

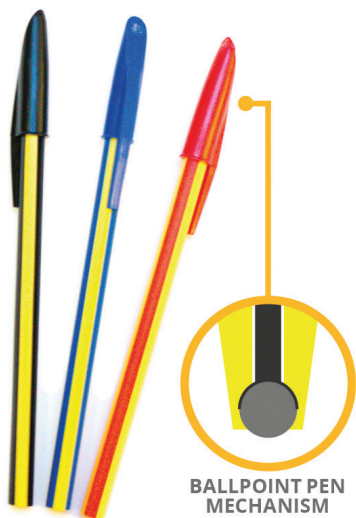
PeriodicGraphics

With Compound Interest

A collaboration between C&EN and Andy Brunning, chemistry educator and author of the popular graphics blog Compound Interest. To see more of Brunning's work, go to compoundchem.com.

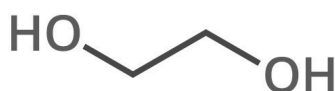
THE CHEMISTRY OF WRITING INKS

It's back-to-school season, which means stocking up on office supplies. Billions of pens are manufactured every year, and a blend of chemicals dictates the color and flow of their ink.



BALLPOINT PEN MECHANISM

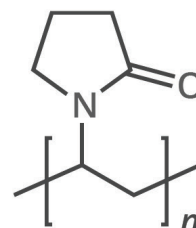
SOLVENTS



ETHYLENE GLYCOL

Solvents suspend or dissolve dyes and pigments in ink, allowing them to flow onto paper. In ballpoint pens, solvents are often glycols, such as ethylene glycol. Manufacturers also add lubricants to ensure that the metal ball doesn't stick.

BINDERS



POLYVINYLPIRROLIDONE
An example binder compound

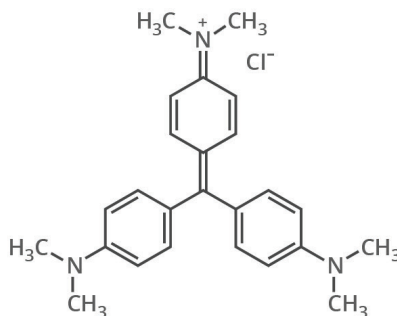
A variety of different binder compounds help carry an ink's dye or pigment and also help stick it to the surface of the paper.

INK COLORANTS

Inks get their colors from pigments, which are insoluble compounds suspended in a solvent, or from dyes, which are soluble. Writing inks tend to use dyes because pigments can clog the pen tip.

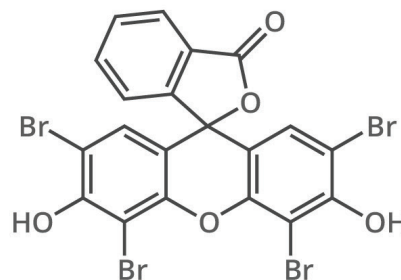
Black inks use carbon black or a mixture of colored compounds. Blue ink usually gets its hue from triphenylmethane dyes, and red ink is often based on eosin dye.

BLUE INKS



CRYSTAL VIOLET
Substituted triphenylmethane dye

RED INKS



EOSIN Y
Used in dilute solution for red ink



© C&EN 2015 Created by Andy Brunning for *Chemical & Engineering News*