Part A: Diffusion

1. Describe two factors that could speed up the rate of diffusion. **(0.5 pt)**

Increasing temperature or type of solute (smaller sized) used.

2. At what point does net diffusion end? **(0.5 pt)**

When equilibrium is reached, or more specifically, when there is no net change between concentrations.

3. The video discusses five factors that can affect the rate of diffusion. List one and explain it using your own words. **(1 pt)**

Temperature is a factor. This is because increased temperature increasing molecular movement, which increases the chances and thus ability for the solute to diffuse.

4. Identify a biological situation in which efficient diffusion of a solute from one region to another would be a matter of life or death for an organism. Please describe that situation, and what factors would influence the diffusion. **(1 pt)**

One example is our red blood cells and IV fluids. You need to have concentration of electrolytes otherwise the red blood cells will burst. This is really osmosis, where the water is moving into the cell, but this is still due to concentration differences.

Part B: Osmosis and Tonicity; Simulation

5. Explain one way that osmosis differs from diffusion, and one wya that it is similar. **(1 pt)**

Osmosis references the movement of water, rather then the movement of solutes like in diffusion. Both diffusion and osmosis occur from differences in solute concentration, and often happen at the same time, but osmosis takes over when solutes cannot diffuse across the barrier.

Simulation Questions

6. How long will the dialysis tubes remain in each beaker? Why does this matter? **(1 pt)**

24 hours. We need to allow sufficient time for osmosis to occur and reach equilibrium.

Table 1: Comparative analysis of osmosis between dialysis tube and beaker with various concentrations of added sugar as solute.

Trial	A	B	C	D	E
Beaker % Sugar	0	0	5	10	15
Dialysis Tube % Sugar	0	10	10	10	10
Initial Mass (g)	17.59	8.75	11.24	10.71	18.05
Final Mass (g)	17.66	10.42	12.10	10.57	15.60
Δ Mass (g)	0.07	1.67	0.86	0.14	-2.45

7. Name two variables that remained constant throughout the lab. **(1 pt)**

Same amount of water, same pressure on water, and same type of solute, and same amount of sugar in dialysis tube.

8. Name the *dependent* variable. **(1 pt)**

The amount of mass gained or loss of each dialysis tube.

9. Name the *independent* variable.**(1 pt)**

Concentration of solute in the dialysis tubes.

The percent concentration of both fluids is different. There is **0**% sugar in the beaker and **100**% sugar in the dialysis tube. Now, think of it from the water's point of view. There is **90.2**% water in the beaker and **9.8**% in the dialysis tube

10. Answer the following for B:

(a) Did the beaker have a higher/lower concentration of water than the dialysis tube? **0.5 pt**

Lower.

(b) Did the water flow in or out of the tube and what type of diffusion is this? **0.5 pt**

Into the tube and passive diffusion.

11. Answer the following for C-E:

(a) Which beaker had a higher concentration of sugar solution fluid outside than inside? **0.5 pt**

E

(b) How will the water flow in this situation? If the tube was a cell, what type of solution was the cell placed in? **0.5 pt**

Water will flow **out**; **hypertonic**.

12. Answer the following for C-E:

(a) Which beaker had a percent concentration that was equal on both inside/outside the cell? **0.5 pt**

D

(b) How will the water flow in this situation? What type of solution was the cell (tube) placed in? **0.5 pt**

Zero net change in water flow; **isotonic**.

13. Answer the following for C-E:

(a) Which beaker has a higher concentration of sugar solution inside the cell than outside? **0.5 pt**

C

(b) How will the water flow in this situation? What type of solution was the cell (tube) placed in? **0.5 pt**

Water will flow **in**; **hypotonic**.

14. Graphically represent the results of today's simulation. **(2 pts)**

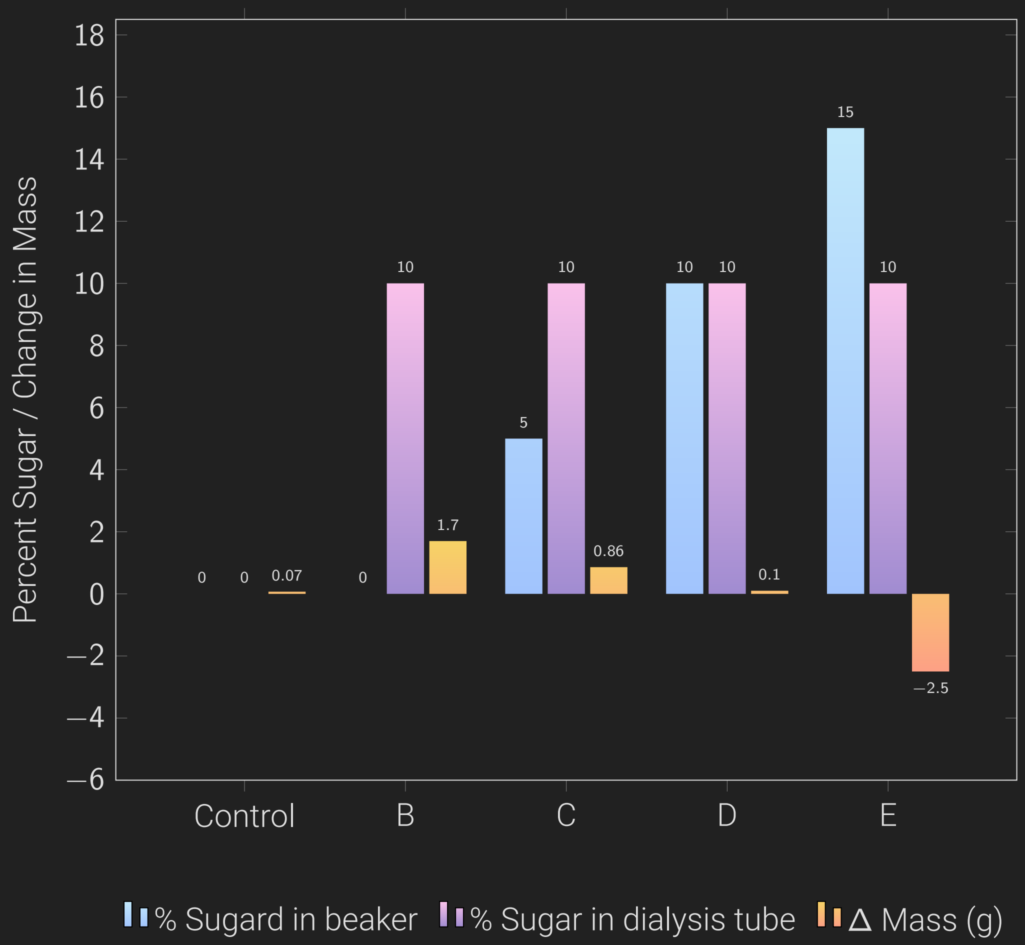

Figure 1: Graphical representation of data from Table 1; a comparative analysis of osmosis between dialysis tube and beaker with various concentrations of added sugar as solute.

Part C: Regulatory Mechanisms

15. Describe one challenge inherent to being a marine organism. **(1 pt)**

Marine organisms must control the gain of large concentrations of ions and loss of water.

16. Describe one challenge inherent to being a freshwater organism. **(1 pt)**

Freshwater fish must compensate for a high amount of water flowing into the gills in order for gas exchange to occur, which results in loss of ions.

17. What mechanisms have evolved to compensate for these challenges for both types of organisms? **(1 pt)**

Fresh water fish deal with their problem by producing large quantities of **diluted** urine to deal with the increased water and active transport ion pumps located in the gills to pumps ions **into** the blood.

Marine fish solve their problem by drink large amounts of seawater and excrete highly **concentrated** urine and deal with increased ions by by actively transporting ions **out** of the blood.

18. Describe mechanisms that have evolved to facilitate organisms that switch from freshwater to marine environments. **(2 pts)**

Organisms such as salmon start of living in freshwater, but then switch the marine environment through a process called smoltification, which is where they develop specialized cells called ionocytes that pump out excess salt. Expression of related binding proteins at different times help control the expression of IGF which supports smoltification and regulates the transition.