

Exercise walk-through

8.5

Acid-Base Titrations

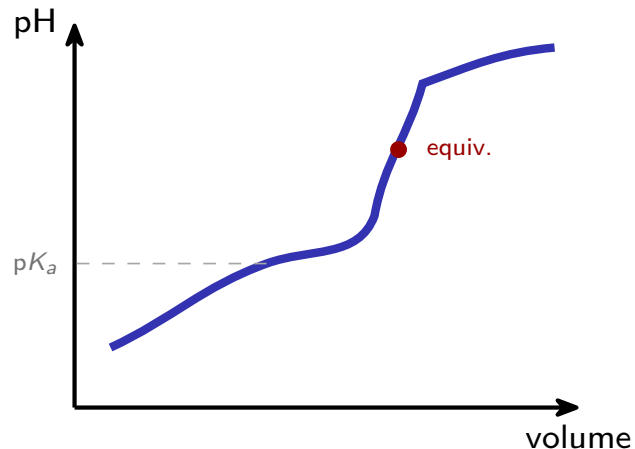
AP Chemistry

Acid-base titrations

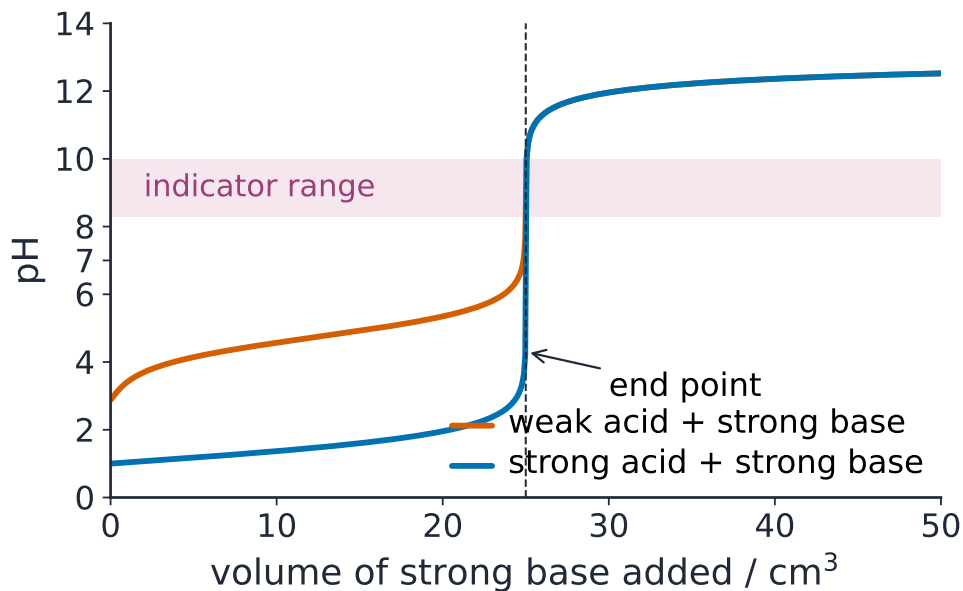
A **titration curve** plots pH against titrant volume:

- the **equivalence point** is the steep jump
- at the **half-equivalence point**, $\text{pH} = \text{p}K_a$

Strong-strong: equivalence at pH 7.
Weak acid-strong base: above 7.



A titration curve has a steep jump



A titration curve has a steep jump near the equivalence point

Exercises 2.1-2.3

2.1 What is true of the moles of acid and base at the equivalence point? [1]

2.2 At the half-equivalence point, pH equals what? [1]

2.3 For a strong acid-strong base titration, what is the equivalence pH? [1]

Exercises 2.1-2.3

2.1 What is true of the moles of acid and base at the equivalence point? [1]

2.1

- They are equal (in the stoichiometric ratio)
-

2.2 At the half-equivalence point, pH equals what? [1]

2.2

- $\text{p}K_a$
-

2.3 For a strong acid-strong base titration, what is the equivalence pH? [1]

2.3

- 7

Exercise 3.1

3.1 The equivalence point of a weak acid titrated with a strong base has a pH that is [1]

☐

A exactly 7

B greater than 7

C less than 7

D zero

Exercise 3.1

3.1 The equivalence point of a weak acid titrated with a strong base has a pH that is [1]

☐

A exactly 7

B greater than 7

C less than 7

D zero

3.1 B

- greater than 7

Exercise 3.2 (a)

3.2 A weak acid is titrated with NaOH. The equivalence point is at 20.0 mL of base.

(a) At what volume is the half-equivalence point?

[1]

Exercise 3.2 (a)

3.2 A weak acid is titrated with NaOH. The equivalence point is at 20.0 mL of base.

(a) At what volume is the half-equivalence point?

[1]

(a)

- 10.0 mL (half of 20.0)

Exercise 3.2 (b)

3.2 A weak acid is titrated with NaOH. The equivalence point is at 20.0 mL of base.

(b) If the pH there is 4.7, find $\text{p}K_a$ and K_a . [3]

Exercise 3.2 (b)

3.2 A weak acid is titrated with NaOH. The equivalence point is at 20.0 mL of base.

(b) If the pH there is 4.7, find pK_a and K_a . [3]

(b)

- $pK_a = \text{pH} = 4.7$; $K_a = 10^{-4.7} = 2.0 \times 10^{-5}$

Exercise 3.3

3.3 Explain why the equivalence pH of a weak acid-strong base titration is above 7. [2]

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3.3

- At equivalence all the acid has become its conjugate base A^- , which is a weak base and reacts with water to give OH^- , raising the pH above 7