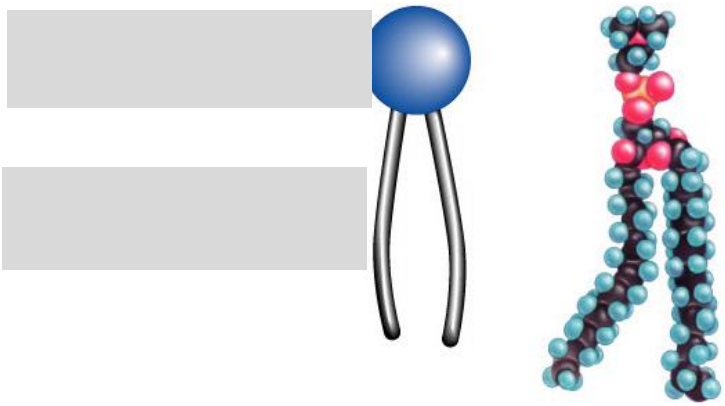
Ch. 7 – Membrane Structure and Function

<table>
<tr>
<td>1. Structure of PHOSPHOLIPIDS</td>
<td> 
Arranged as a
_____

Amphipathic =</td>
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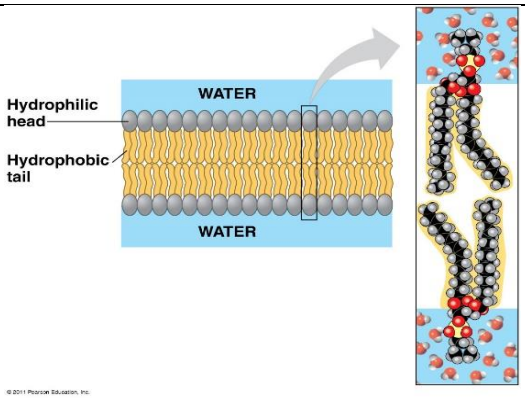
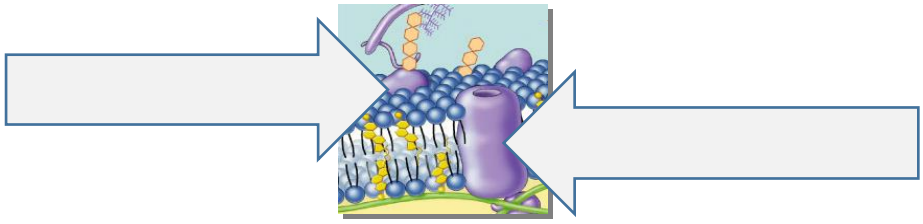
<tr>
<td>2. Role of the PHOSPHOLIPID BILAYER</td>
<td> 

Fluid:

Mosaic:</td>
</tr>
<tr>
<td>3. Membrane FLUIDITY</td>
<td>• _____: phospholipids w/_____ tails (kinks prevent close packing)
• _____ resists changes by:
o limit _____ at high temps
o hinder close packing at _____ temps</td>
</tr>
<tr>
<td>4. Membrane PROTEINS</td>
<td>Purpose:

2 classes
 
<table>
<tr><th>PERIPHERAL PROTEINS</th><th>INTEGRAL PROTEINS</th></tr>
<tr>
<td>▪ Loosely bound to _____ of membrane (NOT _____)
▪ _____ or cytoplasmic sides of membrane
◆ ex: cell surface identity marker (_____)
▪ Provides stronger framework</td>
<td>▪ _____ lipid bilayer, usually across whole membrane
▪ Embedded in membrane
▪ _____ protein
◆ ex: transport proteins
◆ _____, permeases (pumps)</td>
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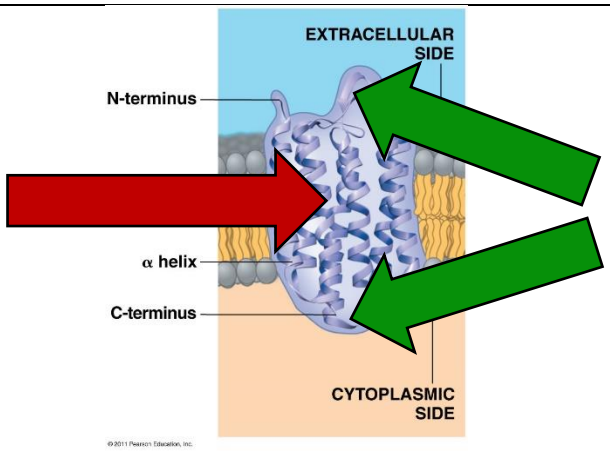
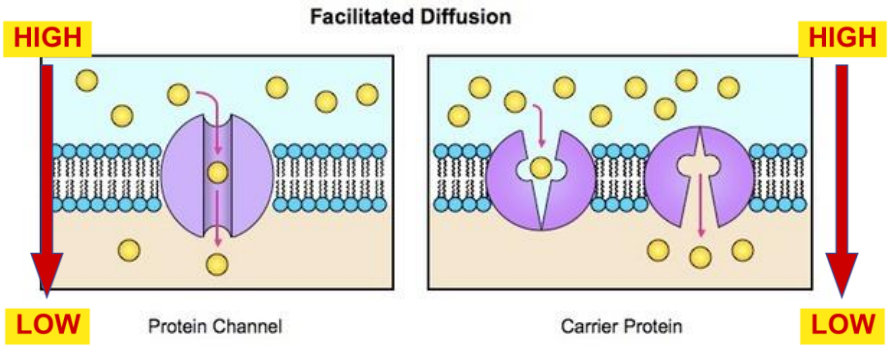
</td>
</tr>
</table>

5. **TRANSMEMBRANE** (integral) **PROTEIN** structure	 ▪ Within membrane ◆ _____ amino acids ▪ _____ ▪ anchors protein into membrane ▪ On outer surfaces of membrane in fluid ◆ _____ amino acids ▪ _____ ▪ extend into extracellular fluid & into cytosol ▪ Examples:
6. Many functions of membrane proteins	1. _____ 2. _____ activity 3. Cell surface _____ (signal transduction) 4. Cell surface _____ marker (cell recognition) 5. Cell _____ 6. Attachment to the _____
7. Membrane **CARBOHYDRATES**	• Play a key role in _____ o ability of a cell to distinguish one cell from another ▪ _____ ▪ _____lipids, _____proteins o important in _____ & tissue development o basis for _____ of foreign cells by _____ system
8. Movement across the cell membrane	Selective Permeability: ▪ _____(polar or nonpolar) cross easily (hydrocarbons, hydrophobic molecules, CO_2, O_2) ▪ Hydrophobic core *prevents* passage of _____, _____ _____ ◆ _____span the membrane to help move these molecules
9. PASSIVE TRANSPORT	• _____ (ATP) needed! • Diffusion _____ (high → low concentration) • Eg. hydrocarbons, _____
10. SIMPLE DIFFUSION	• movement from _____ → _____ concentration • _____ transport • _____ needed
11. **FACILITATED DIFFUSION**	▪ Diffusion through _____ ▪ _____ transport

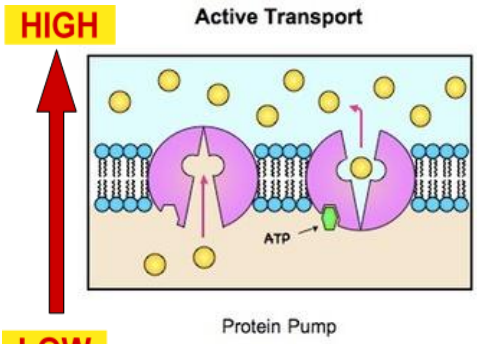
- _____ needed



- _____ proteins (channel or carrier proteins) help _____ substances cross

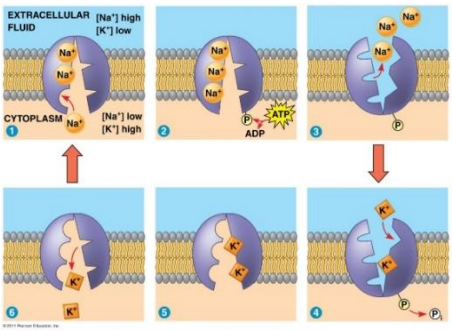
12. ACTIVE TRANSPORT

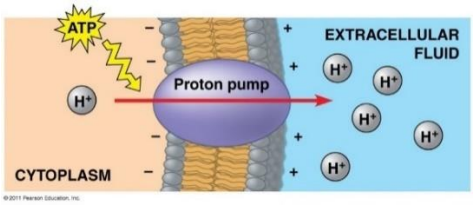
- Movement of molecules _____ concentration gradient (____ → ____)
- conformational shape change transports solute from one side of membrane to other
- protein _____
- "costs" _____ = _____



_____: generate voltage (electric charge) across membrane

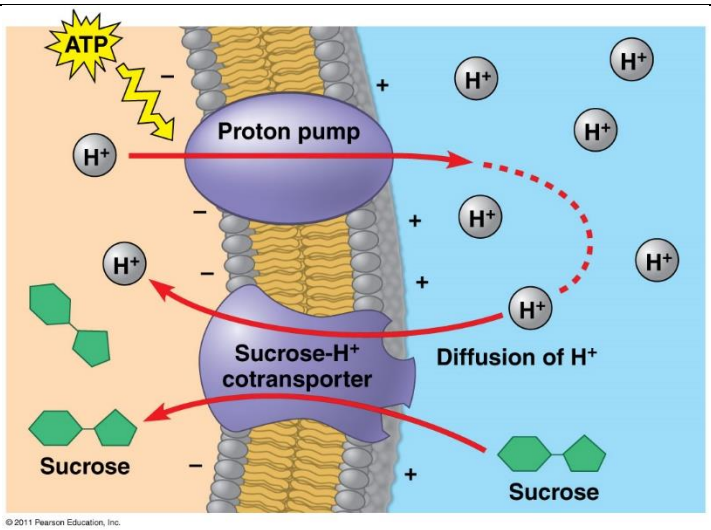
Na^+/K^+ Pump	Proton Pump
▪ Pump _____ cell ▪ Nerve transmission	▪ Push protons (_____) across membrane ▪ Eg. _____ (ATP production)



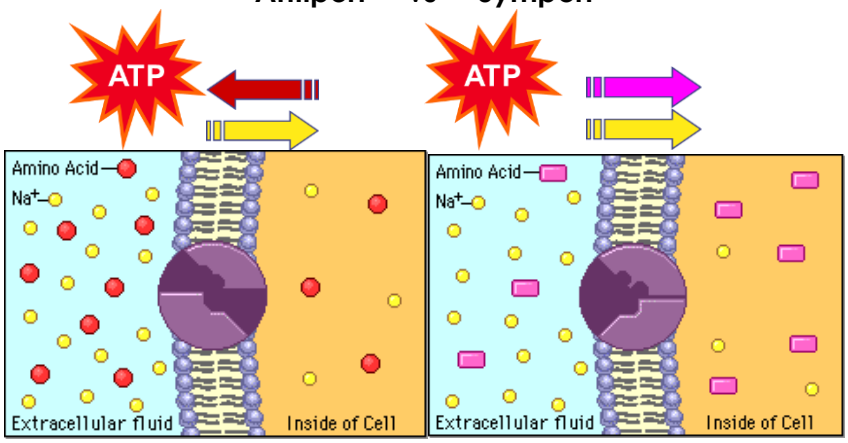


Cotransport: membrane protein enables "downhill" _____ of one solute to drive "_____" transport of other
Ex:

Active Transport Cont'd.



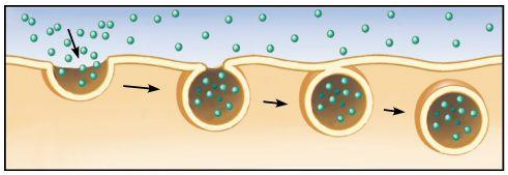
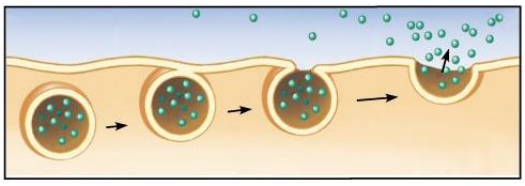
Antiport vs Symport

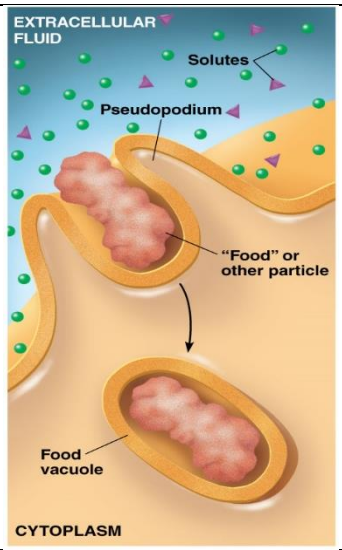
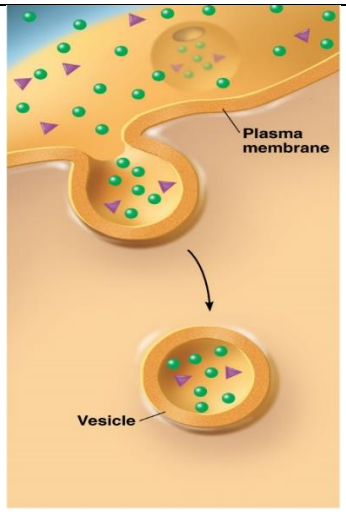
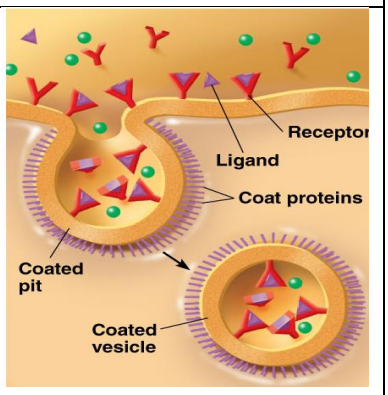


13. BULK TRANSPORT

Bulk Transport - Moving _____ molecules into & out of cell through _____ & vacuoles

- Transport of proteins, polysaccharides, large molecules
- Requires energy (ATP) – so it is a type of _____ transport

ENDOCYTOSIS	**EXOCYTOSIS**
take ___ macromolecules, form new vesicles	vesicles _____ with cell membrane, _____ contents;
	

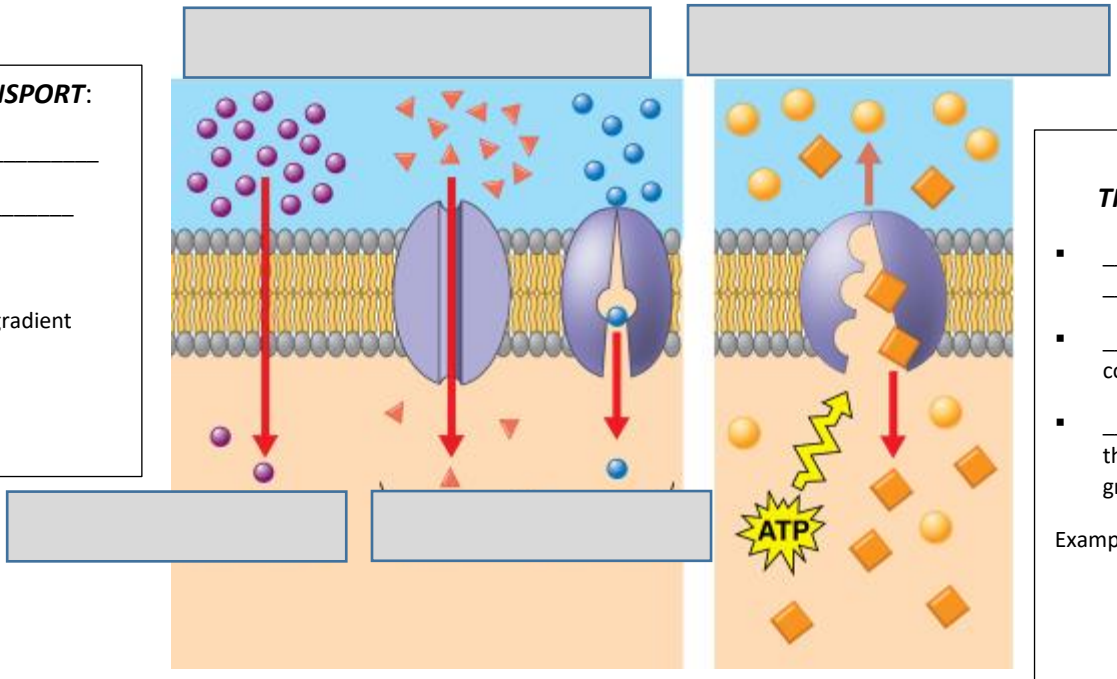
14. Types of **ENDOCYTOSIS**	**PHAGOCYTOSIS**	**PINOCYTOSIS**	**CELL MEDIATED ENDOCYTOSIS**
	Cellular _____	Cellular _____	Ligands (proteins) bind to _____ _____ on cell surface
			

SUMMARY:

PASSIVE TRANSPORT:

- _____
- _____ → _____ concentrations
- _____ the concentration gradient

Examples:



ACTIVE TRANSPORT:

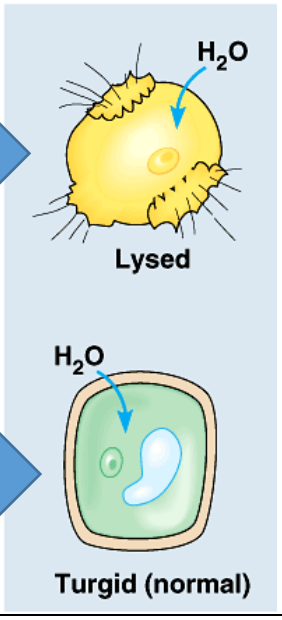
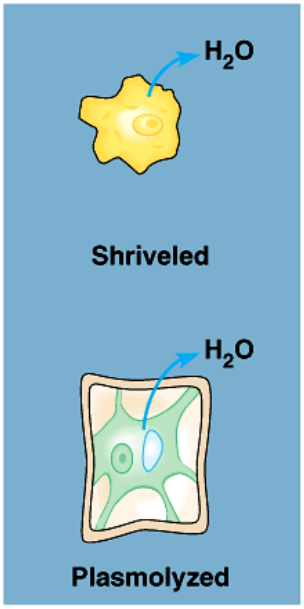
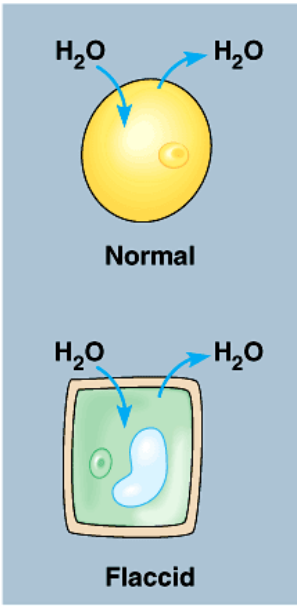
- _____ _____
- _____ → _____ concentrations
- _____ the concentration gradient

Examples:

Ch. 7 Cont'd. – The Special Case of Water

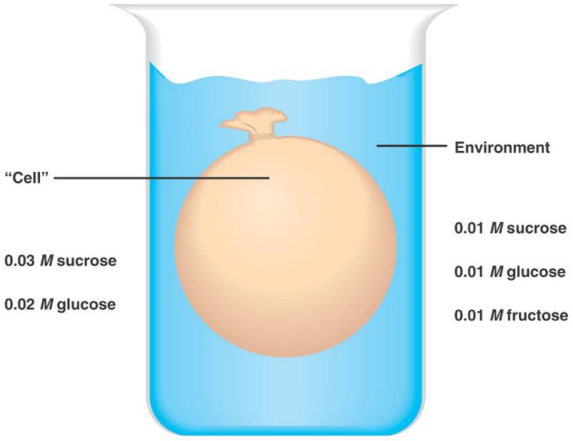
<table>
<tr><td>1. What is OSMOSIS?</td><td colspan="3">▪ Movement (diffusion) of _____ from HIGH concentration of _____ to LOW concentration of _____ across a _____ membrane
▪ Active OR Passive?
▪ Is energy required?</td></tr>
<tr><td rowspan="3">2. Concentration of Water

Effect on Animal Cell

Effect on Plant Cell</td><td colspan="3">▪ Direction of osmosis is determined by comparing total _____ concentrations</td></tr>
<tr><td>HYPOTONIC</td><td>HYPERTONIC</td><td>ISOTONIC</td></tr>
<tr><td>less _____,
more _____
Hypotonic solution
 
</td><td>_____ solute,
_____ water
Hypertonic solution
 
</td><td>_____ solute,
equal _____
Isotonic solution
 
</td></tr>
<tr><td>3. Managing Water Balance</td><td colspan="3">Hypotonic Scenario - a cell in <u>fresh water</u>
▪ _____ concentration of water around cell
▪ Problem:
○ example: _____ - water continually enters Paramecium cell
▪ Solution: _____ - pumps water out of cell using _____
○ Called _____
▪ plant cells only
○ turgid = _____
○ _____ protects from bursting</td></tr>
</table>

	Hypertonic Scenario - a cell in <u>salt water</u> ▪ _____ concentration of water around cell ▪ *Problem*: o example: _____ ▪ *Solution*: **plant cells only** ▪ **plasmolysis** = _____ (can recover)
	Isotonic Scenario - animal cell immersed in _____ solution ▪ no difference in concentration of water between cell & environment ▪ *Problem*: ▪ no _____ movement of water flows across membrane equally, in _____ directions ▪ cell in _____ -volume of cell is stable ▪ example:

Do you understand Osmosis…



Cell (compared to beaker) → hypertonic or hypotonic
Beaker (compared to cell) → hypertonic or hypotonic
Which way does the water flow? → in or out of cell

Understanding Water Potential

Water potential (ψ): H_2O moves from _____ ψ → _____ ψ potential

Water potential equation: $\psi = \psi_S + \psi_P$

- Water potential (ψ) = _____
- Solute potential (ψ_S) = _____ (osmotic potential)
- Pressure potential (ψ_P) = _____
  - *turgor pressure (plants) = pressure from the* _____

  Pure water: ψ_P = 0 MPa

  Plant cells: ψ_P = 1 MPa

Calculating Solute Potential (ψ_S)

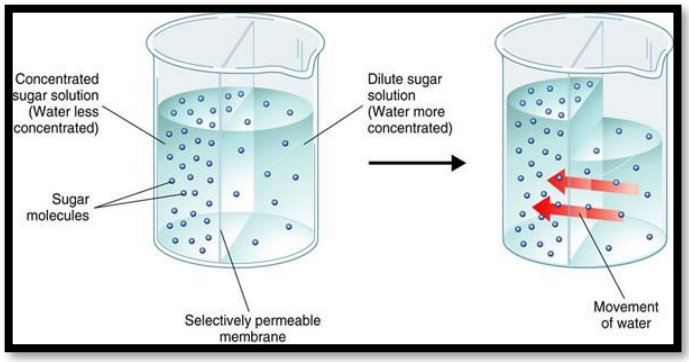
$$\psi_S = -iCRT$$

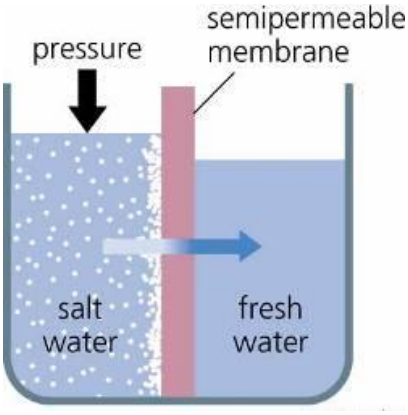
- i = ionization constant (# particles made in water)
- C = molar concentration
- R = pressure constant (0.0831 liter bars/mole-K)
- T = temperature in K (273 + ^{0}C)
- The addition of solute to water _____ the solute potential (more negative) and therefore _____ the water potential.

Where Will the Water Move?

From an area of:

- _____ ψ → _____ ψ (more negative ψ)
- low _____ concentration → high _____ concentration
- _____ pressure → _____ pressure





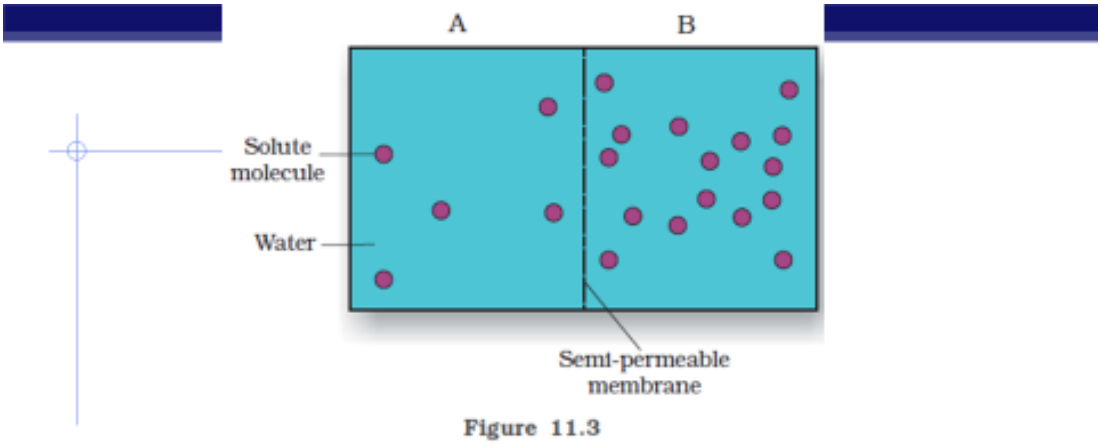


Figure 11.3

1. **Which chamber has a lower water potential?**
2. **Which chamber has a lower solute potential?**
3. **In which direction will osmosis occur?**
4. **If one chamber has a Ψ of -2000 kPa, and the other -1000 kPa, which is the chamber that has the higher Ψ?**

AP Biology

1. Calculate the solute potential of a 0.1M NaCl solution at 25°C.
2. If the concentration of NaCl inside the plant cell is 0.15M, which way will the water diffuse if the cell is placed in the 0.1M NaCl solution?

3.