

## Lesson plan for *pH Scale* :

Time for activity 50 minute class

### Learning Goals:

Students will be able to: Use specific examples to demonstrate each of the following learning goals.

1. Determine if a solution is acidic or basic using
  - a. pH
  - b.  $H_3O^+/OH^-$  ratio (molecular size representation of just the ions in the water equilibrium)
  - c. Hydronium/Hydroxide concentration
2. Relate liquid color to pH.
3. Predict if dilution and volume will increase, decrease or not change the pH
4. Organize a list of liquids in terms of acid or base strength in relative order with supporting evidence.
5. Write the water equilibrium expression. Describe how the water equilibrium varies with pH.

**Background:** This activity was used on the first day of second semester acid-base unit. The students had an introduction to acid-base reactions as part of stoichiometry in semester one. Originally, the learning goal 1b just stated “molecular representation”; many of my students answers demonstrated that they were confusing concentration with ion levels. We had a discussion and I have changed the goals for next year. The next PhET simulation addresses learning goals around strength and concentration directly. My students have done several titrations in labs so they are familiar with indicators.

***pH Scale* Introduction:** I did a short demonstration just to peak interest in acid-bases. I put some universal indicator in a large test tube and then added some .1M HCl. Then I used a pipet to add some saturated  $NaCO_3$  solution. The results will be a variation in colors. We discussed briefly that the layers had varying pH.

**Lesson:** My students worked in pairs and most completed the activity in 40 minutes.

Post lesson: Use clicker questions