

## Indicators

Indicator	Low pH color	Transition pH range	High pH color
Gentian violet (Methyl violet)	yellow	0.0–2.0	blue-violet
Leucomalachite green (first transition)	yellow	0.0–2.0	green
Leucomalachite green (second transition)	green	11.6–14	colorless
Thymol blue (first transition)	red	1.2–2.8	yellow
Thymol blue (second transition)	yellow	8.0–9.6	blue
Methyl yellow	red	2.9–4.0	yellow
Bromophenol blue	yellow	3.0–4.6	purple
Congo red	blue-violet	3.0–5.0	red
Methyl orange	red	3.1–4.4	orange
Bromocresol green	yellow	3.8–5.4	blue
Methyl red	red	4.4–6.2	yellow
Methyl red	red	4.5–5.2	green
Azolitmin	red	4.5–8.3	blue
Bromocresol purple	yellow	5.2–6.8	purple
Bromothymol blue	yellow	6.0–7.6	blue
Phenol red	yellow	6.8–8.4	red
Neutral red	red	6.8–8.0	yellow
Naphtholphthalein	colorless to reddish	7.3–8.7	greenish to blue
Cresol Red	yellow	7.2–8.8	reddish-purple
Phenolphthalein	colorless	8.3–10.0	fuchsia
Thymolphthalein	colorless	9.3–10.5	blue
Alizarine Yellow R	yellow	10.2–12.0	red
Litmus	red	4.5–8.3	blue

## Universal indicator

A **Universal indicator** is a pH indicator composed of a blend of several compounds that exhibits several smooth colour changes over a pH value range from 1-14 to indicate the acidity or basicity of solutions. Although there are a number of commercially available universal pH indicators, most are a variation of a formula patented by Yamada in 1923.

A universal indicator is typically composed of water, methanol, propan-1-ol, phenolphthalein sodium salt, methyl red, bromothymol blue monosodium salt, and thymol blue monosodium salt.

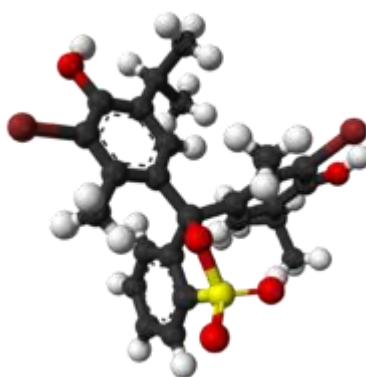
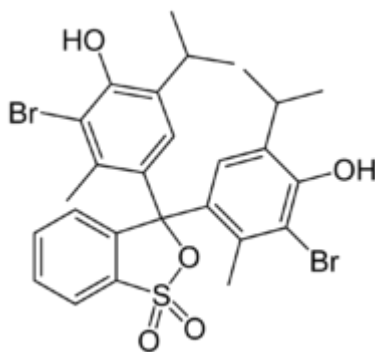
The colours that indicate the pH of a solution, after adding a universal indicator are:

pH range	Description	Colour
0-3	Strong acid	Red
3-6	Acid	Orange/Yellow
7	Neutral	Green
8-11	Base	Blue
11-14	Strong Base	Purple

There are now also available wide range pH test papers with distinct colours for each pH from 1 to 14. Colour matching charts are supplied with the specific test strips purchased.

# Bromothymol blue

## Bromothymol blue



### IUPAC name

4,4'-(1,1-dioxido-3*H*-2,1-benzoxathiole-3,3-diyl)bis(2-bromo-6-isopropyl-3-methylphenol)

### Identifiers

CAS number 76-59-5 ✓

PubChem 6450

SMILES CC1=C(C(=C(C=C1)C2(C3=CC=CC=C3S(=O)(=O)O2)C4=CC(=C(C(=C4)Br)O)C(C)C)C(C)C)O)Br

### Properties

Molecular formula  $C_{27}H_{28}Br_2O_5S$

Molar mass  $624.38 \text{ g mol}^{-1}$

Density  $1.25 \text{ g/cm}^3$

Melting point  $202 \text{ }^\circ\text{C}$ ,  $475 \text{ K}$ ,  $396 \text{ }^\circ\text{F}$

Acidity ( $pK_a$ ) 7.10

**Supplementary data page**

Structure and properties  $n$ ,  $\epsilon_r$ , etc.

Thermodynamic data Phase behaviour  
Solid, liquid, gas

Spectral data UV, IR, NMR, MS

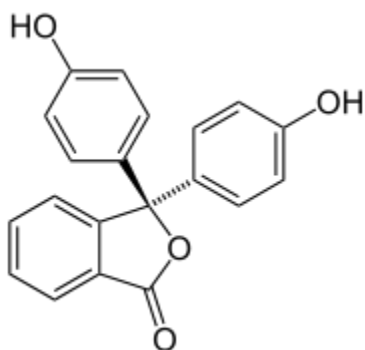
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Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)

Infobox references

# Phenolphthalein

## Phenolphthalein



### IUPAC name

3,3-bis(4-hydroxyphenyl)isobenzofuran-1(3*H*)-one

### Identifiers

CAS number 77-09-8 ✓

SMILES Oc1ccc(cc1)C3(OC(=O)c2ccccc23)c4ccc(O)cc4

### Properties

Molecular formula  $C_{20}H_{14}O_4$

Molar mass  $318.32 \text{ g mol}^{-1}$

Density  $1.277 \text{ g cm}^{-3}$ , at 32 °C

Melting point  $262.5 \text{ °C}$

Boiling point N/A

Solubility in water Insoluble

Solubility in other solvents Insoluble in benzene, very soluble in ethanol and ether, slightly soluble in DMSO

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Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)

Infobox references

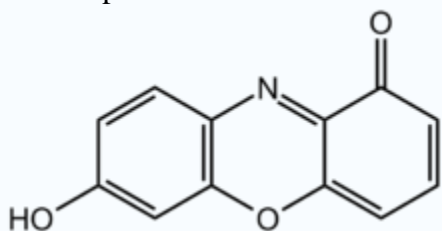
**Phenolphthalein** is a chemical compound commonly pronounced. It has the formula  $C_{20}H_{14}O_4$  and is often written as "**HIn**" or "**phph**" in shorthand notation. Often used in titrations, it turns colorless in acidic solutions and pink in basic solutions. If the concentration of indicator is particularly strong, it can appear purple. In strongly basic solutions, phenolphthalein's pink color undergoes a rather slow fading reaction and becomes colorless again. The molecule has four forms:

Species	$In^+$	$H_2In$	$In^{2-}$	$In(OH)^{3-}$
Structure				
Model				
pH	<0	0–8.2	8.2–12.0	>12.0
Conditions	strongly acidic	acidic or near-neutral	basic	strongly basic
Color	orange	colorless	pink to fuchsia	colorless
Image				

## Litmus



Litmus powder



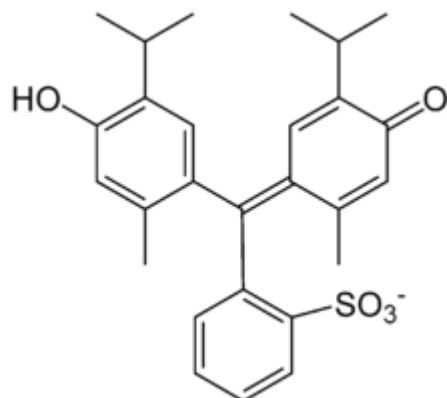
Chemical structure of 7-hydroxyphenoxazone, the chromophore of litmus components

**Litmus** is a water-soluble mixture of different dyes extracted from lichens, especially *Roccella tinctoria*. It is often absorbed onto filter paper to produce one of the oldest forms of pH indicator, used to test materials for acidity. Blue litmus paper turns red under acidic conditions and red litmus paper turns blue under basic (i.e. alkaline) conditions with the color change occurring over the pH range 4.5-8.3 at 25 °C. Neutral litmus paper is purple in color. Litmus can also be prepared as an aqueous solution that functions similarly. Under acidic conditions the solution is red, and under basic conditions the solution is blue.

The litmus mixture has the CAS number 1393-92-6 and contains 10 to 15 different dyes. Most of the chemical components of litmus are likely to be the same as of the related mixture known as orcein, but in different proportions. In contrast with orcein, the principal constituent of litmus has average molecular weight of 3300. Acid-base indicators on litmus owe their properties to a 7-hydroxyphenoxazone chromophore.

# THYMOL Blue

## Thymol blue



### IUPAC name

4-[9-(4-hydroxy-2-methyl-5-propan-2-yl-phenyl)-7,7-dioxo-8-oxa-7λ6-thiabicyclo[4.3.0]nona-1,3,5-trien-9-yl]-5-methyl-2-propan-2-yl-phenol

### other names

$\alpha$ -hydroxy- $\alpha$ , $\alpha$ -bis(5-hydroxycarvacryl)-o-toluenesulfonic acid  $\gamma$ -sultone; thymolsulfonephthalein

## Identifiers

CAS number 76-59-5

SMILES c1cc2S(OC(c2cc1)(c1c(cc(c(c1)C(C)C)O)C)c1cc(c(cc1C)O)C(C)C)(=O)=O

## Properties

Molecular formula  $C_{27}H_{30}O_5S$

Molar mass  $466.5 \text{ g mol}^{-1}$

Appearance Brownish-green crystal powder

Solubility in water Insoluble

Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)

