Diffusion and Osmosis Lab Questions

Answer the following questions and/or perform the following procedures paying special attention to using your data to support your answers.

Procedure 1:
1) Why are cells small?
   Give a specific examples of the following:
   a) tissues/organs in the human body where surface area is maximized for efficiency.
   b) other than mammals, give a specific example in nature where surface area is maximized for efficiency
   - Make sure to answer what, how, and why!

Procedure 2:
2) You are in the hospital and need intravenous fluids. You read the label on the IV bag, which lists all of the solutes in the water.
   a) Why is it important for an IV solution to have salts in it?
   b) What would happen if you were given pure water in an IV?
   c) How would you determine the best concentration of solutes to give a patient in need of fluids before you introduced the fluids into the patients body?
3) How can you use weights of the filled cell models to determine the rate and direction of diffusion? What would be an appropriate control for the procedure you just described?
4) Suppose you could test other things besides weights of the dialysis tubes. How could you determine the rates and directions of diffusion of water, sucrose, NaCl, glucose, and proteins?
5) Will protein diffuse? (remember, they are big, huge molecules) Will it affect the rate of diffusion of other molecules?
6) Which pair(s) of dialysate bags that you tested did not have a change in weight? How can you explain this?
7) If you compared 1 M solutions, was a 1 M NaCl solution more or less hypertonic than a 1 M sucrose solution? What is your evidence? What about 1 M NaCl and 1 M glucose and 1 M sucrose? If you didn’t use 1molar solutions, make an educated guess and back you answer with your data.
8) Would a protein solution have a high molarity? What is evidence for your conclusion?
9) How could you test for the diffusion of glucose?
10) Based on what you learned from your experiment, how could you determine the solute concentration inside a living cell?
Procedure 3: Living Cells

11) What would happen if you applied saltwater to the roots of a plant? Why?
12) What are two different ways a plant could control turgor pressure, a name for internal water potential within its cells? Is this a sufficient definition for turgor pressure?
13) Will water move into or out of a plant cell if the cell has a higher water potential than its surrounding environment?

14) Where is the cell membrane in relation to the cell wall? Can you see the two structures easily? Why or why not?
15) What parts of the cell that you see control the water concentration inside the cell?

Back in Procedure 2 you tested diffusion and osmosis properties of several solutions. Now you are going to determine how they affect plant cell turgor pressure.

16) What changes do you expect to see when the cells are exposed to the solutions?
17) How will you know if a particular treatment is increasing turgor pressure? If it is reducing turgor pressure?
18) How could you determine which solution is isotonic to the cells?

Design your own experiment.

Design an experiment to identify the concentrations of the sucrose solutions and use the solutions to determine the water potential of the plant tissues. (You might want to review the information on water potential described in Understanding Water Potential.) Use the following questions to guide your investigation:

19) How can you measure the plant pieces to determine the rate of osmosis?
20) How would you calculate the water potential in the cells?
21) Which solution had a water potential equal to that of the plant cells? How do you know?
22) Was the water potential in the different plants the same?
23) How does this compare to your previous determinations in the onion cells?
24) What would your results be if the potato were placed in a dry area for several days before your experiment?
25) When potatoes are in the ground, do they swell with water when it rains? If not, how do you explain that, and if so, what would be the advantage or disadvantage?