

Section 15.3 Colligative Properties of Solutions

In your textbook, read about electrolytes and colligative properties, vapor pressure lowering, boiling point elevation, and freezing point depression.

Use the table to answer the following questions.

Solution	Density (g/L)	Boiling Point (°C)	Freezing Point (°C)
1.0 <i>m</i> C ₂ H ₅ OH(aq)	1.05	100.5	-1.8
1.0 <i>m</i> HCl(aq)	1.03	101.0	-3.7
1.0 <i>m</i> NaCl(aq)	1.06	101.0	-3.7
2.0 <i>m</i> NaCl(aq)	1.12	102.1	-7.4

- Which properties in the table are colligative properties?
boiling point and freezing point
- What can you conclude about the relationship between colligative properties and the number of ions in solution from the 1.0*m* NaCl(aq) and 2.0*m* NaCl(aq) solutions?
Colligative properties depend on the number of electrolytes in solution.
- What can you conclude about the relationship between colligative properties and the type of ions in solution from the 1.0*m* HCl(aq) and 1.0*m* NaCl(aq) solutions?
Colligative properties are independent of the type of electrolytes in solution.

Suppose that in a simple system, a semipermeable membrane is used to separate a sucrose-water solution from its pure solvent, water. Match the descriptions of the system in Column A with the terms in Column B.

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| <p>Column A</p> <p>d Cannot cross the semipermeable membrane</p> <p>b Can cross the semipermeable membrane</p> <p>f The side that exerts osmotic pressure</p> <p>e The diffusion of the solvent particles across the semipermeable membrane from the area of higher solvent concentration to the area of lower solvent concentration</p> <p>c The barrier with tiny pores that allow some particles to pass through but not others</p> <p>g The side from which more water molecules cross the semipermeable membrane</p> <p>a A colligative property of solutions</p> | <p>Column B</p> <p>a. osmotic pressure</p> <p>b. water molecules</p> <p>c. semipermeable membrane</p> <p>d. sugar molecules</p> <p>e. osmosis</p> <p>f. solution side</p> <p>g. pure solvent side</p> |
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Section 15.4 Heterogeneous Solutions

In your textbook, read about suspensions and colloids.

For each statement below, write *true* or *false*.

- A solution is a mixture containing particles that settle out of the mixture if left undisturbed.
false
- The most abundant substance in a colloid is the dispersion medium.
true
- A colloid can be separated by filtration.
false
- A solid emulsion consists of a liquid dispersed in a solid.
true
- Whipped cream is an example of a foam.
true
- In an aerosol, the dispersing medium is a liquid.
false
- Brownian motion results from the collisions of particles of the dispersion medium with the dispersed particles.
true
- Dispersed particles in a colloid do not tend to settle out because they have polar or charged atomic groups on their surfaces.
true
- Stirring an electrolyte into a colloid stabilizes the colloid.
false
- Colloids demonstrate the Tyndall effect.
true

The table below lists the characteristics of particles in colloids, solutions, and suspensions. Place a check in the column of each mixture whose particles have a particular characteristic.

Characteristics of Particles	Colloid	Solution	Suspension
11. Less than 1 nm in diameter		✓	
12. Between 1 nm and 1000 nm in diameter	✓		
13. More than 1000 nm in diameter			✓
14. Settle out if undisturbed			✓
15. Pass through standard filter paper	✓	✓	
16. Lower vapor pressure		✓	
17. Scatter light	✓		✓