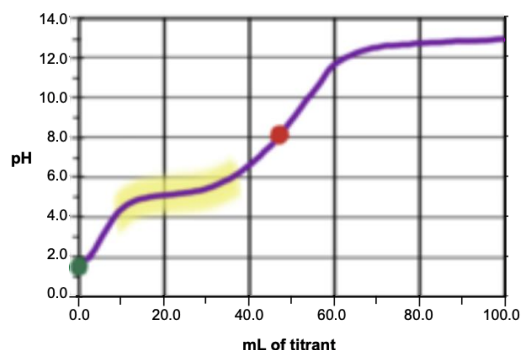


CONCEPT: WEAK TITRATE–STRONG TITRANT CURVES

- Under this type of titration between a weak titrate and a strong titrant a _____ region can exist.

Acid–Base Titration Curve

Weak Titrate–Strong Titrant Curve



Key Features

- ☐ **Pure Titrate** = _____ of titration before any titrant has been added.
- ☐ **Buffer Region** = Region where the pH is _____ resistant to change.
- ☐ **Half Equivalence Point** = Midpoint within buffer region where $[WA]$ _____ $[CB]$
- ☐ **Equivalence Point** = _____ region of the curve that has the steepest incline.
- ☐ After **Equivalence Point** = region where there is _____ titrant still added.

EXAMPLE: Consider the titration of 55.0 mL of 0.120 M HCN with 0.160 M LiOH. Calculate the volume needed to reach the half equivalence point.

STEP 1: Determine the volume of the titrant to reach the equivalence point.

STEP 2: Utilize the correct formula based on the region of the titration curve.

- ☐ Utilize this step only if necessary

Acid–Base Titration Formulas

Equivalence
Volume

$$M_A V_A = M_B V_B$$

Before Equivalence
Point

$$pH = pK_a + \log \frac{[Base]}{[Acid]}$$

Half Equivalence
Point

$$pH = pK_a$$
$$K_a = 10^{-pH}$$

PRACTICE: Consider the titration of 30.0 mL of 0.100 M $HC_2H_3O_2$ with 0.100 M $NaNH_2$. Which volume of $NaNH_2$ would take place within the buffer region?

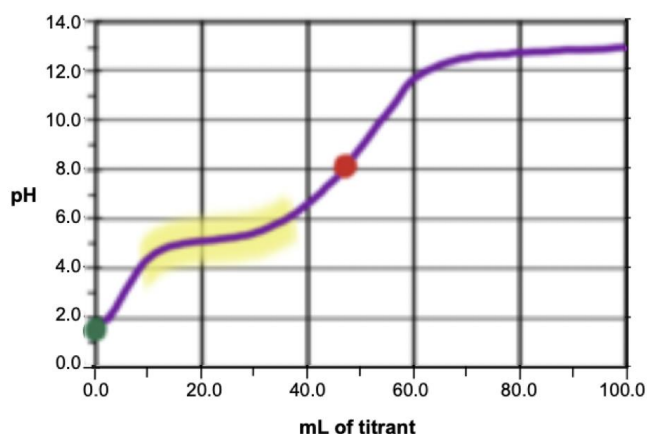
- a) 30.0 mL b) 50.0 mL c) 10.0 mL d) 100.0 mL e) 1.5 L

CONCEPT: WEAK TITRATE–STRONG TITRANT CURVES

- In these 2 types of titration curves the pH changes gradually before the equivalence point (buffer region).

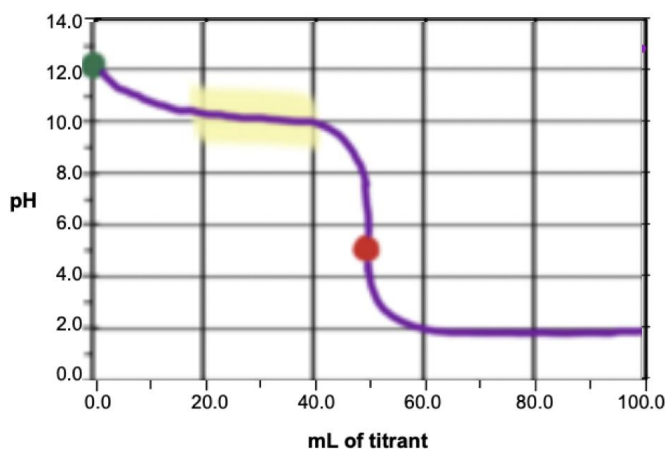
Weak Titrate–Strong Titrant Curve

Weak Acid–Strong Base Titration Curve



- ☐ Titrate = _____ and Titrant = _____
- ☐ pH starts ____ 7.0 and increases gradually with added base.
- ☐ pH ____ 7.0 at the **Equivalence Point**.
- ☐ After the **Equivalence Point**, weak acid is _____ and excess strong base remains.

Weak Base–Strong Acid Titration Curve



- ☐ Titrate = _____ and Titrant = _____
- ☐ pH starts ____ 7.0 and decreases gradually with added acid.
- ☐ pH ____ 7.0 at the **Equivalence Point**.
- ☐ After the **Equivalence Point**, weak base is _____ and excess strong acid remains.

EXAMPLE: At the half equivalence point the $[WA] = [CB]$. Consider the titration of 100.0 mL of 0.200 M of a weak monoprotic acid with 50.0 mL of 0.200 M NaOH. Determine K_a value of the weak acid if the pH is 4.18.

PRACTICE: In titration of NH_3 and HCl, what is the predominant species beyond the equivalence point?

- a) NH_3 b) HCl c) CH_3NH_2 d) Cl^-