

## Examining the Relationship between Absorbance and Transmittance and Determining the Wavelength of Maximum Absorbance for Different Colored Solutions



### A. Preparation of Solutions

1. Prepare color solutions by adding one drop of food coloring to 100 ml of water. Mix well.
2. Make combinations of colors by adding one drop of one or more food colors to 100 ml of water.

### B. Examining the Relationship between Absorbance and Transmittance

#### Procedure

1. Fill a cuvette with one of the single-color solutions
3. Fill a second cuvette with water. This is your blank.
4. Set the %T/A switch of the spectrophotometer to absorbance
5. Set the spectrophotometer to 400 nm
6. Place the cuvette with the water blank into the sample compartment and set to zero absorbance using the transmittance/absorbance control knob
7. Remove the blank and place the cuvette with the colored solution into the sample compartment
8. Record the absorbance
9. Reset the wavelength to 425 nm and repeat steps 6-7. You must ALWAYS re-blank the spectrophotometer when changing the wavelength.
10. Repeat steps 6-7 recording the absorbance readings at 25 nm increments until you reach 700 nm.
11. Graph your data and locate the region(s) of peak absorbance. If you want to narrow down the wavelength of peak absorbance, take the absorbance at 10 nm increments in the area where you see your peak.
12. Repeat steps 4-10 above, except set the spectrophotometer switch to %T. Record the %T from 400-700 nm at 25 nm increments of your food coloring.
13. Graph the %T data. Note areas of peak transmittance.

14. Compare your absorbance and %T graphs. What is the relationship between the peaks of each? Explain.

Wavelength ( $\lambda$ ) nm	Absorbance of food coloring	%T of food coloring
400		
425		
450		
475		
500		
525		
550		
575		
600		
625		
650		
675		
700		

### C. Determining the Wavelength of Maximum Absorbance for Different Colored Solutions

#### Procedure

1. Fill each of four cuvettes with one of the single-color food dye solutions (red, blue, yellow, and green)
2. Fill a fifth cuvette with one of the food color mixtures.
3. Fill a sixth cuvette with water. This is your blank.
4. Set the %T/A switch of the spectrophotometer to absorbance
5. Set the spectrophotometer to 400 nm

6. Place the cuvette with the water blank into the sample compartment and set to zero absorbance using the transmittance/absorbance control knob
7. Remove the blank and sequentially read the absorbance for each of the cuvettes with the colored solutions.
8. Reset the wavelength to 425 nm and repeat steps 6-7. You must ALWAYS re-blank the spectrophotometer when changing the wavelength.
9. Repeat steps 6-7 recording the absorbance readings at 25 nm increments until you reach 700 nm.
10. Graph your data and locate the region(s) of peak absorbance for each color. What colors do the peaks correspond to? What colors do you think the unknown was made with? Why?

Wavelength ( $\lambda$ ) nm	Absorbance Red food coloring	Absorbance Blue food coloring	Absorbance Yellow food coloring	Absorbance Green food coloring	Absorbance unknown mixture
400					
425					
450					
475					
500					
525					
550					
575					
600					
625					
650					
675					
700					