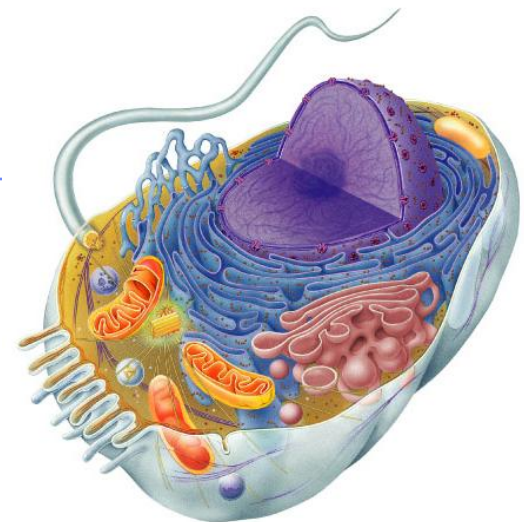


# Cell Membranes & Movement Across Them



# Cell (plasma) membrane

- Cells need an inside & an outside...
  - ◆ separate cell from its environment
  - ◆ cell membrane is the boundary

IN

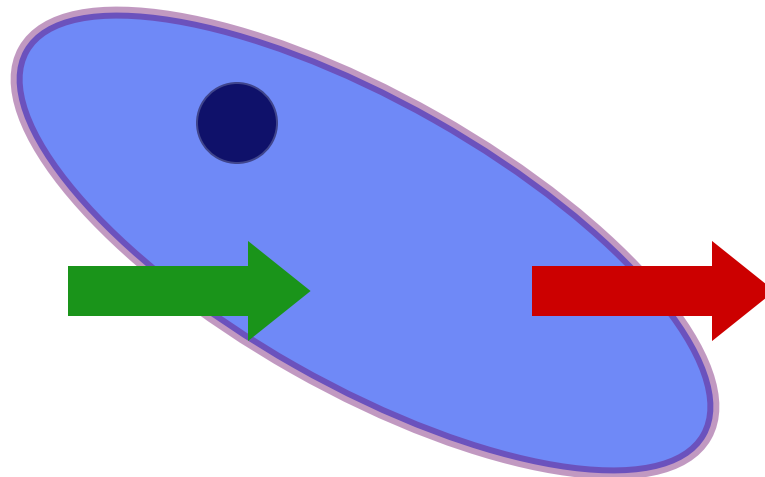
food

- sugars
- proteins
- fats

salts

O<sub>2</sub>

H<sub>2</sub>O



OUT

waste

- ammonia
- salts
- CO<sub>2</sub>
- H<sub>2</sub>O

products

- proteins

cell needs materials in & products or waste out

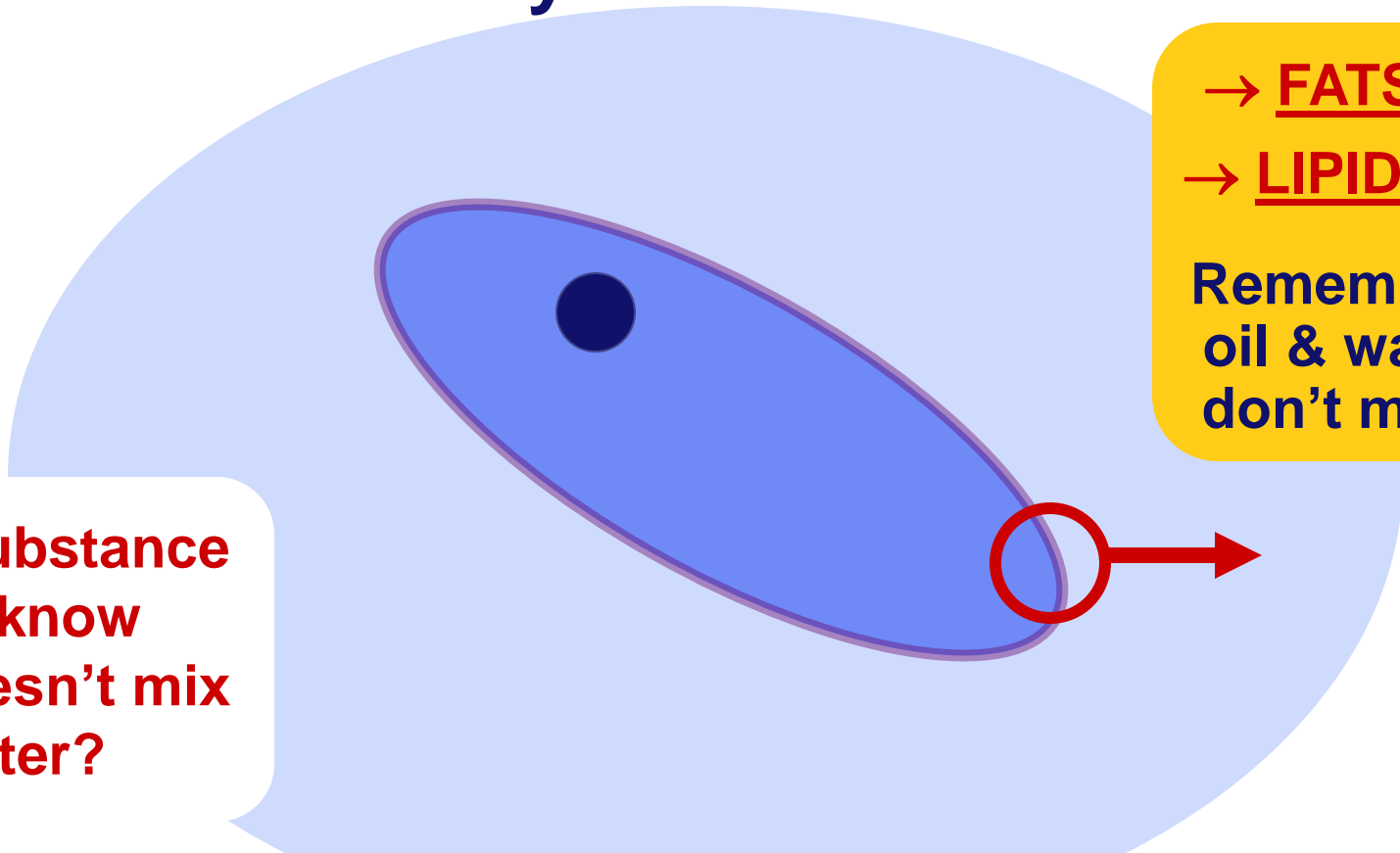
# Building a membrane

- How do you build a barrier that keeps the watery contents of the cell separate from the watery environment?

→ FATS ←  
→ LIPIDS ←

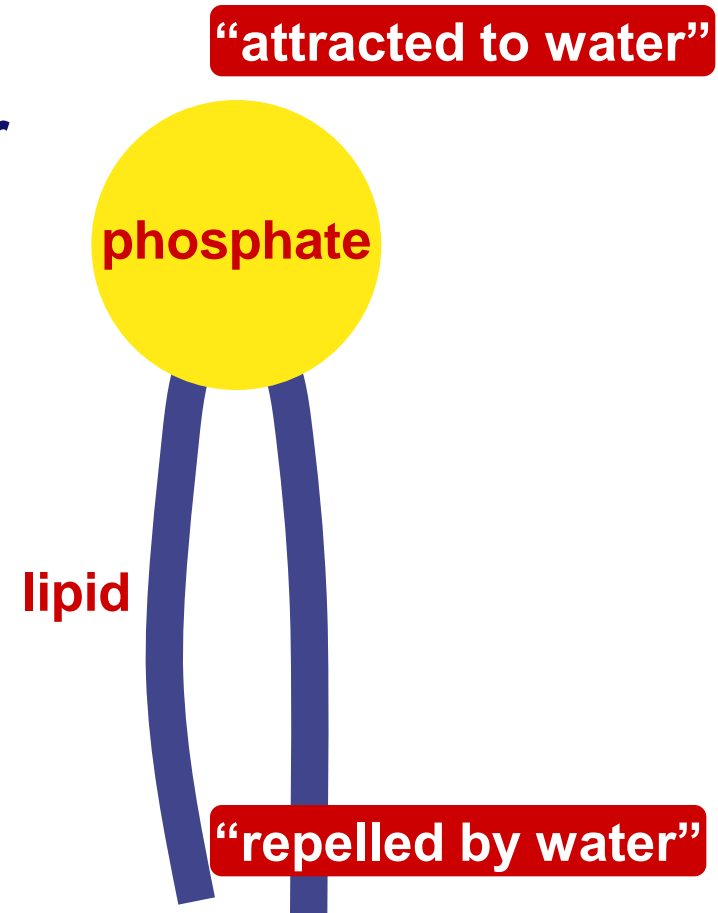
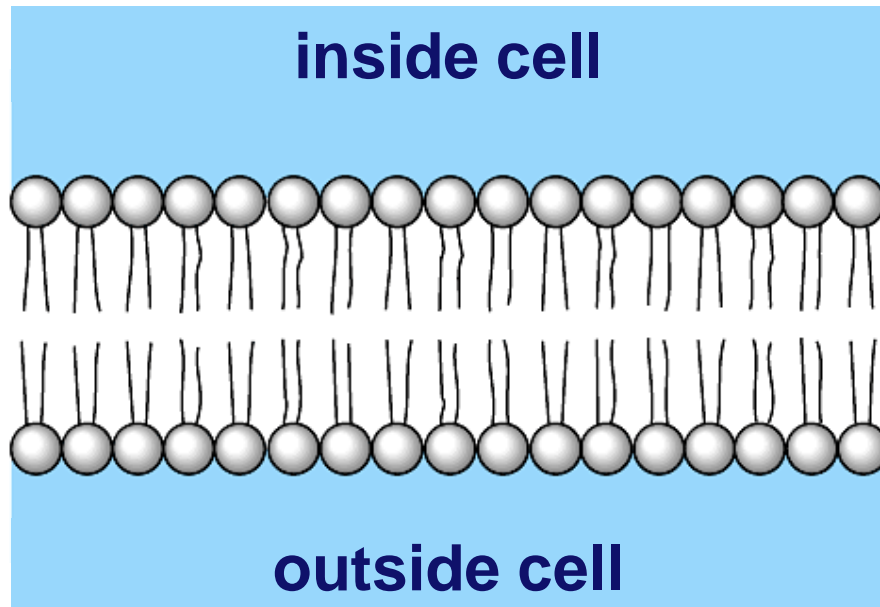
Remember:  
oil & water  
don't mix!!

What substance  
do you know  
that doesn't mix  
with water?



# Lipids of cell membrane

- Membrane is made of special kind of lipid
  - ◆ phospholipids
  - ◆ “split personality”
- Membrane is a double layer
  - ◆ phospholipid bilayer



# Question 1

---

- **List two alternative names for the cell membrane.**

# Selectively permeable membrane

- Cell membrane controls what gets in or out
- Need to allow some materials — but not all — to pass through the membrane
  - ◆ Selectively permeable
    - only some material can get in or out

So what needs to get across the membrane?

sugar

lipids

aa

O<sub>2</sub>

H<sub>2</sub>O

salt

waste



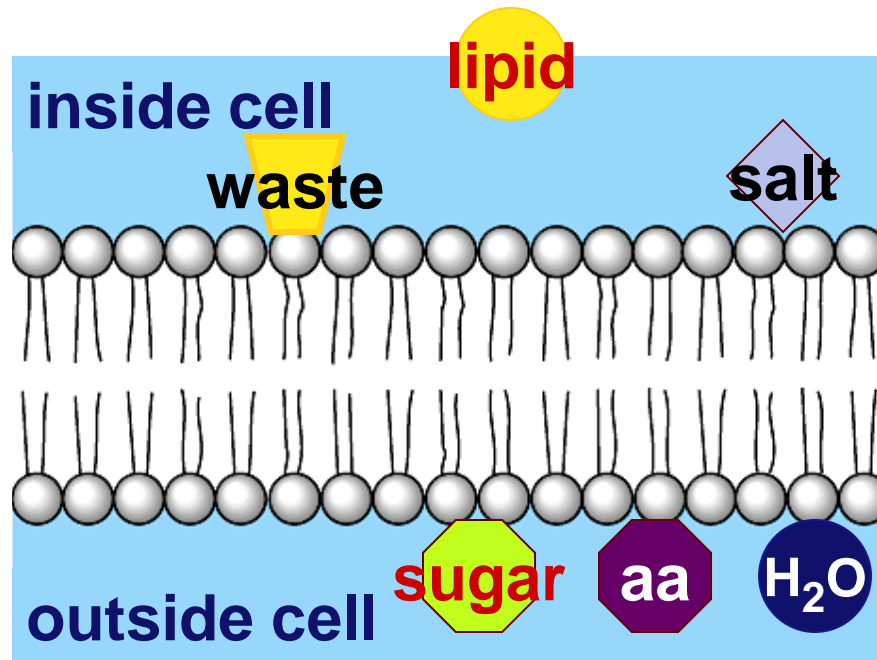
## Question 2

---

- **Why is the cell membrane described as selectively permeable?**

# Crossing the cell membrane

- What molecules can get through the cell membrane directly?
  - fats and oils can pass directly through

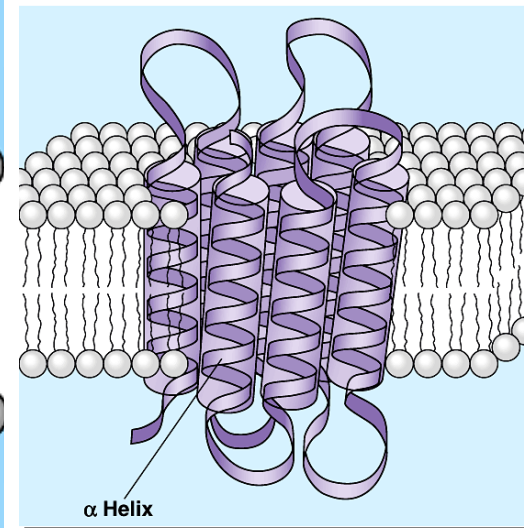
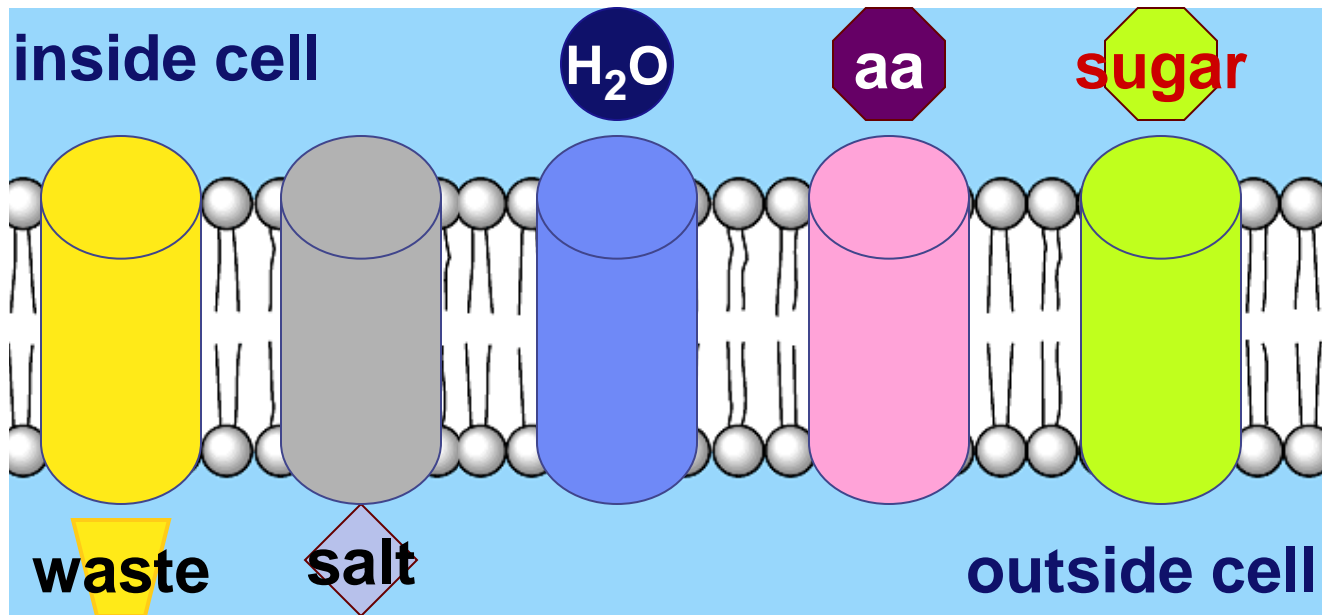


but...  
what about  
other stuff?



# Cell membrane channels

- Need to make “doors” through membrane
  - ◆ protein channels allow substances in & out
    - specific channels allow specific material in & out
    - H<sub>2</sub>O channel, salt channel, sugar channel, etc.



## Question 3

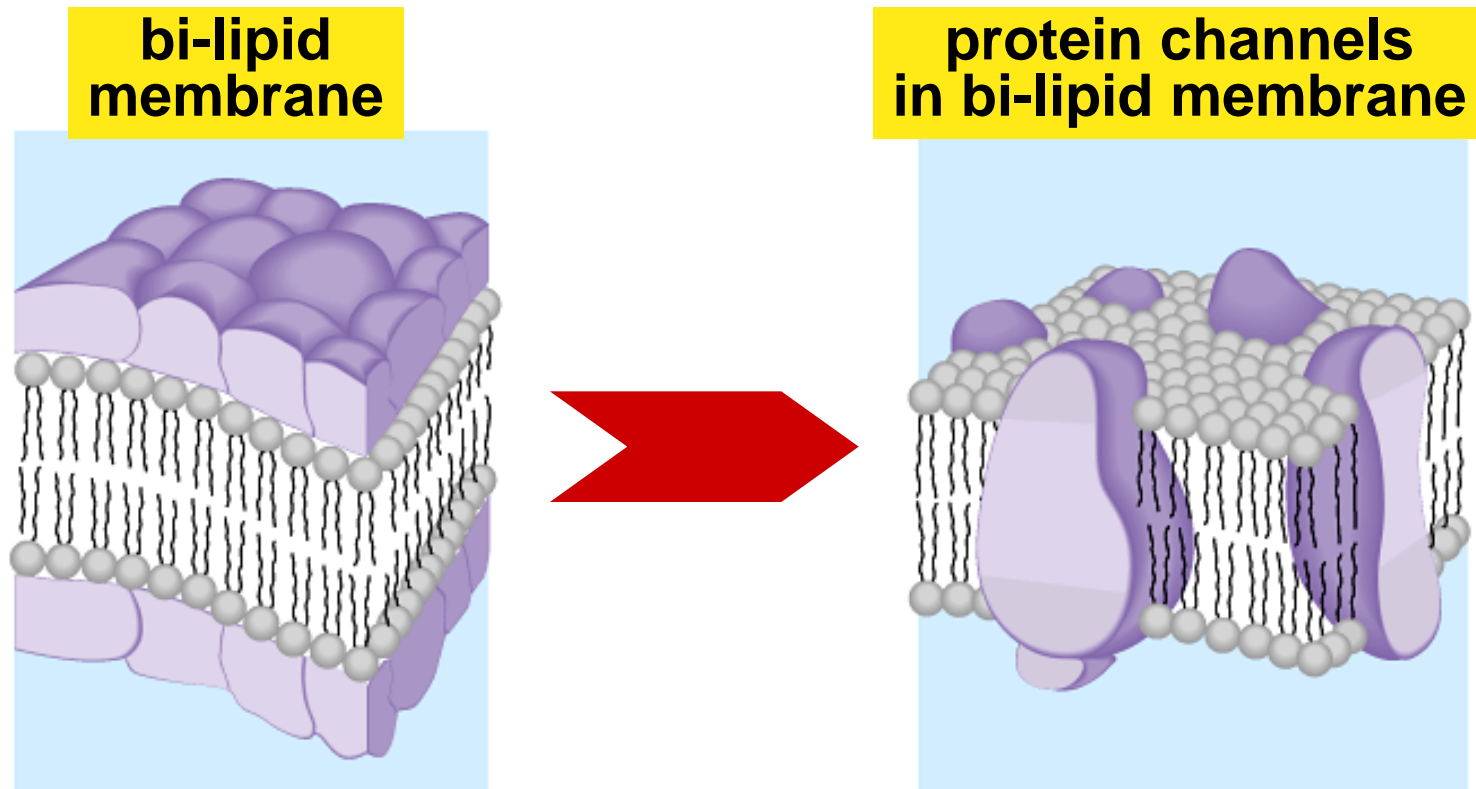
---

- **Identify three items that are transported across the cell membrane.**

# How do you build a semi-permeable cell membrane?

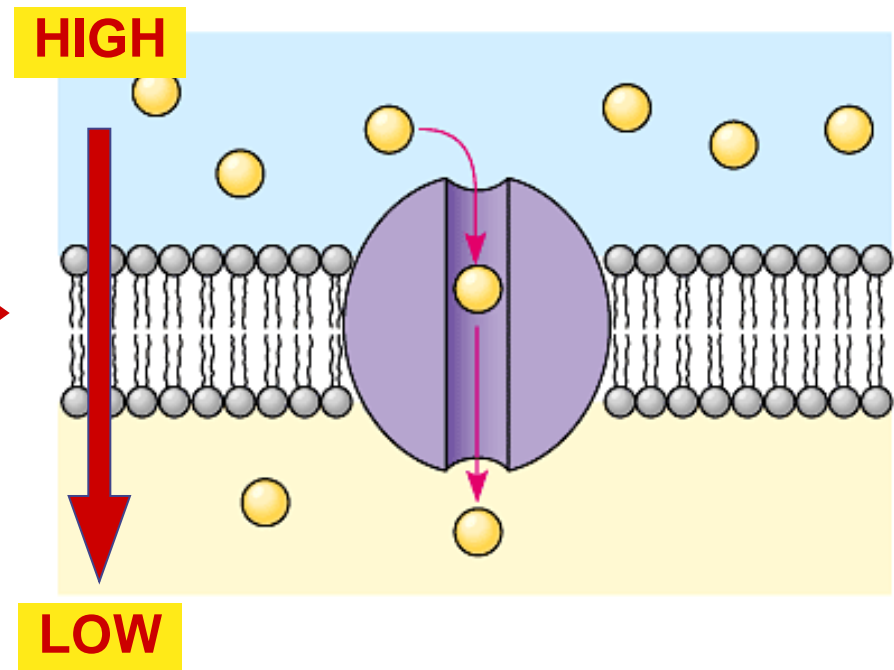
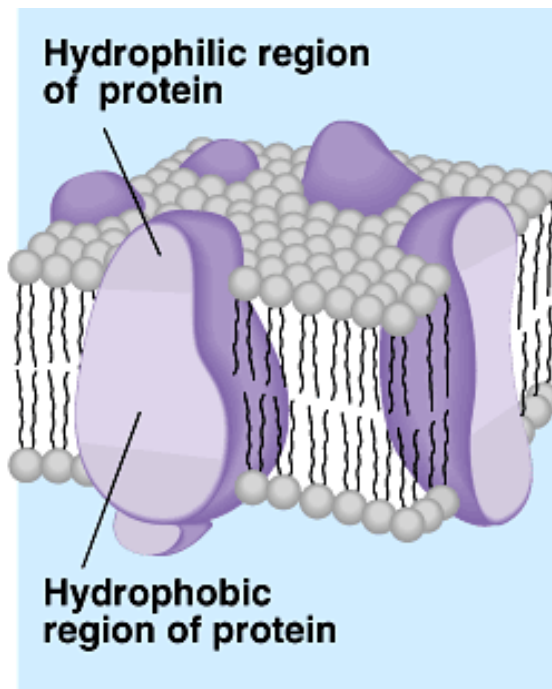
- Channels are made of proteins

- ◆ proteins both “like” water & “like” lipids



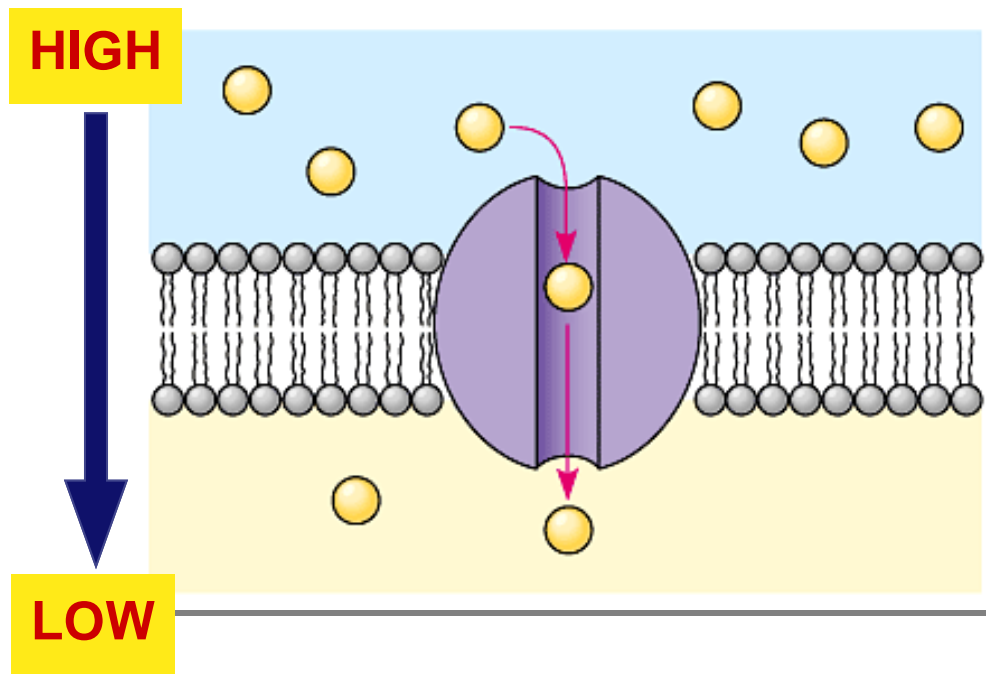
# Protein channels

- Proteins act as doors in the membrane
  - ◆ channels to move specific molecules through cell membrane



# Movement through the channel

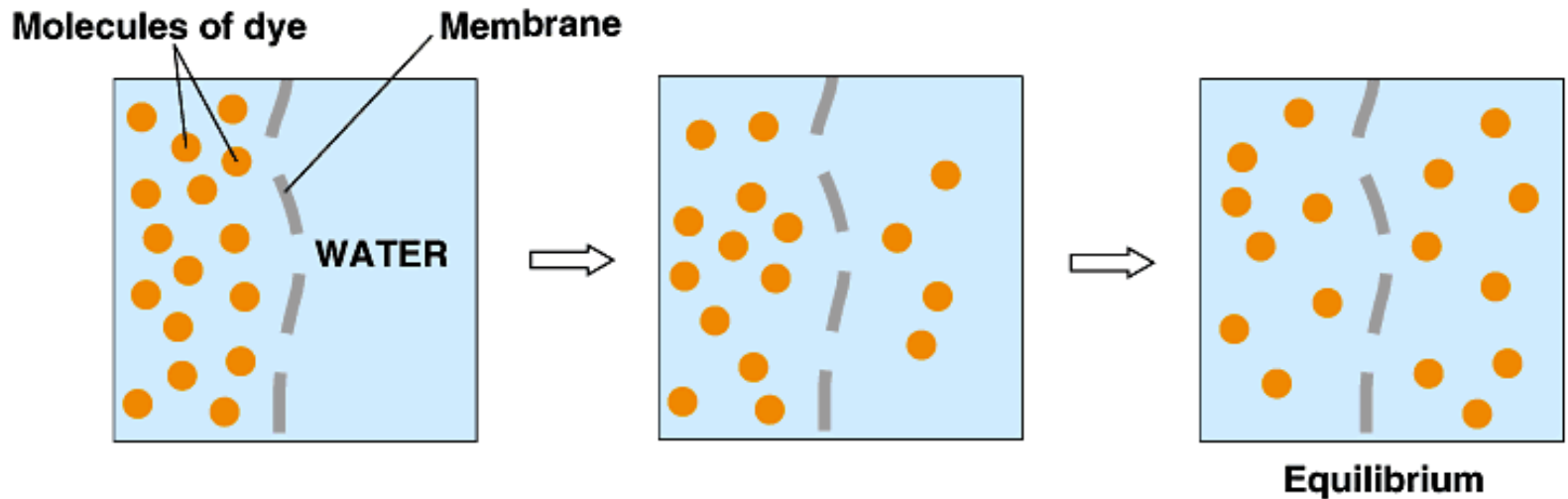
- Why do molecules move through membrane if you give them a channel?



# Molecules move from high to low

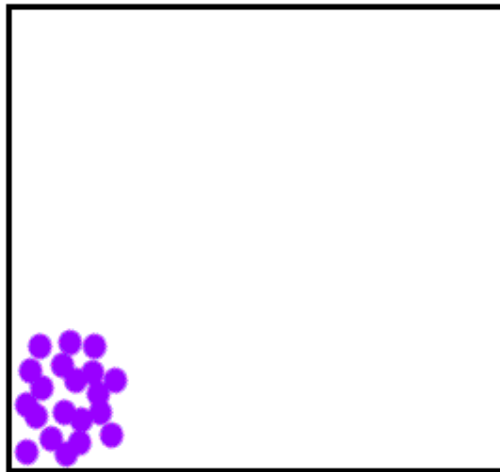
- **Diffusion**

- ◆ Molecules move from **HIGH** to **LOW** concentration



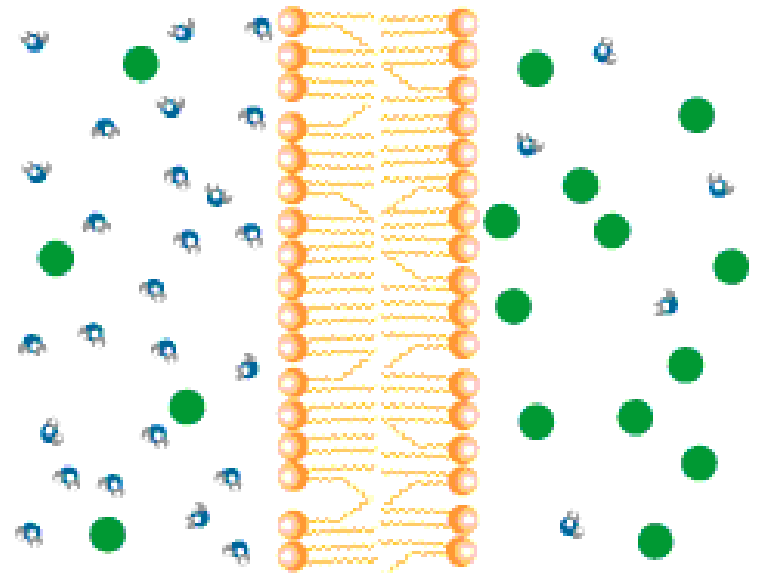
# Diffusion

- Move from **HIGH** to **LOW** concentration
  - ◆ passive transport
  - ◆ no energy needed



diffusion

## diffusion of water



osmosis

## Question 4

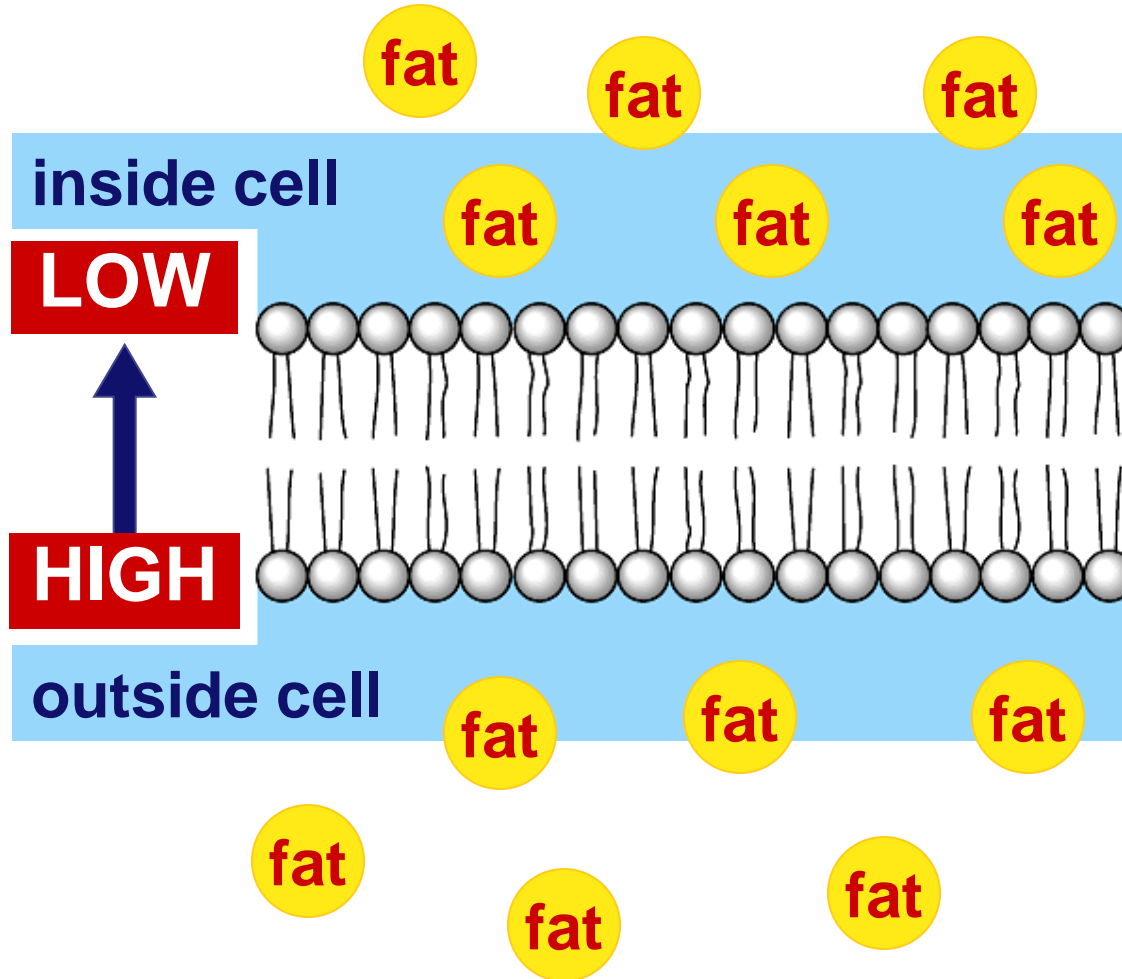
---

- **Define diffusion and osmosis.**



# Simple Diffusion

- Move from **HIGH** to **LOW**



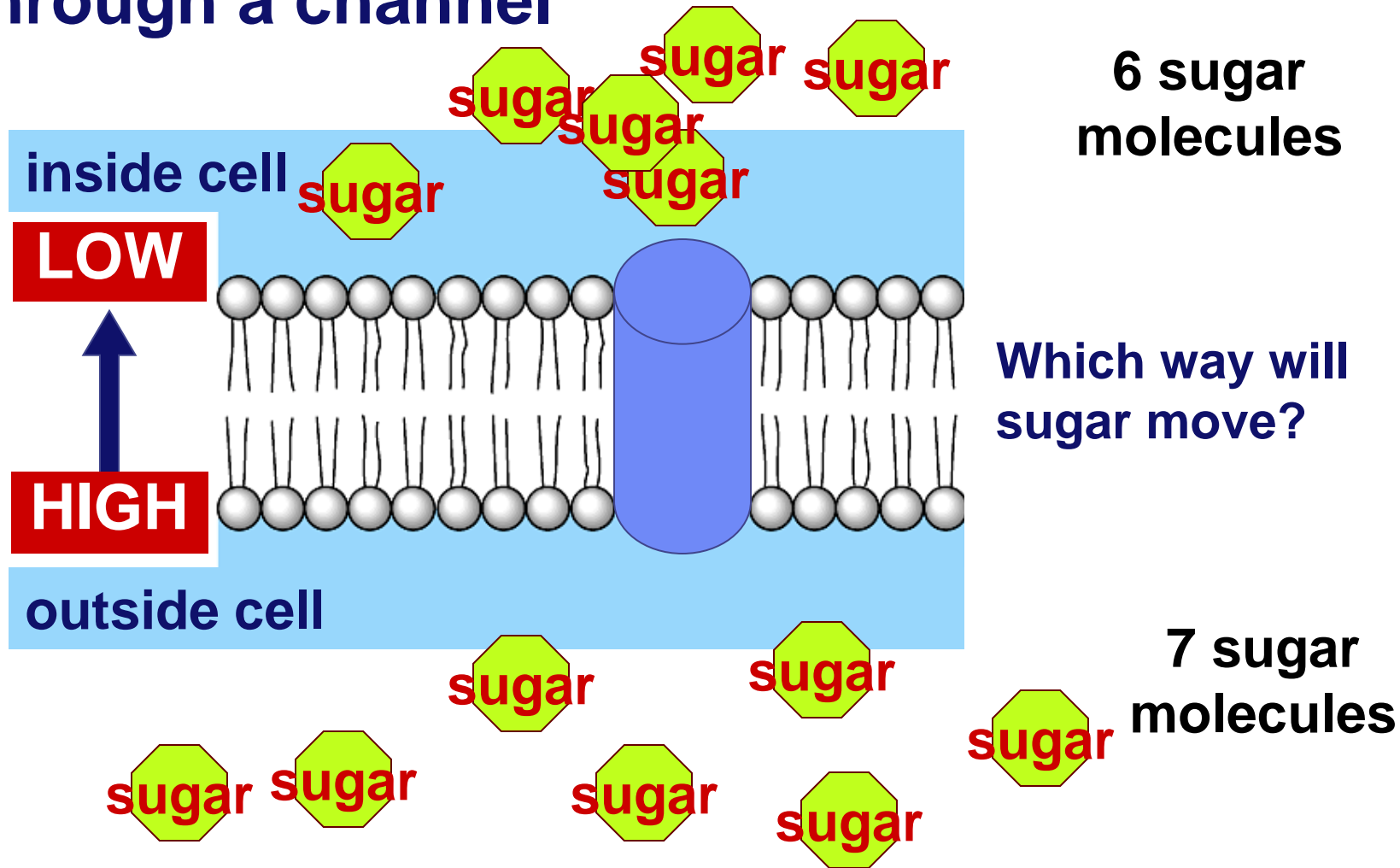
6 fat molecules

Which way will fat move?

8 fat molecules

# Facilitated Diffusion

- Molecules move from **HIGH** to **LOW** through a channel



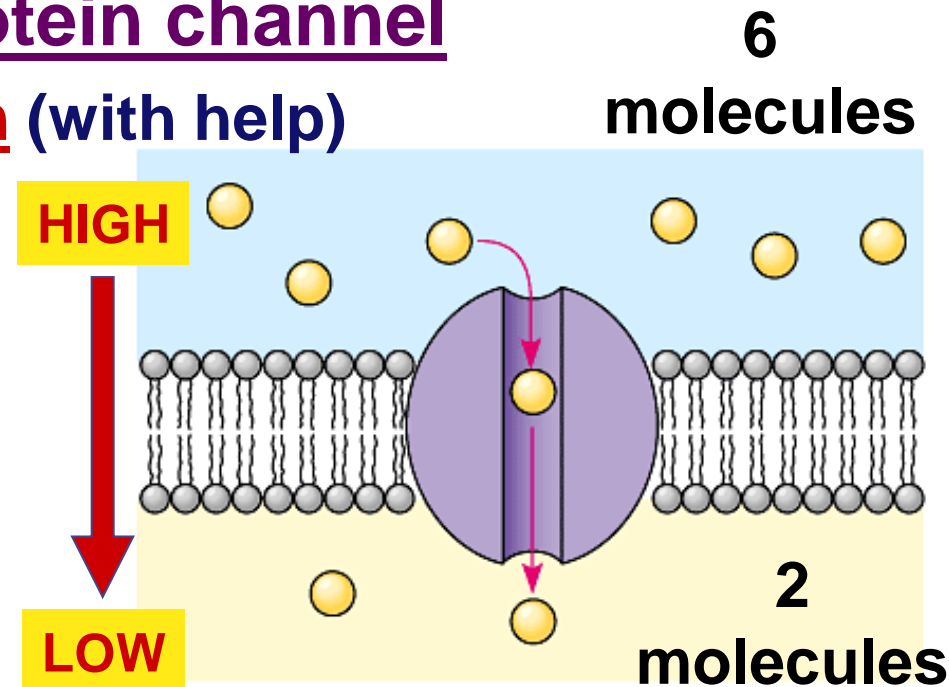
## Question 5

---

- **Define facilitated diffusion.**

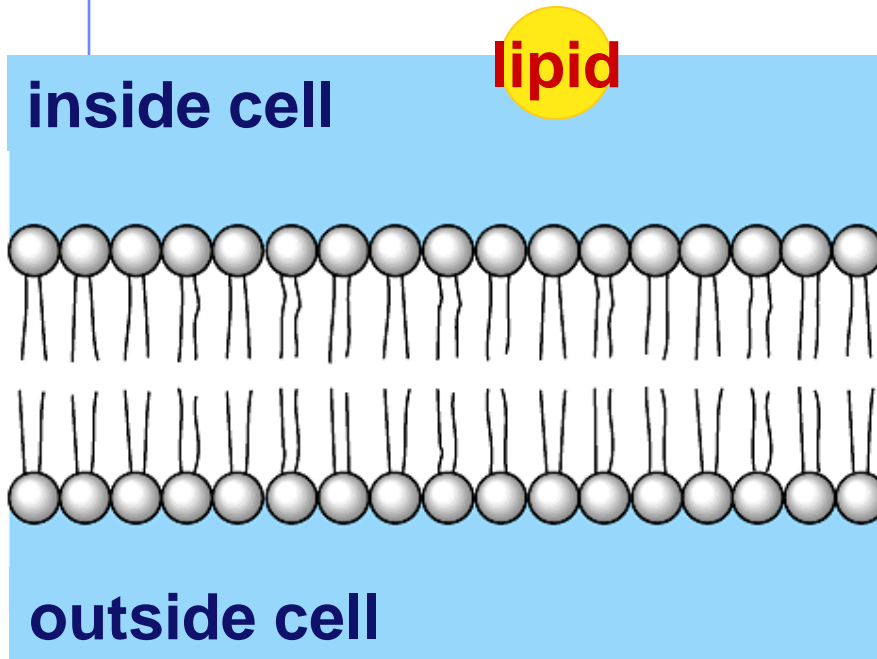
# Diffusion

- Move from **HIGH** to **LOW** concentration
  - ◆ directly through membrane
    - simple diffusion
    - no energy needed
  - ◆ help through a protein channel
    - facilitated diffusion (with help)
    - no energy needed

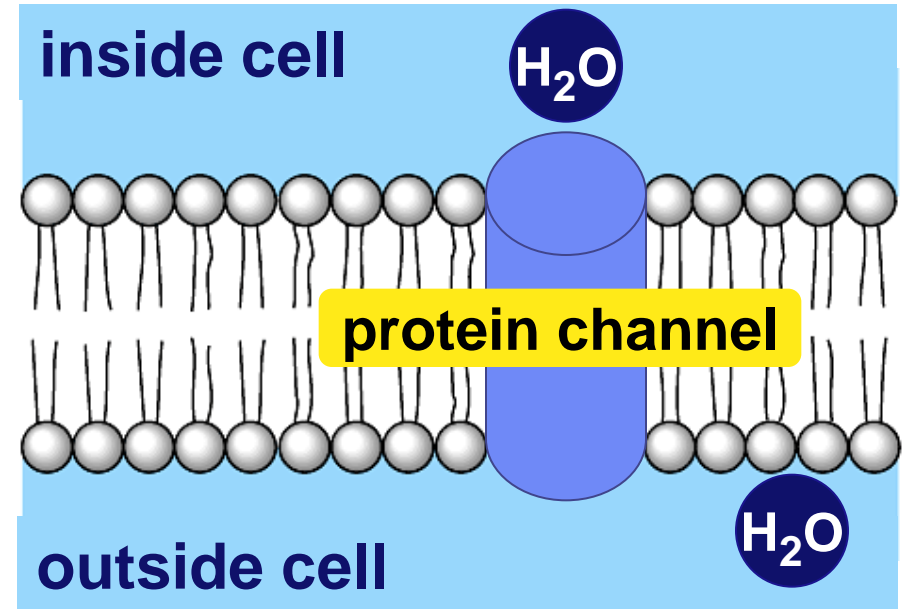


# Simple vs. facilitated diffusion

simple diffusion



facilitated diffusion



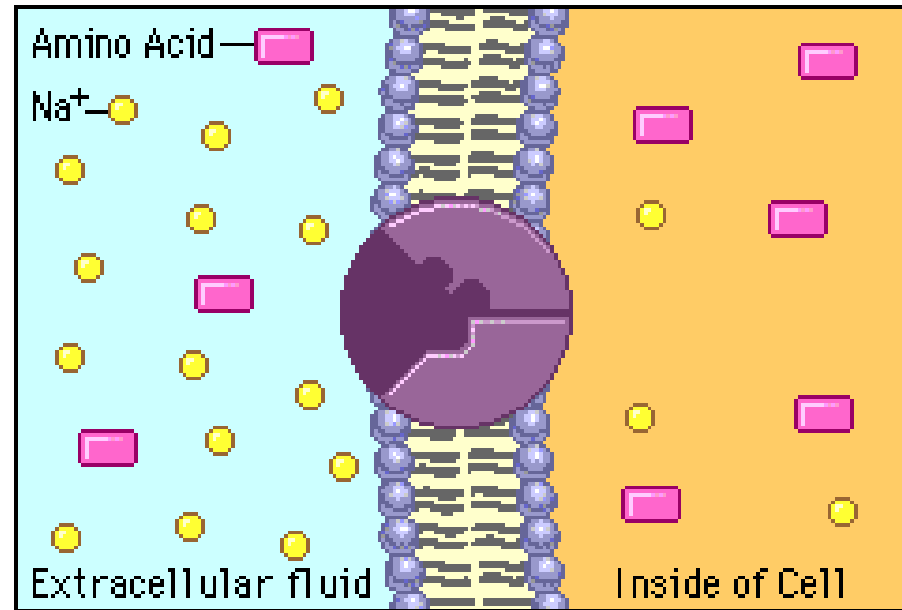
## Question 6

---

- **What does facilitated diffusion use to transport molecules that simple diffusion does not use?**

# Active transport

- Cells may need molecules to move **against** concentration “hill”
  - ◆ need to pump “uphill”
    - from **LOW** to **HIGH** using energy
  - ◆ **protein pump**
  - ◆ **requires energy**
    - **ATP**



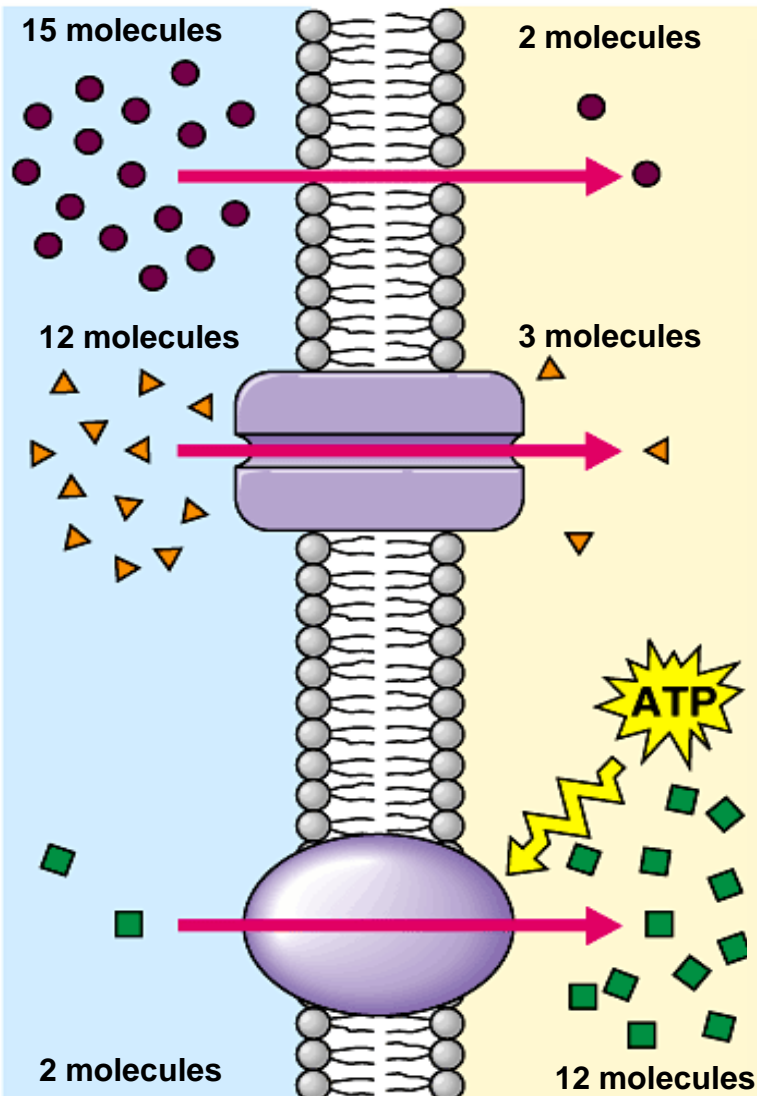
## Question 7

---

- **Define active transport.**



# Transport summary



**simple  
diffusion**

**facilitated  
diffusion**

Passive transport

**active  
transport**

**ATP**

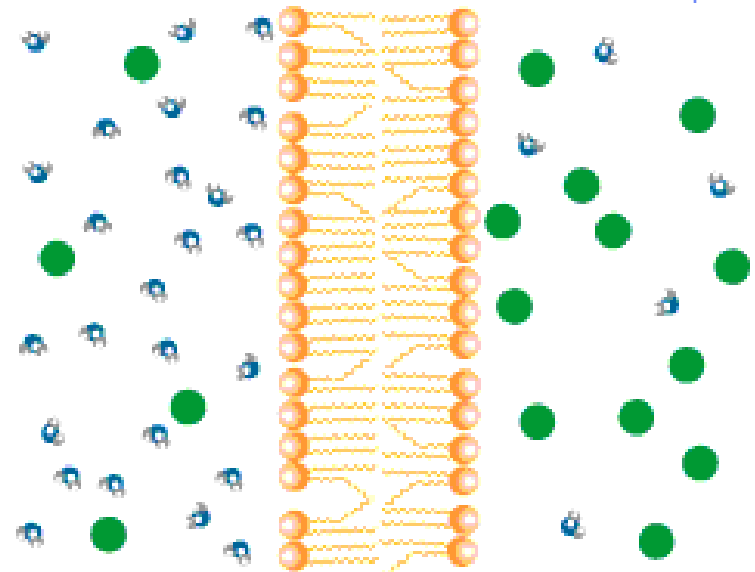
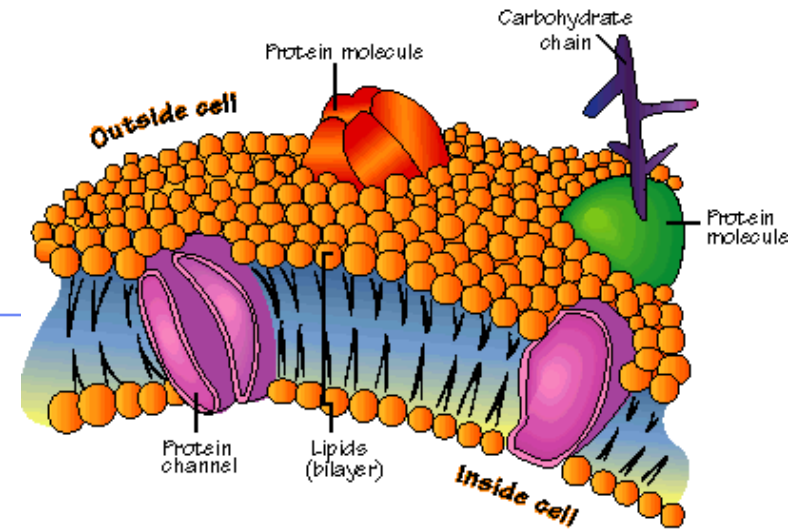
## Question 8

---

- **Sketch the previous slide.**

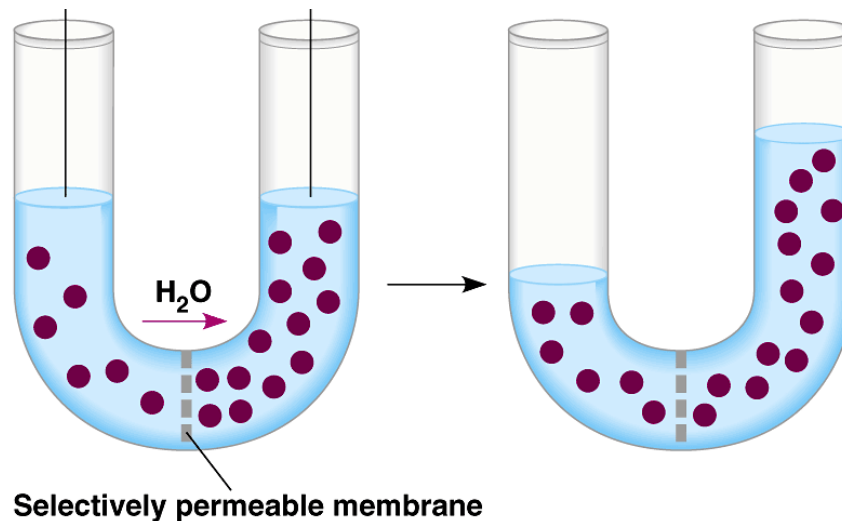
# Osmosis

## Movement of Water Across Cell Membrane



# Osmosis

- Water is very important, so we talk about water separately
- Osmosis
  - ◆ diffusion of water from HIGH concentration of water to LOW concentration of water
    - across a semi-permeable membrane



## Question 9

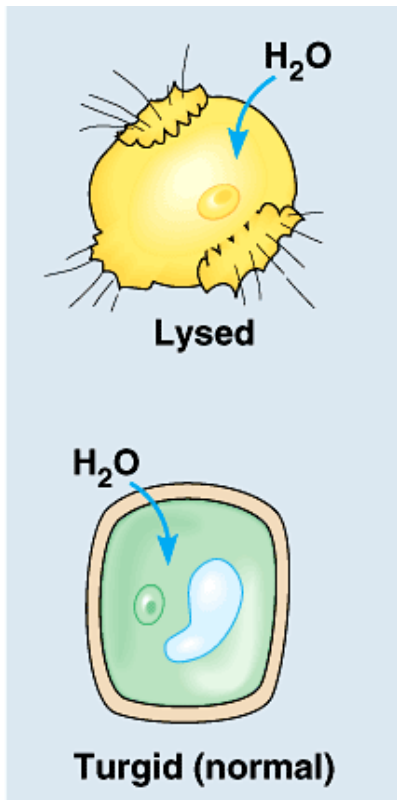
---

- **Define osmosis.**

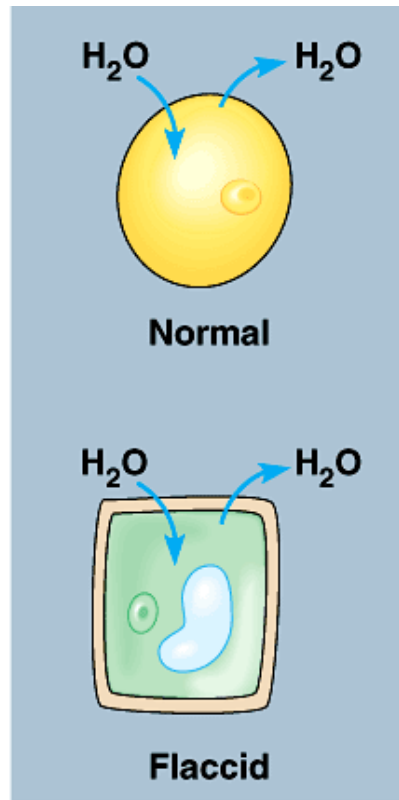
# Keeping water balance

- Cell survival depends on balancing water uptake & water loss

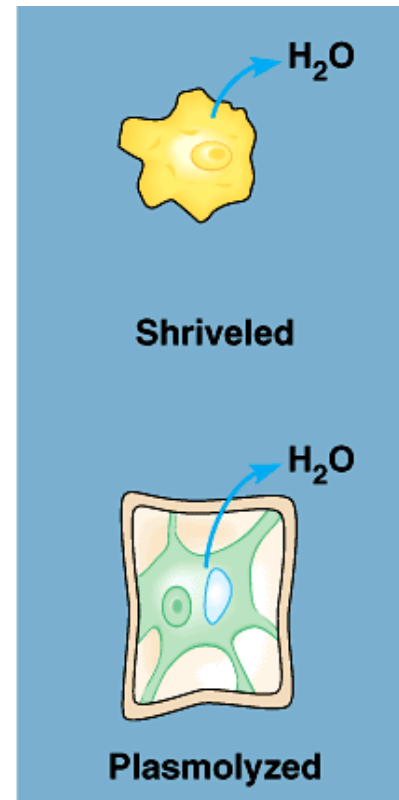
freshwater



balanced



saltwater



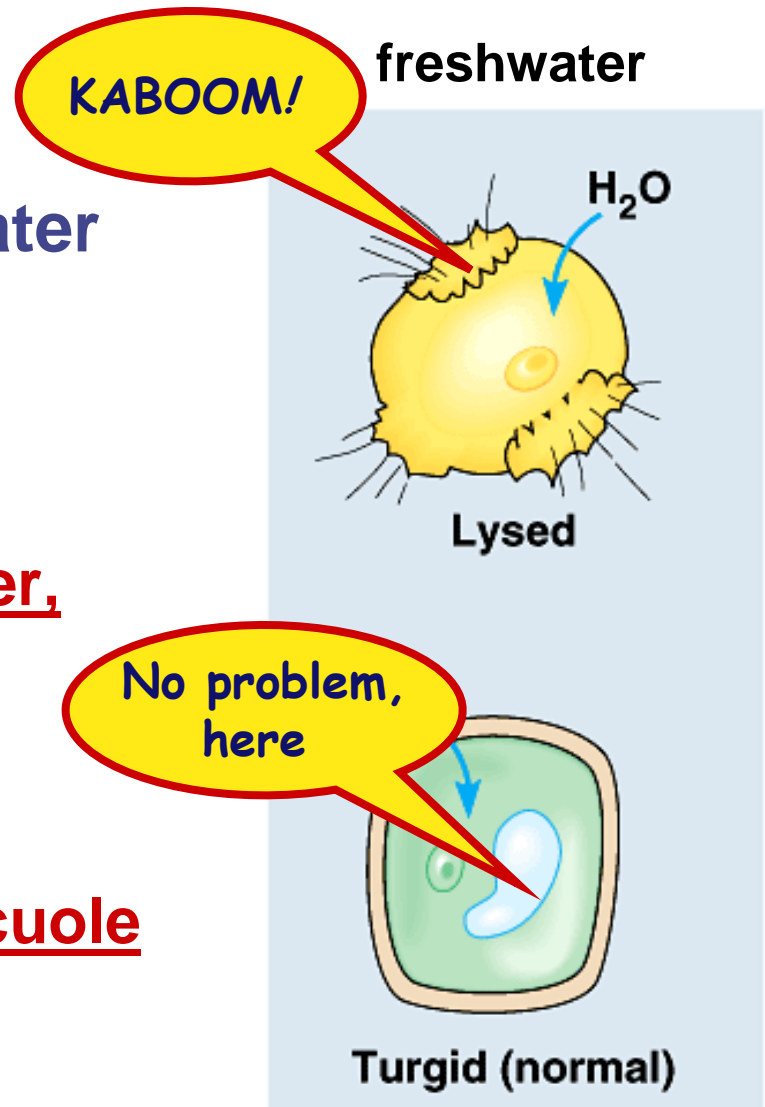
Animal cell

Plant cell

# Keeping right amount of water in cell

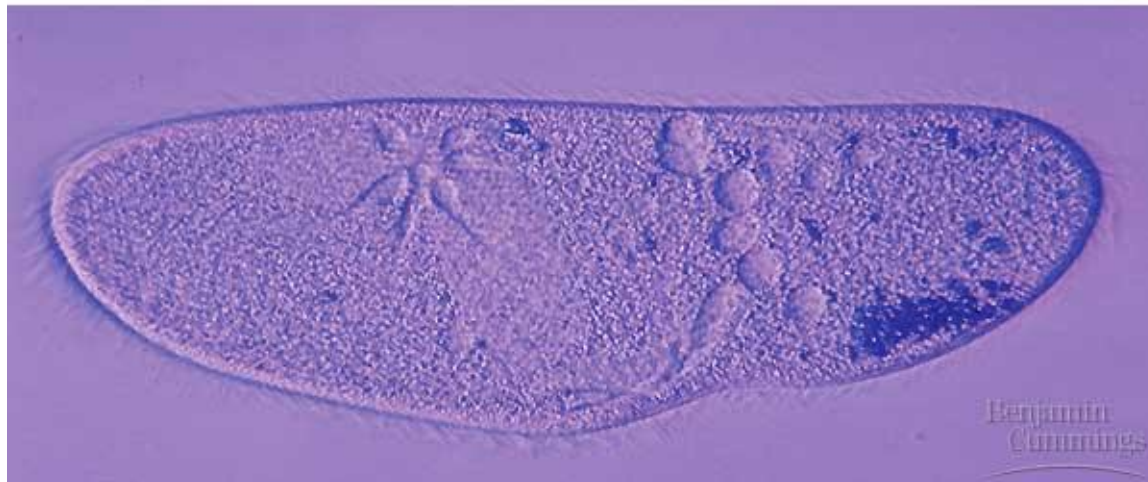
## ■ Freshwater

- ◆ a cell in fresh water
- ◆ high concentration of water around cell
  - cell gains water
  - example: *Paramecium*
  - problem: cells gain water, swell & can burst
    - ◆ water continually enters *Paramecium* cell
  - solution: contractile vacuole
    - ◆ pumps water out of cell



# Controlling water

- Contractile vacuole in *Paramecium*





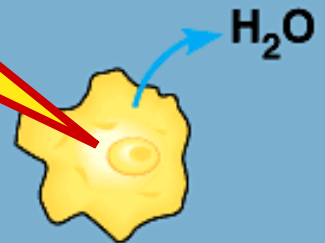
# Keeping right amount of water in cell

## ■ Saltwater

- ◆ a cell in salt water
- ◆ low concentration of water around cell
  - cell loses water
- ◆ example: shellfish
- ◆ problem: cell loses water
  - in plants: plasmolysis
  - in animals: shrinking cell
- ◆ solution: take up water

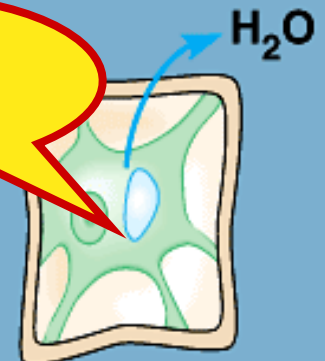
I'm shrinking,  
I'm shrinking!

saltwater



Shriveled

I will  
survive!



Plasmolyzed

# Keeping right amount of water in cell

## ■ Balanced conditions

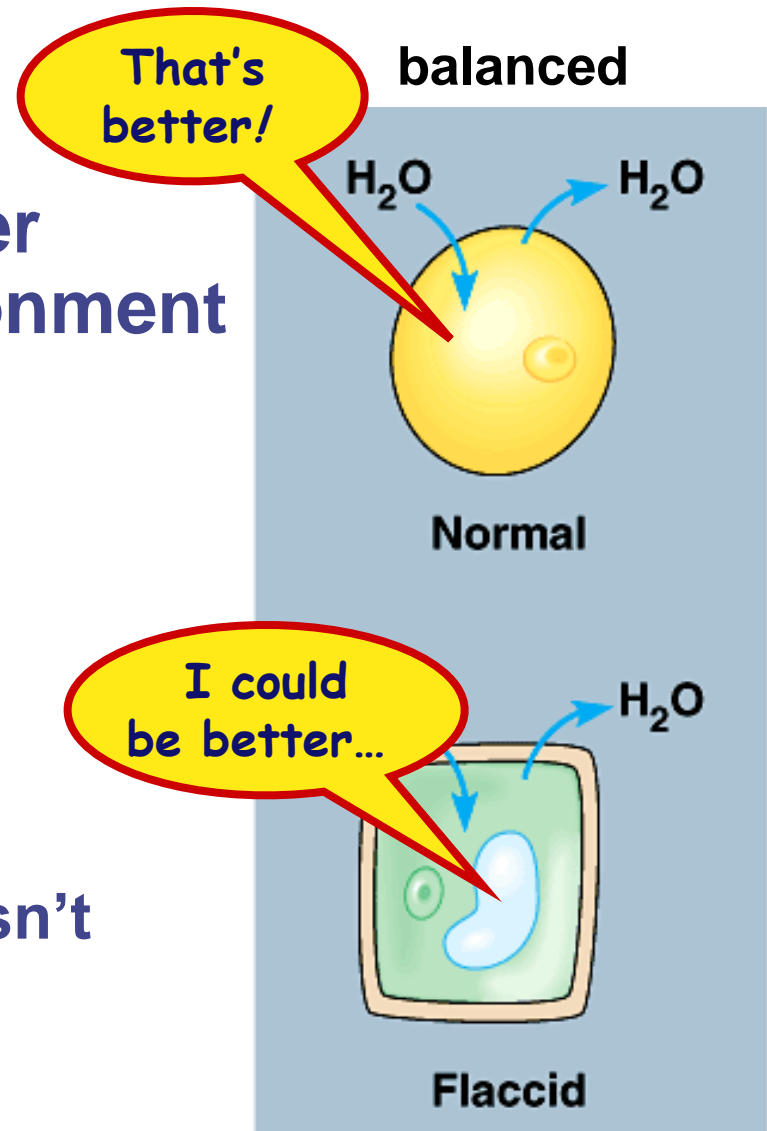
- ◆ no difference in concentration of water between cell & environment

- cell in equilibrium

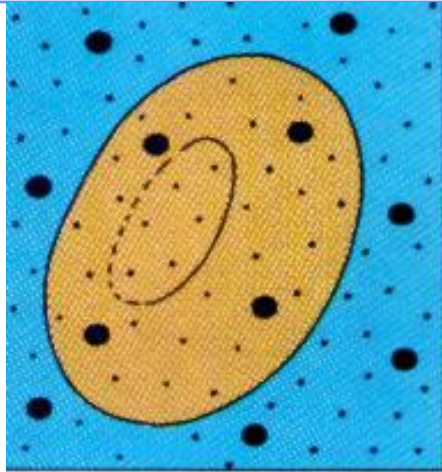
- example: blood

- problem: none

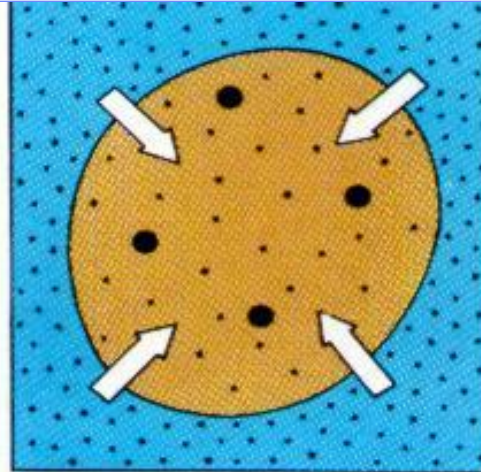
- ◆ water flows across membrane equally, in both directions
- ◆ volume of cell doesn't change



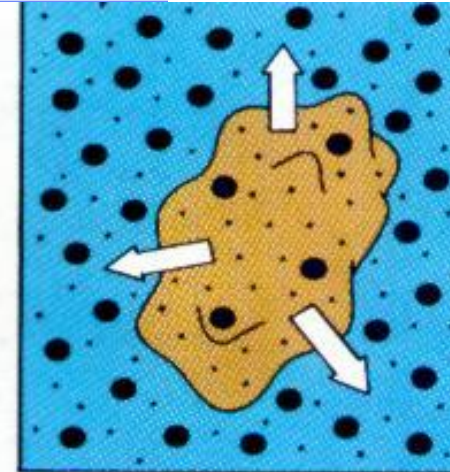
# Just Observe This Slide



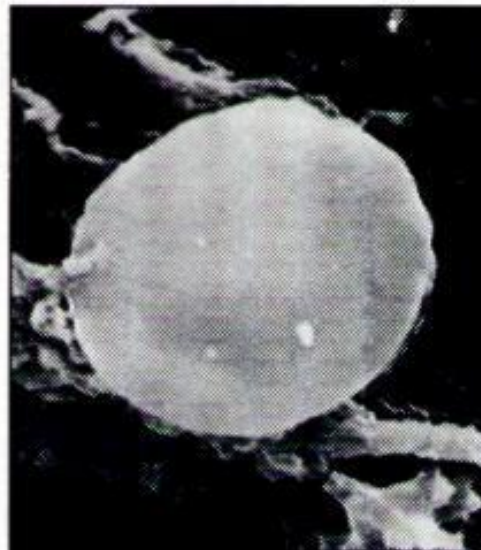
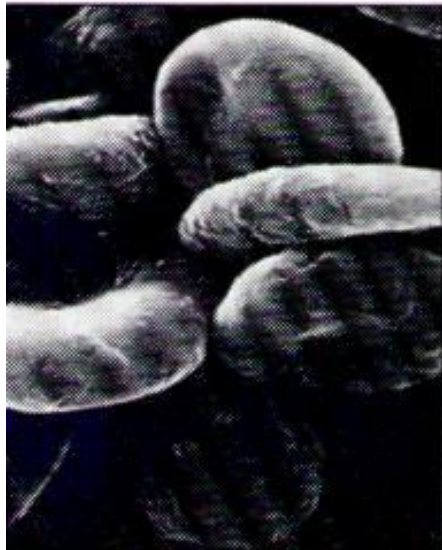
Isotonic



Hypotonic



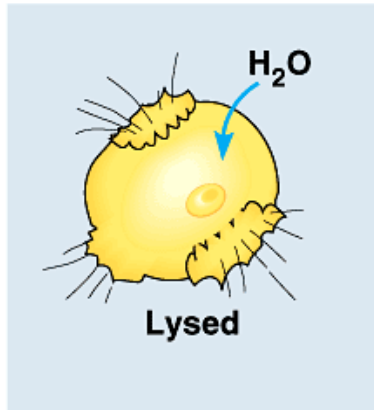
Hypertonic



# Sketch This Slide!

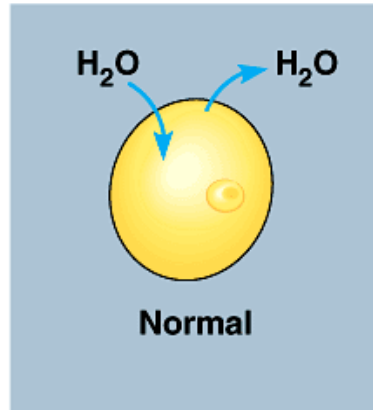
## Osmotic Solutions

Hypotonic solution



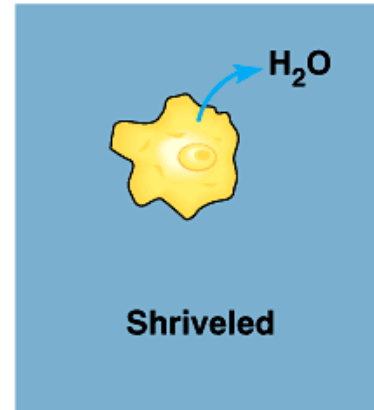
Hypo = Less  
Less Solute  
Outside Cell

Isotonic solution



Iso = Equal  
Same Solute  
Concentration  
Outside & Inside Cell

Hypertonic solution



Hyper = More  
More Solute  
Outside Cell

Animal cell

- **Sketch the graphics (be sure to include the arrows and descriptions!!!)**