Acid Base Chemistry

1. Foundation knowledge
2. The pH scale
3. The pH of Water
4. Acids
    a. Defining strong acids and weak acids
    b. Strong acids
    c. Weak acids
        i. What makes a weak acid?
        ii. How to calculate the pH of a weak acid
5. Bases
6. Acid base titrations
7. Relative acidity and basicity – competition for H+

Calculating pH of weak acids

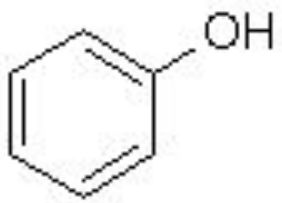
We are learning to:

derive $[H^+] = \sqrt{K_a\ [HA]}$

use $pH = -\log[H^+]$

...to calculate pH of

a) 0.1 moldm^{-3} HCN $K_a = 4.9 \times 10^{-10}$

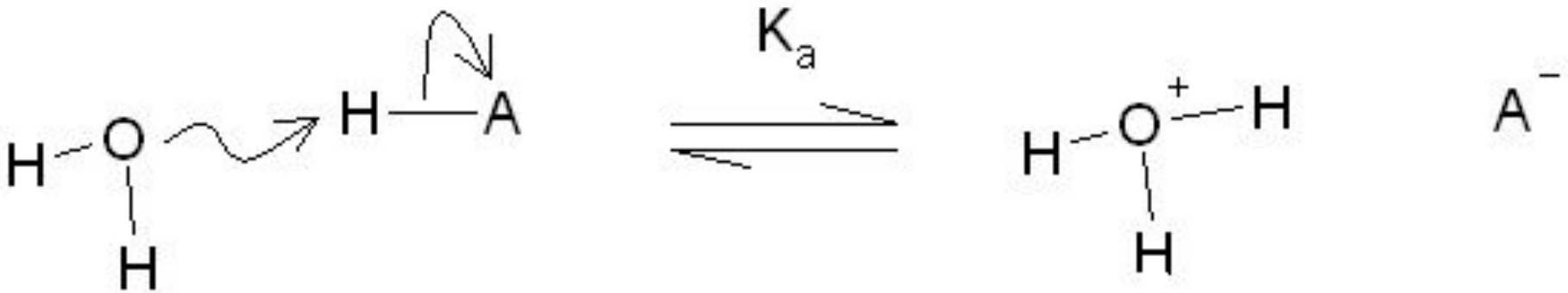
b) 0.05 moldm^{-3} 

$K_a = 1.28 \times 10^{-10}$

Calculating pH of weak acids

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

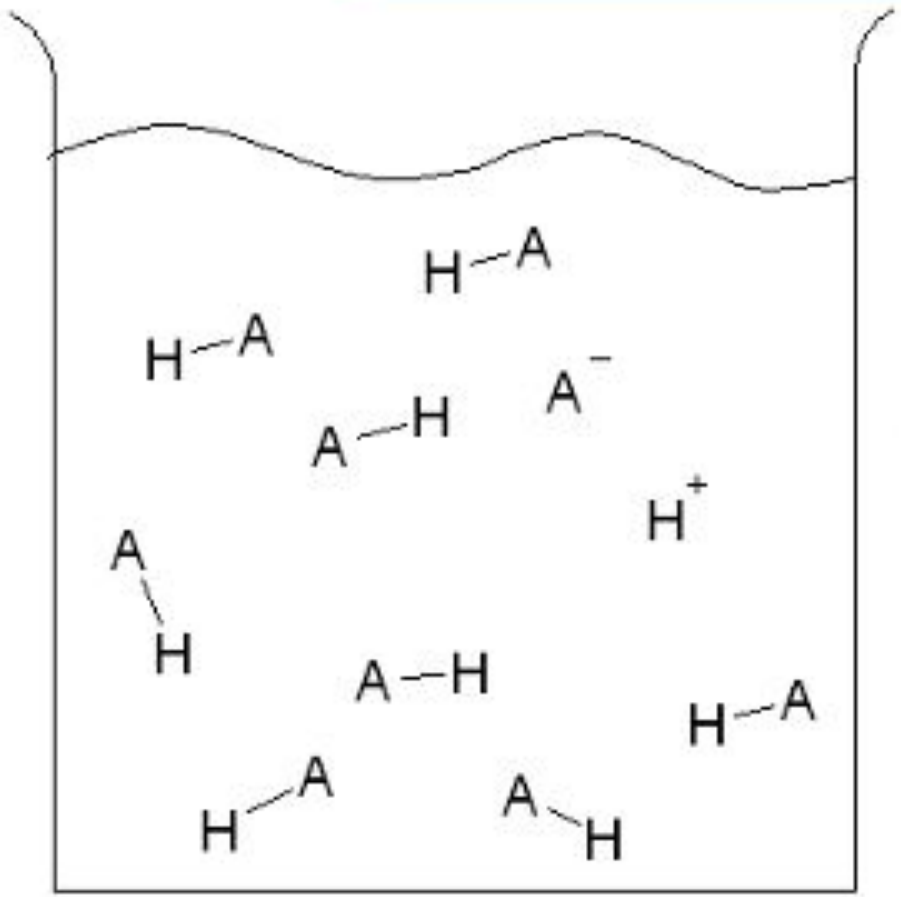


$$K_a = \frac{[H^+][A^-]}{[HA]}$$

Calculating pH of weak acids

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

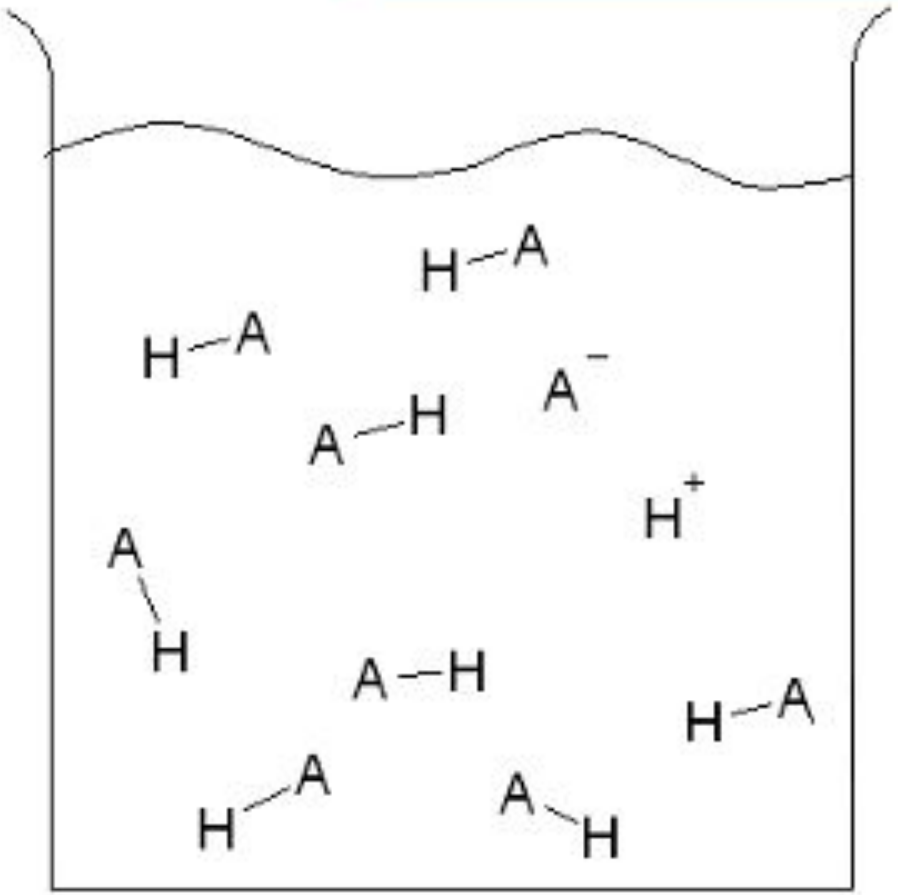


Calculating pH of weak acids

$$HA \rightleftharpoons H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

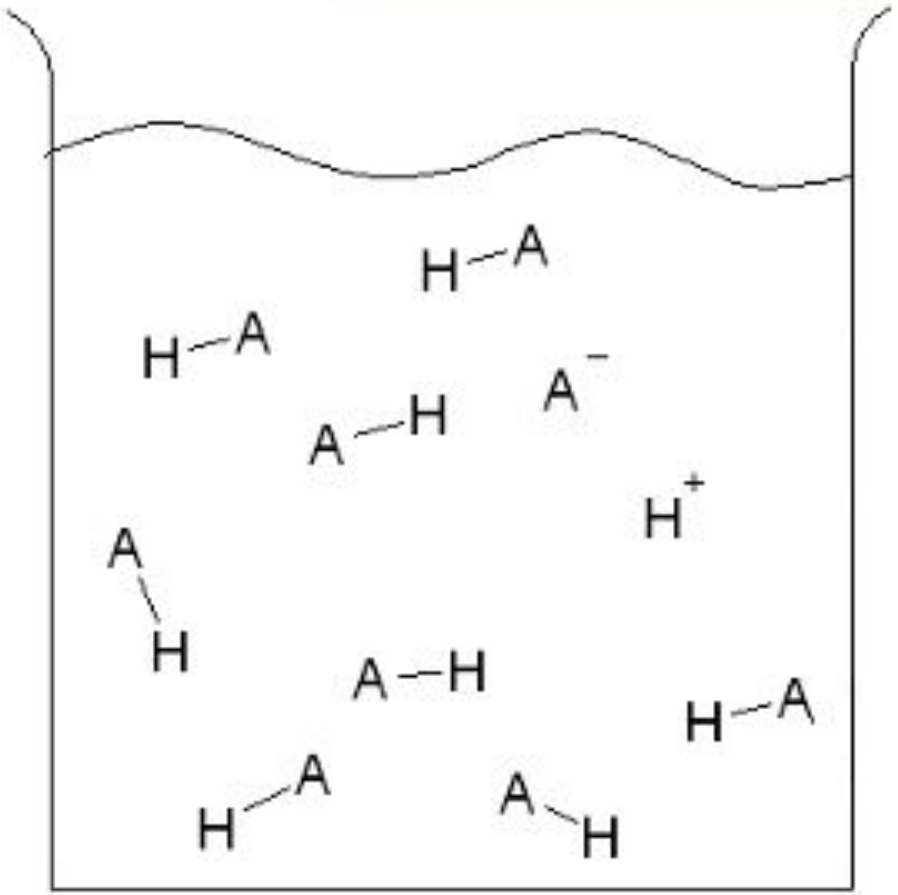


Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$



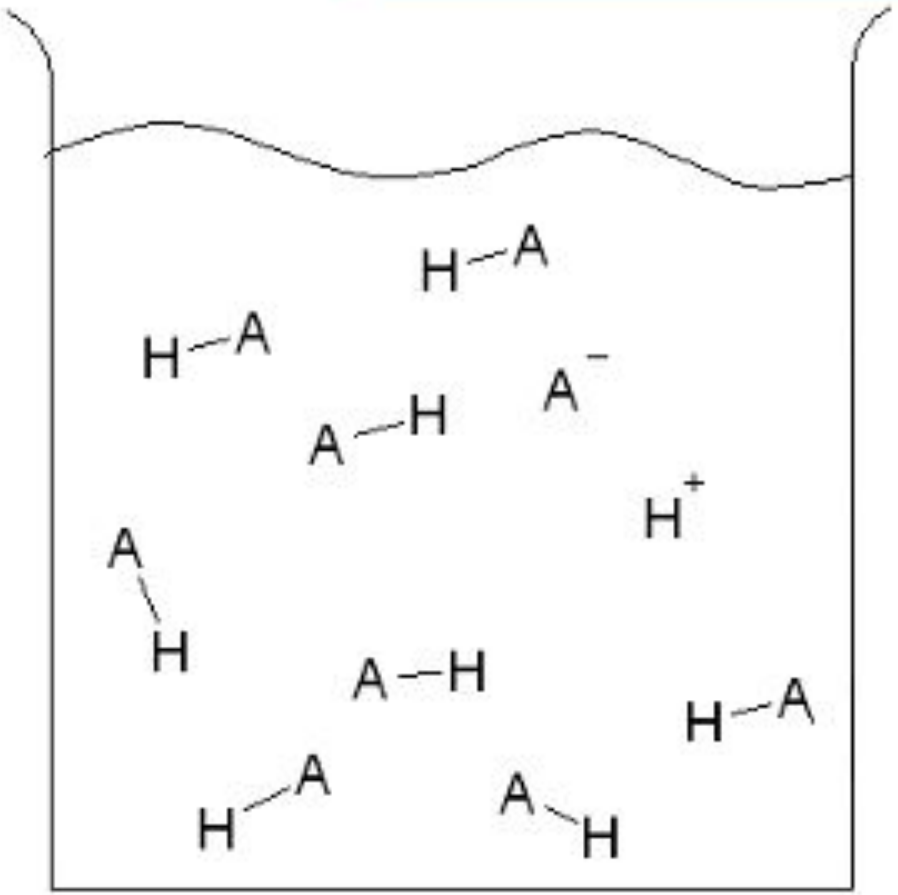
Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$



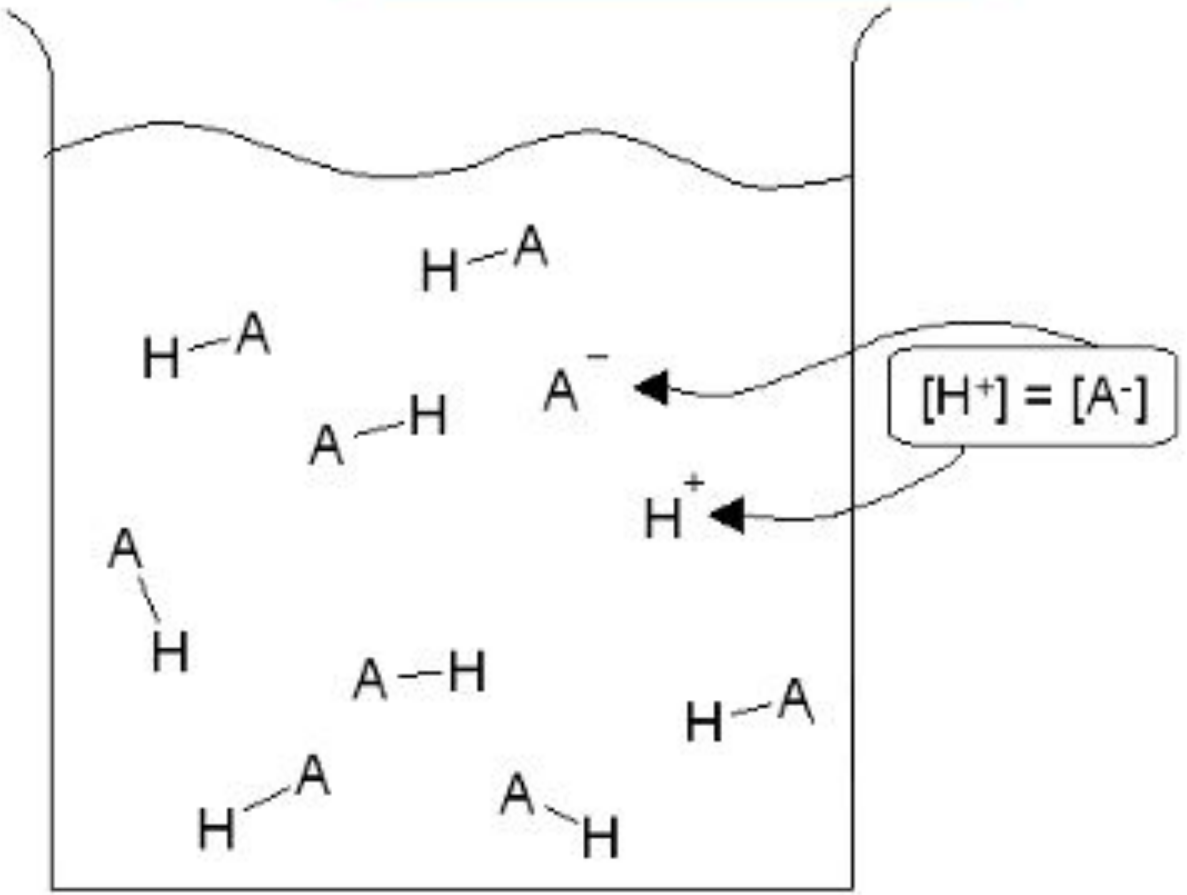
Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$



Calculating pH of weak acids

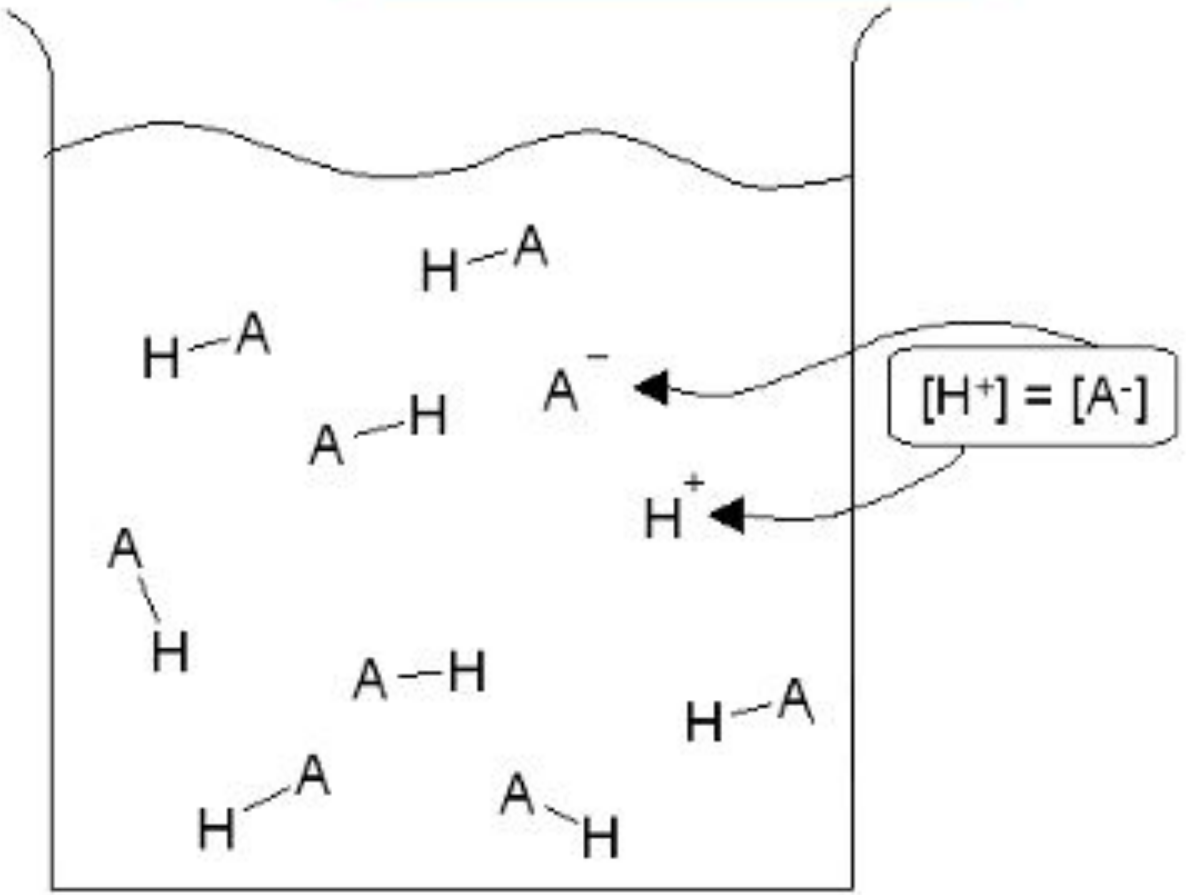
$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$K_a = \frac{[H^+]^2}{[HA]}$$



Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

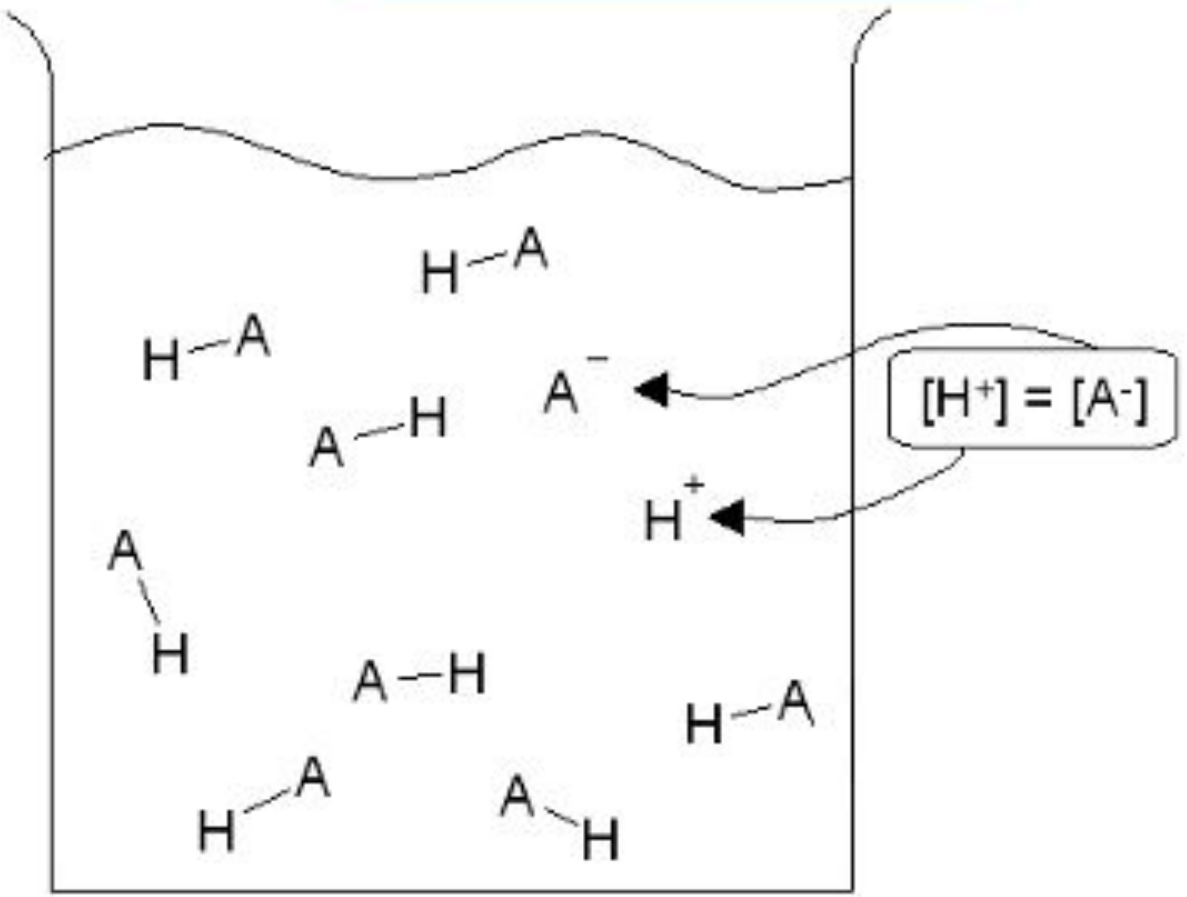
We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$K_a = \frac{[H^+]^2}{[HA]}$$

$$K_a\,[HA] = [H^+]^2$$



Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

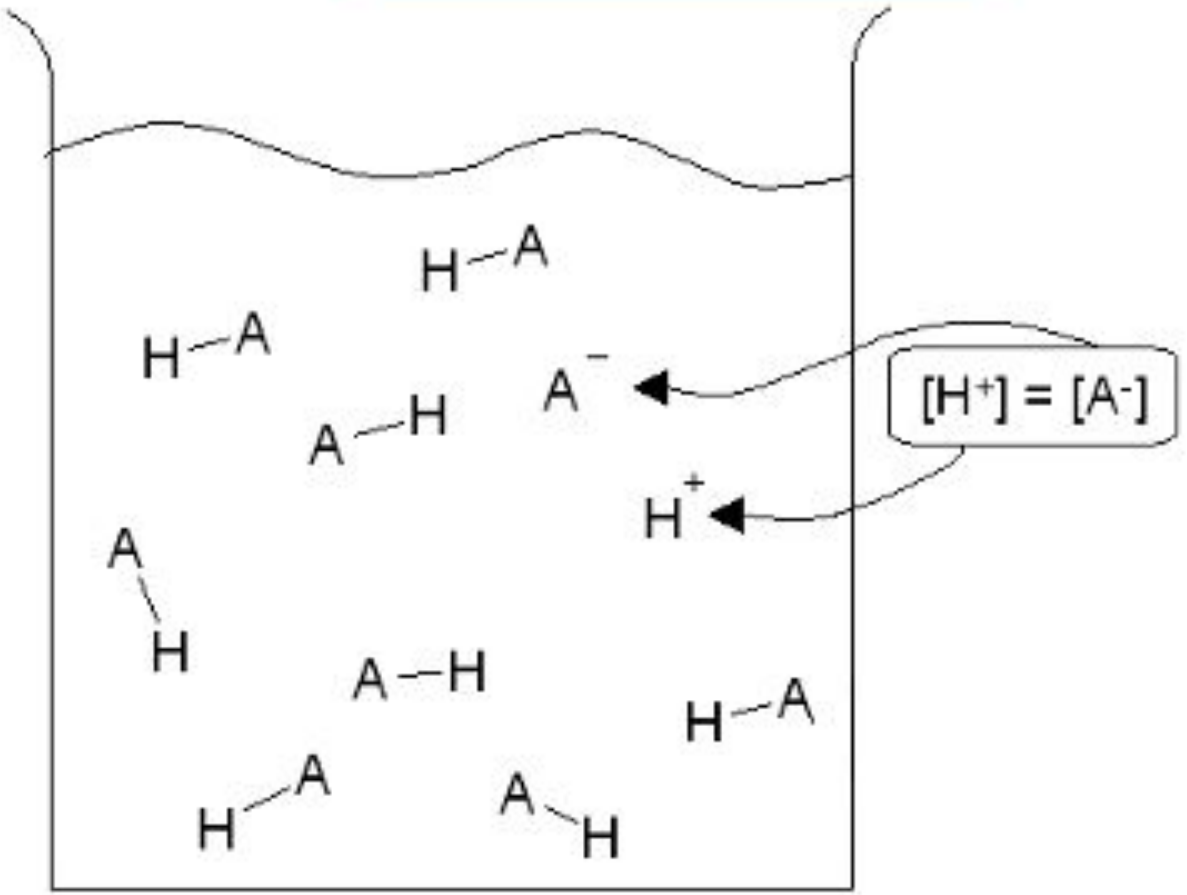
derive $[H^+] = \sqrt{K_a\,[HA]}$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$K_a = \frac{[H^+]^2}{[HA]}$$

$$K_a\,[HA] = [H^+]^2$$

$$[H^+] = \sqrt{K_a\,[HA]}$$



Calculating pH of weak acids

$$HA \underset{}{\overset{K_a}{\rightleftharpoons}} H^+ + A^-$$

We are learning to:

derive $[H^+] = \sqrt{K_a\,[HA]}$

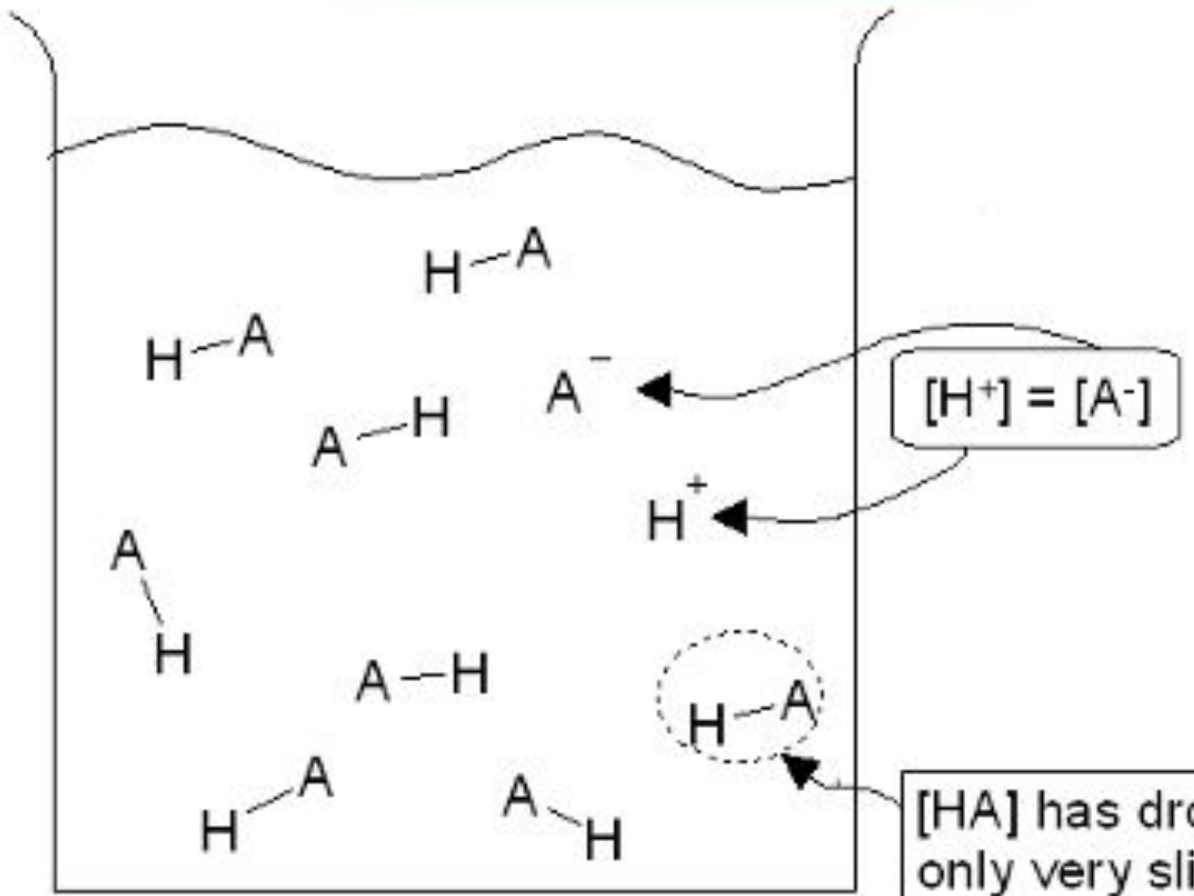
$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$K_a = \frac{[H^+]^2}{[HA]}$$

$$K_a\,[HA] = [H^+]^2$$

$$[H^+] = \sqrt{K_a\,[HA]}$$

use original [HA]



Calculate pH of

a) 0.1 moldm^{-3} HCN $K_a = 4.9 \times 10^{-10}$

$$[H^+] = \sqrt{K_a\,[HA]}$$

$$pH = -\log[H^+]$$

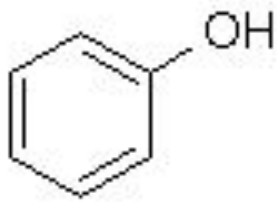
$$[H^+] = \sqrt{4.9 \times 10^{-10} \times 0.1}$$

$$= 7 \times 10^{-6} \text{ moldm}^{-3}$$

$$pH = -\log 7 \times 10^{-6}$$

$$\underline{= 5.15}$$

Calculate pH of

b) 0.05 moldm^{-3}  $K_a = 1.28 \times 10^{-10}$

$$[H^+] = \sqrt{K_a\,[HA]}$$

$$pH = -\log[H^+]$$

$$[H^+] = \sqrt{1.28 \times 10^{-10} \times 0.05}$$

$$= 2.53 \times 10^{-6} \text{ moldm}^{-3}$$

$$pH = -\log 2.53 \times 10^{-6}$$

$$\underline{= 5.6}$$