

11/30/18

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# CELL TRANSPORT: POGIL

## DO NOW

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- ▶ Study for quiz for 3 minutes

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## AGENDA

- ▶ Quiz (15 min)
- ▶ Membrane Structure and Function POGIL
- ▶ Share out

# QUIZ

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- ▶ You will have 15 minutes to complete the quiz
- ▶ When you are finished, flip the quiz over **AND DO NOT COMMUNICATE WITH OTHER STUDENTS** (verbal and nonverbal)

# POGIL

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- ▶ Questions 1- 17
- ▶ You have 30 min

# SHARE OUT

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- ▶ Spokesperson:
  - ▶ One key idea that your team learned
  - ▶ Provide specific example
- ▶ Process Analyst:
  - ▶ Did everyone in your table contribute equally to the answer?
  - ▶ What can you all do to improve in this area?

# TURN IT IN!

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- ▶ Only turn in the report.
- ▶ Do not lose the POGIL!!!





## DO NOW

- ▶ What is the job of the plasma membrane?
- ▶ What is the difference between polar and non-polar molecules?

# DIFFUSION, OSMOSIS AND ACTIVE TRANSPORT LAB

## PART A: DIFFUSION

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GOAL: ANNOTATE AND ANSWER  
QUESTIONS 1-5

YOU HAVE 10 MIN

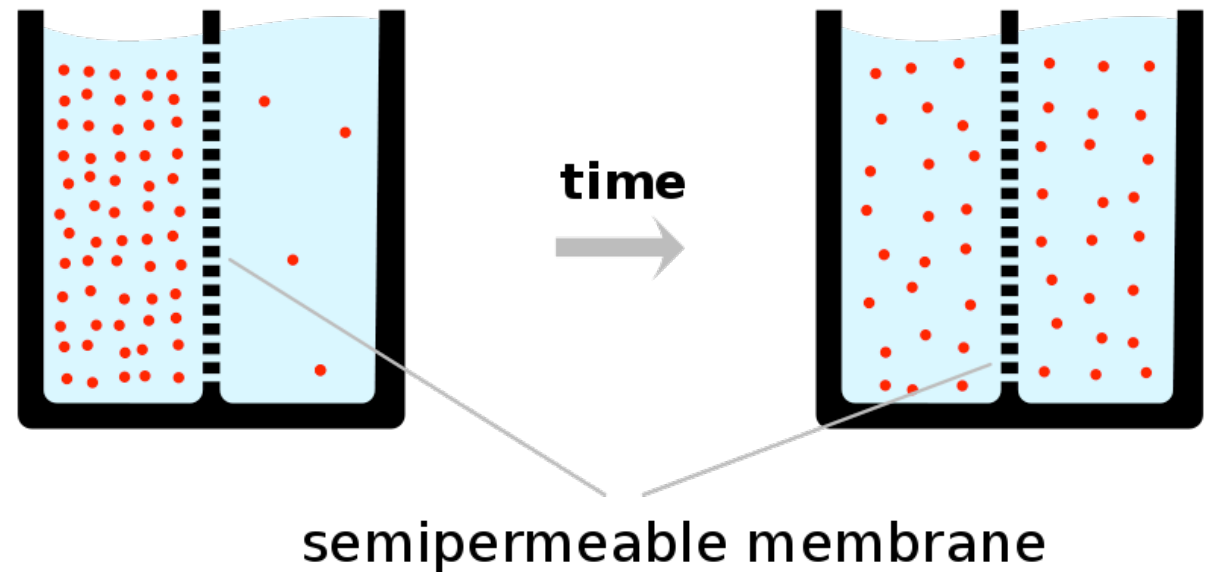
PAGE 67 (CORNELL NOTES TITLE)

# CELL TRANSPORT: DIFFUSION

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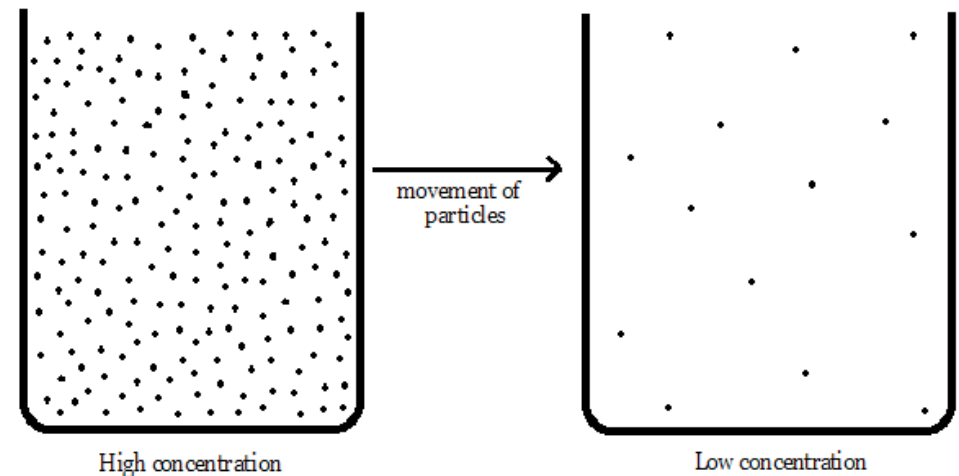
## DIFFUSION

- Movement of molecules from a region of high concentration to low concentration



## CONCENTRATION

- ▶ Number of molecules of a substance in a given volume
- ▶ High concentration - more particles per volume
- ▶ Low concentration - less particles per volume



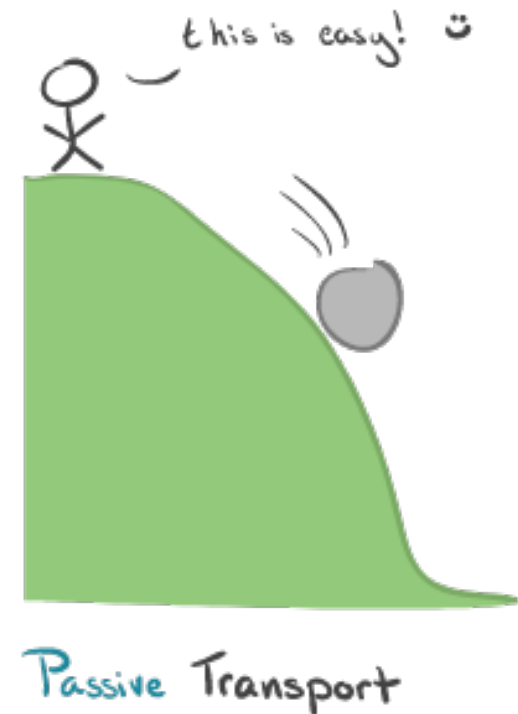
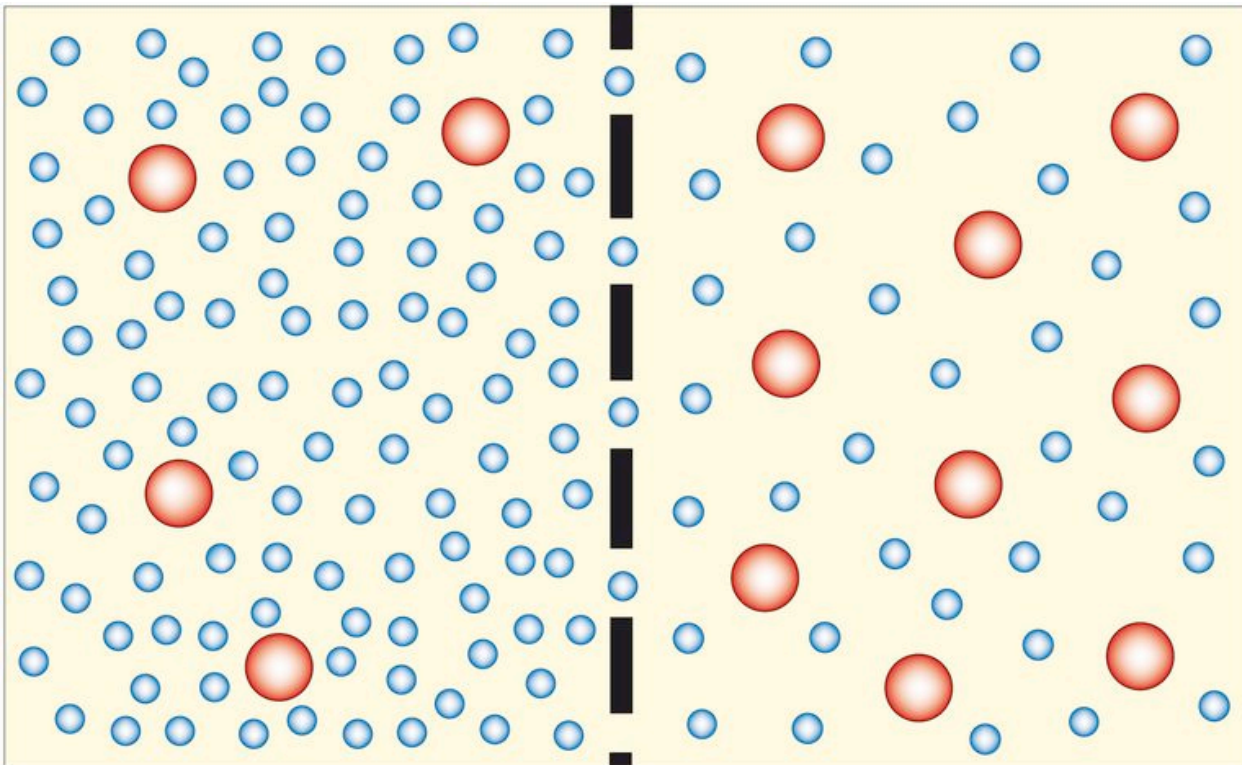
## CONCENTRATION GRADIENT

- ▶ Difference in concentration of a substance from one location to another
- ▶ Molecules diffuse **down** their concentration gradient



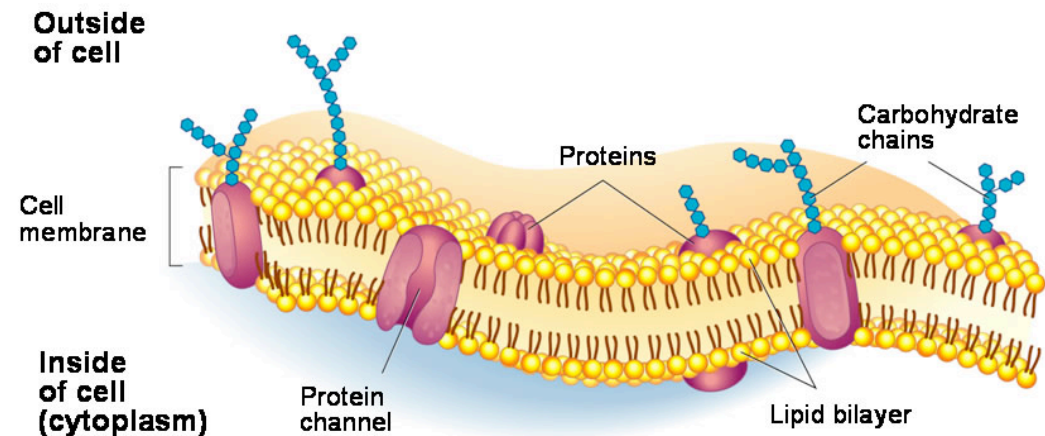
## PASSIVE TRANSPORT

- ▶ Movement of molecules across a cell membrane **without energy input**
- ▶ Diffusion of molecules across a membrane



## PLASMA MEMBRANE

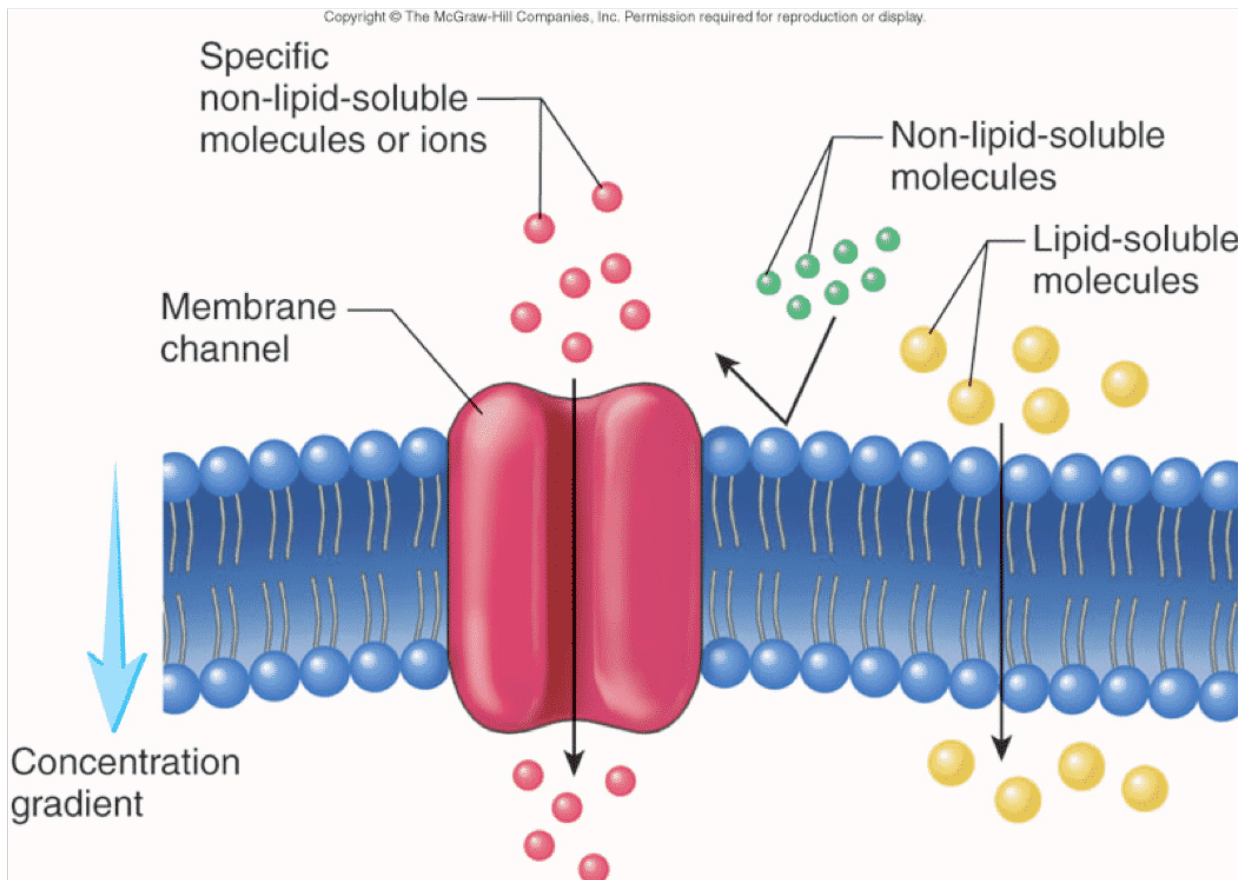
- ▶ Boundary of cell
- ▶ Ensures only specific molecules enter or leave
- ▶ Made of 2 layers of phospholipids (polar head and non-polar tail)
- ▶ lipid bilayer





## WHAT CAN DIFFUSE ACROSS A MEMBRANE?

- ▶ Small lipids and non-polar molecules (such as  $\text{CO}_2$  and  $\text{O}_2$ )

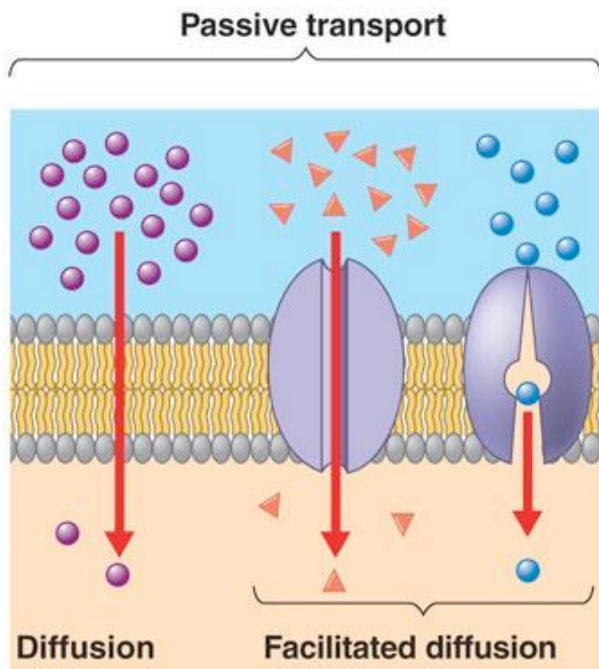


**WHAT ABOUT OTHER  
MOLECULES? LARGER  
LIPIDS? POLAR  
MOLECULES?**

## FACILITATED DIFFUSION

- ▶ “to make easier”
- ▶ Diffusion of molecules across a membrane through transport/channel proteins
- ▶ Form of passive transport

WHY?

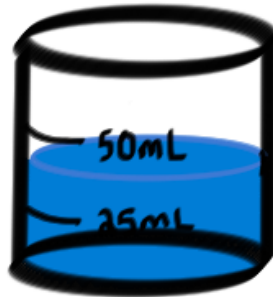


# PARTS OF A SOLUTION

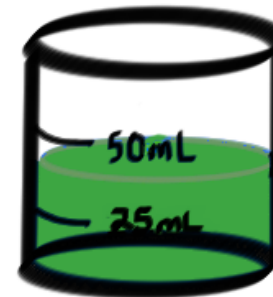
**SOLUTE** + **SOLVENT** = **SOLUTION**



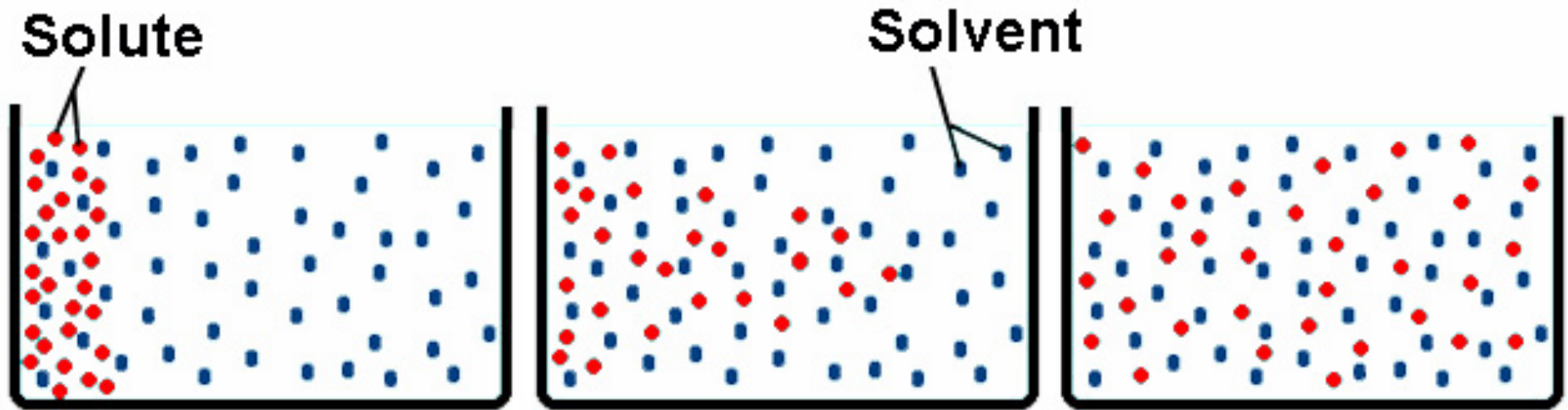
what's being  
dissolved



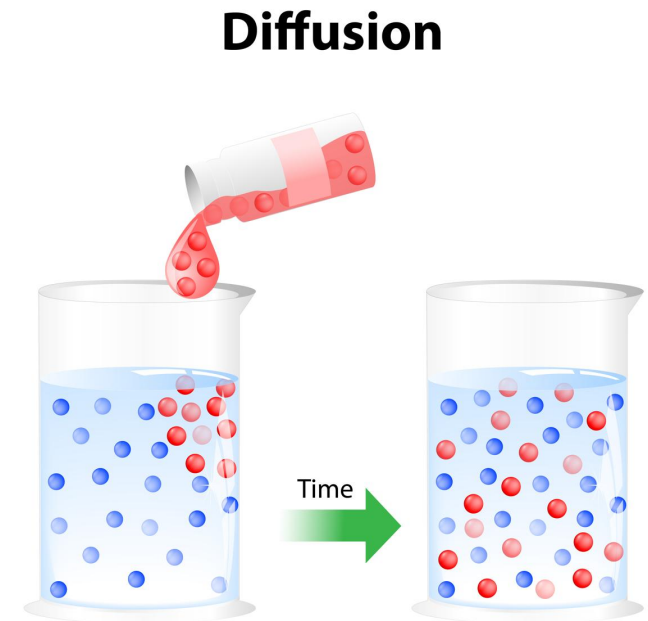
what's doing  
the dissolving



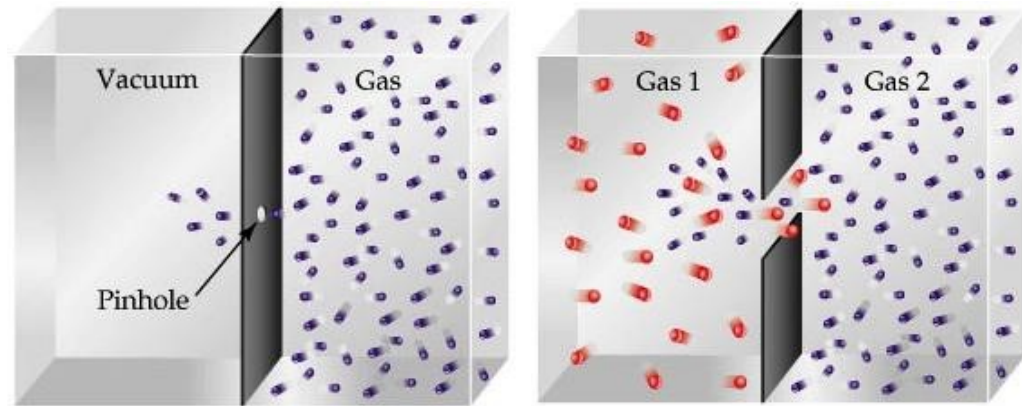
# Are both the blue and red particles dissolving?



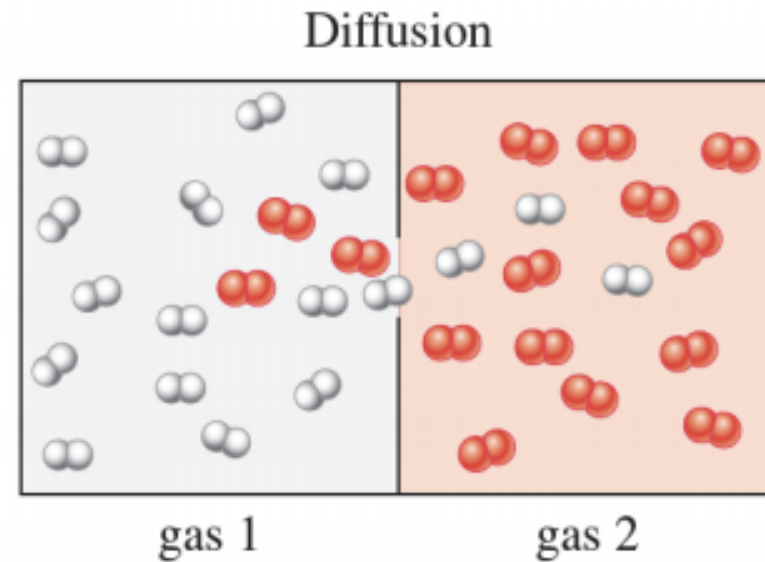
**NO, ONLY THE RED PARTICLE IS DISSOLVING BECAUSE IT HAS A CONCENTRATION GRADIENT. THE BLUE PARTICLE HAS REACHED EQUILIBRIUM**



**Can more than one type of molecule dissolve simultaneously?**

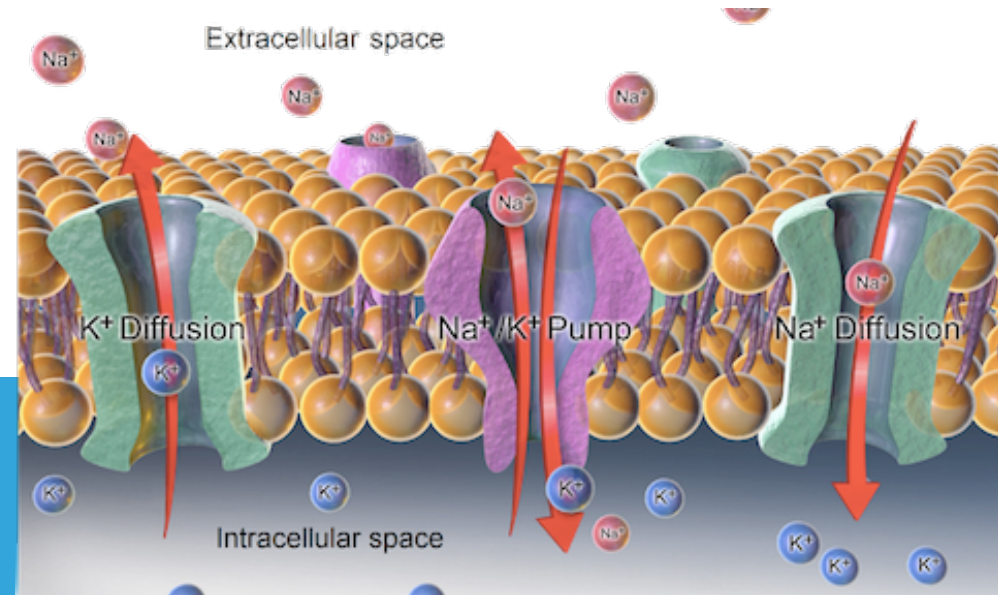


**YES, AS LONG AS EACH MOLECULE HAS NOT REACHED EQUILIBRIUM. EACH TYPE OF MOLECULE WILL DISSOLVE INDIVIDUALLY FROM EACH OTHER**



# How can the cell membrane act like a gate?

DEPENDS ON:  
-MOLECULAR SIZE  
-POLARITY  
-CHANNEL PROTEINS



# ILLUSTRATIVE SUMMARY

## PAGE 66

COMPLETE THE SUMMARY ON PAGE 66

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## DIFFUSION – ILLUSTRATED SUMMARY

- ▶ Create a diagram/picture/flow chart that summarizes ALL of today's notes
- ▶ Use at least 4 colors
- ▶ Label as necessary



# HOMework

- ▶ CELL TRANSPORT: DIFFUSION WORKSHEET
-



12/4/18

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# CELL TRANSPORT: OSMOSIS

## DO NOW

- ▶ **Answer questions 6-9 from "Diffusion, osmosis and active transport lab (dry)"**

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# AGENDA

- ▶ Diffusion, Osmosis and Active Transport Lab (Dry) - Part B
- ▶ ARGUMENTATION
- ▶ Presentations
- ▶ Reflection

DIFFUSION, OSMOSIS AND ACTIVE  
TRANSPORT LAB

# PART B: OSMOSIS

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GOAL: ANNOTATE & ANSWER  
QUESTIONS 10-12B

TEXT

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ARGUMENTATION SESSION

# OSMOSIS CASE STUDY

GOAL 1: GENERATE A VALID ARGUMENT  
(WITH EVIDENCE)

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GOAL 2: VERIFY THE VALIDITY OF  
OTHER'S ARGUMENTS AND THEIR  
PROPER USE OF EVIDENCE



## HINTS

- ▶ Biconcave disk = normal shape of red blood cell
- ▶ NaCl = salt
- ▶ Saline = solution with salt
- ▶ Distilled water = water ONLY. No salt
- ▶ Blood pressure = overall volume of solution in blood





12/5/18

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# CER CASE STUDY

## DO NOW

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**-ANNOTATE OSMOSIS CASE STUDY**

**-COMPLETE THE BACK SIDE IF YOU HAVEN'T  
DONE SO ALREADY**

**-TAKE OUT PACKET**

## HINTS

- ▶ Biconcave disk = normal shape of red blood cell
- ▶ NaCl = salt
- ▶ Saline = solution with salt
- ▶ Distilled water = water ONLY. No salt
- ▶ Blood pressure = overall volume of solution in blood

ARGUMENTATION SESSION

# OSMOSIS CASE STUDY

GOAL 1: GENERATE A VALID ARGUMENT  
(WITH EVIDENCE)

---

GOAL 2: VERIFY THE VALIDITY OF  
OTHER'S ARGUMENTS AND THEIR  
PROPER USE OF EVIDENCE

# TASK 1: GENERATE AN ARGUMENT

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## Argument presentation on a whiteboard

The Guiding Question:

Our Claim:

Our Evidence:

Our Justification  
of the Evidence:



# TASK 1: GENERATE AN ARGUMENT

Guiding Question: How does the concentration of Salt in Water affect the rate of osmosis?

Our claim: The higher the concentration of salt in the water, the higher the rate of osmosis.

Justification: The 30% salt concentration had the greatest increase in mass, which shows that the rate of osmosis was higher for the highest salt concentration.

Guiding Question: How does the concentration of salt in water affect the rate of osmosis?

Our Claim: The rate of osmosis is faster when the concentration difference between the cell & the solution is greatest.

Our Evidence:

**0% cell (Hyper)**

**10% cell (Hypo)**

*Steeper slope = faster rate of osmosis*

Our Justification:

Assuming that dialysis tubing is semi-permeable like a cell membrane, water can move through the membrane but salt cannot. When the solution outside the cell is hypertonic, the water will move out of the cell. In more hypertonic solutions the rate that water left the cell was greater. When the solution outside the cell is hypotonic, the water will move into the cell. In more hypotonic solutions the rate that water enters the cell is greater. In an isotonic solution there should be no net movement.

Guiding Question: How does the concentration of sucrose affect the rate of osmosis?

Claim: If the sucrose concentration of the dialysis tubing moves further away from the concentration of sucrose in the beaker, and thus further from the isotonic concentration, the rate of osmosis will increase.

Our Evidence:

Sucrose Concentration	Mass of Dialysis Tubing (g)	Before	After 5 min	After 10 min	After 15 min
Control 0%	10.16	10.26	10.38	10.46	
Beaker A 10%	10.45	10.49	10.51	10.54	
Beaker B 15%	10.48	10.49	10.99	10.50	
Beaker C 20%	10.25	10.87	10.99	10.91	

Our Justification:

rate of osmosis =  $\frac{\Delta \text{mass}}{\Delta \text{time}}$

Control:  $\frac{(10.46 - 10.16)g}{15 \text{ min}} = 0.2 \frac{g}{min}$

Beaker A:  $\frac{(10.54 - 10.45)g}{15 \text{ min}} = 0.06 \frac{g}{min}$

Beaker B:  $\frac{(10.50 - 10.48)g}{15 \text{ min}} = 0.013 \frac{g}{min}$

Beaker C:  $\frac{(10.91 - 10.25)g}{15 \text{ min}} = 0.044 \frac{g}{min}$

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**QUESTION: WHAT SHOULD LIAM DO TO INCREASE THE PATIENT'S BLOOD PRESSURE?**

▶ 10 min

# GOAL 1: GENERATE AN ARGUMENT WITH EVIDENCE

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## ▶ Criteria

### ▶ **Evidence**

- ▶ Include data from the dry lab "Diffusion, osmosis & Active Transport"

### ▶ **Reasoning:**

- ▶ Use at least 3 of the following vocabulary terms: diffusion, osmosis, isotonic, hypotonic, hypertonic, solutes, concentration
- ▶ Explain HOW the evidence proves the claim to be true (link the evidence and the claim)

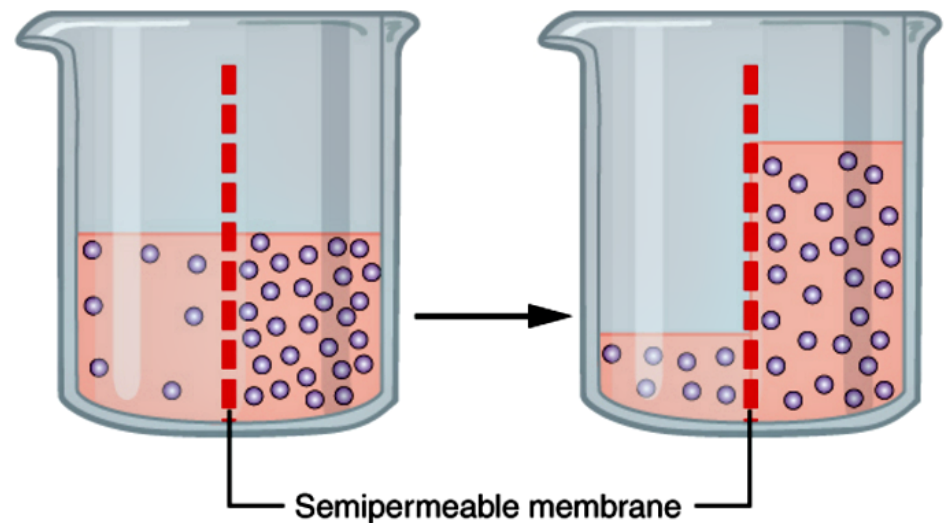
PAGE 69 (CORNELL NOTES TITLE)

# CELL TRANSPORT: OSMOSIS

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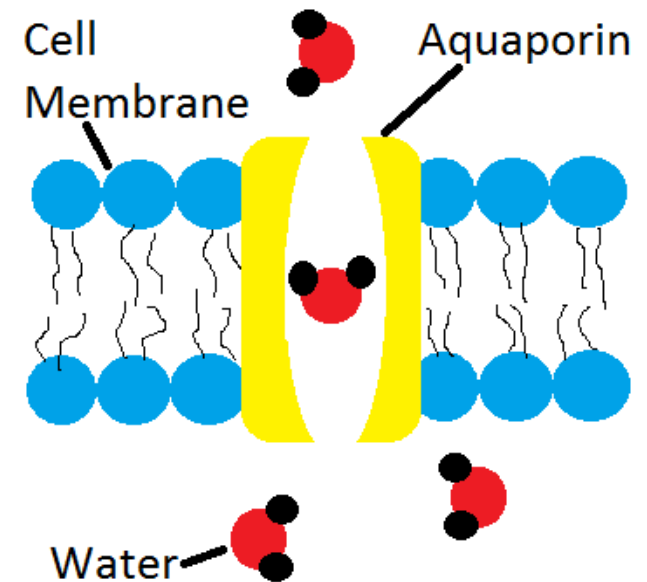
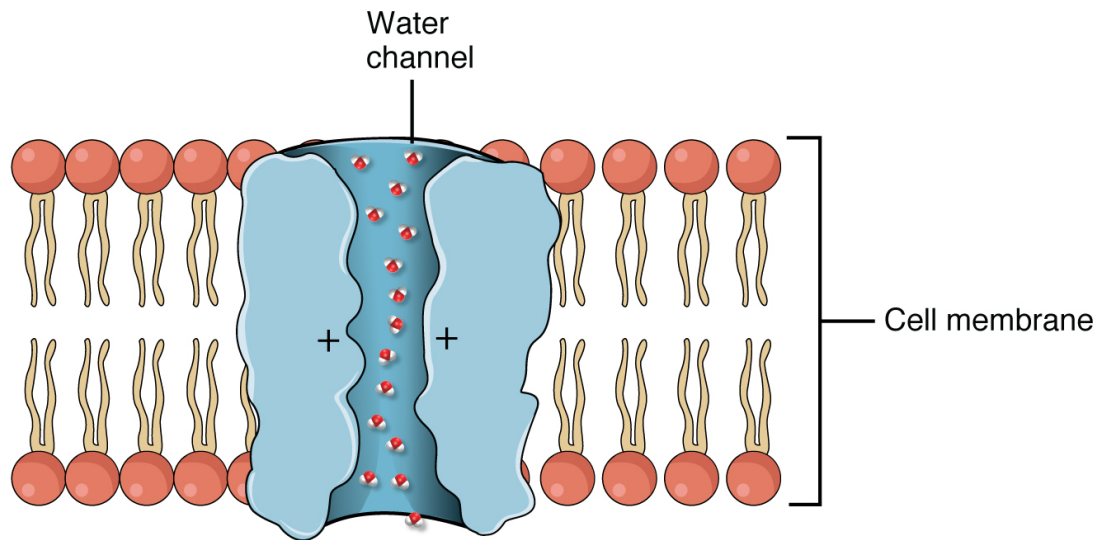
## OSMOSIS

- ▶ Diffusion of water molecules from a region of low solute concentration to high solute concentration
- ▶ Form of facilitated diffusion (uses a transport protein called aquaporin)



## AQUAPORIN

- ▶ Transport protein embedded in cell membrane
- ▶ Allows water to travel through the membrane

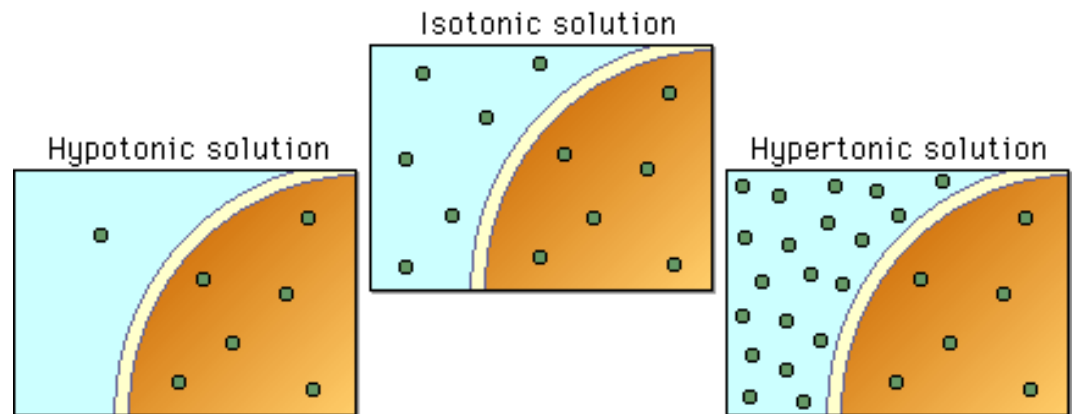




## 3 WAYS TO DESCRIBE A SOLUTION (OUTSIDE THE CELL)

- ▶ The description is relative to another solution

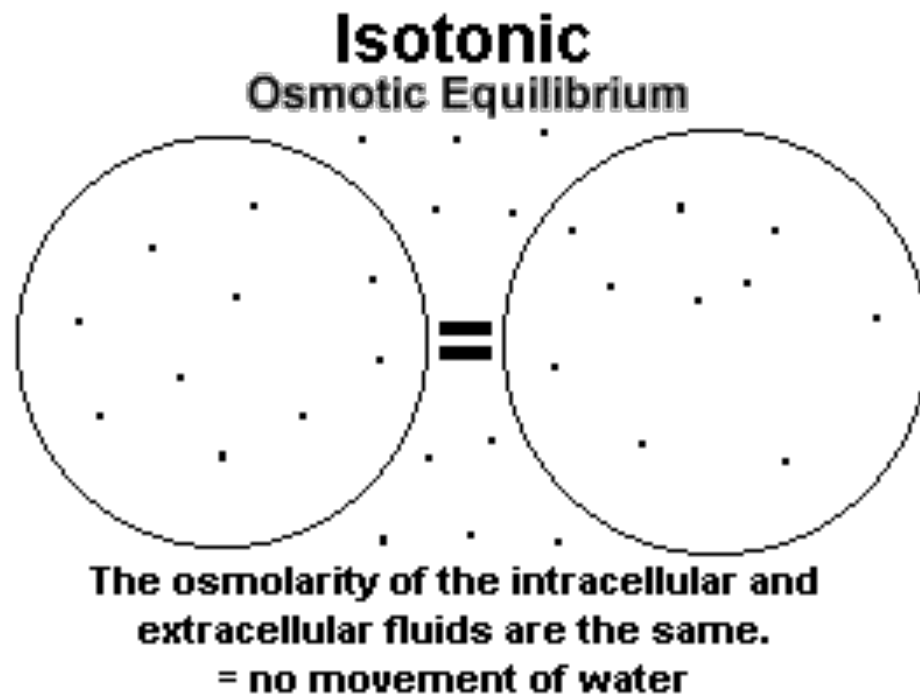
- ▶ Isotonic
- ▶ Hypertonic
- ▶ Hypotonic



- ▶ These terms are comparisons. They require a point of reference.

## ISOTONIC SOLUTION

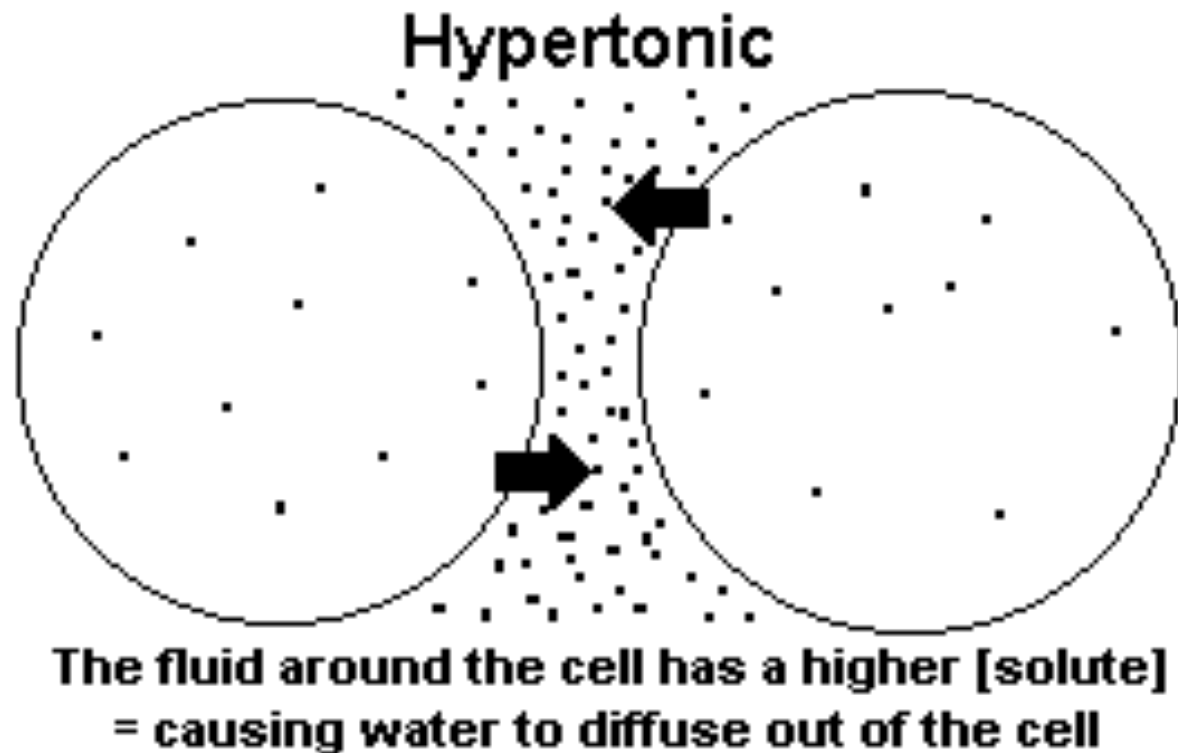
- ▶ Has a solute concentration **equal** to the solute concentration inside a cell





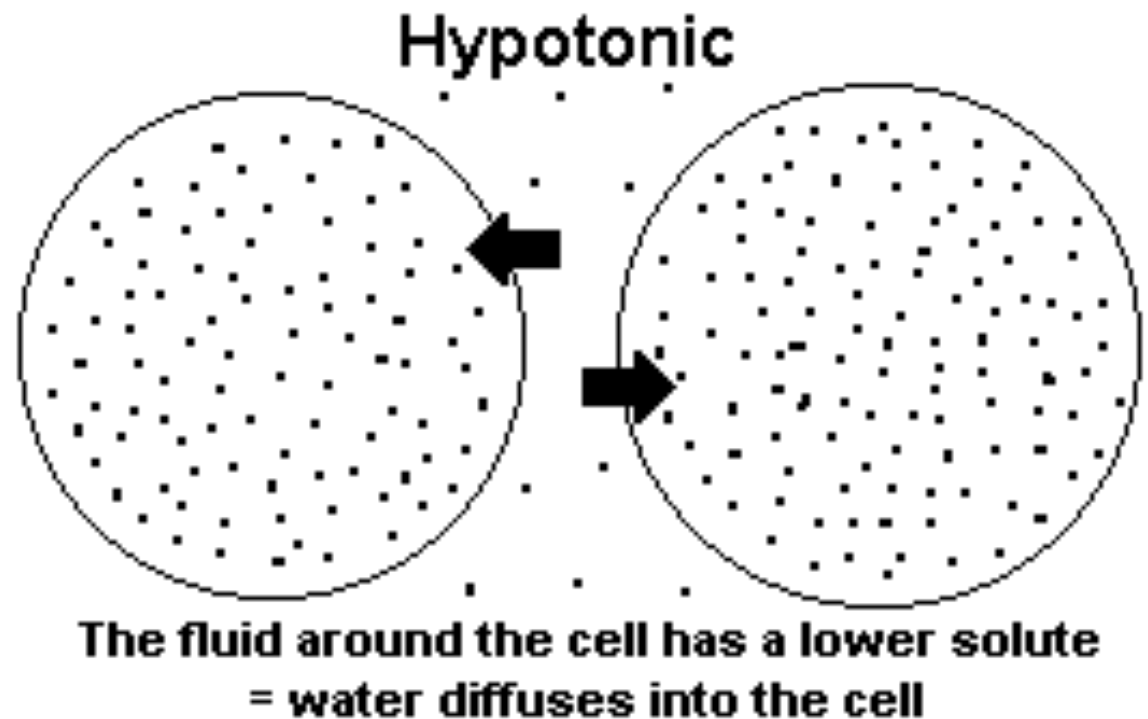
## HYPERTONIC SOLUTION

- ▶ Has a solute concentration **higher** than the solute concentration inside a cell

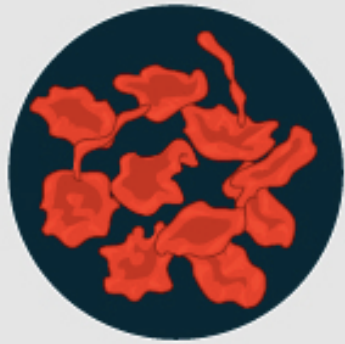


## HYPOTONIC SOLUTION

- ▶ Has a solute concentration **lower** to the solute concentration inside a cell



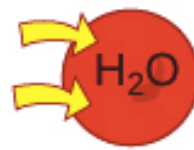
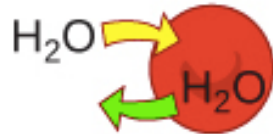
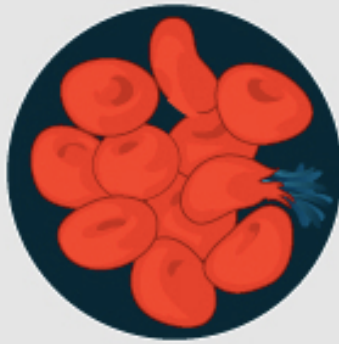
Hypertonic solution



Isotonic solution



Hypotonic solution

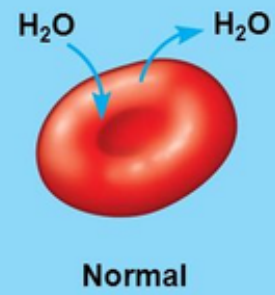


Hypotonic solution

(a) Animal cell



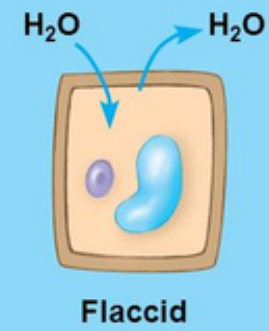
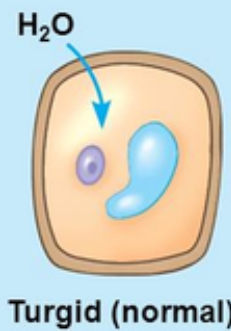
Isotonic solution



Hypertonic solution



(b) Plant cell



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# OSMOSIS CASE STUDY DEBRIEF

# PAGE 68 – ILLUSTRATED SUMMARY

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# CELL TRANSPORT: ACTIVE TRANSPORT

## DO NOW

- ▶ There is 0.5M glucose inside the cell and 0.8M glucose outside the cell. Where will glucose move?
- ▶ In an hypertonic solution, will water enter or leave the cell?
- ▶ If the inside of the cell has 0.5M solutes and the outside has 0.2M solutes, where will water flow?



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▶ **ANSWER QUESTIONS 13-14C on Part B of  
packet**

**PART B DEBRIEF**



# PART C: ACTIVE TRANSPORT

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GOAL: ANNOTATE AND ANSWER  
REMAINING QUESTIONS

PAGE 71 (CORNELL NOTES TITLE)

# CELL TRANSPORT: ACTIVE TRANSPORT

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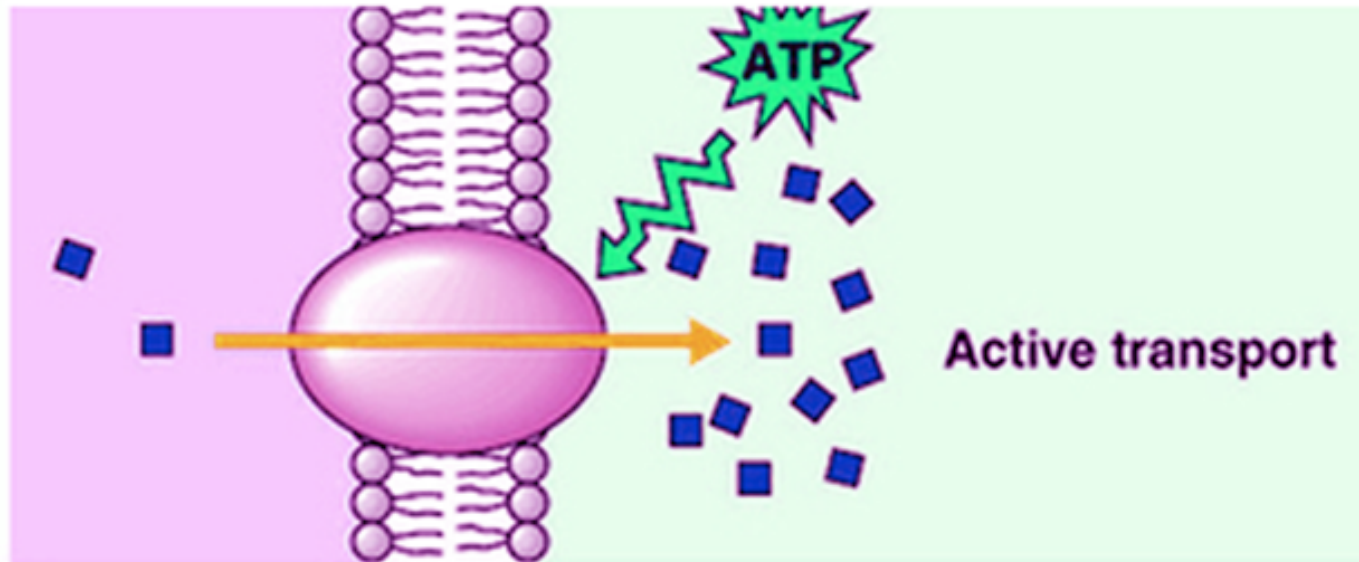
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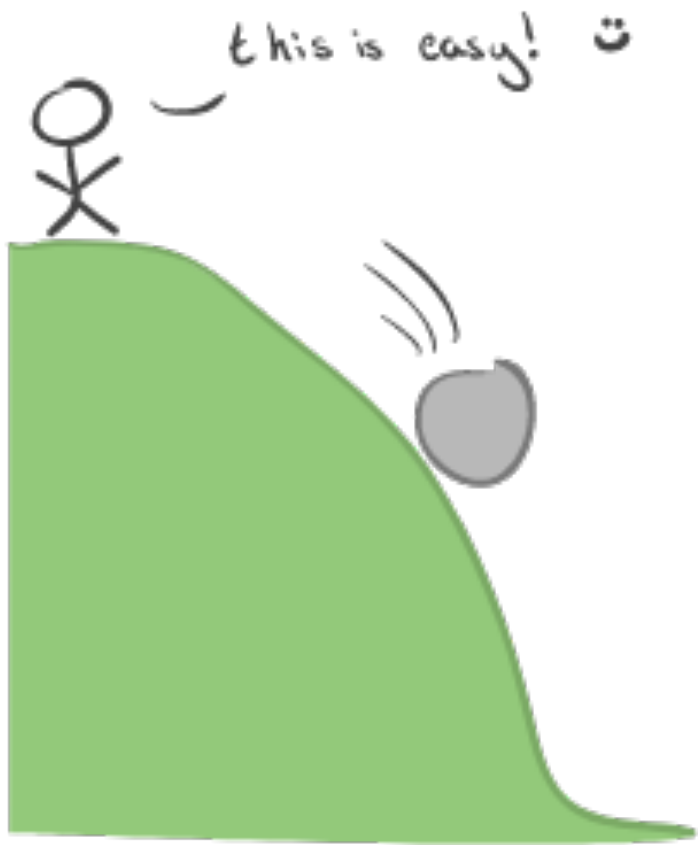
## FOCUS QUESTION: WHAT'S NEEDED TO BOARD THE TRAIN?



## ACTIVE TRANSPORT

- ▶ Moving molecules across a membrane from a region of **low** concentration to high concentration (**against** the concentration gradient)
- ▶ Requires input of energy (ATP)





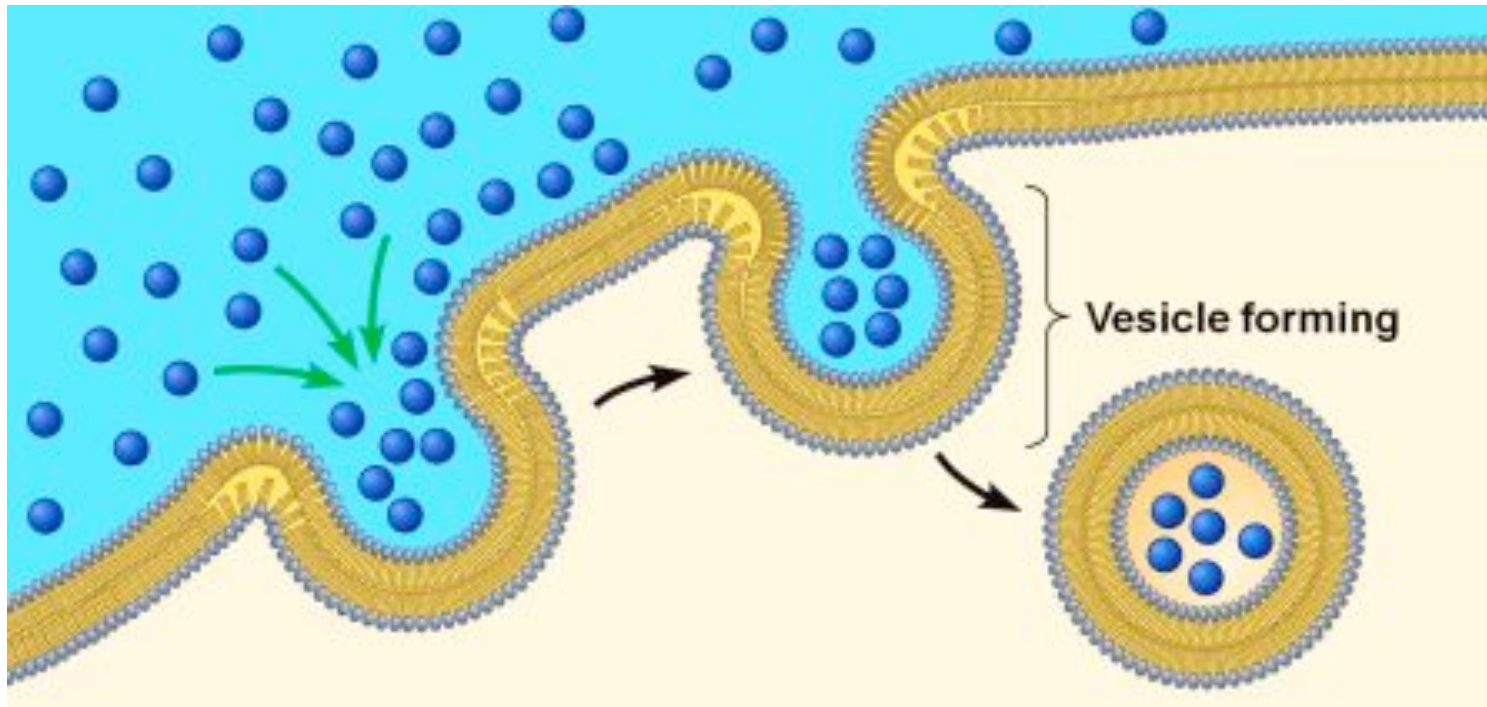
Passive Transport



Active Transport

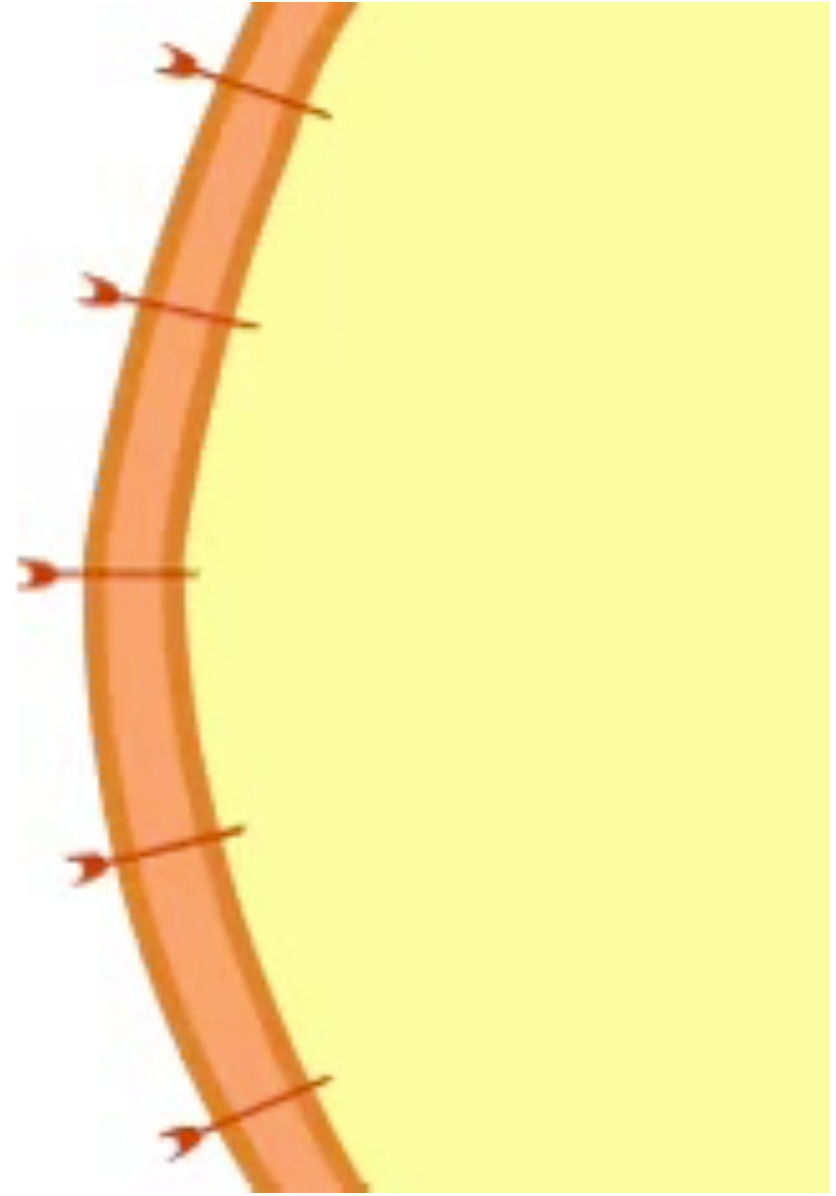
## ENDOCYTOSIS

- ▶ Process of taking in large molecules into a cell by engulfing them in a membrane



## PHAGOCYTOSIS

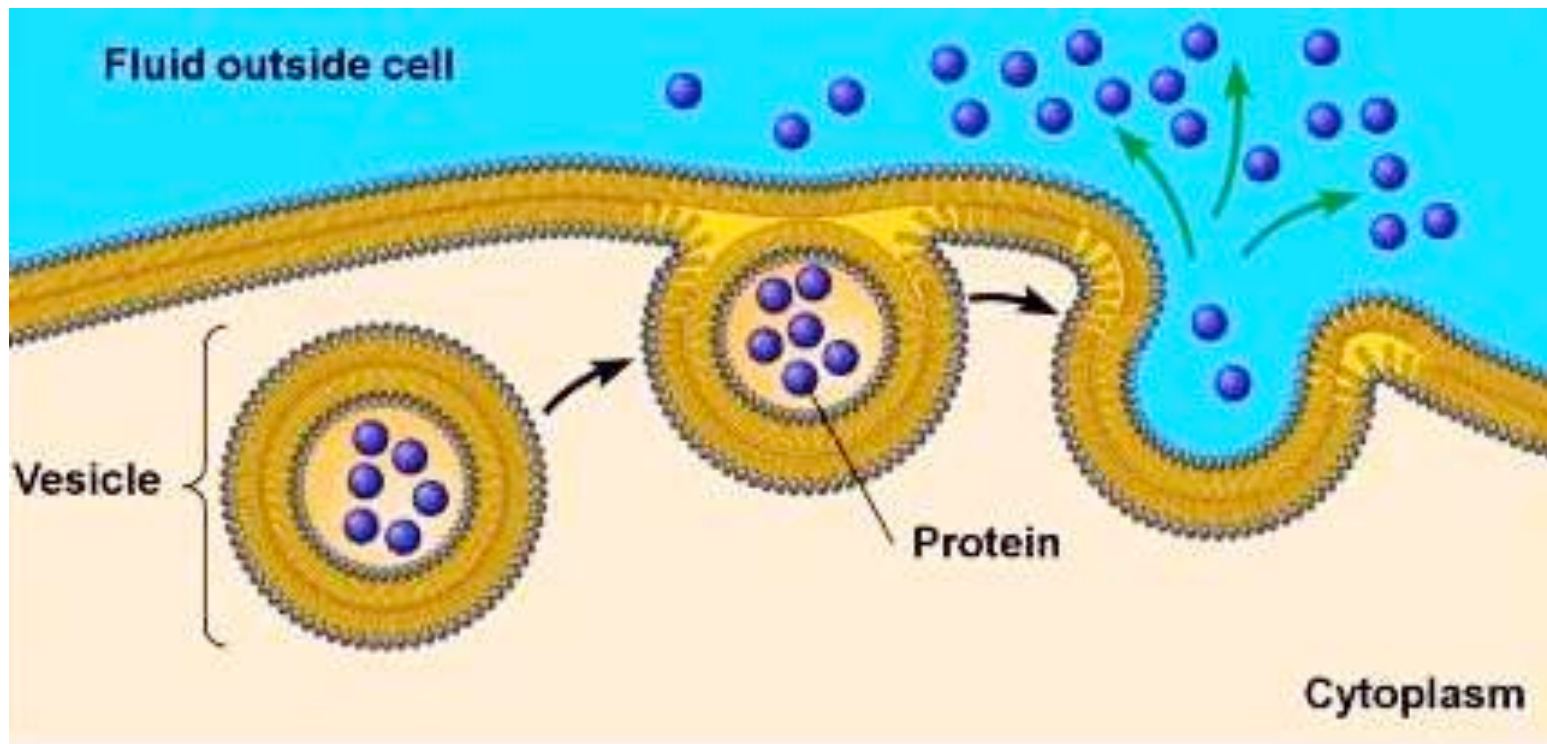
- ▶ “cell eating”
- ▶ Type of endocytosis
- ▶ Molecule fuses with lysosome, which destroys the molecule





## EXOCYTOSIS

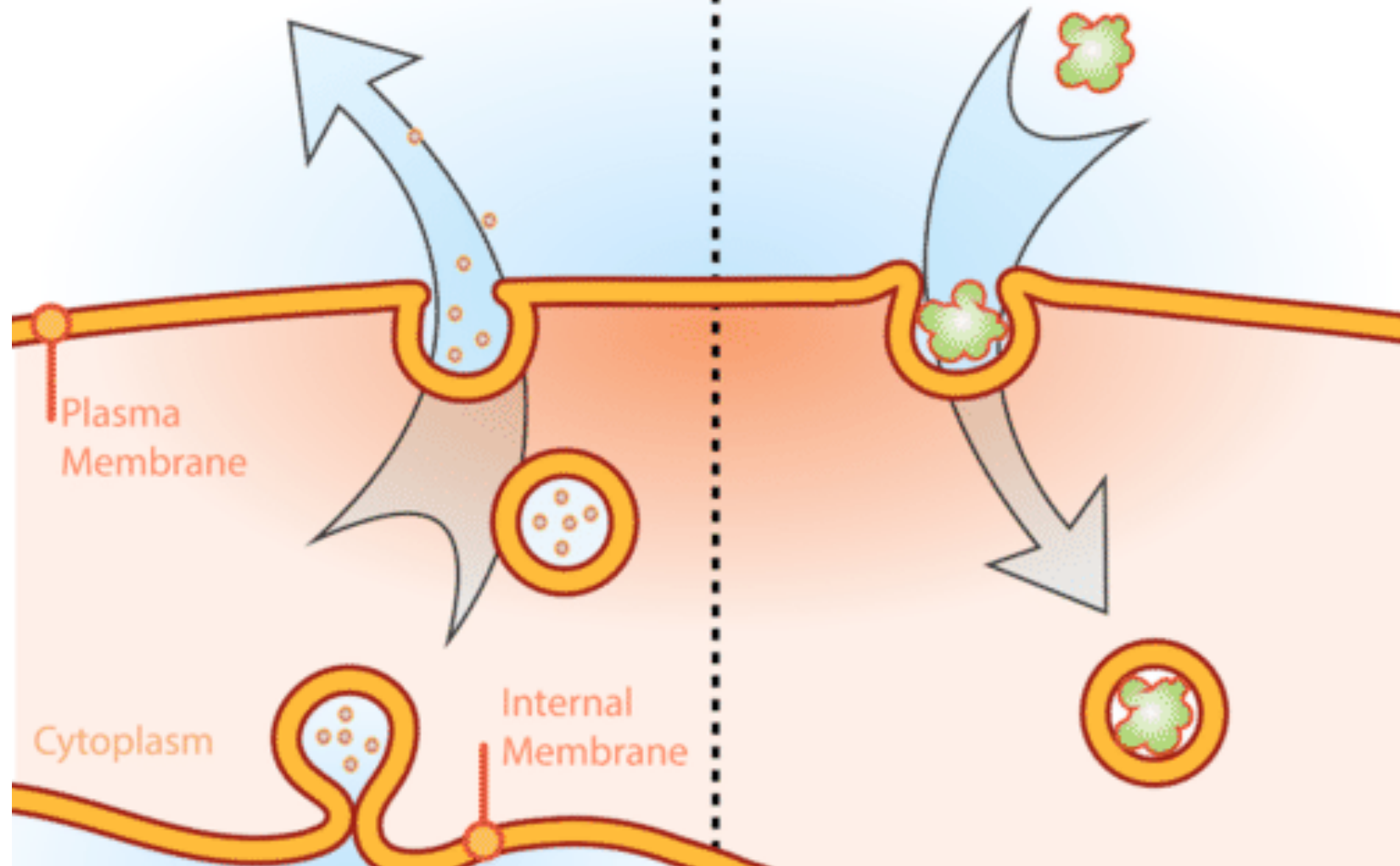
- ▶ Opposite of endocytosis
- ▶ Release of substances by the fusion of a vesicle with the membrane



Extracellular  
Fluid

Exocytosis

Endocytosis



DEBRIEF

# PART C: ACTIVE TRANSPORT

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TURN IT IN AS A GROUP

# PART C: ACTIVE TRANSPORT

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## ACTIVE TRANSPORT – ILLUSTRATED SUMMARY

- ▶ Create a diagram/picture/flow chart that summarizes ALL of today's notes
- ▶ Use at least 4 colors
- ▶ Label as necessary

## CELL TRANSPORT: DIFFUSION WORKSHEET

# HOMework

► WORKSHEET

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# DO NOW

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- ▶ Go to [kahoot.it](https://kahoot.it)
- ▶ wait for code



# REVIEW

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- ▶ Work on review sheet

# HOMework

- ▶ QUIZ ON MONDAY

