

# Modern Physics Lab

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## Millikan Oil Drop experiment

### Purpose of the experiment

- To measure the charge of an electron
- To show that charge is quantized in this amount

To show BOTH of these, you will need to use all of your data together rather than just analyze each experiment separately. This is not really clear in the Pasco instruction manual which we are using. The best way to do this is using a graph of the excess charge on each drop vs. integers. These integers will represent the number of excess electrons on the oil drop. You could probably cheat since you already know the charge of an electron and figure out which integer should go with which charge. Millikan, however, could not and had to do all of this by hand.

After working through the lab and the data as described in the Pasco manual, use some spreadsheet or plotting software to try assigning different integers to each charge until you get data that forms a straight line. The slope of this line gives you the charge of an electron. The fact that such a line exists tells you that charge really is quantized.

### Other comments:

Be sure to use proper uncertainty analysis to calculate the final uncertainty in the charge measurements. This requires combining uncertainties from several other measurements - but it is a direct application of the analysis discussed in the book.

You might compare this calculated uncertainty to the error in your charge measurement which is the difference between your measured charge value for the electron and the accepted value. (I do not call it the actual value because the value seems to change over time as we learn how to make better measurements!)

If you see that exposure to alpha particles changes the number of excess electrons on the oil drop, be sure to offer some speculation as to why this happened.

**A complete downloadable lab manual is available from Pasco at their web site:  
[www.pasco.com](http://www.pasco.com)  
Look under Physics / Fundamental Constants /**