Types of Osmotic Solutions

What Is Diffusion?
Diffusion is the passive transport of molecules from an area of higher concentration to an area of lower concentration; and, surprisingly, you are very familiar with this process, whether you realize it or not.

Diffusion, Osmosis & Tonicity
When you put on perfume or aftershave, you can't Just do it once and stay smelling sweet for the rest of your life (much to the relief of perfumers). Another unpleasant example of diffusion is the very recognizable smell of skunk stink. If you are driving down the road towards a dead (or detonated) skunk, the unpleasant smell gets stronger and stronger as your car approaches the skunk, and weaker as you move away. This is because the stinky molecules are more concentrated closer to their skunky source.

What Is Osmosis?
Osmosis is a specific kind of diffusion; the diffusion of water molecules across a membrane, typically the membrane of a living cell. The environment surrounding each of our cells may contain small amounts of dissolved substances (solutes) that are equal to, less than, or greater than those found within the cell. The relationship between the concentrations of solutes on either side of the membrane is referred to as tonicity.

How Does Tonicity Relate to Osmosis?
If a cell is in a surrounding environment that's:

- **isotonic:** The concentration of solutes is the same on either side of the membrane. A cell in an isotonic solution would not significantly change iri size - there is equal movement of water into and out of the cell.
- **hypertonic:** This term refers to the side of the membrane with a higher concentration of solute. A cell in a hypertonic solution would lose water, causing it to shrink/shrivel.
- **hypotonic:** This term refers to the side of the membrane with a lower concentration of solute. A cell in a hypotonic solution would gain water, causing it to swell/burst.

These terms describing tonicity are dependent on the relationship between the environments on either side of the membrane, and can apply to the environment inside the cell or the environment outside the cell. The key to understanding osmosis and tonicity is to remember that water will always move toward a hypertonic environment! Drinking saltwater actually robs the body of hydration, because it creates a hypertonic environment in the GI tract, which pulls water out of our cells, dehydrating the body.

Osmosis In Cells With a Cell Wall
Plant cells, bacteria, fungi and other cells that have cell walls are subjected to osmotic pressure, just as are cells without a cell wall (such as animal cells and protozoans).

Hypotonic Environment: Plant, fungi and bacterial cells are surrounded by a strong, rigid cell wall that prevents the cell from taking in too much water a.1d exploding. When a cell that has a cell wall is exposed to water, the water moves into the cell, making it plump (turgid). This is why house plants look healthy and firm when they are watered sufficiently.

Hypertonic Environment: All cells are vulnerable to dehydration, as seen in plants that are not

watered enough, or any cell surrounded by a hypertonic environment. When water leaves a cell, it is not as plump, although the structure of the cell wall prevents dehydrated cells from losing their shape entirely. Some cells have a waxy covering, such as plants adapted to dry environments.

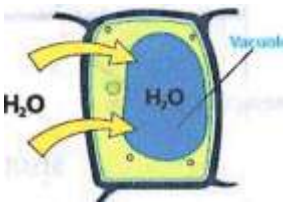
Exposure to extremely hypertonic environments can also kill a plant, such as when a dog creates spots of dead lawn where it pees. The urine is hypertonic compared to the interior of the grass cells. Water always moves towards a hypertonic environment. So, in this tonicity situation, water is drawn out of the grass, killing it.

IMAGE: Cells can either contain the same level of dissolved substances as their surrounding environment (an isotonic situation), or there can be a *difference in concentration of solutes between the inside and outside of the cell. The area with* a *higher level of solutes is considered hypertonic. The area with* a *lower level of solutes is hypotonic.*

Hypertonic

Isotonic

Hypotonic



Analysis: (Answer in complete academic sentences on your notebook page)

1. Why would it be good for cells to generally live in an isotonic environment?
2. If a plant cell was hypotonic and you looked at it under the microscope, would you be able to see the cell membrane as separate from the cell wall? Explain.
3. Why do plants wilt (slump over) when they do not get enough water?