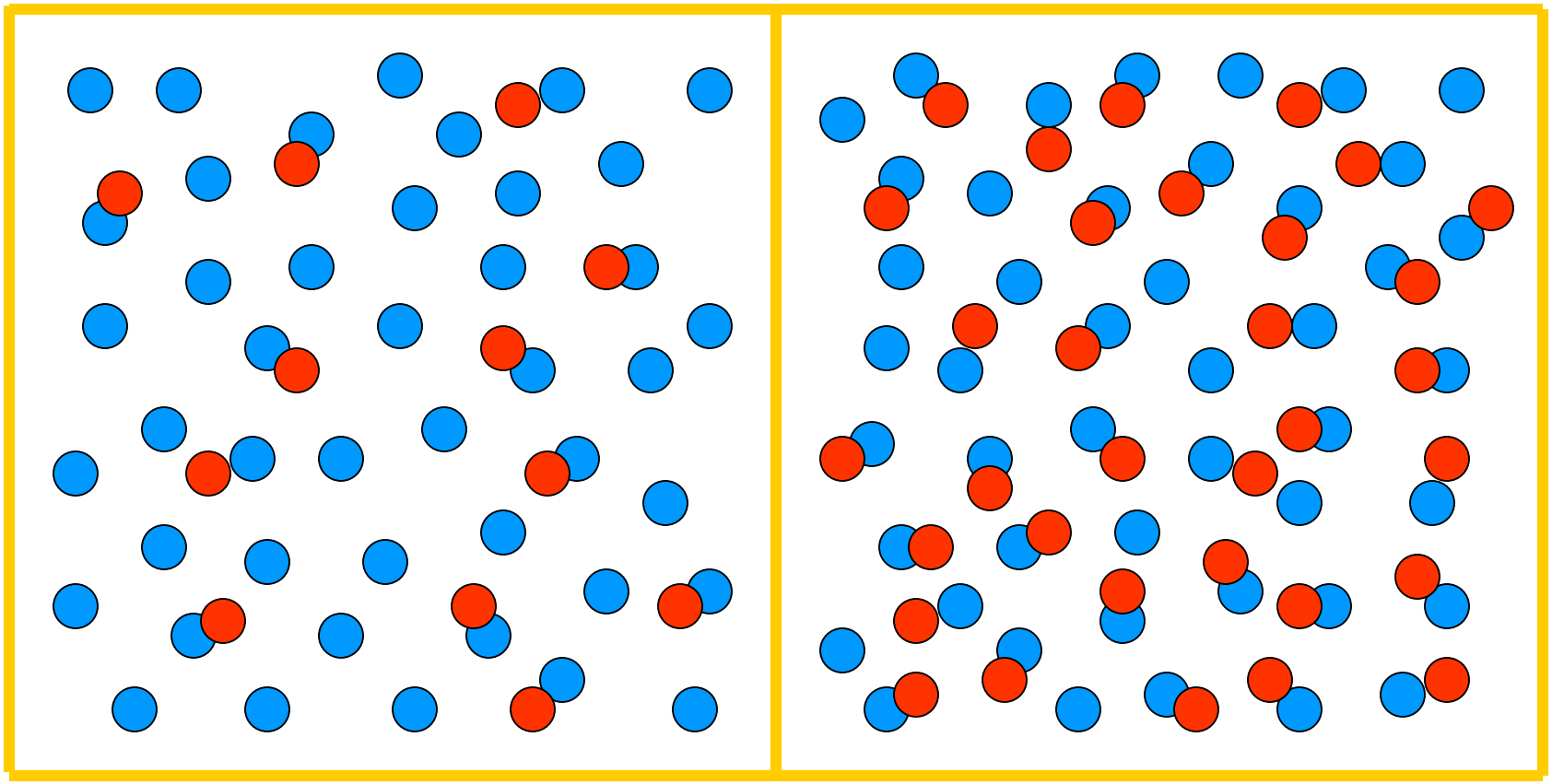
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

CELL A — WATER VIA OSMOSIS — CELL B



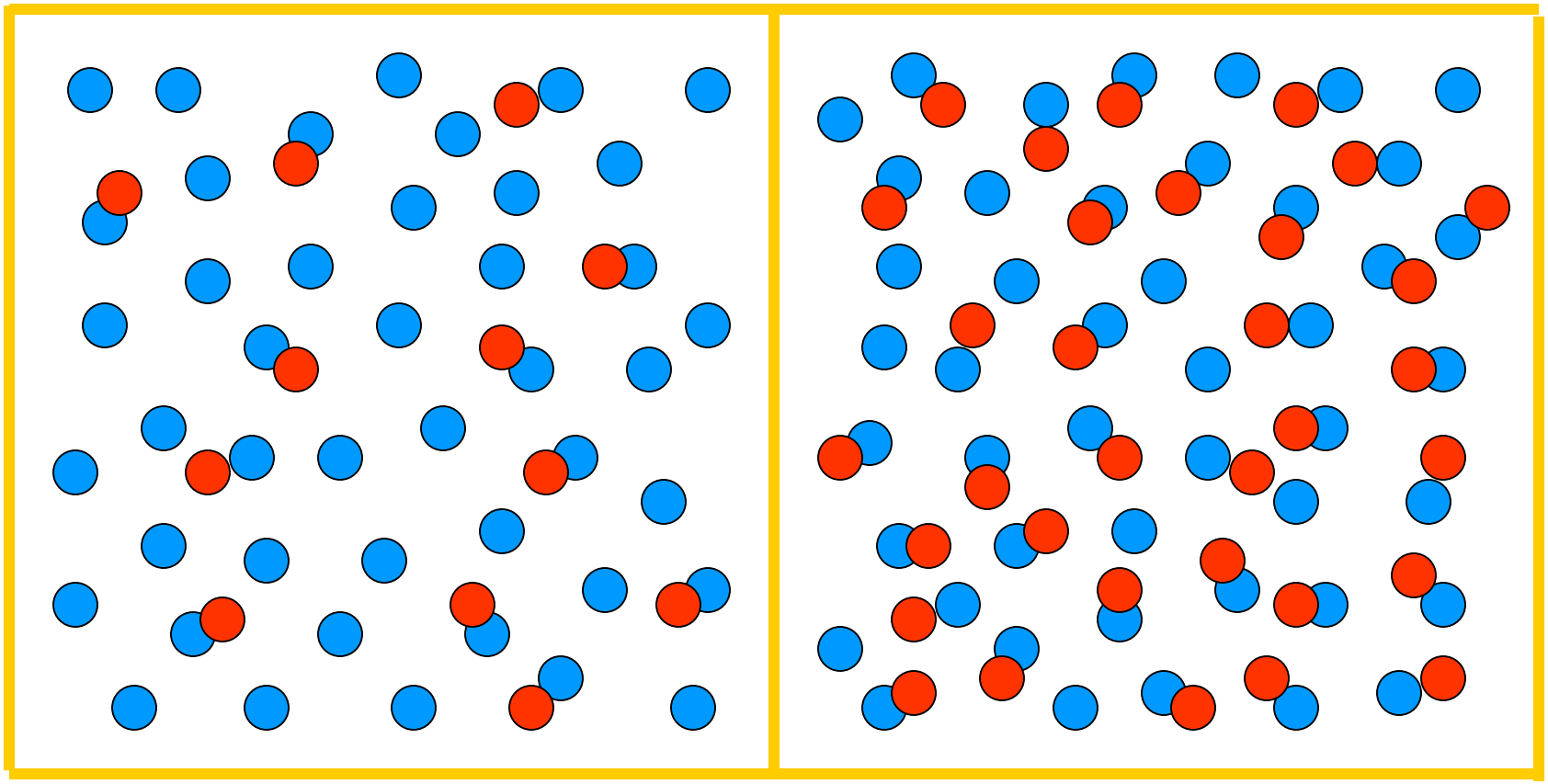
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

CELL A → WATER VIA OSMOSIS → CELL B



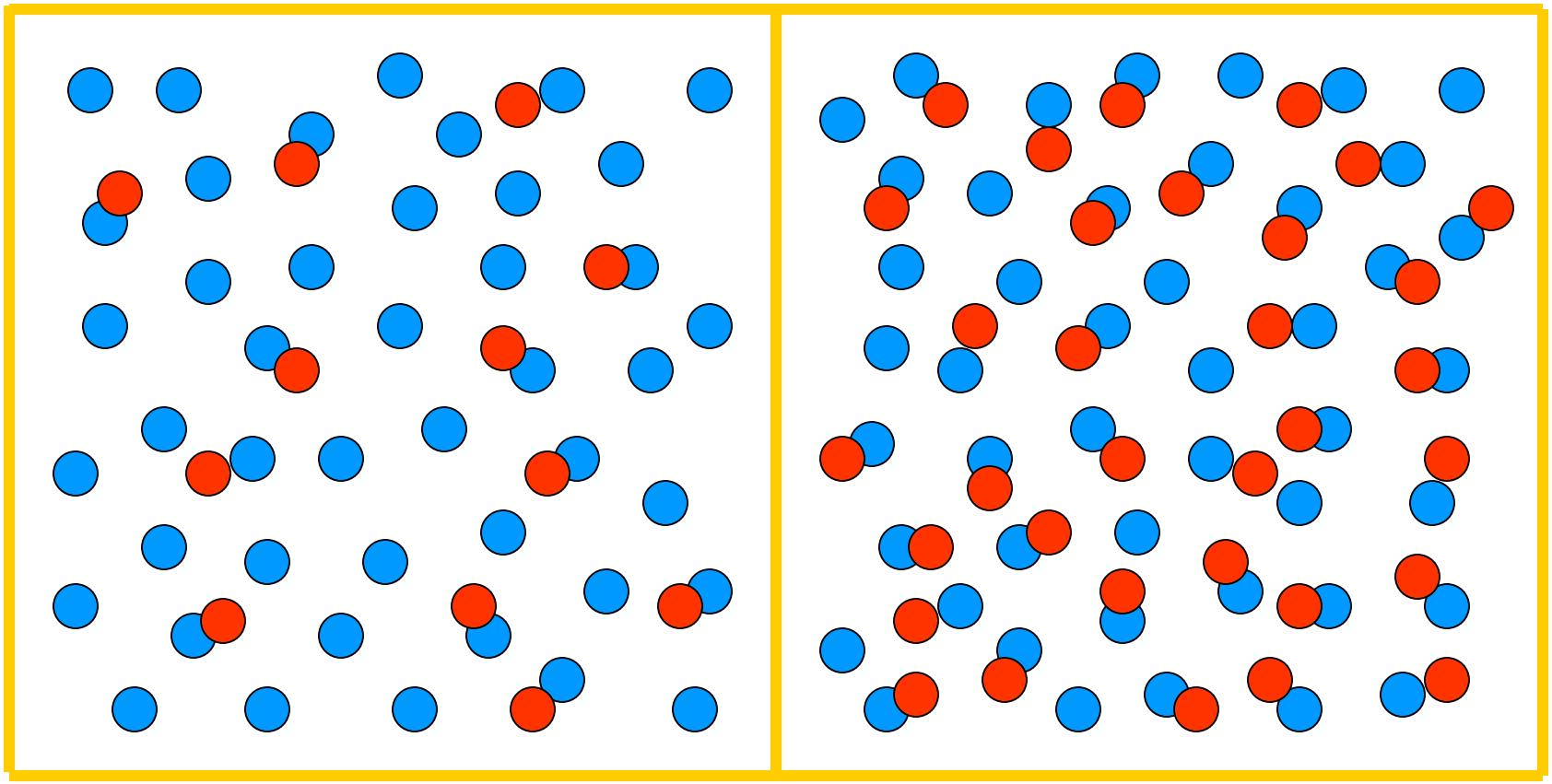
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

CELL A — WATER VIA OSMOSIS — CELL B

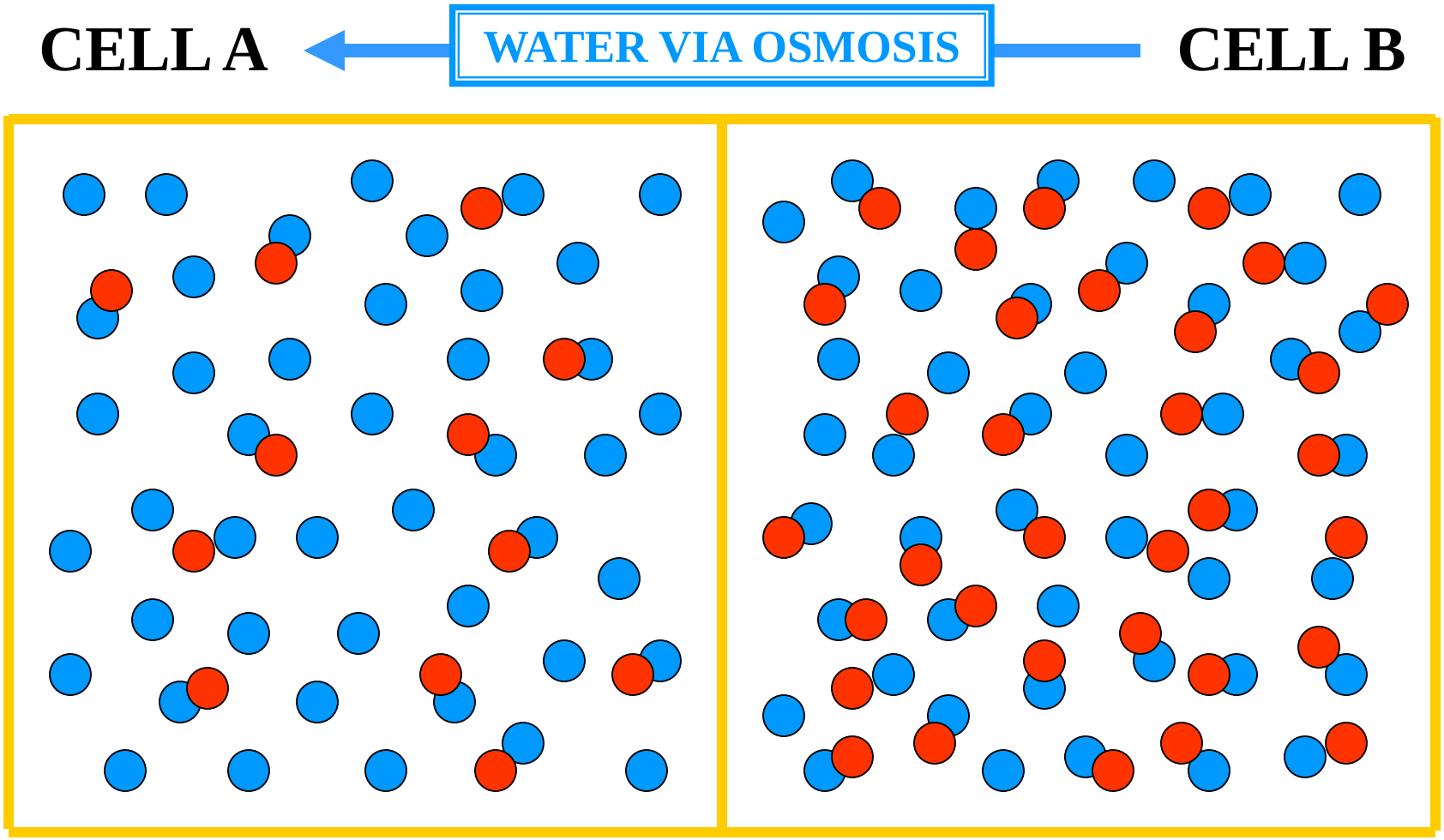


= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS



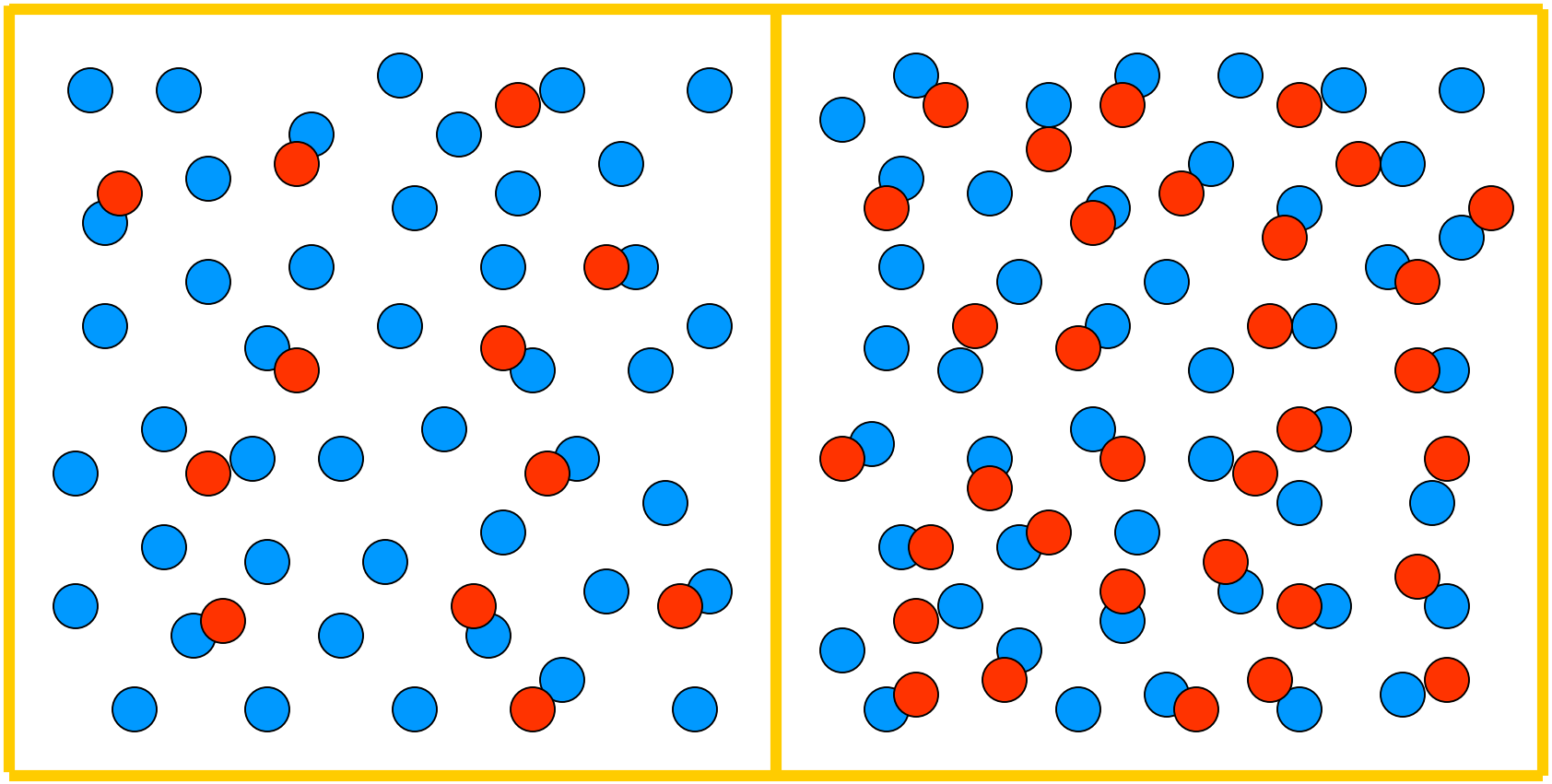
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

CELL A — WATER VIA OSMOSIS — CELL B

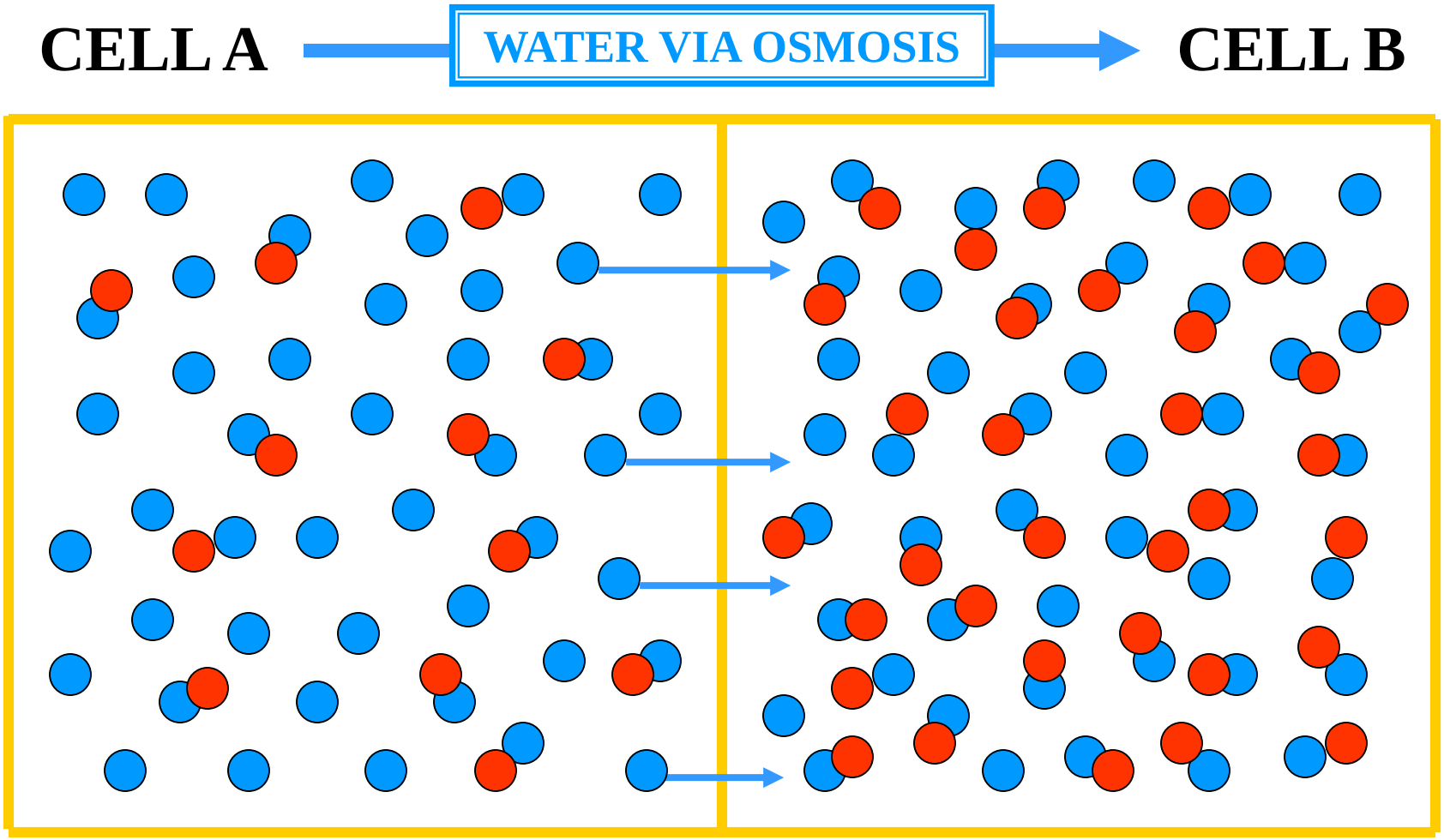


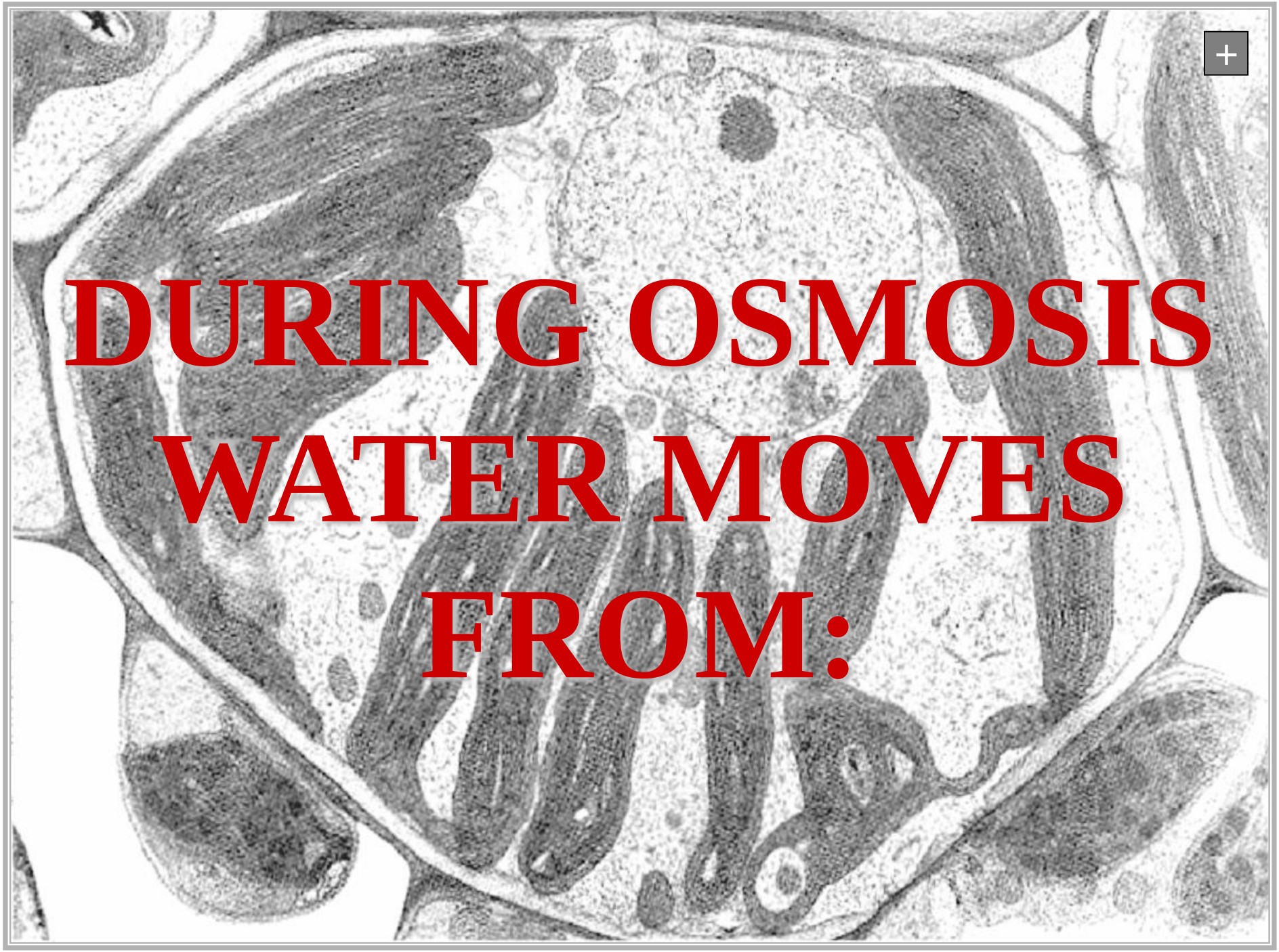
= WATER MOLECULE

= POLAR SOLUTE MOLECULE

= MEMBRANE

OSMOSIS

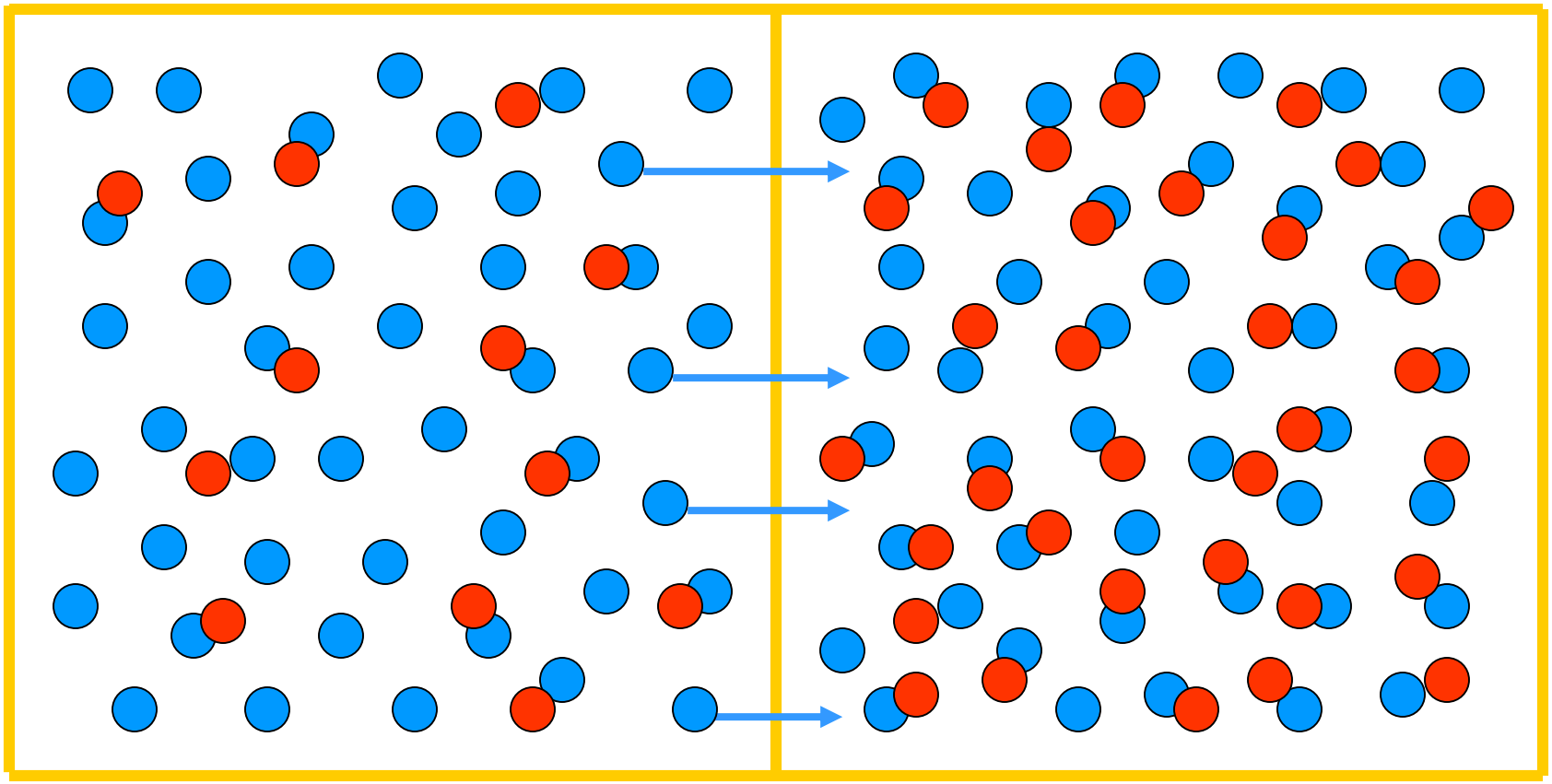

CELL A
WATER VIA OSMOSIS
CELL B
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE



DURING OSMOSIS WATER MOVES FROM:

OSMOSIS

CELL A → WATER VIA OSMOSIS → CELL B

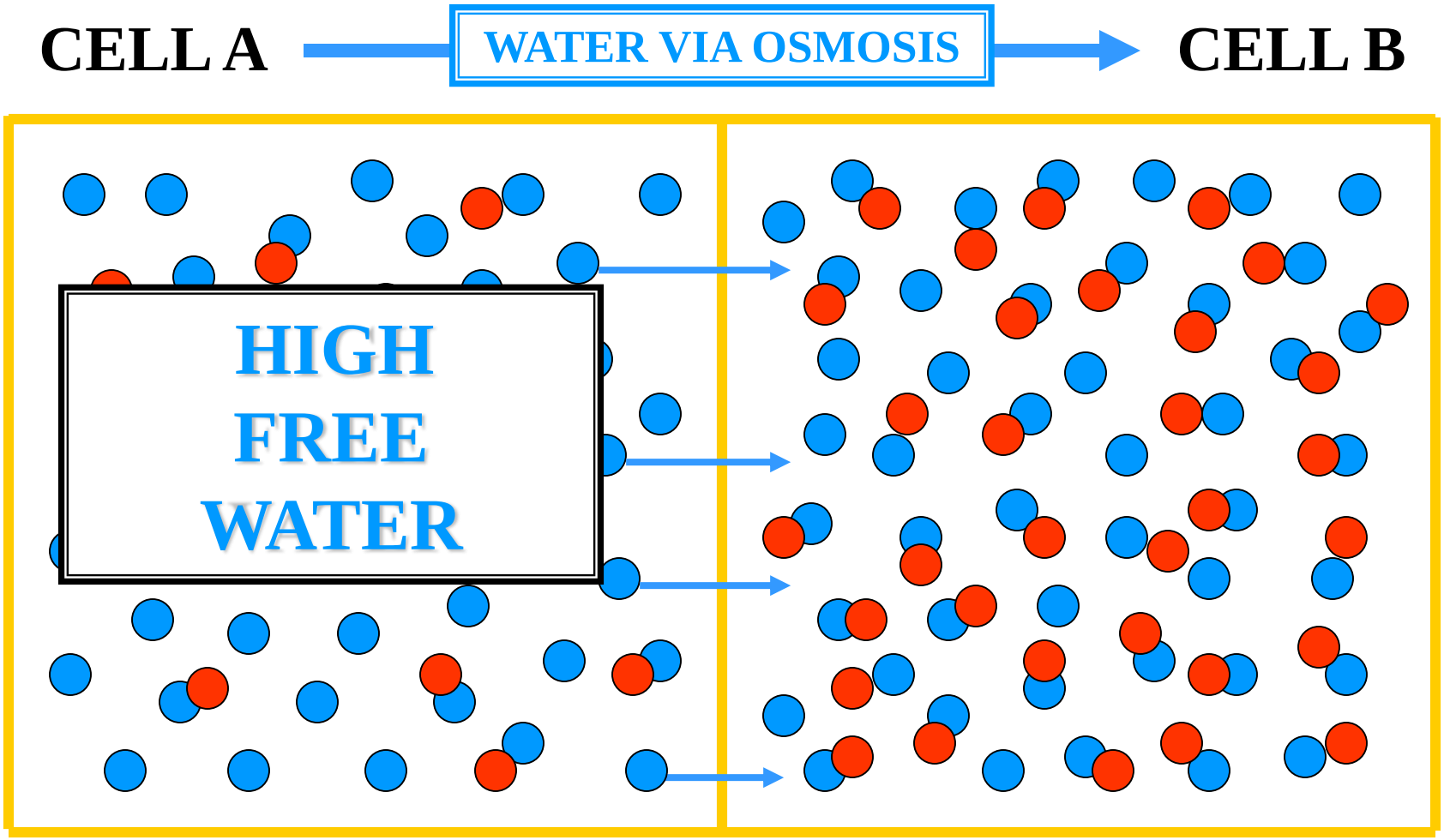


= WATER MOLECULE

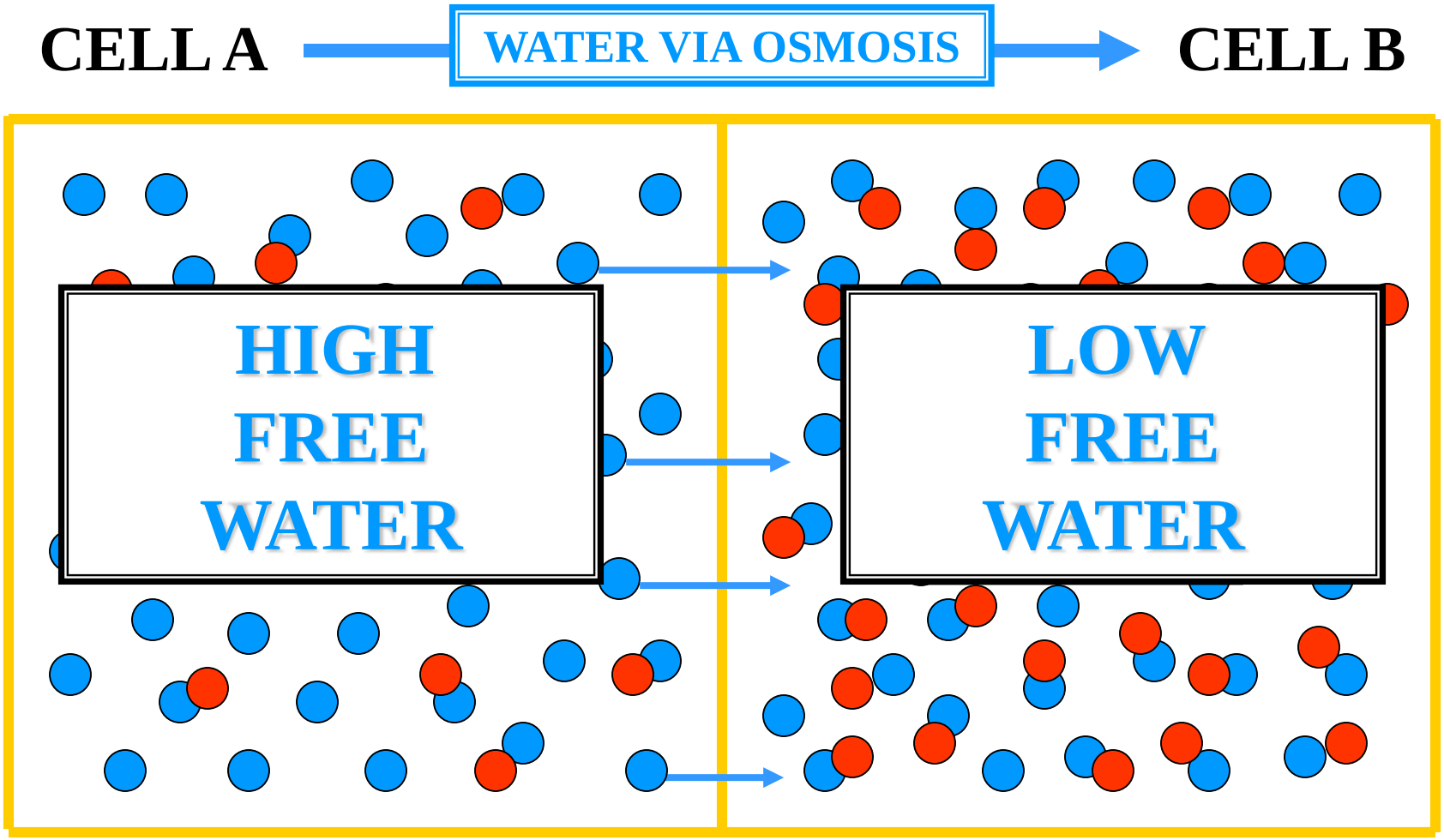
= POLAR SOLUTE MOLECULE

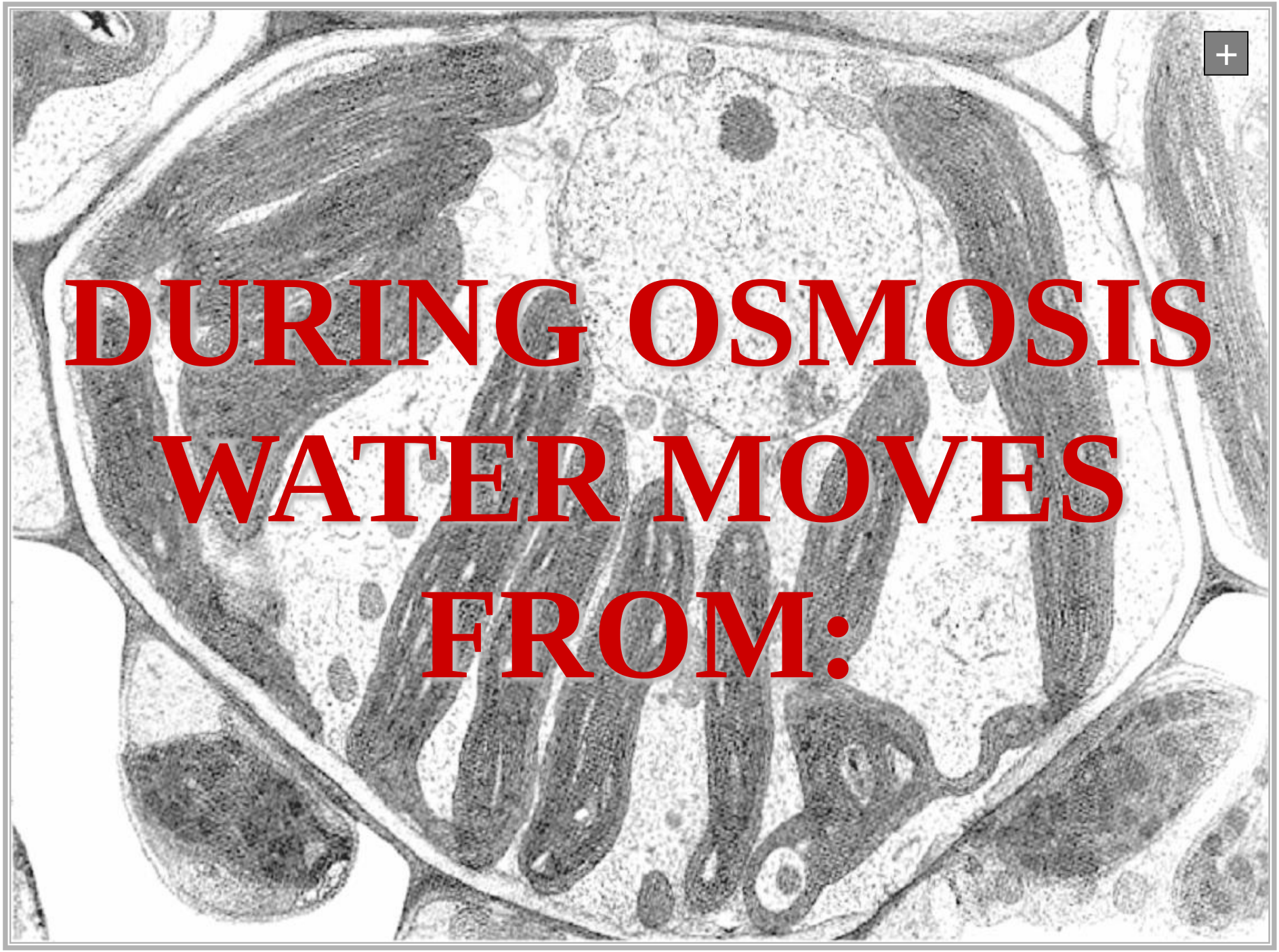
= MEMBRANE

OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
HIGH
FREE
WATER
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

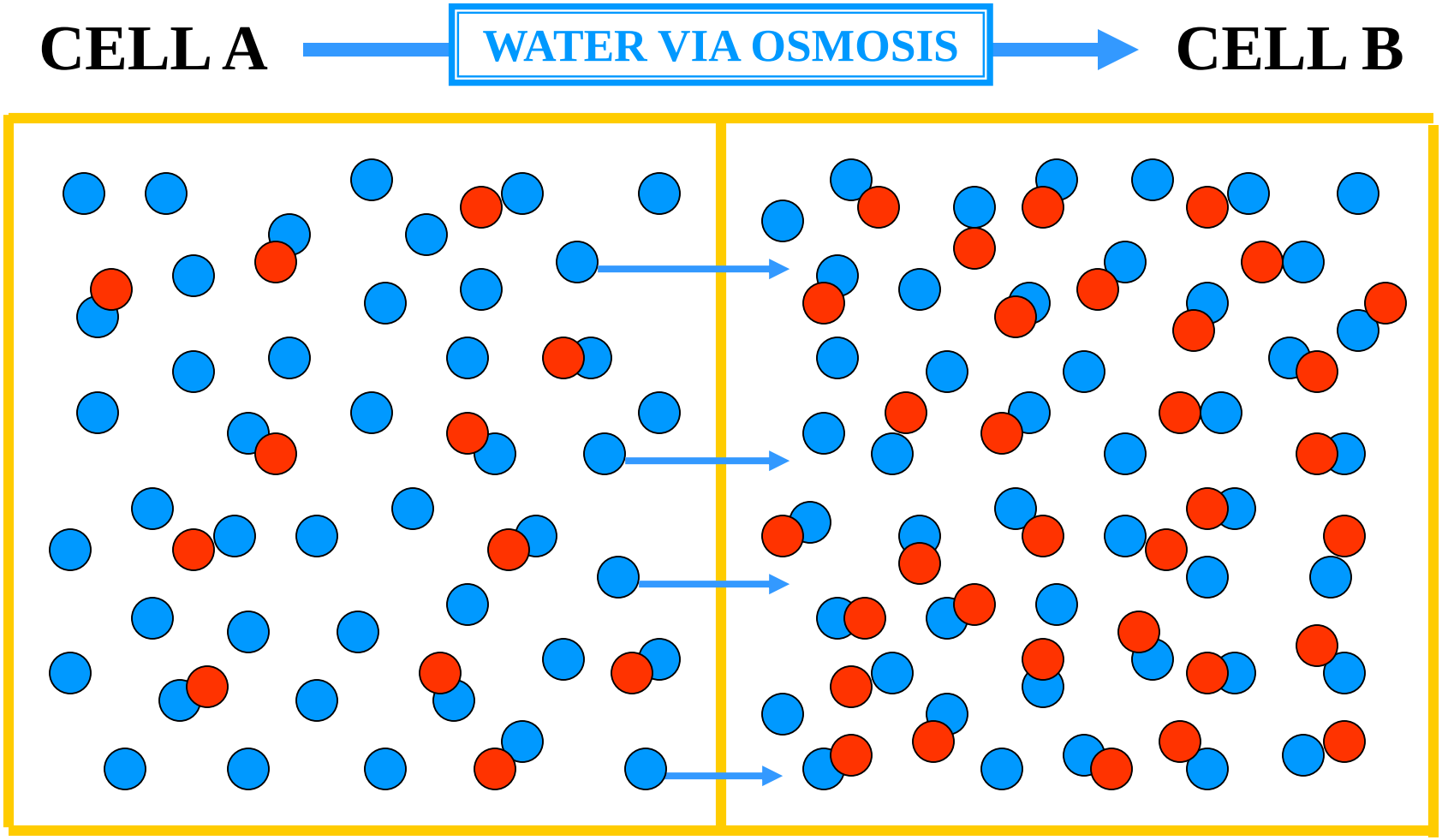
OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
HIGH FREE WATER
LOW FREE WATER
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

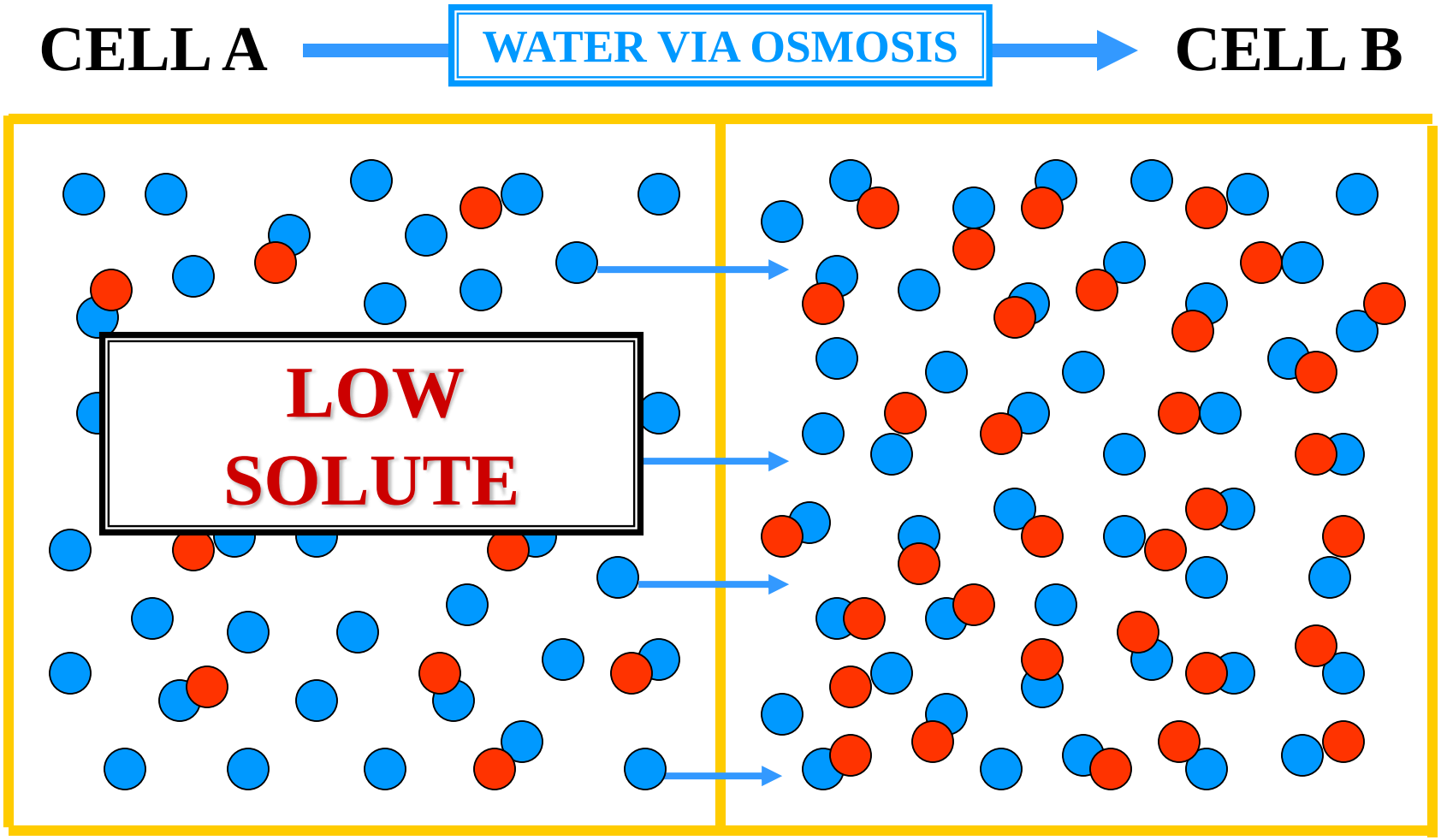


DURING OSMOSIS WATER MOVES FROM:

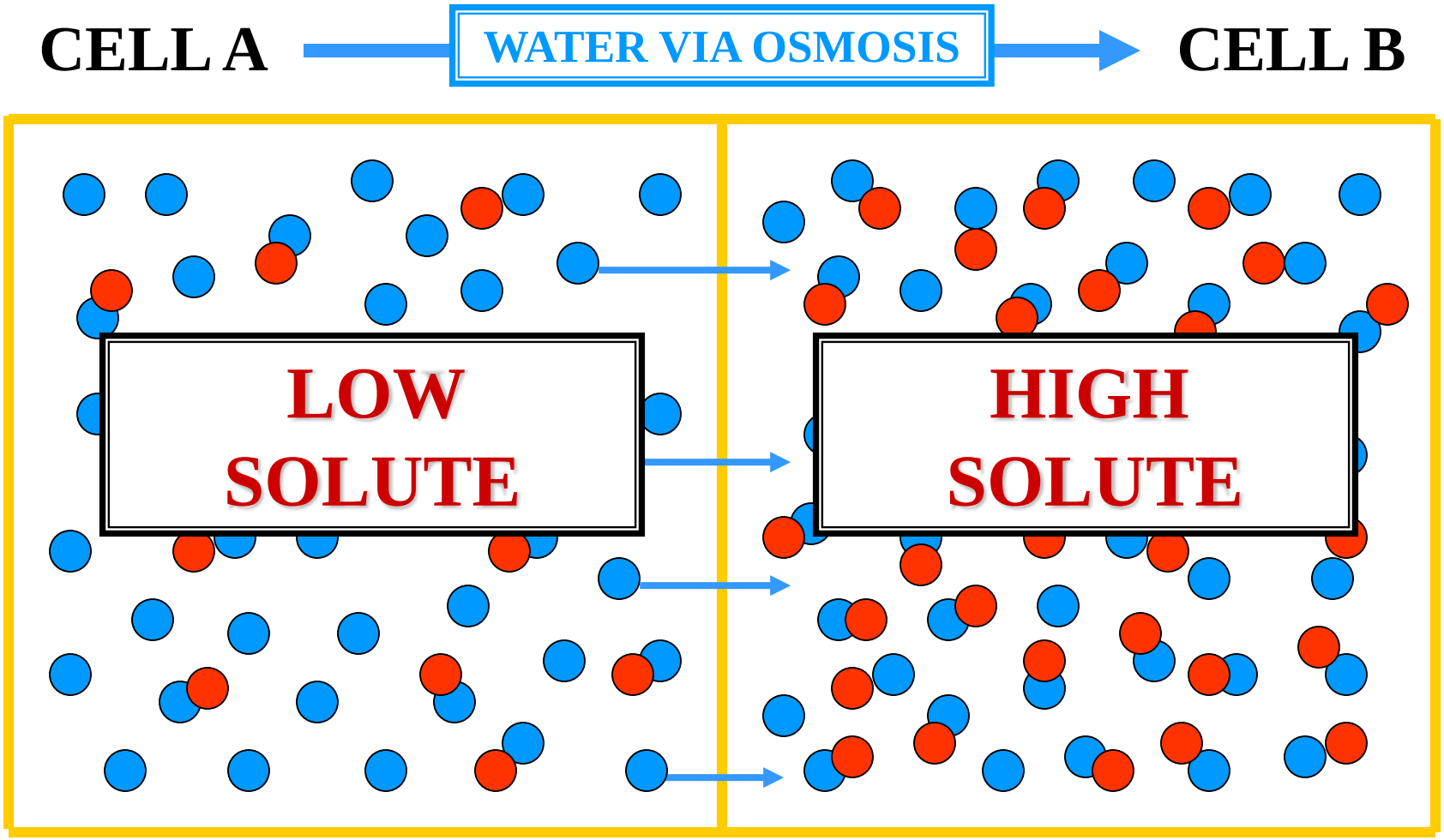
OSMOSIS

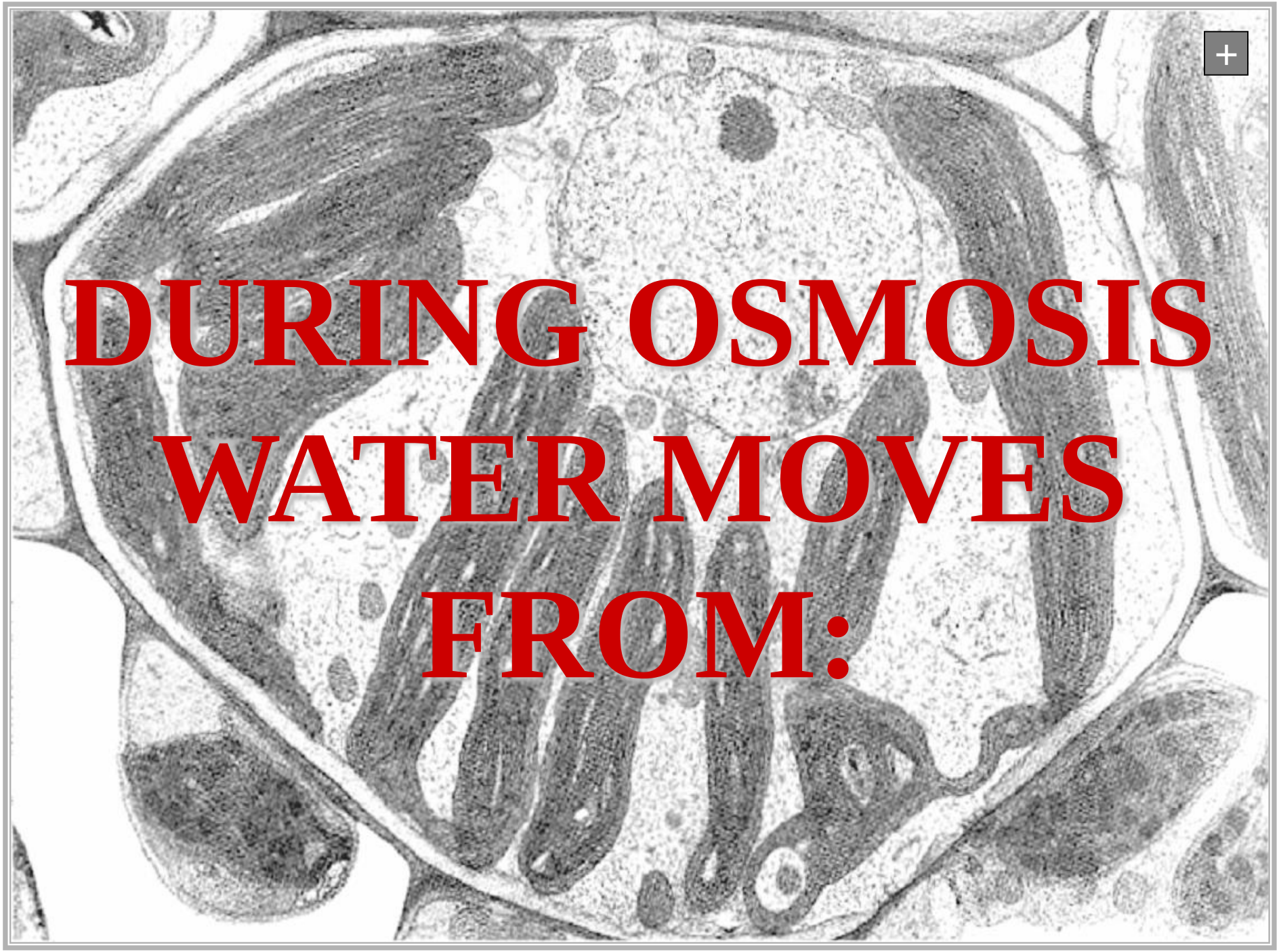

CELL A
WATER VIA OSMOSIS
CELL B
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
LOW SOLUTE
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

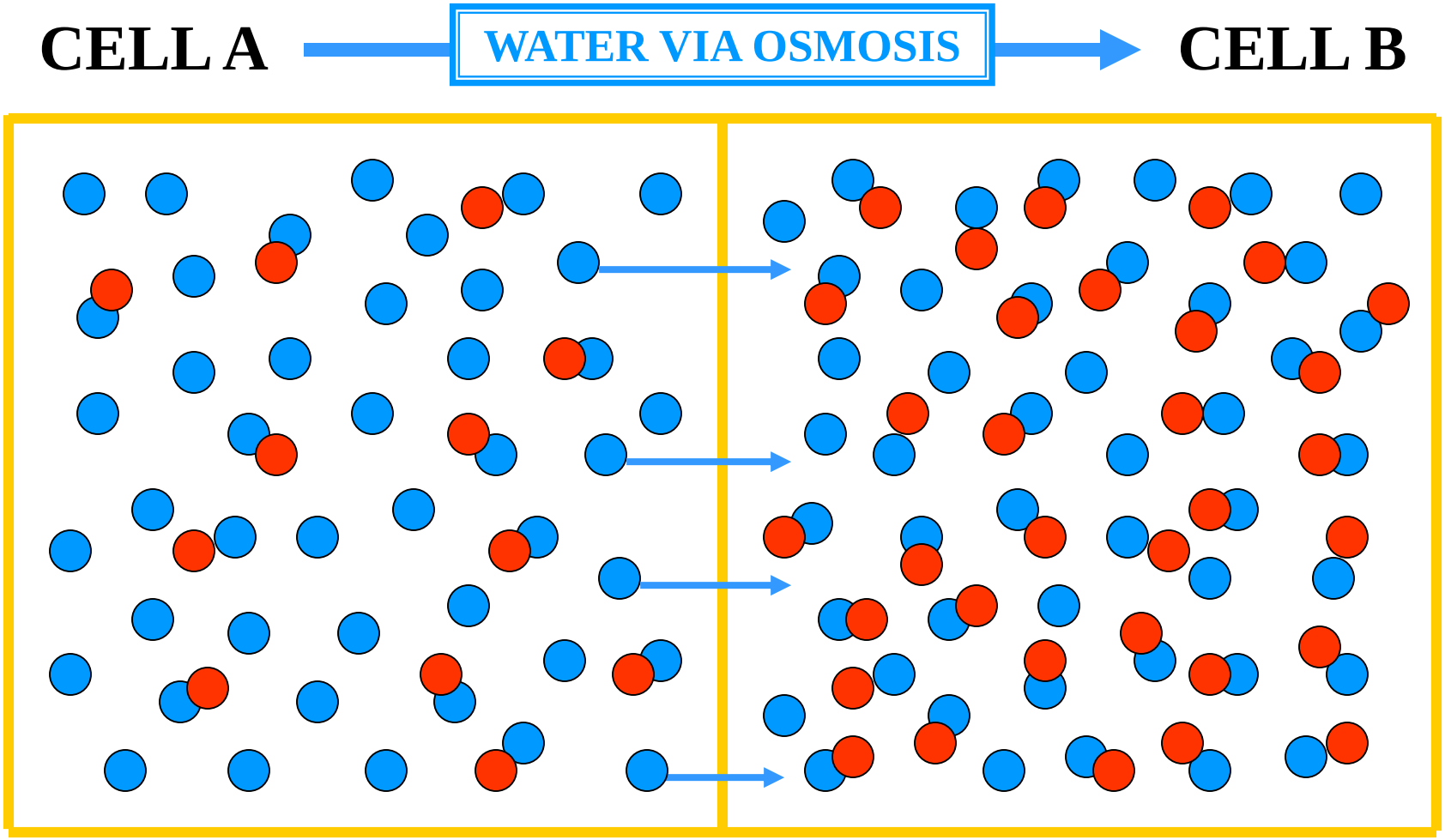
OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
LOW SOLUTE
HIGH SOLUTE
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE



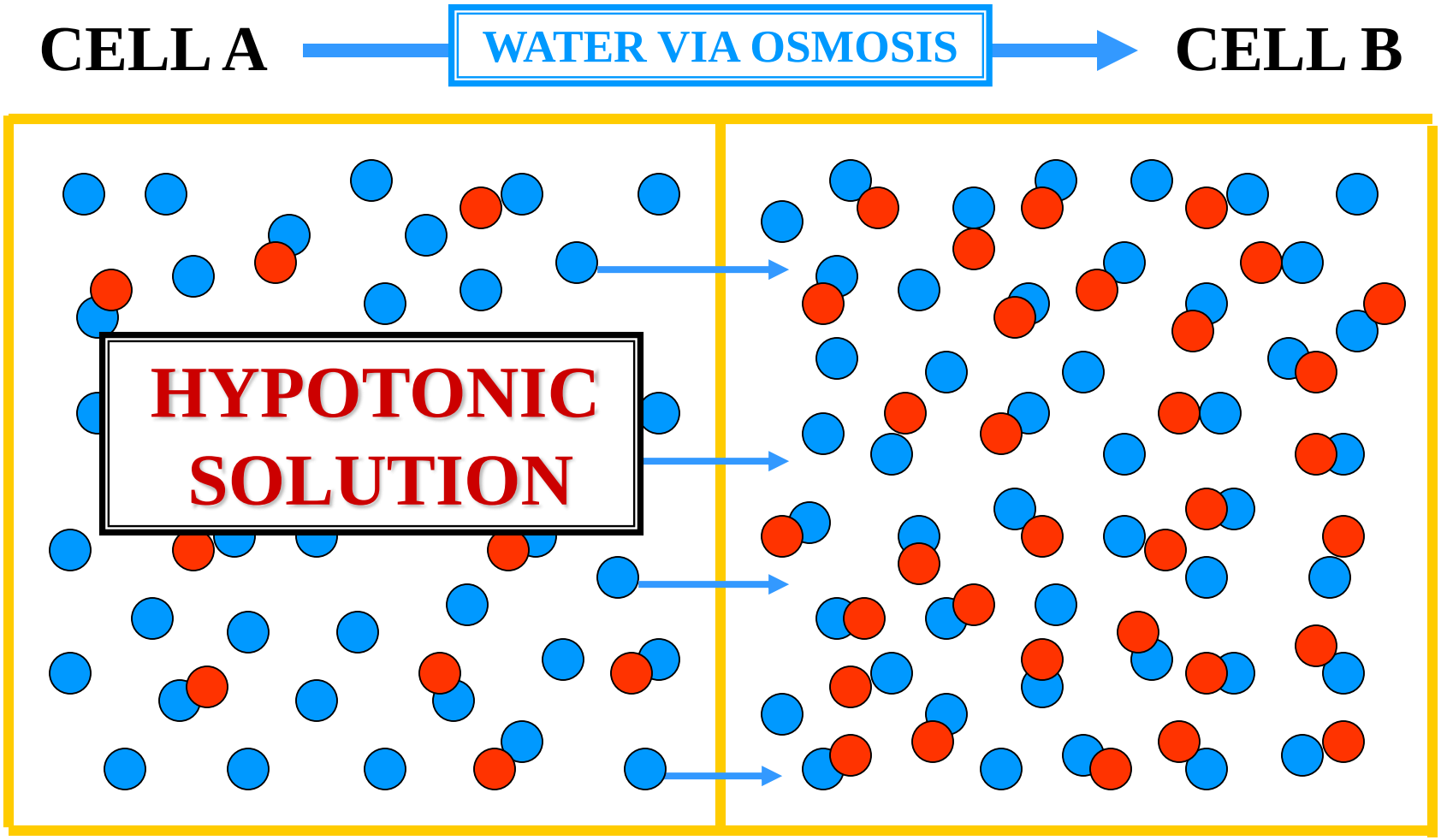
DURING OSMOSIS WATER MOVES FROM:

OSMOSIS

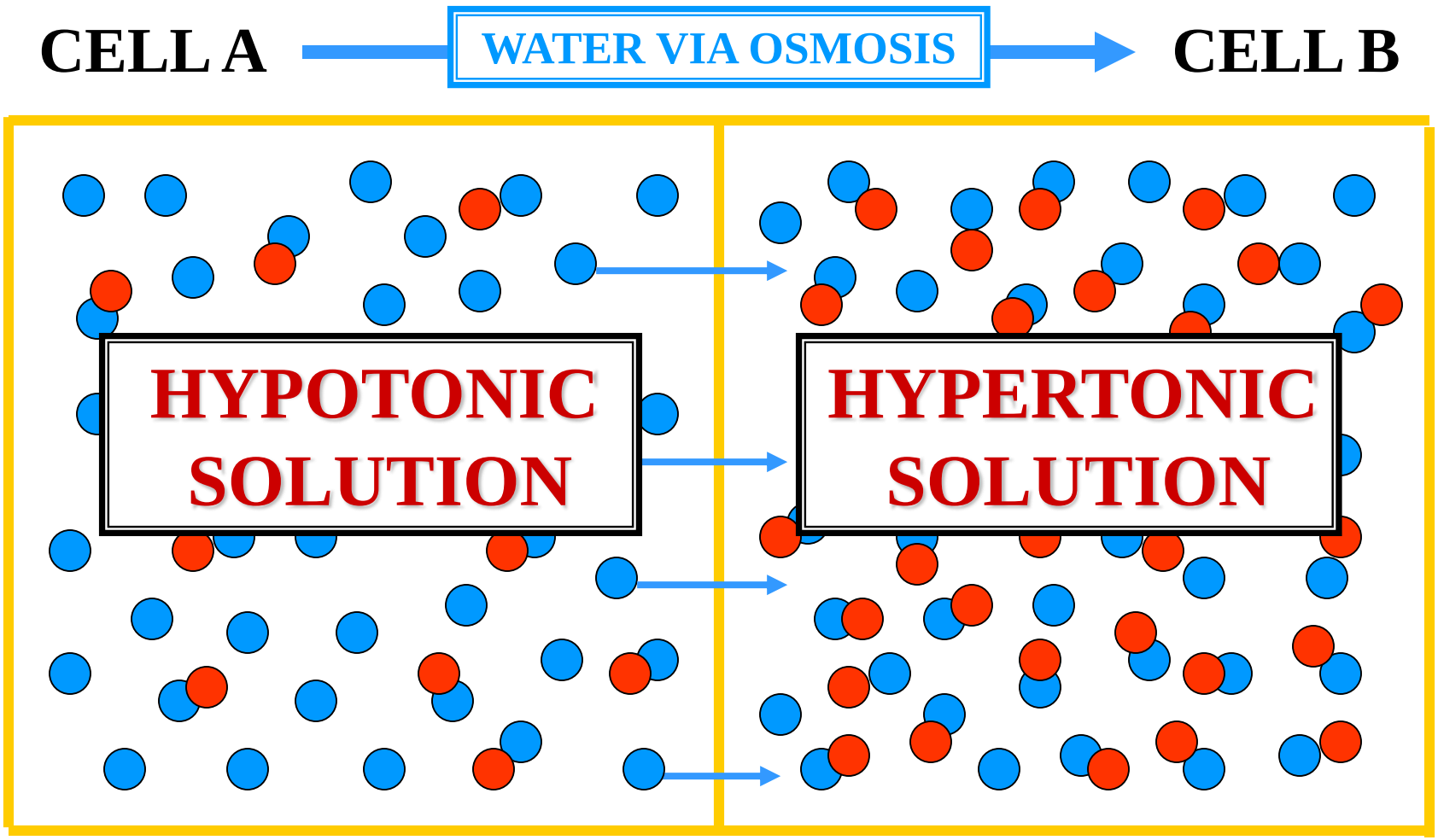

CELL A
WATER VIA OSMOSIS
CELL B
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

HY

OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
HYPOTONIC SOLUTION
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

OSMOSIS


CELL A
WATER VIA OSMOSIS
CELL B
HYPOTONIC SOLUTION
HYPERTONIC SOLUTION
= WATER MOLECULE
= POLAR SOLUTE MOLECULE
= MEMBRANE

TURGOR PRESSURE

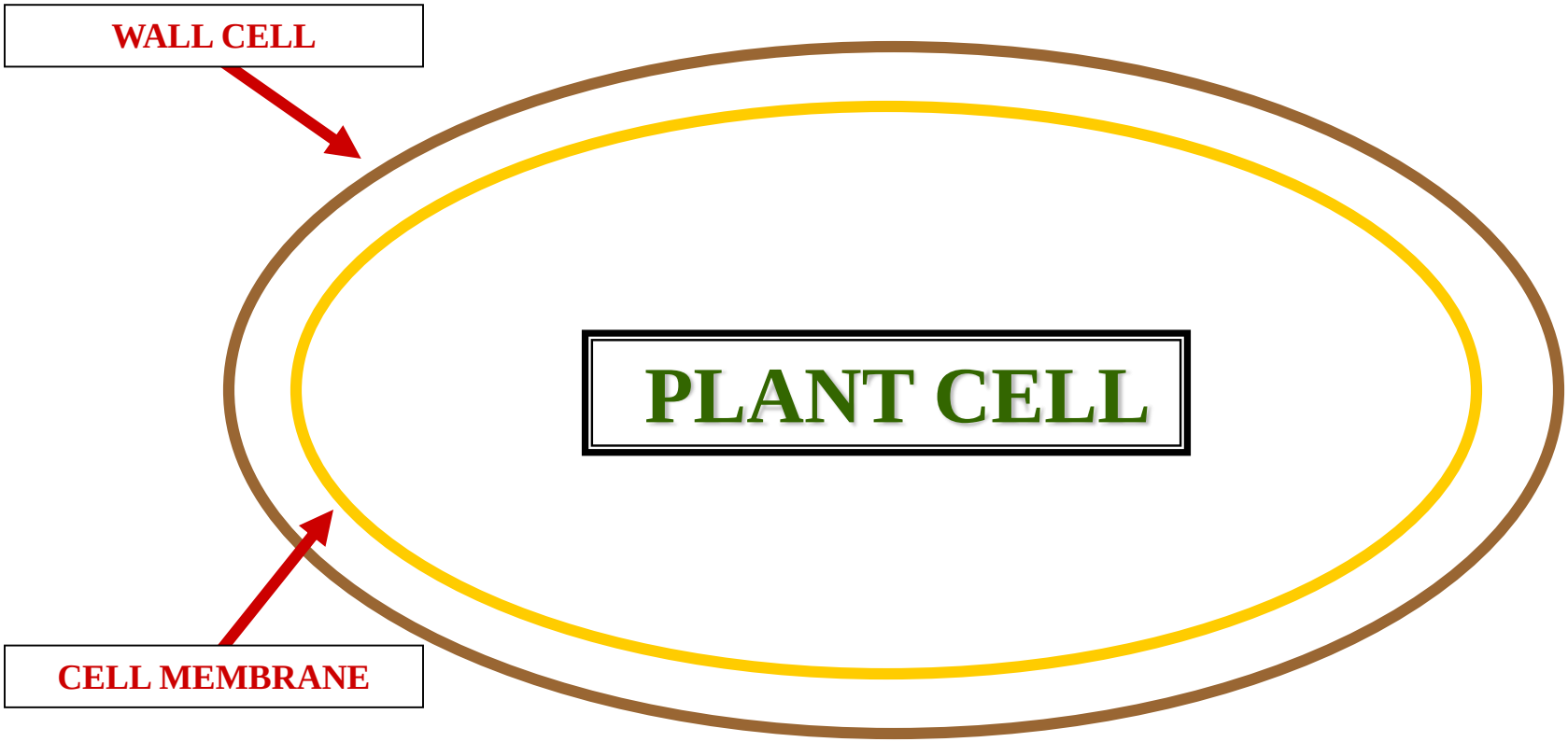
TURGOR PRESSURE

TURGOR PRESSURE

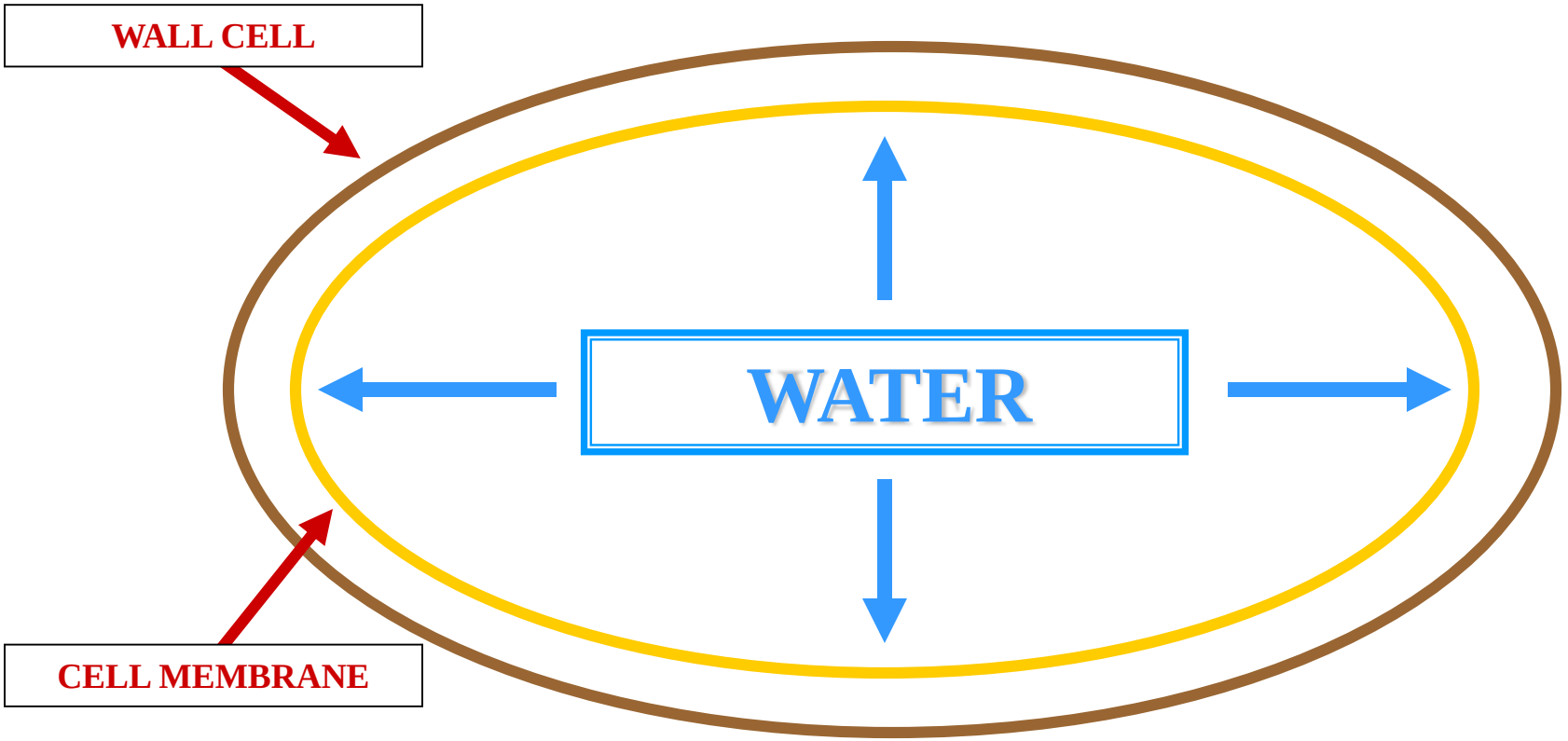
CELL INTERNAL WATER PRESSURE

TURGOR PRESSURE

TURGOR PRESSURE



TURGOR PRESSURE



CELL INTERNAL WATER PRESSURE

TURGID CELL
VS
FLACCID CELL

TURGID CELL

TURGID CELL

AP

TURGID CELL

HIGH TURGOR PRESSURE

TURGID CELL

TURGOR PRESSURE

TURGID CELL

APPLIED