

## 4 • Classifying Chemicals: Acids & Bases

### TITRATION PRACTICE

An acid and a base neutralize each other when the **moles of  $H^+$**  = the **moles of  $OH^-$** . A formula similar to the dilution formula can be used to determine the concentration of an unknown acid or base.

$$V_a M_a = V_b M_b \quad \text{where } a = H^+ \quad b = OH^-$$

**Example:** What is the concentration of a 10.0 mL sample of HCl if 35.5 mL of 0.150 M NaOH is needed to titrate it to a pink endpoint?

$$(10.0 \text{ mL})(x) = (35.5 \text{ mL})(0.150 \text{ M})$$

$$x = \frac{(35.5 \text{ mL})(0.150 \text{ M})}{10.0 \text{ mL}} = 0.5325 \text{ M} = \mathbf{0.533 \text{ M}}$$

1. What is the concentration of a 15.0 mL sample of HCl if 28.2 mL of 0.150 M NaOH is needed to titrate it?
2. A 10.0 mL sample of a monoprotic acid is titrated with 45.5 mL of 0.200 M NaOH. What is the concentration of the acid?
3. A 5.00 mL sample of vinegar has a concentration of 0.800 M. What volume of 0.150 M NaOH is required to complete the titration?
4. A 10.0 sample of household ammonia,  $NH_3(aq)$ , is titrated with 0.500 M HCl. If 25.7 mL of acid is required, what is the concentration of the household ammonia?
5. A 5.00 mL sample of  $H_2SO_4$  is titrated with 0.150 M NaOH. If 20.0 mL of the base is required to titrate the acid sample, what is the  $[H^+]$  of the acid? \_\_\_\_\_ What is  $[H_2SO_4]$ ? \_\_\_\_\_