In [9]:
```
import numpy as np

import pandas as pd
```

In [4]:
```
from metas_unclib import *
```

In [6]:
```
water_tap = ufloatfromsamples(
    (289.5, 281.1, 278.5),
    desc="water tap"
)
water_tap
```

Out[6]: 283.03333333333336 ± 7.2867724653006665

In [7]:
```
water_dei= ufloatfromsamples(
    (2.84, 2.9, 2.8),
    desc="water deionized"
)
water_dei
```

Out[7]: 2.8466666666666662 ± 0.0637931056763051

In [8]:
```
water_pure = ufloatfromsamples(
    (1, 1.2, 0.97),
    desc="water purified, degased"
)
water_pure
```

Out[8]: 1.0566666666666666 ± 0.15847230355837524

In [14]:
```
print(pd.DataFrame(np.array(((1,2),(3,4)))).to_latex())
```

```
\begin{tabular}{lrr}
\toprule
{} &  0 &  1 \\
\midrule
0 &  1 &  2 \\
1 &  3 &  4 \\
\bottomrule
\end{tabular}
```

Molar

K2CO3

In [20]:
```
kalium_M = ufloat(138.205, desc="molar mass potassium carbonate")  # g / mo
kalium_m = ufloat(1.3895, 0.0001, desc="mass potassium carbonate")
kalium_c = kalium_m / kalium_M / 0.1 / 10
kalium_c
```

Out[20]: 0.010053905430338989 ± 7.235628233421367e-07

In [24]:
```
kalium_lambda = ufloatfromsamples(
    (2.163, 2.190, 2.188),
    desc="molar conductivity K2CO3"
) / kalium_c
kalium_lambda  # S cm2 / mol
```

Out[24]: 216.86431690056378 ± 1.8966262009802657

Na2CO3

In [25]:
```
natrium_M = ufloat(105.99, desc="molar mass sodium carbonate")  # g / mol
natrium_m = ufloat(1.3895, 0.0001, desc="mass sodium carbonate")
natrium_c = natrium_m / natrium_M / 0.1 / 10
natrium_c
```

Out[25]: 0.01310972733276724 ± 9.434852344560808e-07

In [26]:
```
natrium_lambda = ufloatfromsamples(
    (1.715, 1.720, 1.720),
    desc="molar conductivity Na2CO3"
) / natrium_c
natrium_lambda  # S cm2 / mol
```

Out[26]: 131.073155811443 ± 0.2792487421399839

Exercises from the book

$$v_i = \frac{e E}{6 \pi \eta} \frac{z_i}{r_i}$$

Ex 1

In [28]:
```
from math import pi
```

In [33]:
```
e = 1.602176e-19  # C
E = 100  # V / m
eta = 1e-3  # Pa s
r = 1e-9  # m

z_mg = 2
z_essig = 1
```

In [34]:
```
e * E / (6 * pi * eta) * z_mg / r  # m/s
```

Out[34]: 1.6999615340213366e-06

In [35]:
```
e * E / (6 * pi * eta) * z_essig / r  # m/s
```

Out[35]: 8.499807670106683e-07