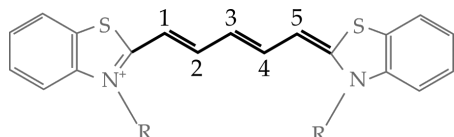


## How Long (Has This Been Going On)

Cyanines are a family of molecules with a central chain of carbon atoms (see fig. below). Electrons are completely delocalized along this chain, where they are confined by end of the molecules. Cyanines are widely used as organic dyes, because they can absorb and emit light at precise wavelengths, which depend on the length of this central chain.



Name	Emission wavelength	C in the chain
Kuhn V	425	3
Kuhn VI	555	5
Kuhn VII	650	7
Kuhn VIII	760	9
Kuhn IX	870	11
Kuhn X	995	13

**Question** Estimate the distance between two carbon atoms in the chain.