



Unit 4: Properties of Solutions
Composition of Aqueous Solutions

This worksheet will explore the composition of aqueous solutions, delving into the interplay between the solvent (usually water) and the solute. It will cover the diverse forms of solutes, including ionic solutes that break into charged ions, creating electrically conductive solutions, and molecular solutes that remain as discrete molecules, subtly influencing properties like vapor pressure and boiling point. This exploration aims to showcase the intricate chemistry within aqueous solutions, where the convergence of solvent and solute gives rise to a myriad of chemical phenomena.

1. Define "aqueous solution" and explain why water is commonly used as a solvent in chemical reactions.
2. Differentiate between a solute and a solvent. Provide examples of each.
3. Explain the concept of ionic solutes and provide examples. How do ionic solutes contribute to the electrical conductivity of aqueous solutions?
4. Describe the behavior of molecular solutes in aqueous solutions. How do they influence properties like vapor pressure and boiling point?
5. Compare and contrast the behavior of ionic solutes and molecular solutes in terms of their impact on solution properties.



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6. Explain how the polarity of a solvent affects its ability to dissolve solutes. Provide an example of a polar solvent and a nonpolar solvent.
7. Examine the factors that influence the solubility of substances in aqueous solutions, considering both ionic and molecular solutes.



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Answer Key:

1. Define "aqueous solution" and explain why water is commonly used as a solvent in chemical reactions.

An aqueous solution is a solution in which water is the solvent. Water is commonly used as a solvent due to its unique properties, such as its ability to dissolve a wide range of substances, its polarity, and its role as a versatile medium for chemical reactions.

2. Differentiate between a solute and a solvent. Provide examples of each.

A solute is the substance that is dissolved in a solution, while a solvent is the substance in which the solute dissolves. For example, in saltwater, salt is the solute, and water is the solvent.

3. Explain the concept of ionic solutes and provide examples. How do ionic solutes contribute to the electrical conductivity of aqueous solutions?

Ionic solutes are compounds that dissociate into charged ions when dissolved in water. Examples include sodium chloride (NaCl) and potassium nitrate (KNO₃). Ionic solutes contribute to electrical conductivity by allowing the flow of electric current through the movement of charged ions.

4. Describe the behavior of molecular solutes in aqueous solutions. How do they influence properties like vapor pressure and boiling point?

Molecular solutes remain as discrete molecules in aqueous solutions. They influence properties like vapor pressure and boiling point by exerting a colligative effect, where the presence of solute particles lowers the vapor pressure and raises the boiling point of the solution compared to the pure solvent.

5. Compare and contrast the behavior of ionic solutes and molecular solutes in terms of their impact on solution properties.

Ionic solutes dissociate into ions, contributing to electrical conductivity, while molecular solutes remain as discrete molecules. Ionic solutes have a more pronounced impact on colligative properties like boiling point elevation and freezing point depression compared to molecular solutes.

6. Explain how the polarity of a solvent affects its ability to dissolve solutes. Provide an example of a polar solvent and a nonpolar solvent.



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The polarity of a solvent influences its ability to dissolve solutes. Polar solvents, like water, dissolve polar and ionic compounds due to their charged regions. Nonpolar solvents, such as hexane, dissolve nonpolar substances effectively but struggle with polar solutes.

7. Examine the factors that influence the solubility of substances in aqueous solutions, considering both ionic and molecular solutes.

Factors influencing solubility include temperature, pressure, the nature of the solute and solvent, and the presence of other solutes. Ionic solutes are influenced by ion charges and sizes, while molecular solutes are affected by polarity and molecular size.