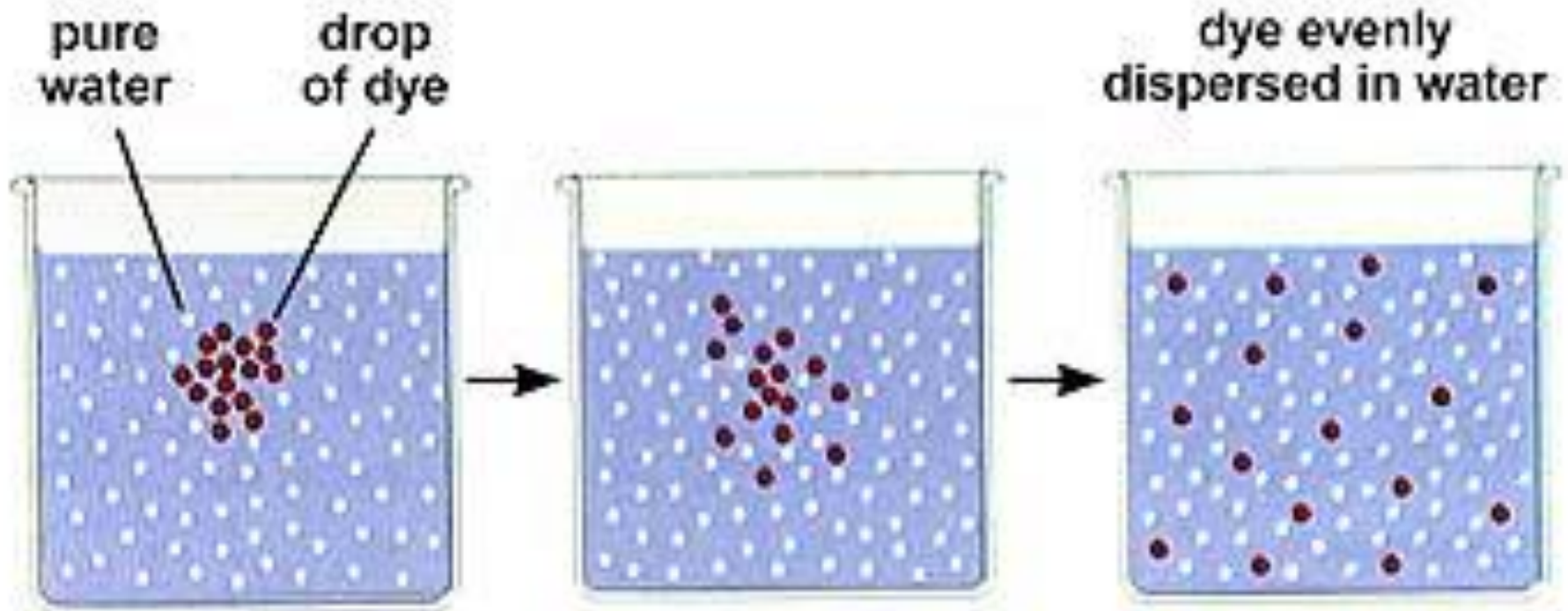


PASSIVE TRANSPORT

- **cell uses no energy**
- molecules move randomly
- Molecules spread out **from an area of high concentration to an area of low concentration.**
- (High → Low)
- **Three types:**
 - **Diffusion**
 - **Facilitative Diffusion** – diffusion with the help of transport proteins
 - **Osmosis** – diffusion of water

Osmosis is Diffusion but
Diffusion is not Osmosis...
WHY?

DIFFUSION

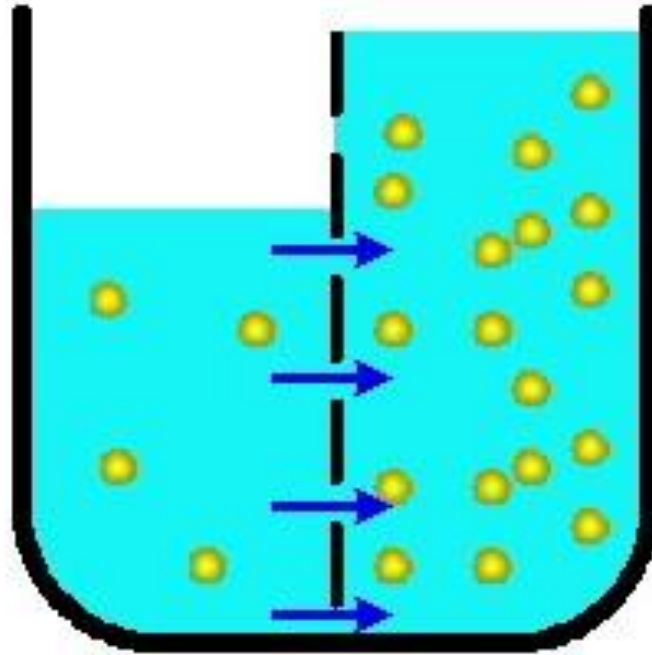


OSMOSIS

- **OSMOSIS:**

- DIFFUSION OF WATER THROUGH A SELECTIVELY PERMEABLE MEMBRANE, MOVING WATER FROM AN AREA OF HIGH CONCENTRATION TO AN AREA OF LOW CONCENTRATION
- HOW IT WORKS:
 - ✦ WATER MOVES THROUGH A MEMBRANE THAT MOLECULES CANNOT GET THROUGH.
 - ✦ IF YOU HAVE A GLASS OF SUGAR WATER AND YOUR SUGAR HAS A HIGHER CONCENTRATION ON ONE SIDE AND A LOWER CONCENTRATION ON THE OTHER SIDE THE WATER IS GOING TO MOVE FROM THE SIDE OF LOWER CONCENTRATION OF SUGAR TO THE SIDE OF HIGH CONCENTRATION OF SUGAR

OSMOSIS



Osmosis

(Water moves by
concentration gradient)

RESULTS OF MEMBRANE TRANSPORT

- **ISOTONIC:**

- “SAME STRENGTH” (DYNAMIC EQUILIBRIUM)
- THE CONCENTRATION OF THE SOLUTES IS THE SAME INSIDE AND OUTSIDE THE CELL

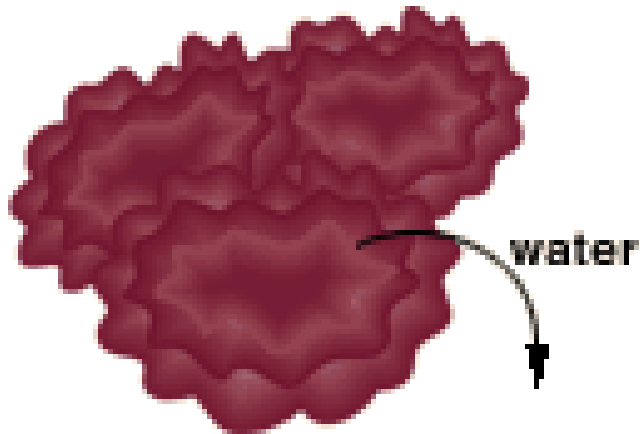
- **HYPERTONIC:**

- “ABOVE STRENGTH”
- SOLUTION HAS A HIGHER SOLUTE CONCENTRATION THAN THE CELL, CAUSING WATER TO LEAVE THE CELL AND IT TO SHRIVLE (PLASMOLYSIS)

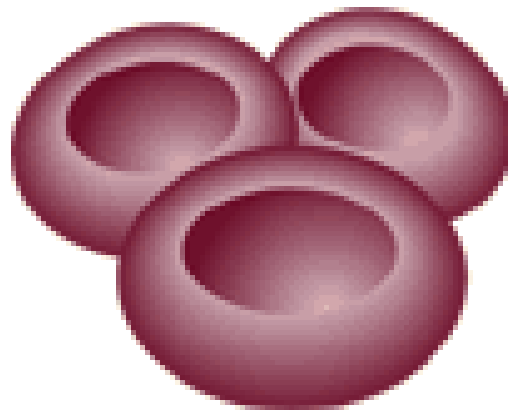
- **HYPOTONIC:**

- “BELOW STRENGTH”
- SOLUTION HAS A LOWER SOLUTE CONCENTRATION THAN THE CELL, CAUSING WATER TO ENTER THE CELL AND IT TO SWELL (CYTOLYSIS)

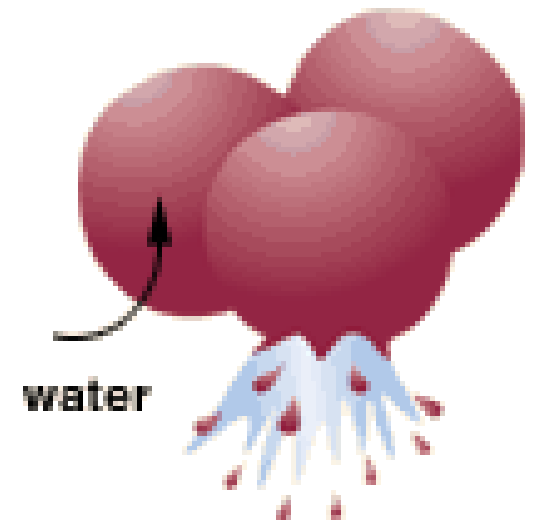
Hypertonic



Isotonic



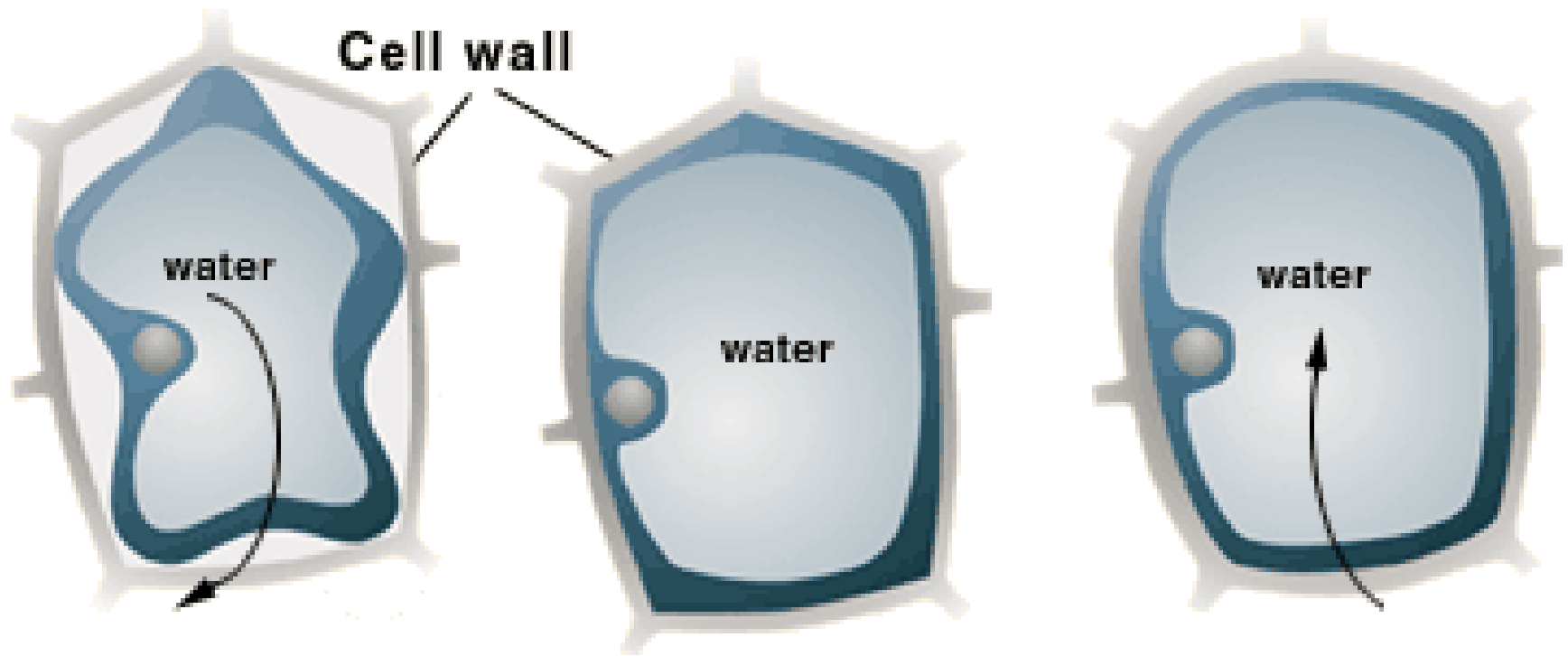
Hypotonic



Hypertonic

Isotonic

Hypotonic



OSMOTIC PRESSURE

- **CAN BE DANGEROUS**

- FOR CELLS THAT DO NOT COME INTO NORMAL CONTACT WITH FRESH WATER OSMOSIS CAN CAUSE A CELL TO BECOME SWOLLEN WITH WATER AND EVENTUALLY BURST
- LUCKILY ANIMAL CELLS DO NOT COME INTO CONTACT WITH FRESH WATER, MOST OF OUR CELLS ARE IN A LIQUID SUITABLE FOR THE CELL TO SURVIVE
 - ✦ ANIMAL CELLS ARE CONTAINED IN LIQUID SUCH AS BLOOD
- PLANT CELLS ARE ALWAYS IN CONTACT WITH FRESH WATER, WHICH IS ANOTHER IMPORTANT REASON THEY CONTAIN A CELL WALL
 - ✦ THE CELL WALL KEEPS THE CELL FROM SWELLING AND EXPLODING

DEALING WITH OSMOSIC PRESSURE

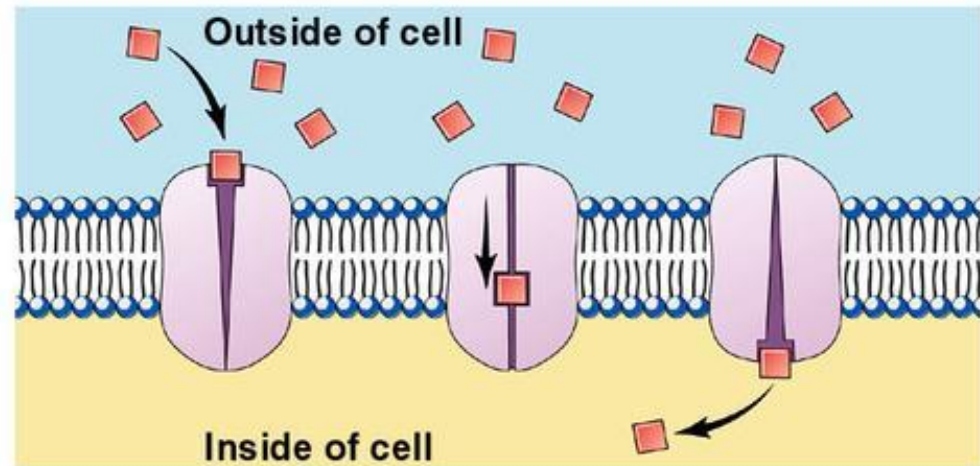
- Bacteria and plants have cell walls that prevent them from over-expanding. In plants the pressure exerted on the cell wall is called turgor pressure.
- A protist like paramecium has contractile vacuoles that collect water flowing in and pump it out to prevent them from over-expanding.
- Salt water fish pump salt out of their specialized gills so they do not dehydrate.
- Animal cells are bathed in blood. Kidneys keep the blood isotonic by remove excess salt and water.

FACILITATED DIFFUSION

- **Facilitated diffusion:** diffusion of specific particles through transport proteins found in the membrane
 - a. Transport Proteins are specific – they “select” only certain molecules to cross the membrane
 - b. Transports larger or charged molecules

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Facilitated Diffusion



FACILITATED DIFFUSION

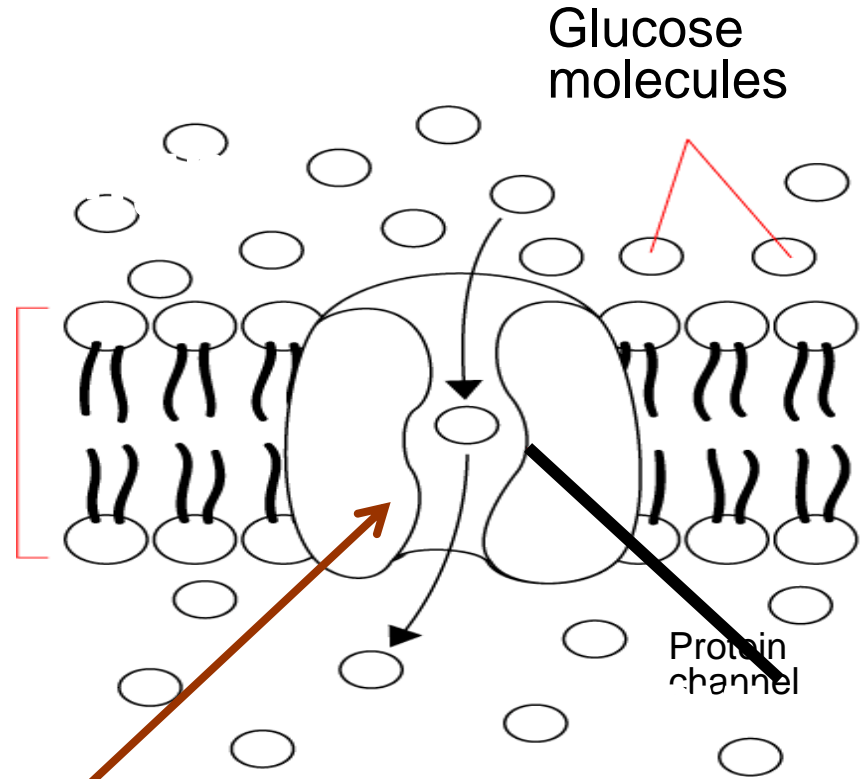
High Concentration

Cell Membrane

Low Concentration

Through a →

Transport Protein

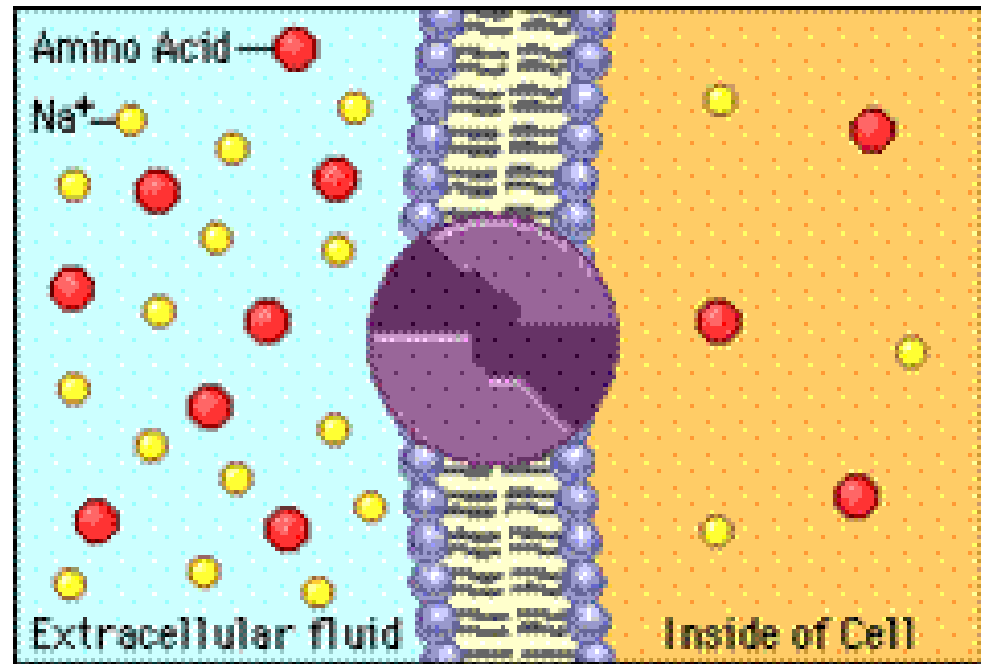


ACTIVE TRANSPORT

- cell **uses energy**
- actively moves molecules to where they are needed
- Movement **from an area of low concentration to an area of high concentration**
- **(Low → High)**
- Three Types:
 - PROTEIN PUMPS
 - ENDOCYTOSIS
 - EXOCYTOSIS

ACTIVE TRANSPORT

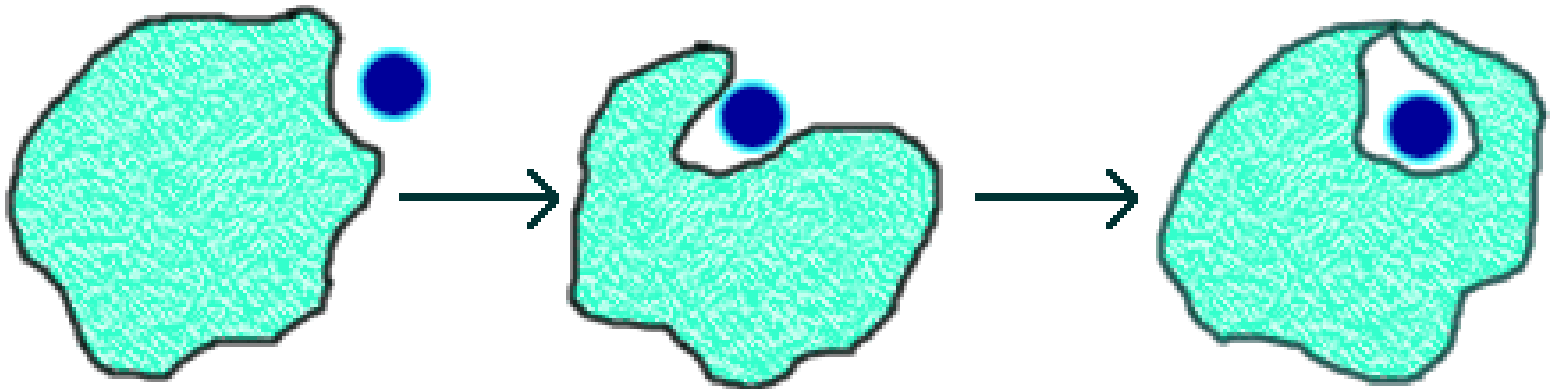
- **Protein Pumps** - transport proteins that require energy to do work
 - Energy is required due to the proteins changing shape.
 - Example: Sodium / Potassium Pumps are important in nerve responses.



ACTIVE TRANSPORT

- **Endocytosis:** taking bulky material into a cell
 - Uses energy
 - Cell membrane in-folds around food particle
 - “*cell eating*”
 - forms food vacuole & digests food
 - This is how white blood cells eat bacteria!

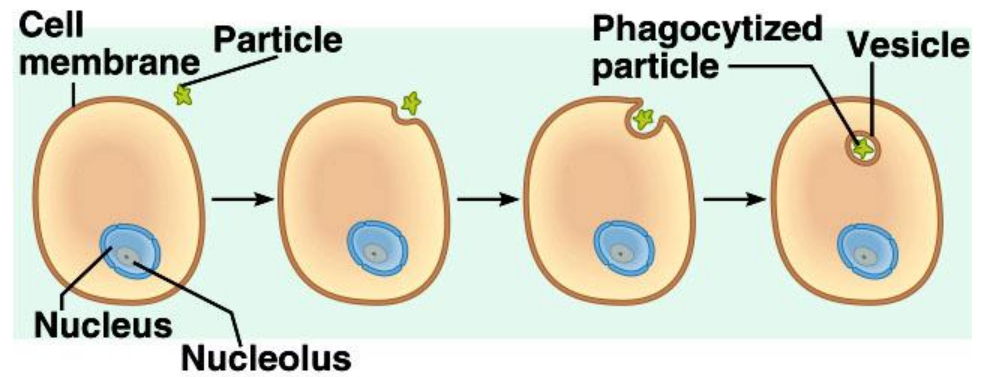
Endocytosis



ACTIVE TRANSPORT

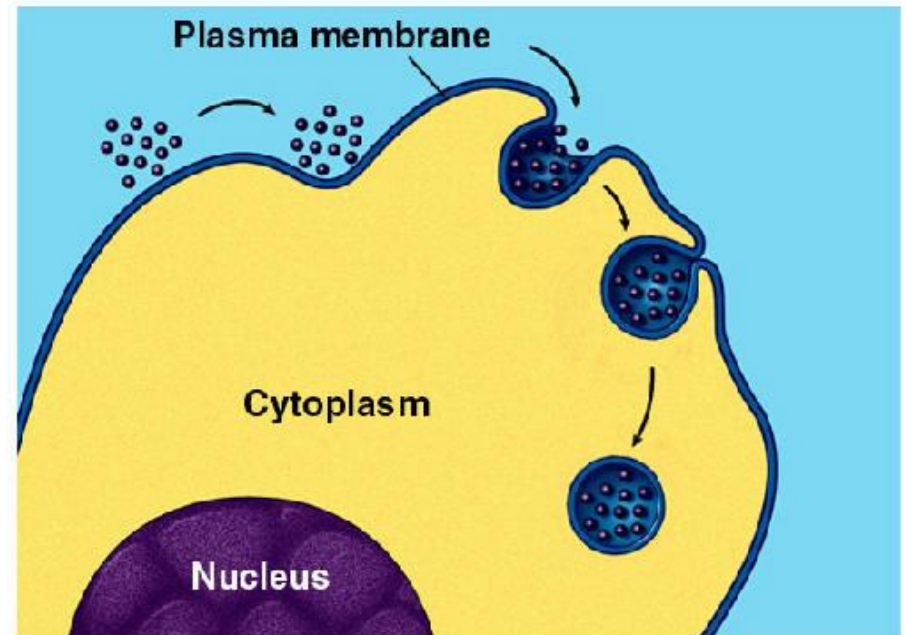
- PHAGOCYTOSIS
 - “CELL EATING”
 - EXTENSIONS OF THE CYTOPLASM SURROUND A PARTICLE AND PACKAGE IT WITHIN A FOOD VACUOLE

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- **PINOCYTOSIS**
 - “CELL DRINKING”
 - TAKING UP OF LIQUID IN THE SURROUNDING ENVIRONMENT BY TINY POCKETS FORMING ALONG THE MEMBRANE CREATING VACUOLES

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Endocytosis – Pinocytosis



ACTIVE TRANSPORT

. Exocytosis: Forces material out of cell in bulk

- membrane surrounding the material fuses with cell membrane
- Cell changes shape – requires energy
- EX: Hormones or wastes released from cell

