

Identification of Food Dyes

Many foods, drugs and cosmetics are artificially colored with federally approved food dyes (FD & C dyes). These dyes include Red 40, Red 3, Yellow 5, Yellow 6, Blue 1, and Blue 2. Since each dye has an identifiable absorption spectrum and peak, a spectrophotometer may be used to identify the types of FD & C dye used in a product. The following table gives the wavelength of peak absorbance for each of these dyes.

Wavelength of Maximum Absorbance of Commonly used FD & C Dyes

FD & C Dye	Wavelength (nm) of Maximum Absorbance
Blue #1	630
Blue #2	610
Red #3	527
Red #40	502
Yellow #5	428
Yellow#6	484

Pigments may be extracted from foods and drinks that contain one or more of these dyes. An absorption spectrum of that extract can then determine what dyes are in that food or drink by comparing the peaks of maximum absorbance with information in the table above. If the absorption spectrum of a food extract has a peak at 630 nm and one at 428 nm you can assume the food contains both Blue #1 and Yellow #5.

FD&C dyes contained in foods and drinks must be listed on the ingredients label of the package. The Kool-Aid® package shown below lists Red 40 and Blue 1 on the ingredients label. If you did an absorption spectrum on this Kool-Aid® where would you expect the peaks? What color would you expect this Kool-Aid® to be?



A. Preparation of Solutions - Choose one of the following.

1. Extract the dye from a piece of candy, such as an M&M or skittle, by placing the candy in a test tube with water and gently shaking. Quickly pour off the liquid into a cuvette. If you leave the candy in too long other components of the candy start to dissolve and your solution will become too cloudy to read in the spectrophotometer. You may need to filter the solution if this happens.
2. Make a solution of Kool-aid® by dissolving 0.3 g of unsweetened powder in 100 ml of water.
3. Gatorade, vitamin waters, mouthwashes, and other colored liquids may be used straight.



B. Procedure

1. Set the spectrophotometer to read absorbance
2. Set the wavelength to 400 nm
3. Fill a cuvette with water. This is your blank.
4. Fill a cuvette with the solution to be tested.
5. Place the cuvette containing the water blank into the sample compartment of the spectrophotometer and set the absorbance to zero. Remove the blank.
6. Place into the solution to be tested into the sample compartment
7. Record absorbance reading
8. Remove cuvette
9. Set the wavelength to 425 nm, repeat steps 5-8
10. Repeat above at 25 nm increments until 700 nm
11. Graph your absorbance spectrum. Where were the peaks of maximum absorbance?
12. What dye(s) were present in your food or drink?

Wavelength (λ) nm	Absorbance of unknown
400	
425	
450	
475	
500	
525	
550	
575	
600	
625	
650	
675	
700	