

100ml
0.1M
HCl
(STRONG)

100ml
0.1M
HF
(WEAK)

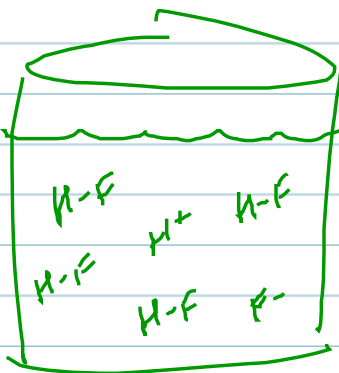
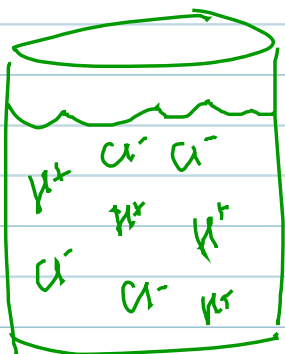
Which one would require more OH^- to completely react away?

NEITHER!
it's the same! (STOICH)

$\text{HCl} + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{Cl}^-$ pH=7
0.1mol 0.1mol

$\text{HF} + \text{OH}^- \rightarrow \text{H}_2\text{O} + \text{F}^-$ pH > 7
0.1mol 0.1mol
BASE

$\text{F}^- + \text{H}_2\text{O} \rightleftharpoons \text{OH}^- + \text{HF}$

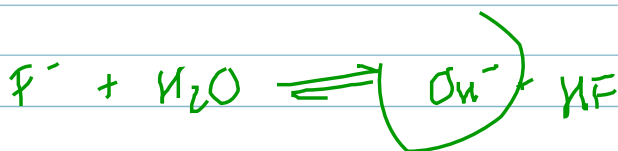
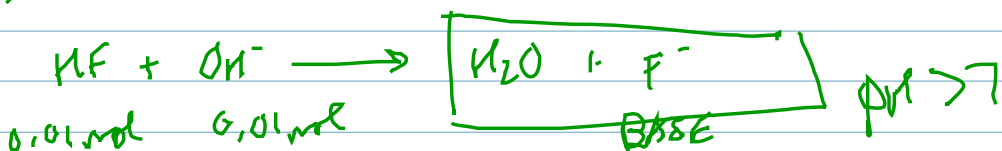
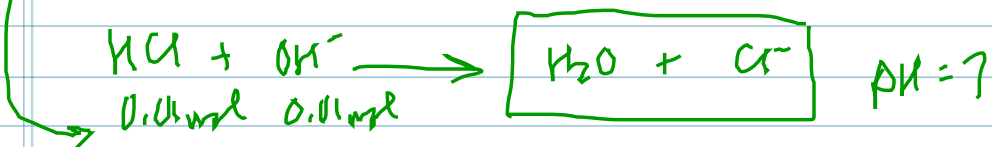


Which one would require more OH^- to completely react away?

100ml
0.1M
HCl
(STRONG)

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(WEAK)

NEITHER!
it's the same! (STOICH)



How do I determine the pH of
"what's in my dish?"

① STRONG ACID
 $[HX] = [H^+]$ $pH = -\log[H^+]$

② STRONG BASE
 $[OH^-]$ $pOH = -\log[OH^-]$; $pH = 14 - pOH$

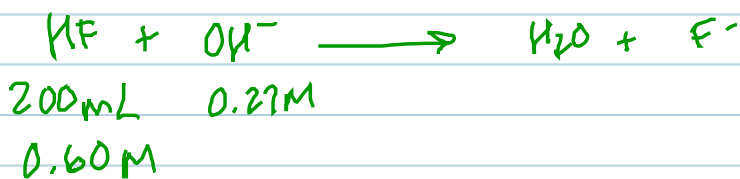
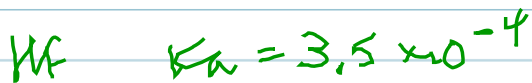
③ WEAK ACID ICE CHART
 $K_a = \frac{x^2}{[HA]}$ $x = [H^+]$ $pH = -\log x$

④ WEAK BASE ICE CHART
 $K_b = \frac{x^2}{[B]}$ $x = [OH^-]$ $pOH = -\log x$
 \Downarrow
 pH

⑤ CONJUGATE PAIR
 NEITHER IS STRONG BUFFER! $pH = pK_a + \log \frac{[BASE]}{[ACID]}$

⑥ STRONG ACID + ~~WEAK ACID~~ $HA \rightleftharpoons H^+ + A^-$
 $\leftarrow \quad \uparrow$
 SEE #1 ABOVE

⑦ STRONG BASE + ~~WEAK BASE~~ SEE #2 ABOVE



a) What volume of OH^- sol'n is needed to completely react with HF sol'n?

$\text{HF} (0.60\text{M})(0.200\text{L}) = 0.12 \text{ mol HF}$
 $\frac{0.12 \text{ mol HF}}{1} = \frac{0.12 \text{ mol OH}^-}{0.27\text{M}} = 0.44\text{L}$

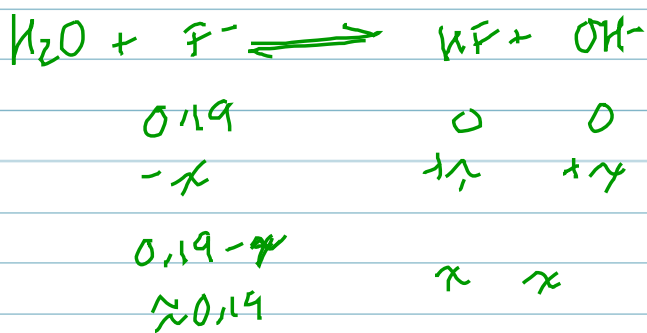
b) What's in your dish now?

* PRODUCTS * H_2O , F^-
 BASE

pH > 7

440 mL of 0.27 M OH^-

c) What is the pH now?



$K_b = \frac{x^2}{0.19} = 2.9 \times 10^{-11}$

$x = 2.35 \times 10^{-6} = [\text{OH}^-]$

$\text{pOH} = -\log x = 5.6$

$\text{pH} = 8.4$

$K_b = \frac{10^{-14}}{K_a} = \frac{10^{-14}}{3.5 \times 10^{-4}}$

$K_b = 2.9 \times 10^{-11}$

$[\text{F}^-] = \frac{0.12 \text{ mol}}{(0.2\text{L} + 0.44\text{L})}$ (total volume)

$[\text{F}^-] = 0.19\text{M}$