Experimental General Physics for Engineers I

Laboratory Report PHYS 192 spring 2022

Section: ___L06__

Experiment name: Viscosity

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Table of results (1.25 pts)	
Graph (1.25 pts)	
Data analysis (2 pts)	
Discussion (0.5 pt)	
References	
Others	
Report Grade (5 pts)	

1. Table of Results

Ball Radius R (m)	$u(R)$ (m)	time t (s)			R^2 (m^2)	$u(R^2)$ (m^2)	velocity v (m/s)			average velocity $\bar{v}$ (m/s)	$u(\bar{v})$ (m/s)
		t_1(s)	t_2(s)	t_3(s)			v_1(m/s)	v_2(m/s)	v_3(m/s)		
0.00316	±0.000005	2.87	2.92	3.02	0.00000998	0.000000032	0.2090	0.2054	0.1986	0.20440	0.00304
0.00157	±0.000005	9.62	9.63	9.65	0.00000246	0.000000016	0.06237	0.06230	0.0621	0.06228	0.000057
0.00276	±0.000005	3.79	3.78	3.77	0.00000764	0.000000028	0.1583	0.1587	0.1591	0.15873	0.000242
0.00223	±0.000005	6.39	6.35	6.34	0.00000497	0.000000022	0.0938	0.0944	0.0946	0.09434	0.000226
0.00236	±0.000005	4.86	4.83	4.88	0.00000559	0.000000024	0.1234	0.1242	0.1229	0.12354	0.000369

2. Graph

2.1. Graph of the velocity vs. the radius square

Insert Excel graph of v (y-axis) vs. R^2 (x-axis) on Excel.
Include error bars on both x and y-axis.

velocity vs R^2   y = 19345x + 0.01 R^2 = 0.9843
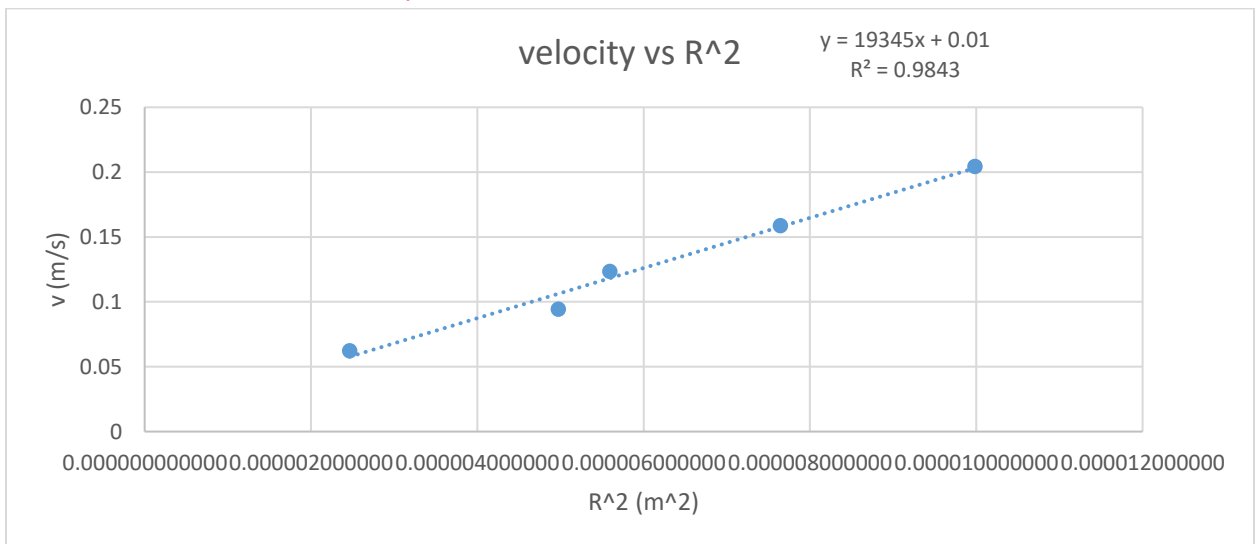
Errors are so small that it is not visible on the graph

3. Data analysis

3.1. Standard deviation of the mean velocity

Show explicitly how to calculate $SDOM$ for the first row
Mean = 0.2090+0.2054+0.1986 / 3 = 0.2043

SDOM =Standard deviation of v /sqrt (3) = sqrt ((0.2090-0.2043)^2+(0.2054-0.2043)^2+(0.1986-0.2043)^2 / sqrt(3)

= ± 0.00304 m/sec

3.2. Error of R^2

Show explicitly how to calculate error of R^2 for the first row

R^2= R*R

U(R^2) = 2R * U(R)

= 2*0.00316*0.000005

= ± 0.000000032 m^2

3.3. Slope and intercept of the graph and their uncertainties.

Use the linest function in excel to find the slope intercept and their uncertainties. Report those values here.

Slope (m*s)^-1 :19345.41   Intercept (m/sec):0.010028
Slope Intercept(m*s)^-1: 1411.477   Intercept Error(m/sec): 0.009368

3.4.   Value of the viscosity coefficient.

From your result above calculate the value of the viscosity. (Show your calculation)

Mass density of sphere= 7860 kg/m^3
Mass density of Liquid = 880 kg/m^3

$$\eta = \frac{2(\rho_s - \rho_L)g}{9 * Slope}$$

=0.785762 kg/m^3

4. Discussion

The obtained value of viscosity is obtained to be 0.785762 kg/m^3 which satisfies the value itself. The values ranging from 0.5 to 1.0 kg/m^3 are satisfied values.
Sources of error could also have affected the answer. This is when errors such as human errors while measuring the time and radiuses may have resulted in the some errors.

5. References