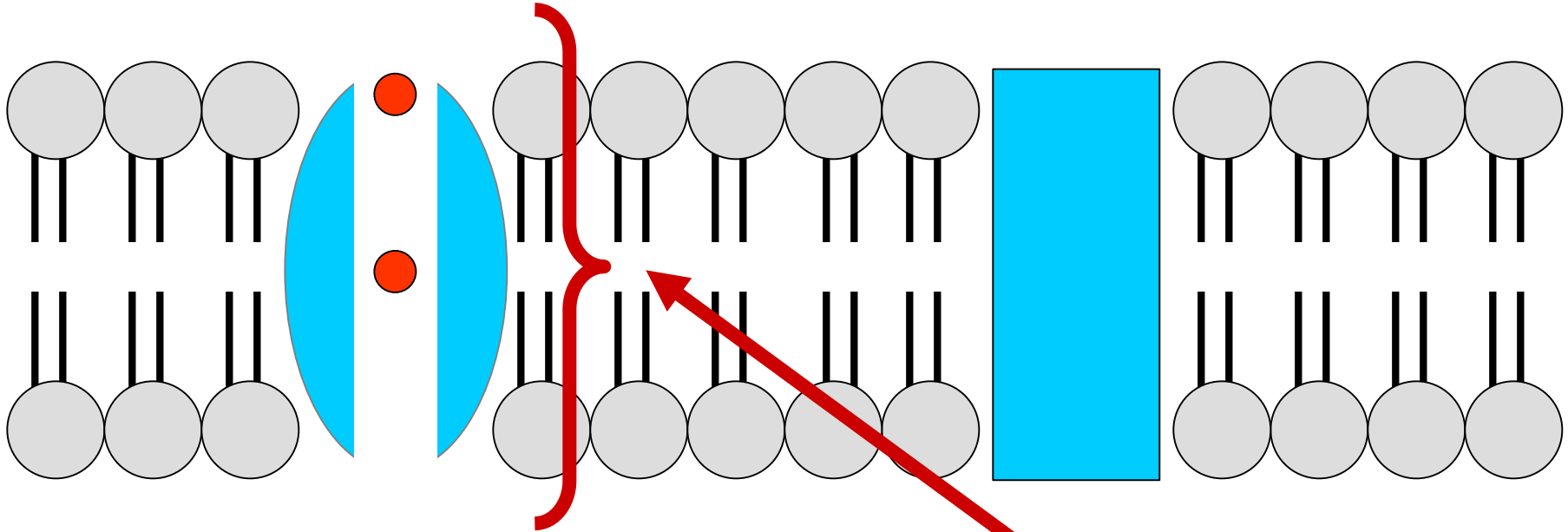


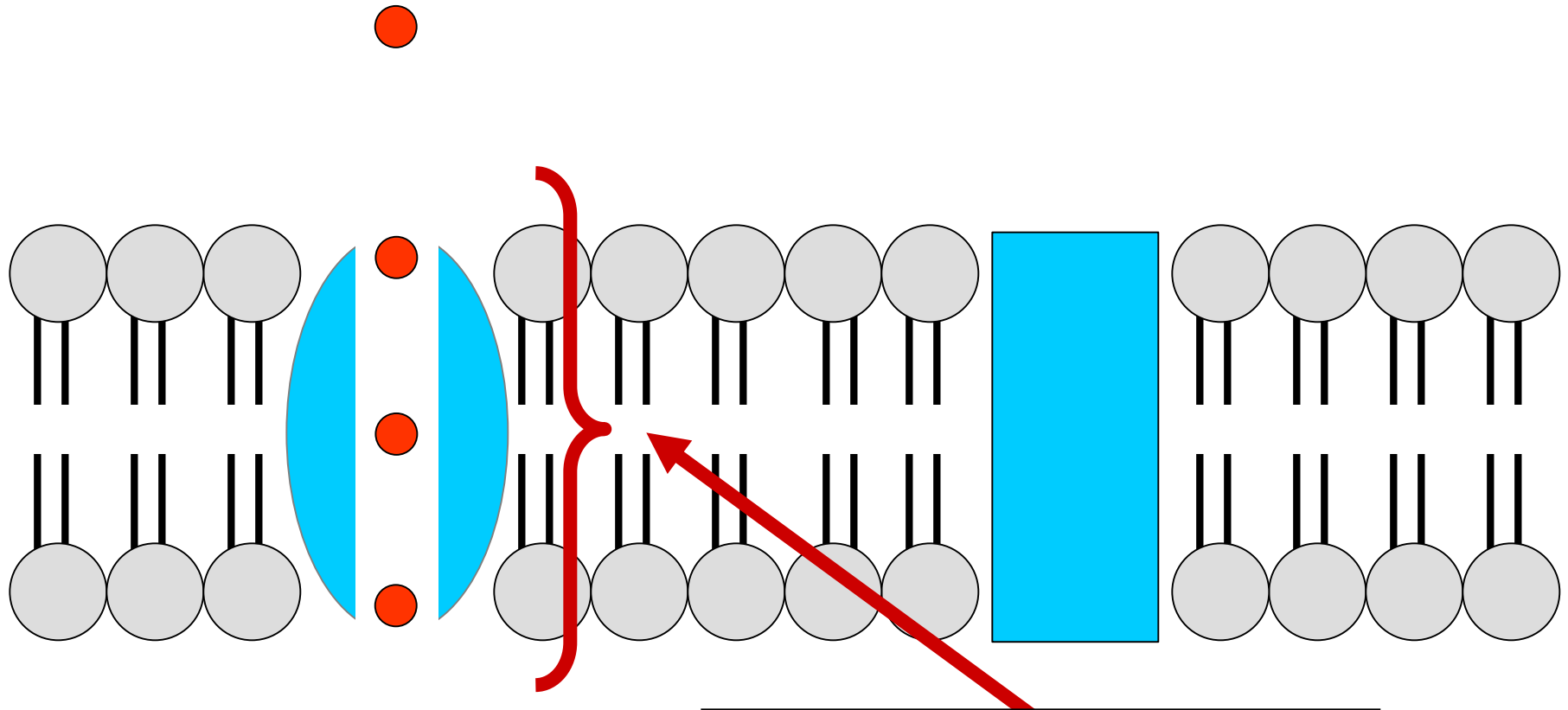
# TRANSPORT PROTEINS



**CHANNEL  
TRANSPORT  
PROTEIN**

**● = POLAR SOLUTE +/-**

# TRANSPORT PROTEINS

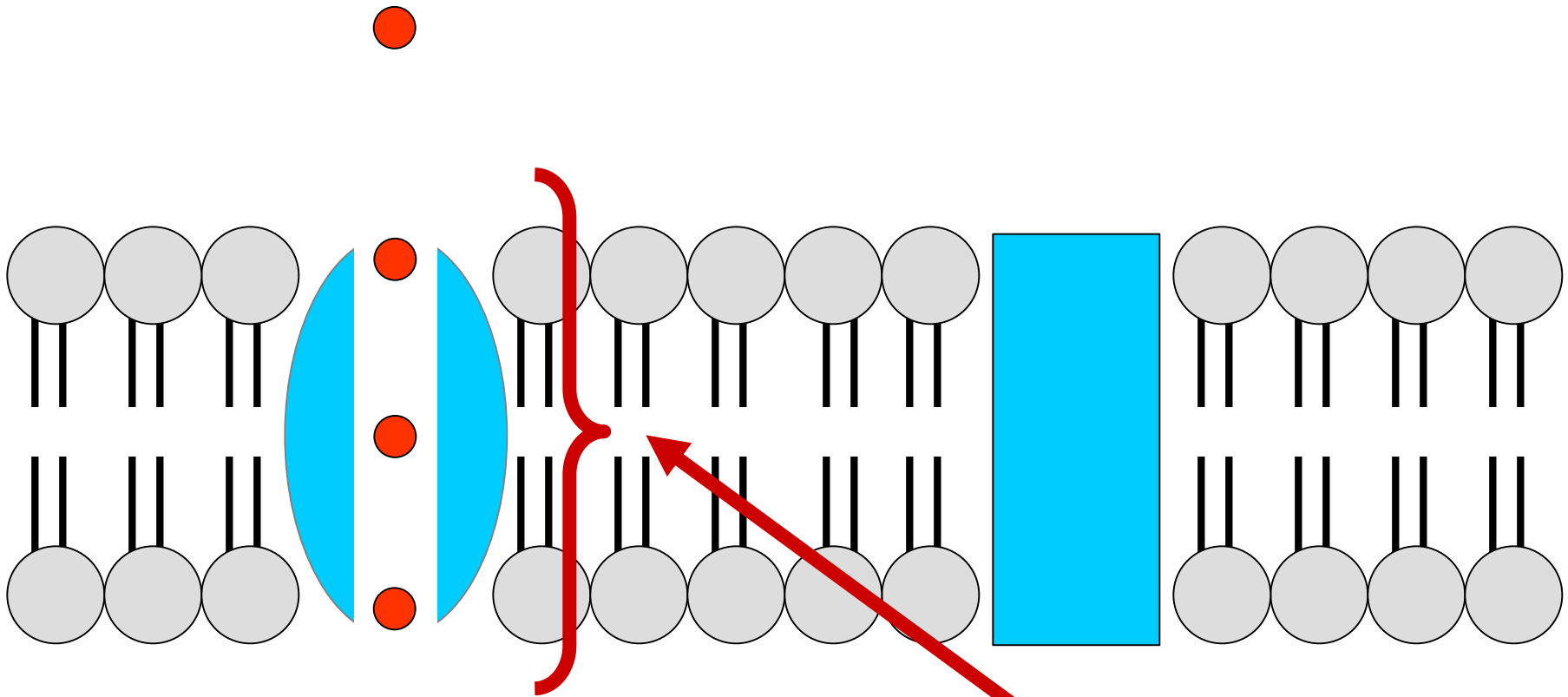


● = POLAR SOLUTE +/-

**CHANNEL  
TRANSPORT  
PROTEIN**

# TRANSPORT PROTEINS

C  
AB

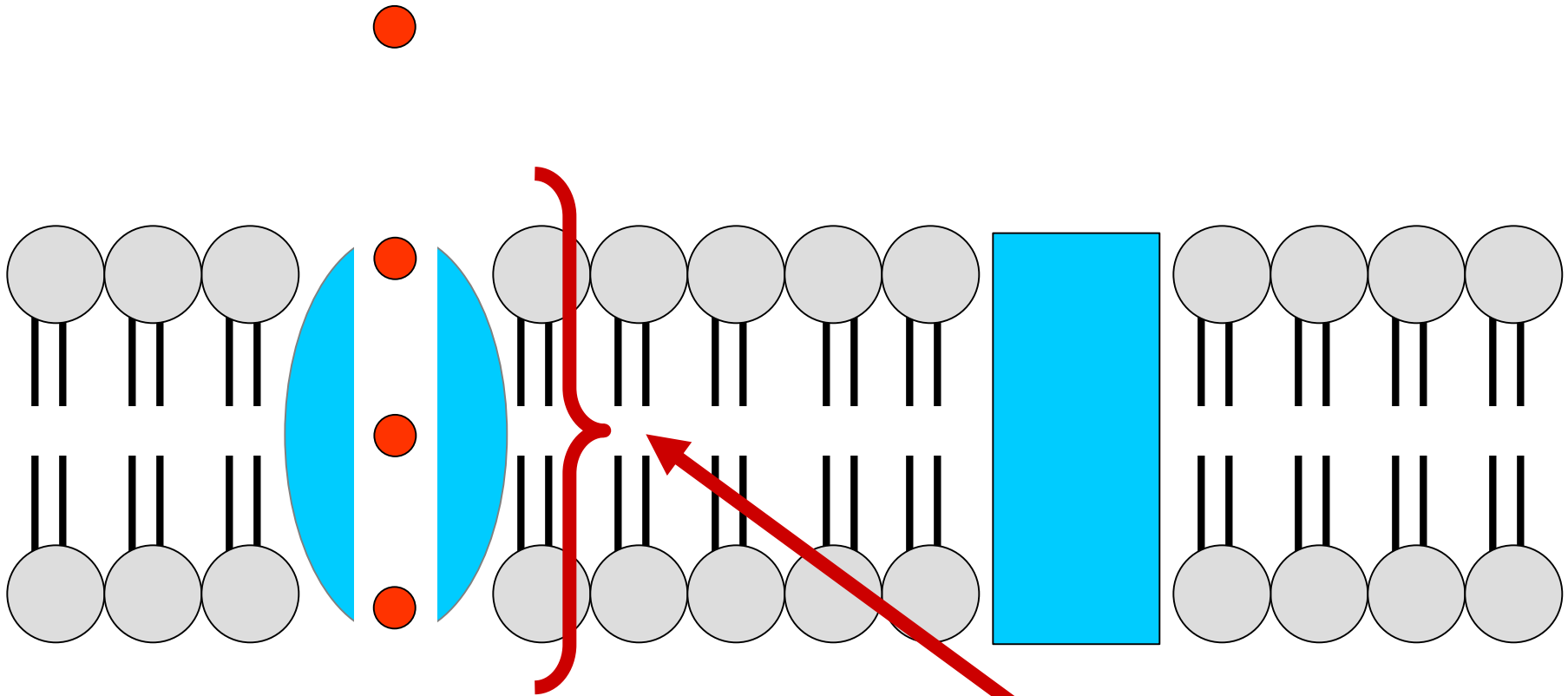


**CHANNEL  
TRANSPORT  
PROTEIN**

● = POLAR SOLUTE +/-

# TRANSPORT PROTEINS

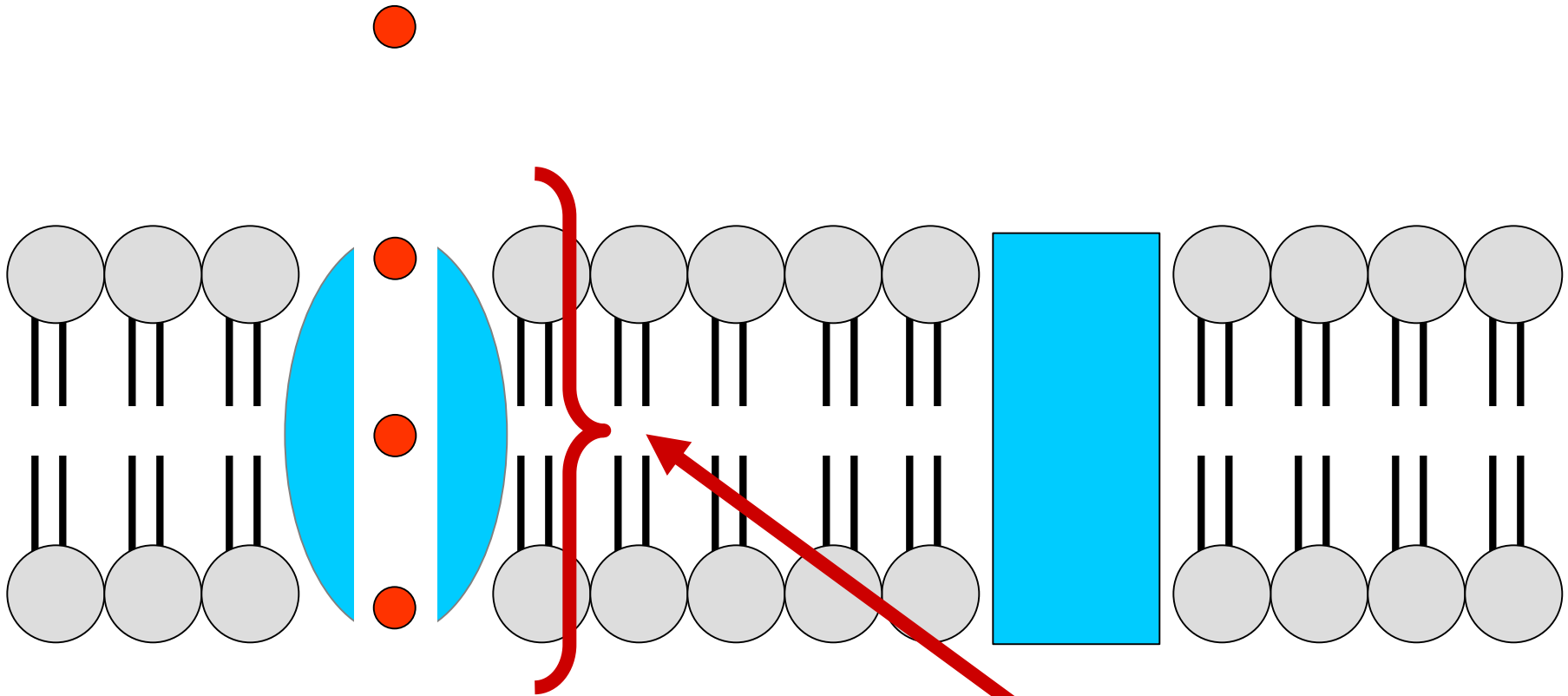
A  
AB



**CONFORMATION  
CHANGE  
ABSENT**

● = POLAR SOLUTE +/-

# TRANSPORT PROTEINS



**ATP**  
**EXPENSE**  
**ABSENT**

● = POLAR SOLUTE +/-

**CARRIER  
TRANSPORT  
PROTEIN**



# **CARRIER TRANSPORT PROTEIN**

**SHUNTS**

**POLAR SOLUTES**

**ACROSS MEMBRANE**

**CARRIER TRANSPORT PROTEIN**



**CARRIER TRANSPORT PROTEIN**

**CONFORMATION  
CHANGE: REQUIRED**

**CARRIER TRANSPORT PROTEIN**





**CARRIER TRANSPORT PROTEIN**

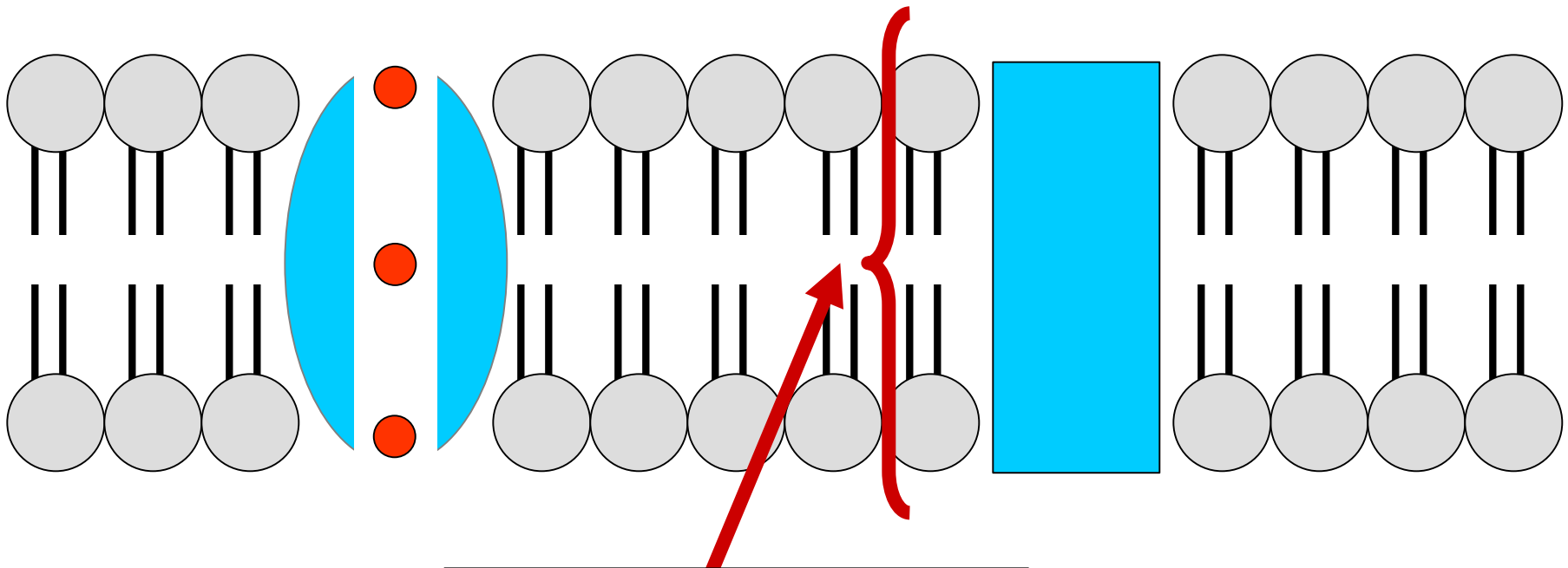
**CONFORMATION  
CHANGE: REQUIRED**

**---**

**ATP EXPENSE: REQUIRED**

**CARRIER TRANSPORT PROTEIN**

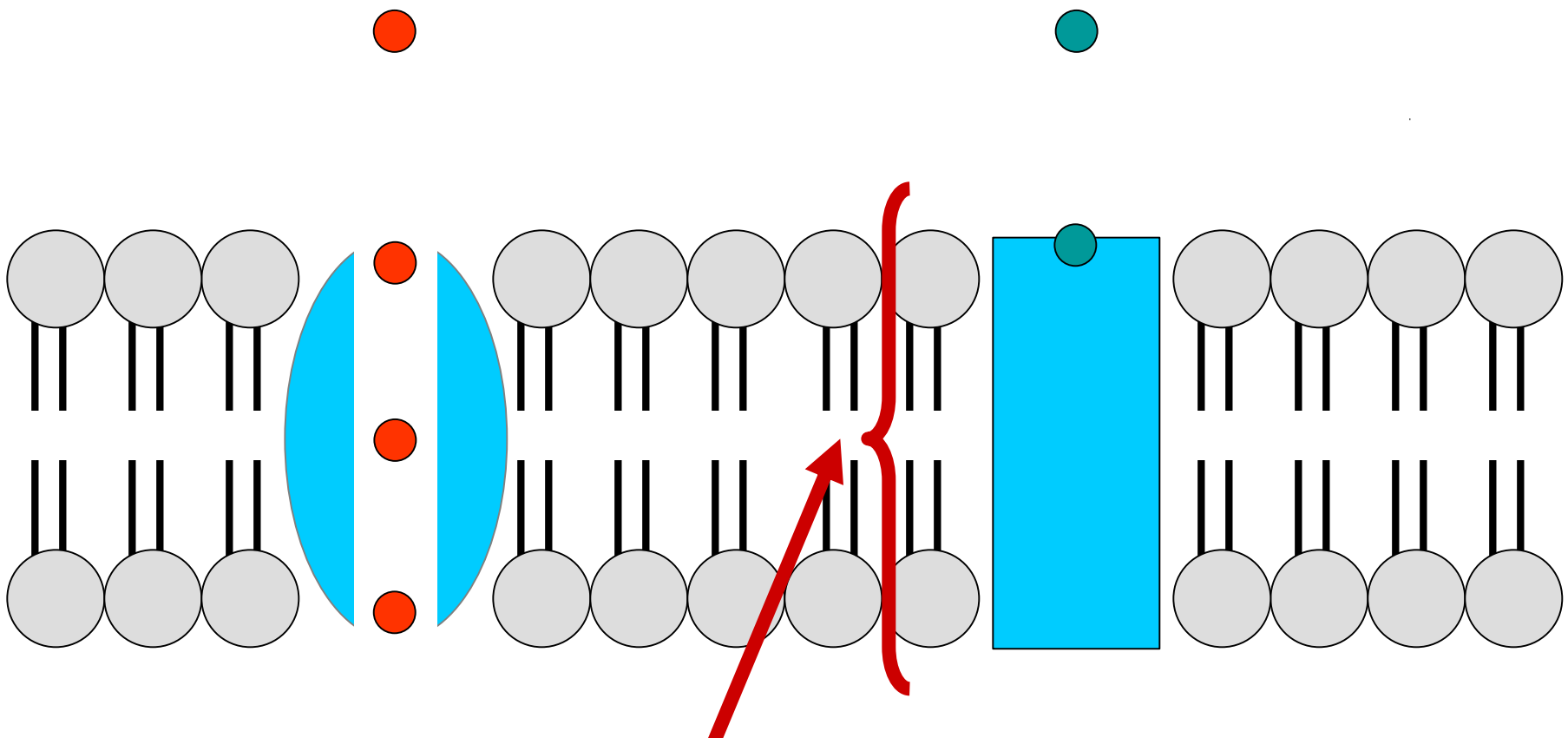
# TRANSPORT PROTEINS



-  = POLAR SOLUTE
-  = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**

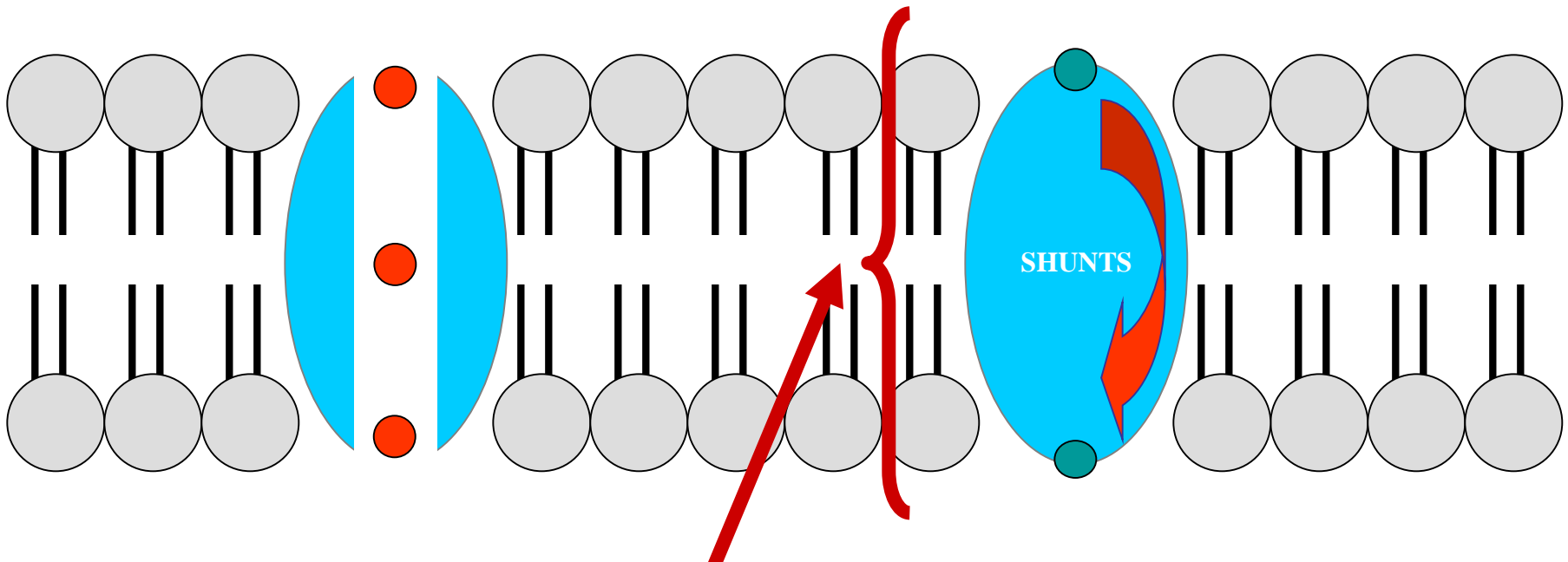
# TRANSPORT PROTEINS



**CARRIER  
TRANSPORT  
PROTEIN**

-  = POLAR SOLUTE
-  = POLAR SOLUTE

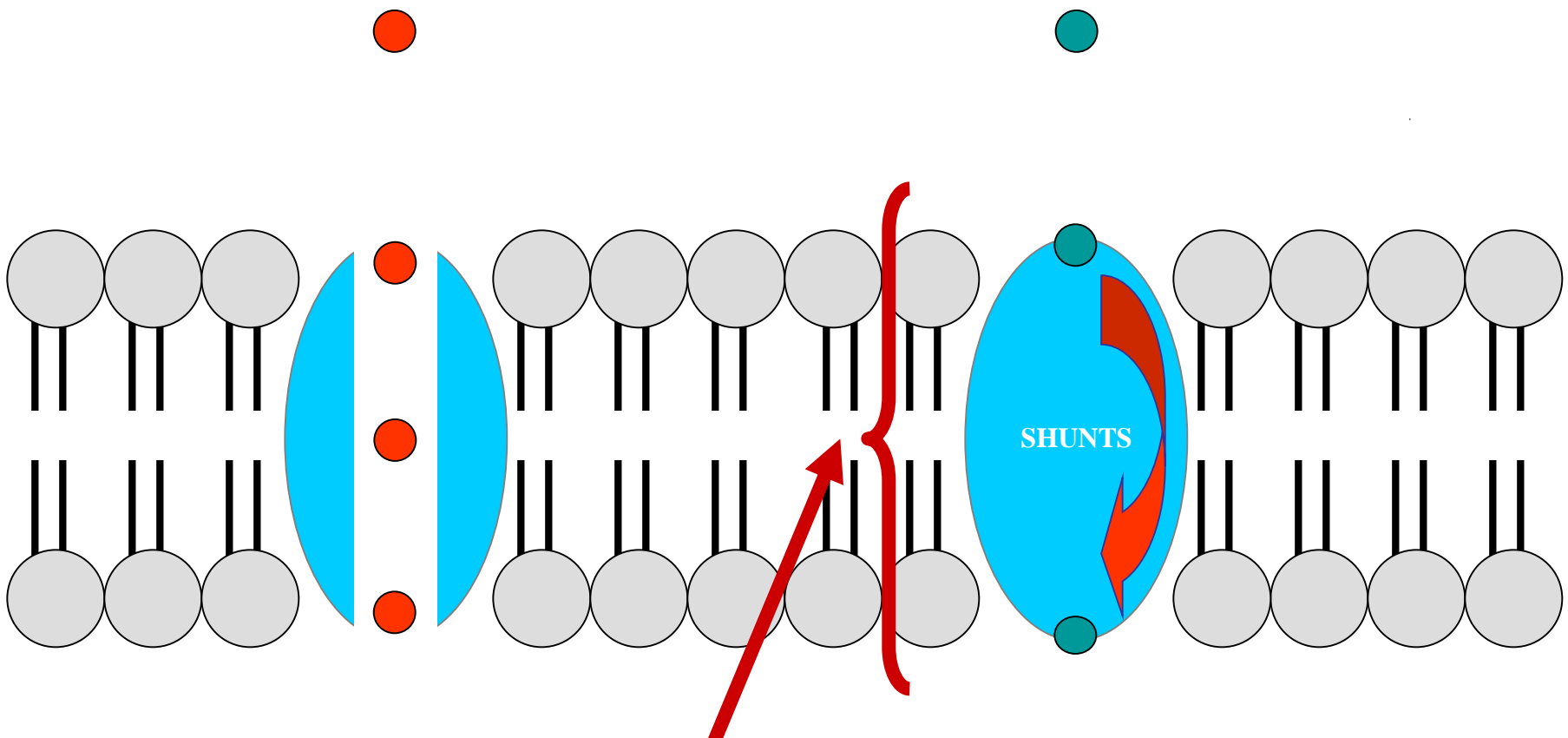
# TRANSPORT PROTEINS



 = POLAR SOLUTE  
 = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**

# TRANSPORT PROTEINS

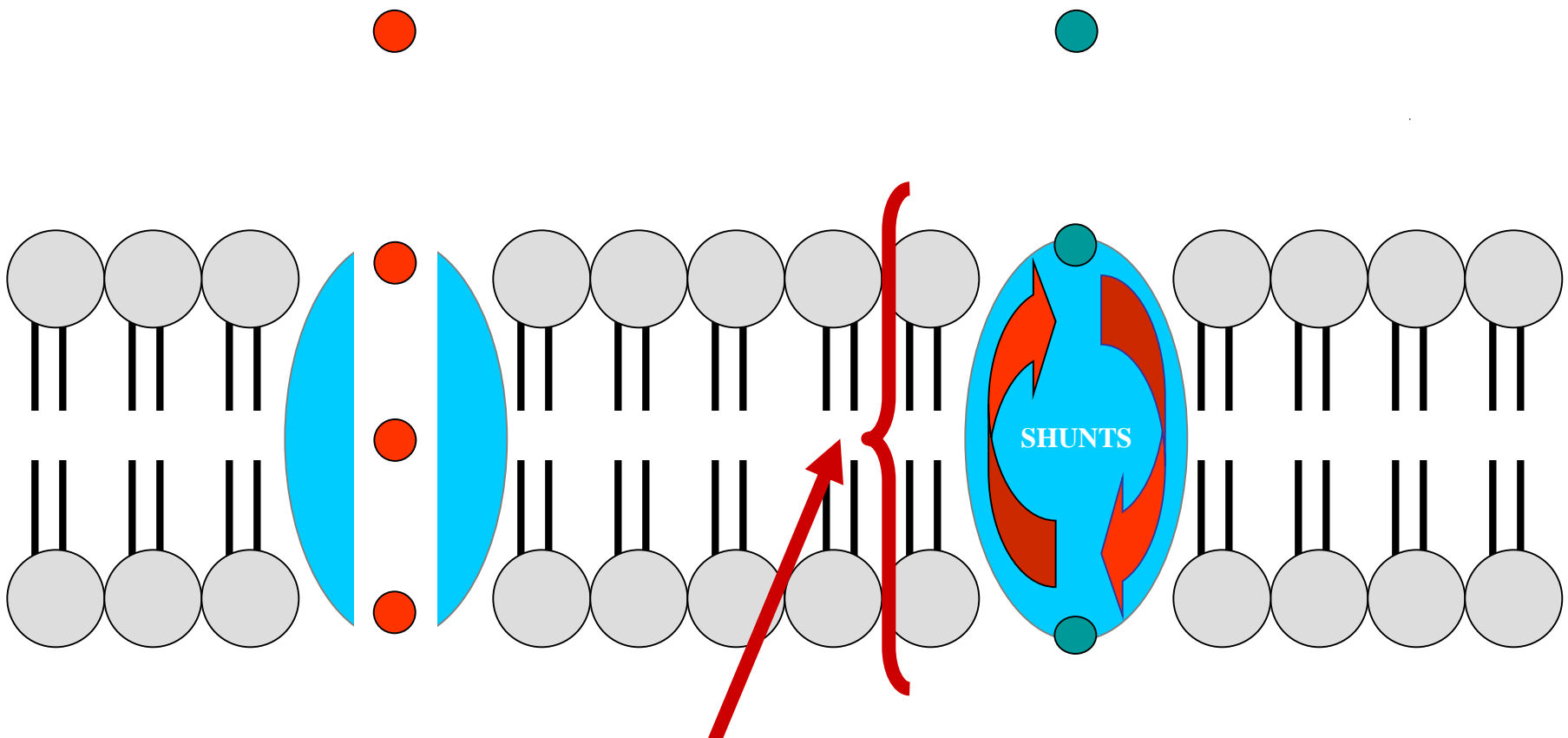


-  = POLAR SOLUTE
-  = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**

# TRANSPORT PROTEINS

C  
RE

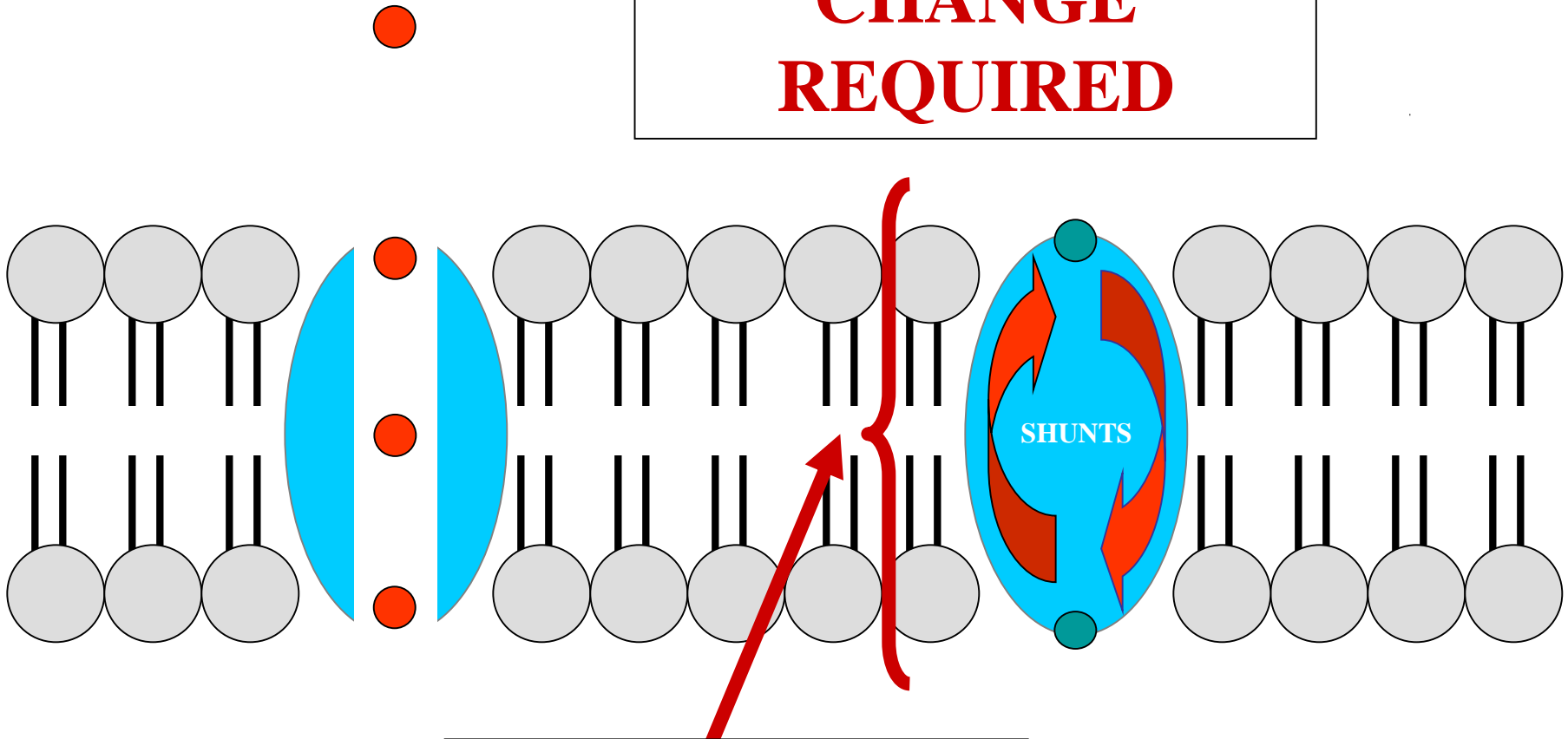


● = POLAR SOLUTE  
● = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**

**TRANSPORT PROTEINS**

**CONFORMATION  
CHANGE  
REQUIRED**

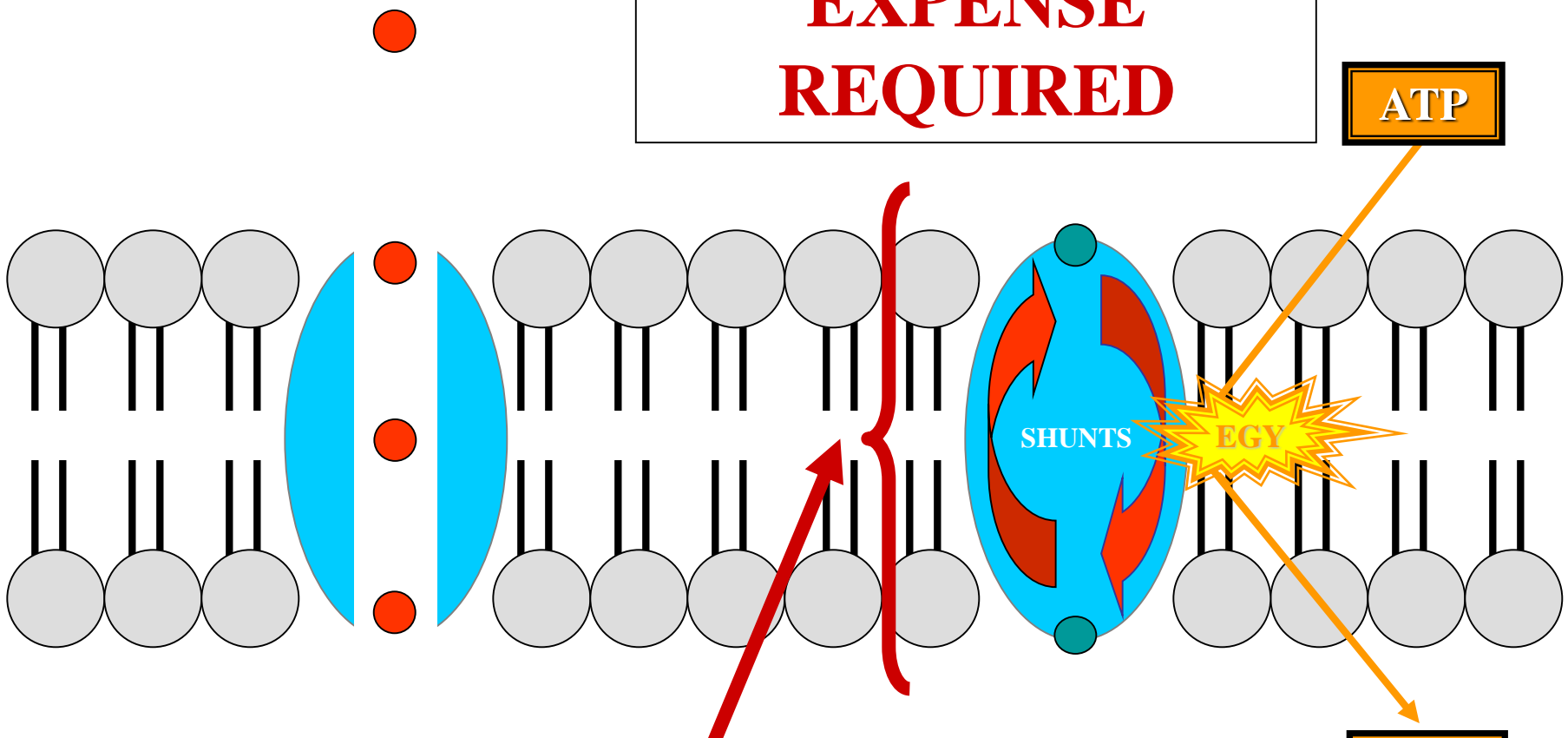


**CARRIER  
TRANSPORT  
PROTEIN**

- = POLAR SOLUTE**
- = POLAR SOLUTE**

**TRANSPORT PROTEINS**

**ATP  
EXPENSE  
REQUIRED**



**ATP**

**ADP**

**CARRIER  
TRANSPORT  
PROTEIN**

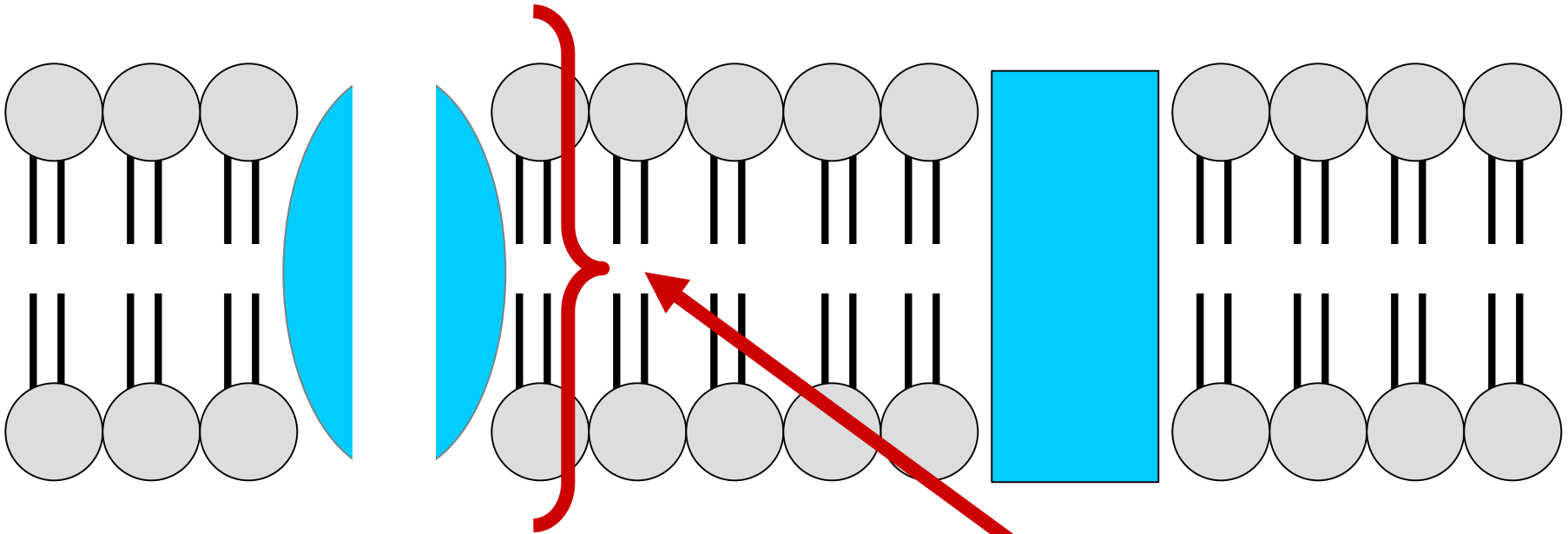
- = POLAR SOLUTE**
- = POLAR SOLUTE**





# **TRANSPORT PROTEINS SUMMARY**

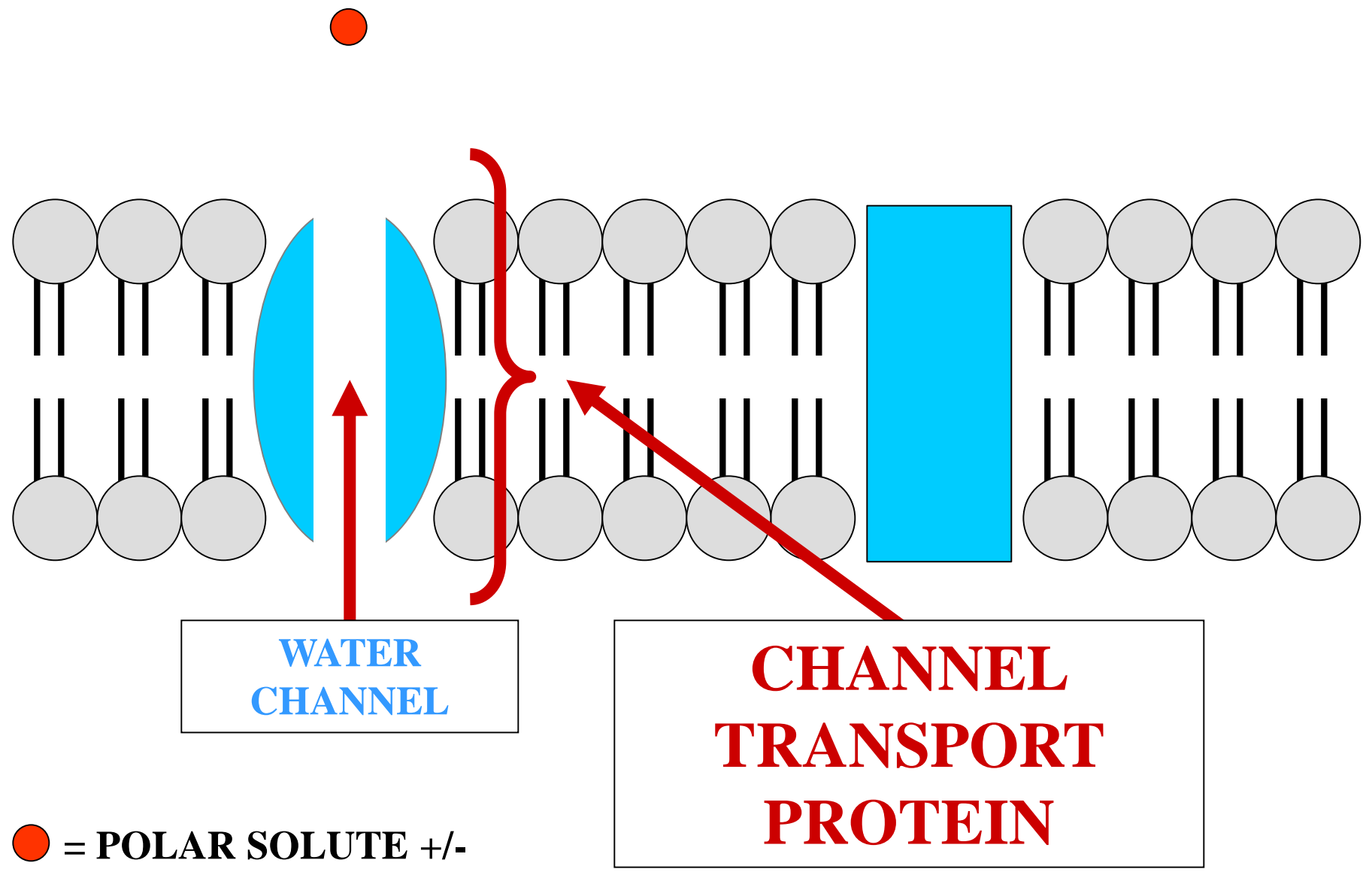
# TRANSPORT PROTEINS



?

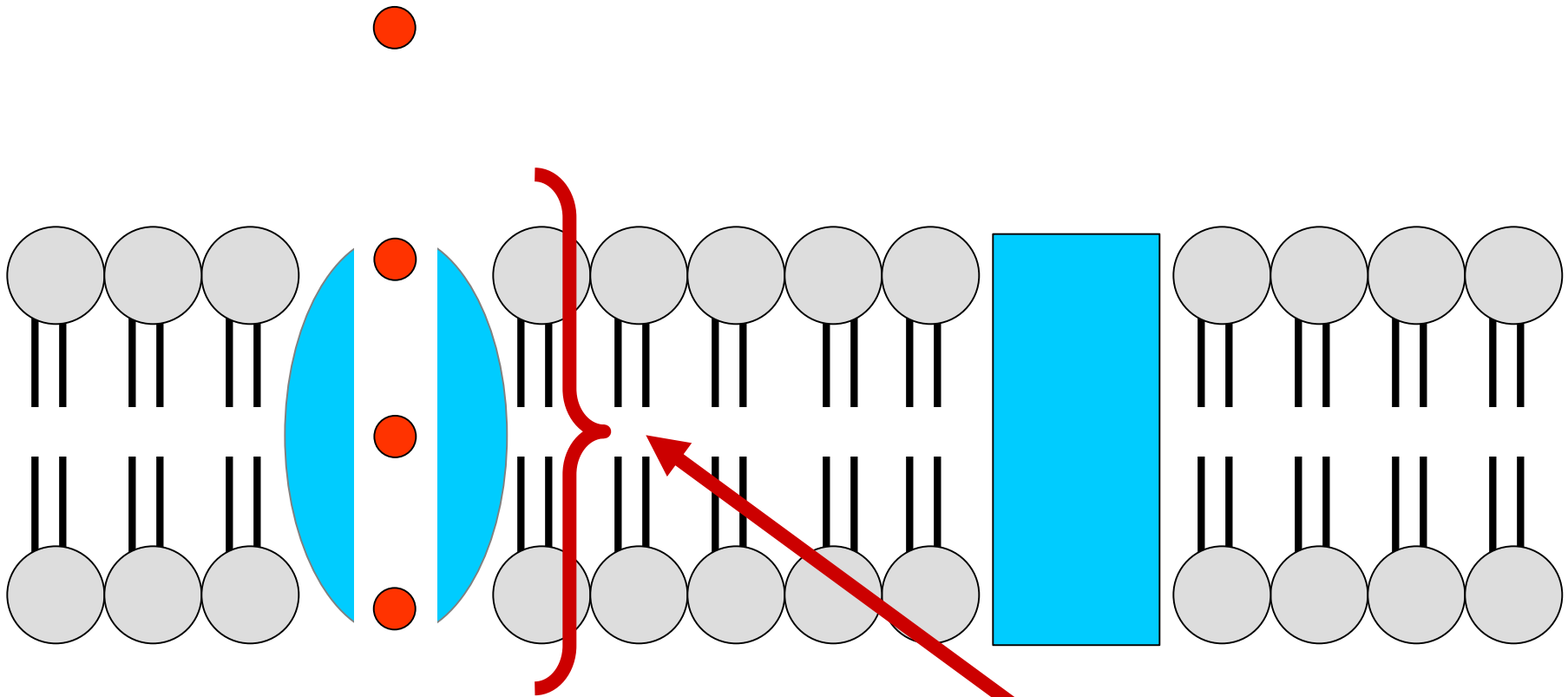
● = POLAR SOLUTE +/-

# TRANSPORT PROTEINS



# TRANSPORT PROTEINS

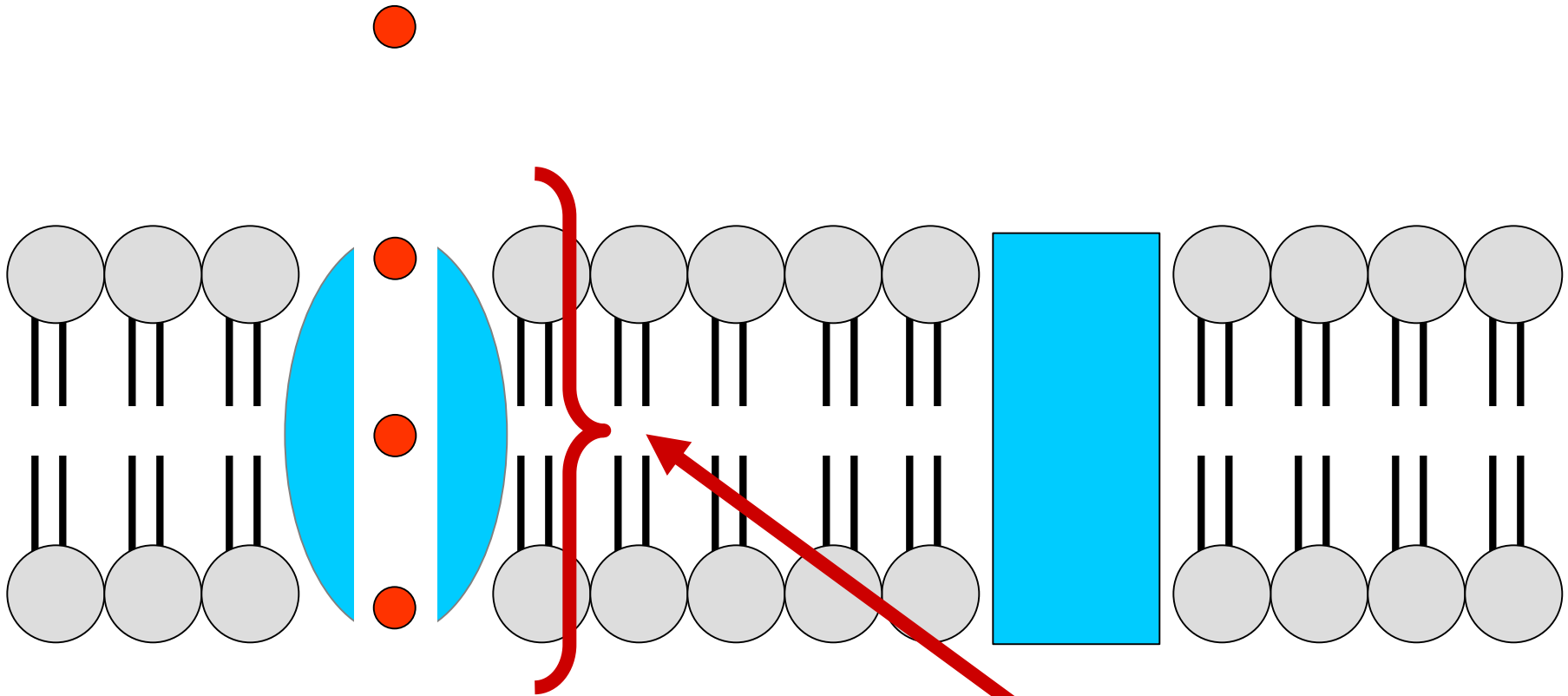
C  
AB



**CHANNEL  
TRANSPORT  
PROTEIN**

● = POLAR SOLUTE +/-

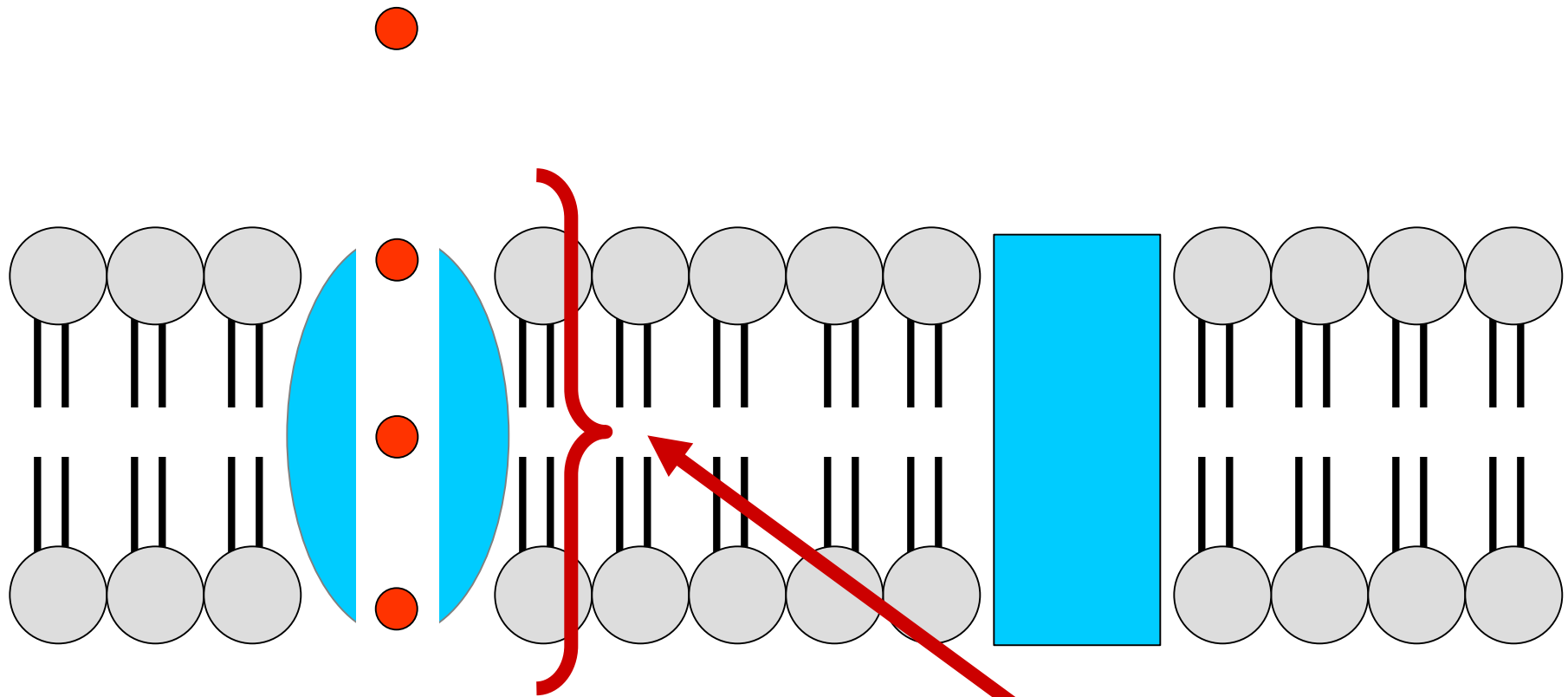
# TRANSPORT PROTEINS



**CONFORMATION  
CHANGE  
ABSENT**

● = POLAR SOLUTE +/-

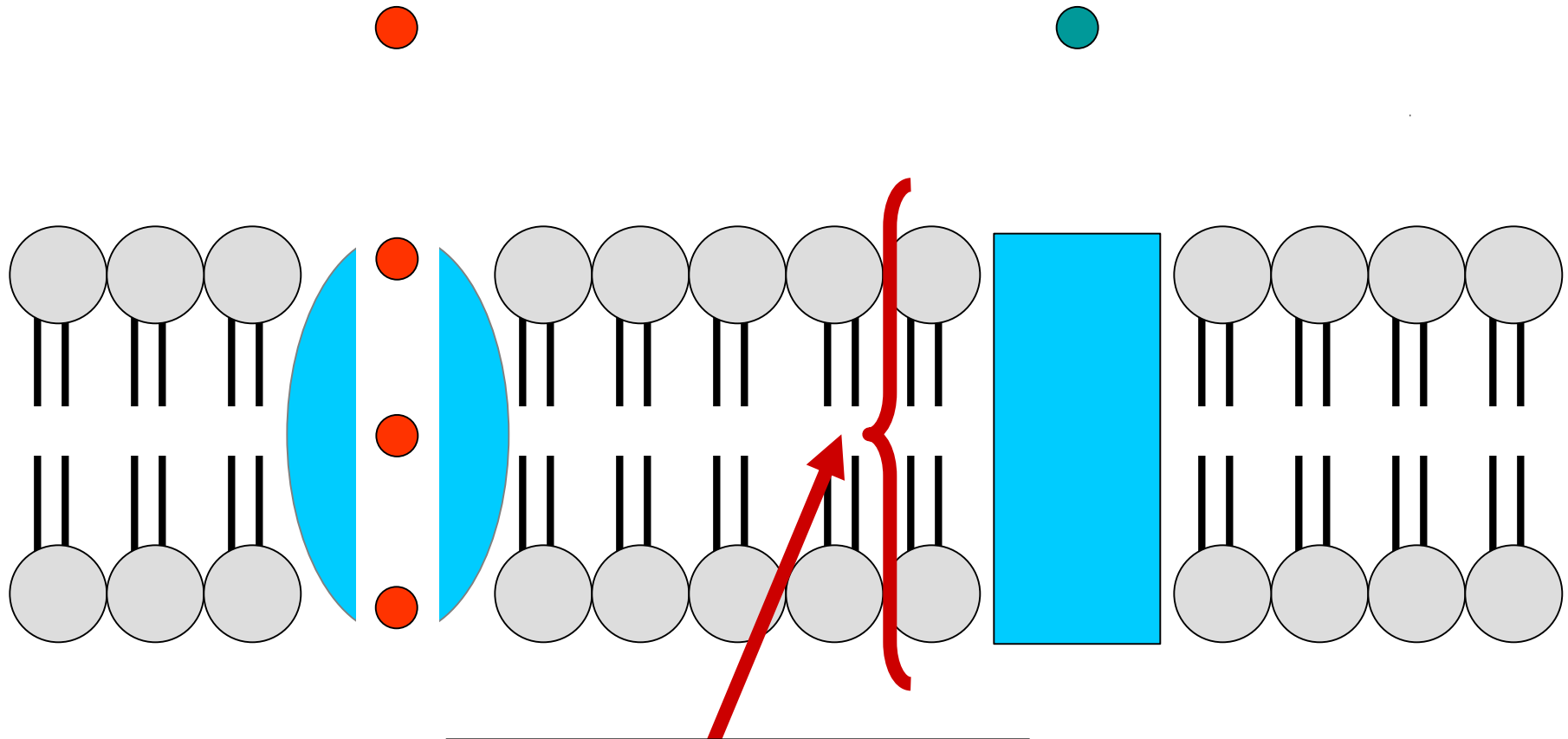
# TRANSPORT PROTEINS



**ATP**  
**EXPENSE**  
**ABSENT**

● = POLAR SOLUTE +/-

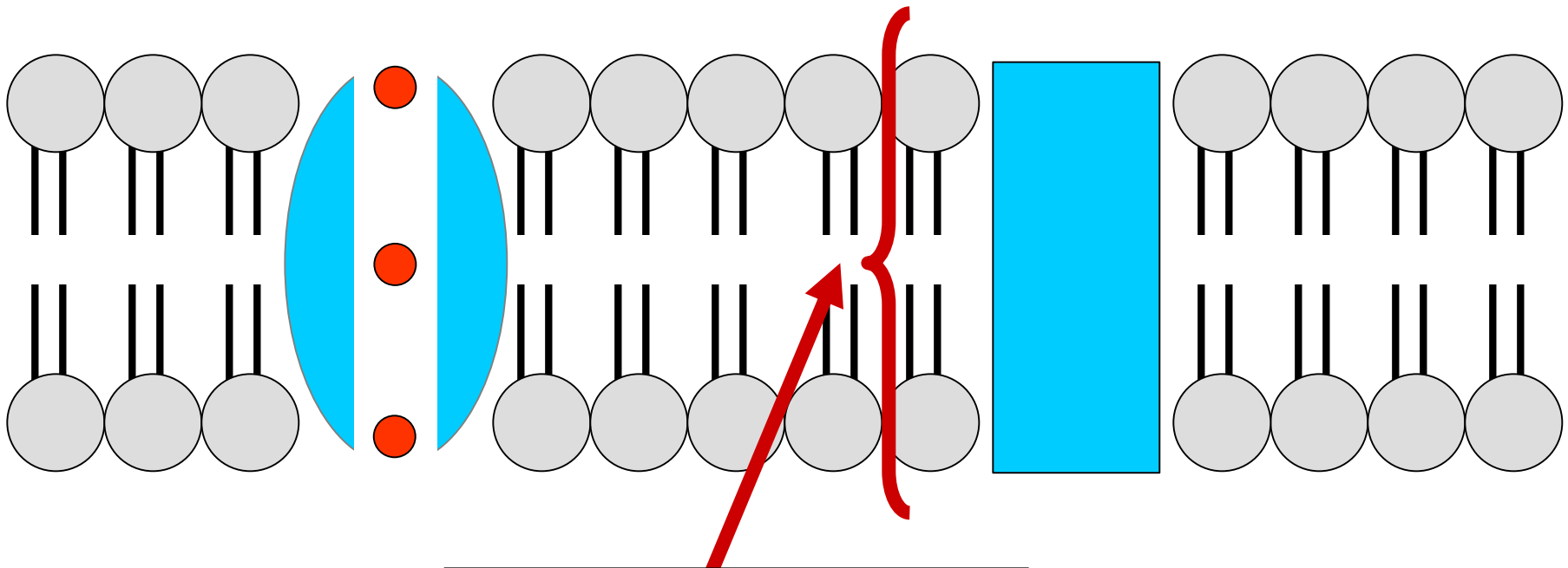
# TRANSPORT PROTEINS



● = POLAR SOLUTE  
● = POLAR SOLUTE

?

# TRANSPORT PROTEINS

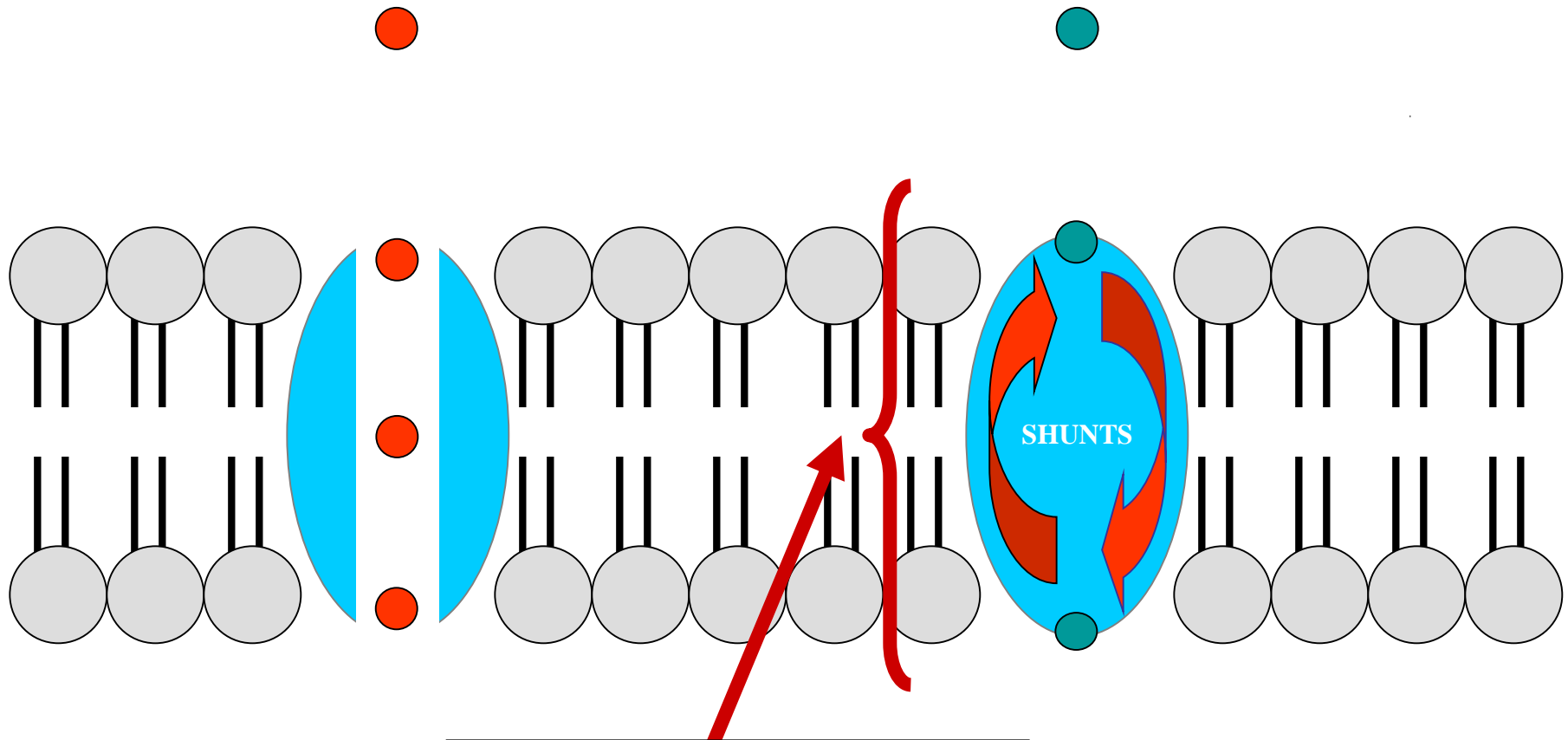




-  = POLAR SOLUTE
-  = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**



# TRANSPORT PROTEINS

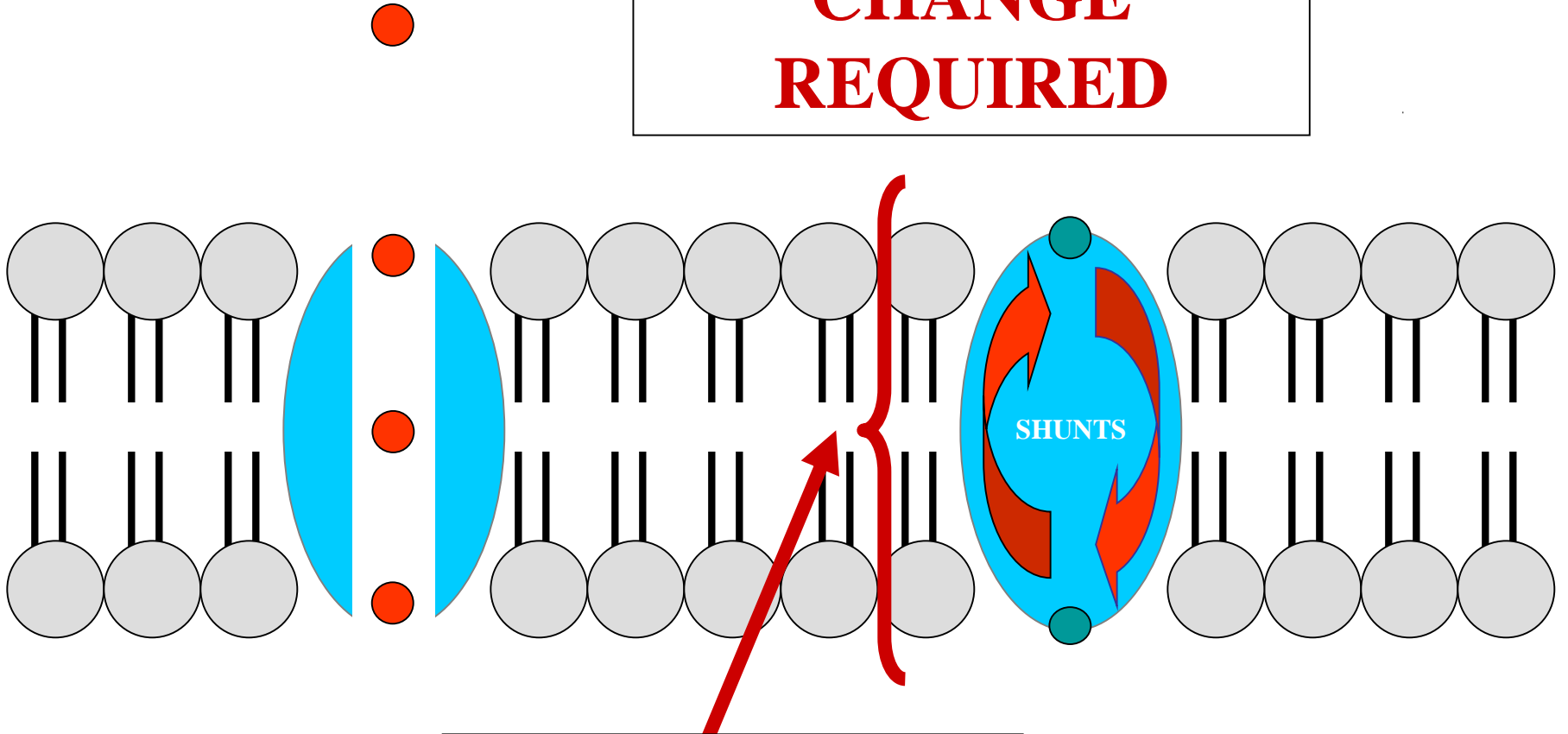


-  = POLAR SOLUTE
-  = POLAR SOLUTE

**CARRIER  
TRANSPORT  
PROTEIN**

# TRANSPORT PROTEINS

# CONFORMATION CHANGE REQUIRED REQUIRED

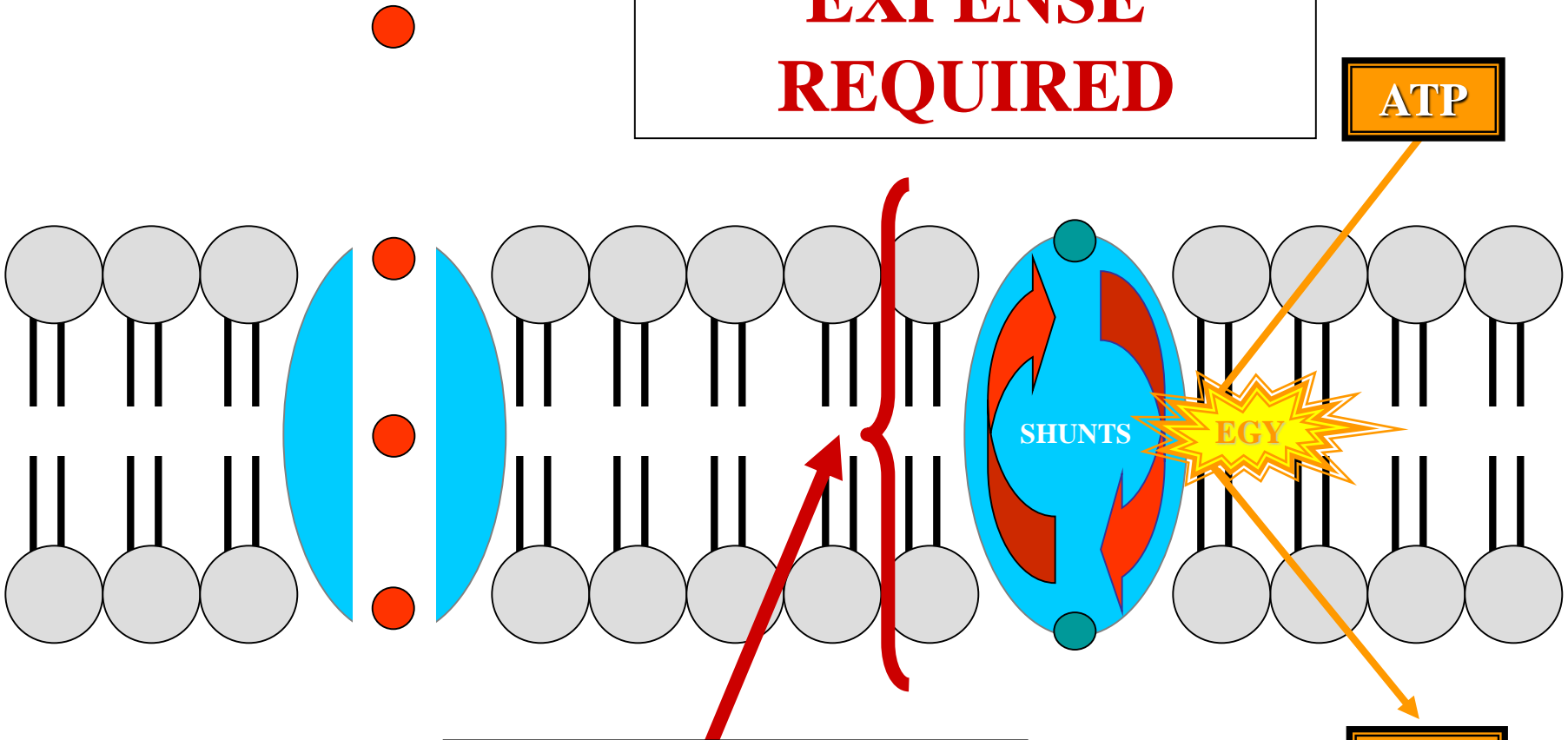


 = POLAR SOLUTE  
 = POLAR SOLUTE

# CARRIER TRANSPORT PROTEIN

# TRANSPORT PROTEINS

**ATP**  
**EXPENSE**  
**REQUIRED**



**ATP**

**ADP**

**CARRIER**  
**TRANSPORT**  
**PROTEIN**

-  = POLAR SOLUTE
-  = POLAR SOLUTE



# **SOLUTE MEMBRANE TRANSPORT**

**SOLUTE  
MEMBRANE  
TRANSPORT  
TYPES**

# **SOLUTE MEMBRANE TRANSPORT TYPES**

**PASSIVE TRANSPORT**

# **SOLUTE MEMBRANE TRANSPORT TYPES**

# **SOLUTE MEMBRANE TRANSPORT TYPES**

**PASSIVE TRANSPORT**

**PASSIVE FACILITATED TRANSPORT**

# **SOLUTE MEMBRANE TRANSPORT TYPES**

# **SOLUTE MEMBRANE TRANSPORT TYPES**



**PASSIVE TRANSPORT**  
**PASSIVE FACILITATED TRANSPORT**  
**ACTIVE TRANSPORT**

# **SOLUTE MEMBRANE TRANSPORT TYPES**



# SOLUTION TERMS

**SOLUTION**

# **SOLUTION TERMS**

**SOLUTION  
SOLVENT-SOLUTE  
MIXTURE**

**SOLUTION TERMS**

**SOLVENT**

# **SOLUTION TERMS**

**SOLVENT**

**LIQUID**

**SOLUTION**

**COMPONENT**

**SOLUTION TERMS**

**SOLUTE**

# **SOLUTION TERMS**



**SOLUTE**

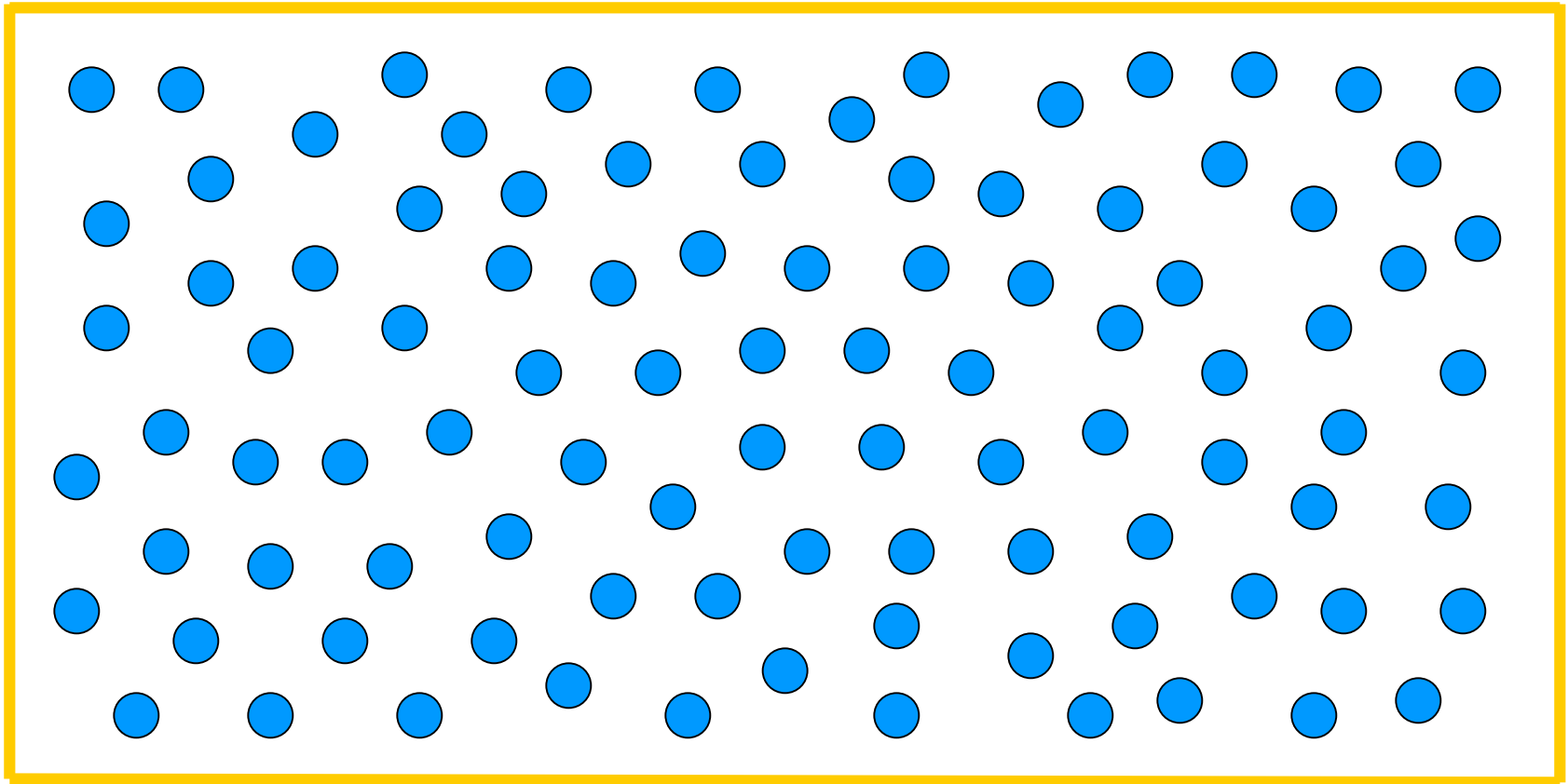
**DISSOLVED**

**SOLUTION**

**COMPONENT**

**SOLUTION TERMS**

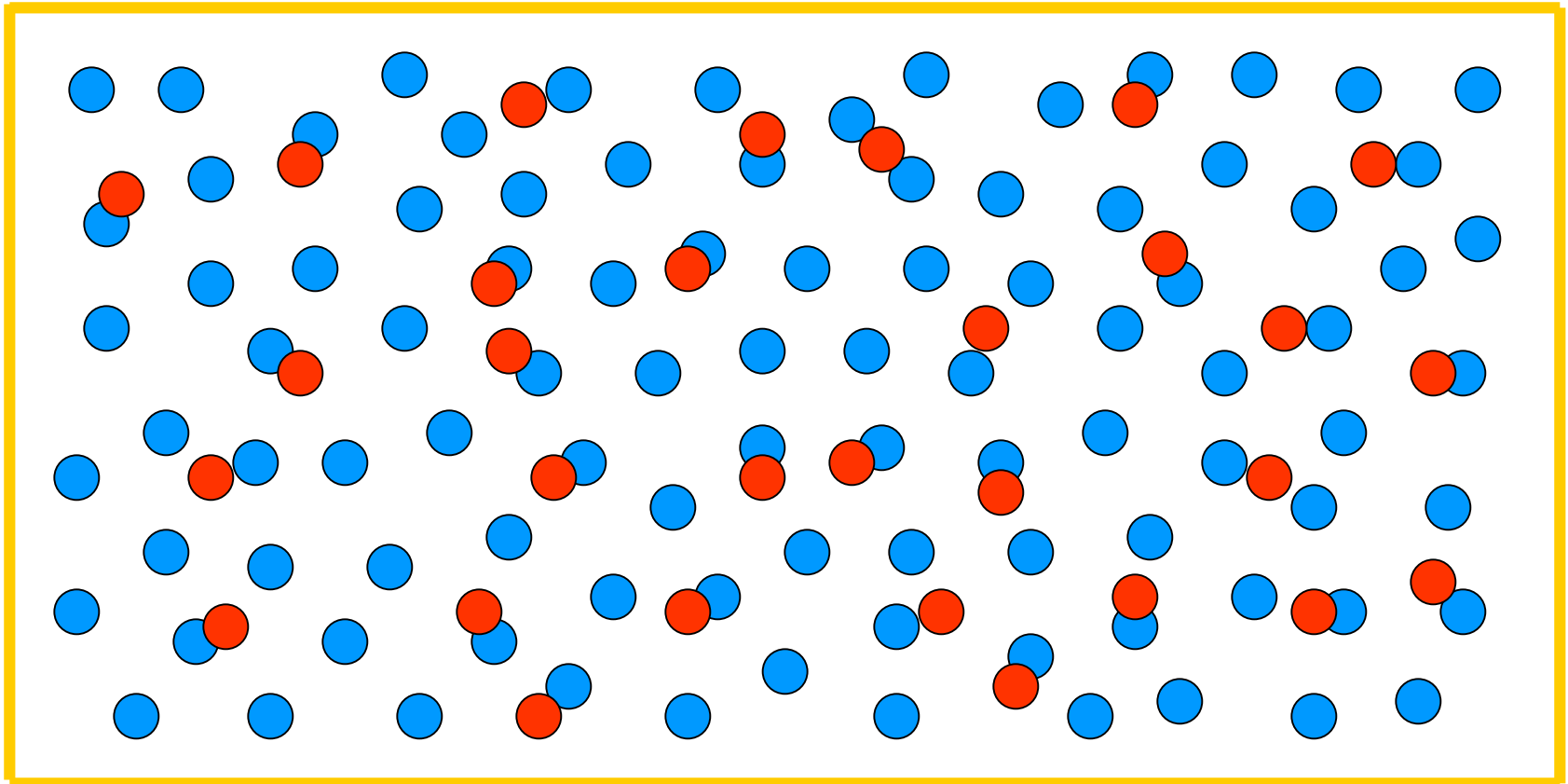
# SOLUTION TERMS



● = SOLVENT MOLECULE

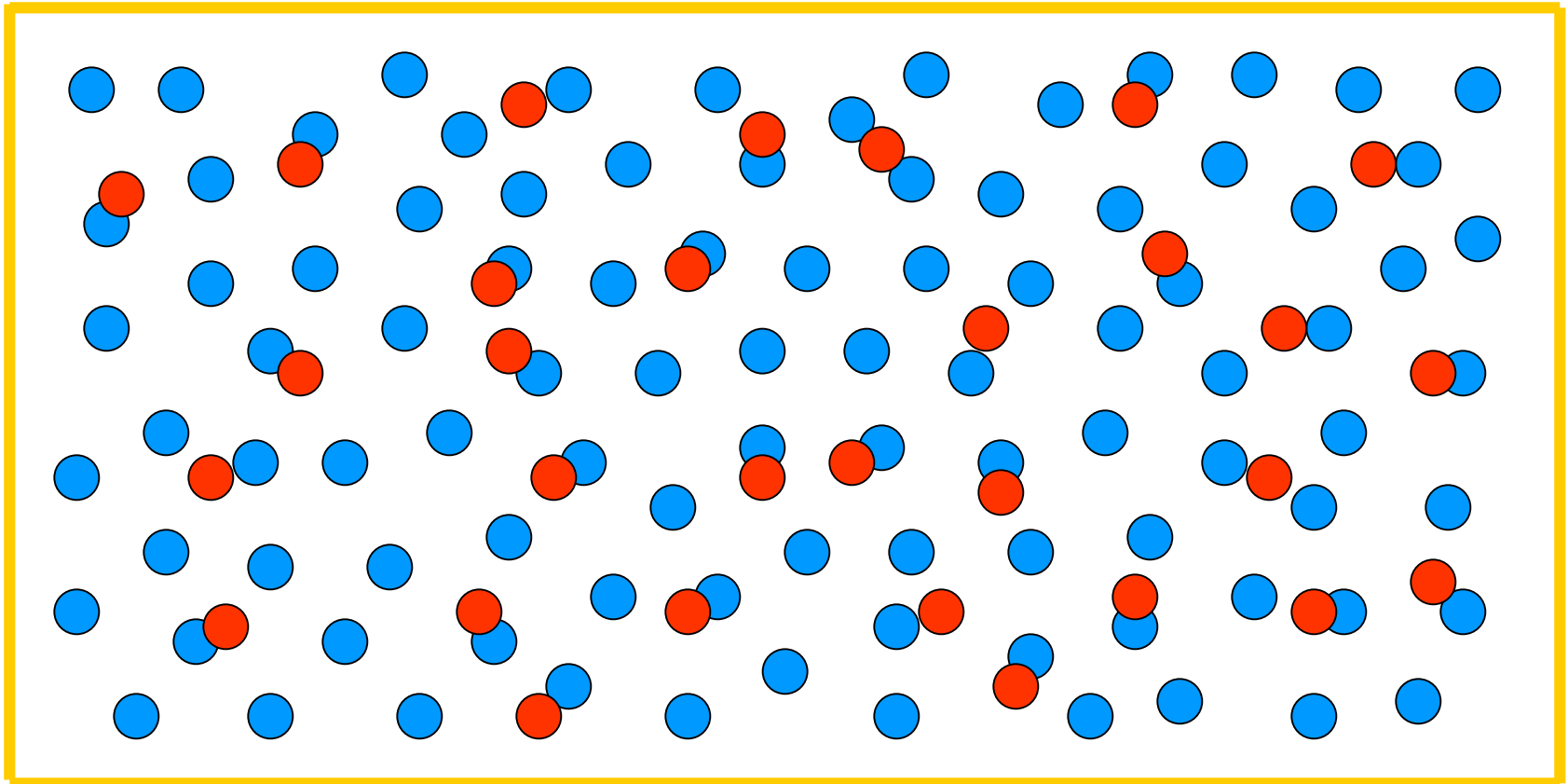


# SOLUTION TERMS



● = SOLVENT MOLECULE  
● = SOLUTE MOLECULE } = MIXTURE

# SOLUTION TERMS



● = SOLVENT MOLECULE  
● = SOLUTE MOLECULE } = SOLUTION

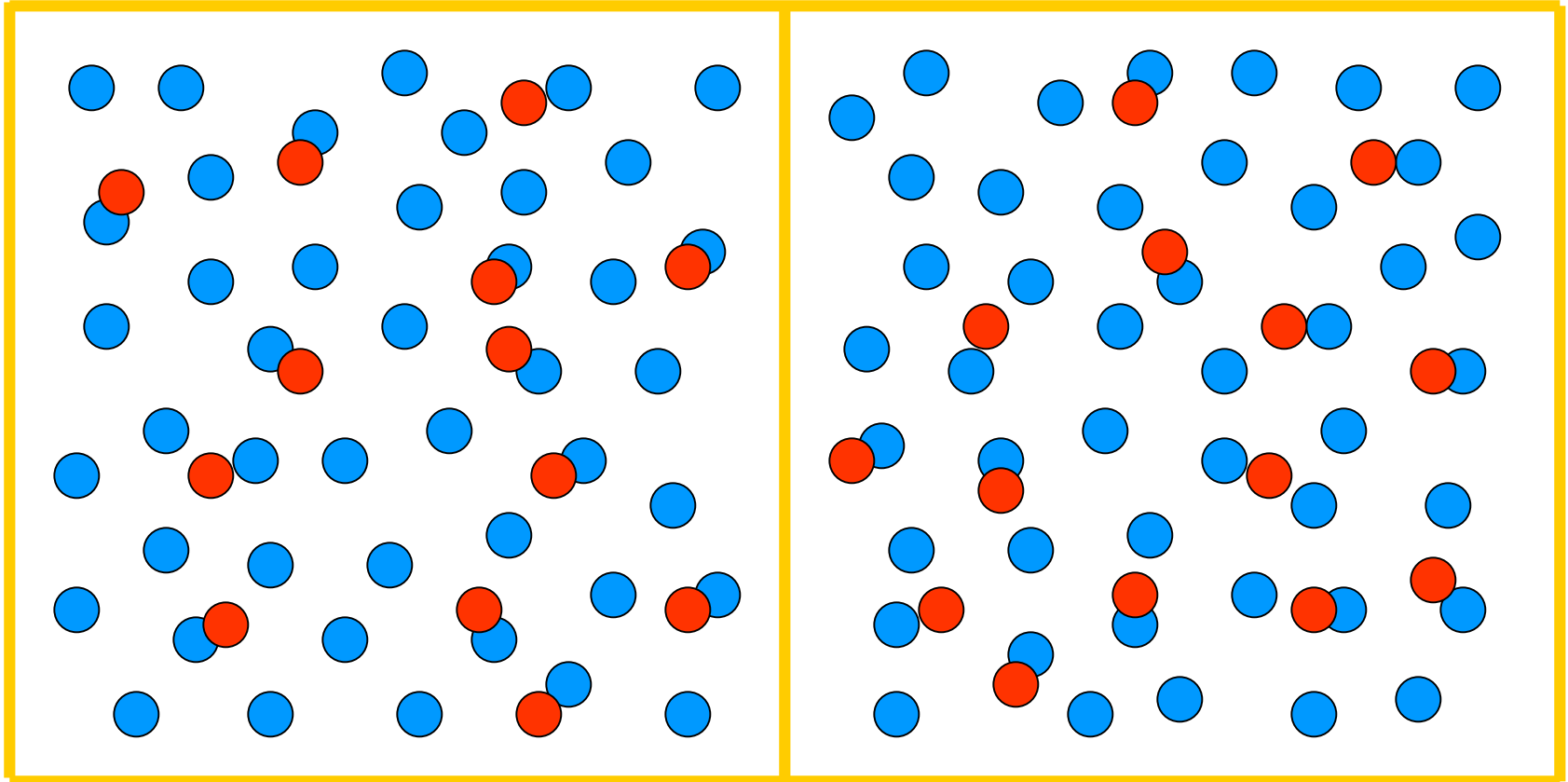


# SOLUTION

SOLUTION A

TERMS

SOLUTION B



● = SOLVENT MOLECULE

● = SOLUTE MOLECULE

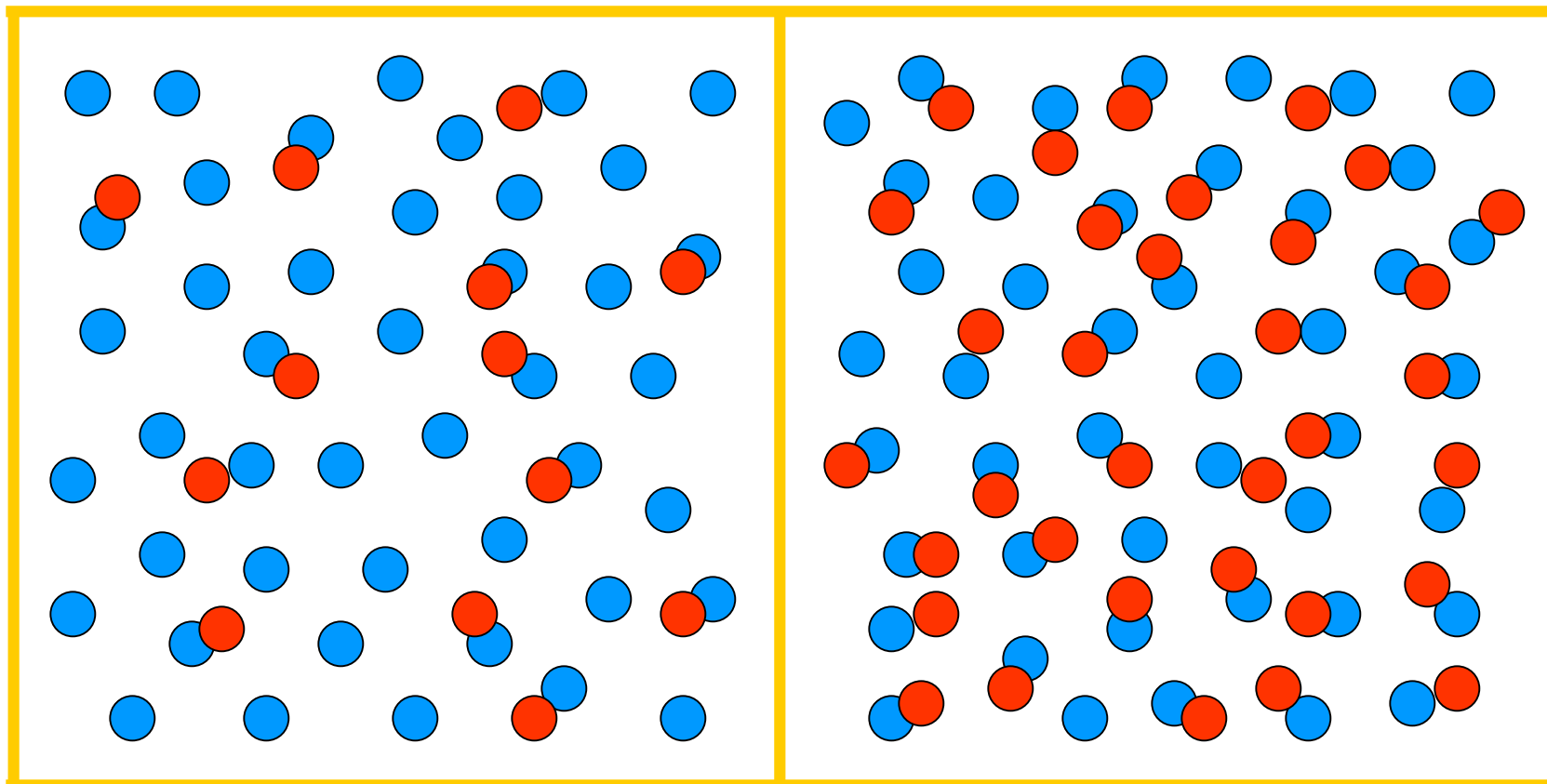
} = SOLUTION

# SOLUTION

## SOLUTION A

## TERMS

## SOLUTION B



● = SOLVENT MOLECULE

● = SOLUTE MOLECULE

} = SOLUTION

**GRADIENT**



# **SOLUTION TERMS**

**2 SOLUTIONS  
WITH DIFFERENT  
SOLUTE  
CONCENTRATION**

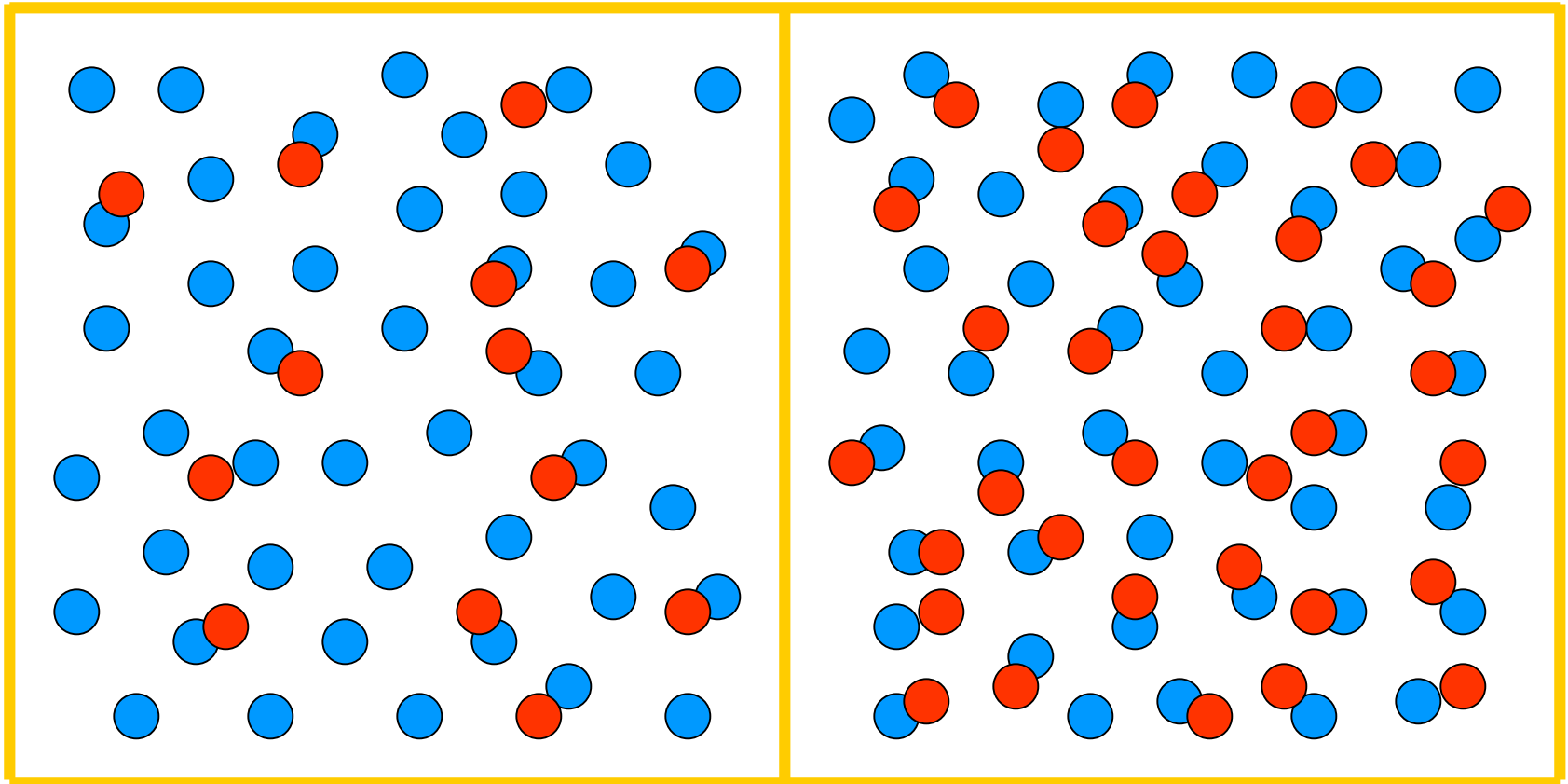
# **SOLUTION TERMS**

# SOLUTION

**SOLUTION A**

**TERMS**

**SOLUTION B**



**25% SOLUTE**

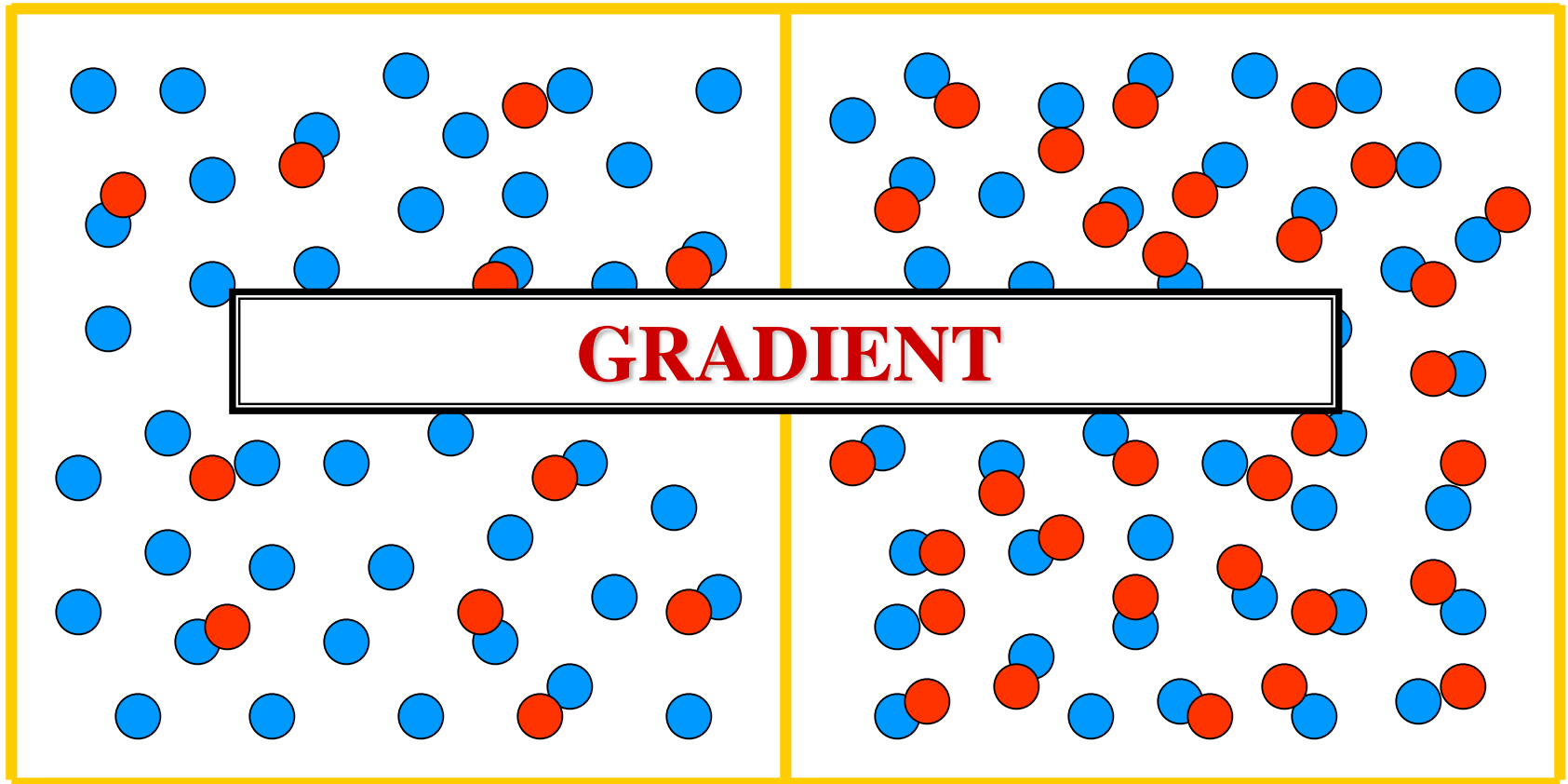
**75% SOLUTE**

# SOLUTION

SOLUTION A

TERMS

SOLUTION B



25% SOLUTE

75% SOLUTE



**CONCENTRATION**



# **SOLUTION TERMS**

**AMOUNT DISSOLVED  
SOLUTE**

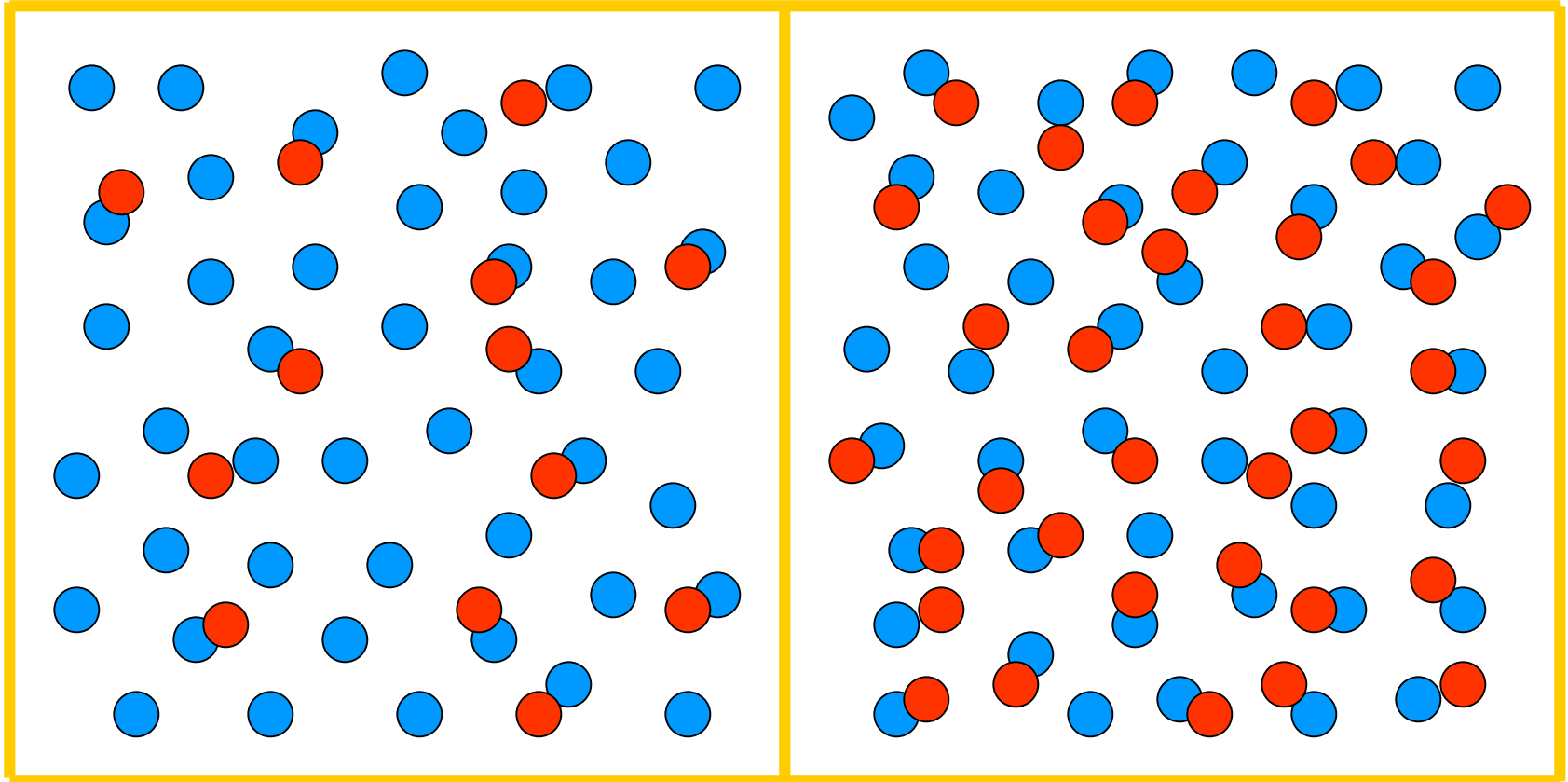
**SOLUTION TERMS**

# SOLUTION

**SOLUTION A**

**TERMS**

**SOLUTION B**



**25% SOLUTE  
CONCENTRATION**

**75% SOLUTE  
CONCENTRATION**

# PASSIVE TRANSPORT

P

PASSIVE

TRANSPORT

SYNONYMOUS

DIFFUSION

# **PASSIVE TRANSPORT**



# **PASSIVE TRANSPORT**

**NET SOLUTE MOVEMENT:**

**PASSIVE TRANSPORT**



# PASSIVE TRANSPORT

NET SOLUTE MOVEMENT:  
DOWN CON GRADIENT

PASSIVE TRANSPORT





# PASSIVE TRANSPORT

NET SOLUTE MOVEMENT  
DOWN CON GRADIENT  
HIGH CON →

PASSIVE TRANSPORT



# PASSIVE TRANSPORT

NET SOLUTE MOVEMENT  
DOWN CON GRADIENT  
HIGH CON → LOW CON

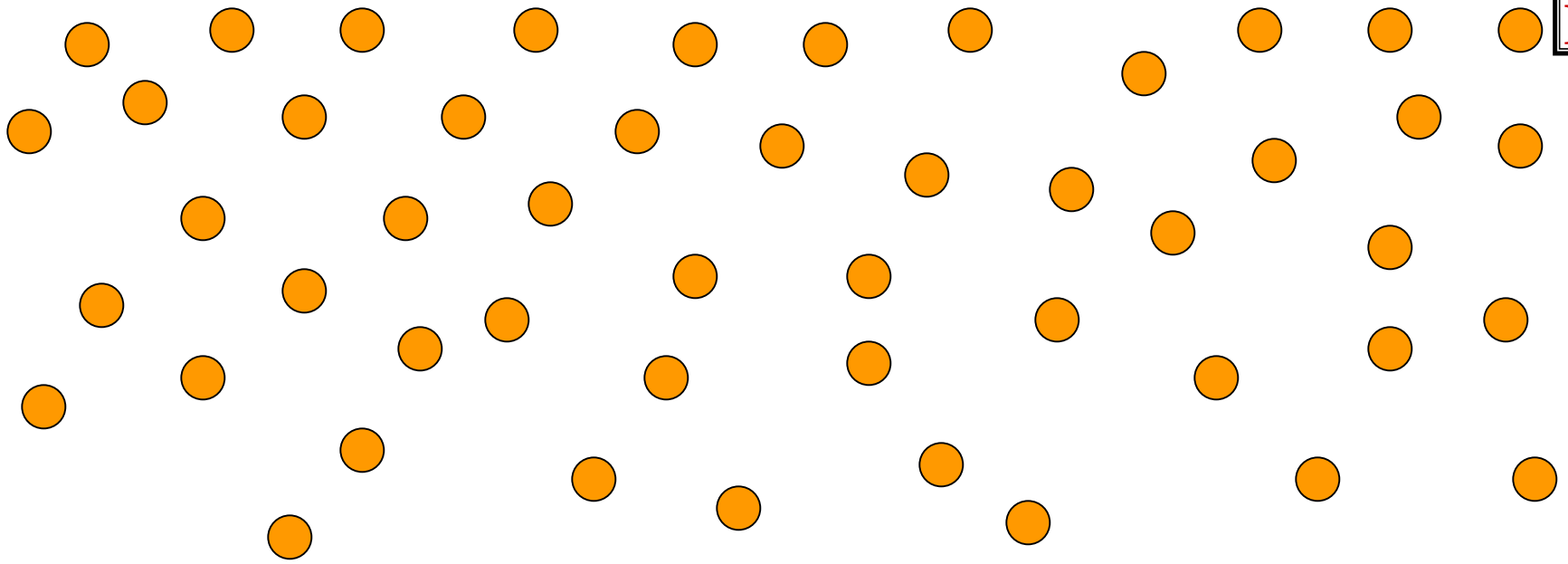
PASSIVE TRANSPORT



# PASSIVE TRANSPORT

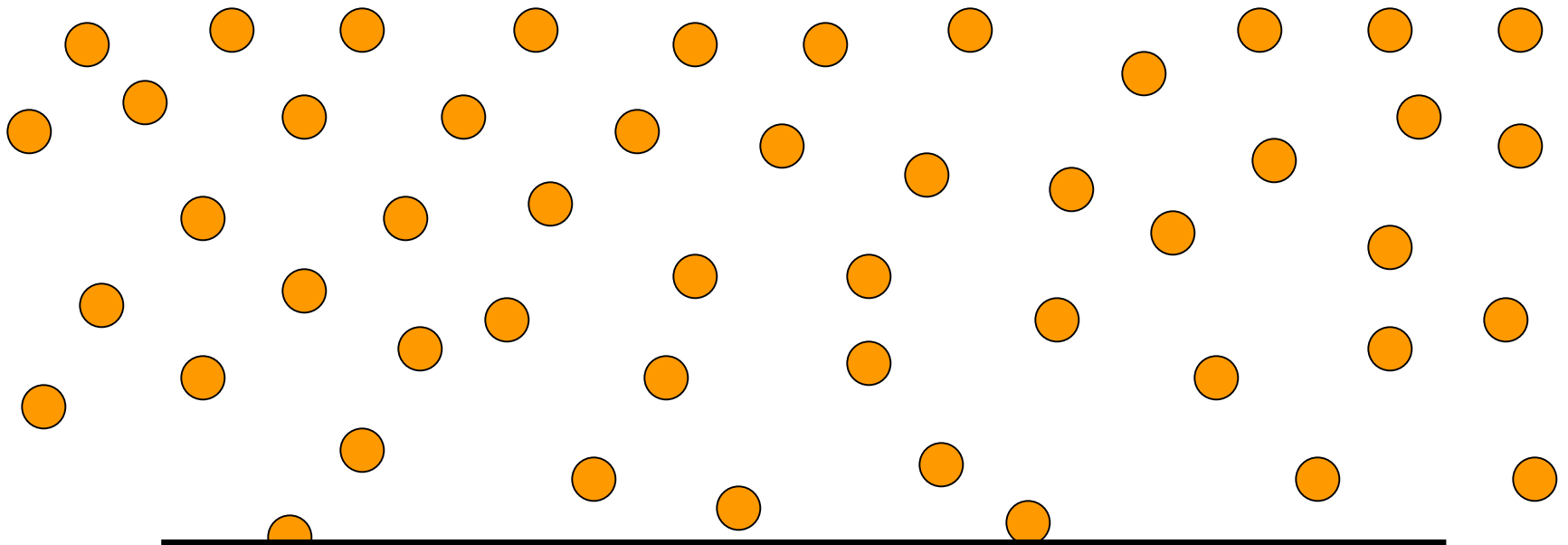
NET SOLUTE MOVEMENT  
DOWN CON GRADIENT  
HIGH CON → LOW CON  
EQUILIBRIUM

# PASSIVE TRANSPORT



**MEMBRANE**

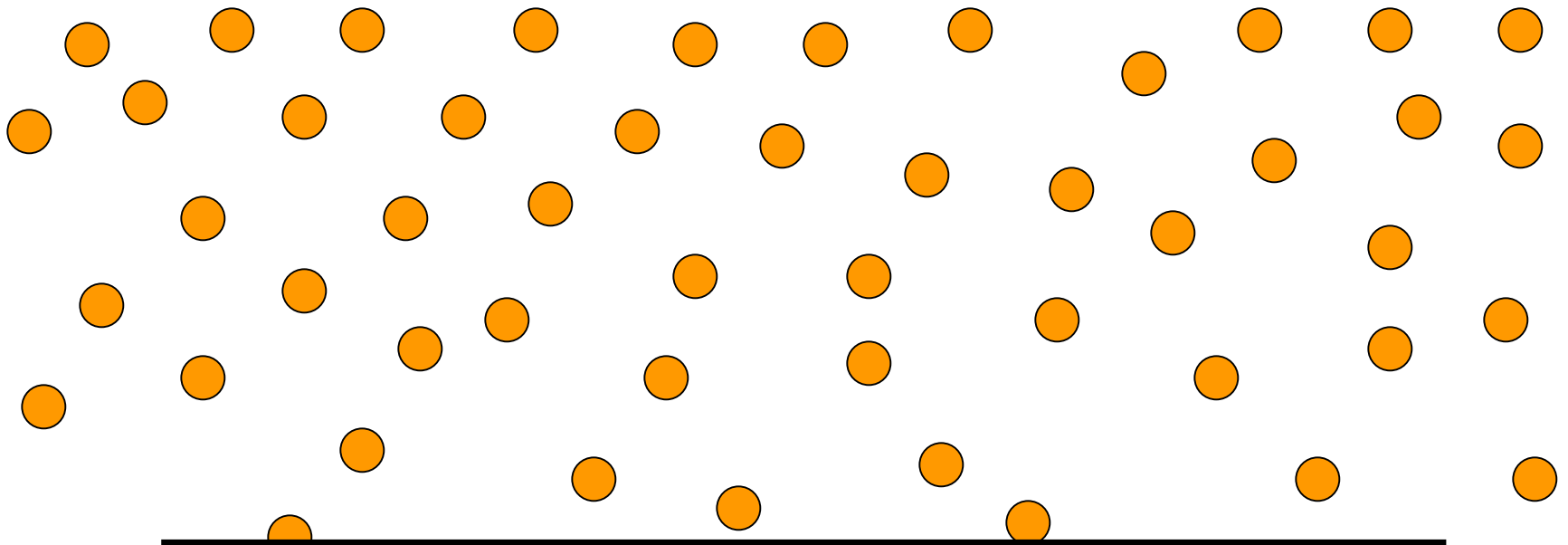
 = **SOLUTE**  
 = **MEMBRANE**



# PASSIVE TRANSPORT

● = SOLUTE

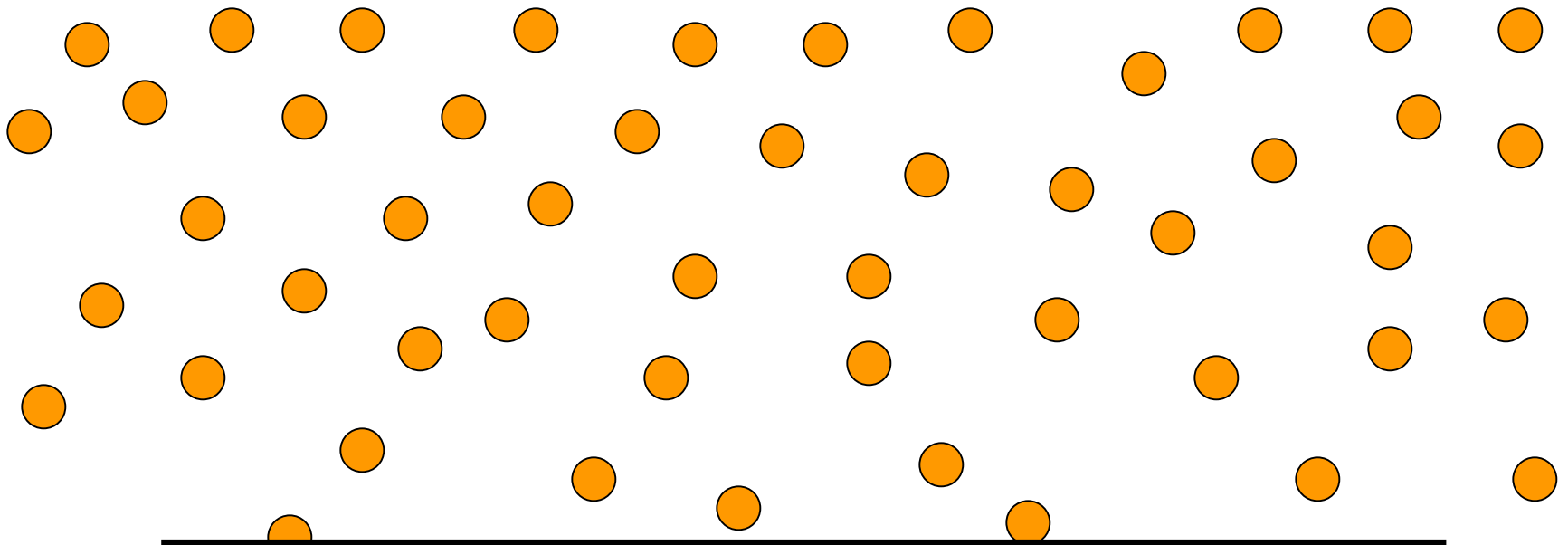
— = MEMBRANE



# NET SOLUTE MOVEMENT

● = SOLUTE

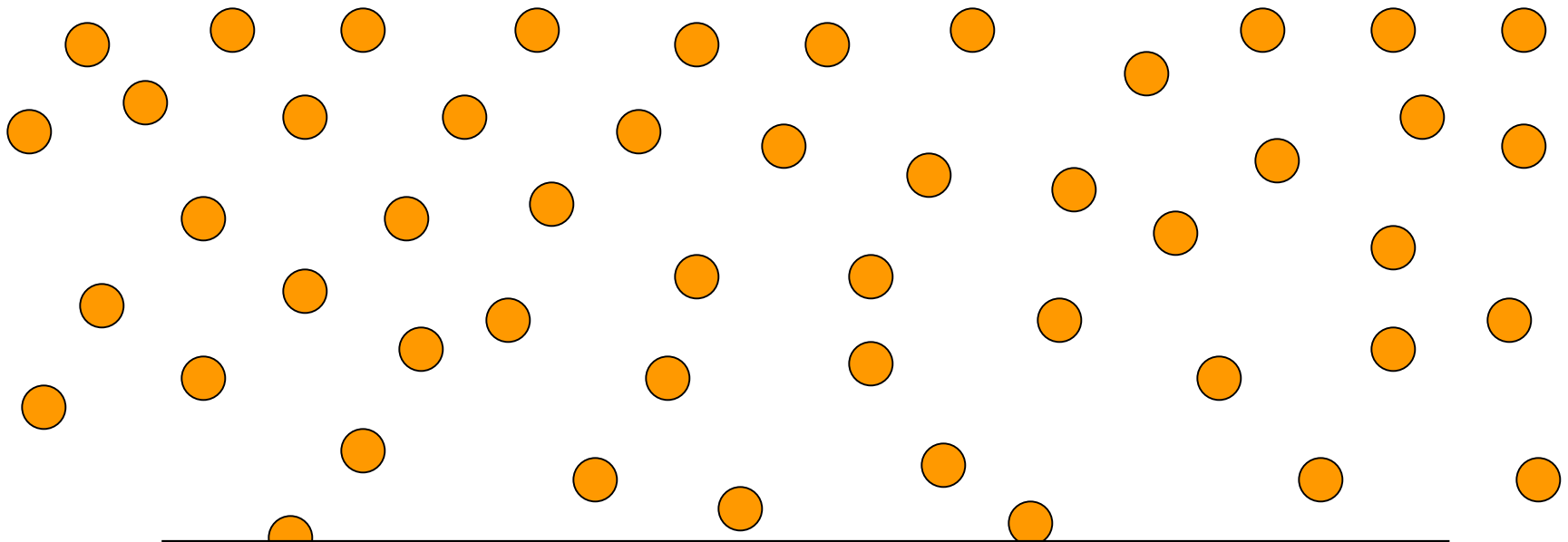
— = MEMBRANE



**DOWN CON GRADIENT**

 = SOLUTE

 = MEMBRANE

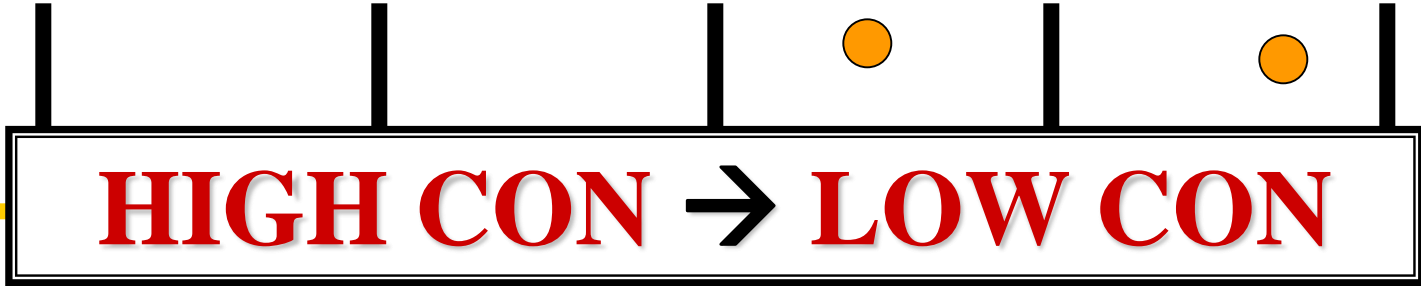


**HIGH CON →**

 = **SOLUTE**

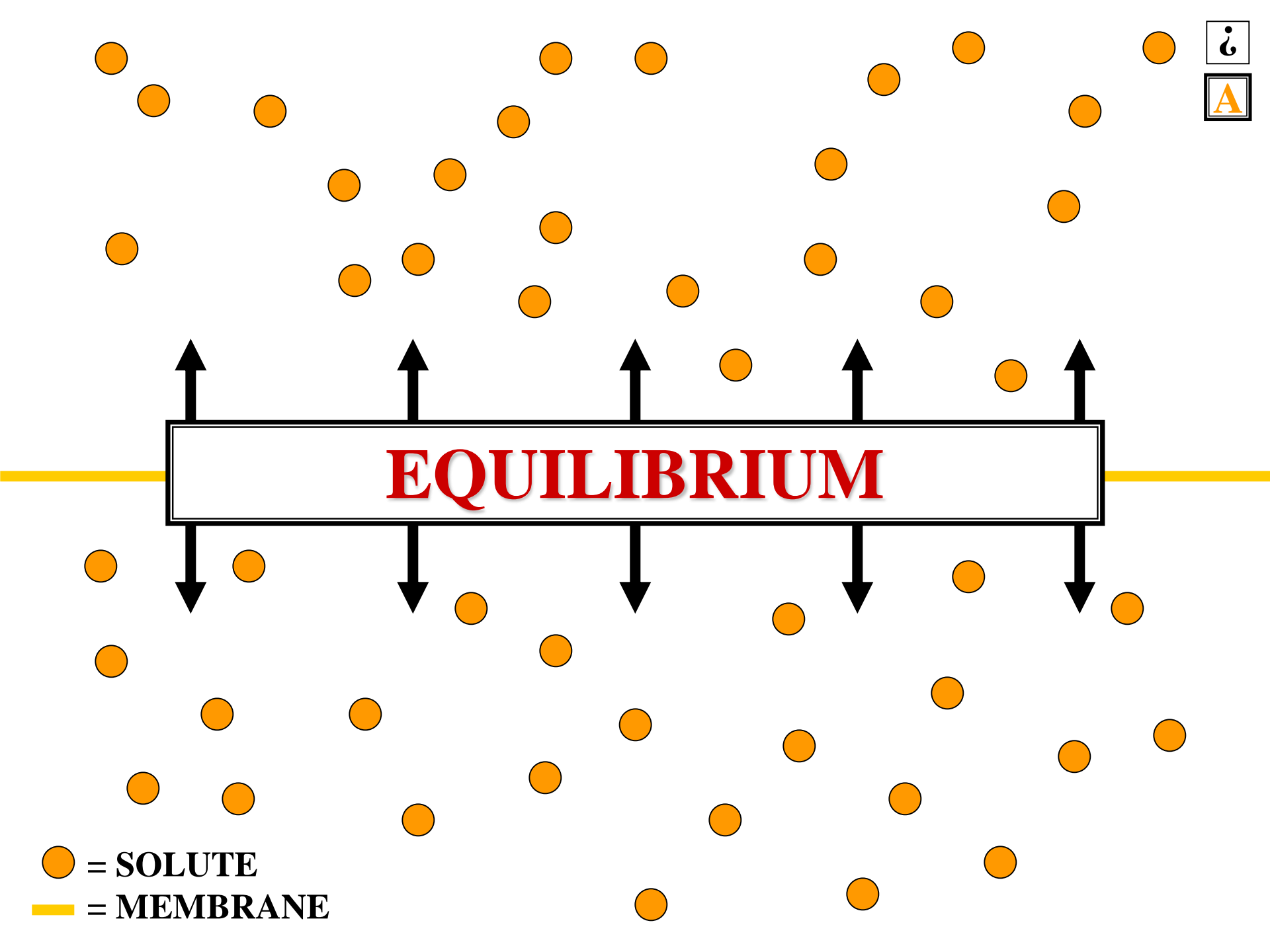
 = **MEMBRANE**





● = SOLUTE

— = MEMBRANE



● = SOLUTE  
— = MEMBRANE

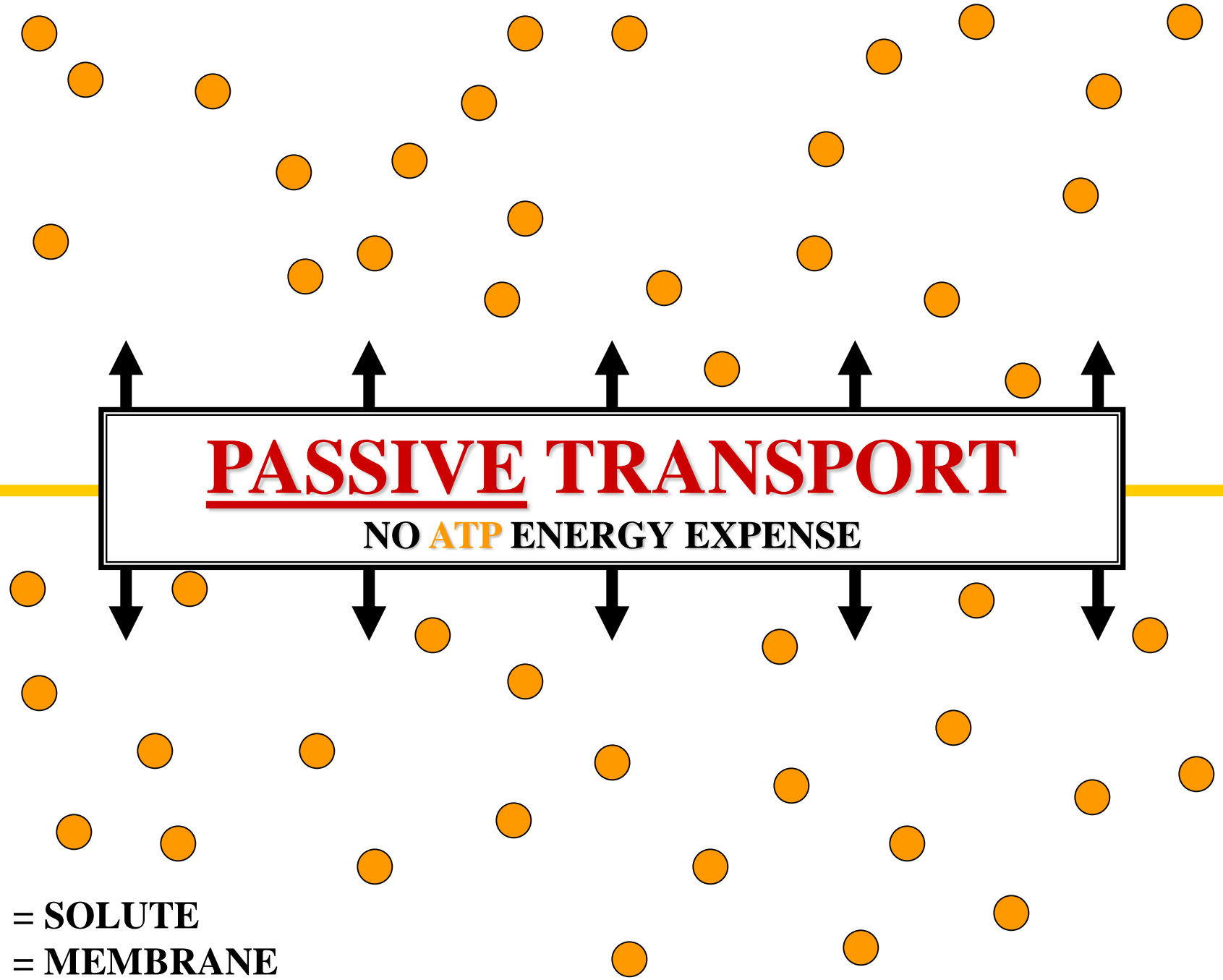


The diagram illustrates a membrane separating two regions. A horizontal yellow line represents the membrane. Above the membrane, there are 15 orange circles representing solute particles. Below the membrane, there are 25 orange circles. A central white box with a black border contains the text "ATP EXPENSE: NO". Four black arrows point upwards from the membrane to the upper region, and four black arrows point downwards from the membrane to the lower region, indicating bidirectional transport.

**ATP EXPENSE: NO**

● = SOLUTE

— = MEMBRANE



**PASSIVE TRANSPORT**  
**NO ATP ENERGY EXPENSE**

**● = SOLUTE**  
**— = MEMBRANE**

**FACTORS  
AFFECTING  
PASSIVE  
TRANSPORT**

# **FACTORS AFFECTING PASSIVE TRANSPORT**

**TEMPERATURE**

# **FACTORS AFFECTING PASSIVE TRANSPORT**

# **FACTORS AFFECTING PASSIVE TRANSPORT**



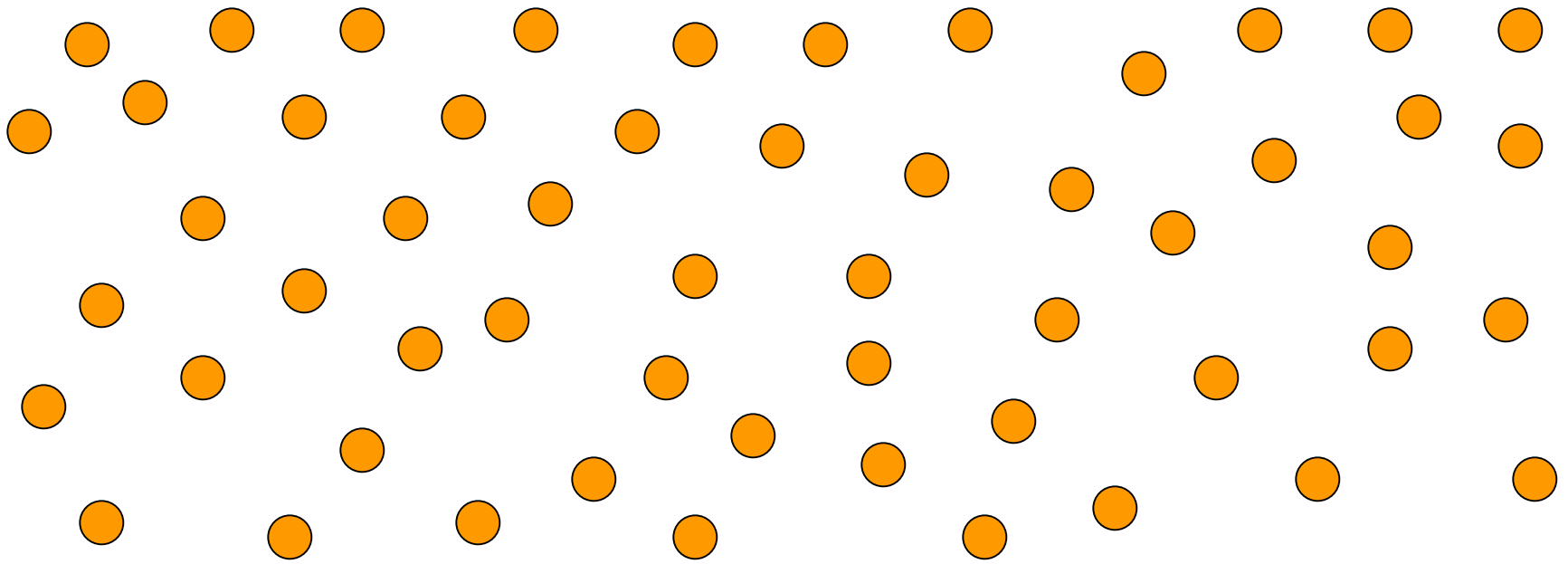
**TEMPERATURE**  
**MOLECULAR SIZE**

**FACTORS AFFECTING  
PASSIVE TRANSPORT**



# PASSIVE TRANSPORT TEMPERATURE



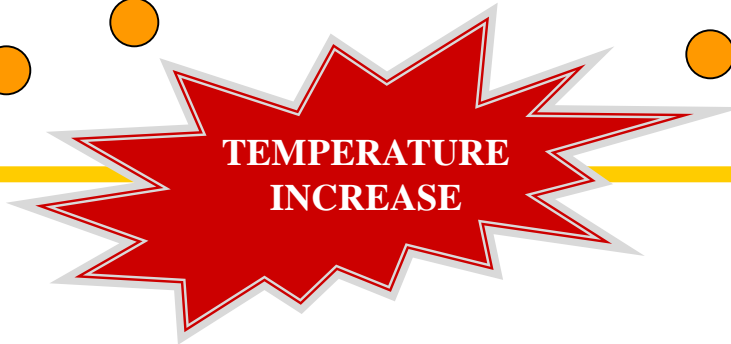


**MEMBRANE**

**TEMPERATURE**

**● = SOLUTE**

**— = MEMBRANE**

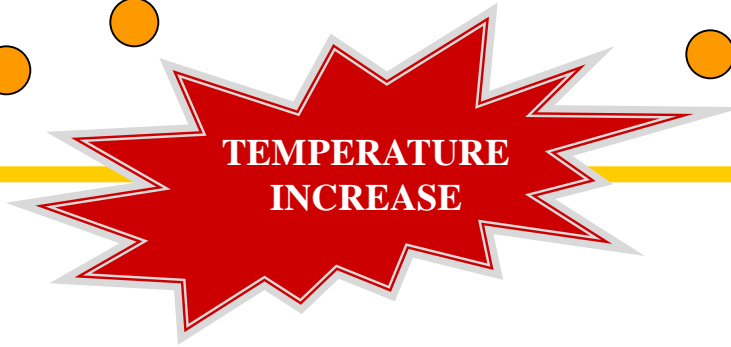


TEMPERATURE  
INCREASE

**INCREASE  
TEMPERATURE**

● = SOLUTE

— = MEMBRANE

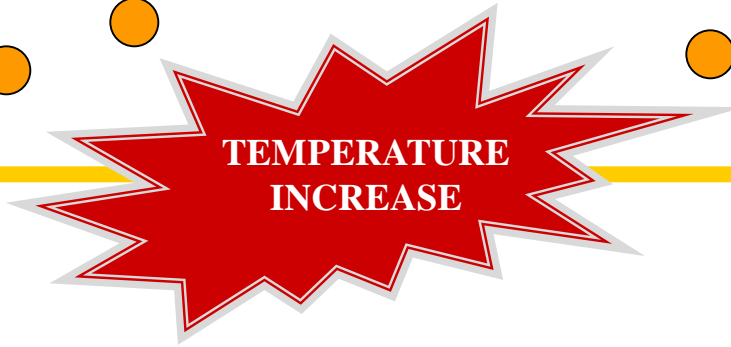


TEMPERATURE  
INCREASE

**RAPID  
SOLUTE MOVEMENT**

 = SOLUTE

 = MEMBRANE

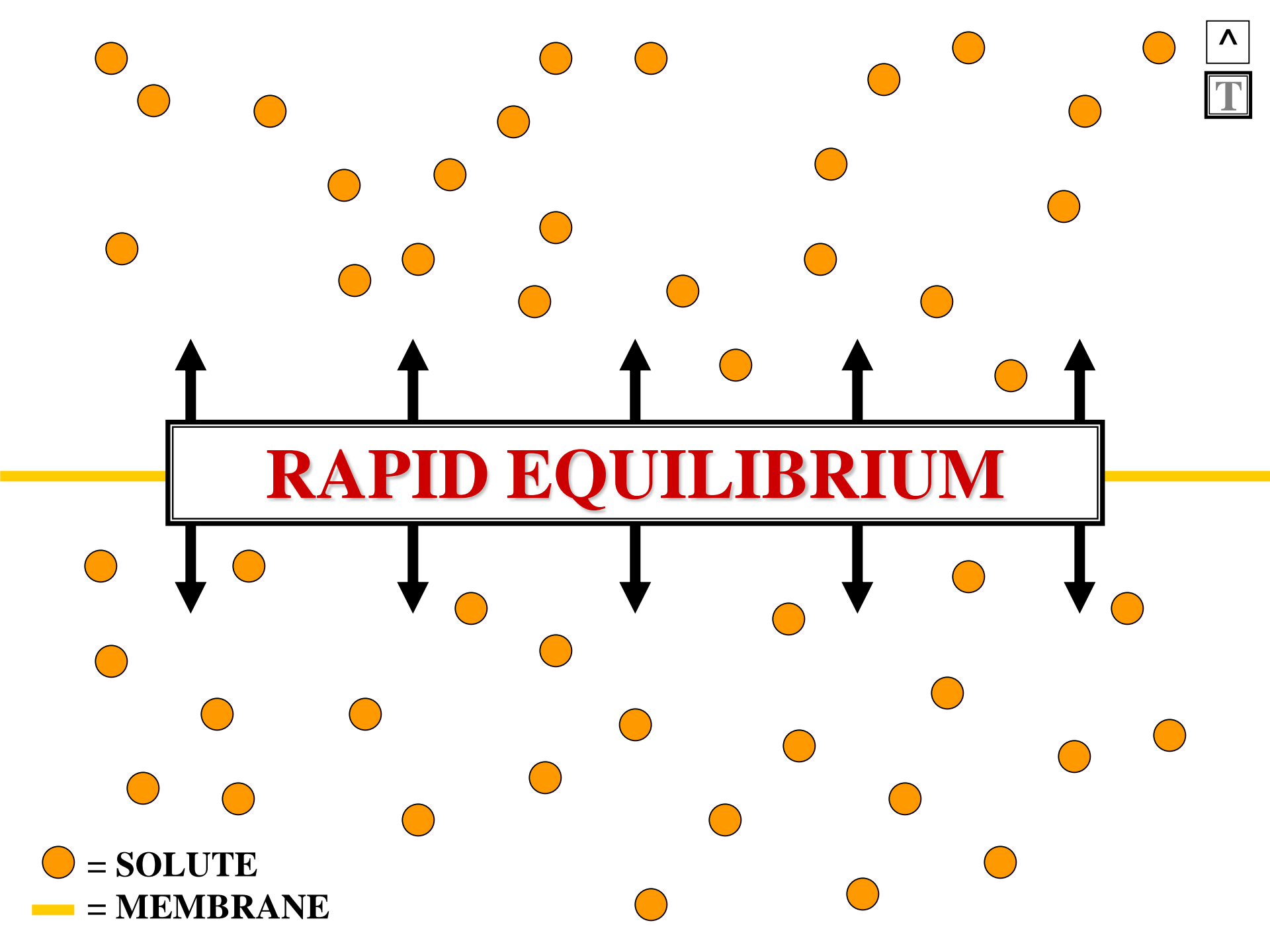


TEMPERATURE  
INCREASE

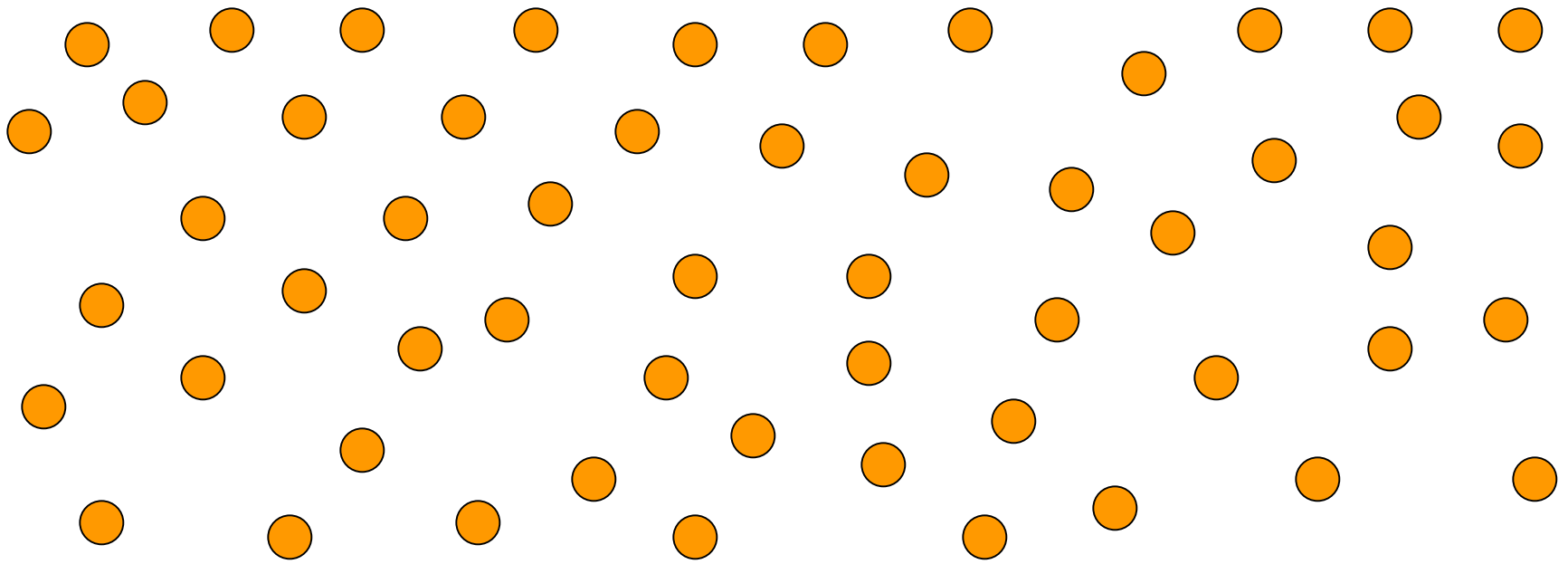
**RAPID  
PASSIVE TRANSPORT**

 = SOLUTE

 = MEMBRANE



● = SOLUTE  
— = MEMBRANE



**MEMBRANE**

**TEMPERATURE**

**● = SOLUTE**

**— = MEMBRANE**

TEMPERATURE  
DECREASE

**DECREASE  
TEMPERATURE**

 = SOLUTE

 = MEMBRANE

TEMPERATURE  
DECREASE

**SLOW  
SOLUTE MOVEMENT**

 = SOLUTE

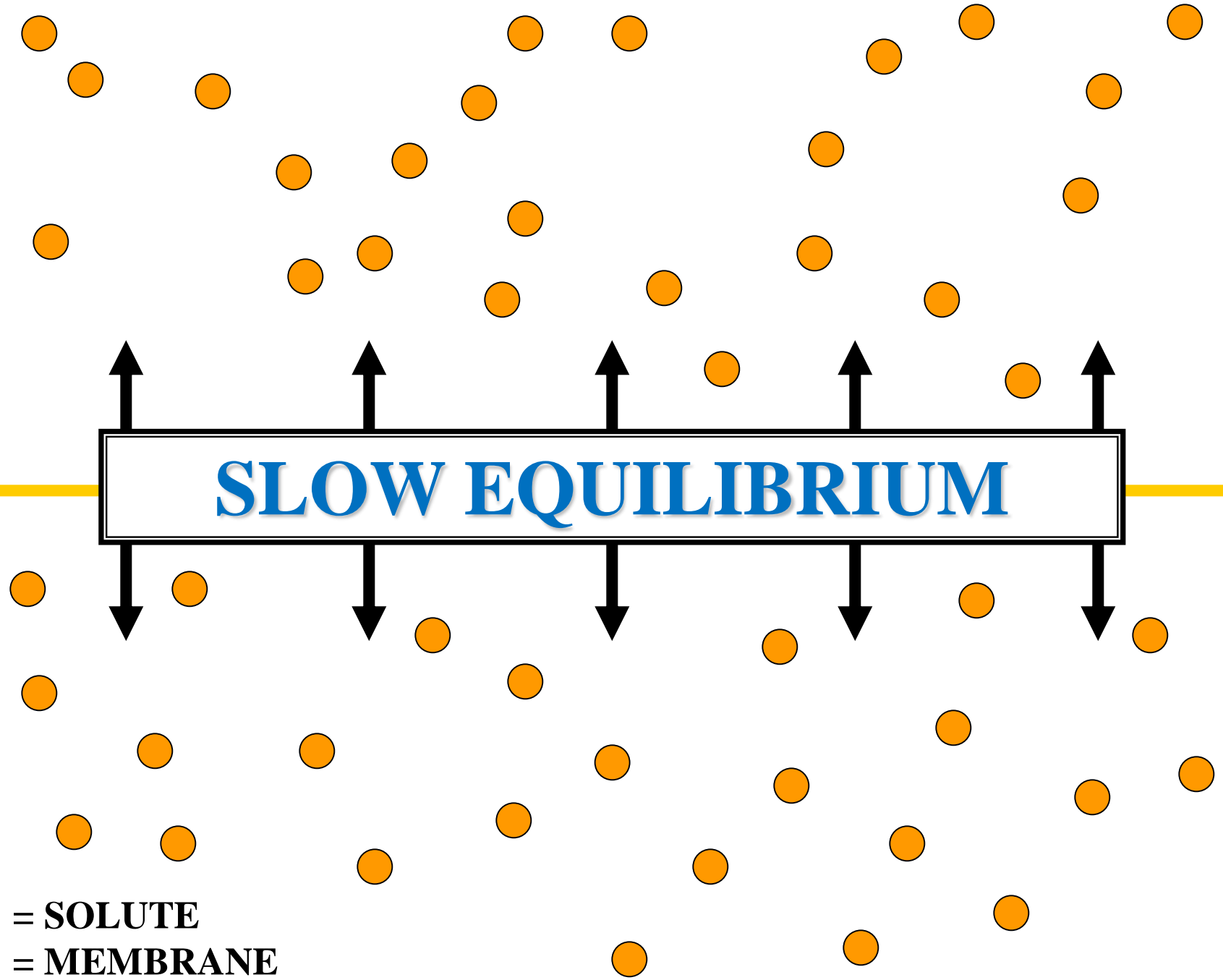
 = MEMBRANE



TEMPERATURE  
DECREASE

**SLOW  
PASSIVE TRANSPORT**

-  = SOLUTE
-  = MEMBRANE

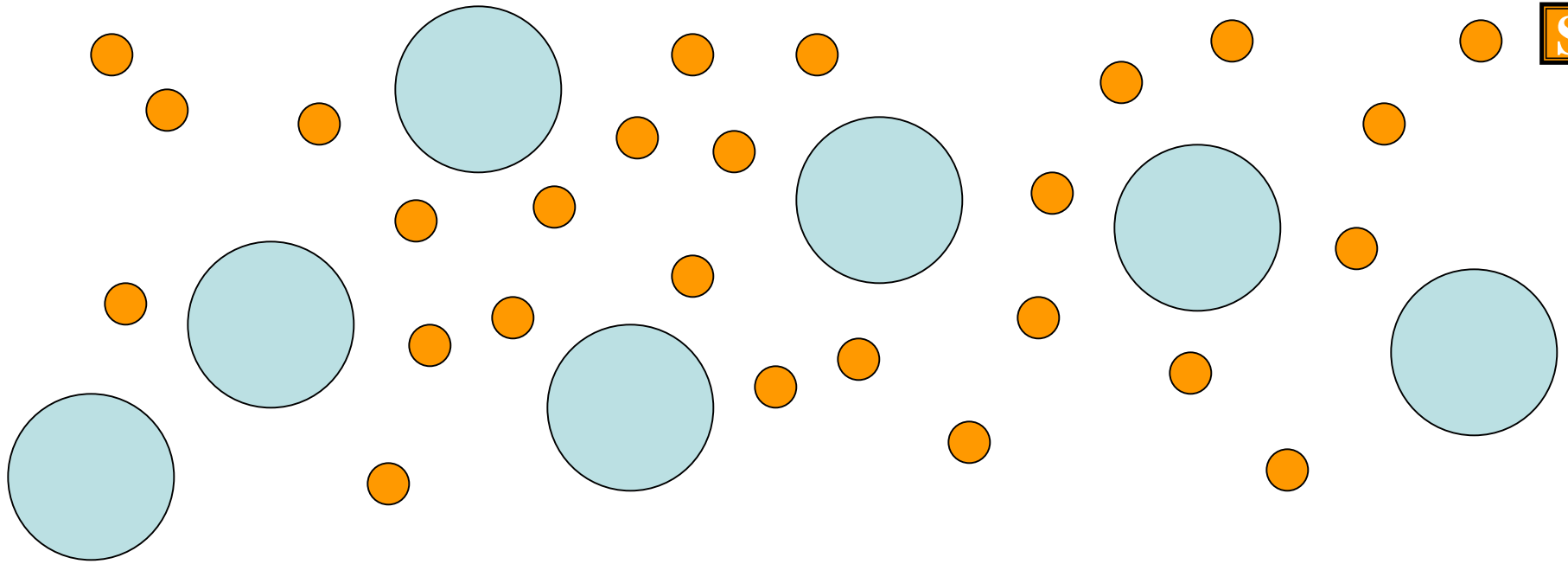


**SLOW EQUILIBRIUM**

● = SOLUTE  
— = MEMBRANE



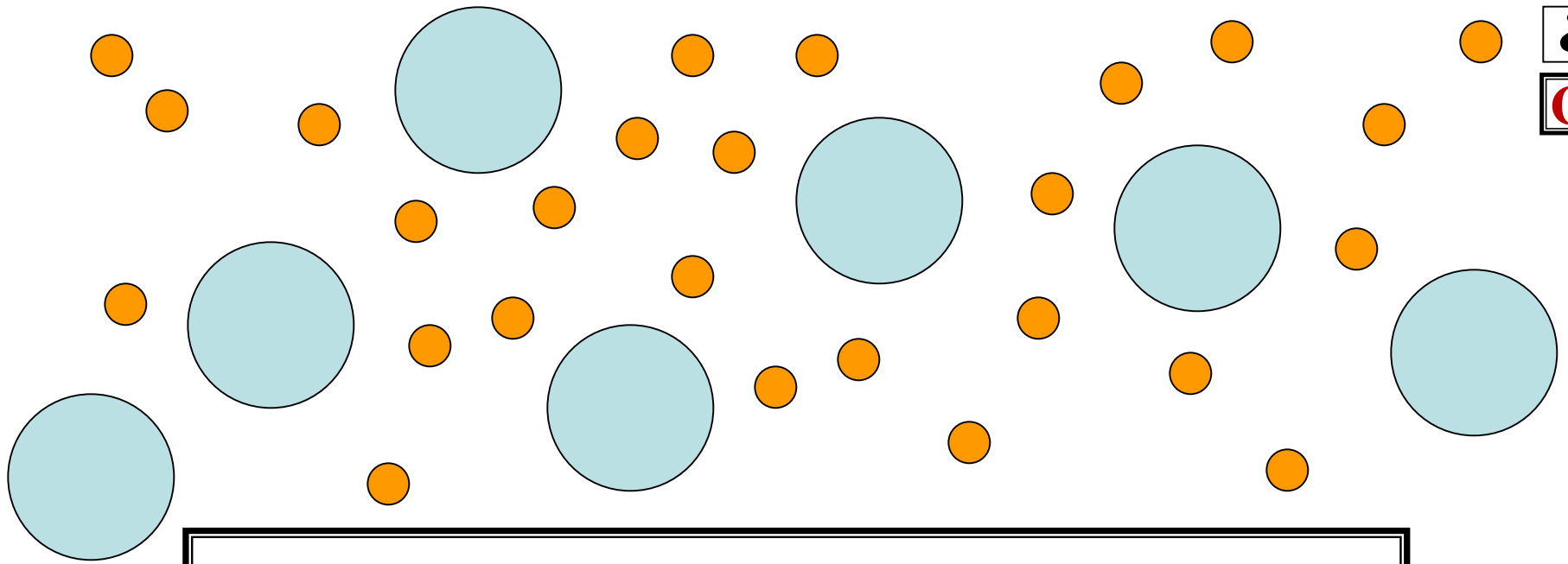
# PASSIVE TRANSPORT MOLECULAR SIZE



**MEMBRANE**

# MOLECULAR SIZE

● ● = **SOLUTE**  
— = **MEMBRANE**

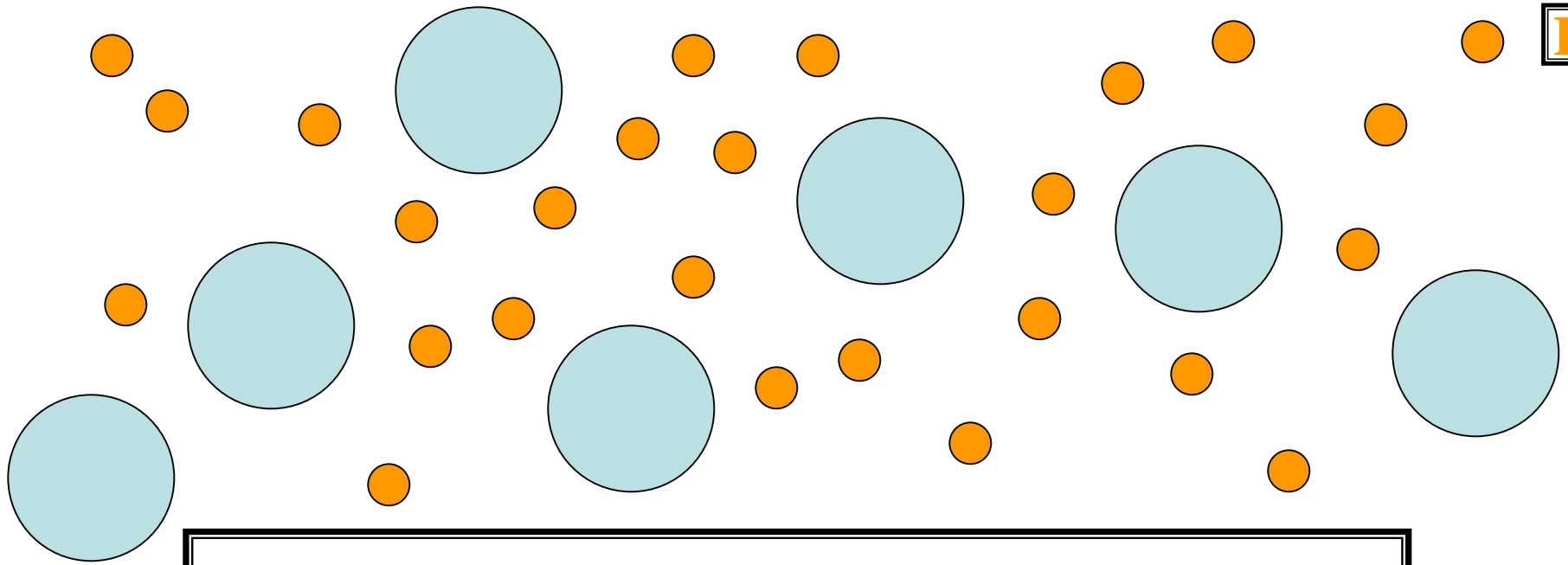


**SMALL SOLUTE**

**MOLECULAR SIZE**

  = **SOLUTE**

 = **MEMBRANE**

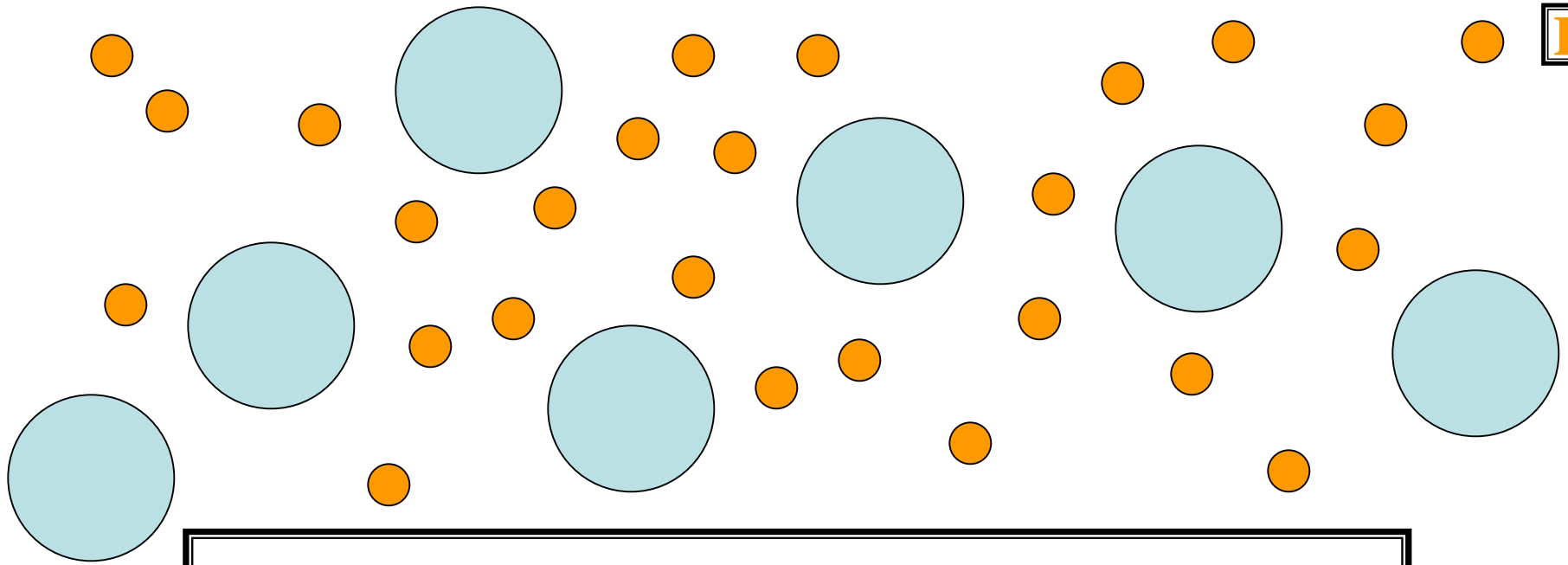


**SMALL SOLUTE**

**GIVEN AMOUNT  
ENERGY EXPENDED**

● ● = SOLUTE

— = MEMBRANE

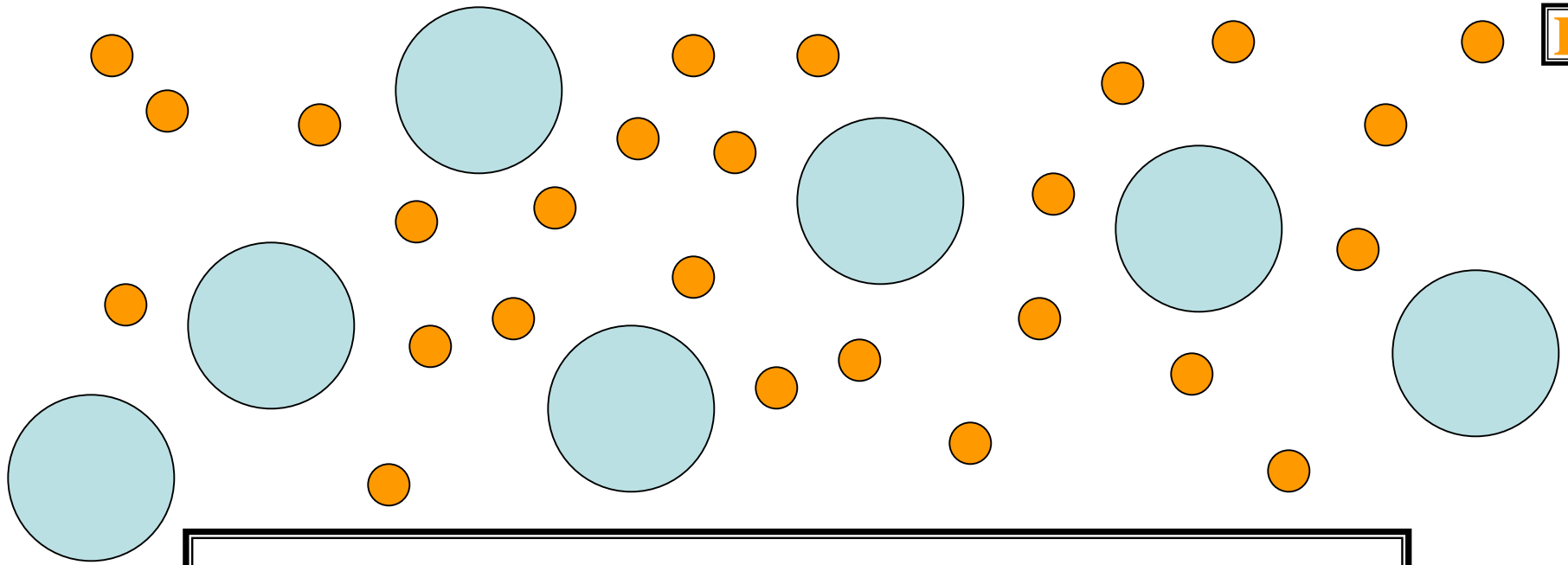


**SMALL SOLUTE**

**RAPID  
SOLUTE MOVEMENT**

● ● = **SOLUTE**

— = **MEMBRANE**



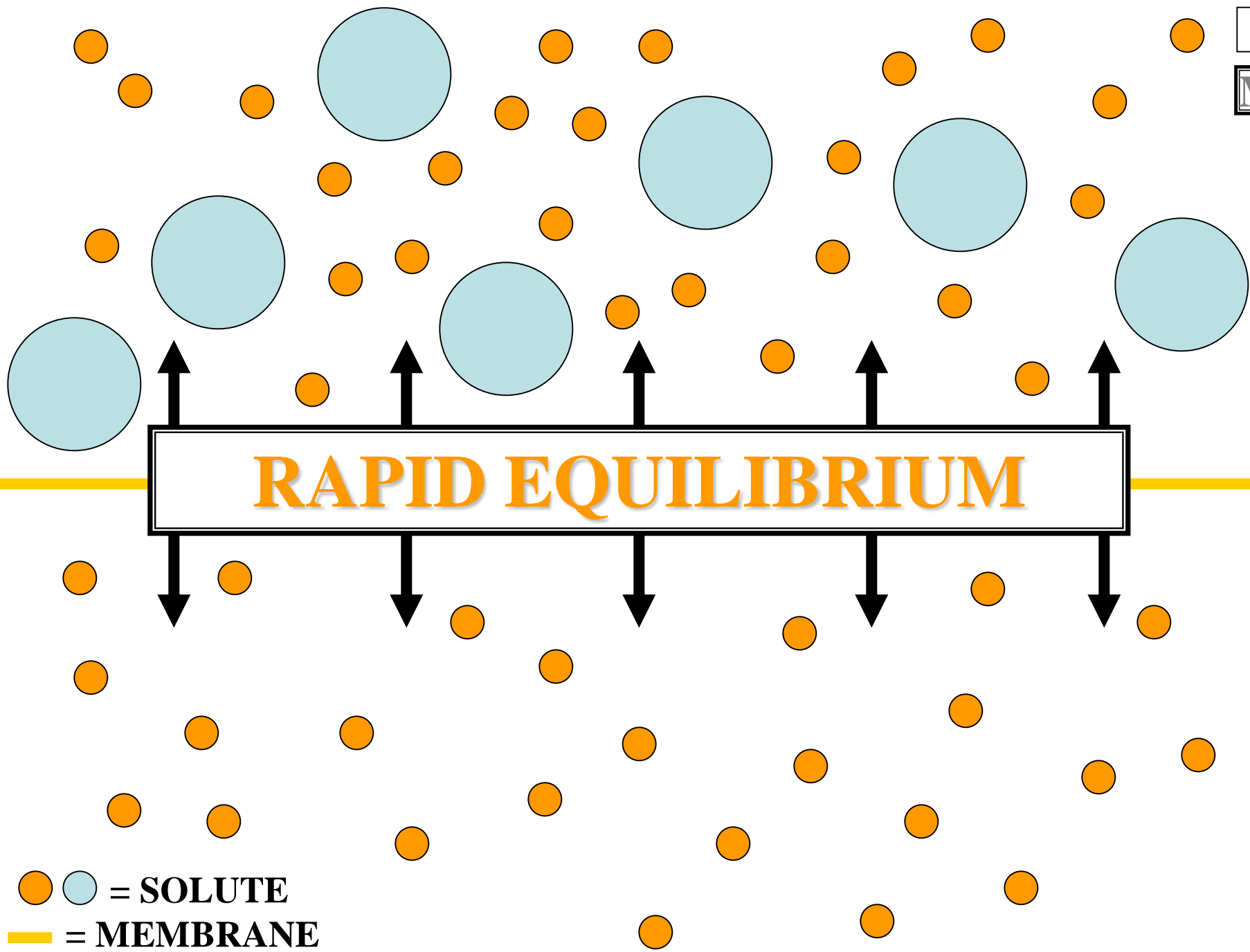
**SMALL SOLUTE**

**RAPID  
PASSIVE TRANSPORT**

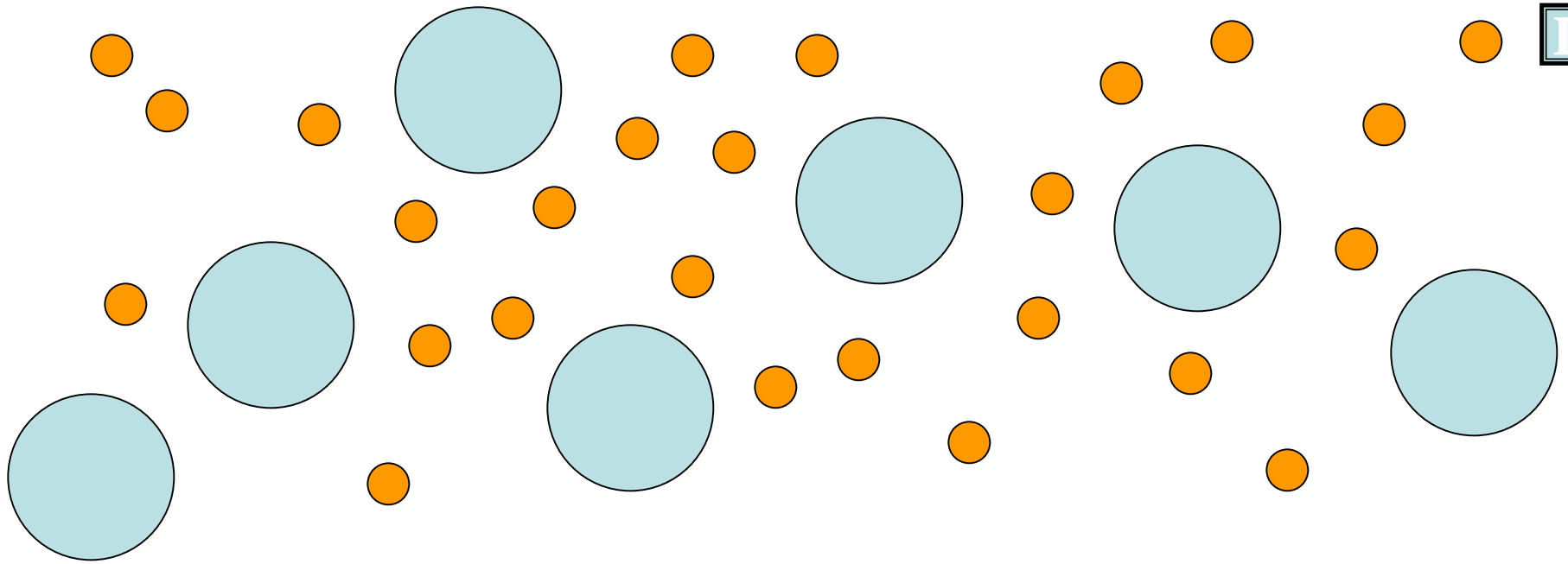
**● ● = SOLUTE**

**— = MEMBRANE**





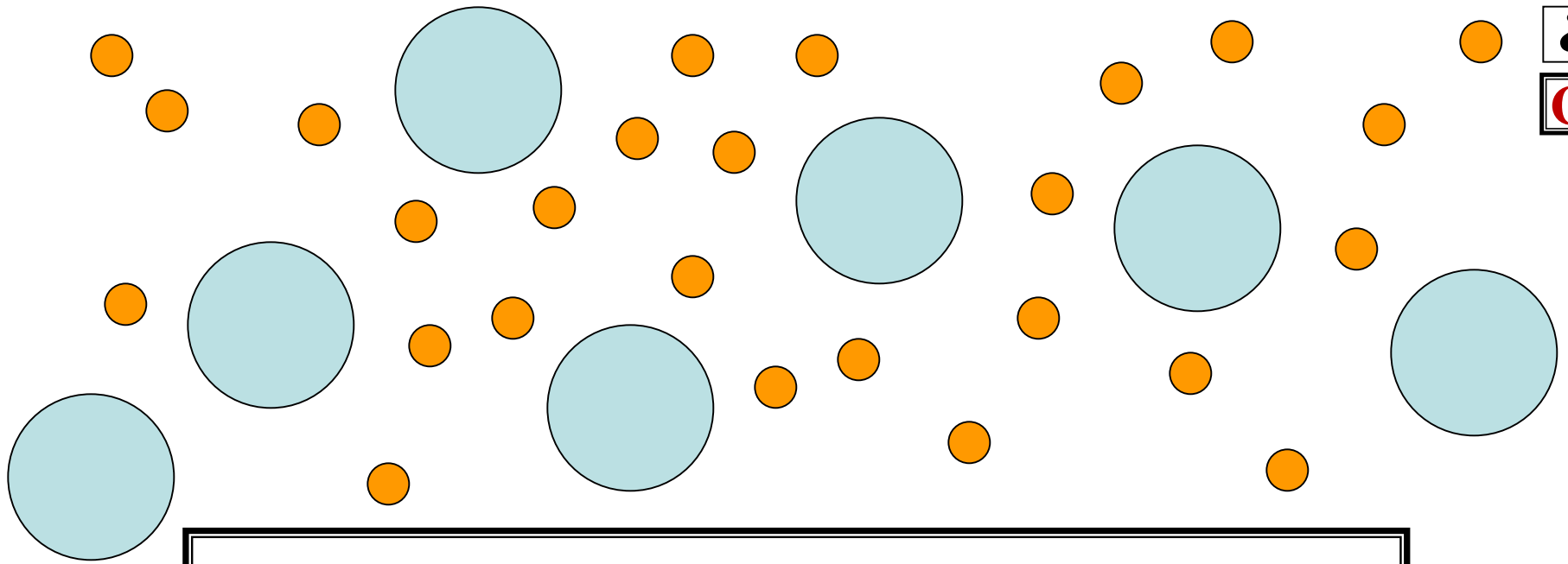
● ● = SOLUTE  
— = MEMBRANE



**MEMBRANE**

# MOLECULAR SIZE

● ● = **SOLUTE**  
— = **MEMBRANE**

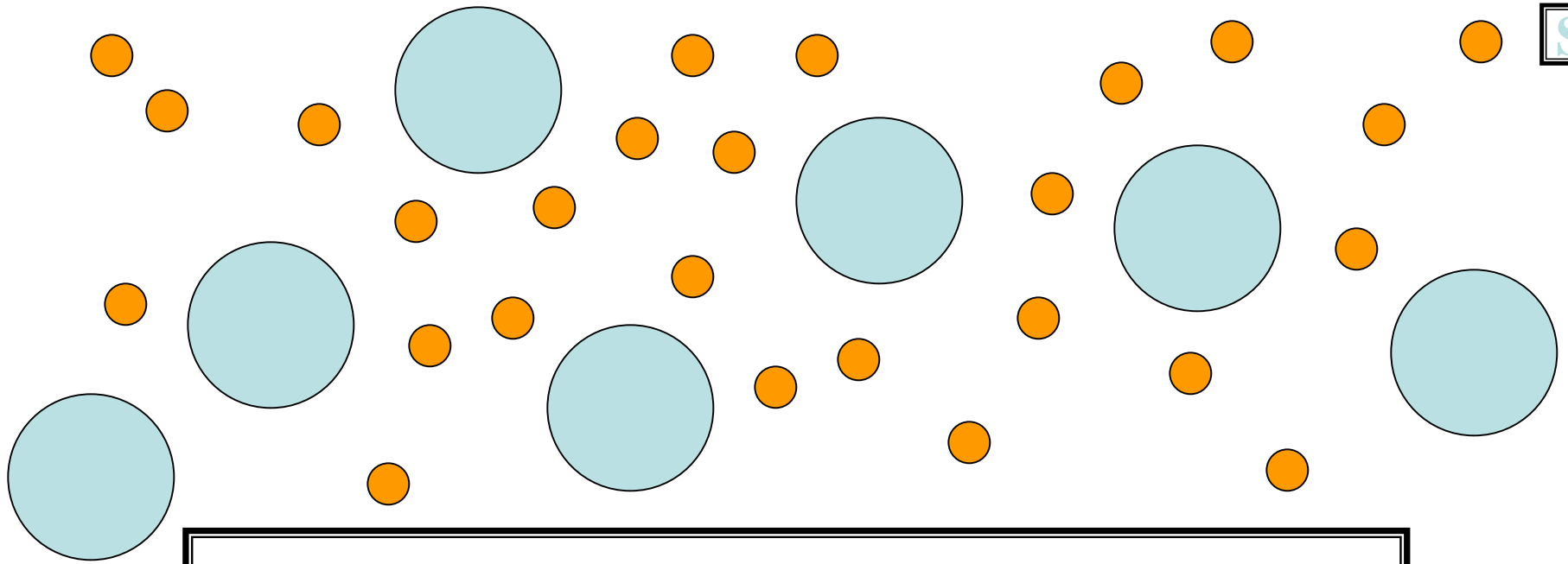


**LARGE SOLUTE**

**MOLECULAR SIZE**

  = **SOLUTE**

 = **MEMBRANE**

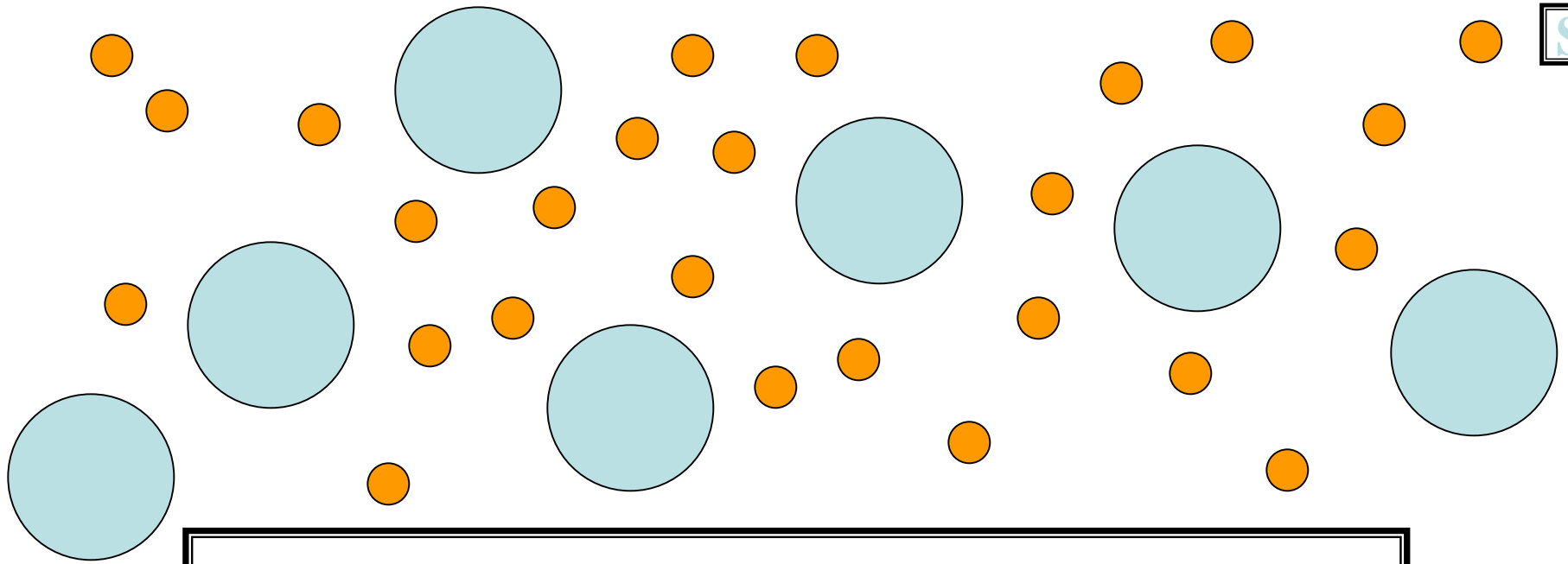


**LARGE SOLUTE**

**GIVEN AMOUNT  
ENERGY EXPENDED**

  = **SOLUTE**

 = **MEMBRANE**

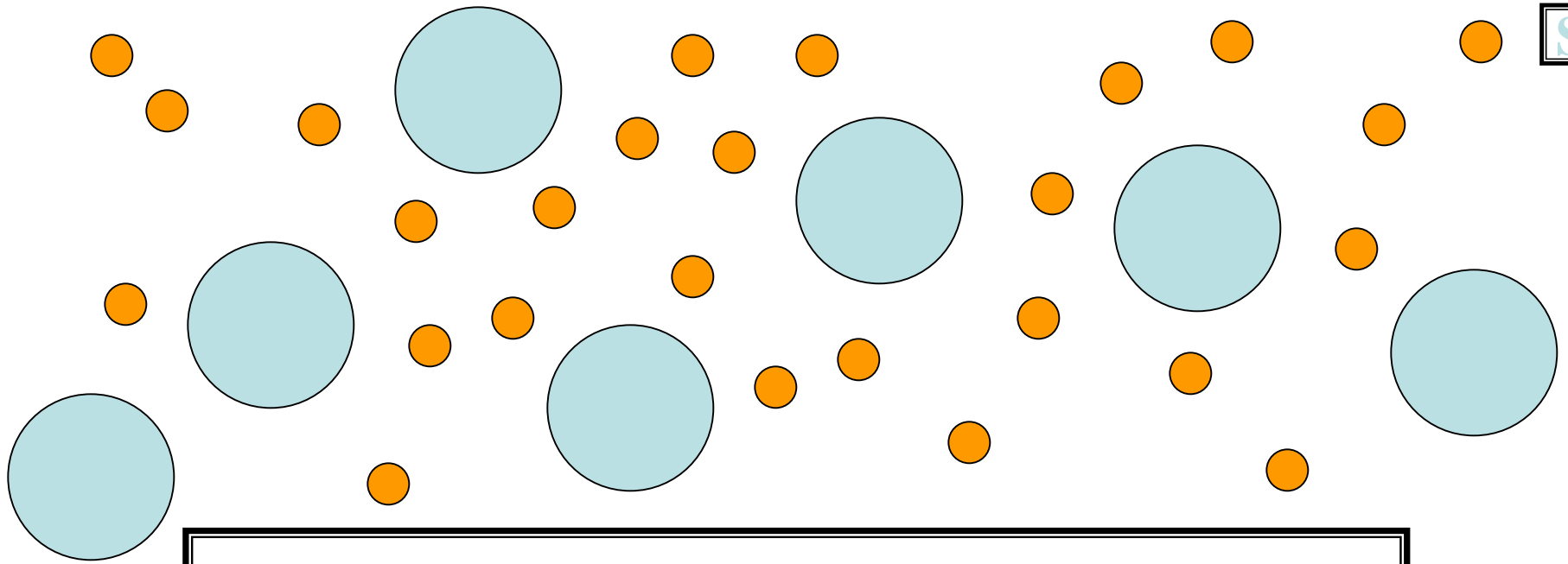


LARGE SOLUTE

SLOW  
SOLUTE MOVEMENT

  = SOLUTE

 = MEMBRANE

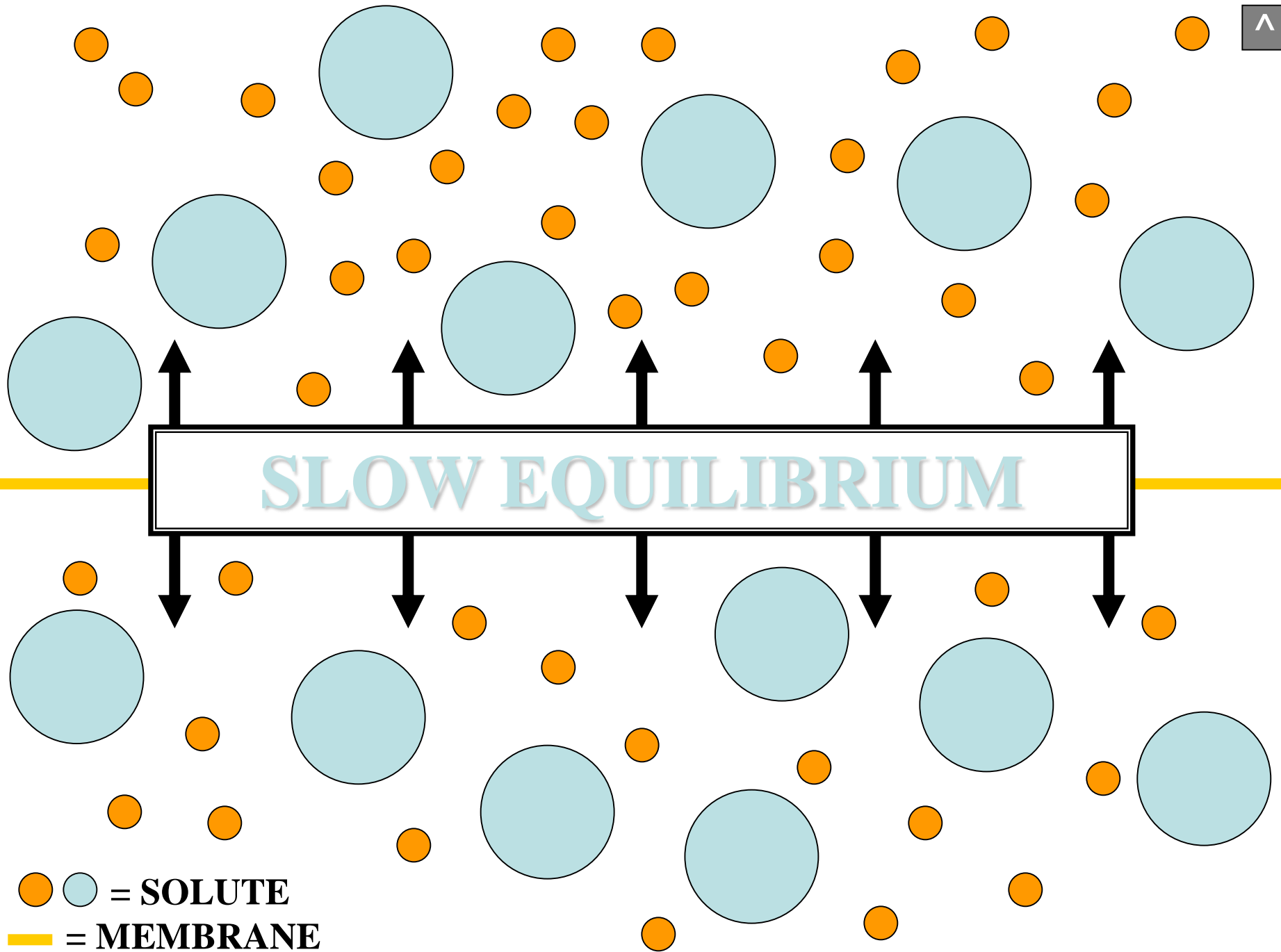


LARGE SOLUTE

SLOW  
PASSIVE TRANSPORT

  = SOLUTE

 = MEMBRANE



● ● = SOLUTE

— = MEMBRANE

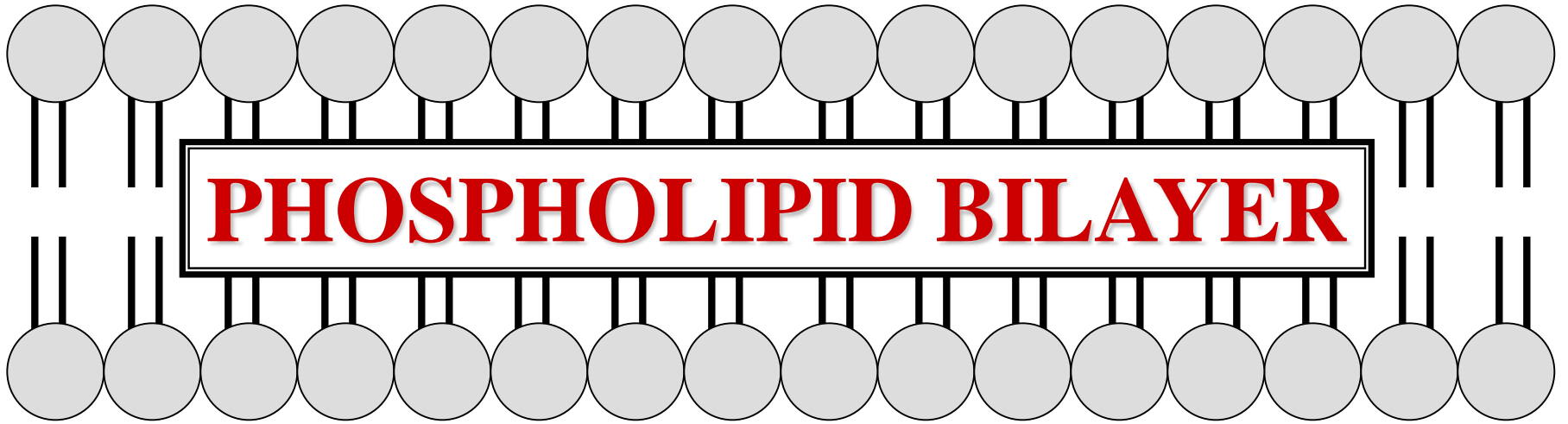
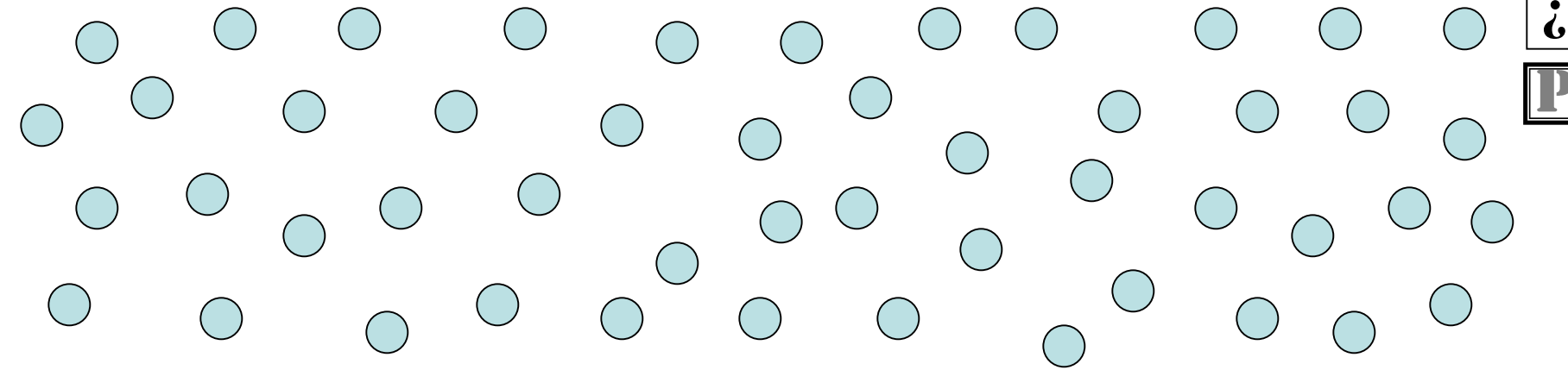


**PASSIVE  
TRANSPORT  
MEMBRANE  
APPLIED**



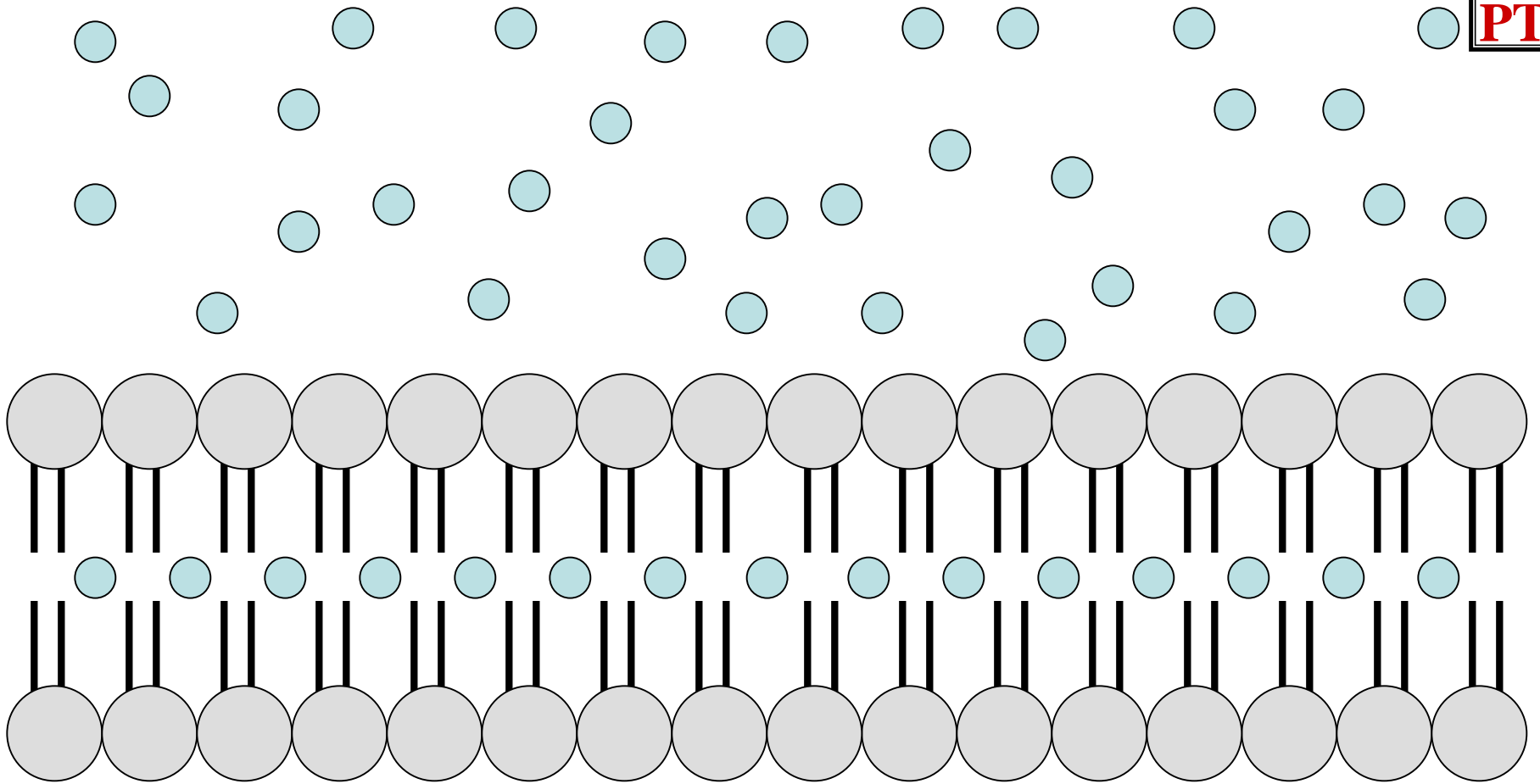


# NON-POLAR SOLUTES



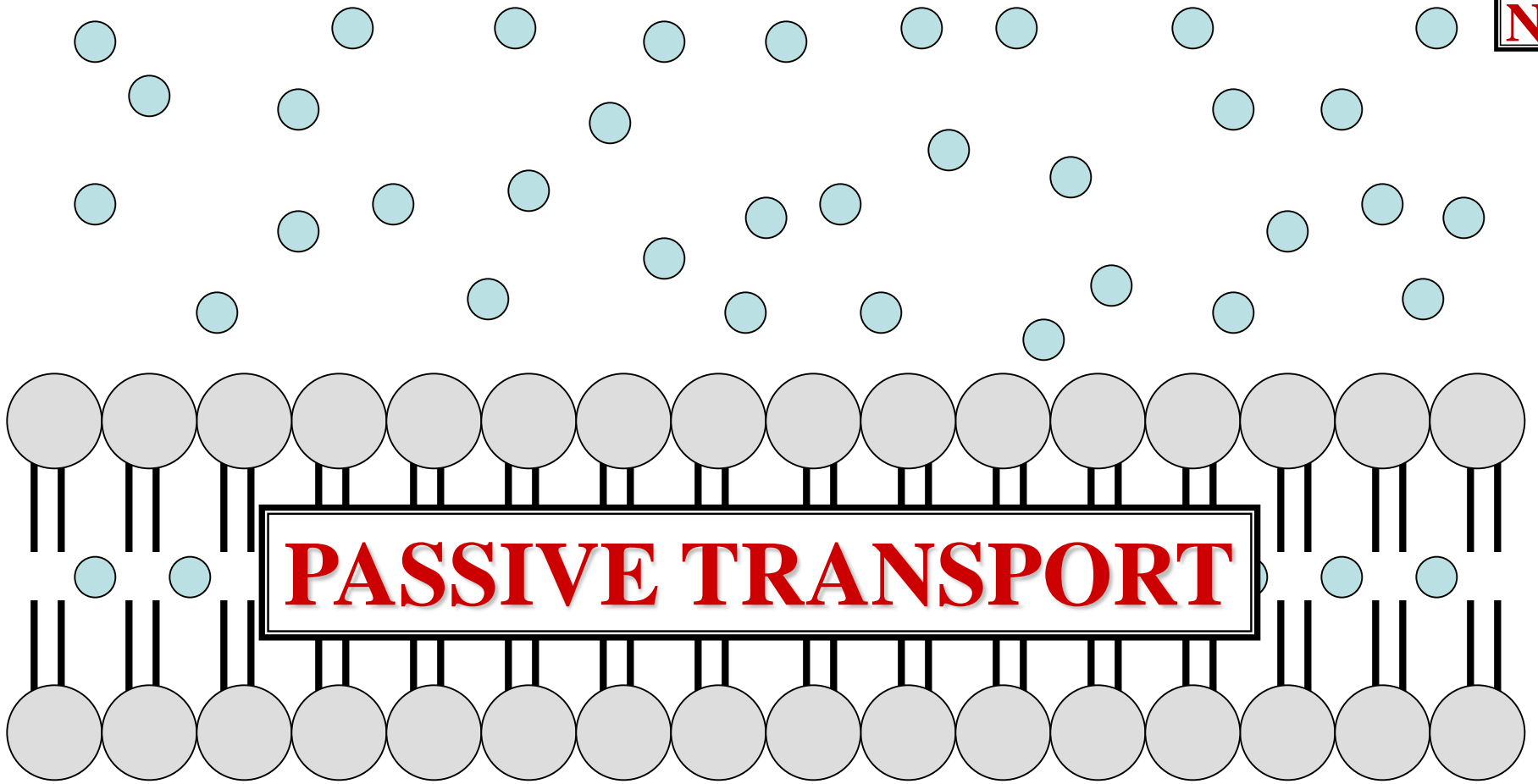
**NON-POLAR SOLUTE**

● = NON-POLAR SOLUTE ~



**BILAYER PERMITS PASSAGE  
NON-POLAR SOLUTES**

● = NON-POLAR SOLUTE ~



● = NON-POLAR SOLUTE ~