

# Unit One: Cellular Biology

## 1. Cell Theory and Characteristics of Life

Done	Task
	<ul style="list-style-type: none"><li>• Characteristics Worksheet</li></ul>

## 2. Rotation Work

Done	Task
	<ul style="list-style-type: none"><li>• Cells Alive - Label and FIB</li><li>• Gizmo - Cell Division</li><li>• Cancer: Historic Views and Animations</li><li>• Cancer: Normal vs Cancer (2 day)</li><li>• **Cancer Flipgrid Reflection</li></ul>

## 3. Enzymes

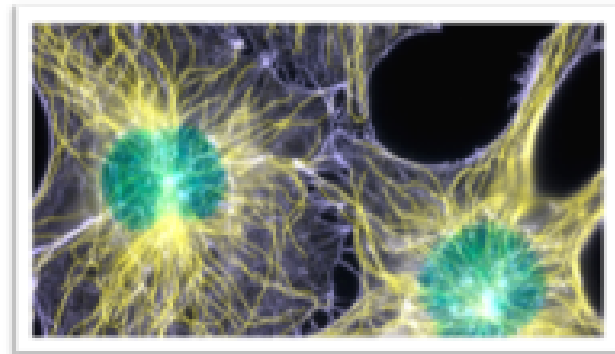
Done	Task
	<ul style="list-style-type: none"><li>• Homework Questions</li><li>• **Gizmo - Enzymes (Claire)</li></ul>

## 4. Macromolecules

Done	Task
	<ul style="list-style-type: none"><li>• Plant Macro and Micromolecules note</li><li>• **Functional Food 1: Take a Stand</li><li>• **Functional Food 2: GM Functional Foods</li></ul>

## 5. Cellular Transport

Done	Task
	<ul style="list-style-type: none"><li>• Notes from Videos</li><li>• **Gizmo - Osmosis (Clark)</li></ul>



# Enzyme: Reflection on Learning

- How does an enzyme affect the activation energy needed for an exothermic reaction?
- Do enzymes work at all temperatures and pHs?  
Why?
- Will any molecule fit into the active site of an enzyme?
- Are catalysts used up as they help speed up a reaction?
- Why do living things need catalysts to function properly?

# Plant and Animal Cell Organelles

Eukaryotes (protozoa, plants and animals) have highly-structured cells. These cells tend to be larger than the cells of bacteria and have developed specialized packaging and transport mechanisms that may be necessary to support their larger size.

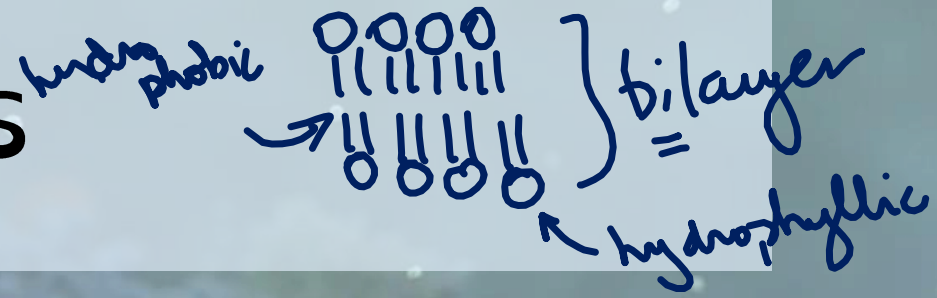
**Nucleus:** The nucleus is the most obvious organelle in any eukaryotic cell. It is enclosed in a **double membrane** and communicates with the surrounding cytosol via numerous nuclear pores. Within each nucleus is nuclear **chromatin** that contains the organism's genome. The chromatin is efficiently packaged within the small nuclear space. Genes within the chromatin are made of **deoxyribonucleic acid (DNA)**. The DNA stores the organism's entire encoded genetic information. The DNA is similar in every cell of the body, but depending on the specific cell type, some genes may be turned on or off - that's why a liver cell is different from a muscle cell, and a muscle cell is different from a

A detailed 3D rendering of a cell, likely a eukaryote, showing various organelles and structures. The cell is depicted with a complex, multi-layered surface and internal components. The background is a dark, textured surface with various colored particles and structures, suggesting a microscopic environment. The overall color palette is dominated by blues, purples, and oranges.

# Cellular Transport

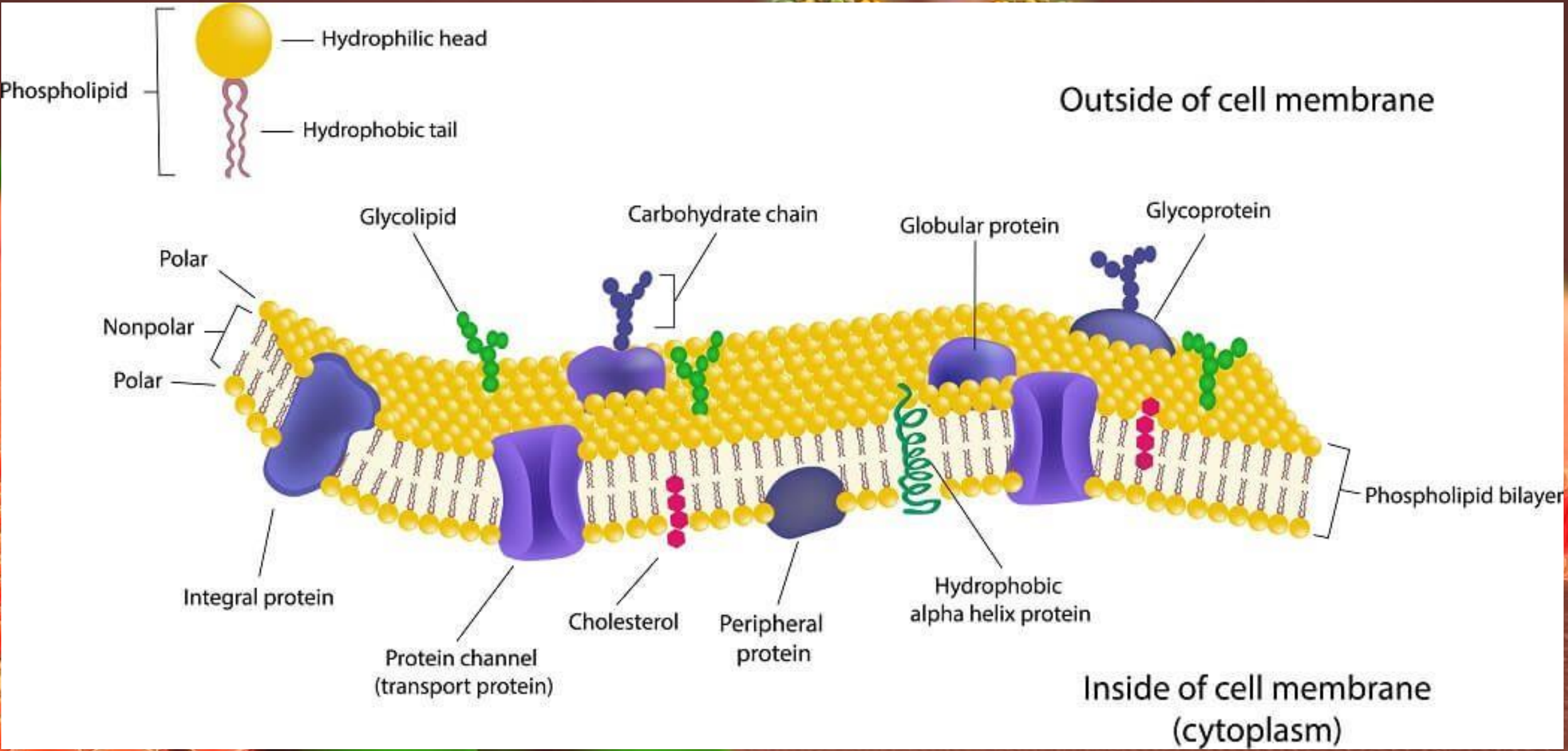
Inside and Outside

# Membrane Components



These components work together to allow the **membrane** to function:

- to **protect the cell from its environment**,
- to **select which substances can enter or leave the cell**,
- to **allow cell-to-cell communication**,
- to **perform** specific biochemical **reactions**.



# Selectivity

- Current focus will be on the membrane's ability to select which substances can enter or leave the cell.
- This **selectivity** of the membrane means that it is to **substrates: impermeable to some but permeable to others**.
- Selectivity allows the cell to establish an **internal environment that is suitable for biological processes** to occur.

# Selectivity

- This internal balance is sometimes called an equilibrium.
- \*\* However, in many cases, homeostasis does not mean that the equilibrium is the same between the inside and exterior of the cell.



# Spontaneous Movement

- Often it's convenient to use words like “need” or “want” to describe the action of these molecules.
- But this is not an accurate way to interpret molecular interactions
- Some truths...
  - Biochemical reactions either use or release energy.
  - in general, order and organization decreases over time.

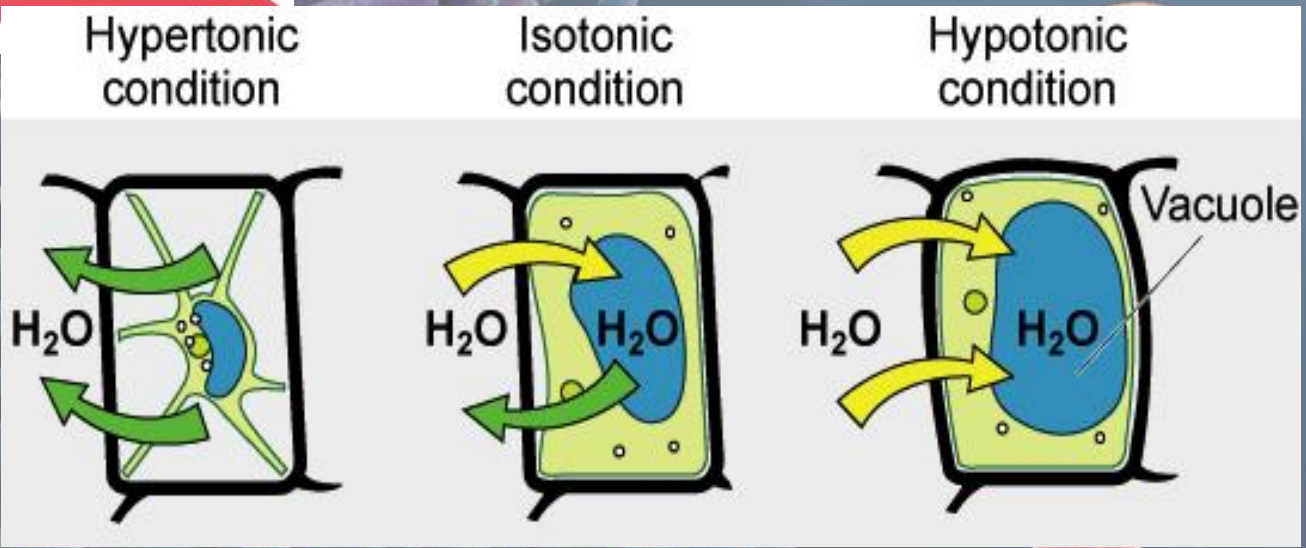
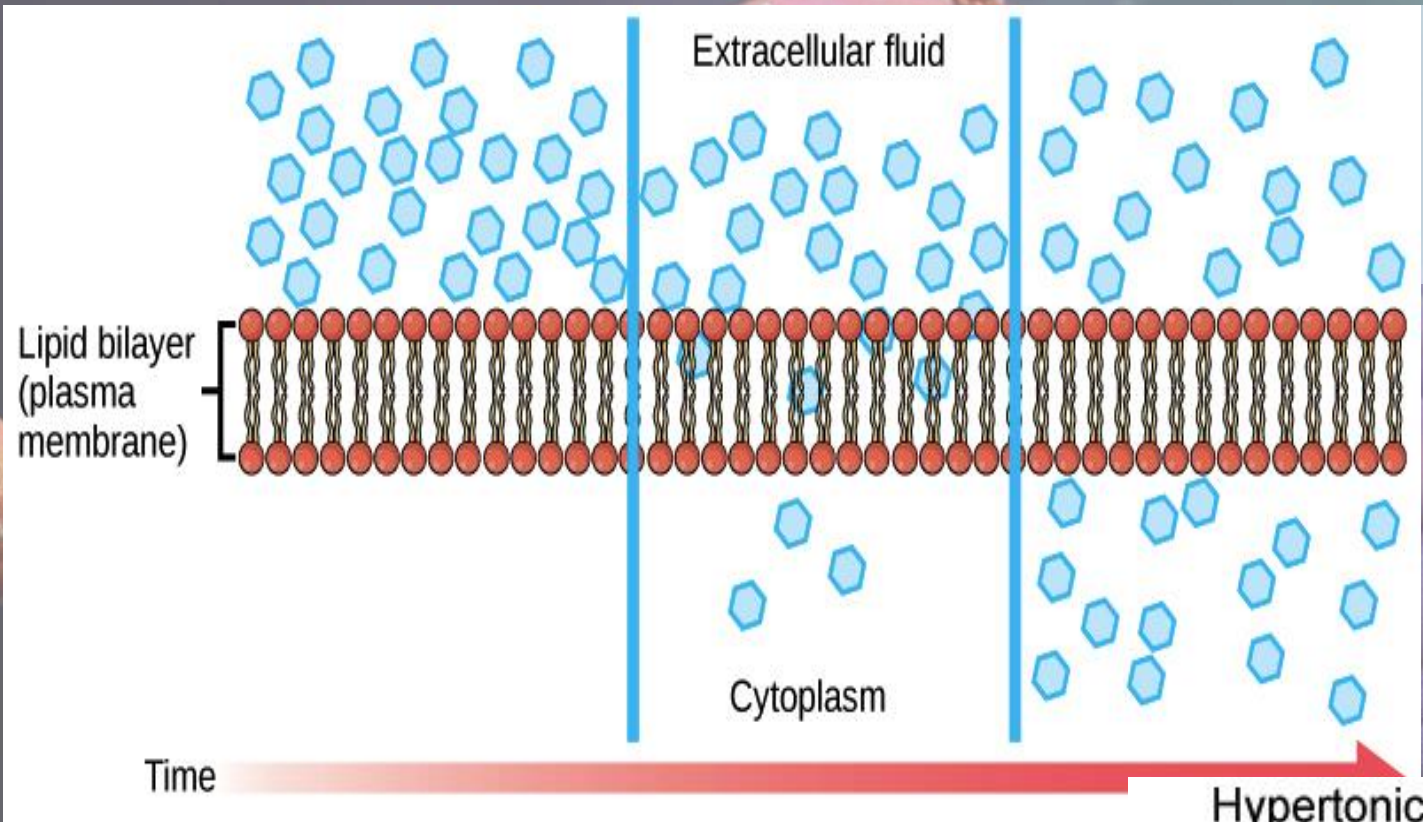
# Spontaneous Movement



- In Biology, many biochemical processes and structures work against this disorganization: cells are far more complex and precisely arranged than a puddle of biological molecules.

# Passive Transport

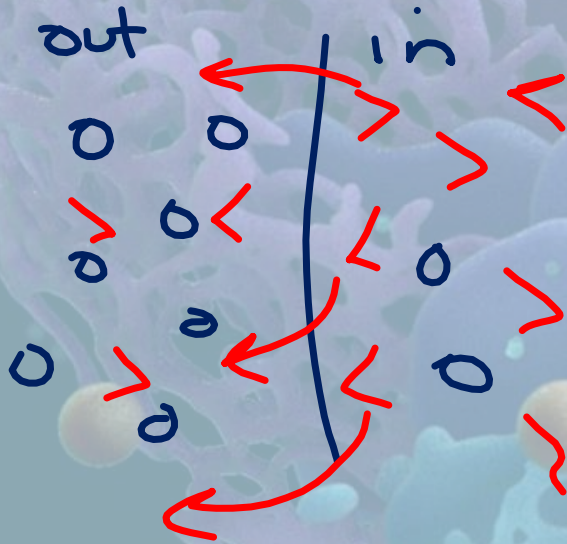
- Does **NOT require energy** to occur!
- **Diffusion**
- **Osmosis** (special – movement of water)
- Both processes involve molecules **moving** from an area of **higher concentration to lower concentration**. We can also say more simply that the molecules are moving along their concentration gradient.



# Osmosis

→ thing that dissolved

- Water moves towards the side of the membrane with greater solute concentration.
- This water movement attempts to 'even out' the concentration of the solute.



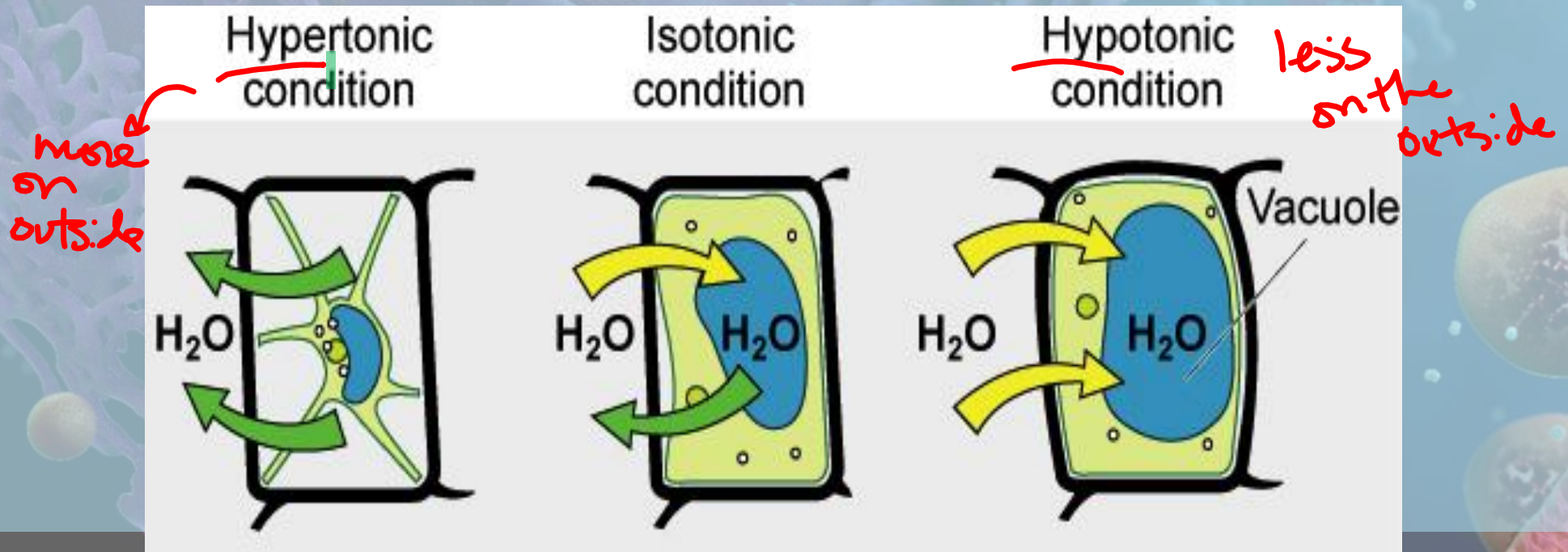
# Osmosis

The concentration of solutes on either side can be described qualitatively as:

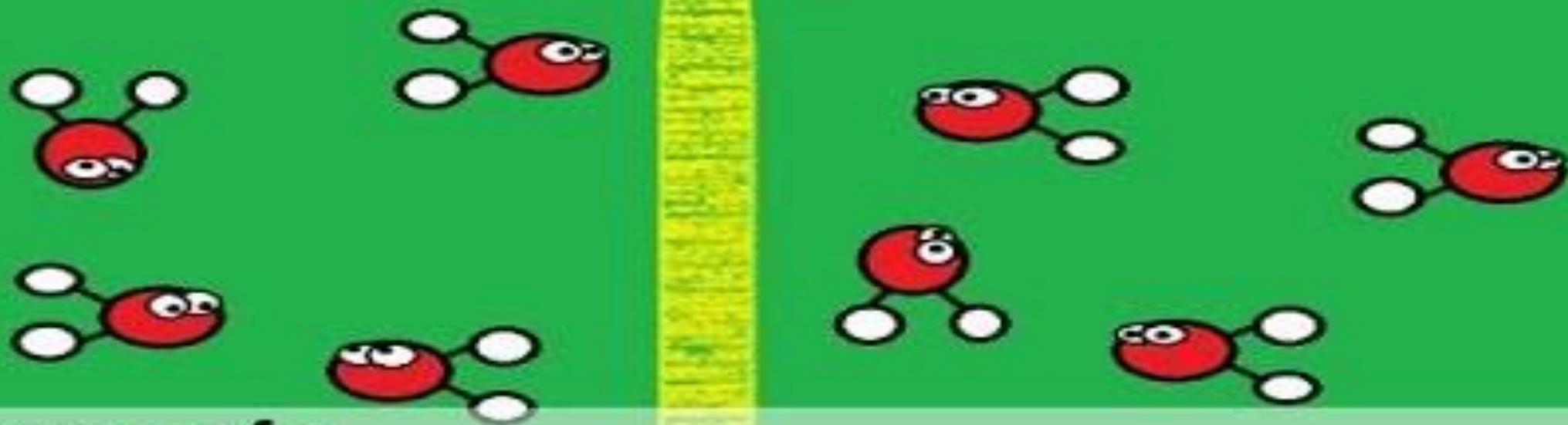
- **hypertonic** - a solution with **greater solute concentration** than inside a cell,
- **hypotonic** - a **solution with lesser solute concentration** than inside a cell, or
- **isotonic** - a solution with **equal concentration of solutes** as inside a cell.

# Osmosis

- Water is helped to move across a membrane with special integral **membrane proteins called aquaporins.**



SEMIPERMEABLE  
MEMBRANE



# Osmosis

With the Amoeba Sisters

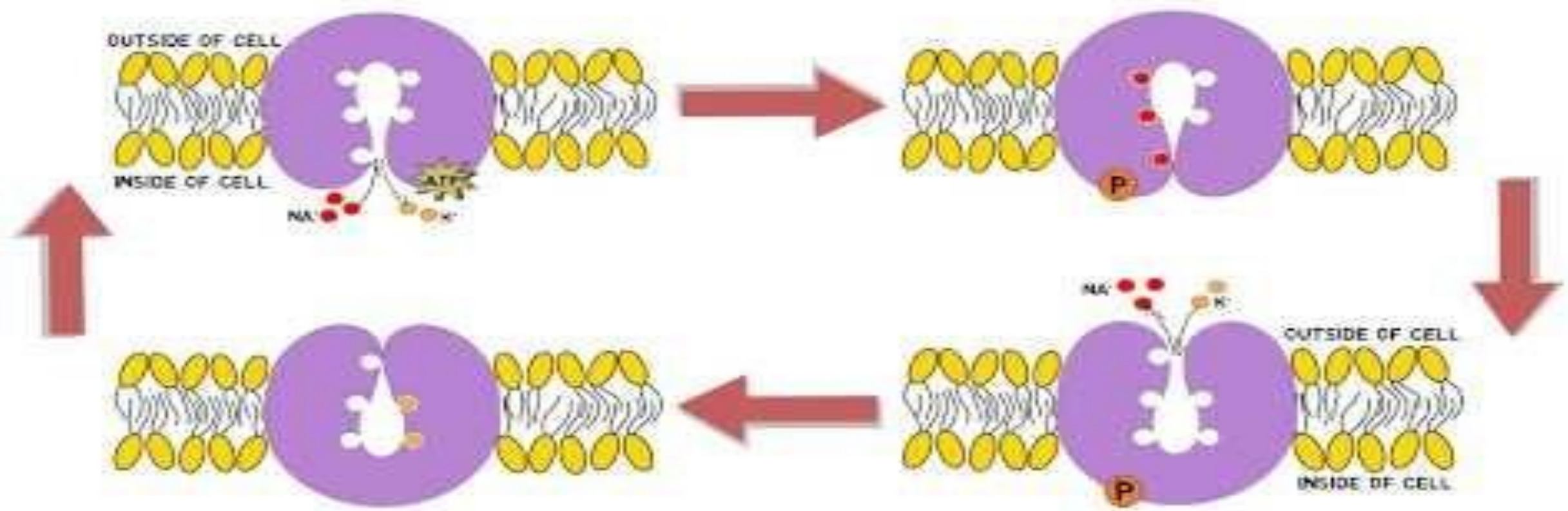


# Active (Facilitated) Transport

- Other biological molecules are too large or too hydrophilic to pass through the semi-permeable membrane.
- Instead, proteins in the phospholipid bilayer allow for them to pass through
- Some of the facilitated transporters are like channels... they can be gated or non-gated.
- Does REQUIRE energy!! In Biological terms the energy packets are ATP (adenosine triphosphate)

# SODIUM-POTASSIUM PUMP CYCLE

-USES ATP TO TRANSPORT SODIUM AND POTASSIUM IONS ACROSS THE CELL MEMBRANE



# Membranes and Homeostasis

- Passive - Water in to roots of a plant or exchange of oxygen/carbon dioxide in lungs...
- Homeostasis often uses active transport in order to maintain the correct balance of biological molecules inside and outside of cells.
- Most cells move sodium ions out and potassium ions in.
- The process works against a concentration gradient so energy in the form of ATP is used to drive this movement.

# Test Ideas

## Test Make Up...

- Short Answer
- Diagrams

- Cell organelles and their jobs (general)
  - Ex. Mitochondria is the powerhouse of cell
  - Cell membrane is a double phospholipid
- Types of Transport
  - Facilitate, active and passive transport
  - Osmosis
  - Isotonic, hypertonic and hypotonic
- Macromolecules
  - monomer, polymer
  - Lipids are fats, CHO make up carbohydrates
- Mitosis
  - Name stages and describe
- Enzyme
  - Lock/Key – Induced Fit
  - Conditions for optimal function
  - Denature
- \*\*Cancer
  - Information will be demonstrated in a podcast...