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## Paper Plate Titration

### **Purpose**

To provide a visual of neutralization as it occurs in a titration, with the endpoint indicated by phenolphthalein .

### **Materials**

8 white paper/polystyrene/ plastic plates and one red/magenta plate, all of the same size.

### **Procedure**

1. Label the white plates as follows:
  - $\text{OH}^-$  on the bottom sides of four plates
  - $\text{H}_2\text{O}$  on the top sides of three plates with  $\text{H}^+$  labeled on the bottom sides
  - Label one white plate Ph (for phenolphthalein) on bottom side. Fit the red/magenta plate to the top side so as the phenolphthalein can flip between red/magenta and white.
2. Two student volunteers are needed, one holding two plates that each display " $\text{H}^+$ ," the other holding one plate displaying " $\text{H}^+$ " and the double-plate representing phenolphthalein with the white plate labeled "Ph" displayed.
3. The teacher acts as the "burette," passing one plate labeled " $\text{OH}^-$ " near the phenolphthalein plates. The  $\text{OH}^-$  and binds briefly with it by being placed over the white plate and instructing the student to flip the plates over to display the red plate, indicating a temporary color change in the "solution."
4. The  $\text{OH}^-$  is then more powerfully attracted to the  $\text{H}^+$  ion and releases the phenolphthalein to bind with an  $\text{H}^+$  and form water. This is represented by the teacher removing the  $\text{OH}^-$  plate from the phenolphthalein plates (instructing the student to turn the phenolphthalein back over so the white plate is displayed again) and placing it on one of the  $\text{H}^+$  plates, which the student volunteer then flips to the side labeled " $\text{H}_2\text{O}$ ."
5. This process is repeated twice until only water and colorless phenolphthalein remain.
6. When the final  $\text{OH}^-$  plate is added, the  $\text{OH}^-$  binds with the phenolphthalein and remains bound to it in the absence of Hydrogen ions, so that the color change is permanent (indicated by the student again flipping the plate over to the red side after the attachment of the  $\text{OH}^-$  plate).