

Name: _____

Period: _____ Date: _____

Structure of Water and Hydrogen Bonding

Getting to the tutorials.

- Go to www.sciencemusicvideos.com; Use the College Bio, AP Bio, or Student Learning Guide Menus to find "The Structure of Water and Hydrogen Bonding"
- Start with "1. Water Polarity, and Hydrogen Bonds"

Note from Mr. W: The videos in these tutorials incorrectly use the term "orbitals" to describe "electron energy levels" (also known as "shells" or "orbits."). So when you hear "orbital," think "energy level" or "shell."

Tutorial 1: Water, Polarity, and Hydrogen Bonds.

Introduction: Water Makes Life Possible

1. Most of the mass of any living thing is _____.
2. Astronomically, life only exists where water is found in a _____ form.

Complete Interactive Reading I.

3. Complete the table below

Water, Electron Distribution Model	Water, Structural Formula

4. Why is water the Mickey Mouse molecule?

Complete Interactive Reading 2: Water and Polarity

5. Add partial positive and partial negative charges to your diagrams of a water molecule above. (δ^+ and δ^- for partial positive and negative, respectively).
6. Explain why water has these partial positive and negative charge.

Complete Interactive Reading 3: Hydrogen Bonding

7. Draw three or four water molecules, showing hydrogen bonding between them.
8. Explain why water is a polar molecule, and why methane is *not* polar?

9. Explain why water is a liquid at room temperature, while methane is a gas.

10. Take the "Chemistry of Water Quiz." Check the box when you're done:

FINAL REFLECTION: Watch the video (up at the top of the page. If you're in class, use ear buds or headphones). Then, use this space to explain why water is sticky, and the consequences of that stickiness.

Proceed to "The Properties of Water."

Tutorial 2: The Properties of Water (a virtual lab)

Parts 1 and 2: Introduction and Background.

1. Complete the table below: include partial charges.

Water, structural formula with charges	Alcohol, structural formula with charges

2. Explain: why is water so much more polar than alcohol?

Part 3: Six Observations/Experiments

Comparing water and alcohol.

3.1. How is the shape of a drop of water on a penny different from the shape of a drop of alcohol? Explain why it's different.

3.2. Compare what happens if you try to pile as many drops of water on a penny as you can, and then do the same with alcohol? Why the difference?

3.3. Compare the evaporation speed of water and alcohol. Explain.

3.4. Compare how drops of water and alcohol feel on your skin. Explain.

3.5. Compare what happens when you try to dissolve salt in water with what happens when you try to dissolve salt in alcohol. What's the difference? Why?

3.6. Compare your attempts to float a paper clip on alcohol and on water? What's the difference? Why?

4. Use the material in the reading "Five Properties of Water that you should remember" to explain:

a. Why water has a relatively high freezing point.

b. Why ice floats on liquid water (why ice is less dense).

5. Complete the Fill-in-the-Blanks quiz. Check the box when you're done.

REFLECTION: Watch the video (up at the top of the page). Why is water a stickier molecule than alcohol? How are the properties of each different?

Click the link to "Acids, Bases and the pH scale"

Tutorial 3: Acids, Bases and the pH Scale

1 and 2. Read the Introduction, and Solutions, Acids, and Bases. As you read, write down definitions of the following terms:

a. Solution:

b. Solute:

c. Solvent

Take the Quiz: "Solutions, Acids, and Bases." Check the box below when you're done

Take a minute and write a sentence comparing and contrasting acids and bases. Use sentences like this: While bases are ..., acids are....Both are similar in that; they differ because....

3. Read "The Chemistry of Acids and Bases..." When you're done, check the box below

Copy the formula that shows what happens when HCl is dissolved in water.

Copy the formula that shows what happens when NaOH is dissolved in water.

In a single sentence, summarize how the pH scale works.

4. Take the quiz: Acids, Bases and pH. When you're done, check the box:

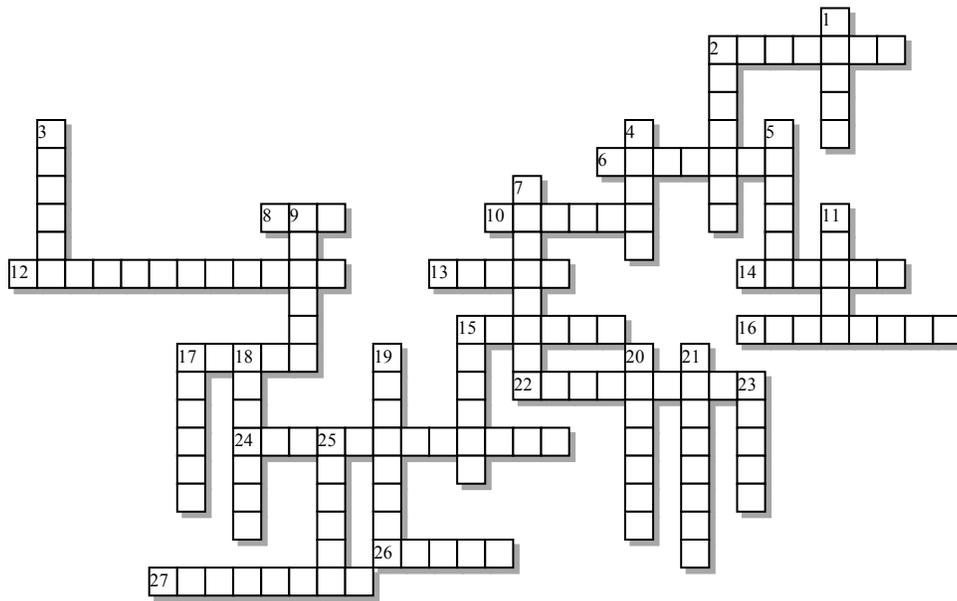
Imagine that someone's asked you to explain how acids and bases are chemically different: write what you'd say in the space below.

5 and 6. Read the section about buffers, and the conclusion

What are buffers? Why are they important?

REFLECT: What are seven (or six or eight) things that everyone should know about acids, bases, the pH scale, and buffers?

Properties of Water, Acids and Bases



Across:

- 2 - Because of hydrogen bonding, water is a great _____ of ionic compounds.
- 6 - A nonpolar compound found in natural gas
- 8 - Nonpolar molecules like methane are a _____ at room temperature.
- 10 - Unlike bases, acids will cause _____ to dissolve.
- 12 - The acid in your stomach
- 13 - A molecule with regions of positive and negative charge is said to be _____.
- 14 - A hydrogen ion is really just a _____.
- 15 - Water's ability to form hydrogen bonds makes it a _____ molecule.
- 16 - The bond that forms between two water molecules
- 17 - A solution with more hydroxide ions than hydrogen ions.
- 22 - In a water molecule, the _____ tend to cluster near the oxygen atom.
- 24 - Because of hydrogen bonding, water has a high heat of _____.
- 26 - A planet with lots of water in liquid form
- 27 - The bonds holding the atoms in a single water molecule together are polar _____ bonds.

Down:

- 1 - Molecular regions of similar charge will _____ one another.
- 2 - This type of tension exists on the top of a body of water.
- 3 - The first name of a cartoon character reminiscent of water
- 4 - An unusual property of water is that it's less _____ as a solid than as a liquid.
- 5 - Compared to a covalent bond, a hydrogen bond is much _____.
- 7 - A water molecule will have a partially _____ charge near its oxygen atom.
- 9 - A solution with more hydrogen ions than hydroxide ions
- 11 - By weight, you're mostly made of _____.
- 15 - The thing that gets dissolved in a solution
- 17 - This kind of soda is a weak base
- 18 - The thing that dissolves the solute is a _____.
- 19 - A water molecule will have a partially _____ charge near its hydrogen atoms.
- 20 - The opposite poles of a polar molecule will _____ one another.
- 21 - The mutual attraction between water molecules is called _____.
- 23 - An acid on a cut will _____.
- 25 - A water molecule has a single atom of _____.

Possible Answers:

Earth, Mickey, acidic, attract, baking, basic, cohesion, covalent, dense, electrons, gas, hydrochloric, hydrogen, metals, methane, negative, oxygen, polar, positive, proton, repel, solute, solvent, solvent, sticky, sting, surface, vaporization, water, weaker