CLASS COPY

PAPER CHROMATOGRAPHY LAB
Tualatin High Science 3.9
Chemistry (G)
~~Duggan~~
BAKER

Name_____
Per. ____ Date_____

Objectives: At the end of this lab, you should:

- know how we write up lab reports according to the scientific method
- know what chromatography is and its purpose in the laboratory
- be able to define "retention factor" (R_f) and utilize a formula to calculate this value
- have familiarity with paper chromatography technique

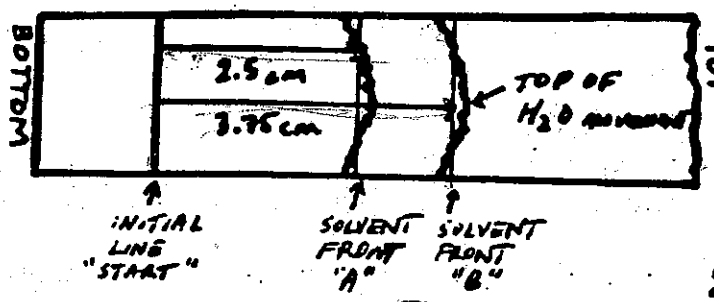
Discussion:

Chromatography is a laboratory method of *separation*. Early chromatography was used to separate colored substances into their individual components (in Greek, "chroma" means color). The colors of each component in a mixture can be observed as they separate.

Paper chromatography is a *partition* technique that uses the *capillary action* properties of water to separate colors of a mixture. As a compound is carried along the paper, the rate at which it moves indicates how *soluble* it is in the *solvent* (or how strongly it is *adsorbed* on the paper). For example, little or no movement on the paper is characteristic of a compound that is strongly adsorbed on the paper, insoluble in the solvent, or both. A large degree of movement is indicative of a compound that is weakly adsorbed on the paper, highly soluble in the solvent, or both. The compound is "partitioned" into separate entities as it moves along the paper in accordance with these edicts.

A quantitative measure of the degree of separation of compounds in chromatography is given by comparing their retention factors (R_f values).

$$R_f = \frac{\text{distance compound travels (cm)}}{\text{distance solvent travels (cm)}}$$



"A" $R_f = \frac{d \text{ compound}}{d \text{ solvent}} = \frac{2.5 \text{ cm}}{3.75 \text{ cm}} = 0.6$

"B" $R_f = \frac{d \text{ compound}}{d \text{ solvent}} = \frac{3.75 \text{ cm}}{3.75 \text{ cm}} = 1.0$

Fig. 1 Typical paper chromatogram

The retention factor is calculated as follows:

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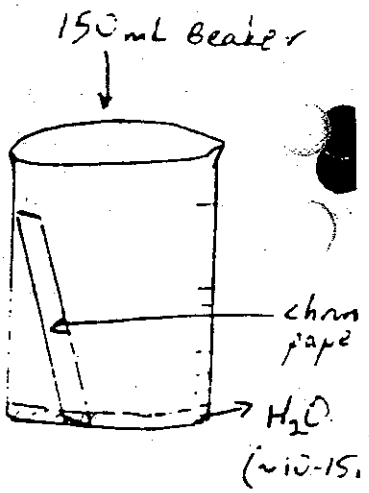

THE EXPERIMENT:
We will follow this format for formal lab writeups:

Purpose/Question
Hypothesis (sometimes)
Materials/Procedure
Data/Observations
Results/Discussion
Conclusions

Please write out the purpose(s) of this lab on your paper, using the overhead model to help you.

Materials: black overhead pen (will be provided), 150ml beaker, strip of Whatman chromatography paper, ruler (metric, of course), water.

Procedure:

1. Obtain a piece of chromatography paper from the instructor.
2. Using the ruler as a straightedge, draw an even, solid line with the overhead pen across the width of the paper approximately 1.5 cm up from one end.
3. Fill the beaker with about 15 ml of water, taking care that excess water does not wet the sides of the beaker (so be careful).
4. Place the paper gently and evenly into the beaker as instructed.
5. Observe the separation of colors.
6. As the solvent front approaches the top of the paper, remove the paper from the beaker. IMPORTANT! Failure to take the paper out before the solvent front reaches the top will result in a repeat of steps 1-5 (due to the fact that R_f can no longer be calculated accurately).
7. IMMEDIATELY mark with pencil the location of the solvent front for calculation purposes.
8. Write down the colors you see, and mark their locations on the paper with a solid pencil line across the paper. Use a ruler. The drying process often fades the colors, making this step a crucial one.
9. Clean your lab area and finish your lab!

Data/Observations: On your paper, write down your observations. What do you SEE? Your chromatography paper is your data. Attach it to your lab after it dries.

Questions (answer in complete sentences):
1. How many colors did you see? Calculate the R_f value for each color, showing the general formula FIRST, then with numbers plugged in. List the colors you saw from lowest R_f to highest R_f value.
2. List the colors in order of adsorptivity/solubility from high/insoluble to low/very soluble.

Conclusions: Write a paragraph conclusion about your findings in this lab. Write complete sentences that ***fully address each objective***. Thank you.