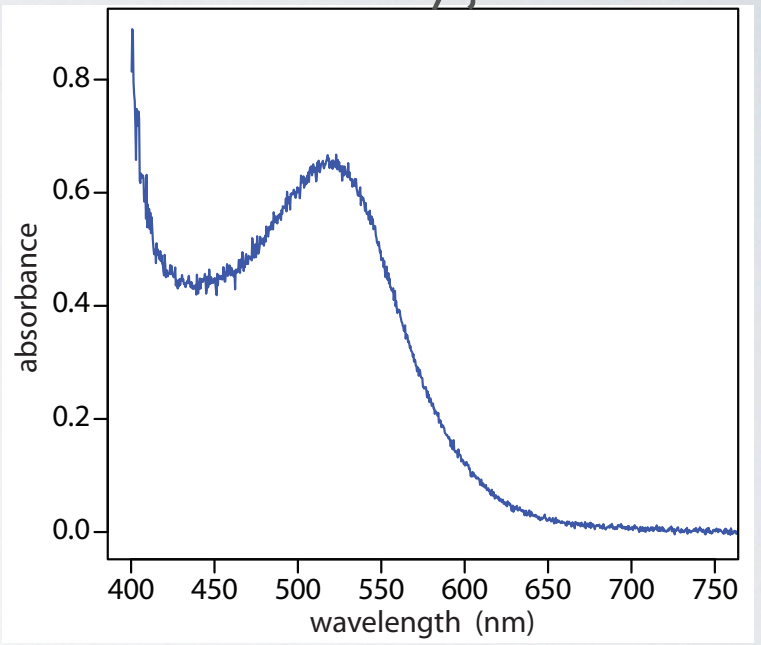
MOLECULAR ABSORBANCE SPECTROSCOPY

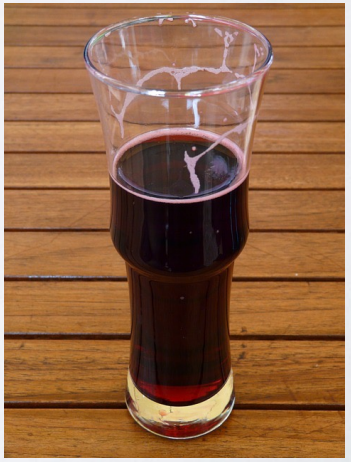
SDSU CHEM 251

MOLECULAR ABSORBANCE

- As molecules contain many electrons, a wide range of electrons they can **absorb light of many different wavelengths**.
- For quantitative absorbance measurements we need to focus on a **single wavelength** related to the compound of interest.
- For the **cranberry juice**, the optimal wavelength to monitor would be at **~525 nm**.

Absorbance spectrum of cranberry juice

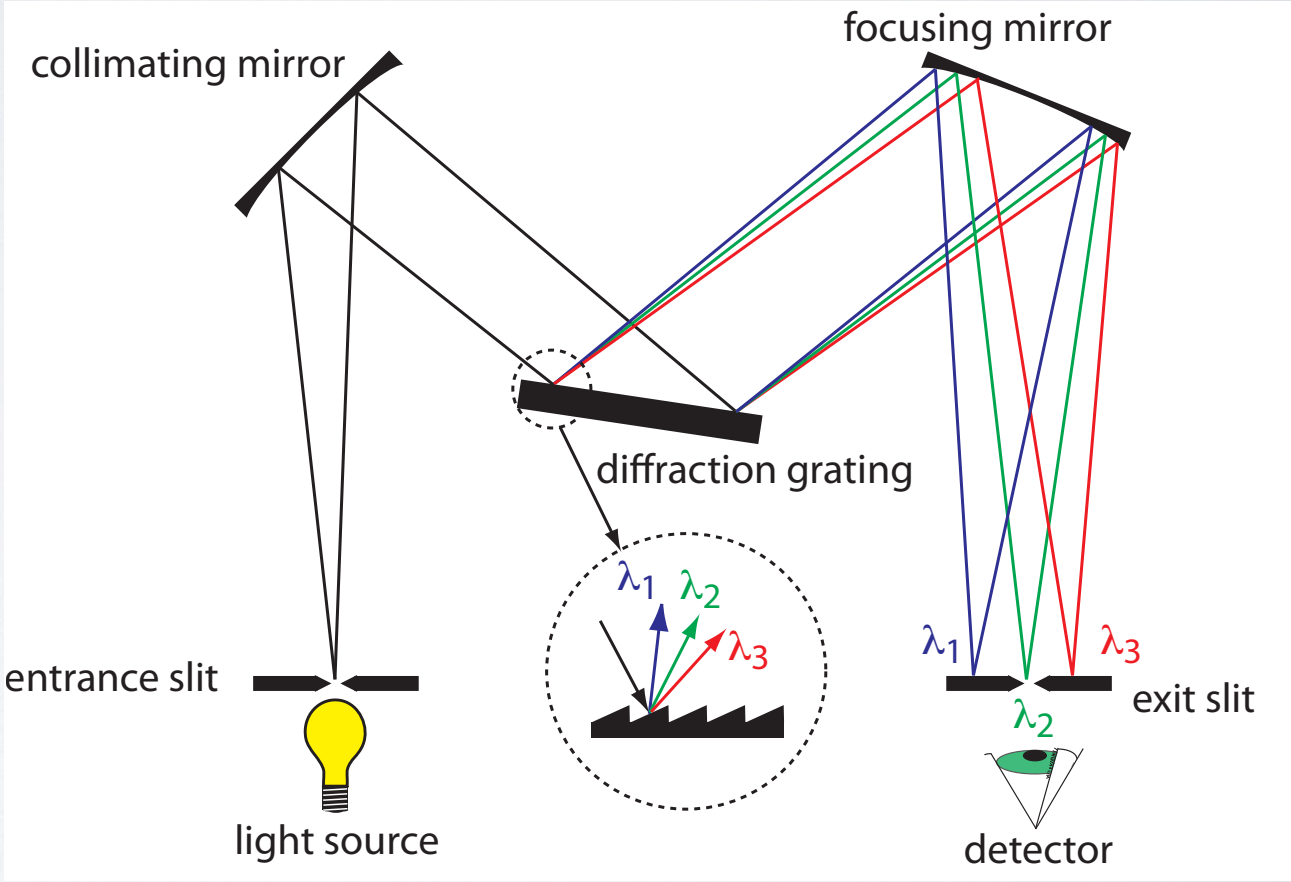




https://pixabay.com/en/drink-glass-juice-spritzer-55929/

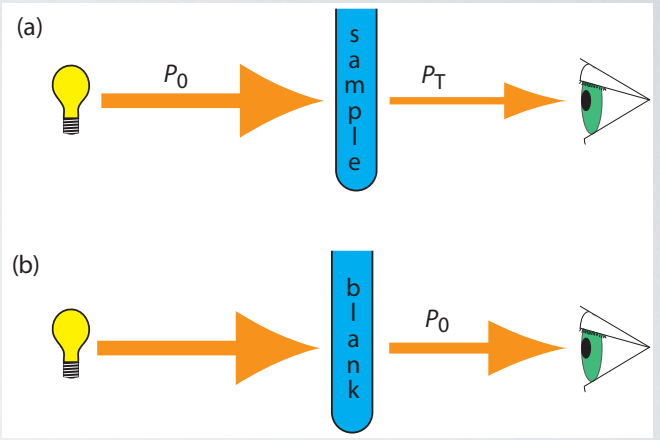
MONOCHROMATOR COMPONENTS

- As most detectors do not differentiate wavelengths, so **monochromators** are used to select the wavelength of analysis.
- A **diffraction grating** separates the light into separate wavelengths and with proper angling, only the **desired wavelength reaches the detector.**



ABSORBANCE QUANTIFICATION

- Absorbance (or transmittance) measurements can be used to quantify the amount of an analyte.



- **Beer's Law** is used to correlated concentration to absorbance measurements.

$$A = -\log T = -\log \frac{P_T}{P_o}$$

- ε is the molar absorptivity
- b is the path length
- C is the molar concentration

Beer's Law:

$$A = \varepsilon b C$$

Transmittance	Absorbance
100%	0.00
60%	0.22
30%	0.52
10%	1.00
1%	2.00

LIMITATIONS TO BEER'S LAW

- Beer's law is effective, but it does encounter **limitations** that cause **non-linear deviations** in the absorbance signal.

- Limitations:
  - Too high analyte concentration
  - Refractive index change
  - Equilibria variations
  - Instrumental limitations