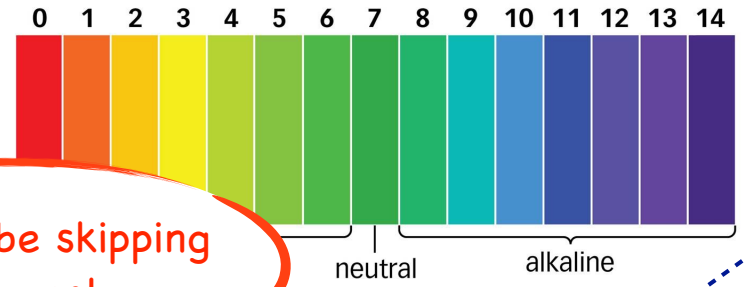
Exp 08: Acids

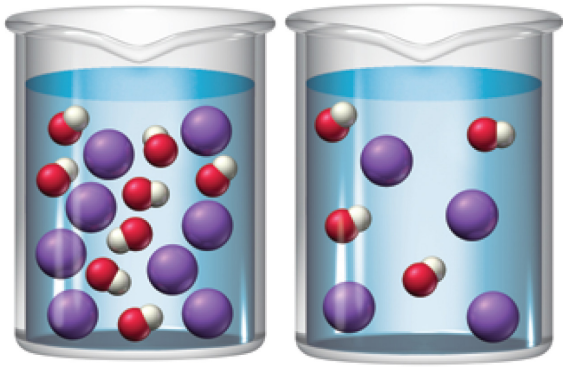
Part A: pH Indicators



We will be skipping this part.

Part B: Measuring pH

Part C: pH Buffers



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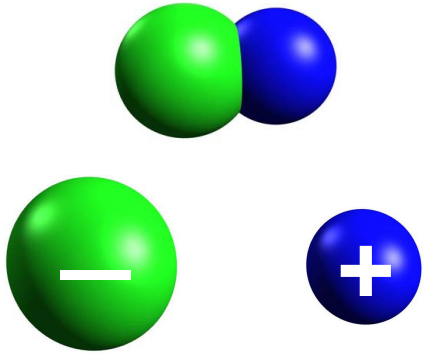


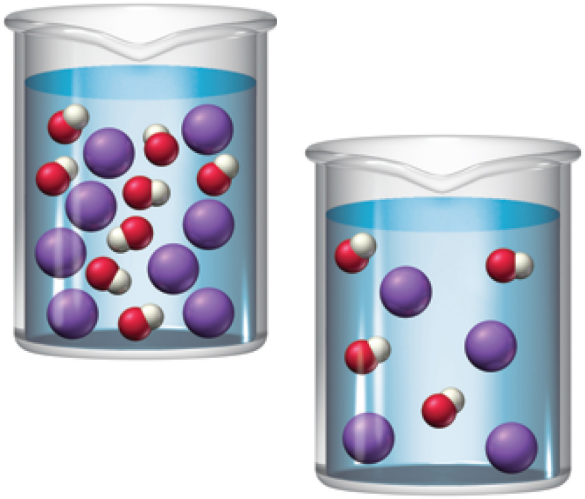
Acids

Arrhenius acids

- produce hydrogen ions (H^+) ions when they dissolve in water

$$HCl(g) \xrightarrow{H_2O(l)} H^+(aq) + Cl^-(aq)$$

- are also electrolytes because they produce H^+ in water
- have a sour taste
- turn blue litmus red
- corrode some metals



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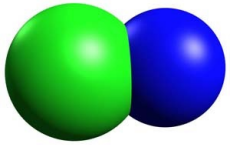
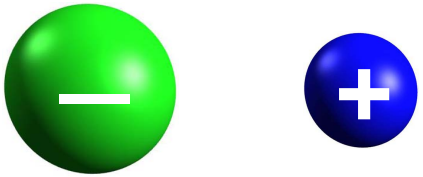
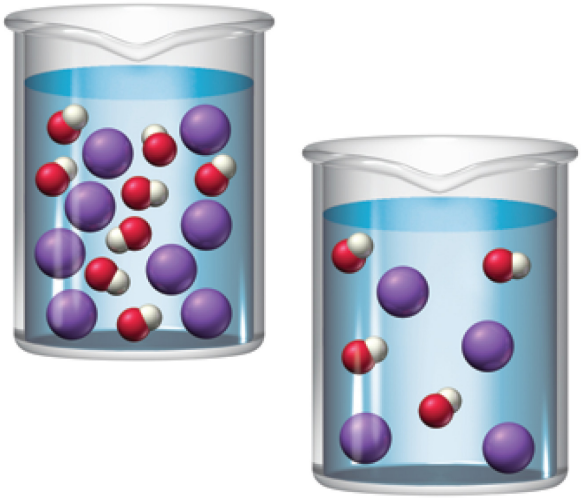


The pH Scale



The pH of a solution

- is used to indicate the acidity of a solution
- has values that usually range from 0 to 14
- is **acidic** when the values are less than 7
- is neutral at a value of 7
- is **basic** when the values are greater than 7



Acidic solution	$pH < 7.0$	$[H_3O^+] > 1 \times 10^{-7}$ M
Neutral solution	$pH = 7.0$	$[H_3O^+] = 1 \times 10^{-7}$ M
Basic solution	$pH > 7.0$	$[H_3O^+] < 1 \times 10^{-7}$ M

$$[H^+] = 10^{-pH}$$

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

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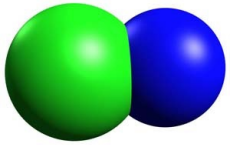

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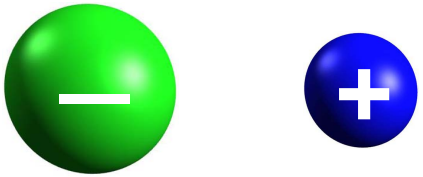
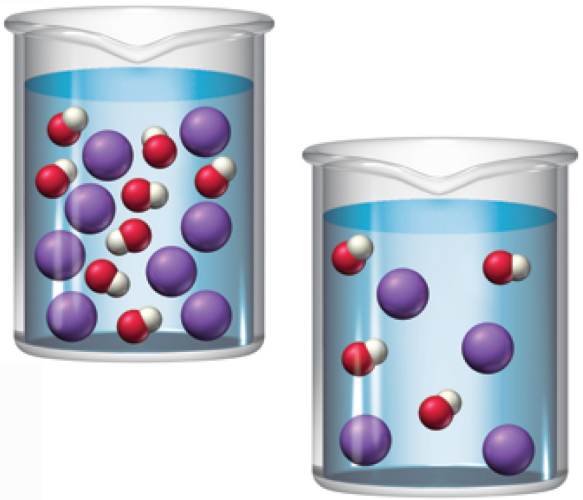


pH	Hydronium ion concentration (moles/L)	
1	.1	(1×10^{-1})
2	.01	(1×10^{-2})
3	.001	(1×10^{-3})
4	.0001	(1×10^{-4})
5	.00001	(1×10^{-5})
6	.000001	(1×10^{-6})
7	.0000001	(1×10^{-7})
8	.00000001	(1×10^{-8})
9	.000000001	(1×10^{-9})
10	.0000000001	(1×10^{-10})
11	.00000000001	(1×10^{-11})
12	.000000000001	(1×10^{-12})
13	.0000000000001	(1×10^{-13})
14	.00000000000001	(1×10^{-14})



$$[H^+] = 10^{-pH}$$

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

Exp 08: Acids

Solutions for A/B

- 0.1 M NaCl
- 0.1 M HCl
- 0.1 M acetic acid
- 0.1 M NaOH
- 0.1 M NH_3

Solutions for C (5 ml each)

- Deionized Water
- 0.1 M NaCl
- 0.1 M buffer (high pH)
- 0.1 M buffer (low pH)

Part A: pH Indicators

Use pH paper to estimate the pH of each solution.

Part B: Measuring pH

Use the pH meter to measure and record the pH of each solution.

Part C: pH Buffers

Observe what happens to the pH of each solution when you add small amounts of acid and base.

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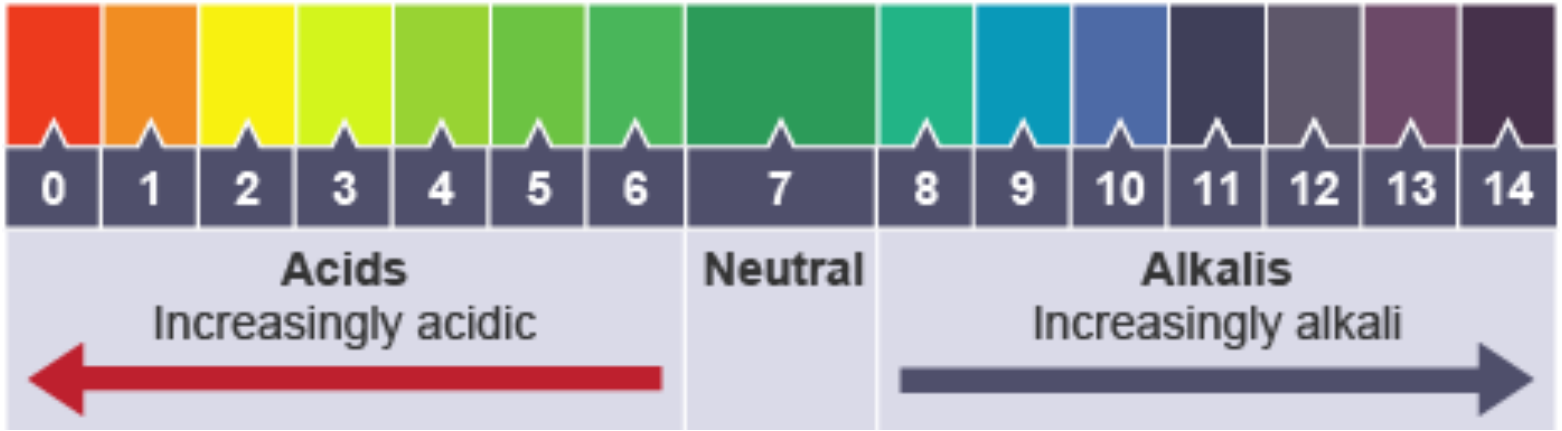

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- 0.1 M NH_3

Solutions for C (5 ml each)

1. Deionized Water
2. 0.1 M NaCl
3. 0.1 M buffer (high pH)
4. 0.1 M buffer (low pH)

Part C: pH Buffers

Observe what happens to the pH of each solution when you add small amounts of acid and base.

ACID TEST

- Prepare 4 test tubes
  - put 5 mL of each solution into a separate tube
- Estimate the pH with pH paper
- Measure the pH with a pH meter

- Add 3 drops of 0.1 M HCl to each tube
- Estimate the pH with pH paper
- Measure the pH with a pH meter

What is the [H+] concentration of each?

Exp 08: Acids

Solutions for A/B

- 0.1 M NaCl
- 0.1 M HCl
- 0.1 M acetic acid
- 0.1 M NaOH
- 0.1 M NH_3

Solutions for C (5 ml each)

1. Deionized Water
2. 0.1 M NaCl
3. 0.1 M buffer (high pH)
4. 0.1 M buffer (low pH)

Part C: pH Buffers

Observe what happens to the pH of each solution when you add small amounts of acid and base.

BASE TEST

- Prepare 4 test tubes
  - put 5 mL of each solution into a separate tube
- Estimate the pH with pH paper
- Measure the pH with a pH meter

- Add 3 drops of 0.1 M NaOH to each tube
- Estimate the pH with pH paper
- Measure the pH with a pH meter

What is the [H+] concentration of each?

Questions?