



UNIVERSIDADE DE SÃO PAULO
INSTITUTO DE QUÍMICA DE SÃO CARLOS
SQF0319 - LABORATÓRIO DE QUÍMICA GERAL



EXPERIMENTO 9

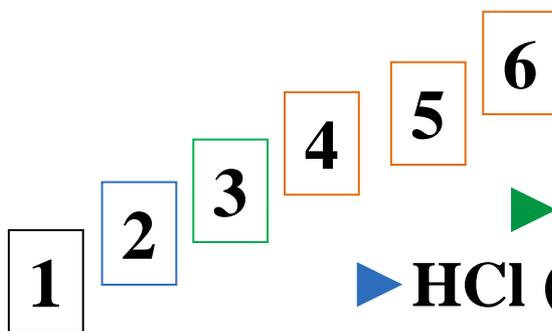
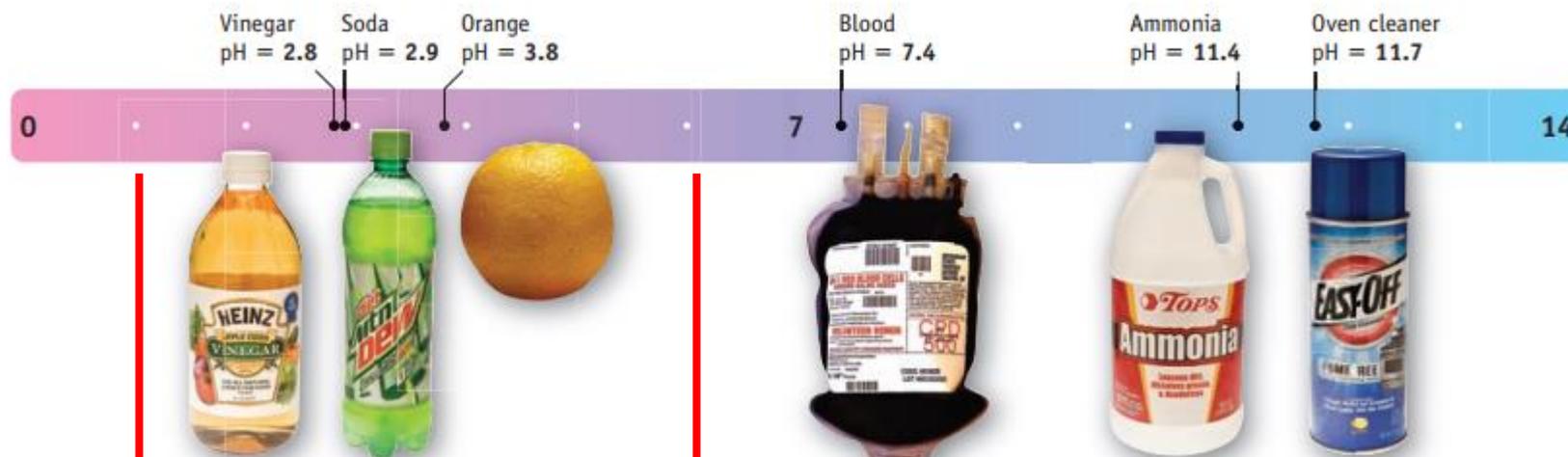
ÁCIDOS E BASES

Monitor: **MSc. Ricardo Sgarbi**
(r.sb@hotmail.com)

Monitor: **Dr. Wanderson O. Silva**
(wanders_1988@yahoo.com.br)

Prof. Dr. **Edson A. Ticianelli**
(edsont@iqsc.usp.br)

► Uso de indicadores para medidas de pH



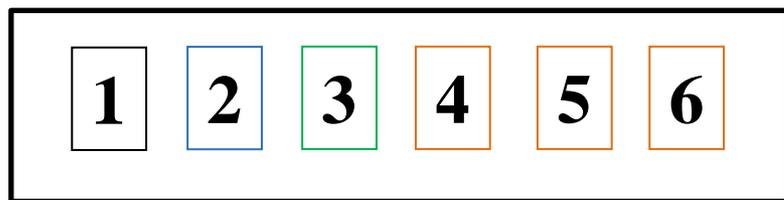
► Soluções Tampão

► HCl (0,01 M) 5 mL → 50 mL

► HCl (0,1 M) 5 mL → 50 mL

► HCl (0,1 M)

► Uso de indicadores para medidas de pH



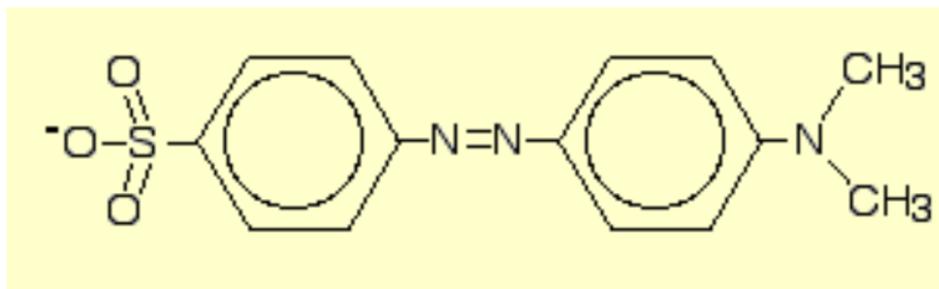
Tropeolina

Alaranjado de Metila

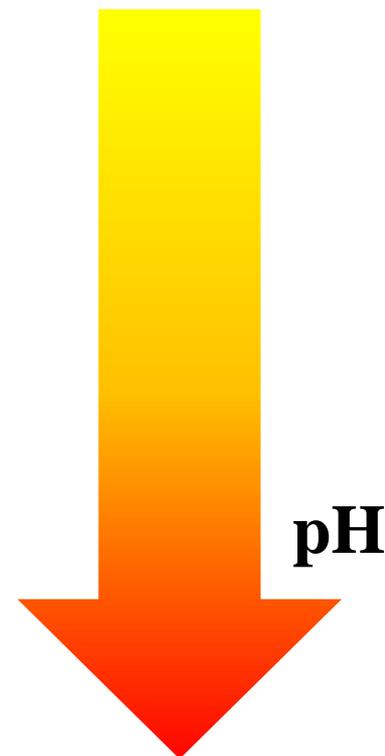
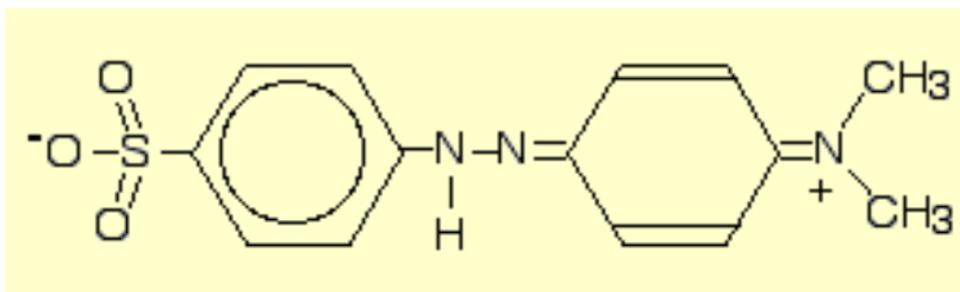
Verde de Bromocresol

	pH range for color change									
	0	2	4	6	8	10	12	14		
Methyl violet	Yellow			Violet						
Thymol blue		Red			Yellow		Yellow		Blue	
Methyl orange			Red			Yellow				
Methyl red				Red			Yellow			
Bromthymol blue					Yellow			Blue		
Phenolphthalein						Colorless			Pink	
Alizarin yellow R							Yellow			Red

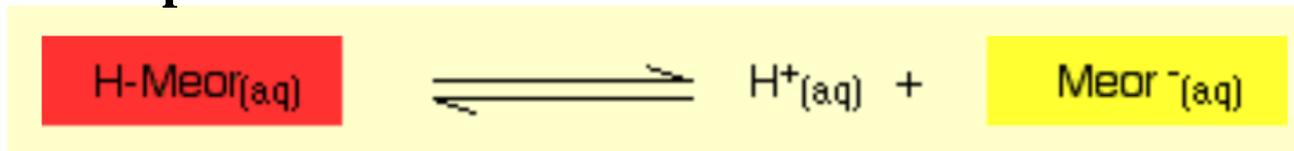
► Uso de indicadores para medidas de pH



Alaranjado de Metila



Princípio de Le Chatelier



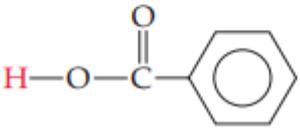
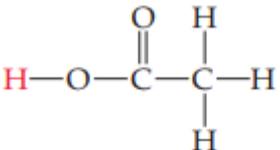
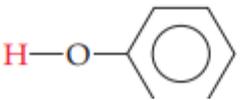
► Uso de indicadores para medidas de pH

**Estimar pH de
solução desconhecida**



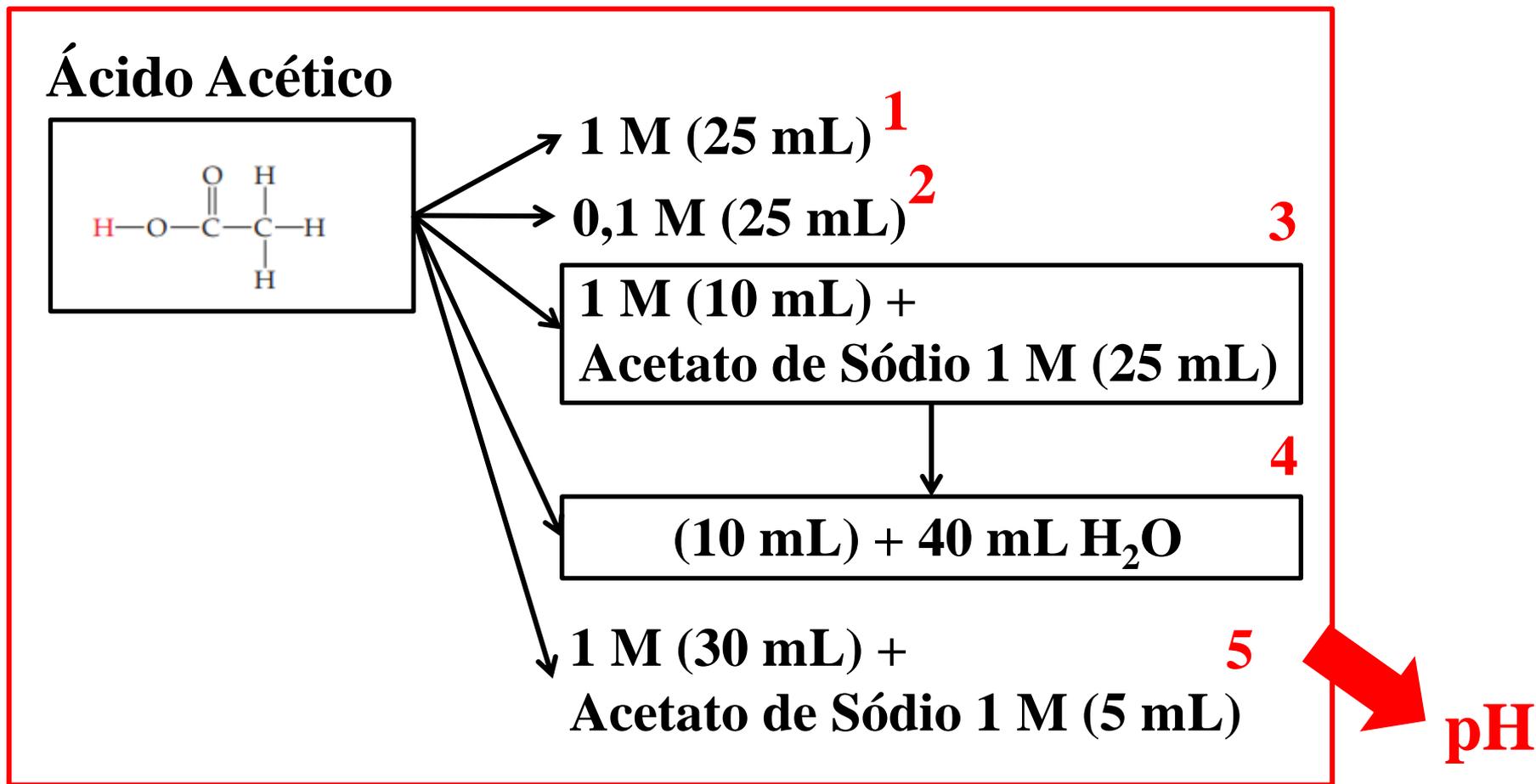
Parte C – Constante de Dissociação do Ácido (K_a)

► Determinações utilizando medidor de pH

Acid	Structural Formula*	Conjugate Base	K_a
Chlorous (HClO_2)	$\text{H}-\text{O}-\text{Cl}-\text{O}$	ClO_2^-	1.0×10^{-2}
Hydrofluoric (HF)	$\text{H}-\text{F}$	F^-	6.8×10^{-4}
Nitrous (HNO_2)	$\text{H}-\text{O}-\text{N}=\text{O}$	NO_2^-	4.5×10^{-4}
Benzoic ($\text{C}_6\text{H}_5\text{COOH}$)		$\text{C}_6\text{H}_5\text{COO}^-$	6.3×10^{-5}
Acetic (CH_3COOH)		CH_3COO^-	1.8×10^{-5}
Hypochlorous (HOCl)	$\text{H}-\text{O}-\text{Cl}$	OCl^-	3.0×10^{-5}
Hydrocyanic (HCN)	$\text{H}-\text{C}\equiv\text{N}$	CN^-	4.9×10^{-10}
Phenol (HOC_6H_5)		$\text{C}_6\text{H}_5\text{O}^-$	1.3×10^{-10}

Parte C – Constante de Dissociação do Ácido (K_a)

► Determinações utilizando medidor de pH



► Determinações utilizando indicadores

1 - Tropeolina

2 - Tropeolina

2 - Alaranjado de Metila

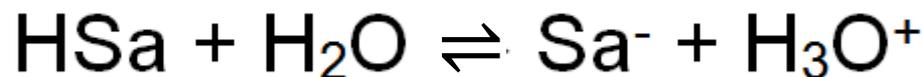
Solução

3 – Verde de Bromocresol

4 – Verde de Bromocresol

5 – Alaranjado de Metila

► Ácido Salicílico e Acetilsalicílico (p. 96-97)



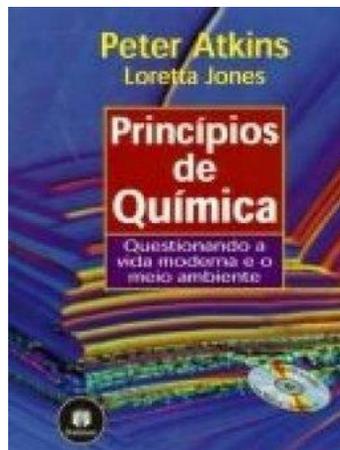
Ác. Acetilsalicílico ($180,2 \text{ g mol}^{-1}$) ~ 0,5 g + 25 mL (etanol)

+ NaOH 0,1 M (x mL)

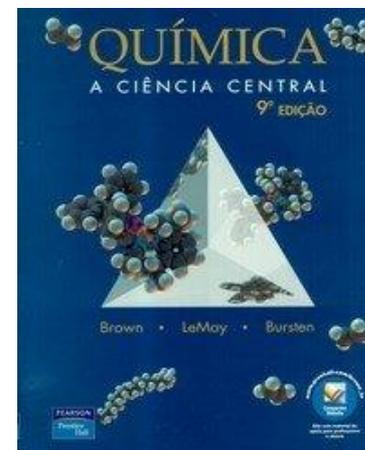
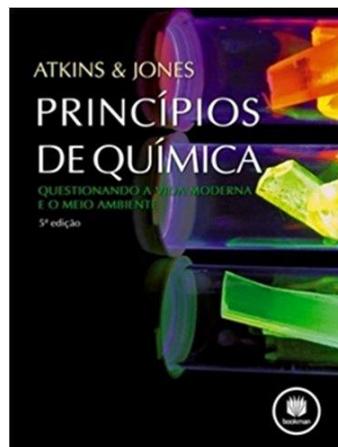
Ác. Salicílico ($138,1 \text{ g mol}^{-1}$) ~ 0,4 g + 25 mL (etanol)

Ác. Benzóico ($122,1 \text{ g mol}^{-1}$) ~ 0,3 g + 25 mL (etanol)
pH ~ 4,2

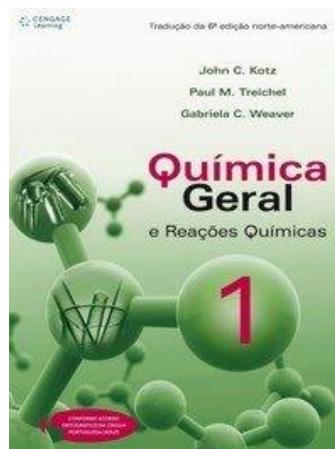
Material para Consulta



Princípios de Química: Questionando a Vida Moderna e o Meio Ambiente
(Peter Atkins)



Química: A Ciência Central
(Theodore Brown)



Química Geral e Reações Químicas
(John Kotz)