



## Detecting UV Light Using Tonic Water

### Estimated Time

40 – 50 minutes

### Supplies

Two beakers, labeled “tap water” and “tonic water”

Tonic water

Tap water

Black paper or cloth

Sunlight

### Learning Objective

This activity will demonstrate the presence of UV light in sunlight. When a photon of UV energy is absorbed, it is re-emitted by the quinine in tonic water as a photon of visible light. This process is called fluorescence. The amount of fluorescence that occurs is influenced by the amount of UV. This will reinforce the concept that UV light is always present in sunlight, although invisible to the naked eye. Have students write a paragraph explaining what has happened in this experiment, using the following words: fluorescence, wavelengths, photon. The students should demonstrate the ability to research scientific background for a certain phenomenon. Students should show comprehension of the idea that it is the size of the UV wavelengths that cause them to appear invisible, but that when a photon of UV energy is absorbed in the tonic water, the quinine re-emits the energy as a photon of visible light.

### Directions

Fill the beaker labeled “tonic” almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water. Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Ask the students to predict what they might observe. Hold a black piece of paper or cloth behind the beakers. Have the class look across the surfaces of the two beakers.

### Questions and Answers

1. What differences do you see? *The top ¼ inch of the tonic water should glow blue.*
2. What time of day is it? Where is the sun in the sky?  
*Answers will vary.*
3. How might the position of the sun affect your results? *Best results occur around noon when the sun is directly overhead. The higher the sun is in the sky, the shorter the distance the UV light must travel through the ozone layer, allowing more UV radiation to reach the Earth’s surface.*
4. What is contained in the sunlight that causes these results?  
*UV radiation. Students should grasp the concept that UV light is always present in sunlight.*



## Detecting UV Light Using Tonic Water

### Directions

In this activity, you will use tonic water to do an experiment with *ultraviolet light*. Fill the beaker labeled “tonic” almost to the brim with tonic water. Fill the other beaker almost to the brim with tap water.

Place the beakers outside, so that direct sunlight strikes the surface of the liquid in both beakers. Hold a black piece of paper or cloth behind the beakers.

Observe the surfaces of the tonic and tap waters in the two beakers. Answer the questions.

### Vocabulary Words

*Fluoresce* – To exhibit fluorescence (luminescence) caused by the absorption of radiation at one wavelength followed by nearly immediate reradiation usually at a different wavelength, and that ceases almost at once when the incident radiation stops.

*Ultraviolet light* – Of or pertaining to the ultraviolet spectrum of invisible light/radiation.

*Wavelength* – In a periodic wave, the distance between two points of corresponding phase in consecutive cycles; a measurement of light/radiation.

### Questions

1. What differences do you see between the two beakers?
2. What time of day is it? Where is the sun in the sky?
3. What is contained in the sunlight that causes these results?

\* This activity is adapted from the Project LEARN module *Ozone in Our Atmosphere*.