D 2.3 Water Potential SL

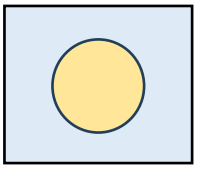
1. Water often acts as a _____, because it can form _____ bonds with _____ molecules. This occurs because water is a _____ molecule, with its _____ atom slightly _____ and its _____ atoms slightly _____. For example, when table _____ (NaCl) dissolves in water, ____ ions are attracted to the _____ side of water molecules, and ____ ions are attracted to the _____ side.

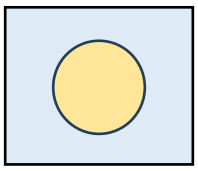
Na^+ Cl^-

This process allows the _____to become _____ by water molecules, keeping them in _____. The ability of water to dissolve _____ molecules and ions is crucial for many _____ processes.

2. _____ refers to the _____ movement of water from areas of_____ solute concentration (_____ solution) to areas of _____ solute concentration (_____ solution).

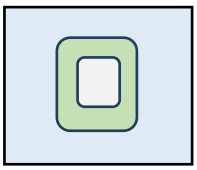
3. If a cell is placed in a _____ solution, water will move _____ ___ the cell. Conversely, if the cell is in a _____ solution, water will move _____ the cell. In an_____ environment, the solute _____ is _____ inside and outside the cell, so water moves __ and ____ at _____ rates, maintaining dynamic _____ without ____ water movement. Add dots to show solutes, and arrows to show the movement of water for a generalized cell:



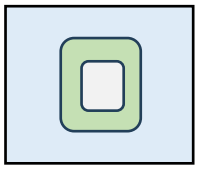


_____ solution _____ solution

4. When plant tissues are bathed in a _____ solution, water moves into the cells via _____. This causes the cells to _____ as the vacuole fills with water, leading to increased _____ pressure. _____ pressure helps maintain the structure of plant cells, making them firm. However, in _____ solutions, water exits the plant cells, causing them to _____. The _____ pulls away from the cell wall, a process known as _____.



_____ solution



_____ solution

5. In cells that lack a _____ wall, such as _____ cells, _____ can have drastic effects. In a _____ environment, water enters the cell, causing it to _____ and potentially _____ (lysis). In a _____ environment, the cell _____ as water leaves, leading to a condition known as _____. To prevent such harmful effects, freshwater unicellular organisms use _____ vacuoles to expel excess water. _____ organisms maintain _____ conditions in tissue fluids to prevent the dangerous effects of _____ or shrinking.

6. Medical applications of _____ solutions include _____ fluids, which are administered to patients to ensure that their blood _____ remains _____, preventing harmful fluid shifts. Additionally, organs ready for _____ are bathed in _____ solutions to preserve _____ integrity.

7. Experimentation: An Estimation of Osmolarity In a Potato

Independent Variable:

To determine how the _____ of a solution impacts the mass of a potato sample.

Dependent Variable:

Controlled variables: (state 3 – method on following page can help)

Method:

Potatoes are pealed and cut into cylinders of equal volume and surface area. The initial mass of each sample is recorded and is then 1 placed in each solution of 0.0, 0.4, 0.8, 1.2, 1.6 %. They are left for 10 minutes, and then the final mass is recorded. The change in mass as a % is then calculated and a graph is produced.

Results:

Concentration (%)	Initial mass of sample (g)	Final mass of sample (g)	Change in mass (g)	Change in mass as a percentage (%)
0.00	3.40	3.65	+ 0.25	
0.40	3.35	3.45	+ 0.10	
0.80	3.45	3.49		
1.20	3.42	3.30		
1.60	3.38	3.00		

Figure 1. Scatter-plot of results:

Analysis/Conclusions

In the _____ solution, water moved _____ the sample, causing the mass to _____. This was between concentrations of approx. _____ and _____ (%).

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In the _____ solution, the solute concentration on either side was _____, so there is no net movement of _____ molecules. This was at a concentration of approx. ____ (%).

In this methodology, there were no _____. It is important to typically _____ an experiment at least ___ times. This allows for the calculation of standard _____. This would allow us to understand the _____ of the results. It would also be possible to work out the standard _____, which would allow us to understand how _____ the average measurements were. Adding these bars to a figure allows for a quick, visual comparison of the _____ of the data.

This is important to understand when transporting _____ to be used in transplants. They must be kept in _____ solution to avoid _____ the tissue.