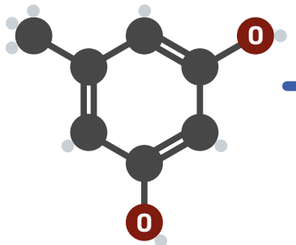
What links litmus paper and lichens?

COMPOUND INTEREST

What is litmus and how is it made?

The litmus dye used in litmus paper is extracted from lichens. The compound orcinol, obtained from some lichens, can be converted into dyes known as orcein by reaction with ammonia and oxygen. The same conversion, with the addition of calcium hydroxide, potassium carbonate and calcium sulfate produces litmus dye.

KEY: Carbon Oxygen Nitrogen Hydrogen



Orcinol

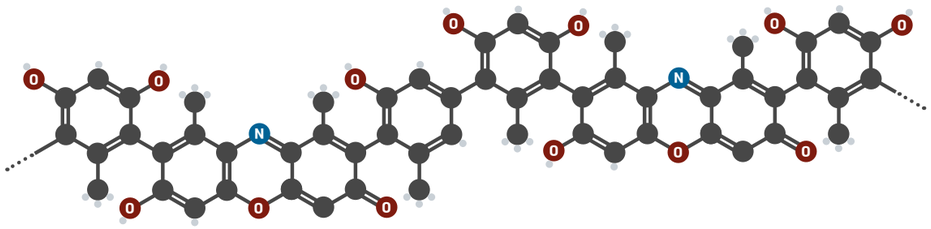
NH_3, O_2

Orcein dyes

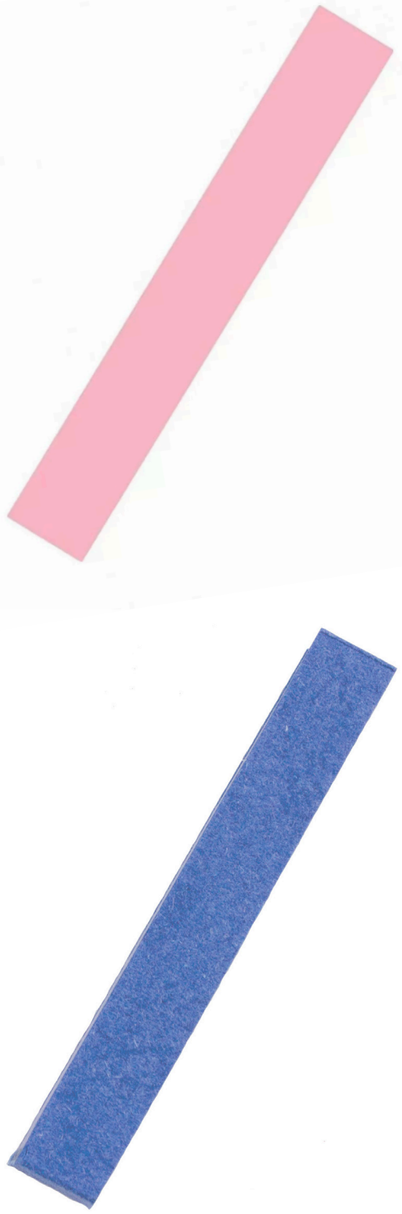
$Ca(OH)_2$
K_2CO_3
$CaSO_4$

Litmus dye

Litmus dye is a complex mixture of polymeric compounds. The main constituent consists of several hydroxyorcein units linked together.



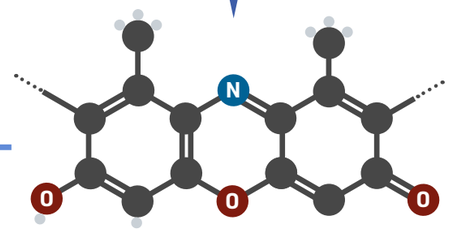
Main polymeric component of litmus dye



How does litmus work as an indicator?

The chromophore (colour-changing part of a molecule) of the litmus dye is 7-hydroxyphenoxazone. In acidic solutions, this structure gains a proton (hydrogen ion) and turns red. In alkaline solutions, the structure loses a proton and turns blue.

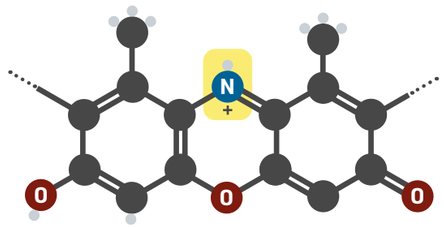
7-hydroxyphenoxazone chromophore



Purple

pH 7

+ Acid

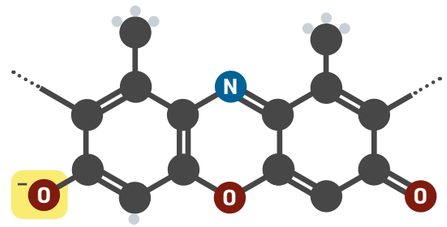


Gains proton (highlighted)

Red litmus

pH < 5

+ Alkali



Loses proton (highlighted)

Blue litmus

pH > 8