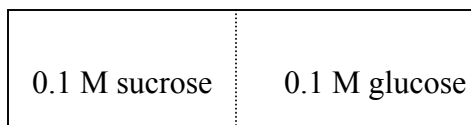


## ConceptTests Involving Solution Properties: Osmosis

Suppose you have two flexible compartments with a semipermeable membrane between them. The membrane allows movement of water but not solute particles. The initial composition of the compartments is as follows:



In shorthand notation it is written as 0.1 M sucrose / 0.1 M glucose. (Note: Sucrose is  $C_{12}H_{22}O_{11}$  and glucose is  $C_6H_{12}O_6$ ).

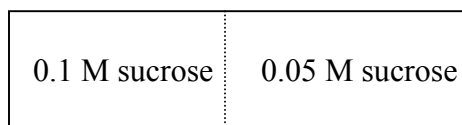
The volume of the left-hand compartment will...

1. increase.
2. decrease.
3. will stay the same.

**Correct Answer: 3. will stay the same. The two solutions have about the same osmotic pressure.**

**Choice 1 indicates students think that the larger molecules will give the sucrose solution a higher osmotic pressure, resulting in flow of water into it.**

**Choice 2 indicates students think that the larger molecules will give the sucrose solution a higher osmotic pressure, pushing water out of it.**

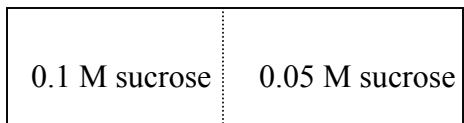


The volume of the left-hand compartment will...

1. increase.
2. decrease.
3. will stay the same.

**Correct Answer: 1. increase. The left-hand compartment has the higher osmotic pressure since it has the higher concentration of sucrose.**

**Choice 2 indicates students confuse the movement of solute and solvent.**



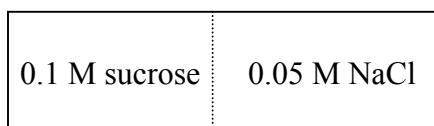
The sucrose concentration in the left-hand compartment will...

1. increase.
2. decrease.
3. stay the same.

*Correct Answer: 2. decrease.*

*Choice 1 indicates students are thinking that it is the sucrose molecules that are moving to the left, rather than the solvent. Some students have trouble thinking that that would be a decrease when something is moving into the chamber.*

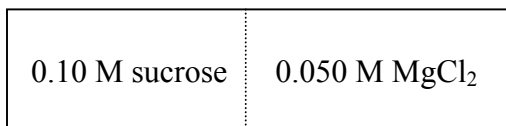
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The volume of the left-hand compartment will...

1. increase.
2. decrease.
3. will stay the same.

*Correct Answer: 3. will stay the same. As NaCl will dissociate into 2 particles, the concentration of particles will be about twice what is stated ( $2 \times 0.05M = 0.1M$ )*  
*Choice 1 indicates students are looking at only the concentration and not at the type of particles. Choice 2 indicates students, in addition to overlooking the dissociation of NaCl, may be thinking that the concentration will decrease, and do not note that the question is asking about volume.*



The volume of the left-hand compartment will...

1. increase.
2. decrease.
3. will stay the same.

*Correct Answer: 2. decrease. Since  $\text{MgCl}_2$  will dissociate into 3 particles, the concentration of particles will be three times what is stated ( $3 \times 0.050 \text{ M} = 0.15 \text{ M}$ ). The solvent will therefore flow from the left compartment into the right.*

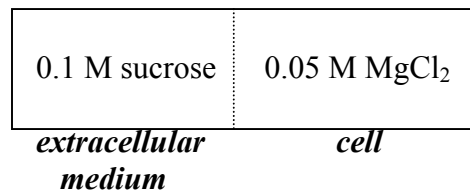
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The sucrose concentration in the left-hand compartment will...

1. increase.
2. decrease.
3. stay the same.

*Correct Answer: 1. increase. Since the solvent will flow out of the left-hand compartment, the concentration will increase.*

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Suppose the right-hand compartment represents a cell with the given (non-biological) composition & the left-hand compartment is the medium in contact with the cell. What will happen to the cell?

1. The cell will swell.
2. The cell will shrink.
3. The cell will stay the same size.

*Correct Answer: 1. The cell will swell. As the particle concentration in the cell is equivalent to around  $3 \times 0.050 \text{ M} = 0.15 \text{ M}$ , water will flow into the cell, and the cell will swell.*

*Students selecting choice 2 are overlooking the dissociation of  $\text{MgCl}_2$  into 3 particles.*

*Students selecting Choice 3 are mostly likely thinking  $\text{MgCl}_2$  would dissociate into 2 particles like  $\text{NaCl}$  in the previous question.*