IN-CLASS ANSWERS SESSION 1

MEMBRANE POTENTIALS

M.A.S.T.E.R. Learning Program, UC Davis School of Medicine
Revised: January 8, 2002
Revised by: Rachel Smith, MS II and Brian Ngo, MS II

I. Body water, osmosis and diffusion.

1. MEMORIZE: either by % body weight or Total body WATER

Total Body Water = 60% of body **weight**	
Plasma = 5% of body **weight**	8.33% of total body **WATER**
Interstitial fluid = 15% of body **weight**	25% of total body **WATER**
Intracellular fluid = 40% of Body **Weight**	66.66% of total body **WATER (2/3)**

2. If an ideally semipermeable membrane separates two solutions and Solution A has twice the osmolarity of Solution B, would water move toward Solution A or B?
Toward solution A. Remember that the concentration of water is LOWER in solution A (the solution with the highest solute concentration), and water will move down its concentration gradient.

3. A hypothetical capillary has 4 mm Hg of osmotic pressure and 6 mm Hg of hydrostatic pressure. The interstitial tissue surrounding this capillary has 2 mm Hg of osmotic pressure and 4 mm Hg of hydrostatic pressure. Which way would water move?
You can use the formula: $Jv = LpA(\Delta P - \Delta\pi)$ where Lp is a constant(the hydraulic conductivity or water conductance) and A is the membrane surface area.
$Jv = LpA[(6\text{-}4) - (4\text{-}2)] = LpA(0)$, i.e. no net movement.
Or you could reason it out by keeping two principles in mind:
   a) hydrostatic pressure pushes water away. In our example, the pressure pushes water away from the vessel or away from the interstitium.
   b) osmotic pressure keeps water. In our example, osmotic pressure keeps water in the interstitium or the vessel.

↓ 4 hydro	↑ 2 osmotic
↓ 4 osmotic	↑ 6 hydrostatic
(capillary lumen)	

In = 8mm Hg
Out = 8mm Hg
In – Out = 0

Because the force that pushes water away from the capillary to the interstitium (2 units hydrostatic) is equal to the force that pushes water into the capillary (2 units osmotic), there is no net movement of water.