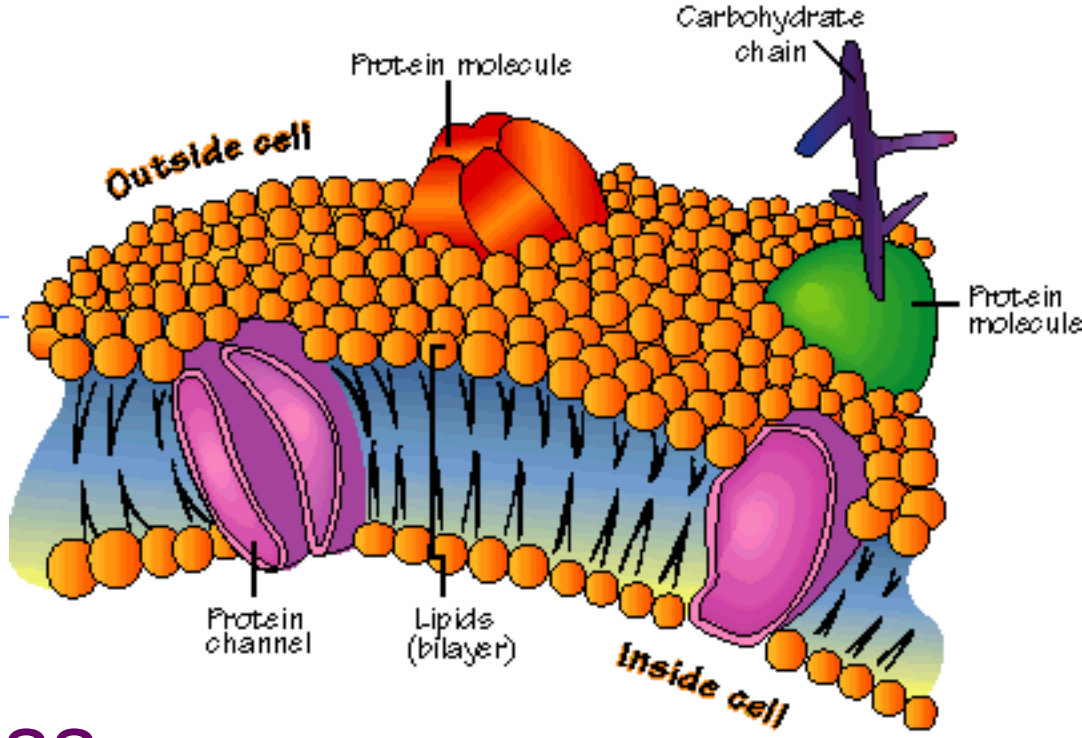
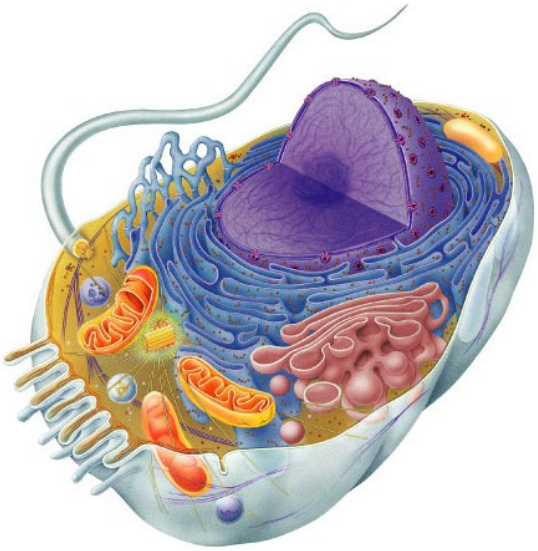


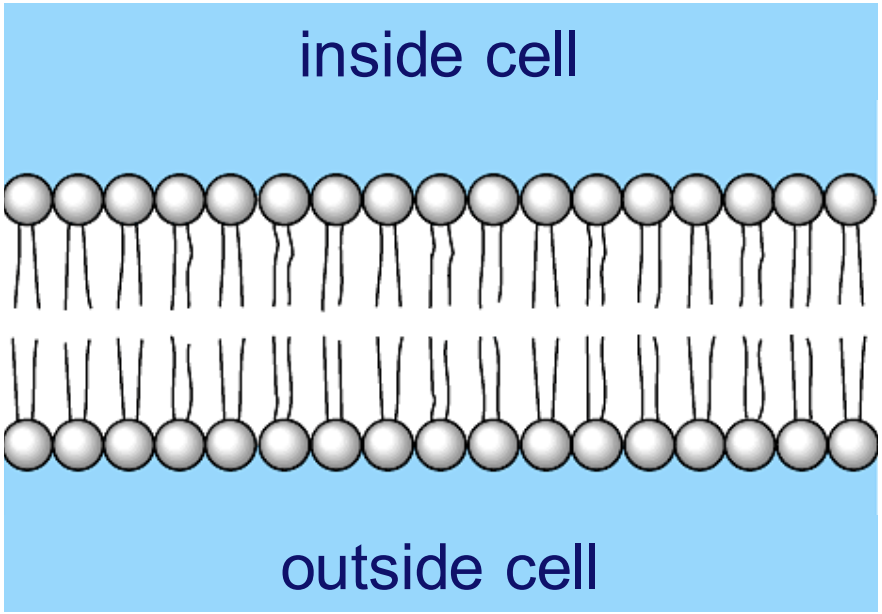
Transport

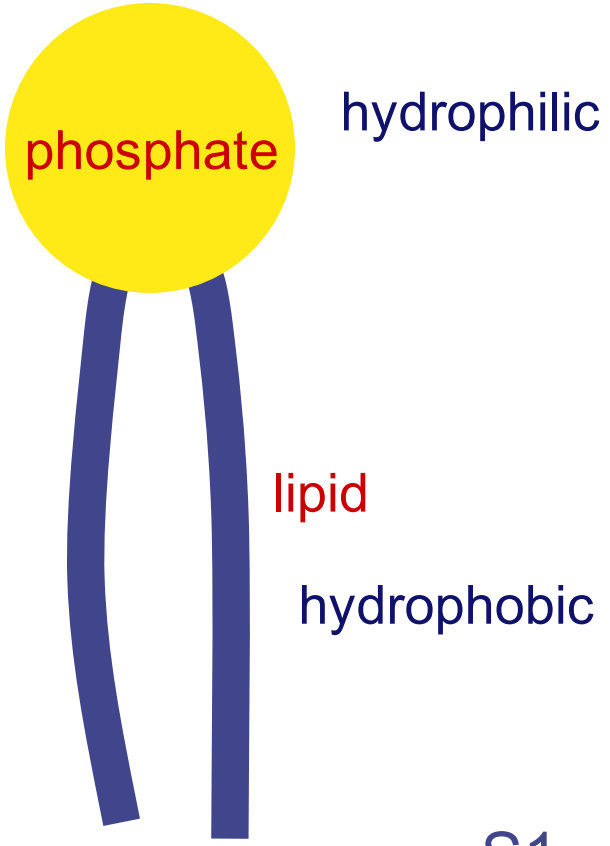
Movement across the Cell Membrane



Lipids of cell membrane

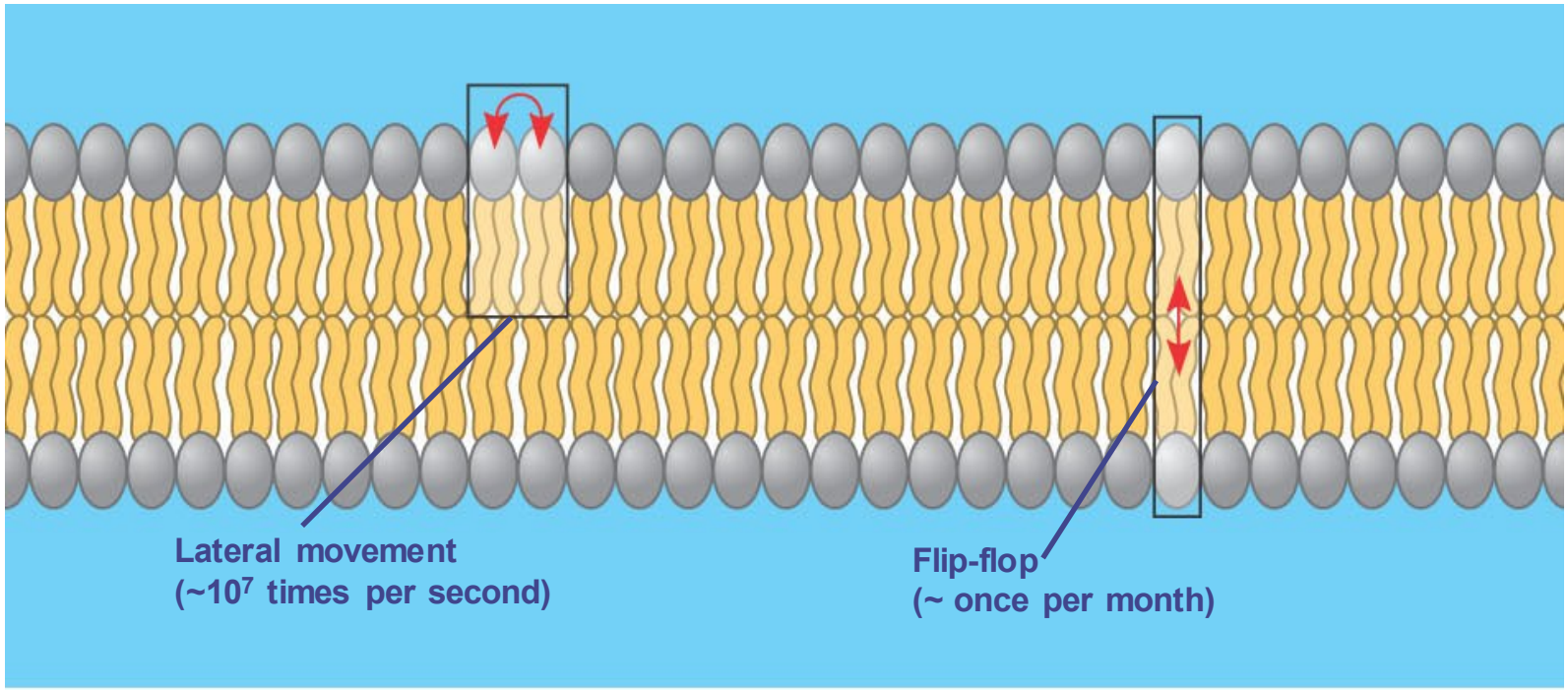
- Membrane consists primarily of phospholipids
  - phospholipid bilayer





The Fluidity of Membranes

- Phospholipids in the membrane are
- fluid – like (can move easily)

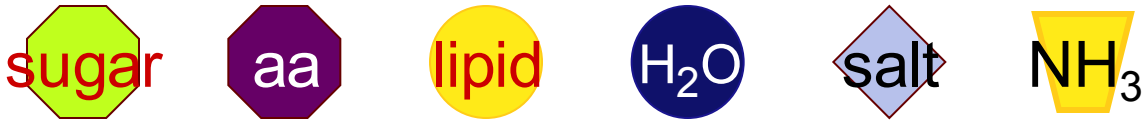


(a) Movement of phospholipids

Figure 7.5 A

Semi-permeable membrane

- Will allow passage through the membrane
- But need to control what gets in or out
  - membrane is semi-permeable

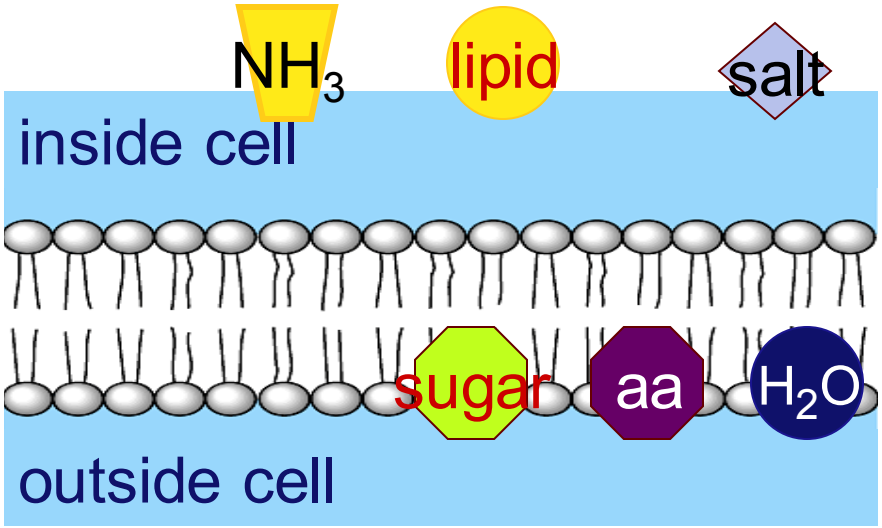


So how does a semi-permeable membrane work?

Phospholipid bilayer

- What molecules can get through directly?

Small lipids can slip directly through the phospholipid cell membrane.

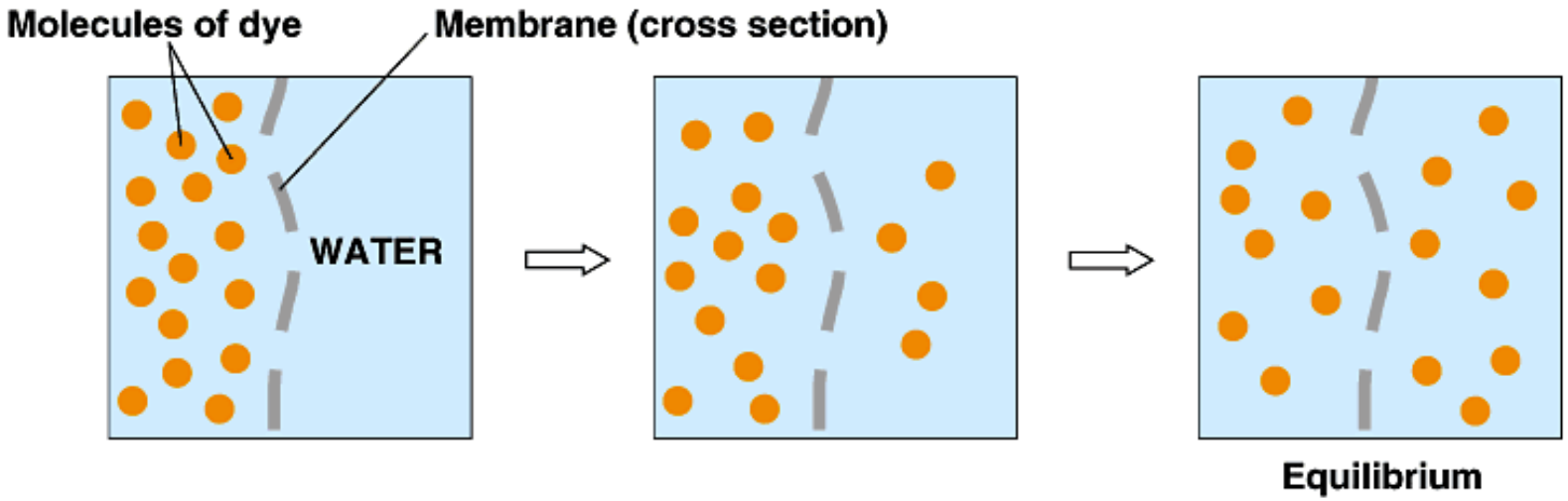


Getting through cell membrane

- Diffusion
  - Movement of molecules from a high concentration to a low concentration until it's equal
- Facilitated Diffusion
  - transport of larger molecules
  - through a protein channel
    - Movement from high → low
- Active transport
    - Movement from low → high
  - uses a protein channel (pump)
  - requires ATP energy

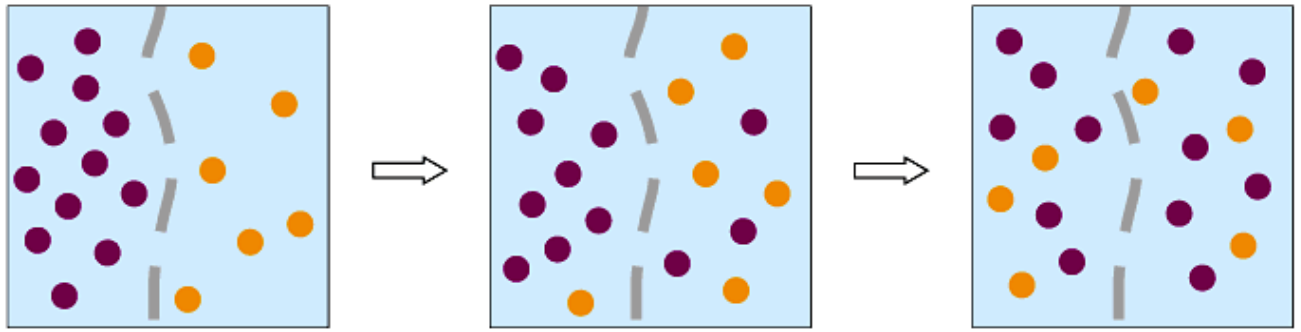
Diffusion (passive transport)

- movement from high → low concentration



Diffusion of two solutes (passive)

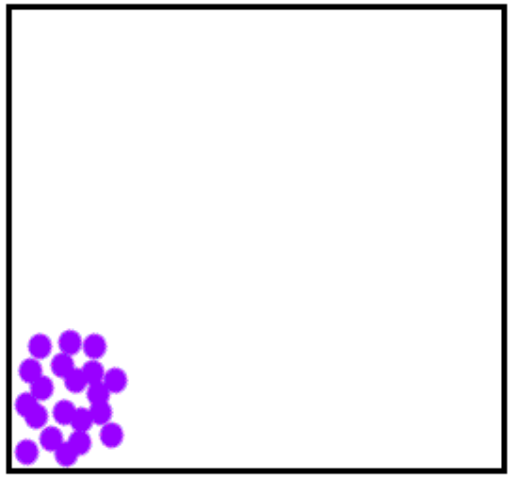
- Each substance diffuses down its *own* concentration gradient, independent of concentration gradients of other substances



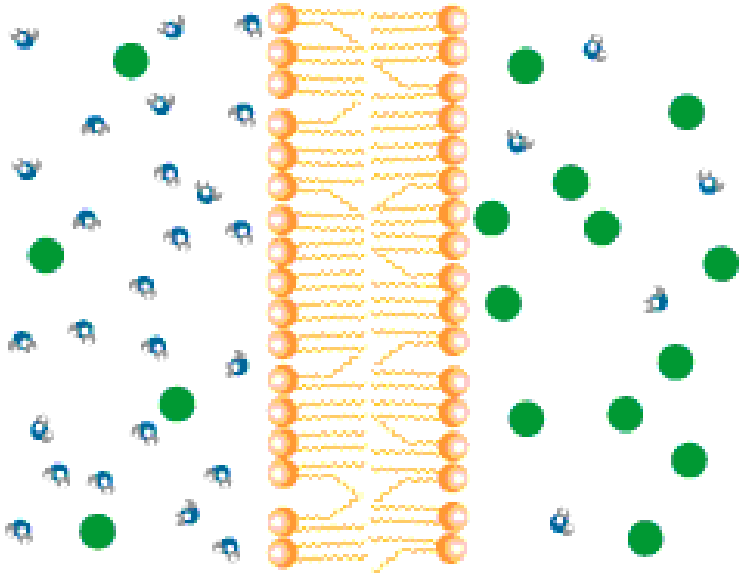
(b) Diffusion of two solutes

Osmosis, the diffusion of water

- Water goes from HIGH to LOW concentration
  - "passive transport"
  - no energy needed (does not require ATP)



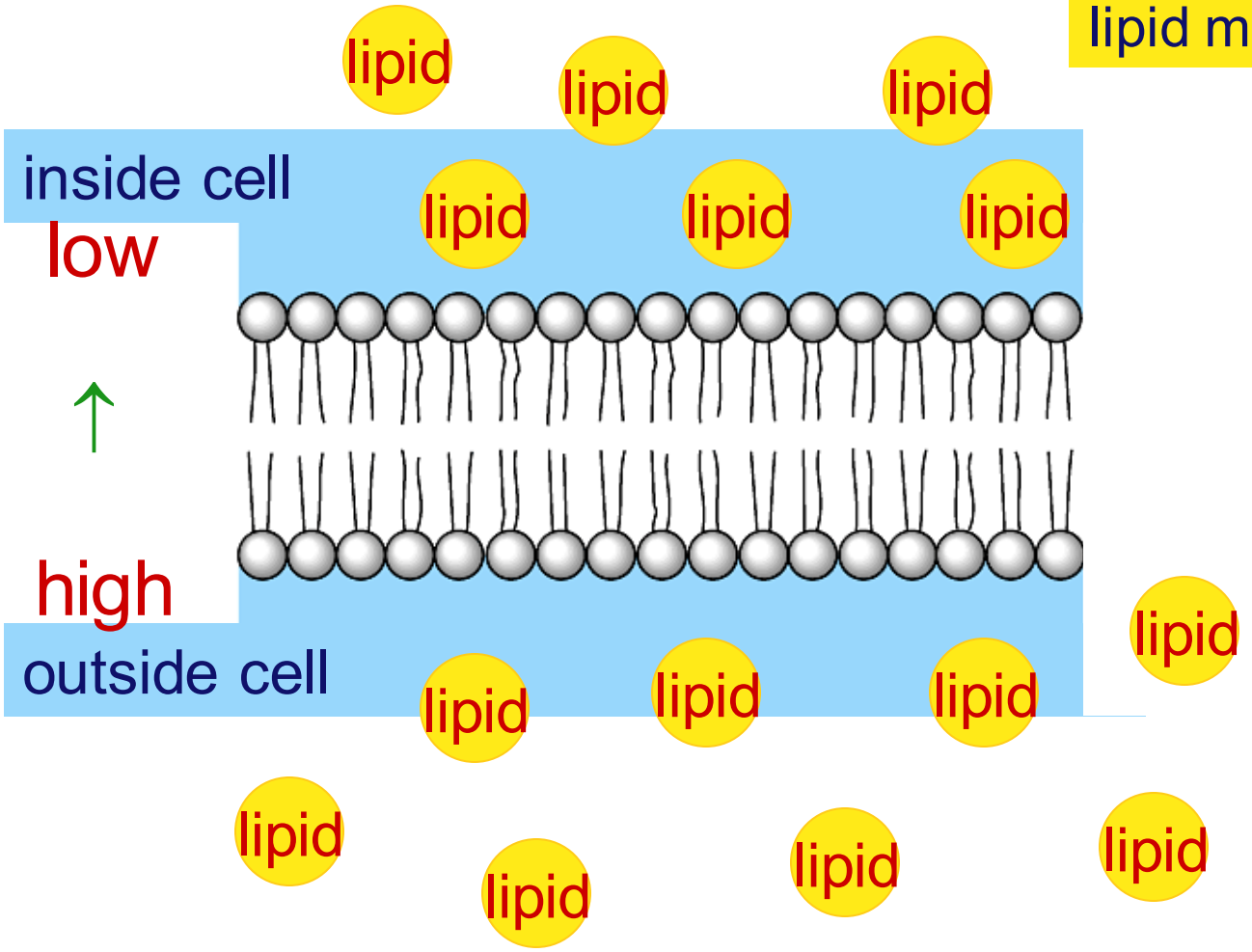
diffusion



osmosis

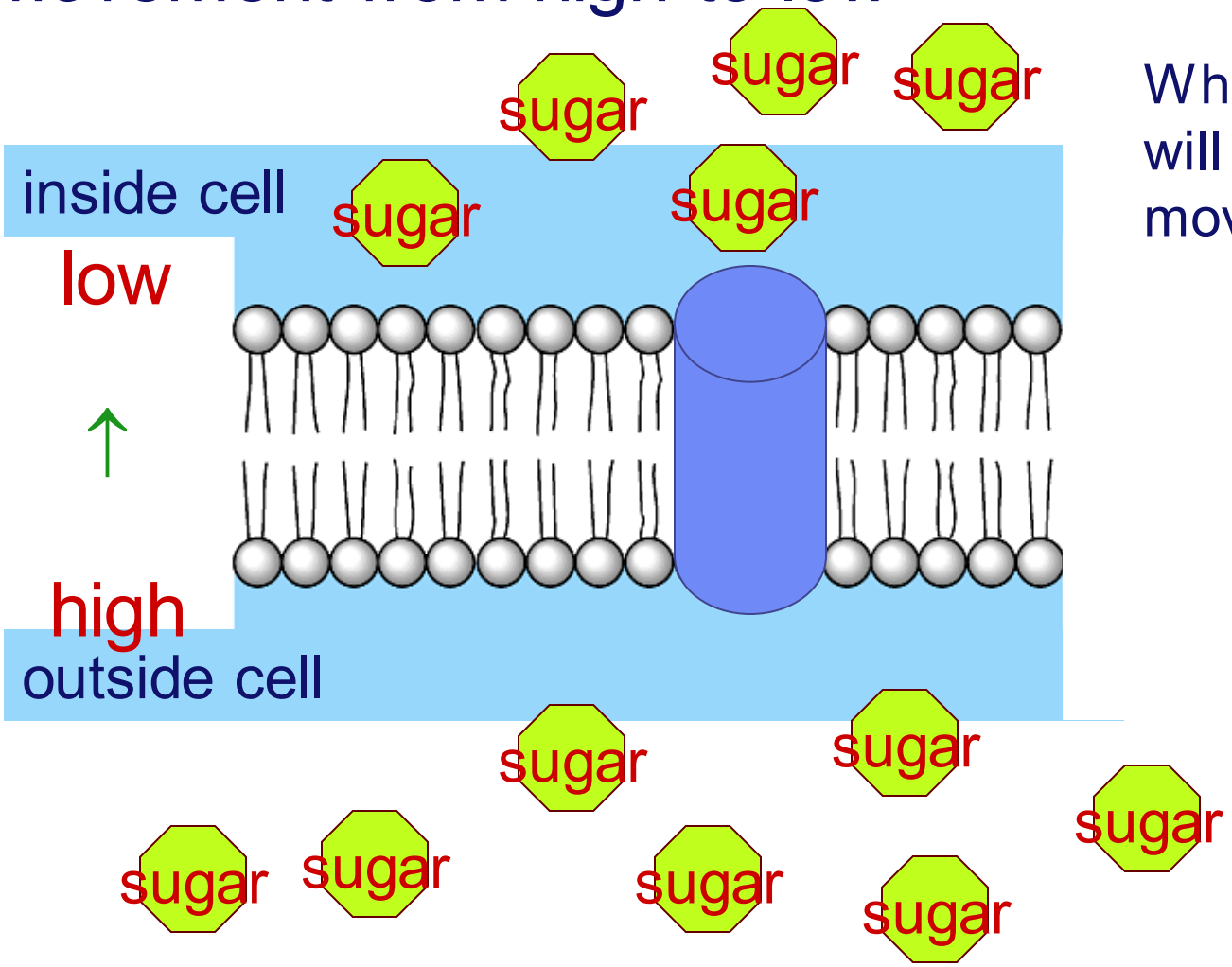
Simple diffusion across membrane

Which way will lipid move?



Facilitated Diffusion through a Channel

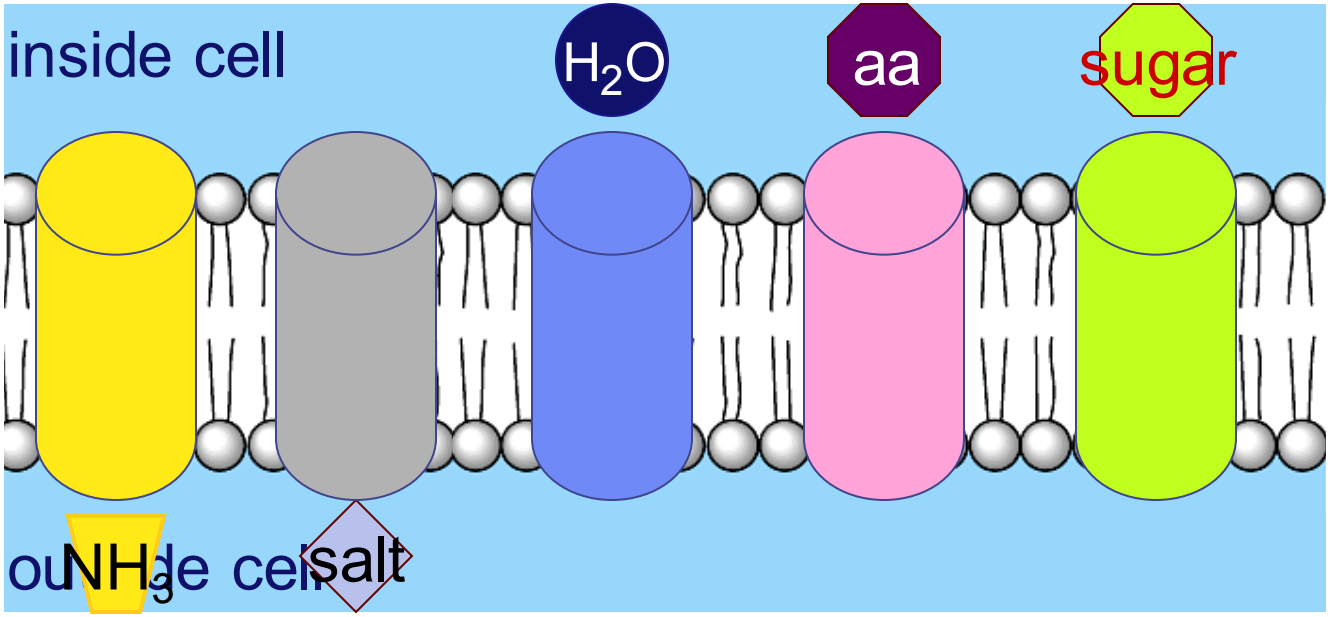
- Movement from high to low



Which way will sugar move?

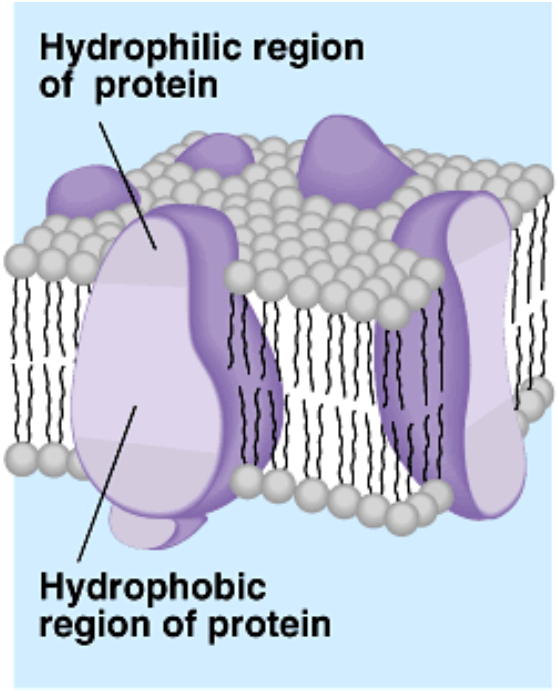
Semi-permeable cell membrane

- But the cell still needs control
  - membrane needs to be semi-permeable
    - specific channels allow specific material in & out



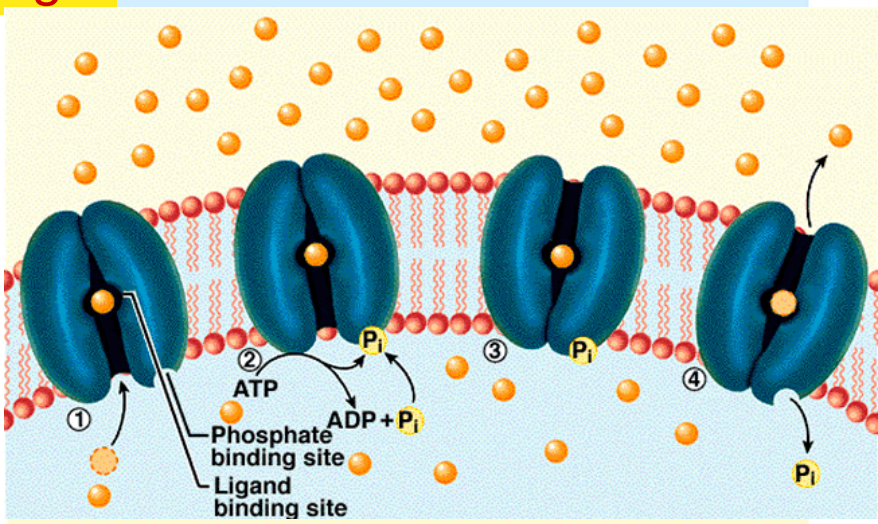
Active Transport (needs ATP energy)

- Membrane proteins act as a PUMP for specific molecules
  - Uses ATP –energy
  - Proteins act as pumps and channels



shape change transports

high



low

"The Doorman"

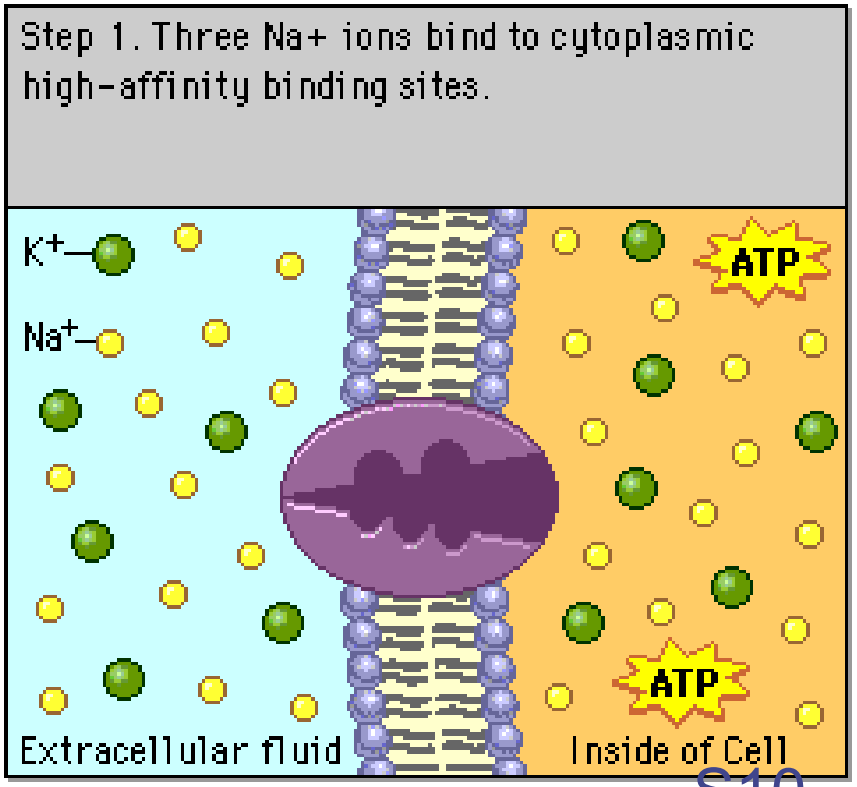
Active transport can move materials from low to high concentration

- Cells may need molecules to move
- *against* concentration situation

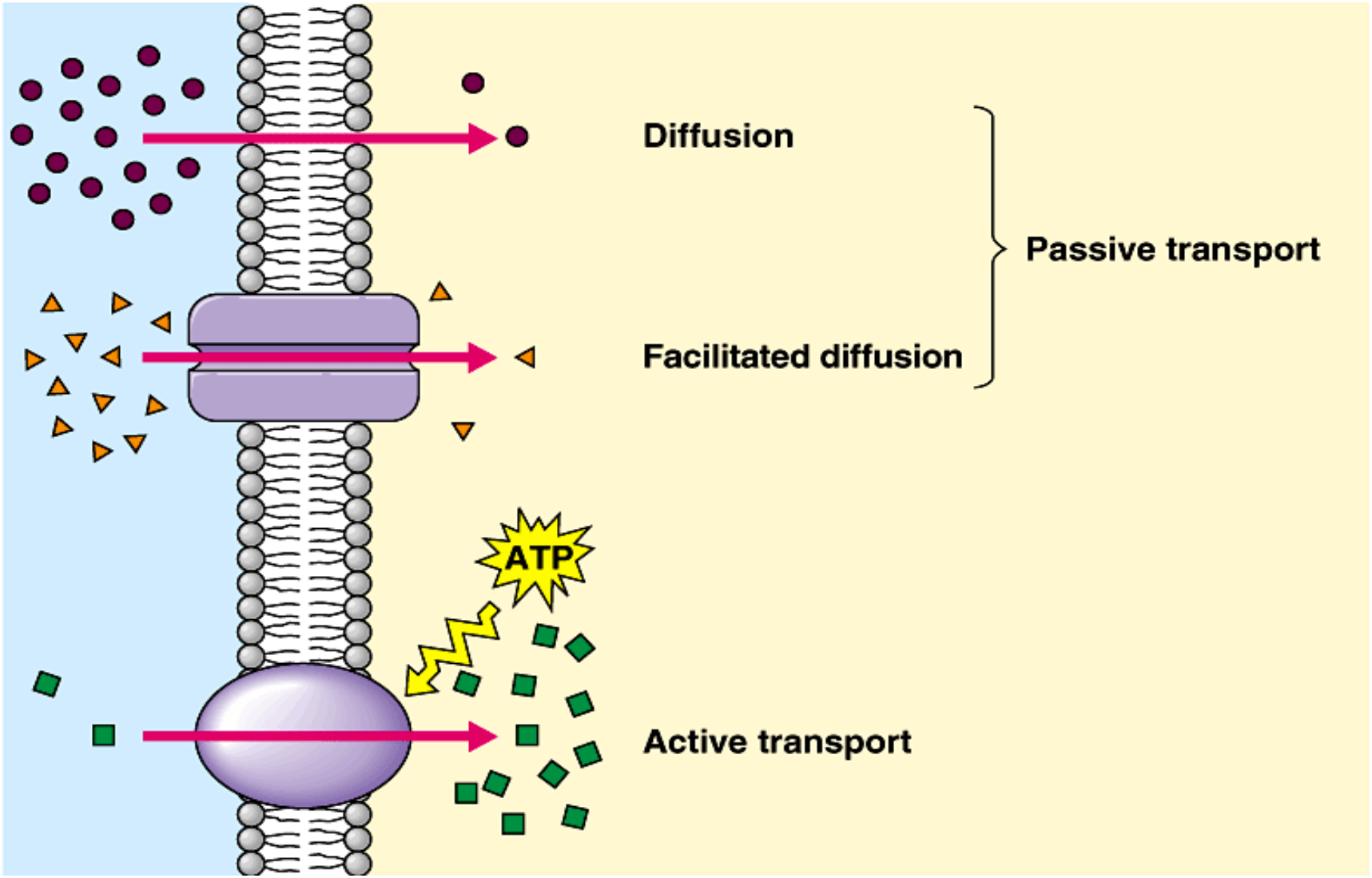
protein pump

- requires energy
  - ATP for NRG

Na+/K+ pump
in nerve cell membranes

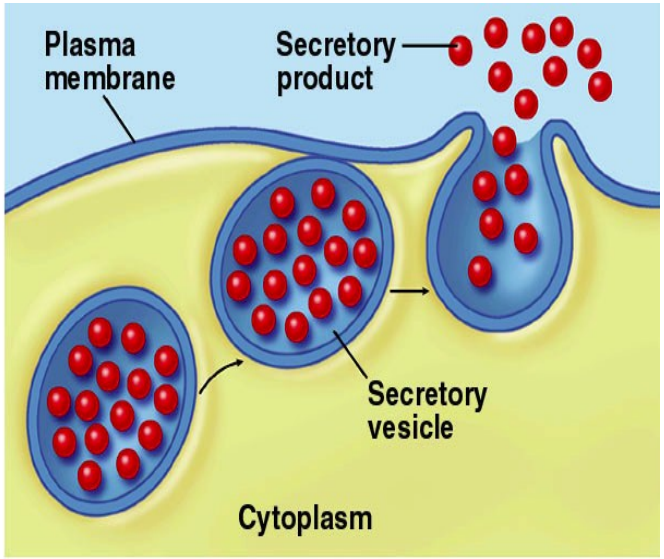


Transport summary



How about large molecules?

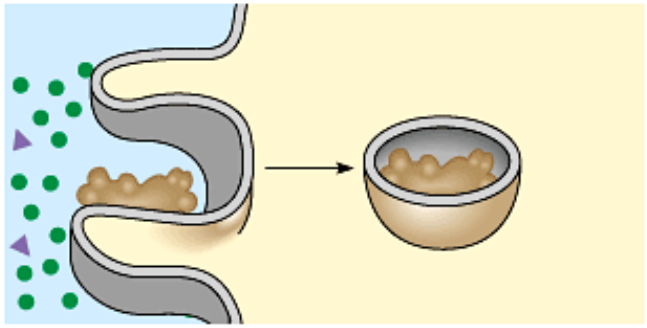
- Moving large molecules into & out of cell through **vesicles & vacuoles**
  - Endocytosis (moving into cell)
    - phagocytosis = "cellular eating"
    - pinocytosis = "cellular drinking"
    - receptor-mediated endocytosis
  - Exocytosis (moving out)



exocytosis

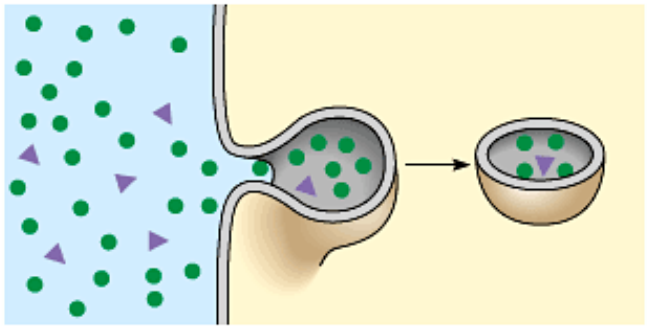
Endocytosis

phagocytosis



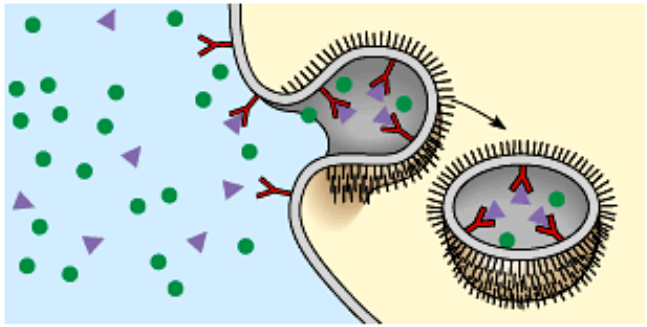
fuse with lysosome for digestion

pinocytosis



non-specific process

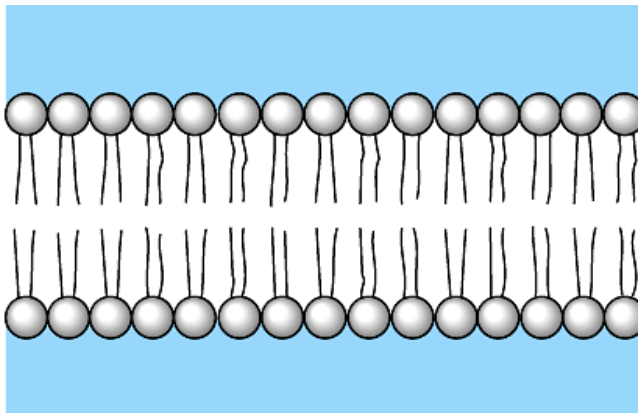
receptor-mediated endocytosis

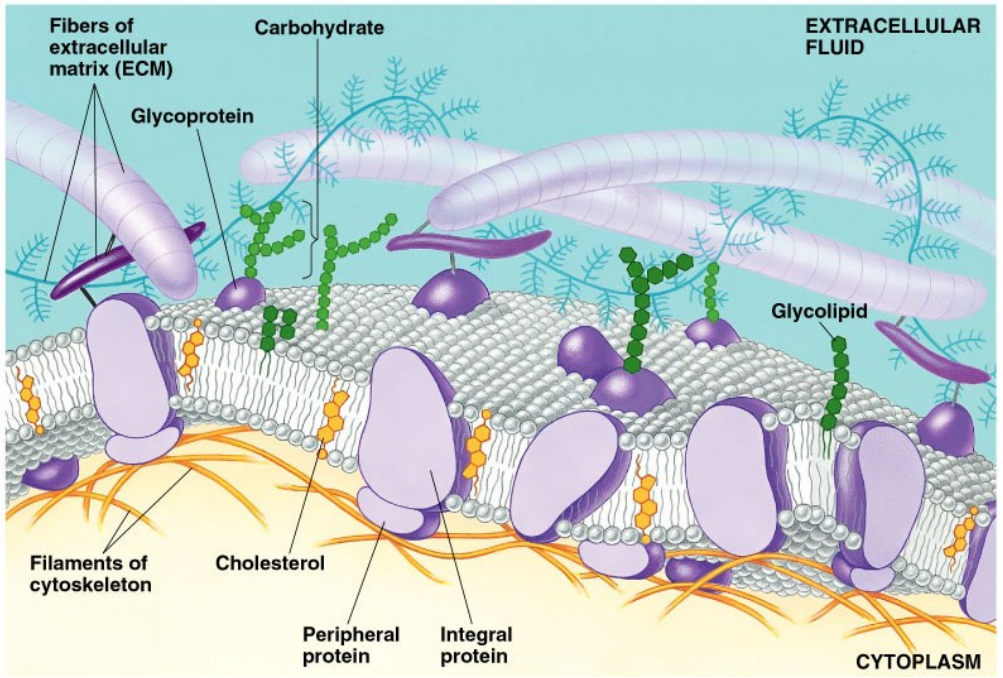


triggered by chemical signal

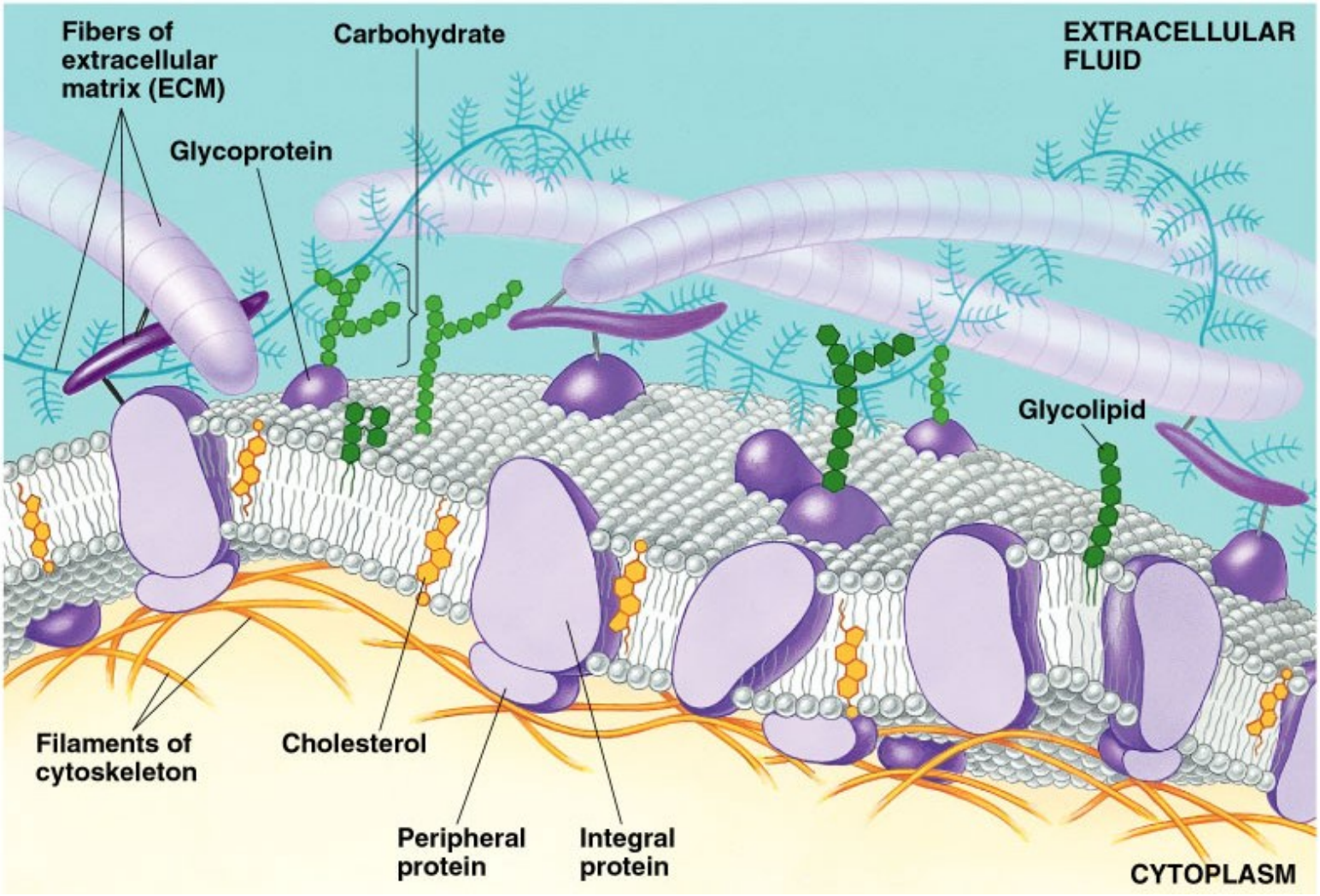
More than just a barrier…

- Expanding our view of cell membrane beyond just a phospholipid bilayer barrier
  - phospholipids plus…



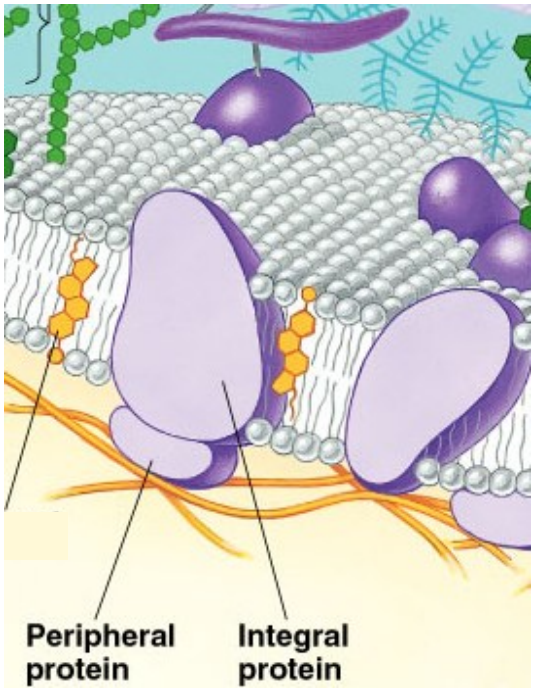


A membrane is a collage of different proteins embedded in the fluid matrix of the lipid bilayer



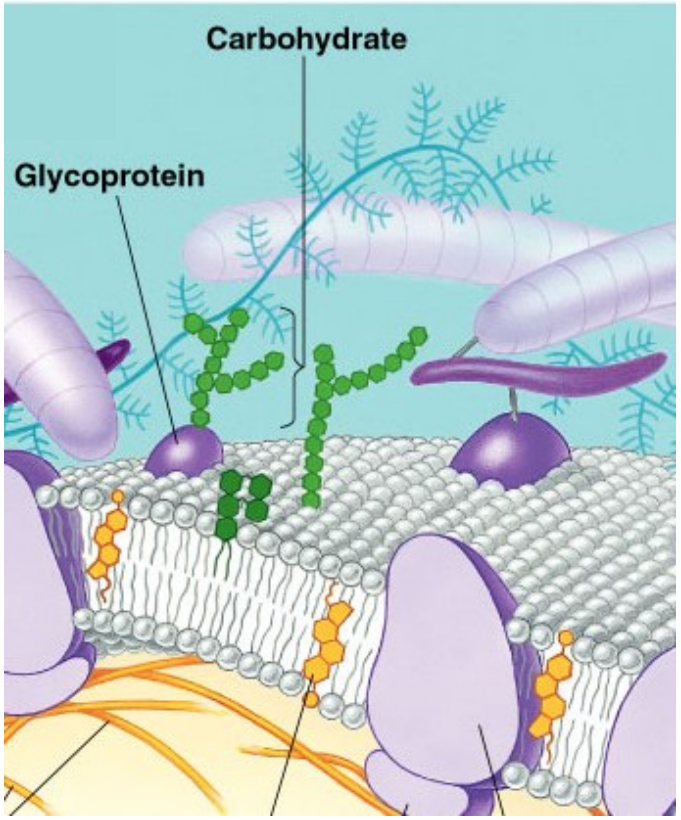
Membrane Proteins

- Proteins determine most of membrane's specific functions
  - cell membrane & organelle membranes each have unique collections of proteins
- Membrane proteins:
  - peripheral proteins = loosely bound to surface of membrane
  - integral proteins = penetrate into lipid bilayer, often completely spanning the membrane = *transmembrane* protein



Membrane Carbohydrates

- Play a key role in cell-cell recognition
  - ability of a cell to distinguish neighboring cells from another
  - important in organ & tissue development
  - basis for rejection of foreign cells by immune system



Any Questions?

Fluid Mosaic Model