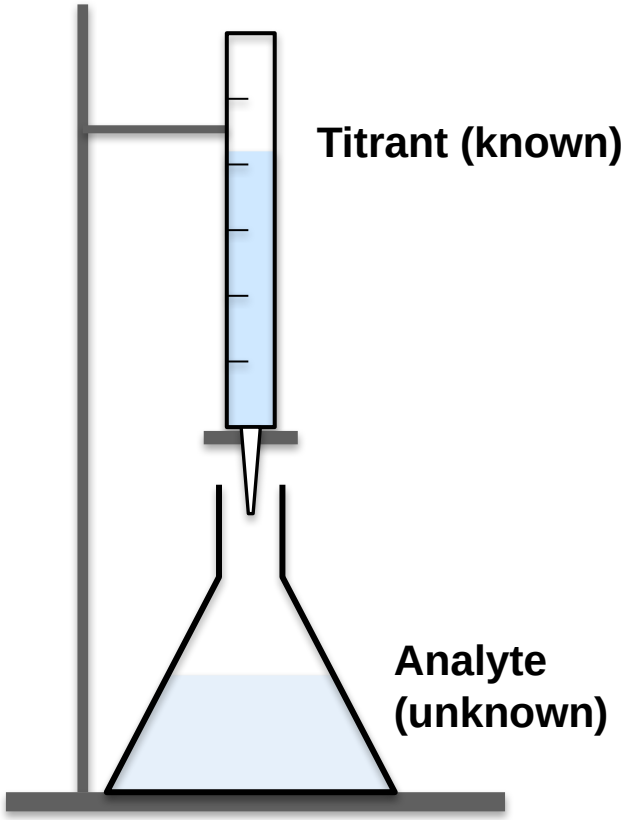
Introduction to Titration

Essential Question

How can we find an unknown concentration?

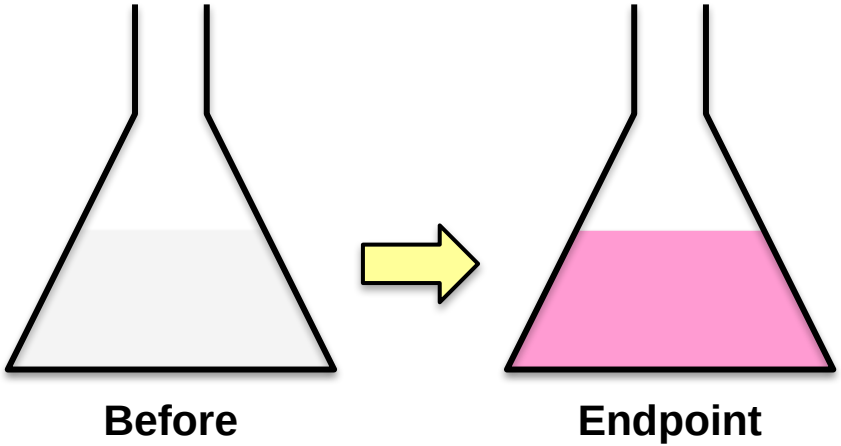
What Is a Titration?

- Find the amount of an unknown
- Add a known solution from a buret
- Stop when the reaction is complete



Equivalence Point and Endpoint

- Equivalence point: analyte is all used up
- Endpoint: indicator changes color
- Good indicator: endpoint ≈ equivalence point



Moles at the Equivalence Point

- Titrant moles react exactly with analyte moles
- Use the mole ratio from the equation

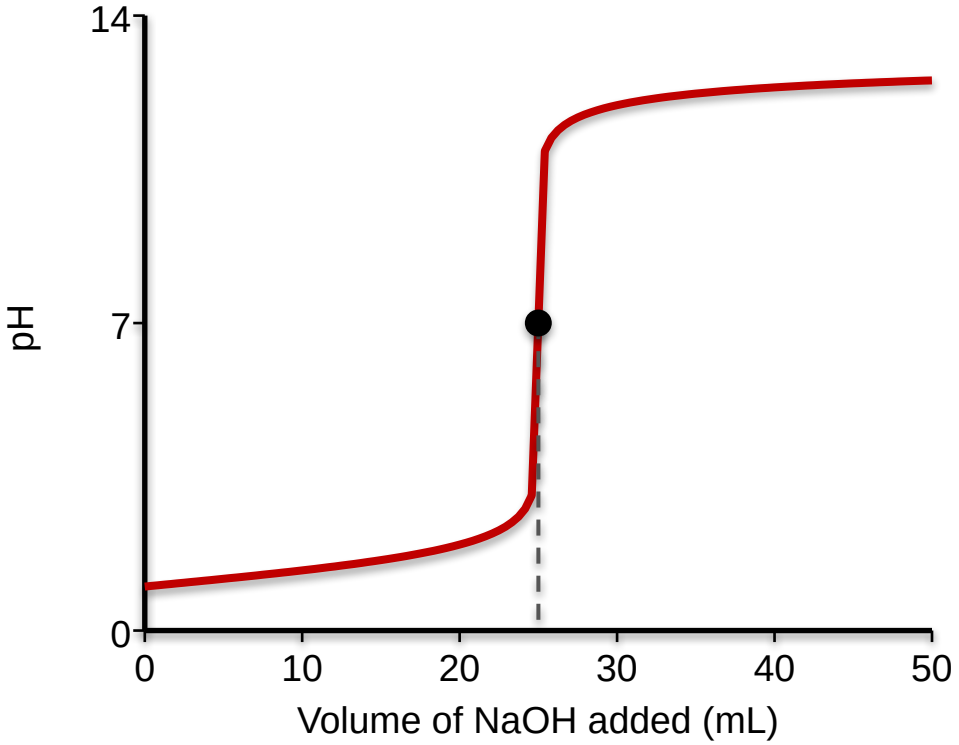
$$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$$

mol HCl = mol NaOH

moles = molarity × volume (L)

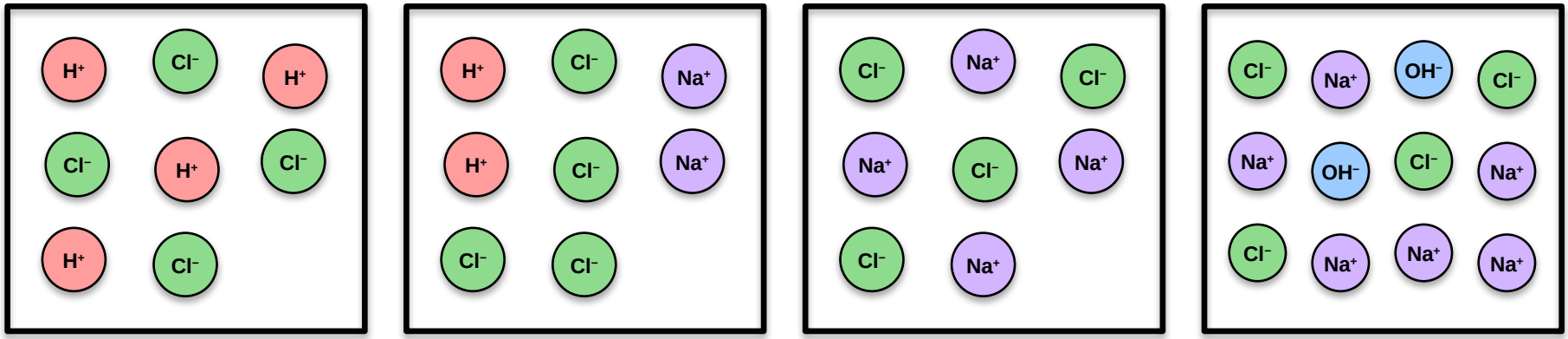
Titration Curve

- pH rises slowly, then jumps
- Equivalence point: middle of the jump
- Strong acid + strong base: pH 7



Particles During a Titration

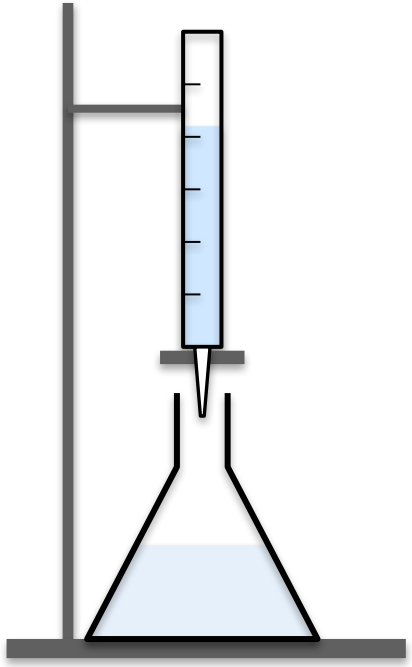
- $H^+ + OH^- \rightarrow H_2O$ as NaOH is added



Start | Halfway | Equivalence | Past equivalence

Example: Finding Molarity

A 25.00 mL sample of HCl is titrated with 0.100 M NaOH. The equivalence point is reached after 18.40 mL of NaOH is added. What is the concentration of the HCl?



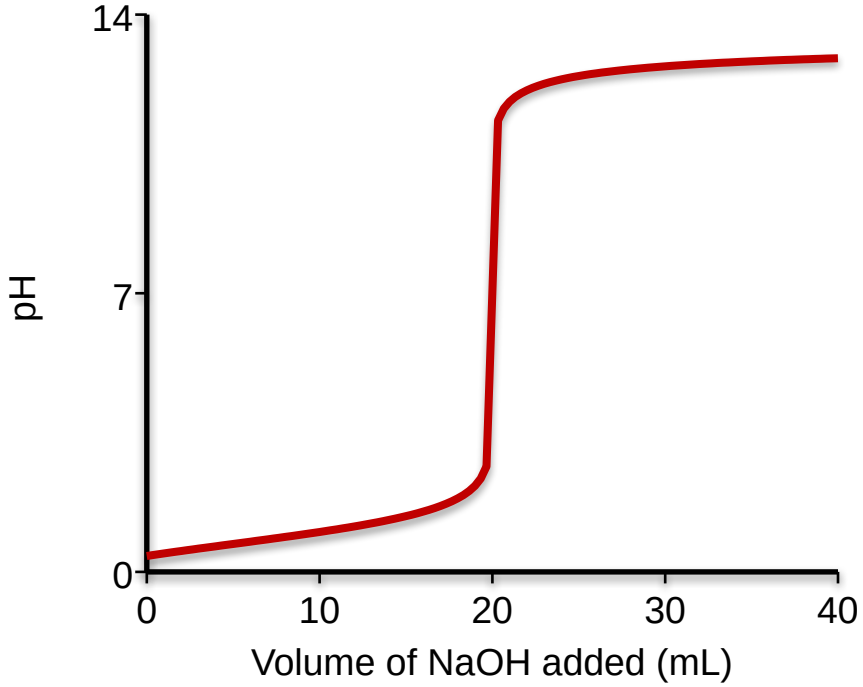
Example: A 1 : 2 Mole Ratio

A 20.00 mL sample of H_2SO_4 requires 32.50 mL of 0.150 M NaOH to reach the equivalence point. Find the concentration of the H_2SO_4.

$H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$

Example: Reading a Titration Curve

A 10.00 mL sample of HCl is titrated with 0.200 M NaOH. Use the curve to find the volume at the equivalence point, then find the concentration of the HCl.



Introduction to Titration

Big Ideas

- Titrant: known; analyte: unknown
- Equivalence point: analyte used up
- Endpoint: indicator changes color
- Middle of the jump = equivalence

