

TØ 7. Extra

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In this note we will work on the same dataset as the main note in which we saw how to plot data. Now we will look at how to manipulate the data, starting by converting the units of one column of the dataset and then doing a calculation that uses two columns.

Below is an excerpt of the dataset.

```
import pandas as pd
pigments = pd.read_csv('../..../datasets/curated_abs_dataset.csv')
display(pigments)
```

	wavelength_nm	chlorophyll-a	chlorophyll-b	fucoxanthin	prasincoxanthin
0	800.2	0.0	0.000035	0.000629	0.000128
1	799.3	0.0	0.000000	0.000588	0.000166
2	798.5	0.0	0.000000	0.000599	0.000165
3	797.6	0.0	0.000000	0.000548	0.000216
4	796.7	0.0	0.000086	0.000491	0.000086
...
558	324.0	NaN	NaN	0.003124	0.002171
559	323.1	NaN	NaN	0.003056	0.002062
560	322.3	NaN	NaN	0.003098	0.002207
561	321.4	NaN	NaN	0.003092	0.002202
562	320.6	NaN	NaN	0.003042	0.002189

1 Data manipulations

We often need to transform parts of our data - e.g.

- Converting units
- Calculating derived properties
- Normalizing

Our dataset has the wavelength in nanometers, perhaps we would like to work with meters instead

```
pigments['wavelength_m'] = pigments['wavelength_nm'] * 10**(-9)
```

This is an example of an **element-wise operation** - every element of `pigments['wavelength_nm']` is multiplied by $10^{**}(-9)$.

1.1 Exercise: Converting to photon energy

A more interesting unit conversion for this dataset would be to work with photon energy in eV, which can be computed with the formula

$$E = \frac{1240}{\lambda}$$

Where E is the photon energy and λ is the wavelength in eV.

In the cell below the dataset is available in the variable `pigments`, Use the cell to make this conversion to eV.

```
# Replace the blank line below with your code to make the conversion
_____

# Make a plot with the x-axis as photon energy
fig, ax = plt.subplots()

_____

plt.show()
```

1.2 Exercise: Mixture of pigments

We can approximate the absorbance of a mixture by using the equation

$$A_{\text{mixture}}(\lambda) = c_1 \cdot A_1(\lambda) + c_2 \cdot A_2(\lambda)$$

Where A are absorbances of each component of the mixture and c_i are proportions of each component. Use this to calculate the absorbance of a mixture of 70% chlorophyll-a and 30% chlorophyll-b

```
# Calculate the mixture
c1 = _____
c2 = _____
A_mixture = _____

# Plot the mixture absorbance
fig, ax = plt.subplots()

x_data = pigments['wavelength_nm']
ax.plot(x_data, pigments['chlorophyll-a'], label='c-a')
ax.plot(x_data, pigments['chlorophyll-b'], label='c-b')

_____

plt.show()
```