

Acid Base Indicators

pH Indicators: Table M

- An indicator is a valuable tool for measuring pH because its acid form and base form have different color in solution.

pH Indicators: Methyl Orange

- Red: pH 3.2 or less
- Yellow: pH 4.4 or more
- Orange: pH 3.2 to 4.4

pH Indicators: Phenolphthalein

- Colorless: pH 8.2 or less
- Pink: pH 9 or more

pH Indicators: Litmus

- Blue paper turns red for acidic solutions
- Red paper turns blue for basic solutions

pH Indicators: Bromocresol Green

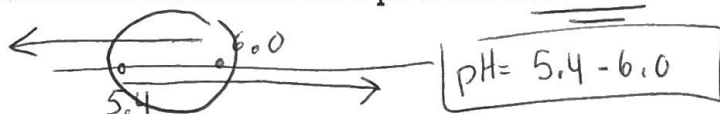
- Yellow: pH 3.8 or less
- Blue: pH 5.4 or more

pH Indicators: Thymol Blue

- Yellow: pH 8.0 or less
- Blue: pH 9.6 or more

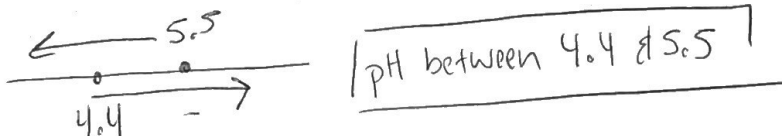
Using More Than One Indicator

- If you put bromocresol green in a solution and the solution turns blue, the pH is 5.4 or more.
- If you put bromthymol blue in another test tube with the same solution and it turns yellow, the pH is 6.0 or less
- Conclusion: the solution has a pH between 5.4 and 6.0



- Mystery solution #1 turns litmus red and is yellow when methyl orange is added.

Litmus Red = 5.5 ↓
 MO = yellow = 4.4 ↑



- Mystery solution #2 is pink when phenolphthalein is added but turns litmus paper blue.

phenol = pink 10 ↑
 litmus = blue 8.2 ↑

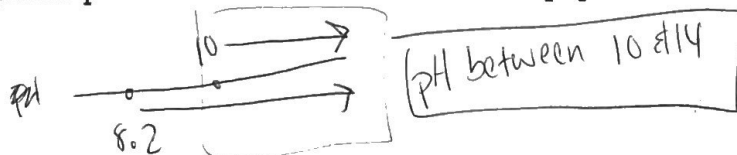


Table M
Common Acid-Base Indicators

Indicator	Approximate pH Range for Color Change	Color Change
methyl orange	← 3.2-4.4 →	← red to yellow →
bromthymol blue	6.0-7.6	yellow to blue
phenolphthalein	8.2-10	colorless to pink
litmus	5.5-8.2	red to blue
bromocresol green	3.8-5.4	yellow to blue
thymol blue	8.0-9.6	yellow to blue

pH INDICATOR COLOURS

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Teacher: _____ Period: _____ Class: _____

Summary

Acids

- pH lower than 7
- Litmus → red
- Phenolphthalein → clear
- Bromthymol blue → yellow
- Methyl orange → red

Bases

- pH higher than 7
- Litmus → blue
- Phenolphthalein → pink
- Bromthymol blue → blue
- Methyl orange → yellow

Summary Questions

A 1. If an aqueous solution turns blue litmus red, which relationship exists between the hydronium ion and the hydroxide ion concentration? acidic solution

- a. $[H_3O^+] > [OH^-]$ acid
- b. $[H_3O^+] < [OH^-]$ basic
- c. $[H_3O^+] = [OH^-] = 10^{-7}$ neutral
- d. $[H_3O^+] = [OH^-] = 10^{-14}$ doesn't exist

B 2. In which 0.01M solution is phenolphthalein pink?

- a. $CH_3OH_{(aq)}$
- b. $Ca(OH)_{2(aq)}$
- c. $CH_3COOH_{(aq)}$
- d. $HNO_{3(aq)}$

pH ≥ 10 = basic

look @ table K&L for acids & bases

A 3. The results of testing a colorless solution with three indicators are shown below

Test - Result
Red litmus - blue
Blue litmus - blue
Phenolphthalein - pink } Base

Which formula could represent the solution tested?

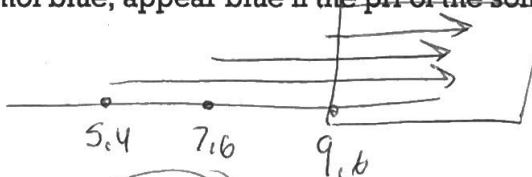
- a. $NaOH_{(aq)}$
- b. $HCl_{(aq)}$
- c. $C_6H_{12}O_6_{(aq)}$
- d. $C_{12}H_{22}O_{11(aq)}$

look at table K&L for acids and bases.

D 4. Three samples of the same solution are tested, each with a different indicator. All three indicators, bromthymol blue, bromcresol green and thymol blue, appear blue if the pH of the solutions is

- a. 4.7
- b. 6.0
- c. 7.8
- d. 9.9

BB = blue 7.6 ↑
BG = blue 5.4 ↑
TB = 9.6 ↑



B 5. Which statement correctly describes a solution with a pH of 9?

- a. It has a higher concentration of H_3O^+ than OH^- and causes litmus to turn blue
- b. It has a higher concentration OH^- than H_3O^+ and causes litmus to turn blue.
- c. It has a higher concentration of H_3O^+ than OH^- and causes methyl orange to turn yellow
- d. It has a higher concentration of OH^- than H_3O^+ and causes methyl orange to turn red.

basic $OH^- > H^+$

MO = red = acidic

Lit = blue = base