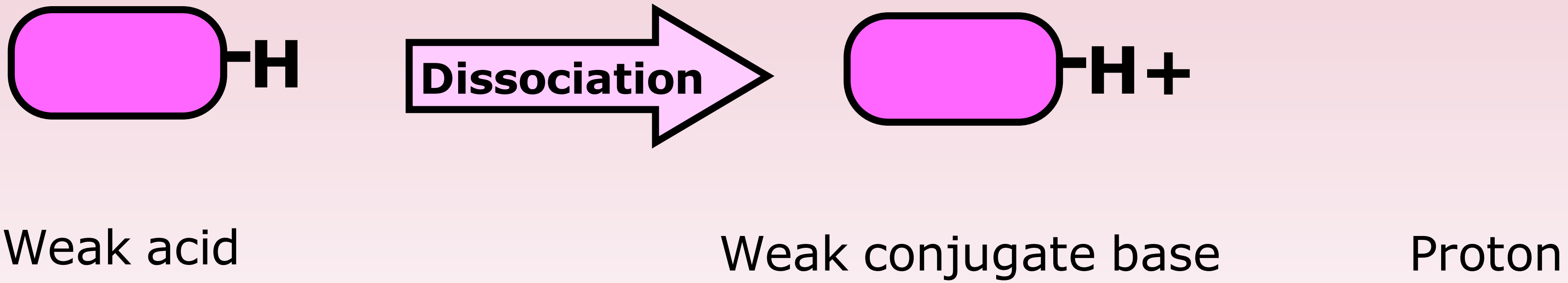
TITRATION ANIMATIONS

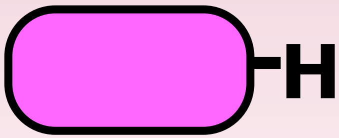
TITRATION ANIMATIONS

Weak acids: Donate a proton



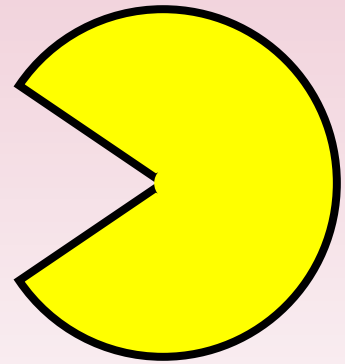
TITRATION ANIMATIONS

When a weak acid is titrated with a strong base:



Weak conjugate base

Weak acid

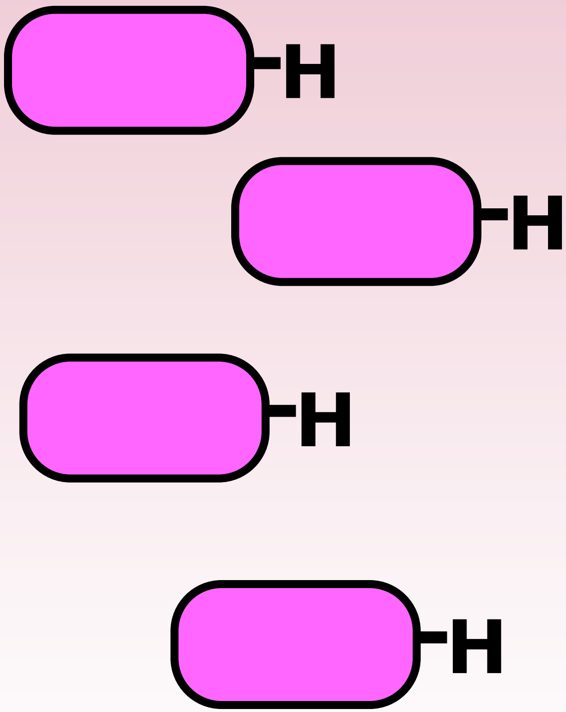


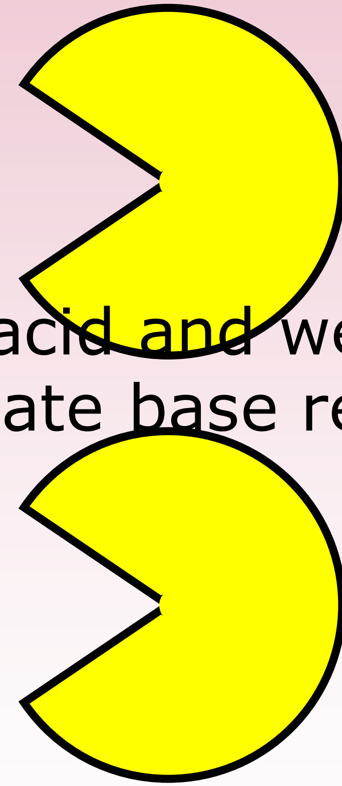
Strong base

TITRATION ANIMATIONS

Weak acid-Strong base:

Part 1: *When there are more moles of acid than base…*





Weak acid and weak conjugate base remain

Weak acid

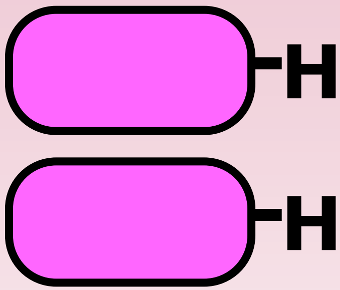
Weak conjugate base

Is the resulting solution acidic or basic?

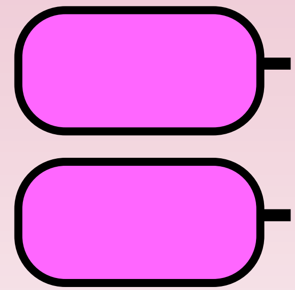
TITRATION ANIMATIONS

Weak acid-Strong base:

Part 1: *When there are <u>more</u> moles of acid than base…*



Is the resulting solution acidic or basic?



Weak acid

$K_a = 1.8 \times 10^{-5}$

$>$

The weak acid dissociates <u>much more</u> than the weak base

Weak conjugate base

$$K_b = \frac{K_w}{K_a}$$

$$K_b = \frac{1.0 \times 10^{-14}}{1.8 \times 10^{-5}}$$

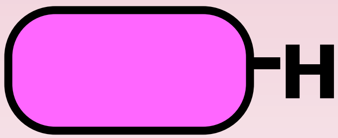
$$K_b = 5.\bar{5} \times 10^{-10}$$

.: the solution is acidic

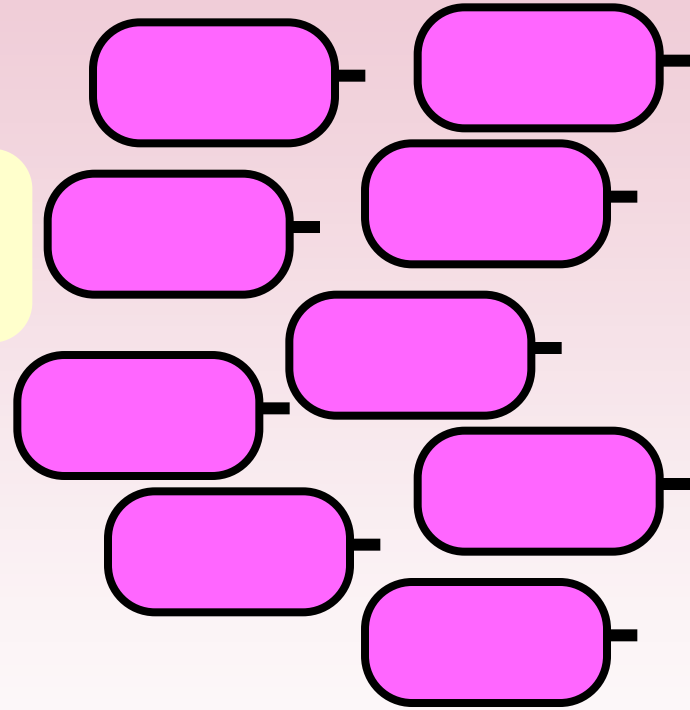
TITRATION ANIMATIONS

Weak acid-Strong base:

Part 1: *When there are more moles of acid than base…*



The solution is NOT always acidic



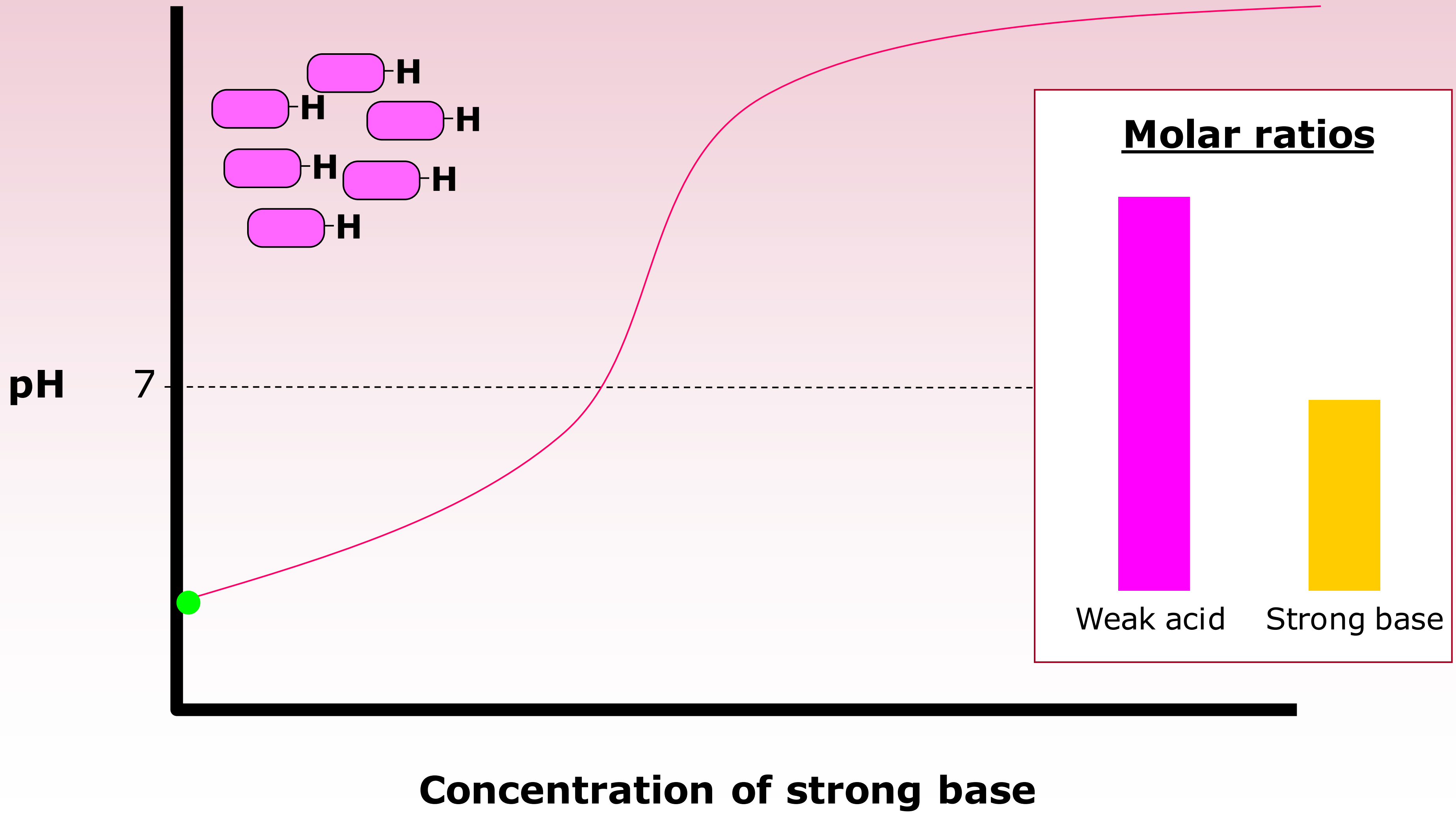
Eventually, VERY few moles of acid remain, and a lot of its conjugate base will be produced.

In this case, the solution will be neutral or slightly basic

TITRATION ANIMATIONS

Weak acid-Strong base:

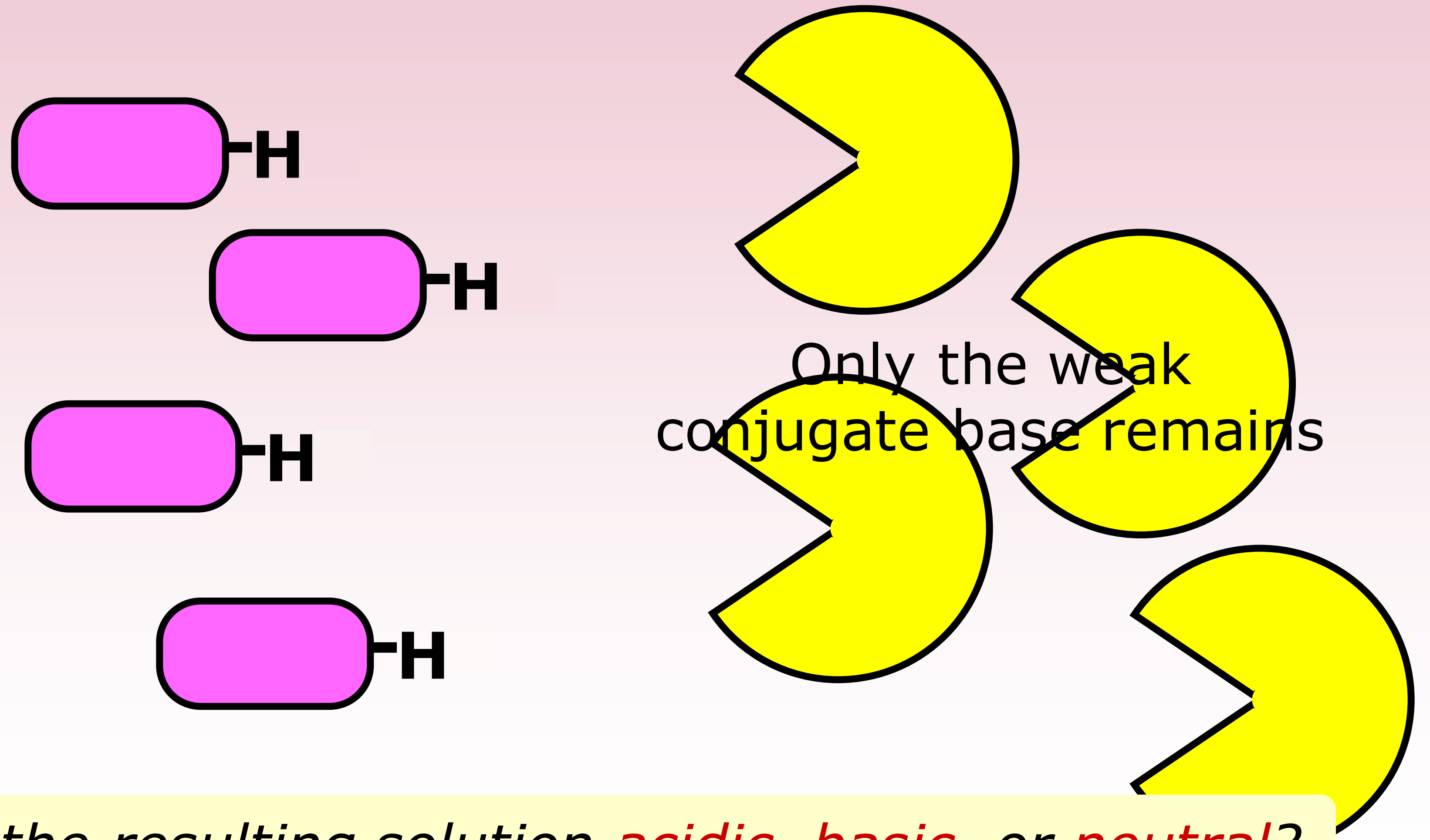
Part 1: *When there are more moles of acid than base…*



TITRATION ANIMATIONS

Weak acid-Strong base:

Part 2: *When there are <u>equal</u> moles of acid and base…*



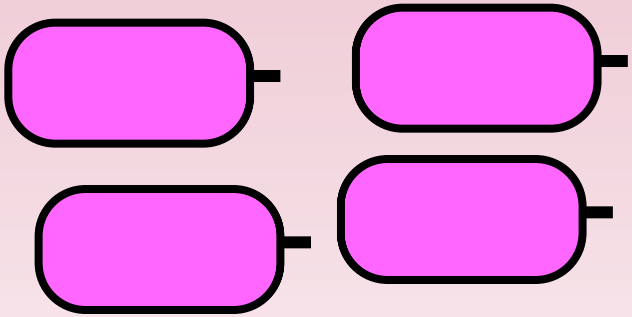
Only the weak conjugate base remains

Is the resulting solution acidic, basic, or neutral?

TITRATION ANIMATIONS

Weak acid-Strong base:

Part 2: *When there are <u>equal</u> moles of acid and base…*



Is the resulting solution acidic, basic, or neutral?

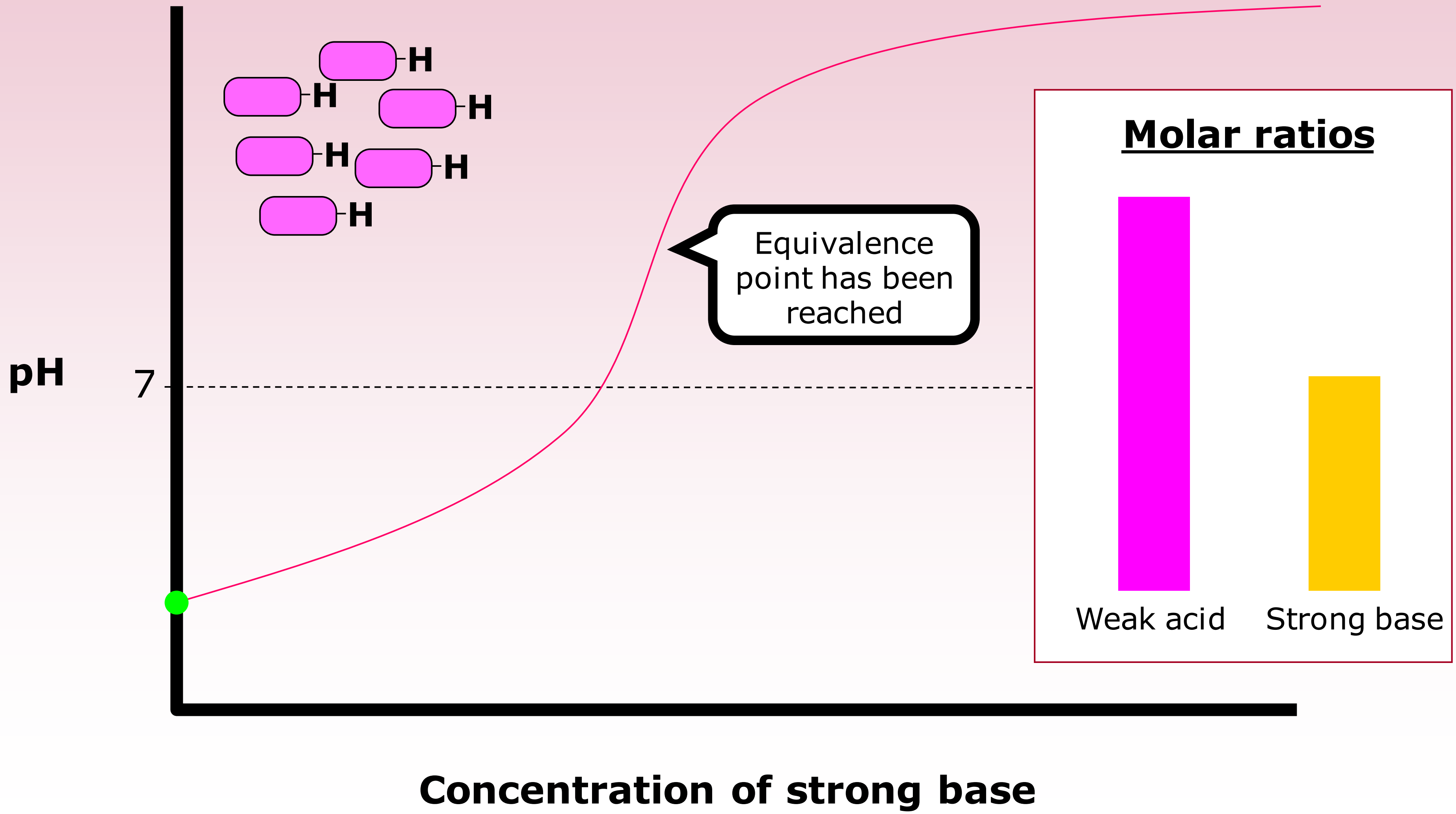
The conjugate base will accept protons from water, producing OH^- ions.

.: the solution is basic

TITRATION ANIMATIONS

Weak acid-Strong base:

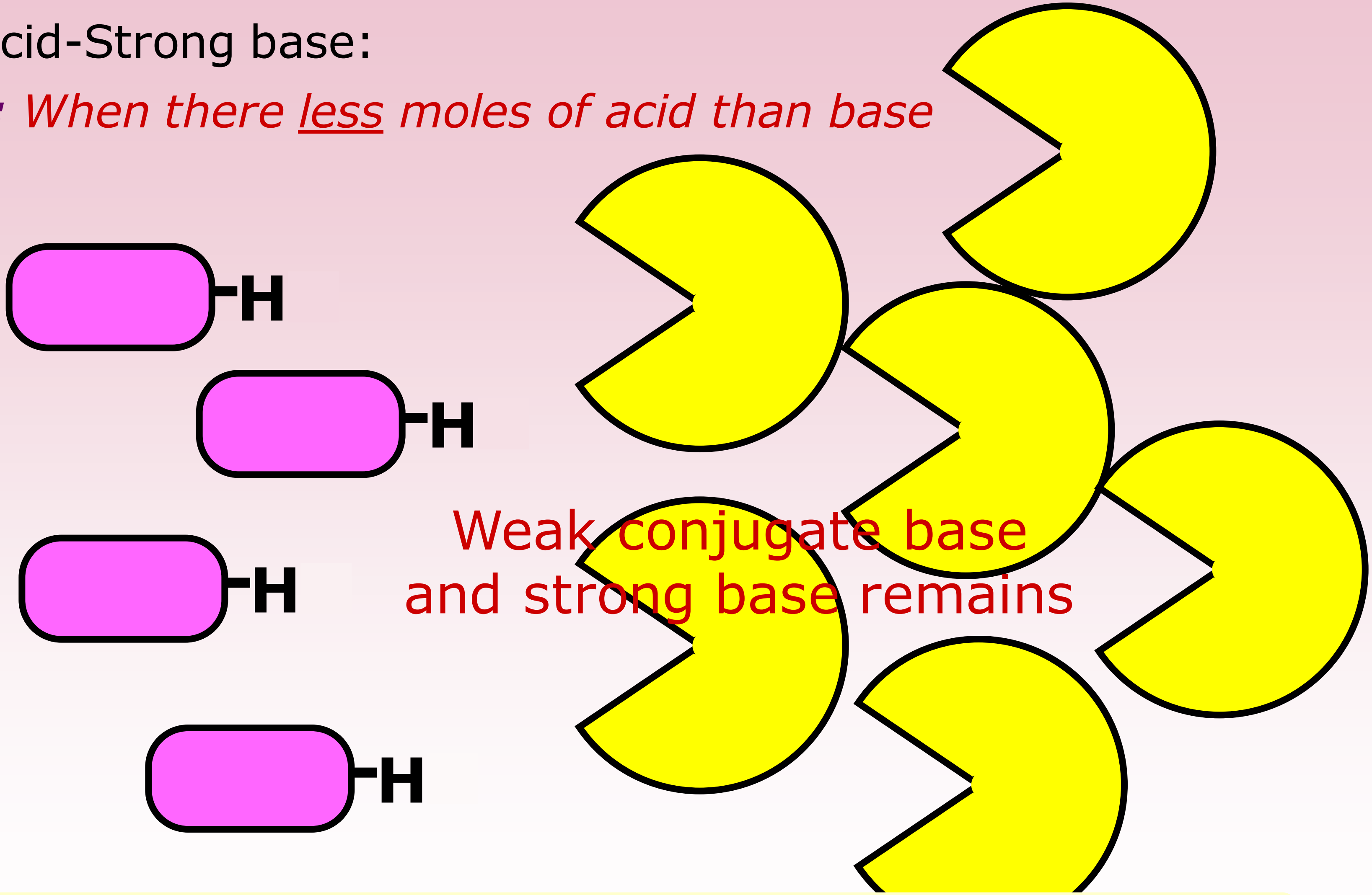
Part 2: *When there are equal moles of acid and base…*



TITRATION ANIMATIONS

Weak acid-Strong base:

Part 3: *When there less moles of acid than base*

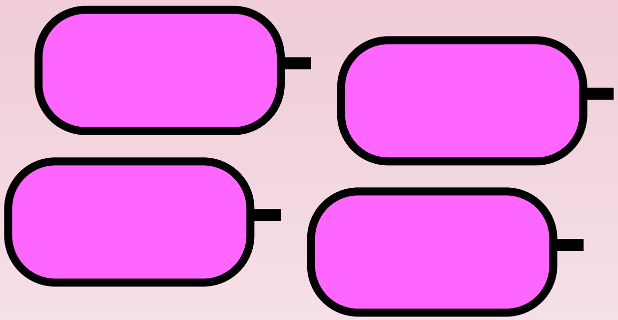


Is the resulting solution acidic or basic?

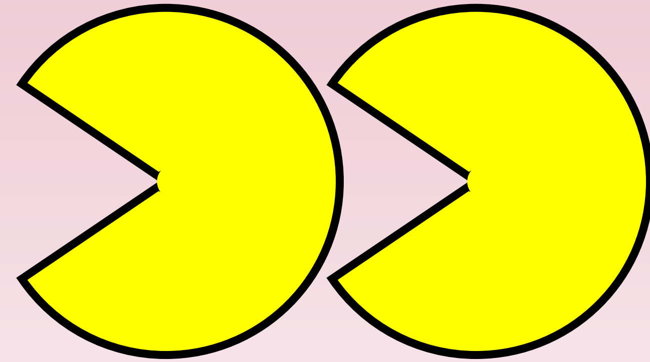
TITRATION ANIMATIONS

Weak acid-Strong base:

Part 3: *When there <u>less</u> moles of acid than base*



Is the resulting solution acidic or basic?



Since both are basic, then the solution is basic

$K_b = 5.\overline{5}x10^{-10}$ $\lll$ K_b = very high

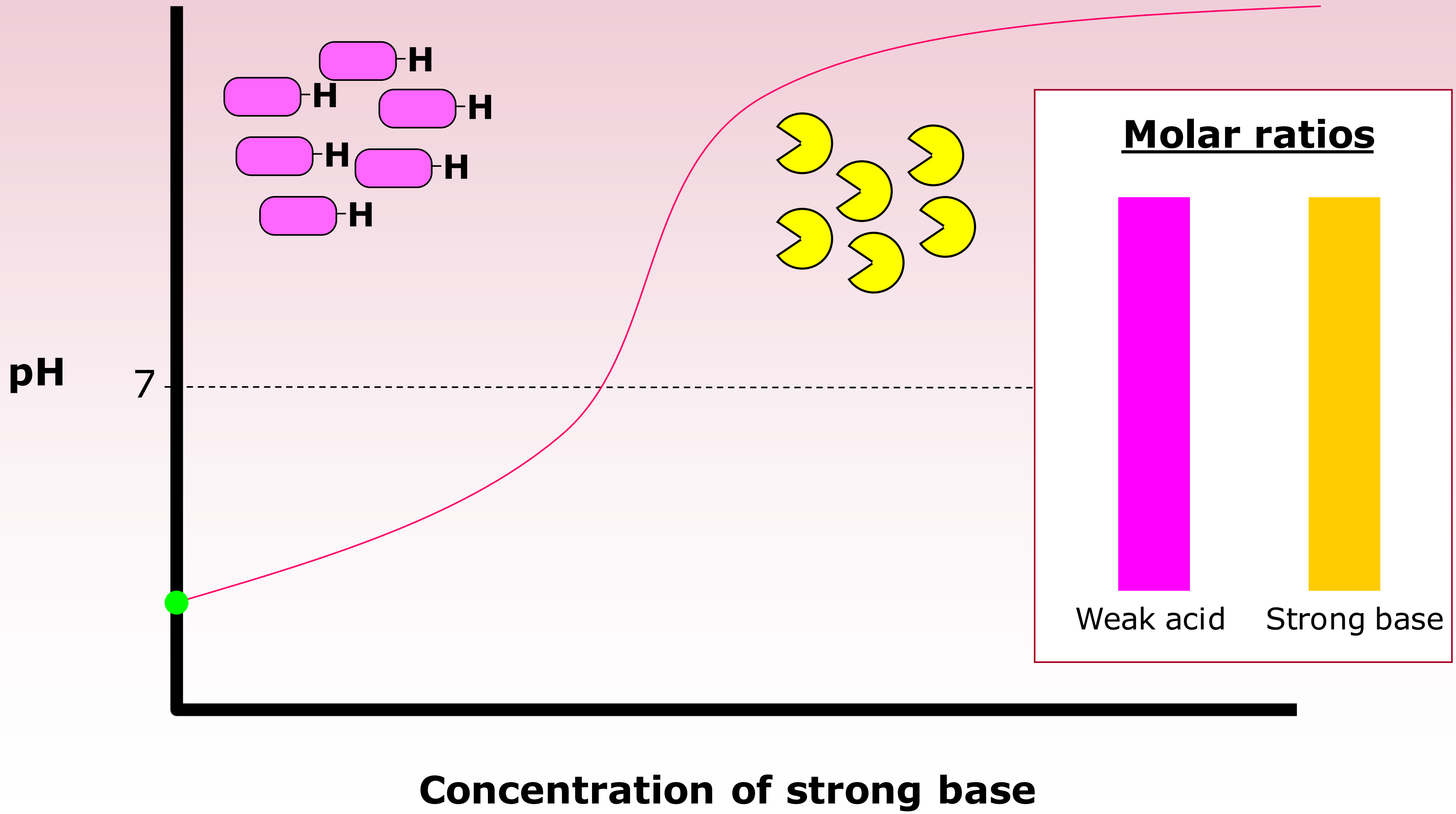
The strong base will ionize MUCH more than the weak conjugate base.

→ *the pH will be solely determined by the amount of strong base that remains*

TITRATION ANIMATIONS

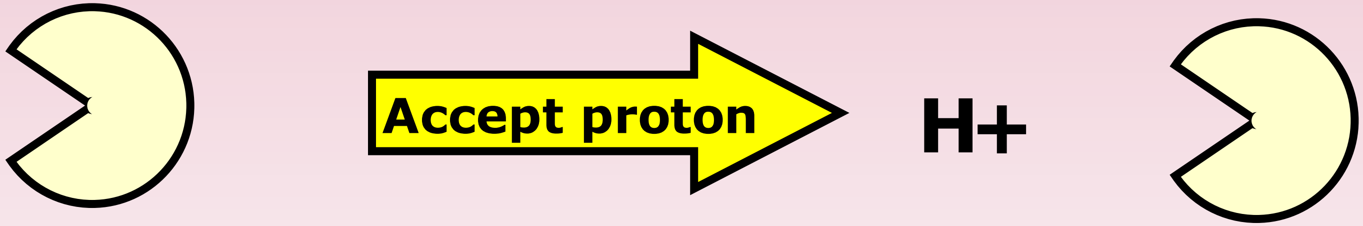
Weak acid-Strong base:

Part 3: *When there less moles of acid than base*



TITRATION ANIMATIONS

Weak bases: Accept a proton

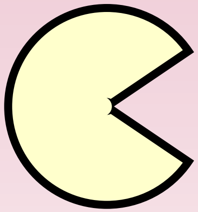


Weak base

Weak conjugate acid

TITRATION ANIMATIONS

When a weak base is titrated with a strong acid:



HCl^{-}

Weak base

Weak conjugate acid

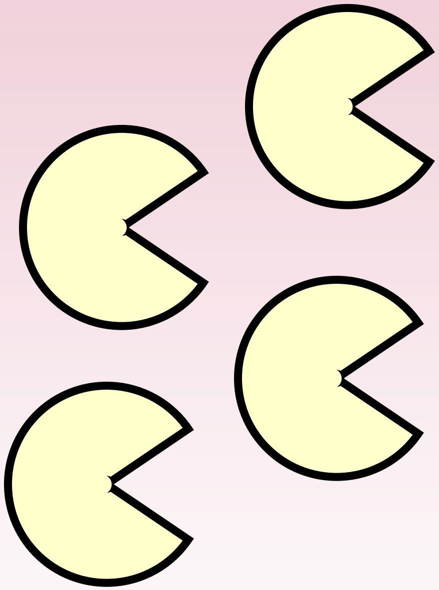
Strong acid

Neutral anion

TITRATION ANIMATIONS

Weak base-Strong acid

Part 1: *When there are <u>more</u> moles of weak base than strong acid…*



$\mathbf{HCl}^{-}$

Weak base and weak conjugate acid remain

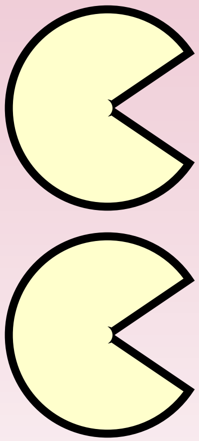
$\mathbf{HCl}^{-}$

Is the resulting solution acidic or basic?

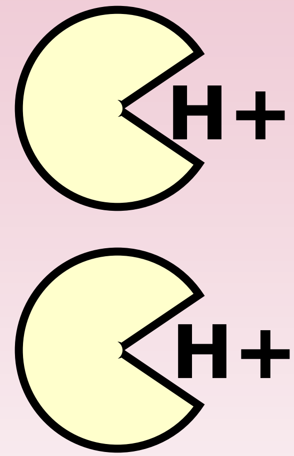
TITRATION ANIMATIONS

Weak base-Strong acid

Part 1: *When there are <u>more</u> moles of weak base than strong acid…*



Is the resulting solution acidic or basic?



Weak base

$K_b = 1.8\text{x}10^{-5}$

$>$

Weak conjugate acid

$$K_a = \frac{K_w}{K_b}$$

$$K_a = \frac{1.0\text{x}10^{-14}}{1.8\text{x}10^{-5}}$$

$$K_a = 5.\overline{5}\text{x}10^{-10}$$

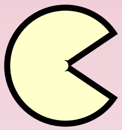
The weak base dissociates <u>much more</u> than the weak acid

.: the solution is basic

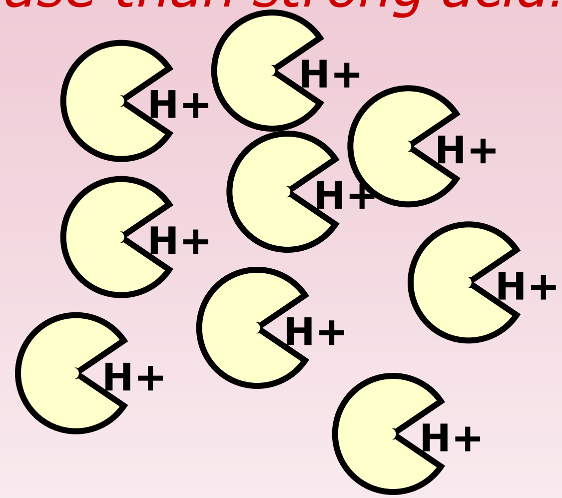
TITRATION ANIMATIONS

Weak base-Strong acid

Part 1: *When there are <u>more</u> moles of weak base than strong acid…*



The solution is NOT always basic



Weak base

Weak conjugate acid

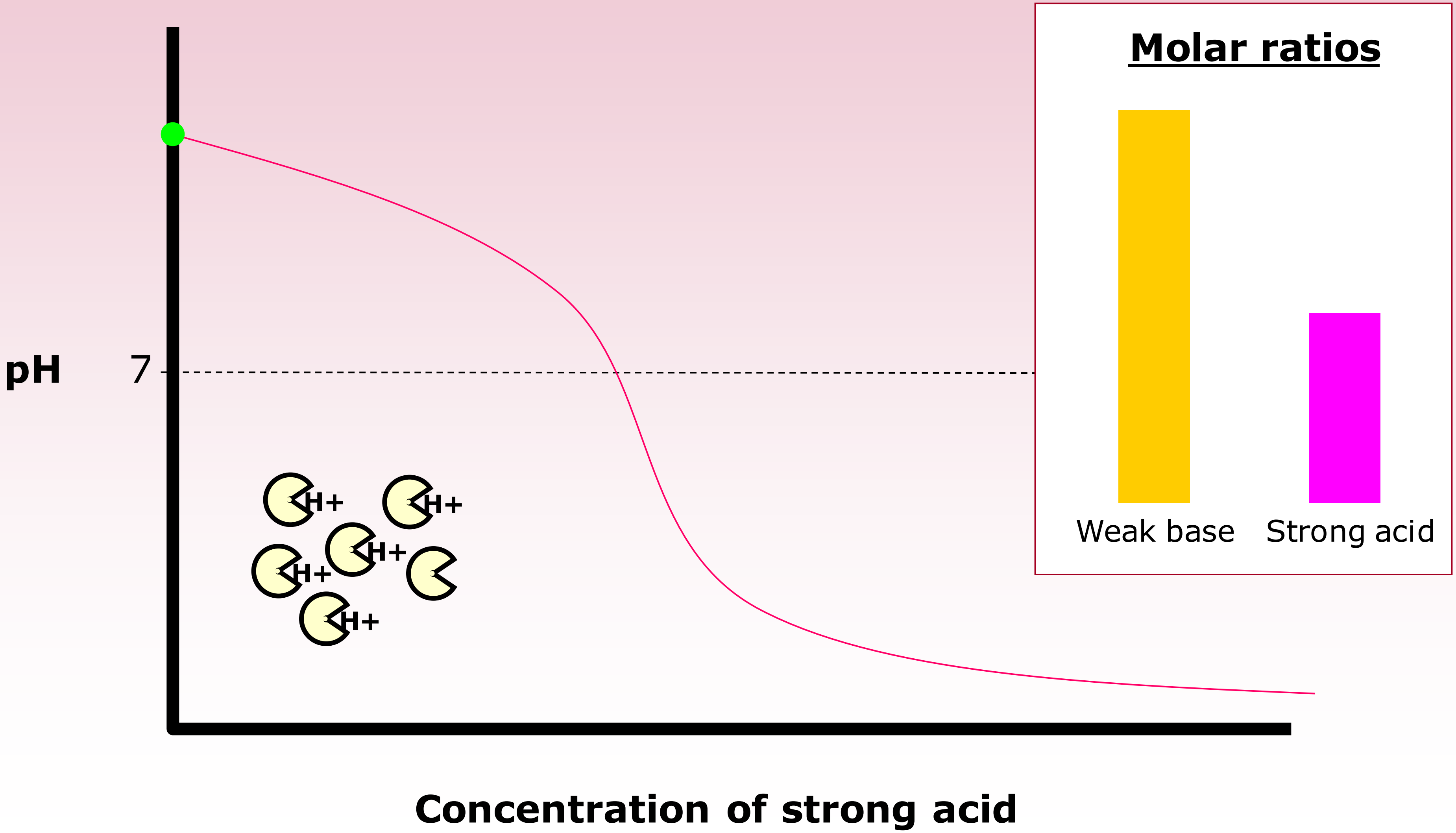
Eventually, VERY few moles of base remain, and <u>a lot</u> of its conjugate acid will be produced.

In this case, the solution will be neutral or slightly acidic

TITRATION ANIMATIONS

Weak base-Strong acid

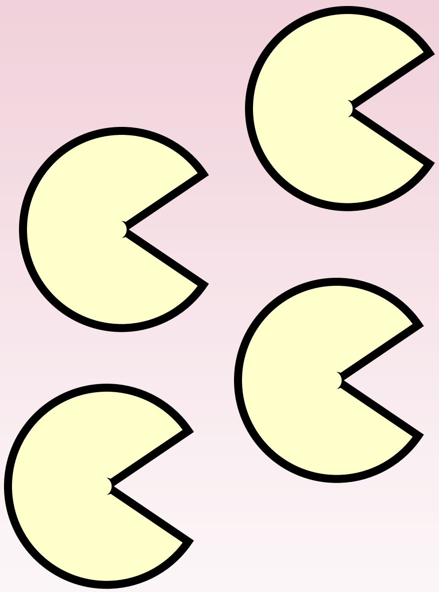
Part 1: *When there are <u>more</u> moles of weak base than strong acid…*



TITRATION ANIMATIONS

Weak base-Strong acid

Part 2: *When there are equal moles of weak base and strong acid…*



HCl^-

HCl^-

Only the weak conjugate acid remains

HCl^-

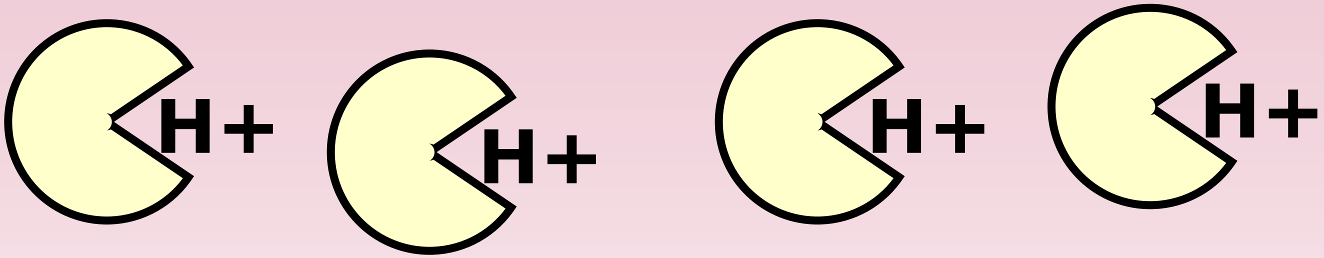
HCl^-

Is the resulting solution acidic, basic, or neutral?

TITRATION ANIMATIONS

Weak base-Strong acid

Part 2: *When there are <u>equal</u> moles of weak base and strong acid…*



Is the resulting solution acidic, basic, or neutral?

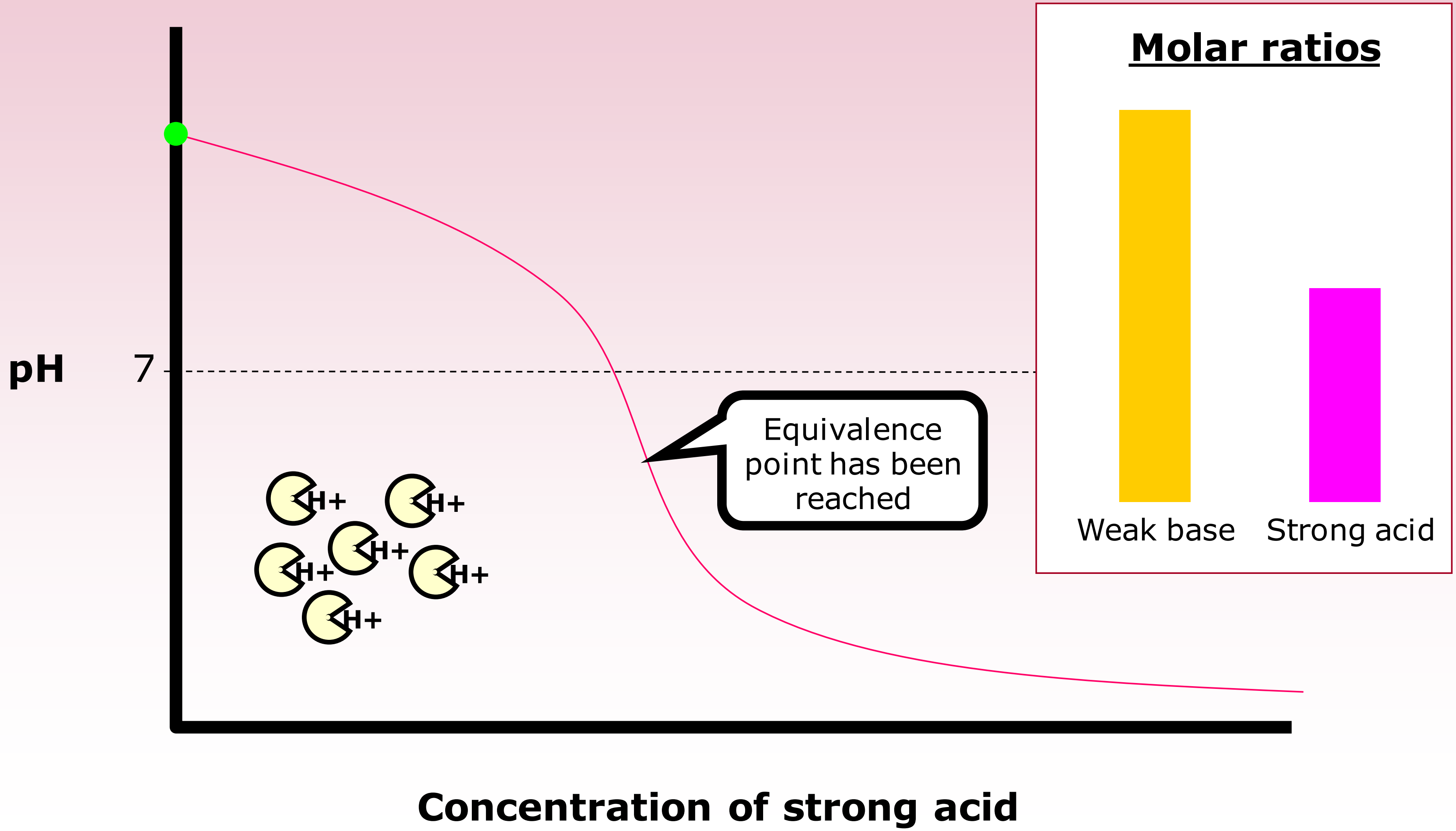
The conjugate acid will donate protons from water, producing H^+ ions.

.: the solution is acidic

TITRATION ANIMATIONS

Weak base-Strong acid

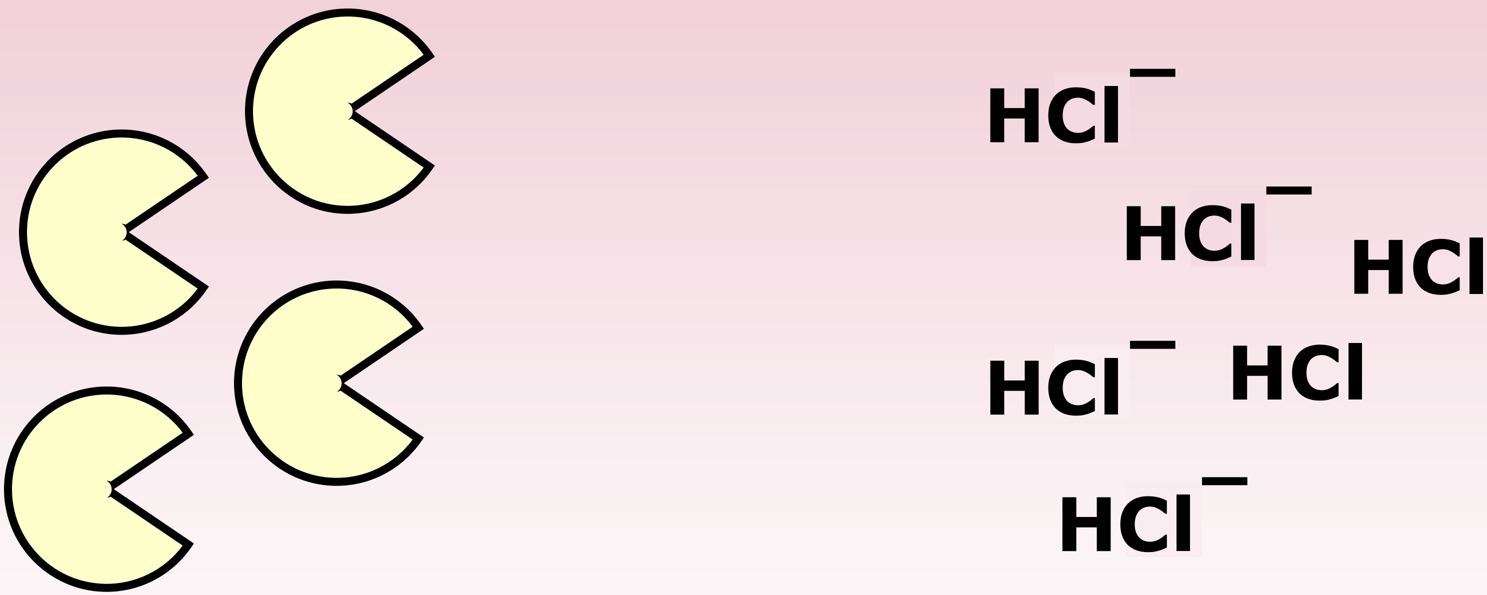
Part 2: *When there are equal moles of weak base and strong acid…*



TITRATION ANIMATIONS

Weak base-Strong acid

Part 3: *When there are <u>fewer</u> moles of weak base than strong acid…*



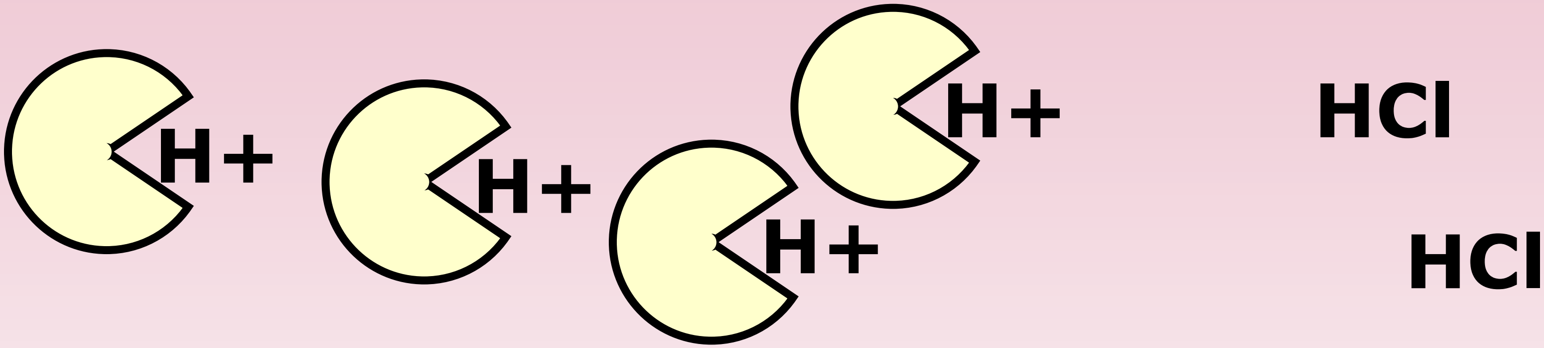
The weak conjugate acid AND strong acid remain

Is the resulting solution acidic or basic?

TITRATION ANIMATIONS

Weak base-Strong acid

Part 3: *When there are <u>fewer</u> moles of weak base than strong acid…*



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TITRATION ANIMATIONS

Weak base-Strong acid

Part 3: *When there are <u>fewer</u> moles of weak base than strong acid…*