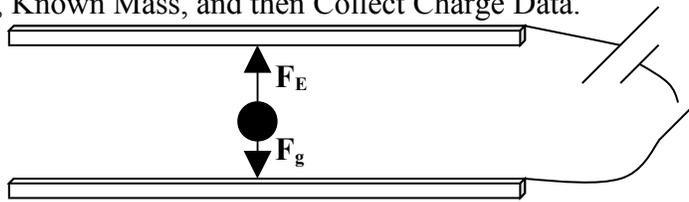NAME_____
PARTNER'S NAMES_____

ROBERT MILLIKAN'S OILDROP EXPERIMENT

1. Get into DOS mode by choosing it from the PROGRAM menu from the START UP button.
2. Change to the A: drive by typing **A: Oildrop2**
3. Choose Charge e⁻, then Real e-, then ESC.
4. Now, choose EXPT, Known Mass, and then Collect Charge Data.

At this point you will see a screen which simulates the experiment Robert Millikan performed in order to determine the charge of an electron. The switch activating the electric field between the plates is open so the charged oil drop will fall to the bottom under the force of gravity. Close the switch and the **E** field may or may not be strong enough to cause the oil drop to rise upward.

Adjust the strength of the **E** field until the drop levitates *anywhere* between the plates. Change to MEDIUM speed mode and continue, eventually moving to FAST speed until the drop is as balanced as can be between the plates. Record the observation (**F6**) in your "electronic notebook" and change the charge (**F2**) before beginning to collect more data. Continue until at least 6 charged drops have been experimented with and recorded. Record your data in the table below.

Observation #	Mass (kg)	Voltage (V)	Velocity (m/s)	Charge (C)

Analyze your data (**F10**) and you will see your data in the form of a bar graph. Sort your data (**Sort Data**) and now a comparison can be made easily between charged drops. Look at the two drops that are most nearly charged and activate each as OBSERVATION 1 and OBSERVATION 2. The charge difference between the drops is denoted by D = and you have the ability to divide that D by an integer I, if you choose. Change the value of I until you see a D/I value of 1.6×10^{-19} C. If I was 5, this tells us one drop had 5 more electrons than the other drop. Compare at least a few more pairs of drops to see that the same D/I of 1.6×10^{-19} C appears. Now for the "fun" part.

Go back to the main menu of the program and do another experiment, but this time allowing the computer to choose a **Random e-**. Perform the experiment again (yes, clear the notebook!) and see if you can figure out the computer's choice of the electron's fictitious charge.

Observation #	Mass (kg)	Voltage (V)	Velocity (m/s)	Charge (C)

> You will need to write down your values of **D/I** for each comparison and see if a common number appears between all comparisons. Perhaps that is your **q** $_{e-}$.

BEFORE you make a choice of the charge, write your value down and then call me over.

Charge of electron = _____ C

INITIALED BY TEACHER (IF CORRECT) _____

INTERPRETATION
1. Explain the two forces acting on the oil drop in this experiment.
2. Look at your observations #1 and #2. Show how many more electrons one drop had than the other.
3. Assuming the distance (d) between the two plates is 5 cm (0.05 m), calculate the electric field intensity (E) between the plates using observation #1 and the voltage (V) required to suspend the drop.
4. Calculate the electric field intensity (E) using **E = F$_e$ / q** for observation #1 and the fact that the F$_e$ = F$_g$ = mg.