**A Problem-Solving Experiment: Using Beer’s Law to Find the Concentration of Tartrazine**

A 140-pound athlete drinks two 28-ounce bottles of a yellow sports drink every day, one before practice and one after practice. When she starts to notice a rash on her skin, she reads the label of the sports drink and notices that it contains a yellow dye known as tartrazine. While tartrazine is safe to drink, it may produce some potential side effects in large amounts, including rashes, hives, or swelling. She wonders if two bottles of the yellow sports drink per day is too high of a dose of tartrazine.

To determine if tartrazine poisoning is causing her illness, you must determine the concentration of tartrazine in the yellow sports drink and how many milligrams of tartrazine are contained in two 28-ounce bottles. To determine the amount of tartrazine, you will be given a 0.01 M stock solution with the yellow dye tartrazine and a sample of the yellow sports drink. You will also have access to a spectrophotometer and cuvettes. You will need to design your own experiment to determine the concentration of tartrazine in the yellow sports drink.

After you have determined the concentration of tartrazine in the yellow sports drink, you will need to calculate the number of milligrams of tartrazine in two 28-ounce bottles of the sports drink. The maximum recommended daily allowance of tartrazine is 7.5 milligrams per kilogram of body mass. The athlete weighs 140 pounds. Has this athlete exceeded the maximum daily recommended amount of tartrazine? Is tartrazine poisoning the cause of her illness?

Figure 4. Problem-solving experiment problem statement.