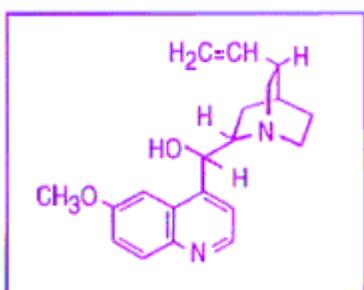


## Fluorescence Emission from Tonic Water

### Objective:

To observe the fluorescence of quinine in tonic water. This experiment demonstrates the important and fascinating phenomenon of fluorescence, the prompt emission of longer wavelength light when a molecule absorbs a shorter wavelength of light. The difference in energy is dissipated as thermal energy. The active ingredient in tonic water is quinine, a natural product extracted from the bark of the cinchona tree which is native to the Andean highlands in South America. This organic compound has a complex structure (see below) and is classified as an alkaloid by organic chemists. Quinine is responsible for the bitter taste of tonic water. The addition of large amounts of sugar and carbonation makes tonic water a valued drink mix.



Quinine is a very fluorescent molecule and in fact is used as an important fluorescence standard in chemistry. Black light is ultraviolet light in the 360 nm range. When some NaCl is added to the solution, the fluorescence emission is reduced. This phenomenon is called fluorescence quenching and involves a chemical interaction of the chloride ion with the electronically excited quinine molecule, reducing the efficiency of emission.

As an extension of this experiment, check the fluorescence from various grades of "white" paper and white clothing. You will find that many of these materials will give off a blue fluorescence. The "whiter" the paper or clothing, the more intense is the blue fluorescence? Why? What material is causing the fluorescence? To help answer this question place some detergent crystals under the black light and observe if there is any fluorescence.

Products and materials that "glow in the dark" often rely on fluorescence to make them work. For examples, fireflies glow because they produce a chemical reaction that gives off fluorescence. Road signs glow when you shine light on it because the paint used is fluorescent.

### Materials:

- tonic water
- jar
- NaCl
- black light lamp and power supply (can be bought at local lighting shop)

### Procedure:

With the room darkened and the black light source on, pour tonic water into a jar. Note a strong blue/violet fluorescence coming from the liquid. The emission lasts as long as the black light is on. This can be repeated indefinitely since quinine is not destroyed by this process. Add some NaCl to the solution and note the decrease in the fluorescence.