Pre-lab preparation for the Osmosis/Diffusion lab

Got to this link http://phschool.com/science/biology_place/labbench/lab1/intro.html

Only do the first 5 concepts for now:

Define diffusion: ____________________________________________
________________________________________________________________________
________________________________________________________________________

Define osmosis: ____________________________________________
________________________________________________________________________
________________________________________________________________________

Is there a net movement of water? If so, in which direction?
________________________________________________________________________
________________________________________________________________________

What molecules are moving and in which direction?
________________________________________________________________________
________________________________________________________________________

Quick math review: which number is “bigger” -5 or -40 ???

-5 is the bigger number of course, it is further to the right on the number line.

Next question which water potential is higher?
Ψ = -5 bars or Ψ = -40 bars ?? same logic... Ψ = -5 bars is the bigger number which means it has the has the higher water potential!

Water always moves from high to low water potential

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<th>Ψ</th>
<th>Is water moving up or down?</th>
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One way of thinking of this is to consider the solvent concentration of water. The higher the concentration of water: the higher its water potential. Pure water has a water potential of zero, it never gets higher than that! Start diluting water with solute and the water potential decreases, becomes more negative as it slides left along the number line.

That is why almost all free-living cells (except for animals) have cell walls.

If the inside of the cell has a negative pressure, i.e. \(-\Psi\), then water is moving into the cell.

To prevent the cell from blowing up, an opposing pressure must be exerted. That second pressure must be a positive pressure, i.e. \(+\Psi\). Think of the cell wall as a mechanical device “squeezing” water out of the cell.

If the cell in the diagram above were in pure water, which direction water would be moving? Explain using symbols \(\Psi\)

If sufficient water moves into the cell, what happens to the value of \(\Psi_S\)?

When is the net movement of water equal to zero? Explain using symbols \(\Psi\)

Remember that when you check out the following video:

http://www.youtube.com/watch?v=nDZud2g1RVY

Stop the video when you see this equation: \((\frac{\Delta V}{V}) = -iCRT\)

OK take a deep breath - That equation is really not too scary! Go to the following link: http://phschool.com/science/biology_place/labbench/lab1/watpot.html

Now you understand while almost all free-living cells have cell walls!

Explain why cell walls are important for free-living cells:

Explain what is happening using the terms “hypotonic” & “hypertonic”
You should be on this link to answer this question:  http://phschool.com/science/biology_place/labbench/lab1/watcalc.html

Here is the definition of Water Potential

Water potential (\( \Psi \)) = solute potential (\( \Psi_s \)) + pressure potential (\( \Psi_p \))

When Water potential (\( \Psi \)) is inside the cell is less than outside the cell, is water moving into or out of the cell? Explain

1 bar = approximately ________________________________.

There are two components to water potential: solute concentration and pressure. How do you think this fact affects the movement of water into and out of cells? For example, can two solutions that differ in their solute concentration be at equilibrium in terms of water movement? Can a solution with a molarity of 0.2 be in equilibrium with a solution with a molarity of 0.4? Explain your answer: ________________________________

Here is a diagrammatic representation of what should have been your answer above.

Explain briefly why Water potential (\( \Psi \)) for the cell (immediately after being put into water) CAN NOT equal 0. ________________

Explain briefly why Water potential (\( \Psi \)) for the cell (after being in distilled water for some time) MUST equal 0. ________________

OK – now we are ready to do calculations involving water potential. They are quite easy actually, little more than plugging values into a formula is all. You will not be expected to memorize the formula. You only need to know what the symbols mean.

Proceed to this link:
http://phschool.com/science/biology_place/labbench/lab1/watcalc.html

Define the symbols found on http://phschool.com/science/biology_place/labbench/lab1/analysis.html

**Solute potential (\( \Psi_s \)) = -iCRT**

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OK, now finish the Bozeman video: we left off at about the 5 minute mark

http://www.youtube.com/watch?v=nDZud2g1RVY

Sample Problem
found here: http://phschool.com/science/biology_place/labbench/lab1/analysis.html

The molar concentration of a sugar solution in an open beaker has been determined to be 0.3M. Calculate the solute potential at 27 degrees.

Round your answer to the nearest hundredth. _______________________________________

The pressure potential of a solution open to the air is zero. Since you know the solute potential of the solution, you can now calculate the water potential. (If you need to, review the equation for calculating water potential.)

What is the water potential for this example?

Round your answer to the nearest hundredth. _______________________________________

Here is a quick quiz: http://phschool.com/science/biology_place/labbench/lab1/quiz.html

You are now ready for the Osmosis/Diffusion Lab!