




2.2 Properties of Water

Lesson Objectives

-  Discuss the unique properties of water.
-  Differentiate between solutions and suspensions
-  Explain what acidic solutions and basic solutions are.

Lesson Summary

The Water Molecule Water molecules (H_2O) are polar because of an uneven distribution of electrons, creating a slight negative ($-$) charge in the oxygen atom and a slight positive ($+$) charge in each hydrogen atom. The attraction between a hydrogen atom of one water molecule and the oxygen atom of another water molecule is called a **hydrogen bond**.

- ▶ **Cohesion** is an attraction between molecules of the same substance. It causes water molecules to be drawn together, producing surface tension
- ▶ **Adhesion** is an attraction between molecules of different substances. It causes capillary action, an effect that causes water to rise in a narrow tube against the force of gravity.

Solutions and Suspensions A **mixture** is a material composed of two or more elements or compounds that are physically mixed together but not chemically combined. A **solution** is a mixture in which all the components are evenly spread out: the substance dissolved is the **solute**; the substance that causes the dissolving is the **solvent**. Mixtures of water and undissolved materials are **suspensions**.

Acids, Bases, and pH A water molecule (H_2O) can split apart to form a hydrogen ion (H^+) and a hydroxide ion (OH^-).

- ▶ The **pH scale** measures the concentration of hydrogen ions in a solution. The scale ranges from 0 to 14. Pure water has a pH of 7.
- ▶ An **acid** is any compound that forms H^+ ions in solution. Acidic solutions have pH values below 7. A **base** is a compound that forms OH^- ions in solution. Basic, or alkaline, solutions have pH values above 7.
- ▶ **Buffers** are weak acids or bases that can react with strong acids or bases to prevent sudden changes in pH.

The Water Molecule

For Questions 1–4, write True or False on the line provided.

- _____ 1. Water is a polar molecule.
- _____ 2. Hydrogen bonds are an example of adhesion.
- _____ 3. Covalent bonds give water a low heat capacity.
- _____ 4. A hydrogen bond is stronger than a covalent bond.

Solutions and Suspensions

5. Complete the table

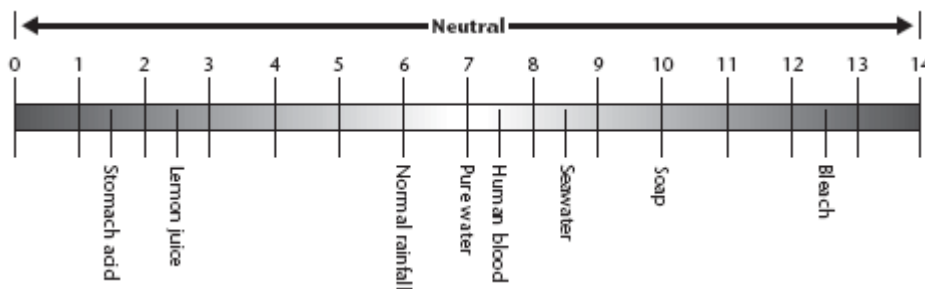
Substance	Definition	Example(s)
	Physical combination of two or more substances	Cinnamon sugar
Solute		Salt in saltwater
	Mixture of water and nondissolved substance	Blood
Solution		

Acids, Bases, and pH

6. What makes pure water neutral?

7. What does the pH scale measure?

8. On the pH scale, indicate which direction is increasingly acidic and which is increasingly basic.



9. Identify two solutions that have more H^+ ions than OH^- ions.

10. Identify two solutions that have more OH^- ions than H^+ ions.

11. How would you buffer a solution that has a pH of 12?



Apply the Big idea

12. Why are buffers important to living things?

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BUILD Vocabulary

- A. The chart below shows key terms from the lesson with their definitions. Complete the chart by writing a strategy to help you remember the meaning of each term. One has been done for you.

Term	Definition	How I'm Going to Remember the Meaning
	Any compound that forms H^+ ions in solution	
	The attraction between molecules of different substances	
	A compound that produces hydroxide (OH^-) in solution	
	Attraction between molecules of the same substance	
	The attraction between the oppositely charged regions of two molecules	
	A substance that is dissolved	

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Term	Definition	How I'm Going to Remember the Meaning
	A mixture of solute dissolved in a solvent	
	The substance in which the solute dissolves	
	A mixture of water and undissolved material in which the solute is evenly distributed	<i>A student who undergoes a suspension from school is not allowed to mix with the other students. A suspension is a material that does not mix with water.</i>

B. As you work through this lesson, you may find these terms in the activities. When you need to write a key term or a definition, **highlight** the term or the definition.



BUILD Understanding

Venn Diagram A Venn diagram is made up of overlapping circles. It is a useful tool for comparing two or even three topics. In each circle, write one of the topics that you want to compare. In the space where the circles overlap, write the features that the topics share. In the space where the circles do not overlap, write the features that are unique to each topic.

Use the Venn diagram to compare solutions and suspensions.

