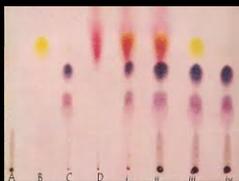


# Chromatography Lab



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## The Lab Today (Work in Pairs)

### Extract Dyes From an M&M

Place an M& M on a watch glass

Use five different colors ... a different watch glass for each color

Add drops RO water to each watch glass (cover the candy)

Let stand several minutes ... water will extract the dye from the shell



### Prepare the Chromatogram

Place a pre-cut piece of filter paper on a paper towel.

Draw a line along one of the shorter sides, 2 cm from the edge of the paper. (USE PENCIL)

Write your initials in pencil at the very top right of the paper.

Apply a sample of dye on the penciled line ~ 1.5 cm from the left side of the paper.

Let dry

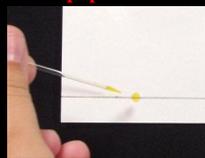
Reapply another drop

Keep drops as small as possible

Let dry

Reapply a third drop

Spot each extracted dye - leave about 1.5 cm between spots



Push a Cu wire through the top end of the filter paper about 1 cm from the top.

Bend the copper wire to suspend the filter paper inside a dry 2-L beaker.

Colored dots from samples → 1 cm above the 200-mL line at the bottom of the beaker

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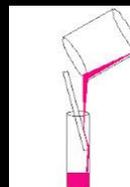
## Develop the Chromatogram

Temporarily remove the filter paper and wire assembly

Add ~200 mL 1.0 % NaCl solution

Do not disturb the beaker

Let it stand until the mobile phase has stopped moving



## Mark Spot Migrations

Remove the chromatogram from the beaker

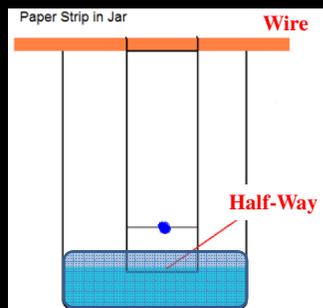
Place on several layers of paper towel

Mark with a pencil:

progress of the mobile phase (solvent front)

outline each colored spot

Dry the paper



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## Data: Measure Spot Migrations

For each spot Measure cm to 2 decimal places:

Distance from origin to solvent front

Distance from origin to spot

Calculations:

Calculate  $R_f$  for each spot

$$R_f = \frac{\text{Distance to spot}}{\text{Distance to solvent}}$$

$R_f$  has 3 sig figs

(0.xxx)

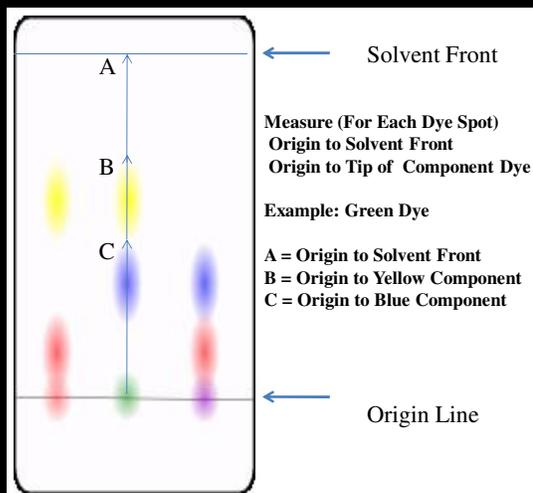
Results:

Table of  $R_f$  values

Conclusion:

Always answers purpose

Questions



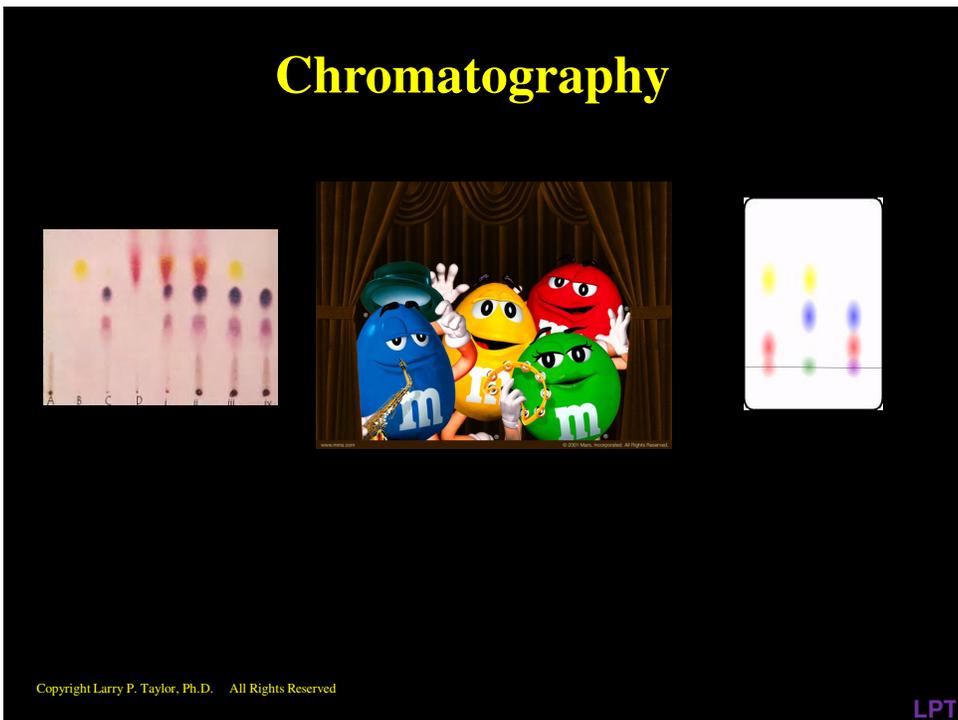
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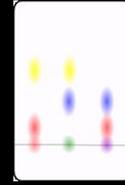
# Let's Boldly Go Explore Today's Lab



# Chromatography



# Chromatography



From “Chromos” (Color)

Powerful technique in analytical chemistry

Separates mixtures into individual components

Improvements continually redefine definition of “chemical purity”

All modes partition between a “moving phase” and a “stationary phase.”

**Paper Chromatography**

Stationary phase → filter paper

Moving phase → solvent.

Also:

TLC (Thin-Layer) – thin layer silica; liquid moving phase

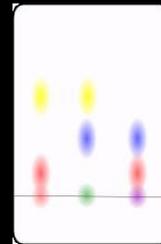
GC (Gas) – gas mobile phase; solid particle non-moving phase

HPLC (High Pressure Liquid) – liquid moving phase; solid non-moving phase

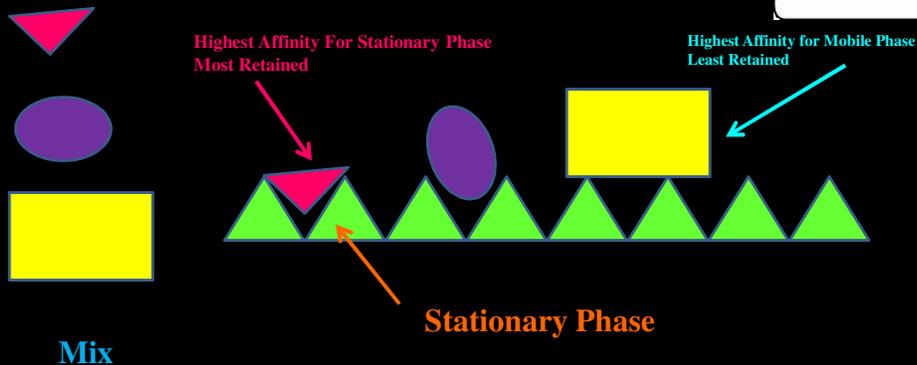
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# Chromatography Experiment



Direction of Moving Phase Flow



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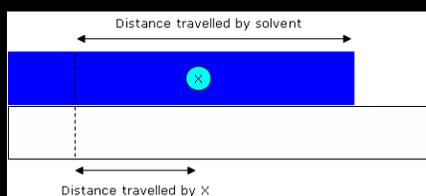
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## Chromatography Experiment



How far a substance “moves” on the chromatogram depends upon:

- Chemical nature of non-moving phase
- Chemical nature of moving phase
- Temperature
- Concentrations of moving phase components
- Affinity of each component for both mobile and stationary phases



$R_f$  Value of component  
Compared to  
 $R_f$  Value of Known standard

$$R_f = \text{Distance Spot moved} / \text{Distance Solvent Moved}$$

$R_f$  = Retention Factor

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## Chromatography Experiment



Chromatography great for “what’s not there”

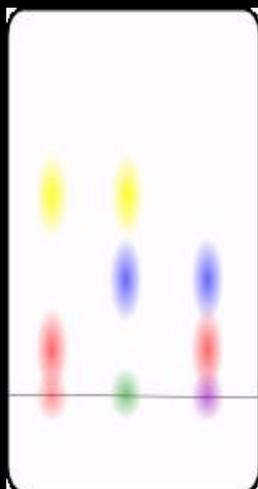
- Sample #1 definitely does not contain purple component
- Sample #2 definitely does not contain red component
- Sample #3 definitely does not contain yellow component

Need something else to determine chemical identify

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## Chromatography Experiment: Sig Figs



**Cm measurement with no decimal points:**

**All  $R_f$ 's either 0 or 1**

**Cm measurement with one decimal point:**

**All  $R_f$ 's have 2 sig figs**

**No discrimination value**

**Experiment of little or no value**

**Cm measurement with two decimal points:**

**All  $R_f$ 's have 3 sig figs**

**Useful  $R_f$ 's**

**Can discriminate spots**

**Useful identity tool**

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## You Can Do Chromatography At Home (Kids Love Colors)

**Try anything that is colored: inks, dyes, flowers, etc**



**Chalk as stationary phase**



**Coffee filter strips as stationary phase**



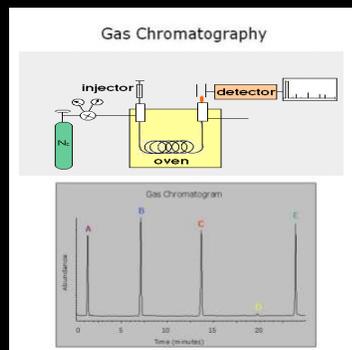
**Coffee Filter  
Spot dye in the center**

**Try different amounts of salt solution as mobile phase**

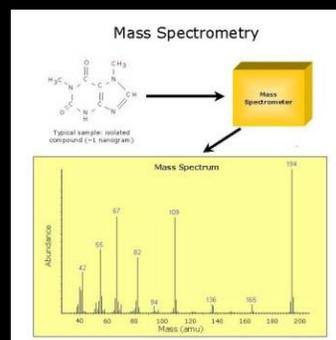
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**C.S.I. Often refers to identifying unknown materials with GC/MS**  
**GC/MS = Gas Chromatography / Mass Spectrometry**



**GC Separates Components**

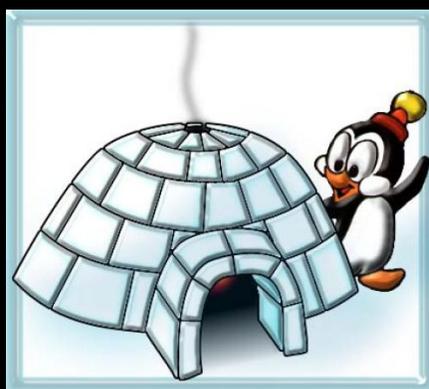


**MS Identifies Components**

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**Thought for today: Chemistry is Cool!**



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