Millikan experiment with phyphox acoustic stopwatch.

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Millikan experiment was the first clear demonstration of the electric charge quantification and the determination of the elementary charge (charge of electron). Radius R and charge q of the oil drop in this experiment is determined from the two times: t_1 of the drop free fall over $h = 1$ mm and t_2 of its rise over the same height h under vertical electric field U/d, where U is electric tension applied between two metallic plates at distance d.

$$R^2 = \frac{9}{2} \frac{\eta}{\rho g} \frac{h}{t_1} \tag{1}$$

and

$$q = \frac{K}{U} \left(\frac{h}{t_1} + \frac{h}{t_2} \right) \sqrt{\frac{h}{t_1}}, \tag{2}$$

where

$$K = 6\pi \sqrt{\frac{9}{2}} \frac{\eta^{\frac{3}{2}} d}{\sqrt{\rho g}} \tag{3}$$

The following parameters are used:

oil density ρ	874 kg/m^3
air viscosity η	18.5×10^{-6} kg/(m $\cdot$ s)
gravitational acceleration g	9.81 m/s^2
distance d between plates	6.0 mm

This version of the phyphox acoustic stopwatch as its prototype measures every time between two loud acoustic signals. These can be clicks, beeps, claps etc. as long as they are louder than the environment. You might want to adjust the threshold, giving the level at which the stop watch is triggered (ranging from 0 to 1).

After starting the experiment, the clock will start measurement of t_1 on the first click exceeding the threshold and will be stopped on the second click. The third click will start measurement of t_2 and stop it on the fourth click. Two more clicks save the measured times and calculated radius and charge, and return the stopwatch to the original state. Make sure that the click is short enough as a long sound might be immediately detected as a stop.