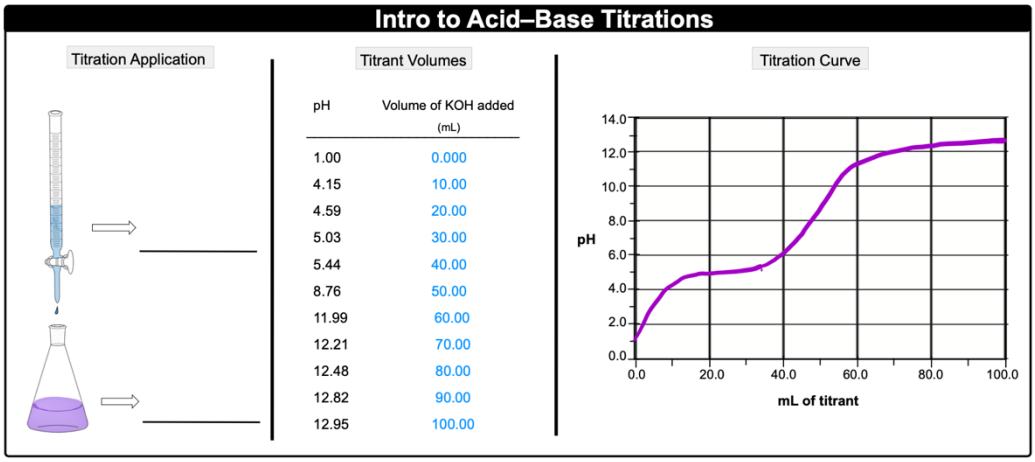
**CONCEPT:** INTRO TO ACID-BASE TITRATION CURVES

- An **acid–base titration** is a _____ reaction used in determining the concentration of an acid and base.
  - □ **Titrant**: A strong acid or base solution with a _____ concentration that is added to the titrate.
  - □ **Titrate**: An acidic or basic solution with an _____ concentration being neutralized by the titrant.
  - □ **Titration Curve**: A graph of the _____ of the titrate during the titration with a *titrant*.




**The Equivalence Point**

- The point of complete neutralization where the moles of acid _____ the moles of base.
  - □ The equivalence point volume equation represents a simplified approach to _____ stoichiometric calculations.

**Equivalence Point Volume Formula**

$M_AV_A = M_BV_B$

- □ $M_A$ = Molarity of the _____.
- □ $V_A$ = Volume of the _____.
- □ $M_B$ = Molarity of the _____.
- □ $V_B$ = Volume of the _____.

- For a diprotic and polyprotic acid the number of ____ will affect the overall concentration.

| | |
|---|---|
| 0.40 M $H_2SO_4$ ⟶ 2 $H^+$ + $SO_4^{2-}$ | $[H^+]$ = 0.40 M x __ = _____ |
| 0.10 M $Ba(OH)_2$ ⟶ $Ba^{2+}$ + 2 $OH^-$ | $[OH^-]$ = 0.10 M x __ = _____ |

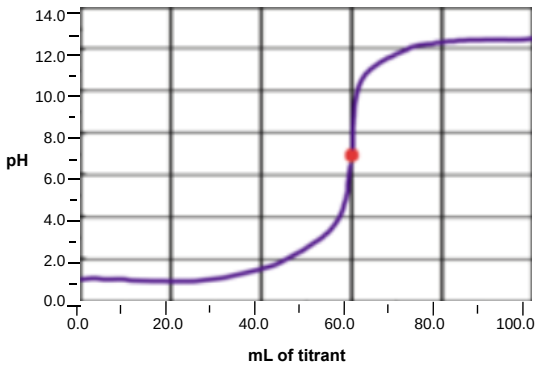
**EXAMPLE:** Consider the titration of 40.0 mL of 0.0550 M $H_2CO_3$ with 0.160 M $Al(OH)_3$. How many milliliters of 0.160 M $Al(OH)_3$ are required to reach the equivalence point?

**CONCEPT:** INTRO TO ACID-BASE TITRATION CURVES

- The parts and overall _____ of the titration curve depends on the type of titrate and titrant used.
  - □ _____: The shape of the titration curve when both the titrate and titrant are strong.

## Acid–Base Titration Curve

### Strong Titrate–Strong Titrant Curve




### Key Features

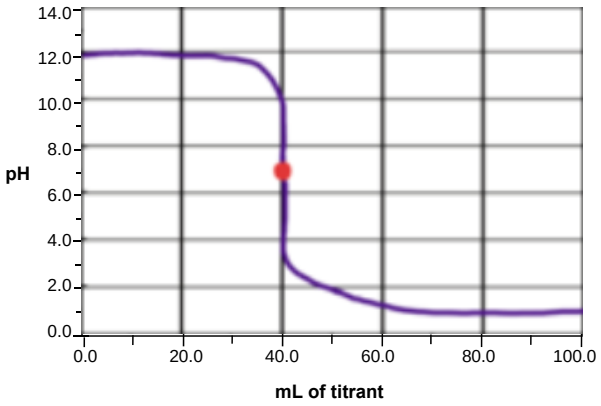
- ☐ **Pure Titrate** = _____ of titration before any titrant has been added.
- ☐ **Equivalence Point** = _____ region of the curve that has the steepest incline.
- ☐ After **Equivalence Point** = region where there is _____ titrant still added.

---

**EXAMPLE:** Based on the image of the titration curve provided below, what is the potential identity of the titrate?

a) $HNO_3$ b) HF c) KOH d) $HC_2H_3O_2$ e) $CH_3NH_3^+$

### Strong Titrate–Strong Titrant Curve




**PRACTICE:** Consider the titration of 100.0 mL of 0.40 M HCl with 0.40 M NaOH. If sodium hydroxide is the titrant, which volume would place it in excess?

a) 70.0 mL b) 25.0 mL c) 100.0 mL d) 110.0 mL e) 9.0 mL