

## WHAT DYE IS PRESENT IN DRINK?

### Spectroscopic analysis

The company producing certain alcoholic beverage is suspect that they use very cheap, but non legal, dye to color their product. Unfortunately, the non-legal dye can cause, in some cases, health problems and allergic reactions. To protect customer rights, it is necessary to analyze the beverage and identify the used dyes. On the basis of your analysis, the steps to set the right will be applied and the guilty party will be penalized (if the law is broken).

The manufactures of drinks, sweets and other food products often use dyes to make their products more interesting. For example, if no dyes are used, some sweets as gelatine bears would be colorless. And, it looks strange if orange taste bear is not orange or strawberry bear is not of a red color. Similarly, drinks (alcoholic as well as non-alcoholic) are also often colored by dyes to make them more attractive for costumers. For example, typical drink in the Czech pubs is "Zelená" (translated into English - Green drink) with peppermint taste. Naturally, it consists of water, alcohol and peppermint taste and it would be colorless, nevertheless, this drink is colored by two dyes, blue and yellow, to get a green color which resembles peppermint leaves. Hence, often, the dyes in foods and drinks are, in fact, added chemical substances. Some added substances can influence man's health as well as preferences in customer behavior (despite the substance is of synthetic or natural nature). The manufactures are obliged by law to mention the composition of their product (and all the additives) at the food label. If the company wants to cheat the costumers, the appropriate analysis of the food product is necessary to identify the content of the product. In the case of dyes, UV-VIS spectrometry can be useful. Try to find the basics of spectroscopy analysis on the basis of following measurements.

**What dyes are used in the sample of beverage? Did the producer broke the law using a non-legal dye?**

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## Try this experiment ...

What you need to perform this experiment?

### Chemicals:

- yellow food dyes (E-110 – Yellow SY, E-104 – Chinoline yellow, E-102 – Tartrazine yellow)
- blue food dyes (E-132 – Indigotin, E-133 – Brilliant blue, E-131 – Patent blue and Methylene blue)\*
- water
- sample of tested beverage

\* - the dyes with E-code are legal for use of food and beverages coloring, dyes without the code are not allowed to be used.

### Equipment:

- 8 beakers or test-tubes with a stand
- cuvette
- UV-VIS spectrometer
- spatula

### Procedure:

1. Prepare solutions of all of dyes in Chemical section (so you will have 7 solutions). Very small amount of solid dye is needed to prepare the mentioned volume, hence add few powder grains by tip if the spatula into 20 mL of water, the prepared solution must be transparent.
2. Switch the spectrometer into absorption mode (hence, you will measure, which wavelength is absorbed from the white light). Measure the spectra of all the dye solutions. Find maxima of the peaks in the spectrum and fill them into the table below. If the absorption (value at y-axis is not between 0.5 – 1.5 or there are some artefacts (strange lines) on the spectrum, dilute the solution to get between these values.
3. Measure a spectrum of the sample. Draw the measured spectrum bellow and fill in in the table the maxima of peak(s) in the spectrum. If the absorption (value at y-axis is not between 0.5 – 1.5 or there are some artefacts (strange lines) on the spectrum, dilute the solution to get between these values.

Dye name	Color	Dye code	Absorption maximum(a) (nm)

Sample (beverage) spectrum:

Maxima: .....

### Evaluate your data

Look at the table above (table with dye absorption maxima) and try to find factors and features which can be helpful to solve the problem of analysis of beverages.

*Hint: Does all the yellow dyes the same spectra (although, the color of all of them is yellow)?*

Which dyes are present in the sample of analyzed beverage?

*Hint: Use an approach derived in a previous task.*

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### Question:

1. Can the spectrum of one dye have two maxima?

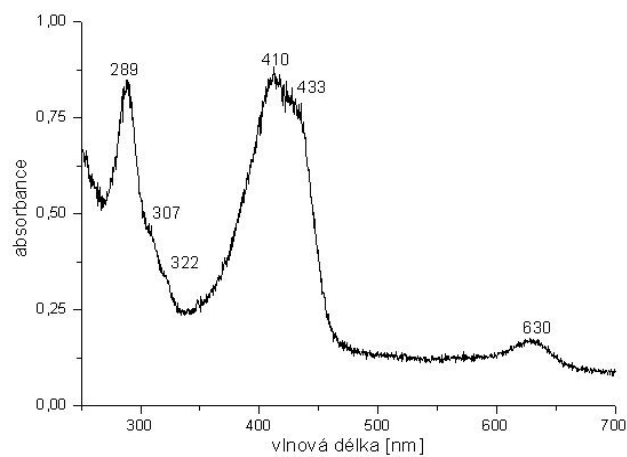
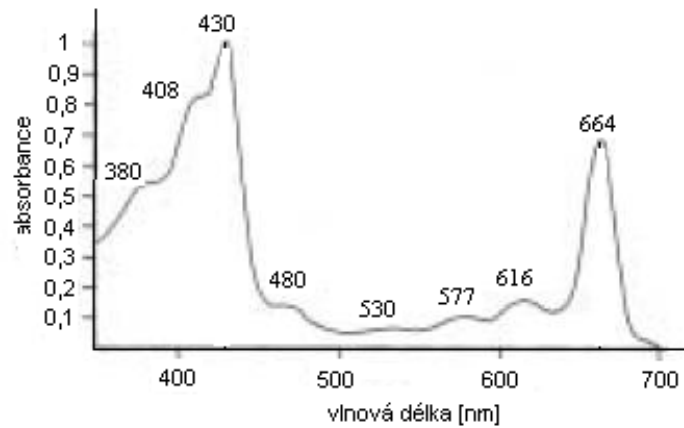
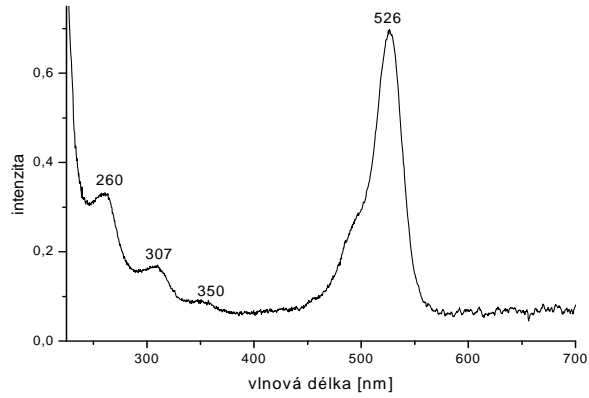
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2. Look at the figures of spectra of particular solutions bellow and identify whether the dyes used to prepare the solutions are the same that you measured.



## Conclusion

Summarize the results of your analysis and legal state.