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

<table>
<thead>
<tr>
<th>Strong</th>
<th>Medium-</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Color Spectrum" /></td>
<td></td>
<td></td>
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Light Source:

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

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<tr>
<th>Strong</th>
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<tbody>
<tr>
<td><img src="image2.png" alt="Color Spectrum" /></td>
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Light Source:

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

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<tr>
<td><img src="image3.png" alt="Color Spectrum" /></td>
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<td></td>
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</table>
Light Source:

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

- Strong -
- Medium -
- Weak -

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*.

$$R_f = \frac{\text{distance from baseline to color}}{\text{distance from baseline to solvent front}}$$
Chromatography

<table>
<thead>
<tr>
<th>Pen:</th>
<th>$R_f$</th>
<th>Ink color</th>
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</thead>
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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.

<table>
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<tr>
<th>$R_f$</th>
<th>Ink color</th>
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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.
  o What colors is it (draw and label)

Object:
Colors:

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

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.
  - What colors is it (draw and label)

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

| Colors: |