Lab 7: Electrophoresis and charge screening

Team info

Lab section: 12 PM | 3 PM | 6 PM

Team name: \_\_\_\_\_\_\_\_\_\_\_

Journalist: \_\_\_\_\_\_\_\_\_\_\_

Data Interpreter: \_\_\_\_\_\_\_\_\_\_\_

Critic: \_\_\_\_\_\_\_\_\_\_\_

Checker: \_\_\_\_\_\_\_\_\_\_\_

# Data

Fill in the charts below with your data. This is maybe overkill, but will ensure that you don’t forget to record any important data.

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Symbol** | **Value** |
| Bead radius | R | µm |
| Viscosity of water | µ | Pa s |
| Distance between electrodes | L | cm |
| Image scale |  | µm/pixel |

|  |  |  |
| --- | --- | --- |
| **Medium** | **Applied voltage ΔV (volts)** | **Measured speed**  **vavg ± Δv (µm/s)** |
| Pure (DI) water |  | ± |
|  | ± |
|  | ± |
|  | ± |
|  | ± |
| Salt water (180 mg/L) |  | ± |
|  | ± |
|  | ± |
|  | ± |
|  | ± |

# Speed vs voltage plots

Include two plots of average bead speed (on the y axis) vs applied voltage (on the x axis), as well as linear fits to your data (straight lines with zero intercept): one for beads in pure water and one for beads in salt water. Report the slope of your fit line (including its units!) either on the graph or separately. The most elegant way to do this is to put both plots on the same graph, as this allows the reader to easily compare them. Make sure to include a legend (either on the graph, or in the accompanying text) so we know which is which. Include error bars on your data points (though Excel ignores the error bars if you use Excel for your fitting, so they’re probably just a guide to the reader).

# Calculation of effective charge

Derive a symbolic relation between the slope of your graphs and the effective charge on the beads, in terms of the physical quantities in your experiment (bead size, viscosity of water, size of well, etc.).

Using the numbers from your measurements, calculate the effective charge on beads in DI water and salt water.

|  |  |  |
| --- | --- | --- |
| **Medium** | **Slope of v vs ΔV (units?)** | **Bead charge (C)** |
| Pure (DI) water |  |  |
| Salt water (180 mg/L) |  |  |

# Questions?

Make sure you have answered all the questions from the web page. Don’t forget to explain *why* you think your results turned out the way they did.