Chemistry of Color:
Laboratory Notebook

University of Oregon

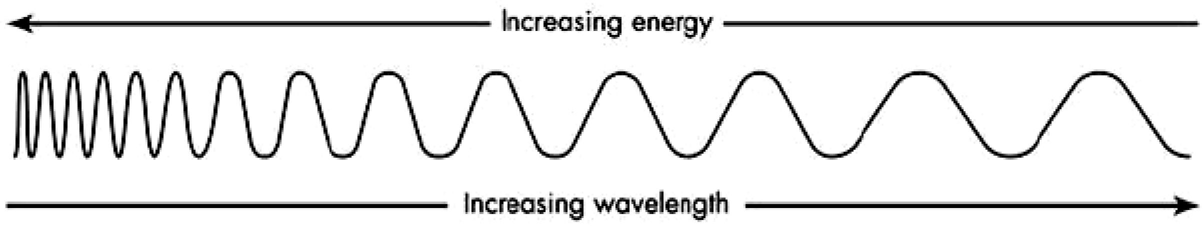
Name:____

Date:____

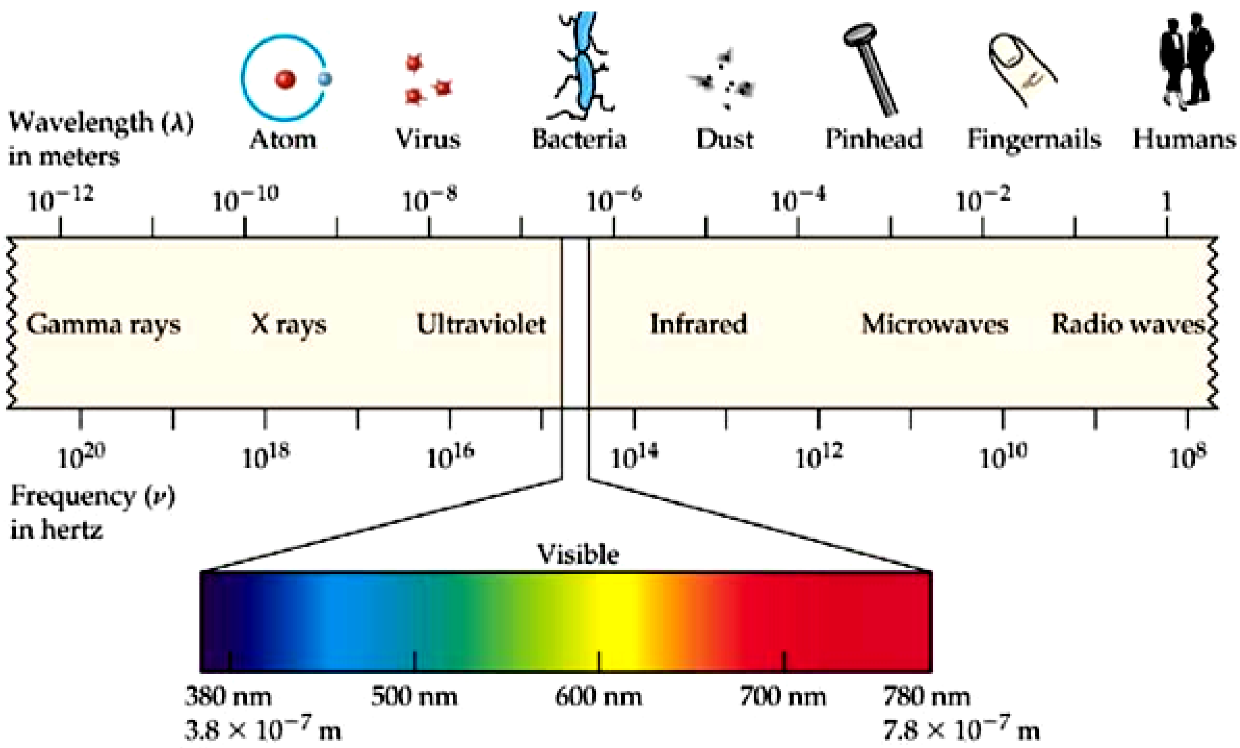
Favorite Color:__________________________________

What is light?

- Light is a form of energy. Different types of light have different wavelengths and frequencies.



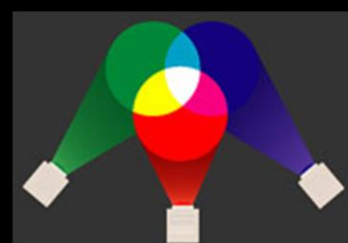
- The only light we can see is the "visible spectrum". There is lots of other electromagnetic radiation, but we can't see it.



Additive color

- *Light **emission***
- *Light source*

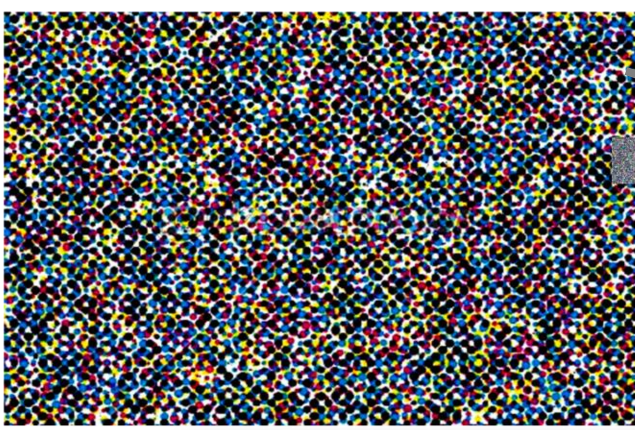
Appears more white as colors merge

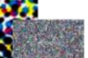


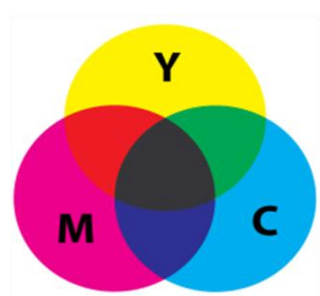
Subtractive color

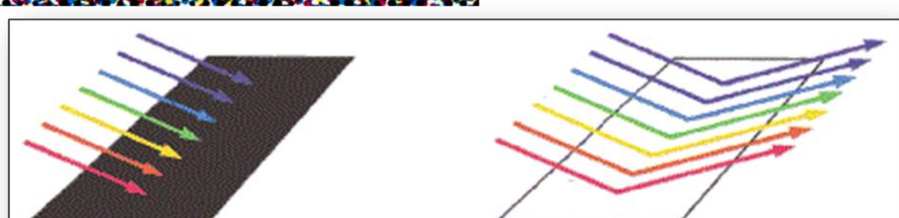
- ***Light absorption***
- ***Reflected light***

Appears more grey as colors merge



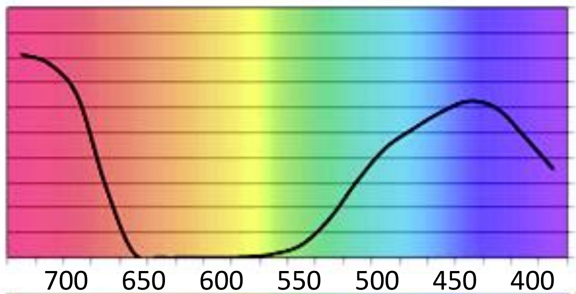


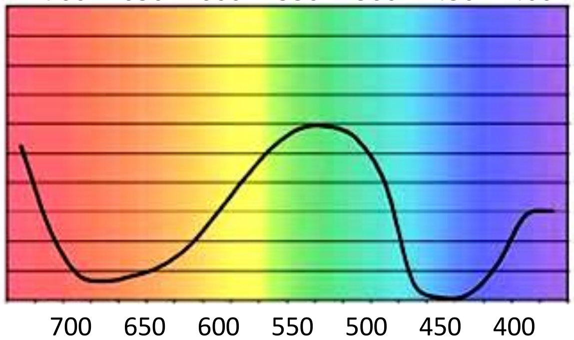


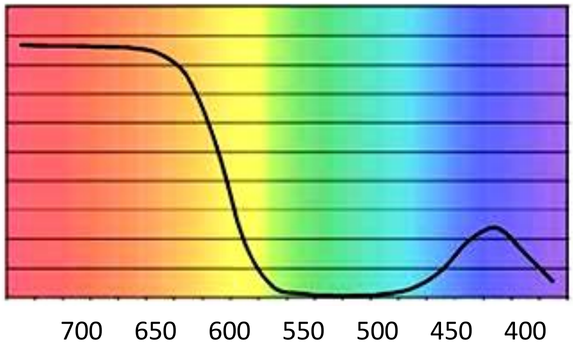


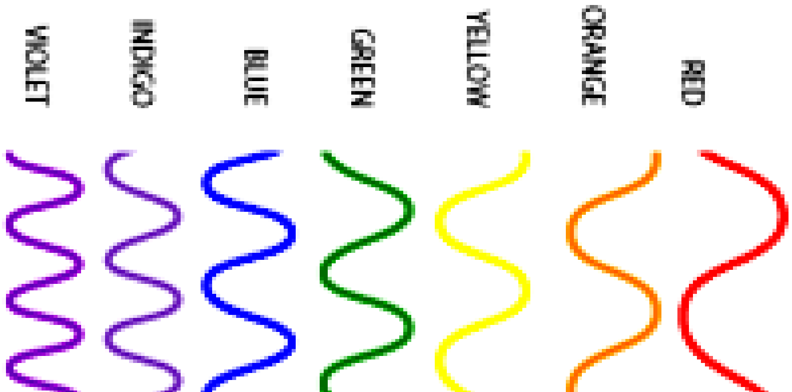
Calibrating your spectroscope

- Look at a light source with your spectroscope.
- Some colors are bright, some are dark, draw the bright colors as peaks, and the dark (or black) colors as valleys
- For example, look at colored lamps with the colors shown below and see how your spectrometer matches up.
- Look at any light source or colored object (these may be harder to see) and see what the color spectrum looks like using the spectroscope!



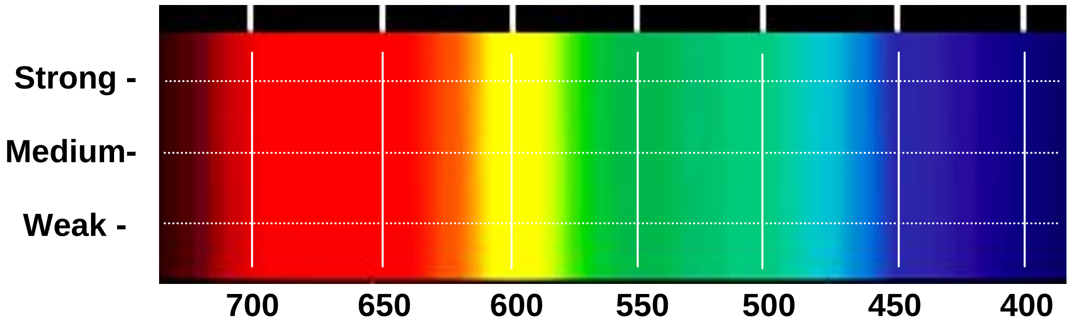






Light Source:

⇒ **Draw bright colors as peaks and dull colors (or black) as valleys**



Notes/observations

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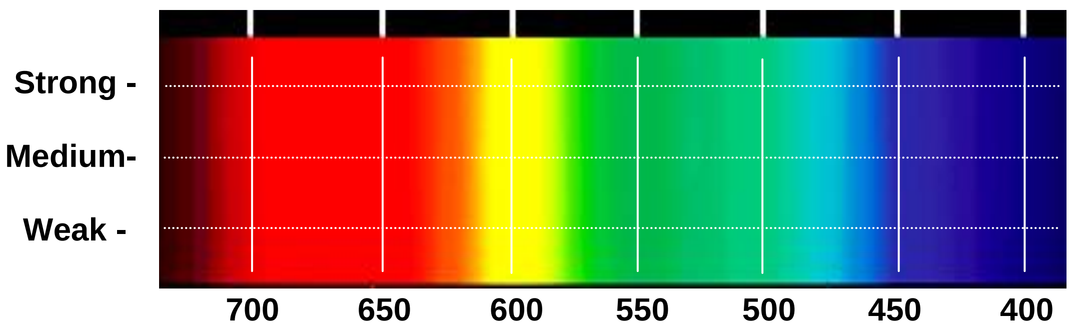

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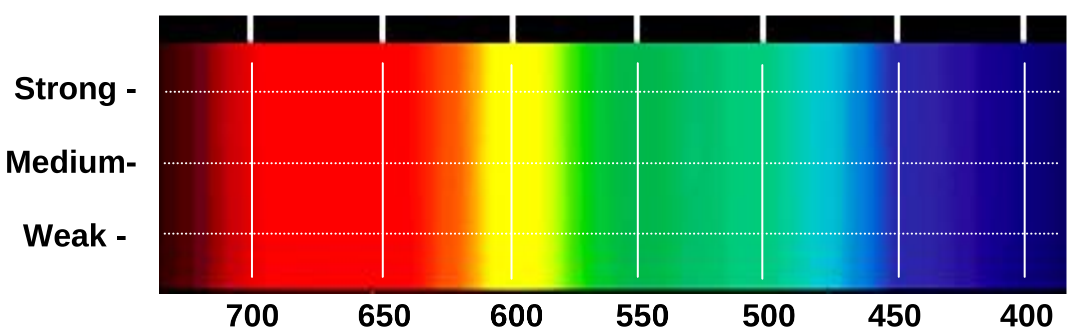

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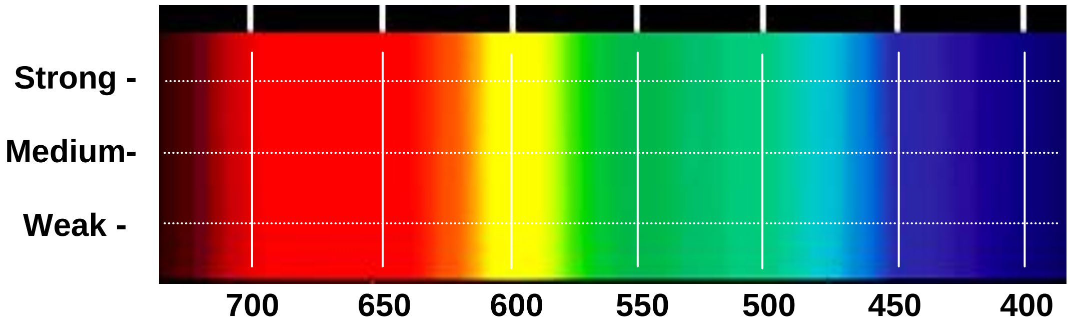

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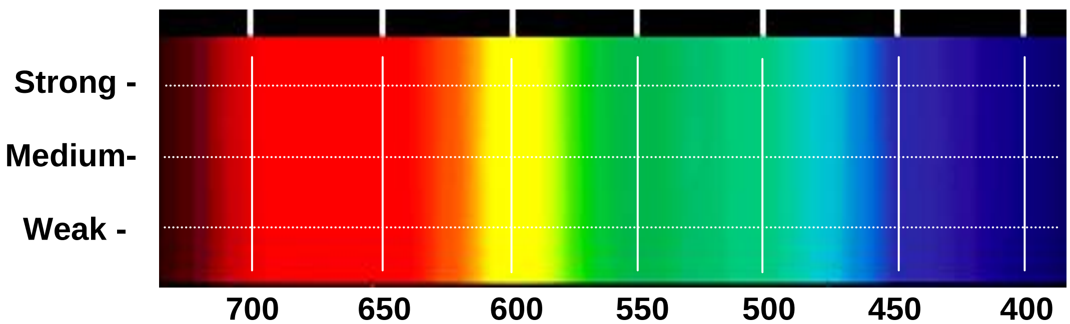

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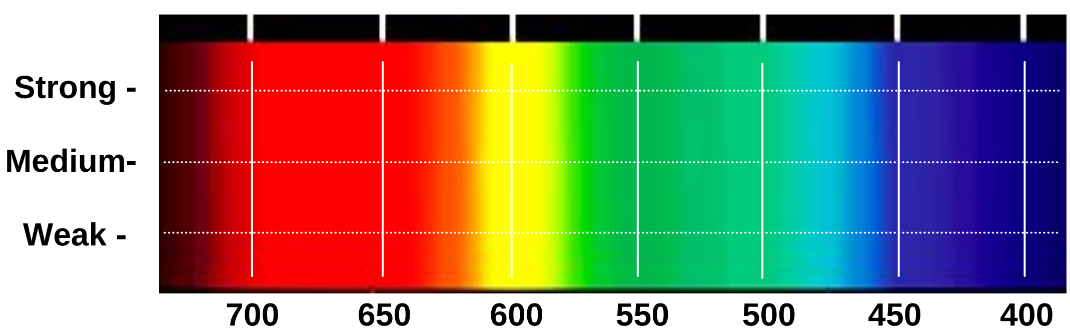


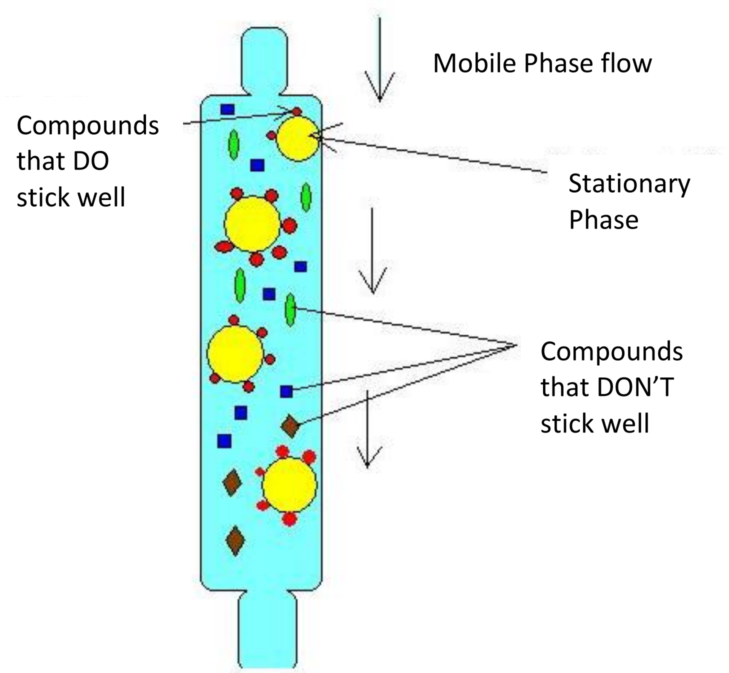
Notes/observations

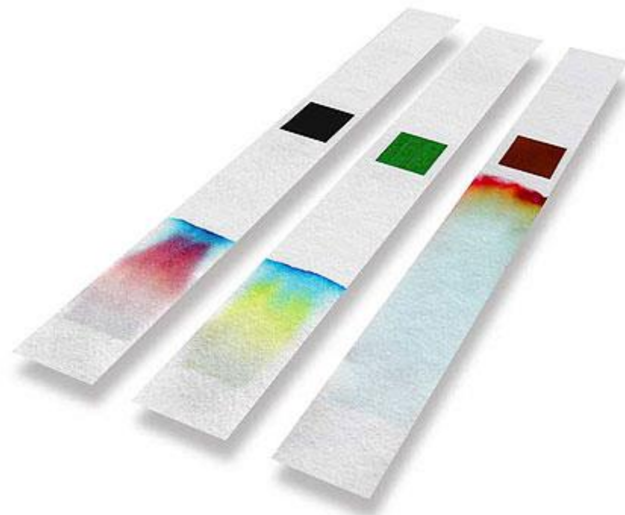
What is Chromatography?

Chromatography is the separation of individual components of a mixture. The word comes from *chroma*, the Latin word for “color.” In these experiments, you’ll see what separate colors of ink make up the color you actually see when you write.

When we chromatograph a mixture, we use a substance’s chemical properties (like polarity) or physical properties (like size), to separate it from the other components. A typical chromatography experiment uses these properties to make some compounds “stick” better to the *stationary phase* while others will like to “flow” in the *mobile phase.*

We can quantify and differentiate compounds by calculating R_f, which is given in the formula below. Different compounds which have different colors in your experiment will have different R_f values.



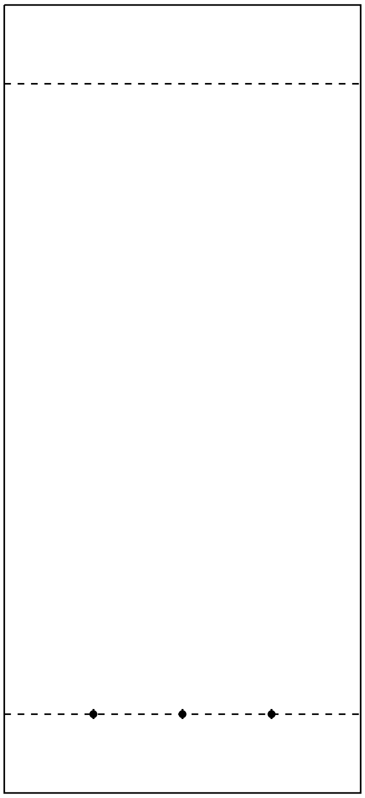


A few definitions:
Mobile phase: A liquid or gas that moves compounds through the *stationary phase*.
Stationary phase: A solid (generally) that attracts compounds flowing in the *mobile phase*.

$$\mathrm{Rf} = \frac{\text{distance from baseline to color}}{\text{distance from baseline to solvent front}}$$

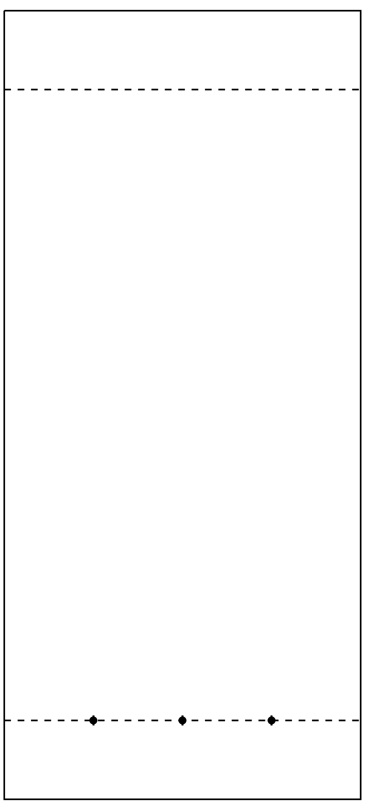
Chromatography

Pen:



R_f	Spot color

Pen:



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Chromatography

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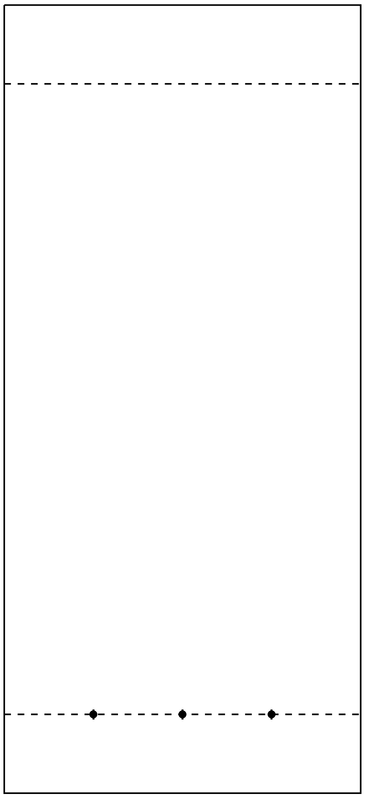
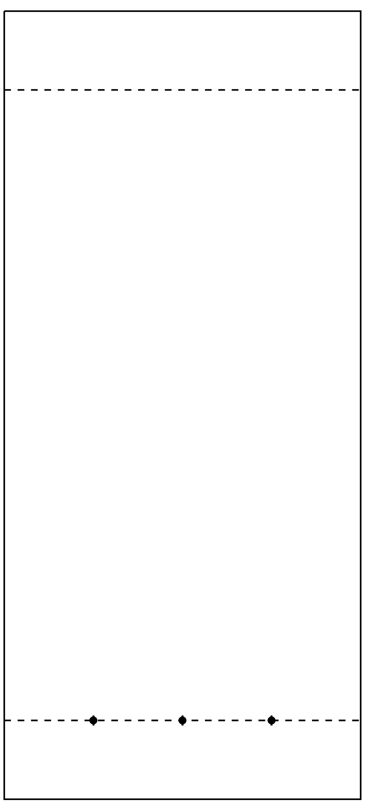


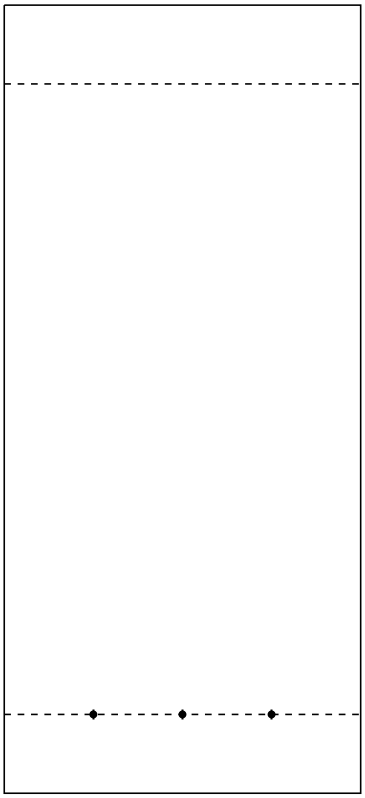
R_f	Ink color

Pen:



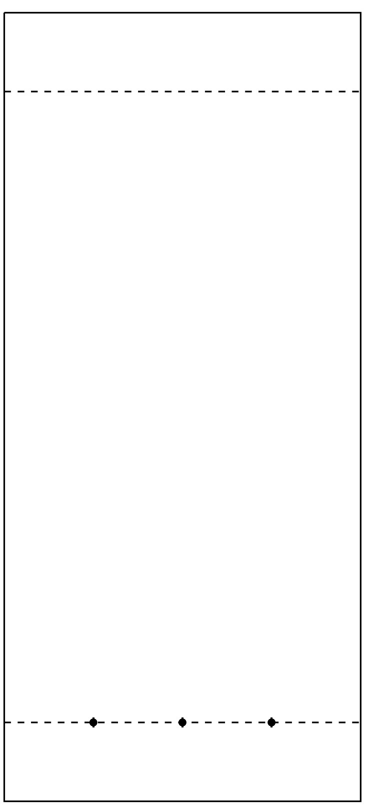
R_f	Ink color

Pen:



R_f	Ink color

Pen:

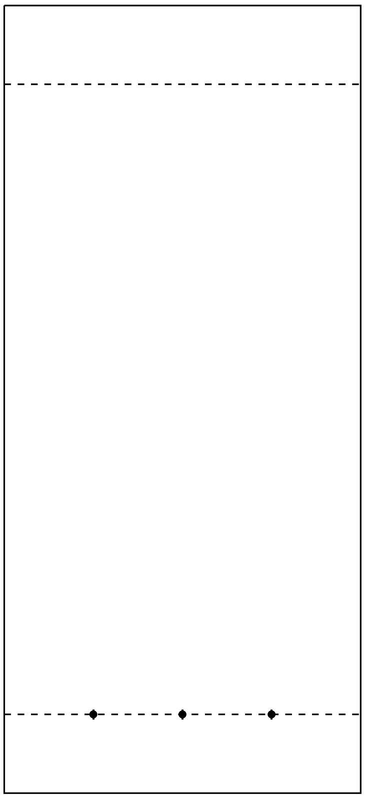


R_f	Ink color

UNKNOWN PEN!

Using the R_f values you got from doing chromatography on many different pens, you can figure out which pen was used to write a secret note. The component colors and R_f values should be the same.

R_f	Ink color



Which pen was used?
Answer:

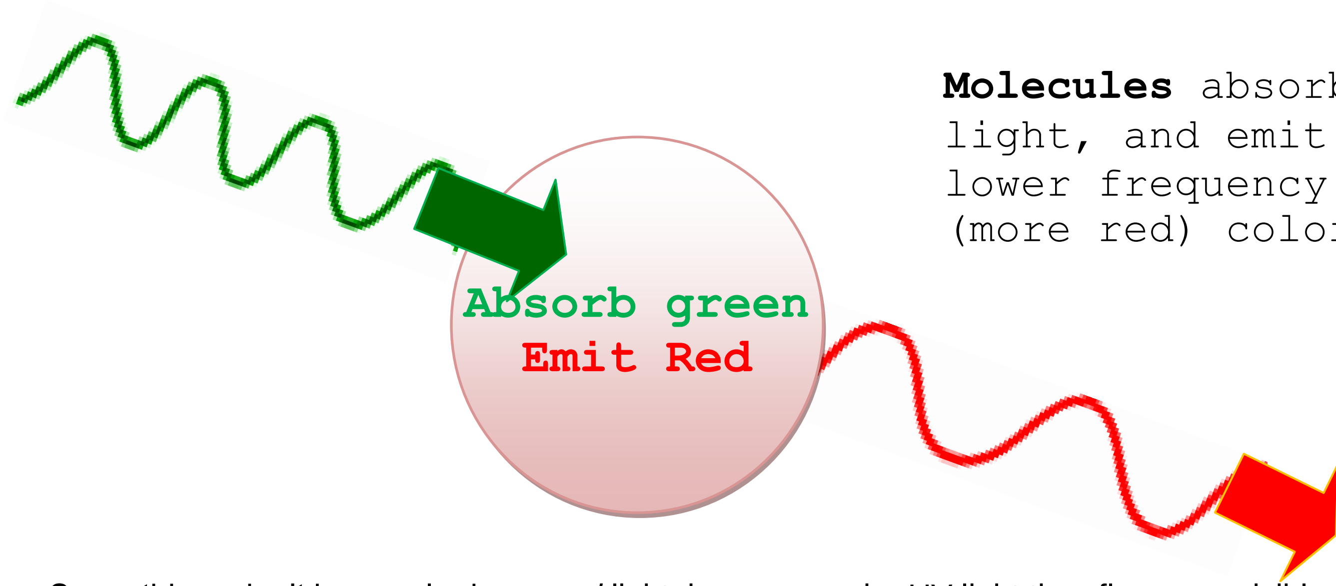
BONUS:
Who is the culprit?

Fluorescence!

What is fluorescence?

Fluorescence is a form of [luminescence](). In most cases, emitted light has a longer wavelength, and therefore frequency and lower energy, than the absorbed radiation.

Molecules absorb light, and emit a lower frequency (more red) color



Some things don't have color in *normal* light, however under UV light they fluoresce visible colors!

- Look at an object under normal light.
    - What colors is it (draw and label)

Object: Colors:

- Look at that same object under Ultra-Violet (UV) light.
    - What colors have changed?

Colors:

- Look at an object under normal light.
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Colors:

- Look at that same object under Ultra-Violet (UV) light.
  - What colors have changed?

Colors: