



电子科技大学  
格拉斯哥学院  
Glasgow College, UESTC

Score

## Physical Experiment II

### Prelab Report 11

Experiment Title: The Millikan Oil Drop Experiment

Student Number: 2017200602011

Chinese Name: 张立澄

Teaching Assistant: Hao Wen

Instructor: Jing Wu

Date: 2018.10.8

Score

## Answers to Questions (20 points)

(1) When it is stationary in an electrostatic field, the gravitational force, the buoyant force, and electric field force act on it. When the field is removed and it reaches its terminal speed, the buoyant force, viscous resistance and gravitational force would be acting on it.

(2)

$$\frac{qV}{d} = mg$$

$$q = \frac{mgd}{V} = \frac{3.3 \times 10^{-15} \text{kg} \times 9.8 \text{N/kg} \times 0.95 \text{cm}}{340 \text{V}} = 9.036 \times 10^{-19} \text{C}$$

$$q = 5.6e$$

Since the number of electrons should be integer, there are about 6 excess electrons on the droplet.

(3) Stokes' law is used for the frictional force exerted on spherical objects with very small Reynolds numbers in a viscous fluid.

The force of viscosity on a small sphere moving through a viscous fluid is given by

$$F_d = 6\pi \eta R v$$

where:

$F_d$  is the frictional force – known as Stokes' drag – acting on the interface between the fluid and the particle

$\eta$  is the dynamic viscosity (some authors use the symbol  $\mu$ )

$R$  is the radius of the spherical object

$v$  is the flow velocity relative to the object.