**Class\_\_\_\_\_\_ Student ID\_\_\_\_\_\_\_\_\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pre-class Assignment Grade\_\_\_\_\_\_\_\_\_\_\_ Final Grade\_\_\_\_\_\_\_\_\_\_**

**Experiment: Millikan Oil Drop Experiment**

**Ⅰ. Pre-Lab Preparation**

In this experiment, we need to select oil droplets with "appropriate" charge and speed for the experiment. Please explain what is a "appropriate" oil droplet.

**II.** **Recording of Original Data**

Table 1 Static Method (Oil Drop #1)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Equilibrium Voltage *Un*/V |  |  |  |  |  |  |
| Falling Time *t*/s |  |  |  |  |  |  |

Table 2 Static Method (Oil Drop #2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Equilibrium Voltage *Un*/V |  |  |  |  |  |  |
| Falling Time *t*/s |  |  |  |  |  |  |

Table 3 Static Method (Oil Drop #3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Equilibrium Voltage *Un*/V |  |  |  |  |  |  |
| Falling Time *t*/s |  |  |  |  |  |  |

Table 4 Dynamic Method (Oil Drop #1) **(Optional)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Rising Voltage *U*/V |  |  |  |  |  |  |
| Falling Time *t*1/s |  |  |  |  |  |  |
| Rising Time *t*2/s |  |  |  |  |  |  |

Table 5 Dynamic Method (Oil Drop #2) **(Optional)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Rising Voltage *U*/V |  |  |  |  |  |  |
| Falling Time *t*1/s |  |  |  |  |  |  |
| Rising Time *t*2/s |  |  |  |  |  |  |

Table 6 Dynamic Method (Oil Drop #3) **(Optional)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Rising Voltage *U*/V |  |  |  |  |  |  |
| Falling Time *t*1/s |  |  |  |  |  |  |
| Rising Time *t*2/s |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **Instructor**  **Signature** |  |

**Ⅲ.** **Data Processing**

Calculate the charge *qi* of each oil droplet, calculate (*e* =1.602×10-19 C), round off the quotient to get the number of electrons *ni* carried by the oil droplet; then get the elementary charge *ei* of each measurement, and then calculate the average value of the measurement, and compare it with the theoretical value *e* (*e* =1.602×10-19 C) to find the percentage error. There should be a detailed calculation process and neat format.

**Related Reference Data Used in the Experiment:**

Oil Density: *ρ* = 981 kg·m-3

Gravity Acceleration: *g* = 9.78 m·s-2

Air Viscosity Coefficient: *η* = 1.83×10-5·kg·m-1·s-1

Oil Droplet Uniform Descent Distance: *l* = 1.60×10-3m

Correction Constant: *b* = 8.22×10-3m·Pa

Atmospheric Pressure (Shenzhen): *P* = 1.0098×105 Pa

Parallel Plate Distance: *d* = 5.00×10-3m

**Ⅳ. Discussion and Conclusions**

(Analyze and discuss the experimental phenomena and causes of electron charge measurement errors in this experiment, and how to reduce the errors?)

**Ⅴ. Questions**

1. When tracking and observing a certain oil droplet, the original clear image becomes blurred. What may be the reason?

2. Due to the volatilization of oil, the quality of the oil droplet will continue to decline. When tracking and measuring the same oil droplet for a long time, what parameters will change due to the volatilization of the oil droplet?