EXPERIMENT 2

COLORFUL CHEMISTRY WITH FOOD DYES

PURPOSE:

1. To separate the components of commercial food dyes by paper chromatography.

2. To identify different brands of food dyes by paper chromatography.

PRINCIPLES:

Chromatography is a method of separating the components of a mixture by distributing them between two phases, one of which is moving past the other one, which is stationary. Since the extent to which the components of the mixture are attracted to the moving phase and respectively to the stationary phase differs, the components of the mixture will be selectively picked up by the moving phase.

The height to which the components of the mixture rise depends upon the relative strength of the:

- mixture and moving phase attract ions, and

- mixture and stationary phase attractions.

Thus, the components can be separated in this experiment:

(A) The **stationary phase** is a good quality **filter paper**.

(B) The **moving phase** (referred to as the **solvent**) is a 0.1% solution of sodium chloride in water.

The moving phase (solvent) moves along the stationary phase (filter paper) by capillary action due to the attraction between the solvent and the cellulose of which the paper is made.

The mixture (food dye) to be separated is placed on the paper as a small spot, and is carried along with the solvent. Since the different components of the mixture are not attracted to the paper and to the solvent to the same degree, they win move with different speeds along the paper and thus can be separated.

You will analyze three different colors (red, blue and green) of two different brands of commercial food dyes using a 0.1 % solution of sodium chloride as the

solvent.

An analysis of the two chromatograms will enable you:

(1) To deduce the extent of relative attractions of the components of the food dyes to the paper and to the solvent, respectively.

(2.) To identify the brand of two unknown food dyes.

PROCEDURE:

1. Preparation of the filter paper

- The filter paper should be cut into a rectangle about 11 cm x 20 cm.

- Draw a pencil line 1.5 cm from one edge (use a long edge) and another line exactly 8.0 cm above the first. The lower line is your origin or baseline, and the upper line is the desired level for your solvent to reach.

- Place five evenly spaced pencil “X” marks along the lower line, 3 cm from each side and 3.5 cm away from each other.

- Using a pencil, label your chromatogram in the upper right hand side corner with your name and the brand of food dye you are analyzing.

- Using a pencil, label the "X" marks on the baseline with R for Red, B for Blue, G for Green and Numbers for the two unknowns. See figure 1 below:

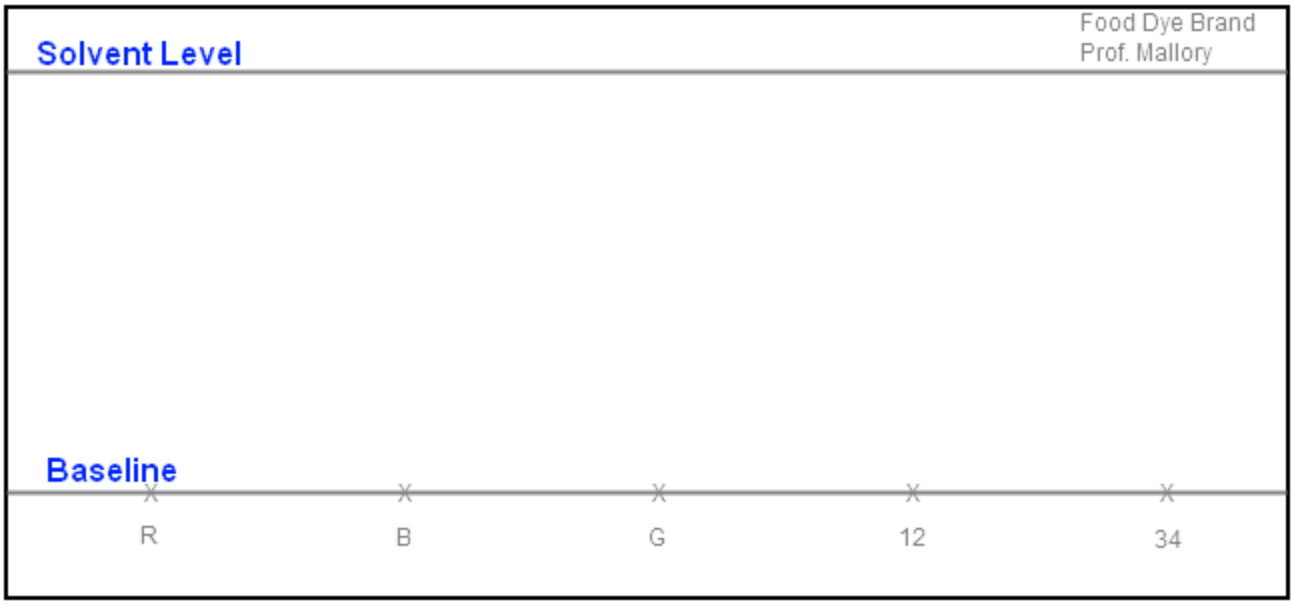

Figure 1

2. Preparation of the chromatographic developing chamber.
   - Measure out 30 ml of solvent (0.1% solution of sodium chloride in water) into a 600 ml beaker.
   - Cover the beaker with a watch glass to slow down the evaporation of the solvent.
3. Spotting the filter paper.
   - Use the 3 colors (Red, Blue, and Green) of the same brand of food dye and the two unknowns assigned to you for analysis. This will give you a total of five spots.
   - Place 1 drop of each of the followings in three different depressions of your spot plate: Red Food dye, Blue Food dye and Green Food dye.
   - Use an open ended capillary tube to practice applying small spots on a piece of paper towel.

     NOTE: Place all used capillary tubes in the common container filled with water provided by your instructor. Try not to break them as they can be used again after proper washing.
   - When you are confident that you master the technique of spotting, place a small spot of each of the three dyes on the X marks.

     From your unknown container, place a small spot of each of your two unknowns on the respective “X” marks.

     Make sure that the spots are applied exactly over the “X” marks, as to avoid having them below the solvent level when placing the paper in the developing chamber.

Use a different capillary tube for each dye and try to keep the spots small (they should be no more than 3 to 5 mm in diameter). If capillary tubing of about 1 mm ID (inside diameter) is used, one application is sufficient. If narrower capillary tubing is used, about 0.4 mm ID, three applications are needed.

Let the spots dry between applications to keep the spot size down. Let the paper dry for 5 minutes.

4. Roll the paper into a cylinder and staple the sides without overlap.

   Place the lower staple above the baseline. See Figure 2.

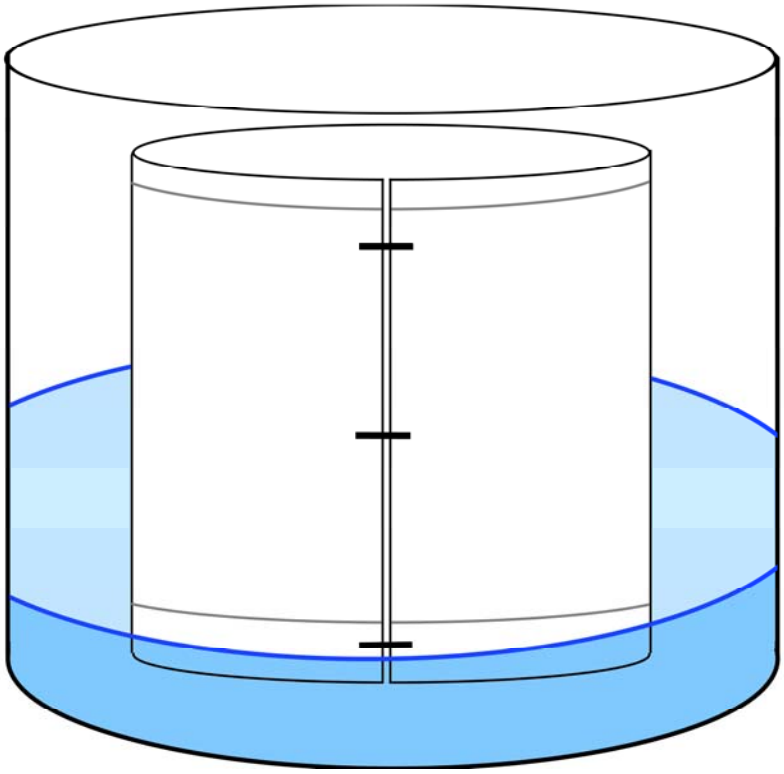

Figure 2

5. Place the cylinder in the beaker with the solvent and cover it with a watch glass to slow down the evaporation of the solvent. Leave the beaker undisturbed and allow the solvent to flow up the paper until it reaches the 8.0 cm level.
6. While your first chromatogram is running (it takes about 20 to 25 minutes), spot a second piece of filter paper with the three colors (Red, Blue. and Green) of the other brand of food dye and the same two unknowns assigned to you.

   Do not forget to label in pencil this second chromatogram with the same pertinent information that was required for the first chromatogram. Let the paper dry for 5 minutes.

7. When the solvent in the beaker reaches the 8.0 cm level, remove the first chromatogram and let it dry on a piece of paper towel without removing the staples or handling it too much with your hands.
8. Place the second chromatogram into the beaker containing the solvent and let this second chromatogram run in the same manner as the first one. When the solvent reaches the 8.0 cm level, remove the second chromatogram. When the paper is completely dry, remove the staples and outline the different colored spots lightly with pencil (some of the colored spots will tend to fade in sunlight).

   In case one or both of your chromatogram are still wet at the end of the laboratory session, place the chromatogram (s) carefully into your locker (best, in an upright position on a dry watch glass) and let it (them) dry till the next laboratory session.

   The removal of the staples and the outlining of the colored spots should only be only when the chromatogram are completely dry.
9. Attach both chromatograms to your report form (Use staples or tape and do not place them on the top of each other).

EXPERIMENT #2

NAME: _____

DATE: _____

PARTNER: _____

COLORFUL CHEMISTRY WITH FOOD DYES

REPORT FORM

1. Analysis of the food dyes.

First Chromatogram

	Food Dye Brand:		
	Number of Components	Component most attracted to the stationary phase (color)	Component most attracted to the moving phase (color)
Red Dye			
Blue Dye			
Green Dye			

Attach your chromatogram below:

Second Chromatogram

	Food Dye Brand:		
	Number of Components	Component most attracted to the stationary phase (color)	Component most attracted to the moving phase (color)
Red Dye			
Blue Dye			
Green Dye			

Attach your chromatogram below:

2. Identification of different brands of food dyes.

	Number of Components	Component most attracted to the paper (color)	Component most attracted to the solvent (color)
Unknown#_____			
Unknown#_____			

3. Conclusion

Unknown #_____ is _____ _____
(brand) (color)

Unknown #_____ is _____ _____
(brand) (color)

4. Questions

a. Based on the results of your chromatographic analysis, how could you distinguish between Dye-A Red food dye and Dye-B Red food dye?

b. If a Blue Food Dye unknown were assigned to you for chromatographic analysis, could you distinguish between a Dye-A Blue food dye and a Dye-B Blue food dye? Explain your answer.