

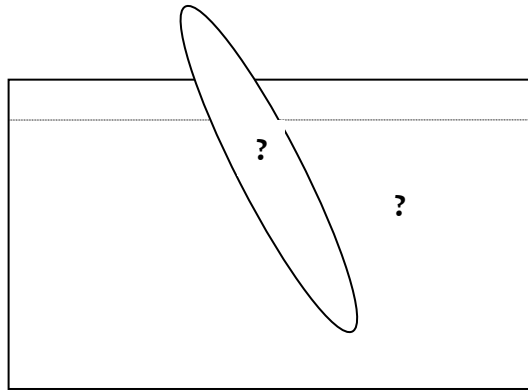
Tonicity Application

Name: _____

Period: _____

Purpose: This activity will allow you to apply what you have learned about membrane permeability, concentrations, and tonicity to hypothetical lab scenarios. These scenarios will be reflective of problems that you may encounter on future tests, and can be applied to medicine, agriculture, and various other biological fields.

1. An unknown solution is put into dialysis tubing (a membrane) and another unknown is put into a beaker. The dialysis tubing is **semi-permeable** to H₂O and glucose, but not to starch. Before putting the tube into the beaker it had a mass of 5.6 g, after 24 hours it weighed 8.7 g.
 - a. Why did the tube gain mass? Use the diagram to show what solutes were in the tubing and what solutes were in the solution, and which direction they were traveling.



2. An experiment similar to the one described in problem 8 is set up. There are two beakers, one is filled with a salt solution, and the other is filled with distilled H₂O. A solution-filled membrane tube is put into each beaker; this membrane is **selectively permeable** to H₂O only. Beaker A is placed on the left and beaker B is placed on the right. After 20 minutes solution was observed to be overflowing from beaker B.
 - a. Draw a diagram to illustrate this experiment.
 - b. Which beaker contained distilled H₂O, beaker A or beaker B?
 - c. Explain how you know which beaker contained the distilled H₂O.

3. Have you ever spent too much time swimming or washing dishes? You may have observed that your hands wrinkled into “prunes”. Scientists used to think that these wrinkles form when your skin SWELLS with water. Now data shows that the wrinkles are caused by constricting blood vessels.
- Why did scientists used to think that hands swell and form wrinkles when exposed to water for too long? Use tonicity vocabulary to explain the reasoning of past scientists about this phenomenon and describe the relative concentrations of your hands and the water.
4. You decide to buy a new fish for your freshwater aquarium. When you introduce the fish into your tank, the cells of the fish swell up and the fish dies. You later learn that it was a fish from the ocean.
- What is the difference between ocean water and fresh water?
 - Based on what you know of tonicity, why did the fish swelled and die?
 - What would happen if a fish from a fresh water stream was put into a salt water tank?
5. Ocean water is very dangerous for a person to drink. The average salinity (tonicity of salt) of ocean water is 3.5%, the average human body salinity is around 0.09%.
- What happens when a human drinks salt water? (HINT: Does osmosis work toward human tissues or away from them?)
6. Nutrients and water are delivered to the cells in your body through your blood vessels. Blood vessels are also passageways for red blood cells to deliver oxygen to your cells. Healthy red blood cells are capable of carrying 4 molecules of oxygen at a time, but this capacity is DEPENDENT on their shape. If a person becomes severely dehydrated there is less water in the blood vessels that carry red blood cells.
- What will happen to red blood cells when a person becomes severely dehydrated?
 - Why will this occur? Use tonicity vocabulary to explain.
 - Are the red blood cells likely to be effective at carrying oxygen under these conditions?
 - What is likely to happen to a severely dehydrated person that does not restore water to their blood vessels?
 - What happens to a blood vessel and red blood cells when a person drinks too much water?