

PLSC 532: Fall 2006
Problem Set 1
Due October 3

$$R \text{ (gas constant)} = 0.0083 \frac{\text{MPa} \cdot \text{kg}}{\text{mol} \cdot \text{K}}$$

Please show your work in answering the following questions (you may use separate sheets of paper).

1. What is the Ψ_{π} of a 0.5 M solution of ammonium nitrate in a refrigerator (4 C)?
2. What is the Ψ of the above solution?
3. What is the Ψ_{π} of a 100 mM solution of K_2HPO_4 at lab temperature (23 C)?
4. What is the Ψ of a 100 mM solution of NaCl at greenhouse temperature (28 C)?
5. What is 25 C in degrees Fahrenheit?
6. You prepare 500 mL of a solution of NaCl with an Ψ_{π} of -1.2 MPa, for running some tests on your favorite halophyte. Then you add 240 mL of disH_2O . What is the Ψ_{π} of the solution now?
7. You equilibrate a filter disc on the agar of some plantlets you have micropropagated, and then measure it in our Wescor osmometer, which gives a reading of 800 (the osmometer gives readings as osmolality, unit = mosM kg^{-1}). Convert this reading to osmotic potential using the van't Hoff equation. Recall that the osmometer computes osmolality at 37 C. Note: this exercise is useful, but using a graded series of calibration solutions is a better way to convert osmometer readings to Ψ_{π} - why?
8. Convert the Ψ_{π} you computed above in (7) to a lab temperature of 24 C.
9. You excise a leaf and weigh it (0.841 g). You then oven-dry it at 80 C to constant dryness, and reweigh it (0.162 g). What was the water content () of the leaf when you excised it? (express as a percentage).
10. You excise a leaf and weigh it (0.841 g). You then place its petiole in a beaker, cover the beaker and place in the dark at 4 C (you place it in a refrigerator). Next morning you quickly blot the leaf and reweigh it (1.183 g). You then oven-dry it at 80 C to constant dryness, and reweigh it (0.162 g). What was the relative water content (RWC) of the leaf when you excised it? (express as a percentage).