

# Chemistry of Water Lab

Water Makes Life On Earth  
Possible!

What are the **four** major topics of this lab?

- Properties of Water
- pH
- Diffusion
- Osmosis

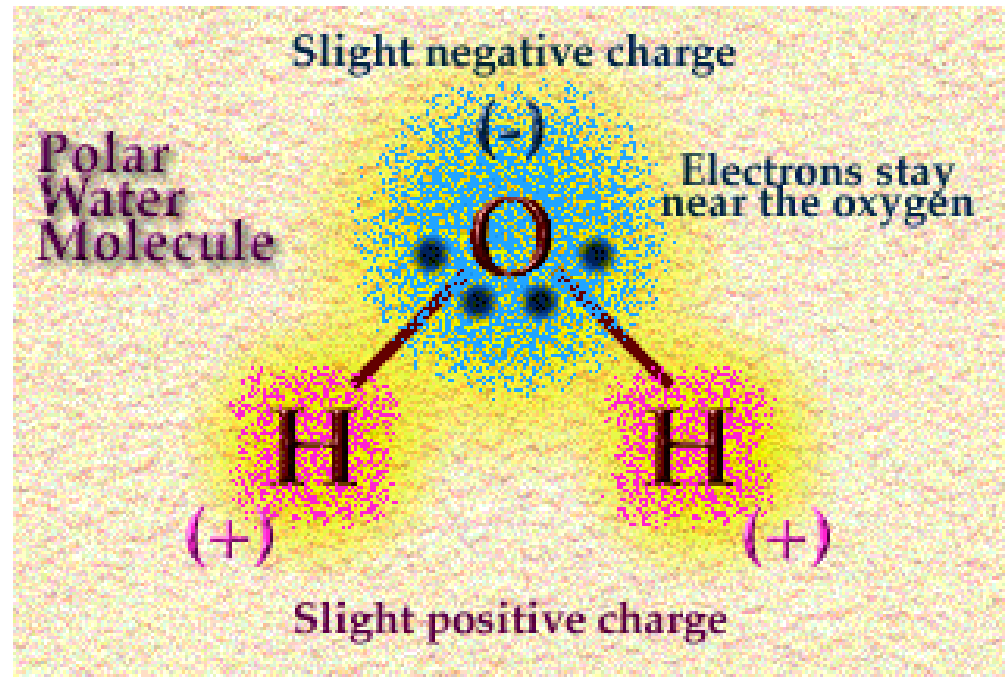
# 1. Properties of Water

## Water is POLAR!

What does it mean to be polar?

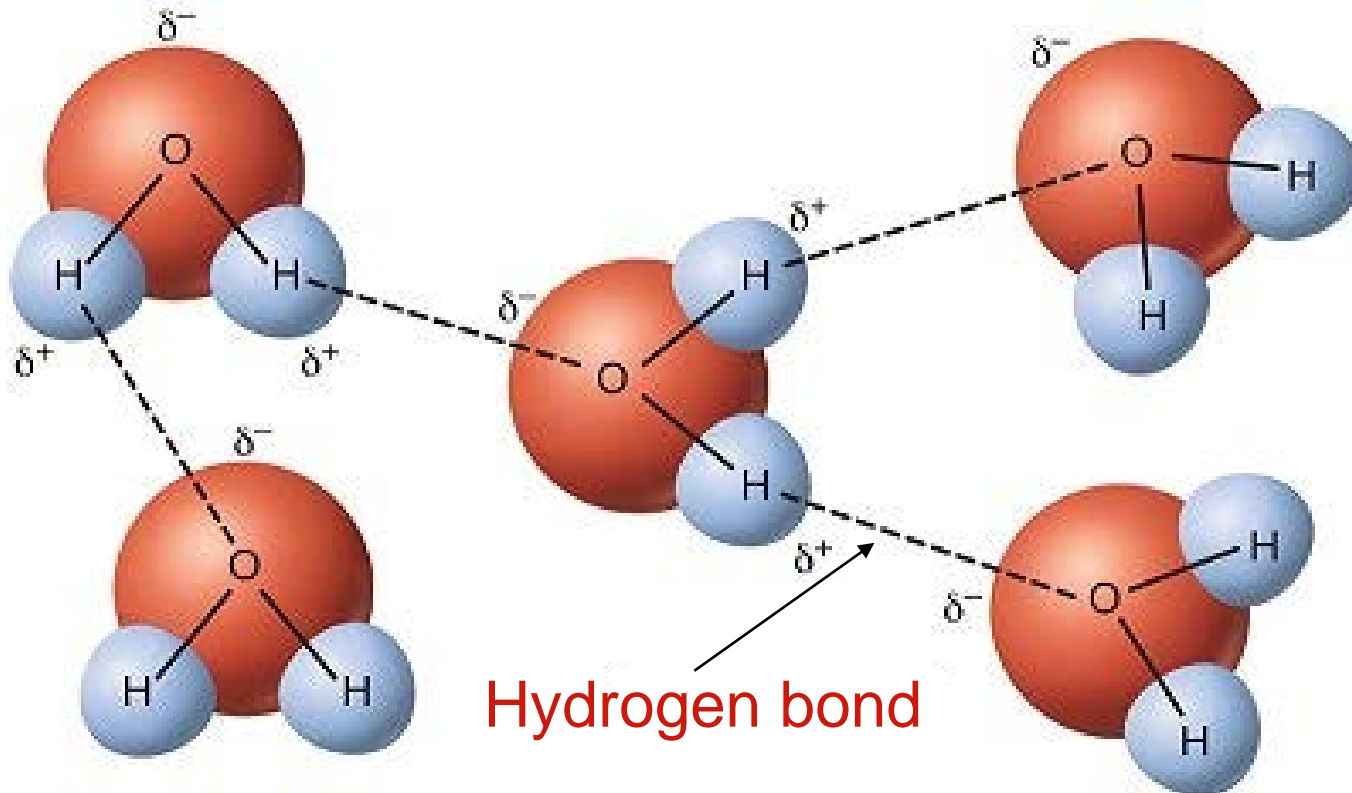
It means the atoms of the water molecule do NOT share electrons equally.

Result? The water molecule has partial charges!



# 1. Properties of Water

Because of its polarity, water forms hydrogen bonds.



Are hydrogen bonds  
weak or strong?

They are weak bonds!

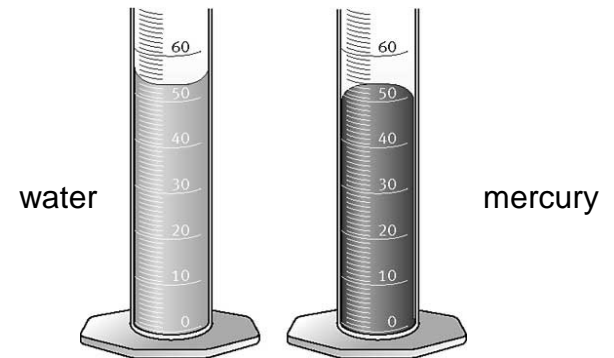
# 1. Properties of Water

Because water is polar:

It is “**cohesive**” that is it sticks to **itself**.



It is “**adhesive**” that is it sticks to **other molecules**.



It is a great **temperature moderator**.

What would be an example of water being a great temperature moderator?

# Example of Water as a Temperature Moderator

National Weather Service Forecast Office  
**San Diego, CA**

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## Forecast at a Glance

For: San Diego Lindbergh Field

Today	Tonight	Thursday	Thursday Night	Friday	Friday Night	Saturday	Saturday Night	Sunday
Patchy Fog	Patchy Fog	Patchy Fog	Mostly Clear	Mostly Sunny	Partly Cloudy	Mostly Cloudy	Partly Cloudy	Partly Cloudy
Hi 66°F PoP 0%	Lo 51°F PoP 0%	Hi 67°F PoP 0%	Lo 51°F PoP 0%	Hi 68°F PoP 0%	Lo 55°F PoP 0%	Hi 60°F PoP 20%	Lo 50°F PoP 20%	Hi 59°F PoP 10%



## Gallup, NM



Enter Your "City, ST" or zip code  Go

NWS Albuquerque, NM

Point Forecast: Gallup, NM  
 35.49N -108.75W (Elev. 6760 ft)

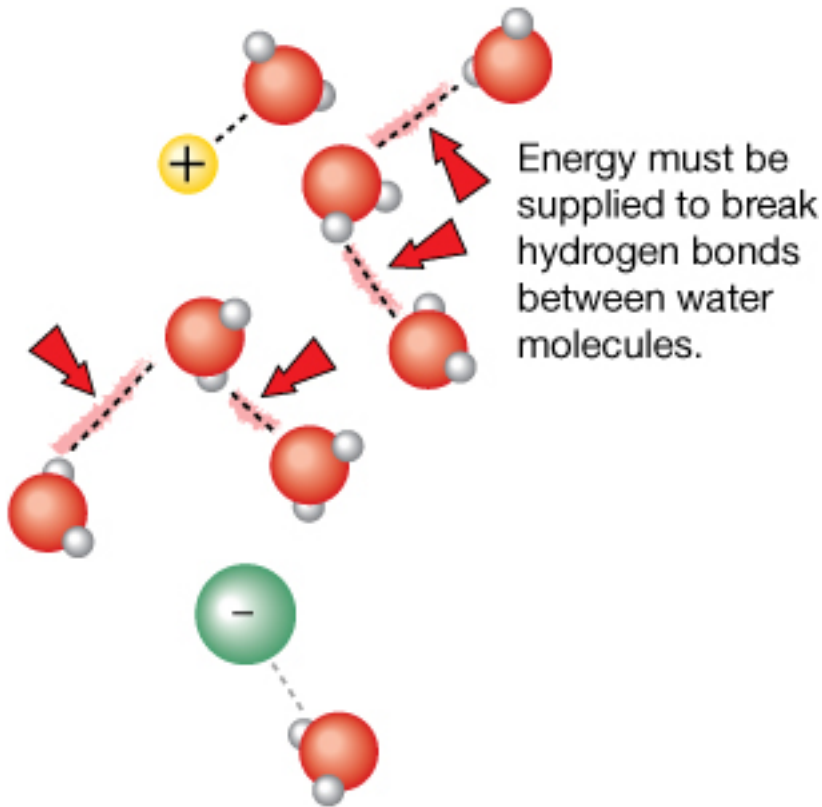
Cell Phone Weather Link: [www.srh.noaa.gov/wml](http://www.srh.noaa.gov/wml)

Last Update: 2:00 pm MST January 11, 2006

## Forecast at a Glance

This Afternoon	Tonight	Thursday	Thursday Night	Friday	Friday Night	Saturday	Saturday Night	Sunday
Mostly Sunny	Partly Cloudy	Mostly Sunny	Mostly Clear	Mostly Sunny	Mostly Clear	Mostly Sunny	Slight Chc Snow	Slight Chc Rain
Hi 54°F	Lo 13°F	Hi 52°F	Lo 0°F	Hi 55°F	Lo 13°F	Hi 59°F	Lo 17°F	Hi 44°F

# Why is water such a great temperature moderator?



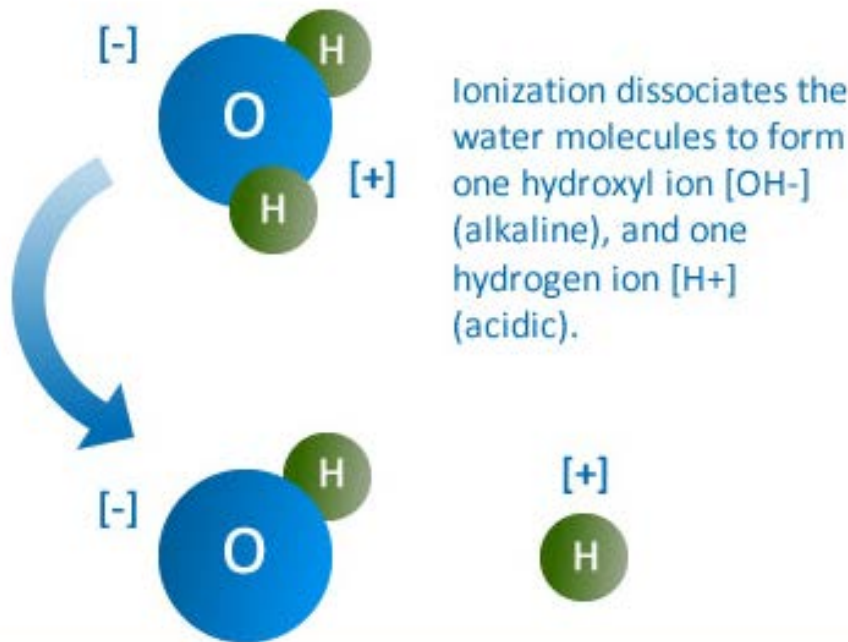
This means it takes extra energy to heat up water. First, energy to break hydrogen bonds and then energy to get molecules moving.

If it takes energy to break hydrogen bonds then it energy must be released when hydrogen bonds are formed.



# 2. pH

- $\text{pH} = -\log$  of the hydrogen ion ( $\text{H}^+$ ) concentration.
- Pure water has neutral pH of 7. Why?



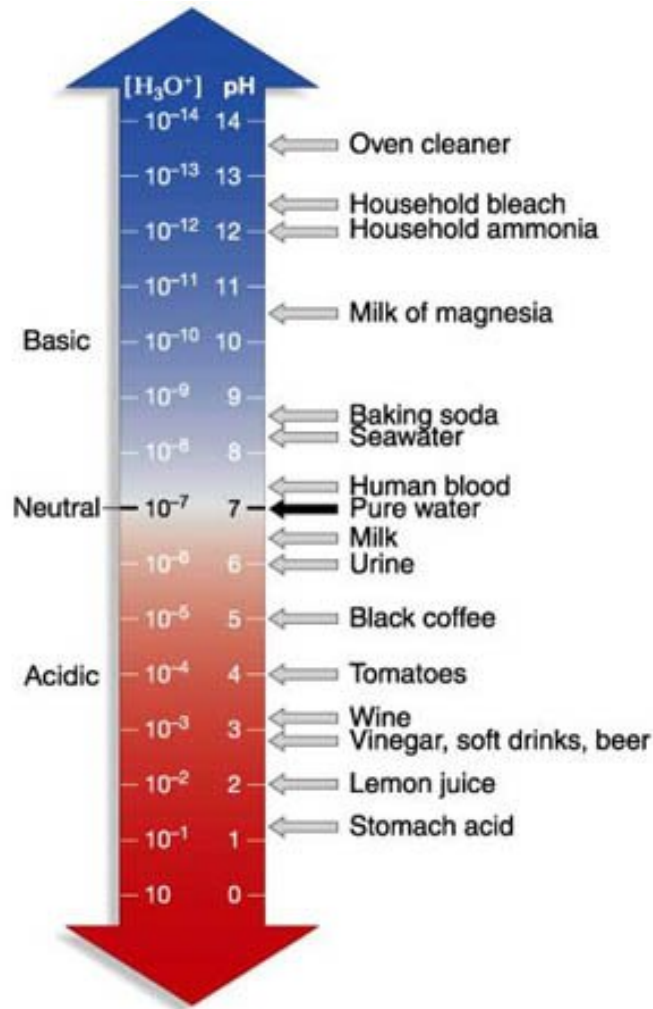
A certain amount of water ionizes. In pure water the  $\text{H}^+ = \text{OH}^-$  so they cancel each other out.

# 2. pH

## Hydrogen Ion (H<sup>+</sup>) Concentration

The higher the pH, the more basic and the lower the H<sup>+</sup> concentration.

The lower the pH, the more acidic and the higher the H<sup>+</sup> concentration.



Each increase is actually a 10X change in pH.

So going from pH 3 to pH 5 would be how big an increase?

100X

PH changes can cause damage to  
cells and molecules.

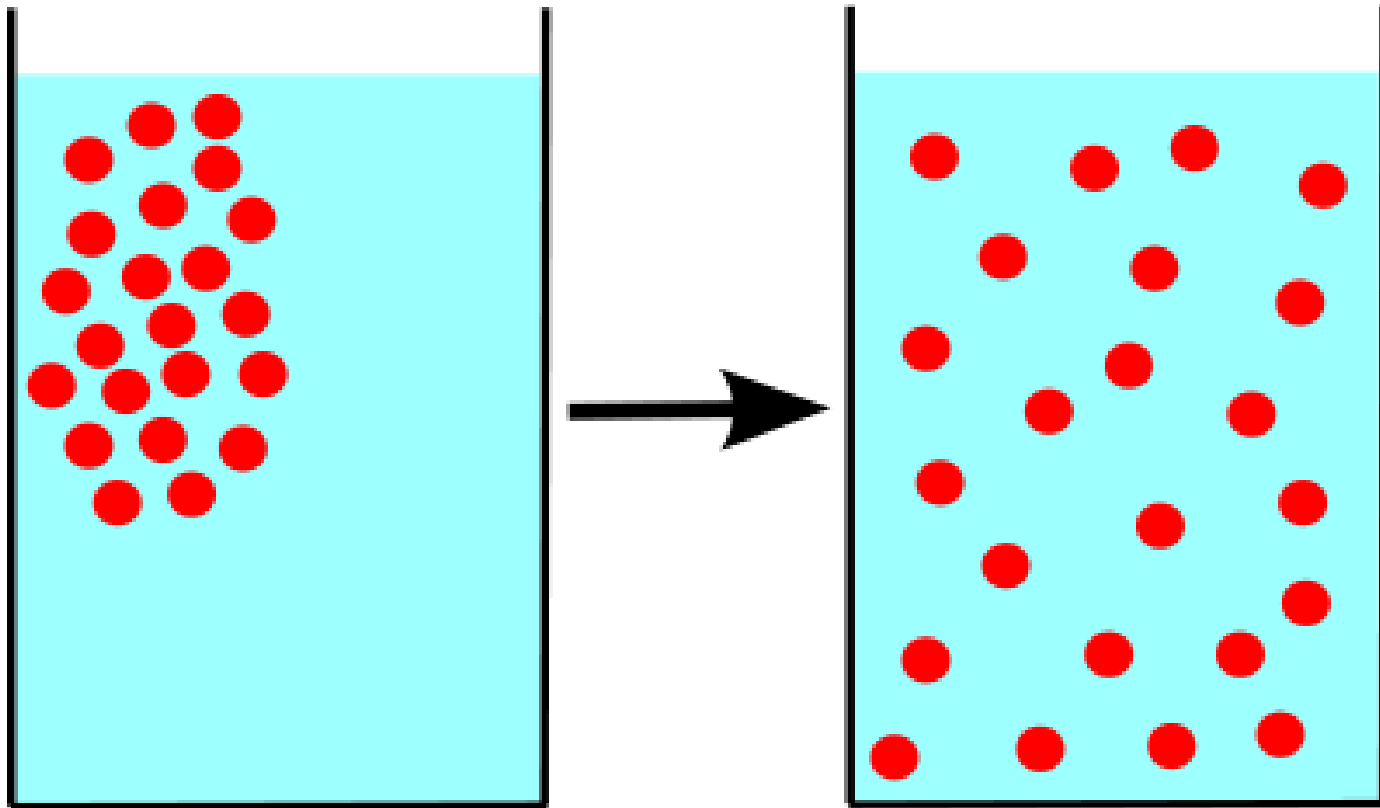
Are you afraid to drink orange juice?

**NO!** Your body has buffers!

Buffers are molecules that help to  
maintain pH even if you add acids or  
bases.

### 3. Diffusion

Molecules going from high to low concentration



# Write a hypothesis for this question:

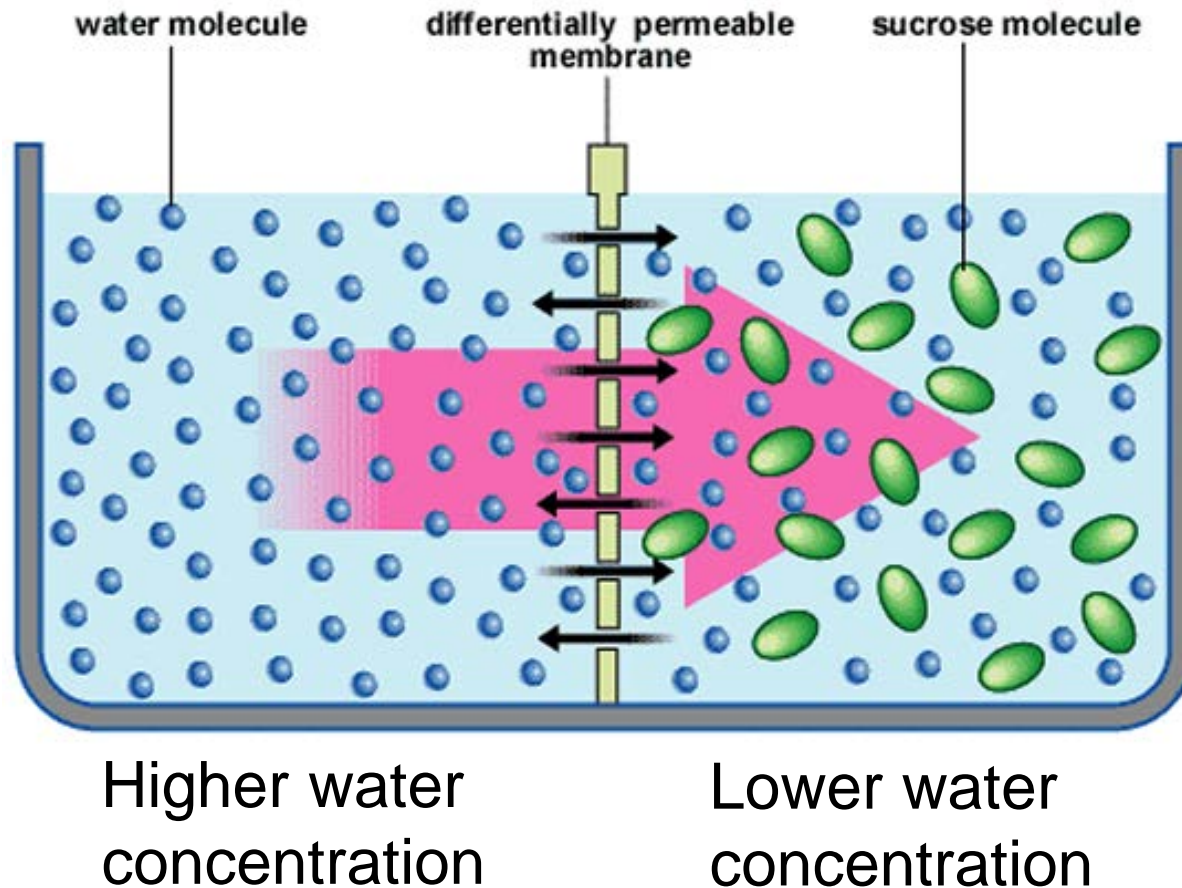
What is the effect of molecular weight on the rate of diffusion?

We will compare methylene blue (mw of 320) and potassium permanganate (mw of 158.)

Measure the diameter of ring of color after 30 minutes and 1 hour.

# 4. Osmosis

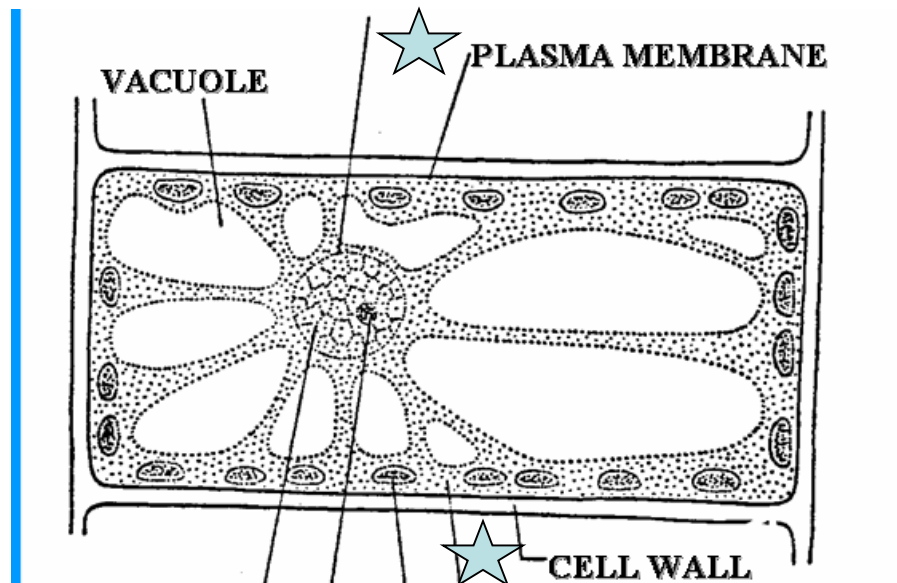
Water Molecules going from high to low concentration across a membrane



Water can cross this membrane but not sucrose.

You will be placing Elodea cells (which, of course, have membranes) in a salt solution.

Elodea is a plant. Remember, plant cells have cell walls that are rigid while plasma membranes are fluid.



# Clean up – please:

- Put all equipment back in its appropriate place.
- Empty beakers from buffer experiment, rinse and turn upside down.
- Put used pH paper in container.
- Wash slide and return and throw away coverslip.
- Wipe down tables and push in chairs.
- Thank you!