

Clase. 4 16 octubre 2020

Título de la nota

16/10/2020

1.1. APE

amortiguador

$$pH = pK_a + \log \frac{C_b}{C_a}$$

$$= 4.75 + \log \frac{100}{1}$$

$$= 4.75 + \log 10^2$$

$$= 4.75 + 2 = 6.75$$

1.1. DPE

base fuerte

$$pH = 14 + \log C_b$$

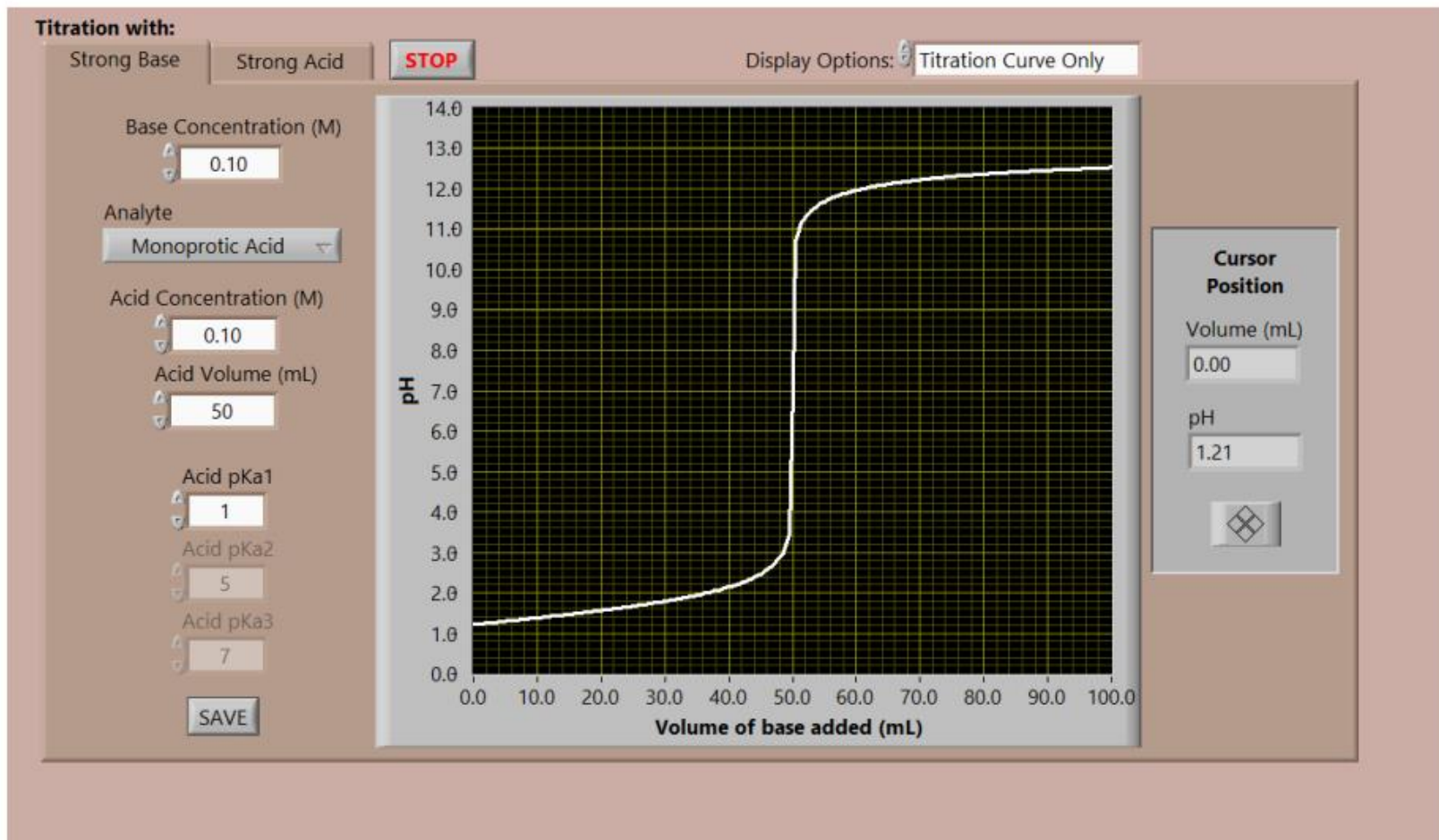
$$pH = 14 + \log 10^{-2} 10^{-2}$$

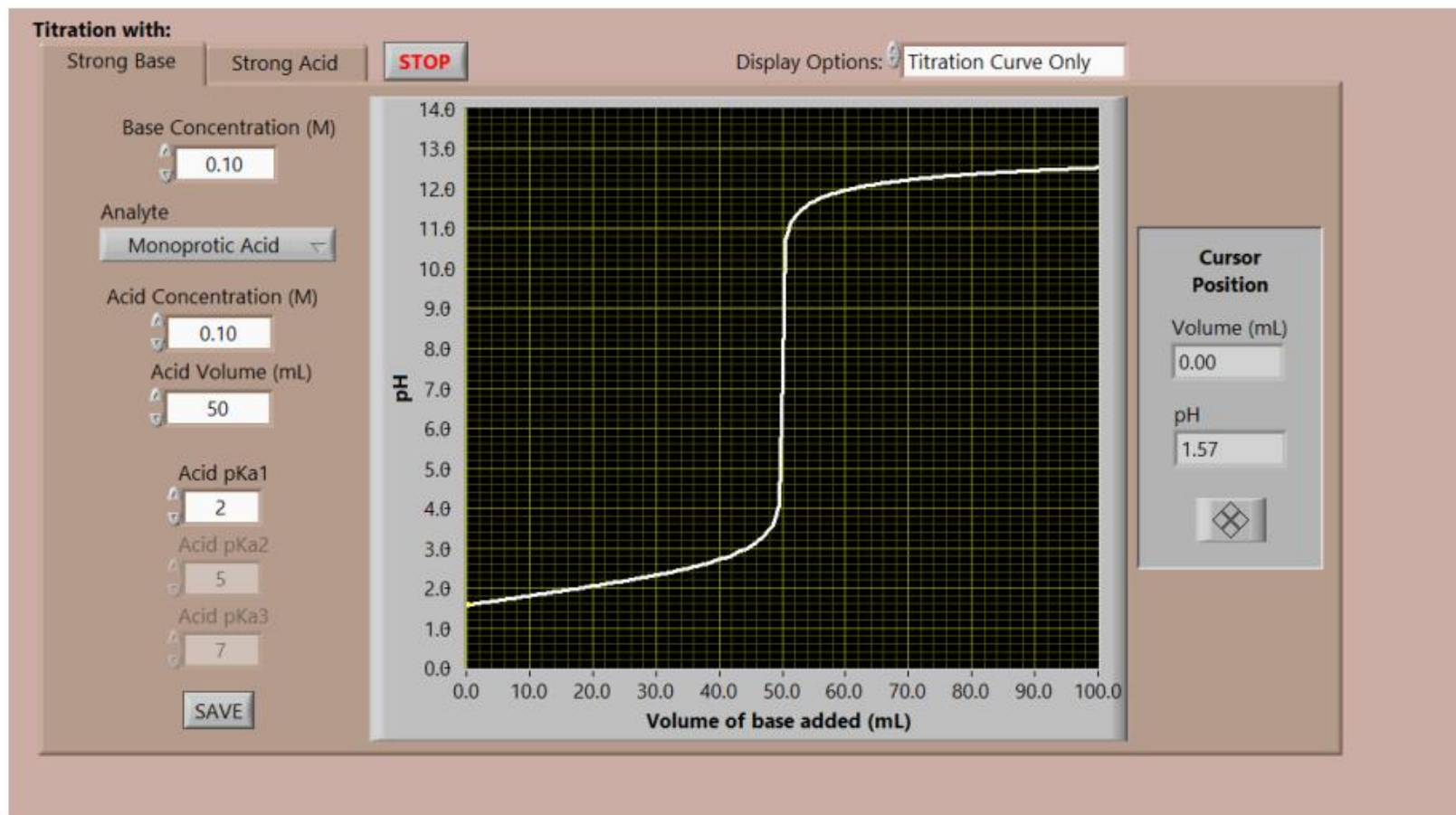
$$pH = 14 + \log 10^{-4}$$

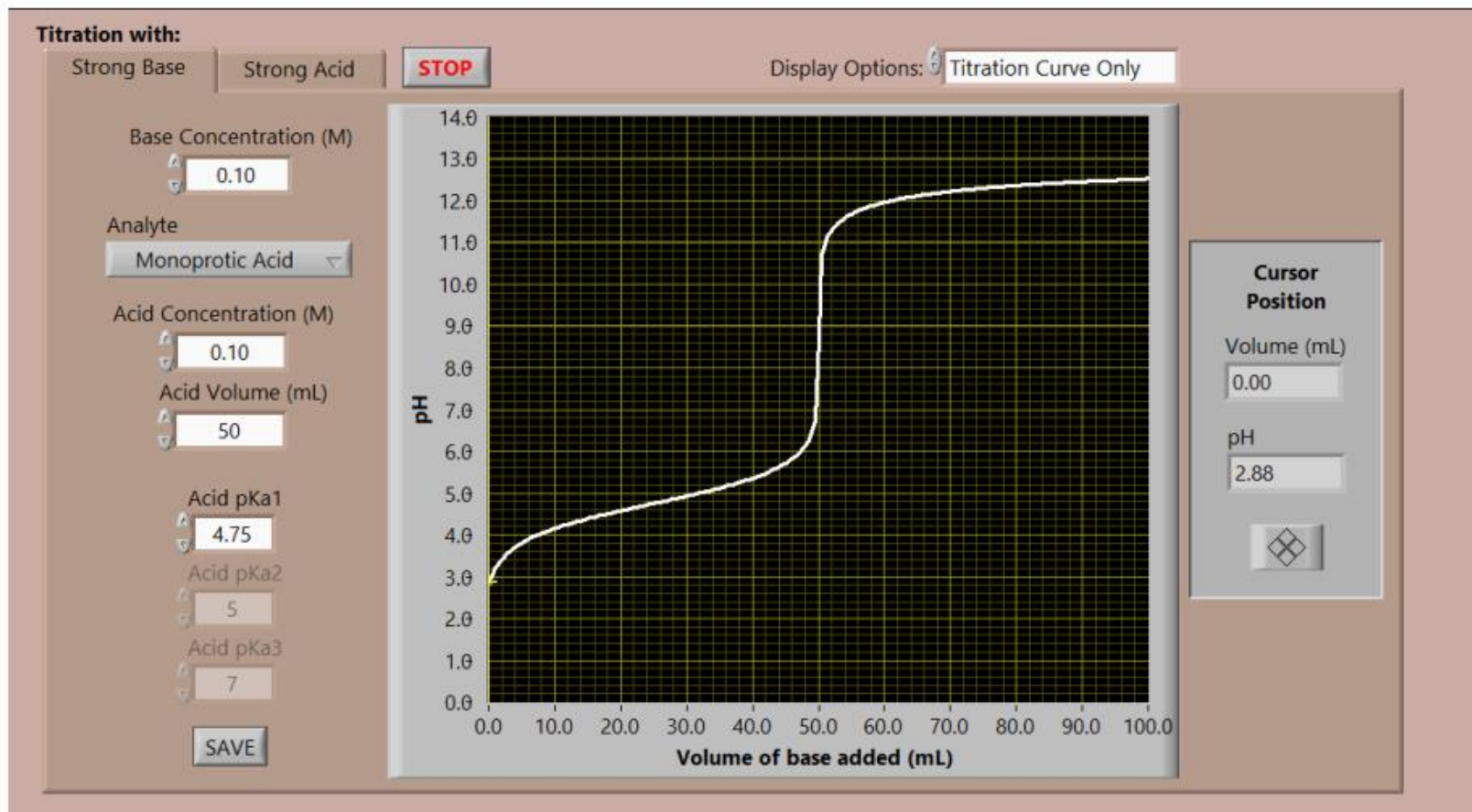
$$pH = 14 - 4 = 10$$

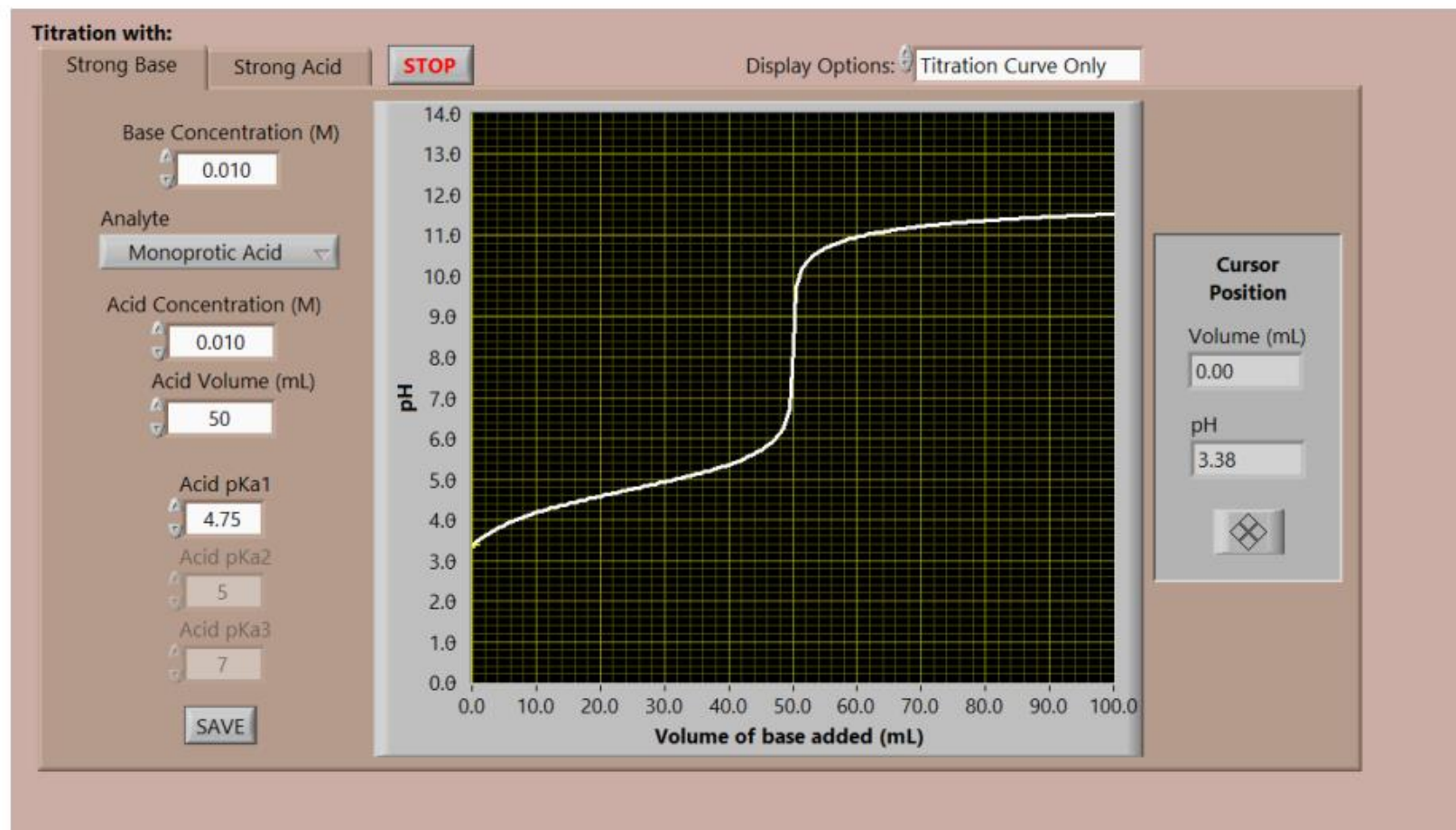
$$pH = p.e. = \frac{6.75 + 10}{2}$$

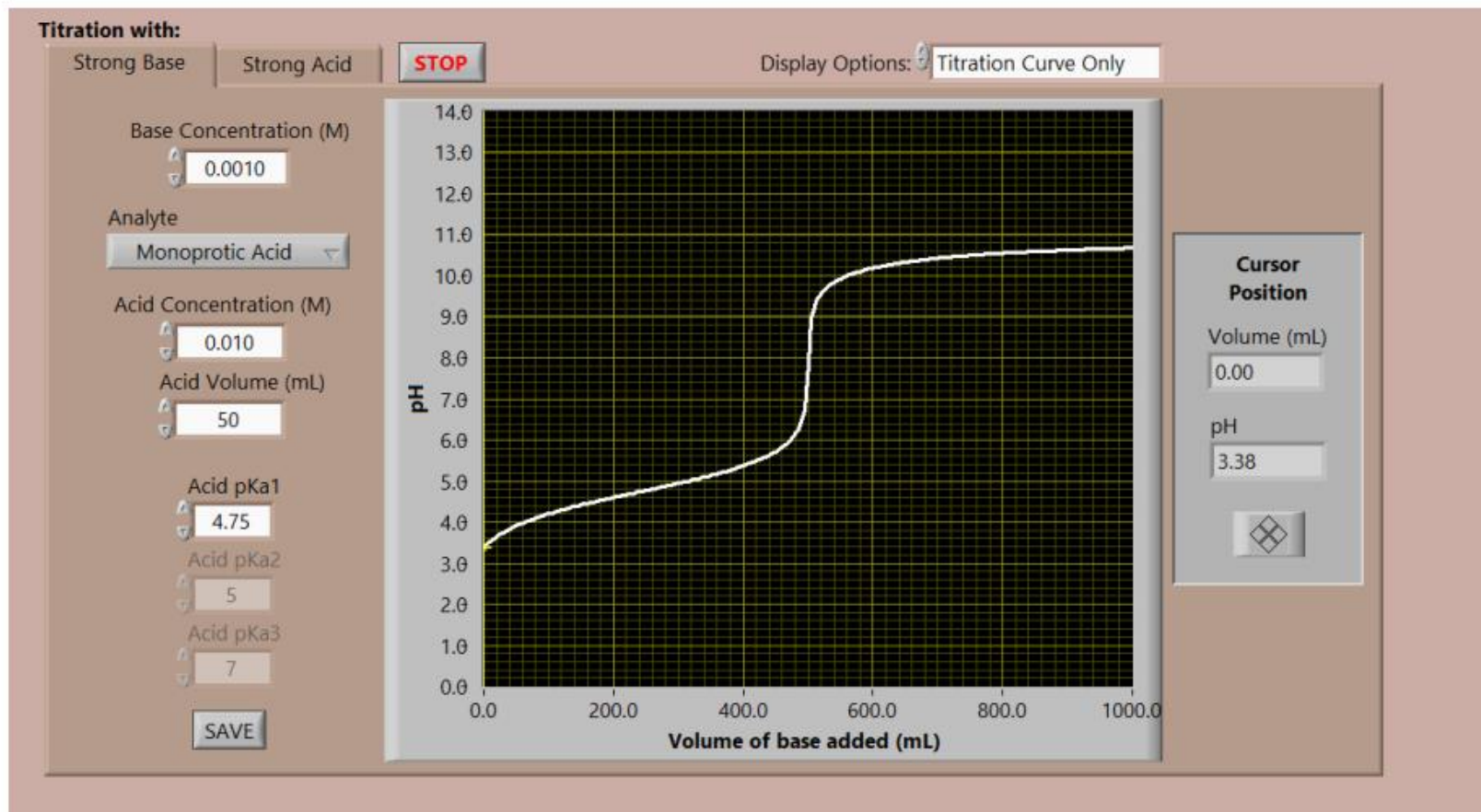
$$= 8.375$$

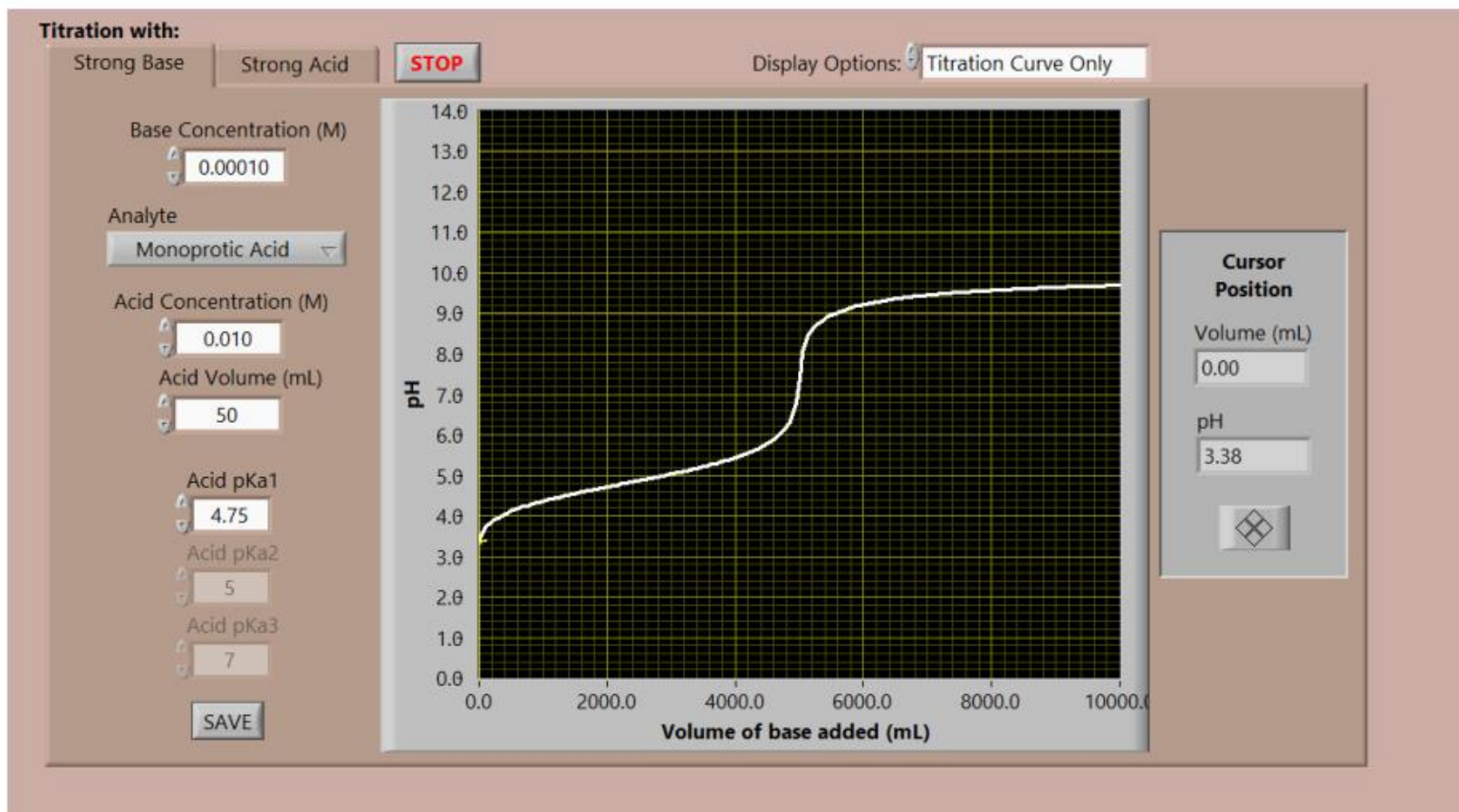


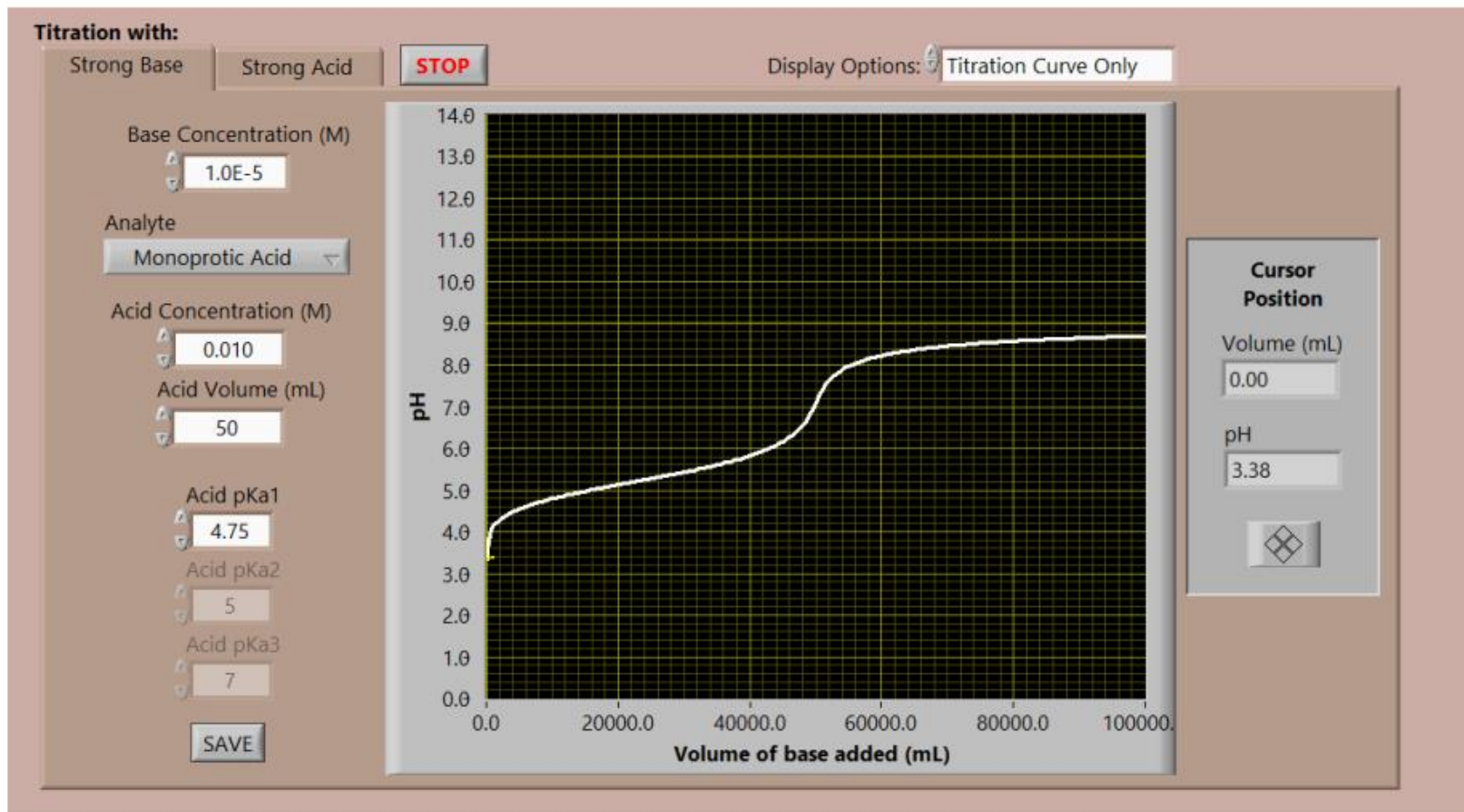


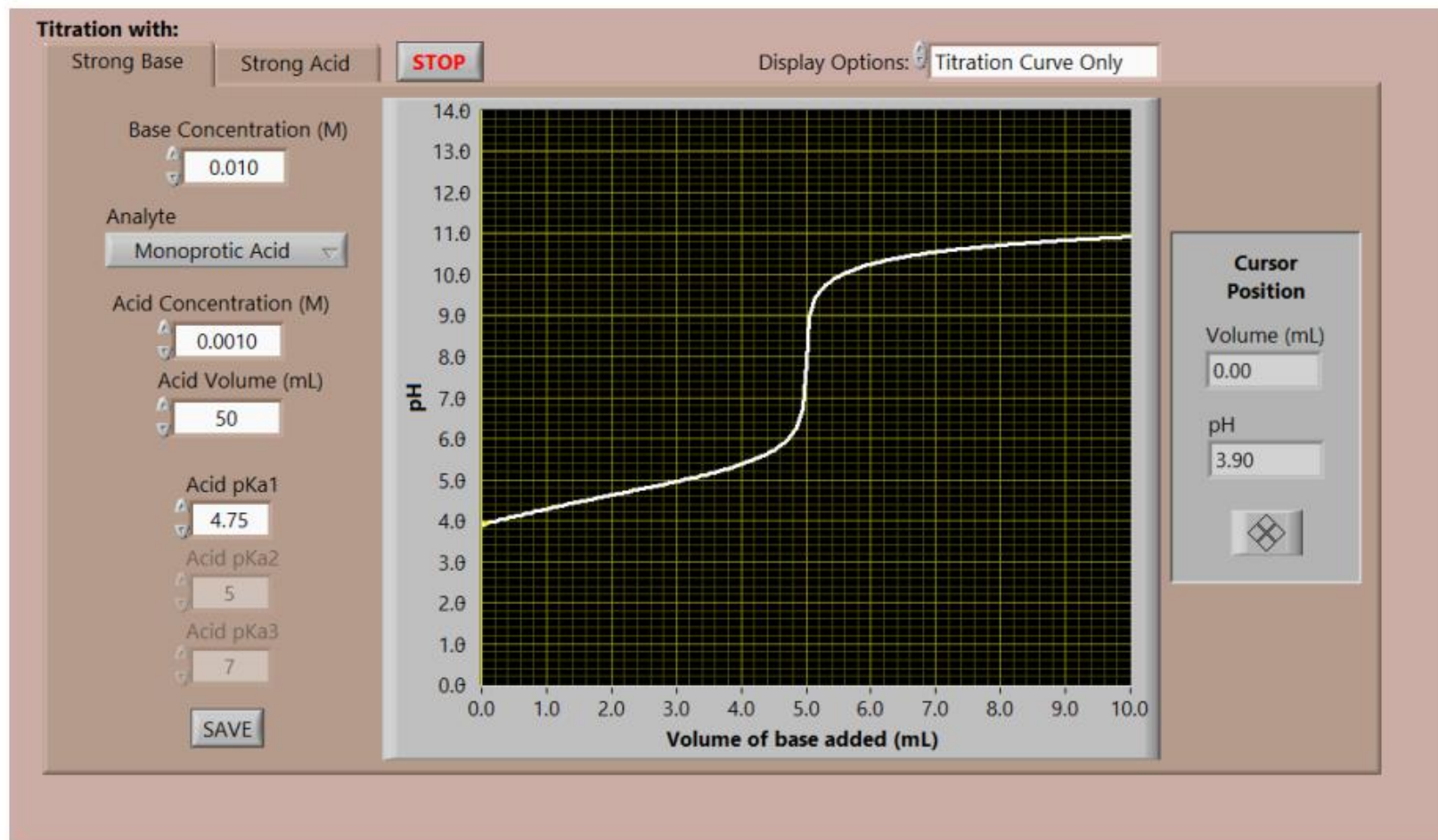


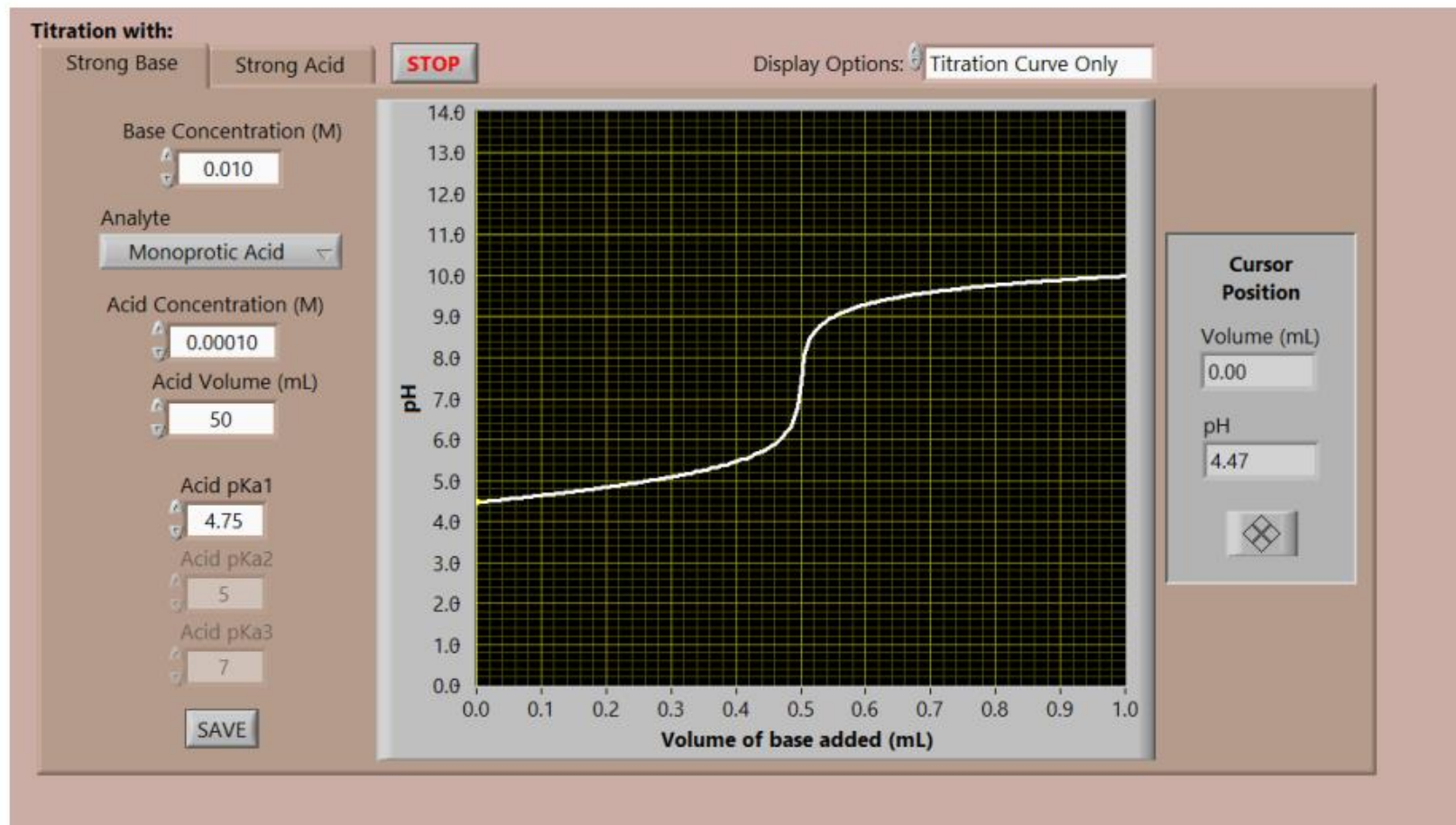


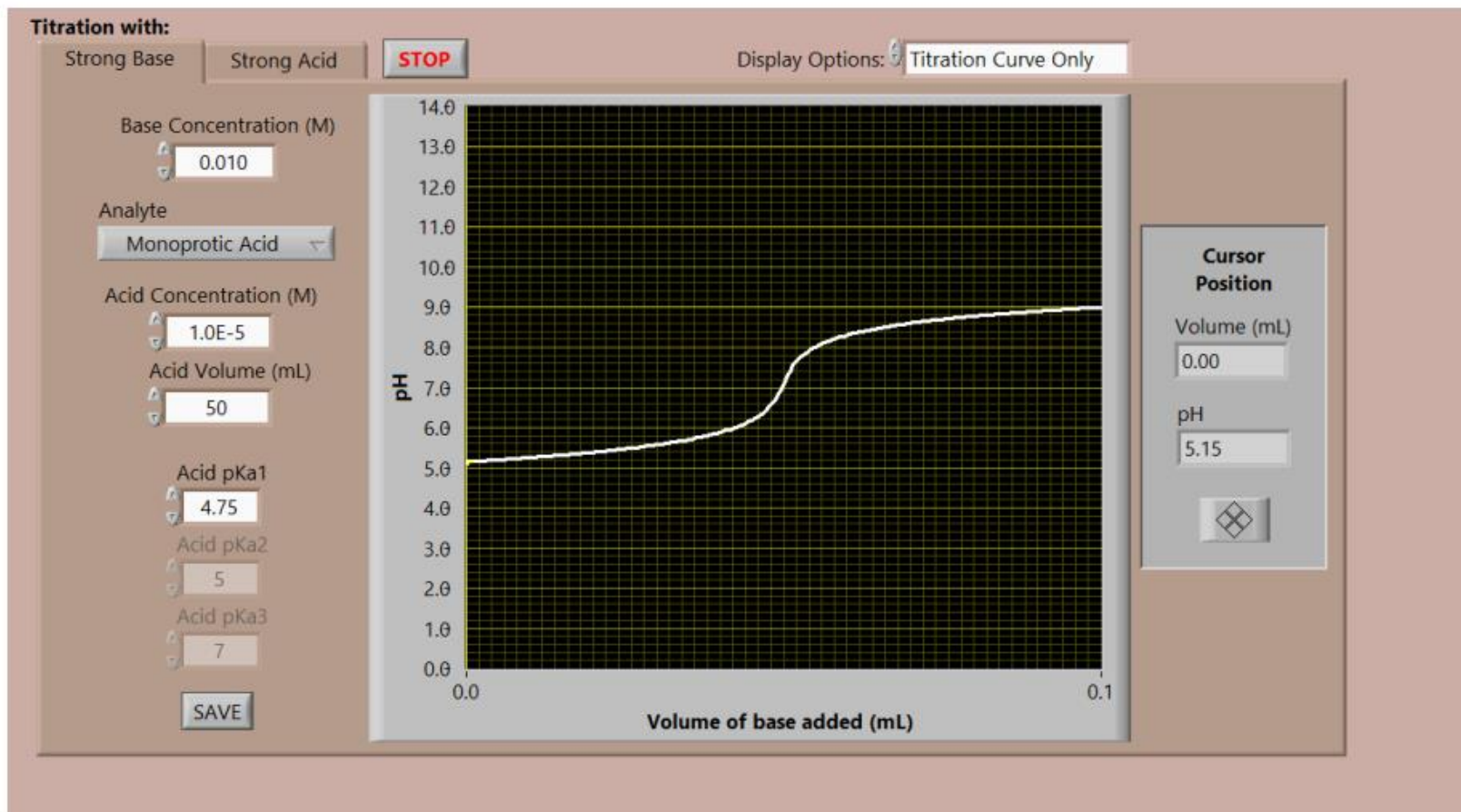


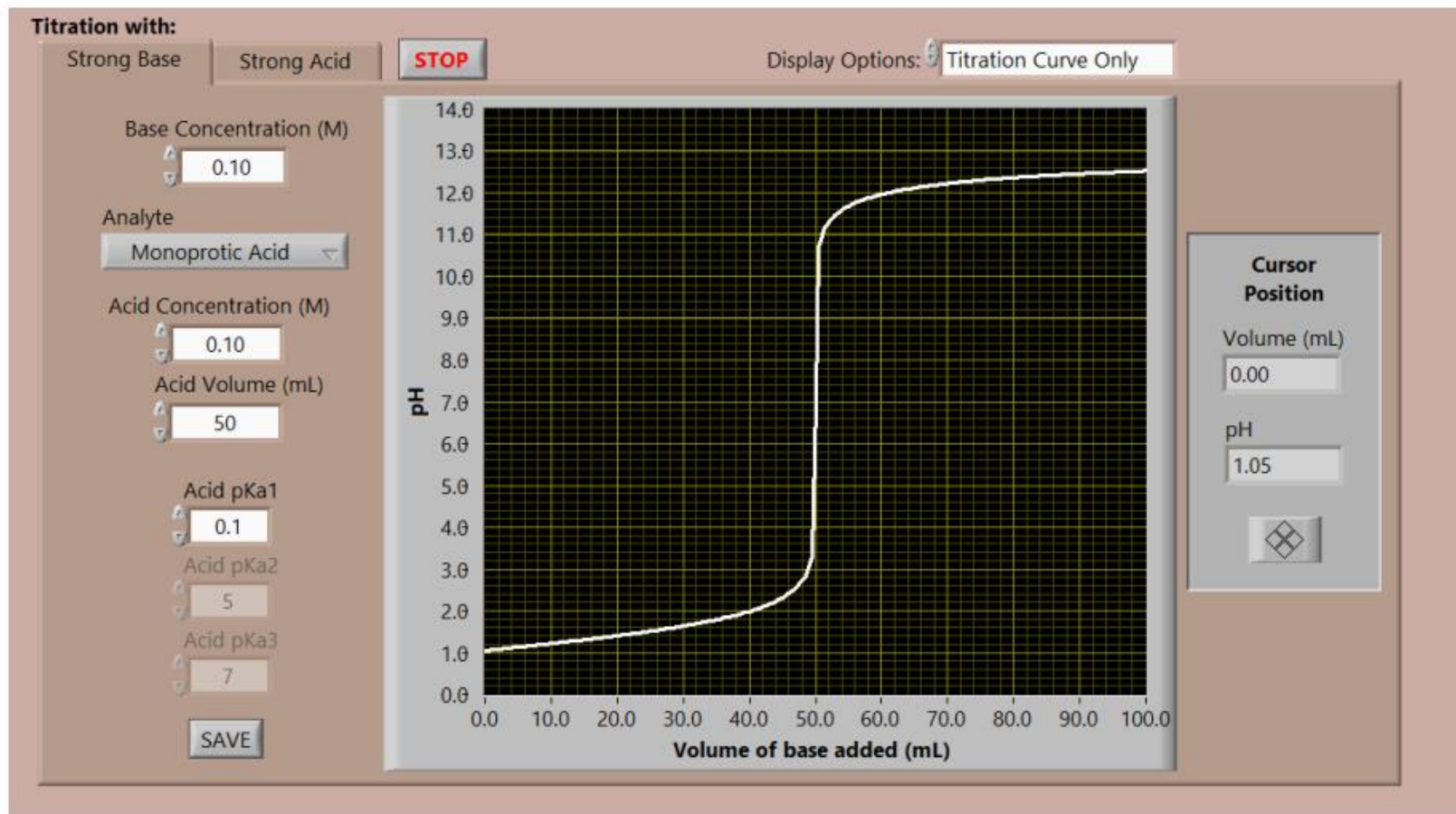


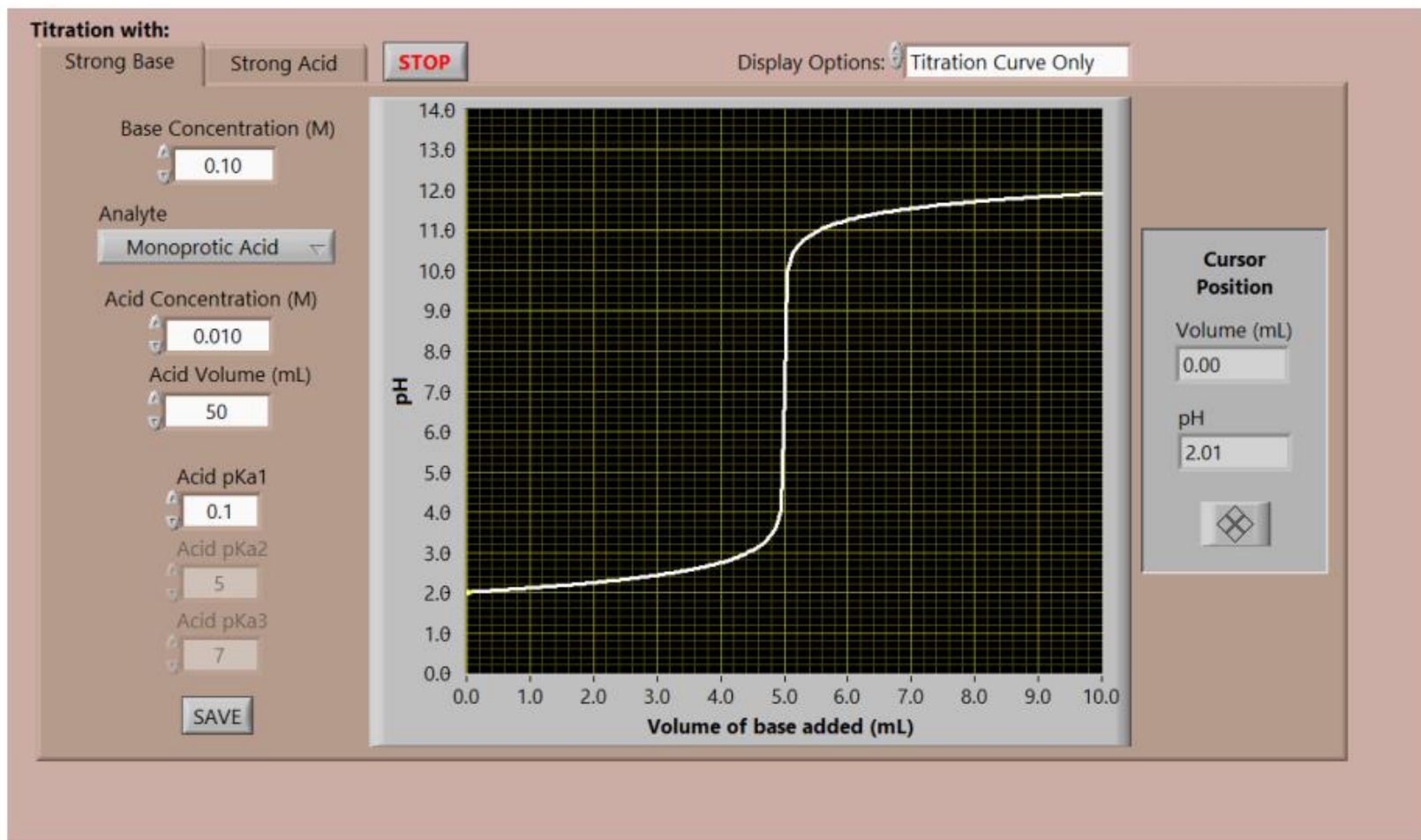


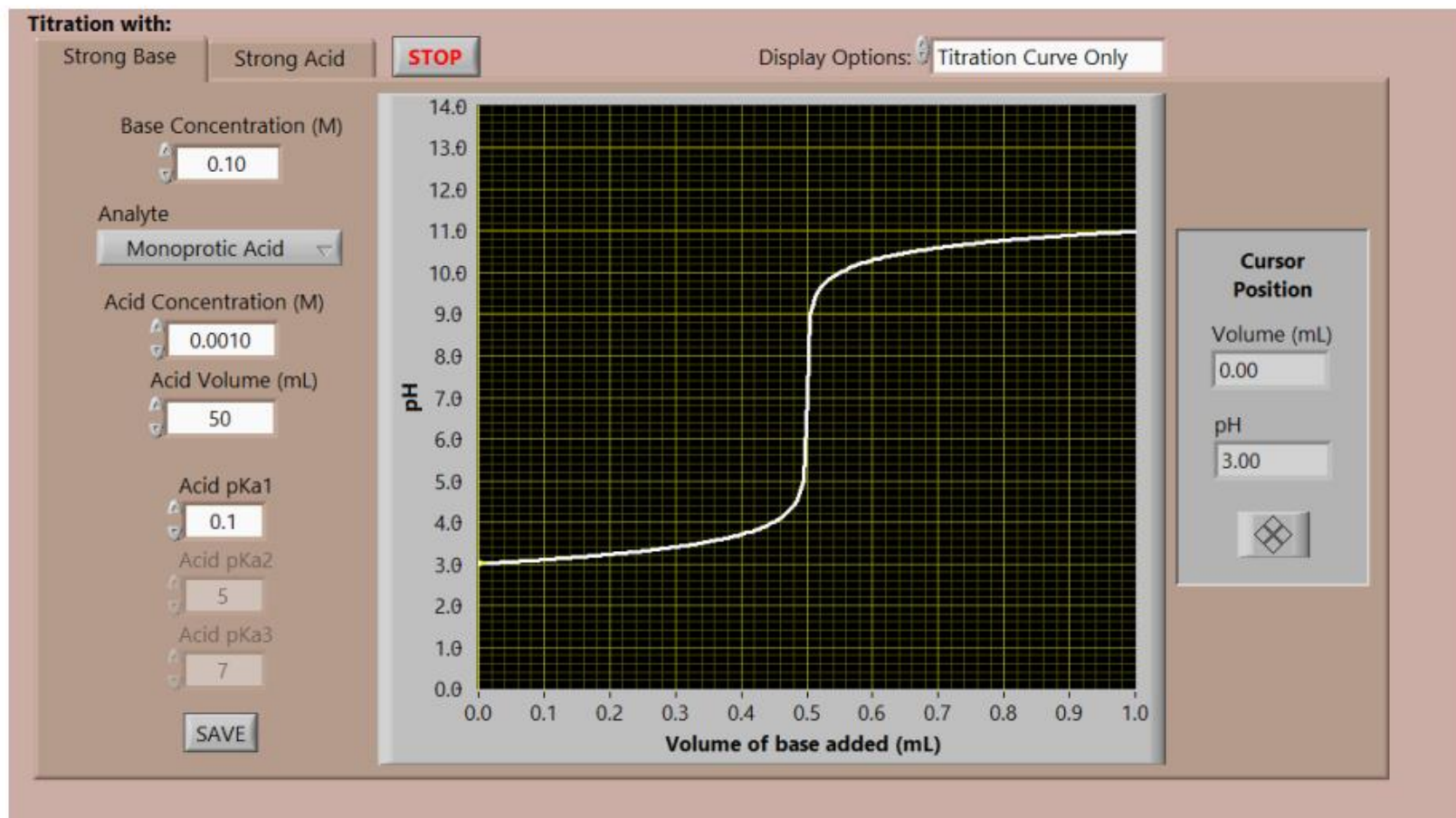


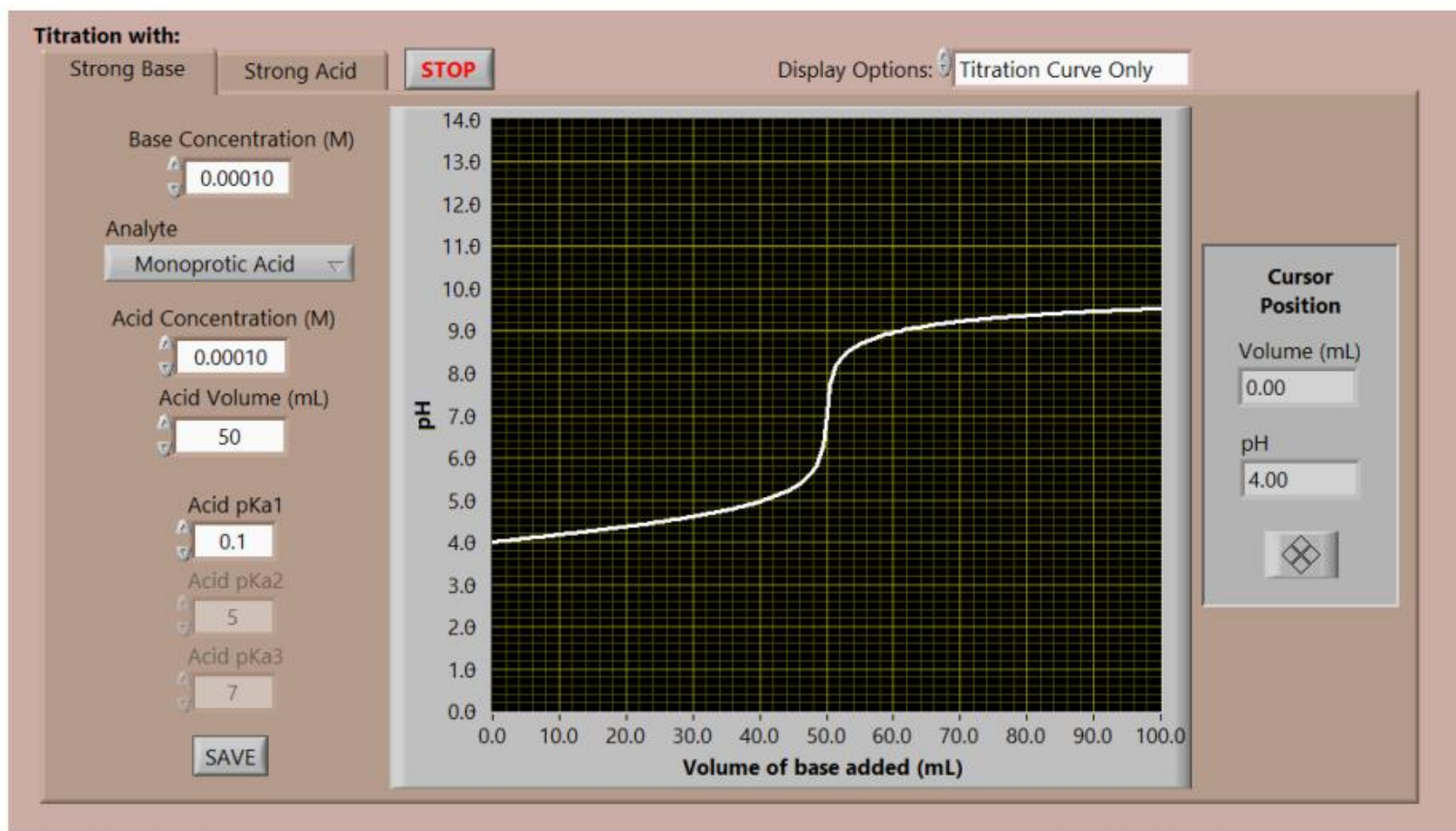


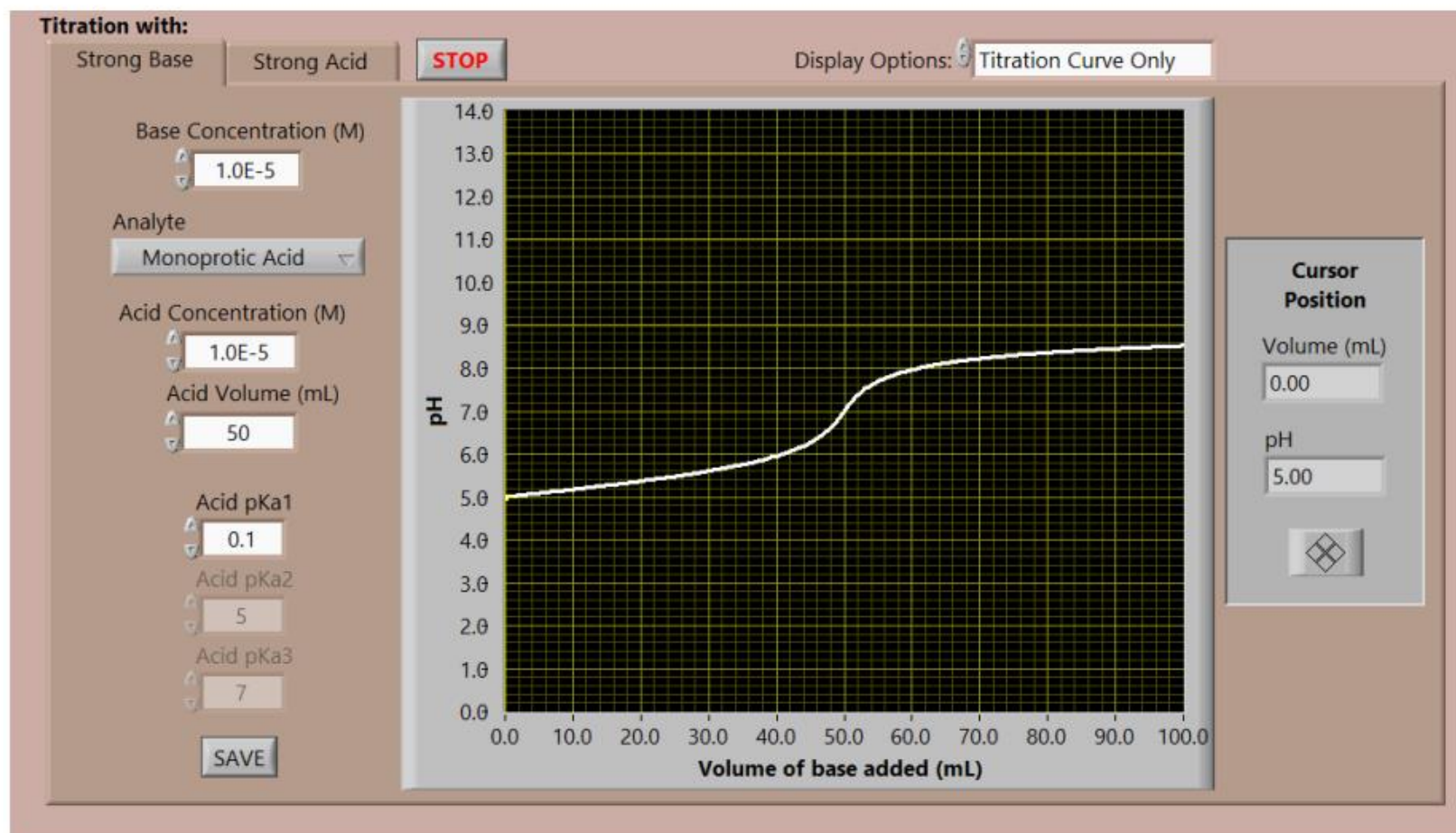












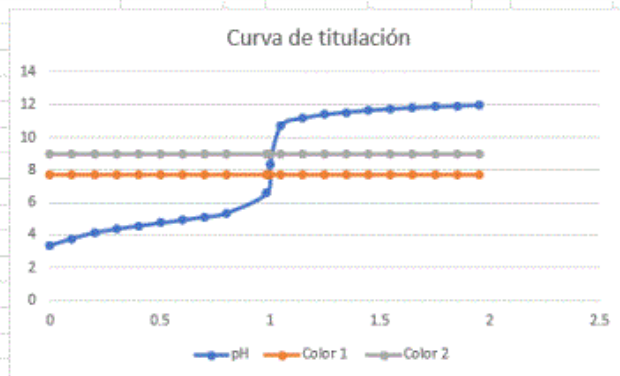
											Balanceo de la reacción				
	1	CH3COOH	+	1	NaOH	↔	1	CH3COONa	+	1	H2O	X	pH	5 H	5
INICIO		Co										0	3.375	2 C	2
AGREGADO					xCo							-	-	1 Na	1
APE		Co(1-x)			~o			xCo			xCo	0.5	4.75	1 O	1
PE		εCo			εCo			Co			Co	1	8.375		
DPE		~o			Co(x-1)			Co			Co	2	12		

Co	0.01
pka	4.75
Ka	1.7783E-05
pkw	14
kw	1E-14
Fuerza	0.00177828
error de indicador	0.1
[] con error	0.00001
[] Indicador APE	7.75
[] Indicador DPE	9

Ácido Debil

Cuantitatividad	
Keq.	1778279410
ε	2.3714E-06
P%	99.9997629
	Cuantitativo

Volumen	pH	Color 1	Color 2
0	3.375	7.75	9
0.1	3.79575749	7.75	9
0.2	4.14794001	7.75	9
0.3	4.38202321	7.75	9
0.4	4.57390874	7.75	9
0.5	4.75	7.75	9
0.6	4.92609126	7.75	9
0.7	5.11797679	7.75	9
0.8	5.35205999	7.75	9
0.985	6.56734497	7.75	9
1	8.375	7.75	9
1.05	10.69897	7.75	9
1.15	11.1760913	7.75	9
1.25	11.39794	7.75	9
1.35	11.544068	7.75	9
1.45	11.6532125	7.75	9
1.55	11.7403627	7.75	9
1.65	11.8129134	7.75	9
1.75	11.8750613	7.75	9
1.85	11.9294189	7.75	9
1.95	11.9777236	7.75	9



$pK_{a1} = 2.9$
 $pK_{a2} = 5.5$

Anfólitico - base fuerte.

$10^{-2} M$



mico

C_0

Ag.

$x C_0$

APE

$C_0(1-x)$

~ 0

$x C_0$

PE

ϵC_0

ϵC_0

C_0

DPE

~ 0

$C_0(x-1)$


C_0

$$1) K_r = \frac{[Ftalato] [H_3O^+]}{[B_1ftalato] [OH^-] [H_3O^+]}$$

$$K_r = \frac{K_{a2}}{K_w} = \frac{10^{-5.5}}{10^{-14}} = 10^{8.5}$$

$$2) K_r = \frac{\cancel{C_0}}{\epsilon C_0 \cancel{\epsilon C_0}} = 10^{8.5} \text{ p.e.}$$

$$\epsilon^2 = \frac{1}{K_r C_0} \quad \therefore \quad \epsilon = \sqrt{\frac{1}{K_r C_0}}$$

$$\begin{aligned}\varepsilon &= \sqrt{\frac{1}{10^{8.5} \cdot 10^{-2}}} = \sqrt{\frac{1}{10^{6.5}}} \\ &= 10^{-6.5/2} = 10^{-3.25}\end{aligned}$$


$$\begin{aligned}3) \text{ -/ } Q &= (1 - \varepsilon) 100 = (1 - 10^{-3.25}) \\ &= 99.94\%\end{aligned}$$

4)

X	pH	comportamiento
0	4.2	anfolito
0.5	5.5	amortiguador débil
1.0	8.75	base débil
1.5	11.7	base fuerte
2.0	12.0	base fuerte

$$\frac{K_b}{C_0} = \frac{10^{-8.5}}{10^{-2}} = 10^{-6.5}$$

10^{-6.5} débil

$$\frac{K_{az}}{C_0} = \frac{10^{-5.5}}{10^{-2}} = 10^{-3.5}$$

10^{-3.5} débil

$x = 0$ inicio

$$pH = \frac{pK_{a1} + pK_{a2}}{2}$$

$$= \frac{2.9 + 5.5}{2}$$

$$= 4.2$$

$x = 0.5$ amortiguador débil

$$pH = pK_{a2} + \log \frac{C_B}{C_A}$$

$$= 5.5 + \log \frac{x C_0}{C_0(1-x)}$$

$$\begin{aligned} \text{pH} &= 5.5 + \log \frac{0.5 C_0}{C_0(1-0.5)} \\ &= 5.5 + \log \frac{0.5 C_0}{C_0(0.5)} \\ &= 5.5 \end{aligned}$$

X=1 base débil

$$\begin{aligned} \text{pH} &= \frac{1}{2} \text{p}K_w + \frac{1}{2} \text{p}K_{a2} + \frac{1}{2} \log C_b \\ &= 7 + \frac{1}{2} (5.5) + \frac{1}{2} \log 10^{-2} \\ &= 8.75 \end{aligned}$$

$$x = 1.5 \text{ base Fite}$$

$$pH = 14 + \log C_b$$

$$= 14 + \log C_0(x-1)$$

$$= 14 + \log 10^{-2}(1.5-1)$$

$$= 14 + \log 10^{-2}(0.5)$$

$$= 14 + \log 5 \times 10^{-3}$$

$$= 14 - 2.3$$

$$= 11.7$$

$x = 2$ base Fuerte

$$pH = 14 + \log C_b$$

$$= 14 + \log C_0(x-1)$$

$$= 14 + \log 10^{-2}(2-1)$$

$$= 14 + \log 10^{-2}$$

$$= 14 - 2 = 12$$

1.1. error de elección de indicador

1.1. APE
amortiguador

$$pH = pK_{a2} + \log \frac{C_b}{C_A}$$

$$pH = 5.5 + \log \frac{100}{1}$$

$$pH = 5.5 + \log 10^2$$

$$pH = 5.5 + 2$$

$$pH = 7.5$$

1.1. DPE
base fuerte

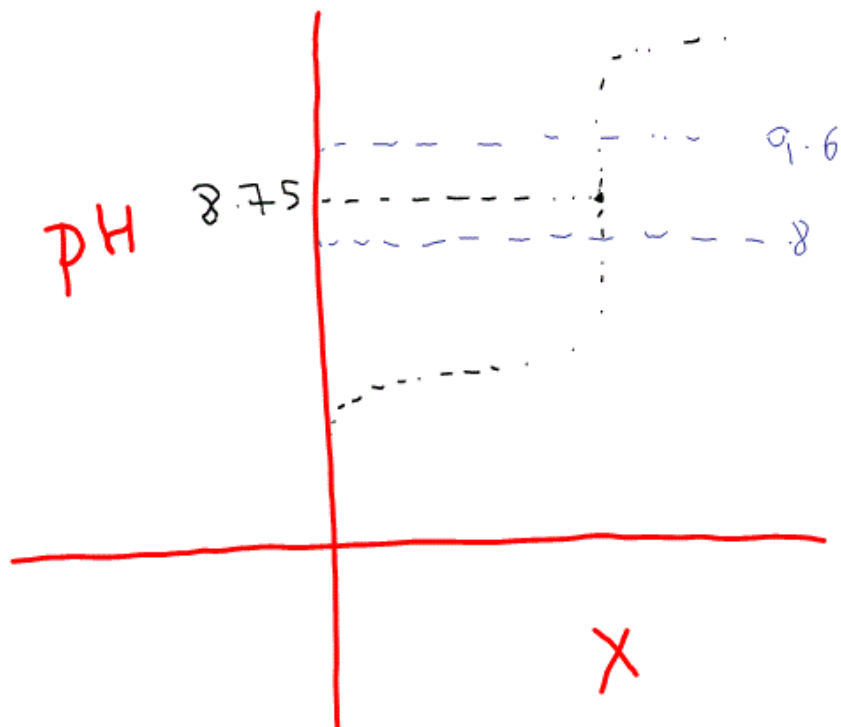
$$pH = 14 + \log C_b$$

$$pH = 14 + \log 10^{-2} 10^{-2}$$

$$pH = 14 + \log 10^{-4}$$

$$pH = 14 - 4 = 10$$

$$pH_{p.e} = \frac{10 + 7.5}{2} = 8.75$$



azul de timol ✓
 $pH = 8 - 9.6$

Fenolftaleína ✓
 $8 - 9.6$

Bicarbonato de sodio $10^{-2} M$

$$pK_{a1} = 6.35 \quad pK_{a2} = 10.35$$



$$1) K_r = \frac{[H_2CO_3]}{[HCO_3^-][H_3O^+]}$$

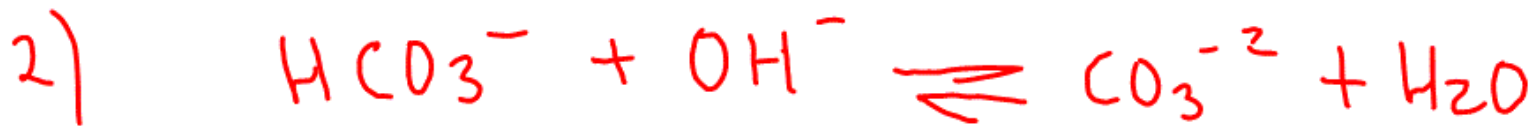
$$= \frac{1}{K_{a1}} = \frac{1}{10^{-6.35}} = 10^{6.35}$$

$$K_r = \frac{C_0}{\epsilon C_0 \epsilon C_0} = 10^{6.35}$$

$$\epsilon = \sqrt{\frac{1}{K_r C_0}} = \sqrt{\frac{1}{10^{6.35} 10^{-2}}}$$

$$\epsilon = \sqrt{\frac{1}{10^{4.35}}} = 10^{-4.35/2} = 10^{-2.175}$$

$$\begin{aligned} \cdot \% Q &= (1 - \epsilon) 100 \\ &= (1 - 10^{-2.175}) = 99.2\% \end{aligned}$$



$$K_r = \frac{[\text{CO}_3^{2-}] \cdot [\text{H}_3\text{O}^+]}{[\text{HCO}_3^-] [\text{OH}^-] [\text{H}_3\text{O}^+]}$$

$$= \frac{K_{a2}}{K_w} = \frac{10^{-10.35}}{10^{-14}}$$

$$= 10^{3.65}$$

$$k_v = \frac{C_0}{\epsilon C_0 \epsilon_0} = 10^{3.65}$$

$$\epsilon^2 = \frac{1}{k_v C_0} \quad \therefore \quad \epsilon = \sqrt{\frac{1}{k_v C_0}}$$

$$= \sqrt{\frac{1}{10^{3.65} \cdot 10^{-2}}} = \sqrt{\frac{1}{10^{1.65}}}$$

$$= 10^{-1.65/2} = 10^{-0.825}$$

$$\therefore Q = (1 - \epsilon) 100 = (1 - 10^{-0.825}) 100 = 85\%$$

Anfólitico - ácido fuerte $10^{-2} M$



Inicio	C_0		
Ag		$x C_0$	
APE	$C_0(1-x)$	~ 0	$x C_0$
PE	$\cdot x C_0$	$x C_0$	C_0
DPE	~ 0	$C_0(x-1)$	C_0

X	pH	comportamiento
0		anfólito
0.5		amortiguador débil
1.0		ácido débil
1.5		ácido fuerte
2.0		ácido fuerte

$$\frac{K_{b2}}{C_0} = \frac{10^{-3.65}}{10^{-2}}$$
$$= 10^{-1.65}$$

base
Fuerza
media