**Equilibrium: Weak and Strong Acids Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

### Obj.: *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 team. You don’t have to agree—just get a sense of what others are thinking. You will re-evaluate your answers at the end, so it’s okay to be unsure at this point.

|  |  |
| --- | --- |
| ***My response:***Always True Always False Sometimes True***My team’s response:***Always True Always False Sometimes True | **1a.** Strong acids completely dissociate in water. |
| ***My response:***Always True Always False Sometimes True***My team’s response:***Always True Always False Sometimes True | **1b.** Strong acids have lower pH’s than weak acids. |
| ***My response:***Always True Always False Sometimes True***My team’s response:***Always True Always False Sometimes True | **1c.** A ten-fold *dilution* of a strong acidic solution will *decrease* the pH by 1. |
| ***My response:***Always True Always False Sometimes True***My team’s response:***Always True Always False Sometimes True | **1d.** A solution with [H3O+] = 0.01 M contains a stronger acid than a solution with [H3O+] = 0.001 M. |
| ***My response:***Always True Always False Sometimes True***My team’s response:***Always True Always False Sometimes True | **1e.** A solution whose pH is 2.00 contains a stronger acid than a solution whose pH is 3.00. |

### Part II: Strong and Weak Acids

Open the simulation on your computer. *PhET Simulations 🡪 Play With Sims 🡪 Chemistry🡪 Acid-Base Solutions 🡪*  <http://phet.colorado.edu/en/simulation/acid-base-solutions>

Use the 1st 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.*

|  |
| --- |
|  This picture and graph depicts a **strong acid** solution. = HAConcentration (M) = A− = H3O+HA A− H3O+ |

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

4. Draw a picture and graph that depicts a more *weak* **acid** solution.

Use the simulation to check your understanding.

**Part III: Concentration and Strength**

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

|  |
| --- |
| **6.** Draw a picture and graph that depicts a more *dilute* **strong acid** solution.  |

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

|  |
| --- |
| **8.** Draw picture/graph that depicts a *stronger* **weak acid** solution. |

9. Use the 2nd tab of the simulation to explore the concepts of *strength* and *concentration*. How do they compare?

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

### 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.

|  |  |
| --- | --- |
| ***My response now:***Always True Always False Sometimes True | **4a.** Strong acids completely dissociate in water. |
| ***My response now:***Always True Always False Sometimes True | **4b.** Strong acids have lower pH’s than weak acids. |
| ***My response now:***Always True Always False Sometimes True | **4c.** A ten-fold *dilution* of a strong acidic solution will *decrease* the pH by 1. |
| ***My response now:***Always True Always False Sometimes True | **4d.** A solution with [H3O+] = 0.01 M contains a stronger acid than a solution with [H3O+] = 0.001 M. |
| ***My response now:***Always True Always False Sometimes True | **4e.** A solution whose pH is 2.00 contains a stronger acid than a solution whose pH is 3.00. |