Practice Problems – Osmosis and Water potential

Use this key to answer all the problems below. If you choose B or C, rewrite the statement so that it is complete and true.
A = TRUE B = FALSE C = NOT ENOUGH INFORMATION

PROBLEM ONE: The initial molar concentration of the cytoplasm inside a cell is 2M and the cell is placed in a solution with a concentration of 2.5M.

1. Initially, free energy is greater inside the cell than outside
2. It is possible that this cell is already in equilibrium with its surroundings.
3. Initially, solute concentration is greater outside the cell than inside.
4. Water will enter the cell because solute potential is lower inside the cell than outside.
5. The cell will become flaccid because the pressure potential is greater outside the cell than inside.
6. The cell is already in equilibrium with its surroundings because of the combination of pressure potential and solute potential inside and outside the cell.
7. Initially, the cytoplasm is hypertonic to the surrounding solution.
8. Initially, the numerical value of the solute potential is more negative inside the cell than outside.
9. Net diffusion of water will be from inside the cell to outside the cell.
10. At equilibrium, the molarity of the cytoplasm will have increased.
11. At equilibrium, the pressure potential inside the cell will have increased.

PROBLEM TWO: The initial molar concentration of the cytoplasm inside a cell is 1.3 M and the surrounding solution is .3M.

1. The cell could already be in equilibrium with the surrounding solution.
2. If the cell is already in equilibrium with its surroundings, there must be pressure potential inside the cell.
3. If the cell is initially flaccid, osmosis will cause the free energy inside the cell to increase.
4. If the cell is initially flaccid, there will be a net gain of turgor during osmosis.
5. If the cell is initially flaccid, diffusion will proceed until solute potential inside the cell equals solute potential outside the cell.
6. At equilibrium, the cytoplasm and the surrounding solution will be isotonic.
7. At equilibrium, water potential inside and outside the cell will be equal.
8. If the cell is initially flaccid, water will move down its free energy gradient and out of the cell.
9. If the cell is initially flaccid, the molarity of the cytoplasm will increase during osmosis.
10. If the cell is initially flaccid, then both solute potential and pressure potential inside the cell will increase during osmosis.
11. At equilibrium, free energy inside and outside the cell will be equal.

Key:

A = TRUE B = FALSE C = NOT ENOUGH INFORMATION

PROBLEM ONE:

1. **A**
2. **B The cell must lose water to reach equilibrium. There is no way pressure can build up to bring the cell to equilibrium.**
3. **A**
4. **B Water will leave the cell because solute potential is higher inside the cell than outside.**
5. **B The cell will become more flaccid because the solute potential is greater inside the cell than outside.**
6. **B The cell is not in equilibrium because there is no pressure potential inside the cell and none will build up when water leaves the cell.**
7. **B ..... cell is hypotonic to the surrounding solution.**
8. **B ..... more negative outside the cell than inside.**
9. **A**
10. **A**
11. **B ..... pressure potential inside the cell will remain zero.**

PROBLEM TWO

1. **A**
2. **A**
3. **A**
4. **A**
5. **C Probably false, but it depends on how much room there is inside the cell for water to enter before pressure begins to build. Most likely, pressure will bring the cell to equilibrium before the cytoplasm and the solution become isotonic.**
6. **C Same as above**
7. **A**
8. **B ..... and INTO the cell**
9. **B ..... will DECREASE...**
10. **C Probably true, but it depends on how much room there is inside the cell for water to enter before pressure begins to build. As soon as pressure begins to build, the statement is true.**
11. **A**