

# Equilibrium: Weak and Strong Acids

Use this recitation to make connections among the concepts of strength, concentration, and pH.

## Part I: Your Initial Ideas

Answer the following True/False questions for yourself. Then check in with your group. You don't all have to agree—just get a sense of what others are thinking. You will re-evaluate your answers at the end of recitation, so it's okay to be unsure at this point.

<p><b>My response:</b> Always True    Always False    Sometimes True</p> <p><b>My group's response:</b> Always True    Always False    Sometimes True</p>	<p><b>1a.</b> Strong acids completely dissociate in water.</p>
<p><b>My response:</b> Always True    Always False    Sometimes True</p> <p><b>My group's response:</b> Always True    Always False    Sometimes True</p>	<p><b>1b.</b> Strong acids have lower pH's than weak acids.</p>
<p><b>My response:</b> Always True    Always False    Sometimes True</p> <p><b>My group's response:</b> Always True    Always False    Sometimes True</p>	<p><b>1c.</b> A ten-fold <i>dilution</i> of a strong acidic solution will <i>decrease</i> the pH by 1.</p>
<p><b>My response:</b> Always True    Always False    Sometimes True</p> <p><b>My group's response:</b> Always True    Always False    Sometimes True</p>	<p><b>1d.</b> A solution with <math>[\text{H}_3\text{O}^+] = 0.01 \text{ M}</math> contains a stronger acid than a solution with <math>[\text{H}_3\text{O}^+] = 0.001 \text{ M}</math>.</p>
<p><b>My response:</b> Always True    Always False    Sometimes True</p> <p><b>My group's response:</b> Always True    Always False    Sometimes True</p>	<p><b>1e.</b> A solution whose pH is 2.00 contains a stronger acid than a solution whose pH is 3.00.</p>

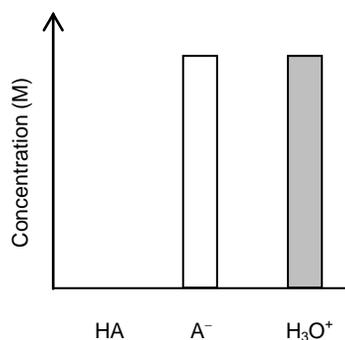
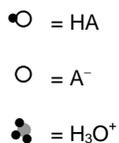
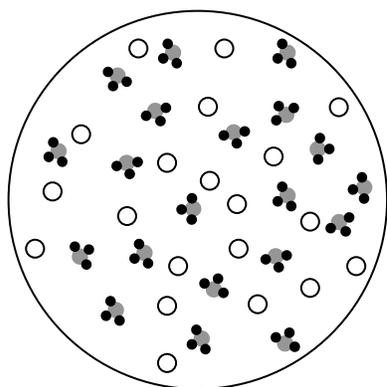
## Part II: Strong and Weak Acids

Open the simulation on your computer. Use the 1<sup>st</sup> tab to explore how *strong* and *weak* acids **differ**. List two ways below:

1. \_\_\_\_\_
2. \_\_\_\_\_

*NOTE: In the representations below, HA denotes a generic acid, and the water molecules are not shown.*

**2a.** This picture/graph depicts a **strong acid** solution.



How would the picture/graph change for a **weak acid** solution? *How would the pH change?*

\_\_\_\_\_

**2b.** Draw picture/graph that depicts a **weak acid** solution.

Use the 1<sup>st</sup> tab of the computer simulation to check your understanding.

### Part III: Concentration and Strength

How would the picture/graph change for a more dilute **strong acid** solution? *How would the pH change?*

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**3a.** Draw picture/graph that depicts a more dilute **strong acid** solution.

How would the picture/graph change for a stronger **weak acid** solution? *How would the pH change?*

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**3b.** Draw picture/graph that depicts a stronger **weak acid** solution.

Use the 2<sup>nd</sup> tab of the simulation to explore the concepts of strength and concentration. How do they compare?

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How can a *weak acid* solution have the **same pH** as a *strong acid* solution?

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## Part IV: Reflection

Reflect on your initial ideas from Part I (True/False questions). Do you still agree with your responses? Why or why not? Make sure you can defend your reasoning. Look for examples within the recitation, or think of your own, to support your reasoning.

<p><b>My response now:</b> Always True    Always False    Sometimes True</p>	<p><b>4a.</b> Strong acids completely dissociate in water.</p>
<p><b>My response now:</b> Always True    Always False    Sometimes True</p>	<p><b>4b.</b> Strong acids have lower pH's than weak acids.</p>
<p><b>My response now:</b> Always True    Always False    Sometimes True</p>	<p><b>4c.</b> A ten-fold <i>dilution</i> of a strong acidic solution will <i>decrease</i> the pH by 1.</p>
<p><b>My response now:</b> Always True    Always False    Sometimes True</p>	<p><b>4d.</b> A solution with <math>[\text{H}_3\text{O}^+] = 0.01 \text{ M}</math> contains a stronger acid than a solution with <math>[\text{H}_3\text{O}^+] = 0.001 \text{ M}</math>.</p>
<p><b>My response now:</b> Always True    Always False    Sometimes True</p>	<p><b>4e.</b> A solution whose pH is 2.00 contains a stronger acid than a solution whose pH is 3.00.</p>