

Trevor N. t1n32 Lab1 PHYS121 Sec:118-B Section 11

	Weight (g) Tennis Ball	Length (cm) String	Diameter (cm) Tennis Ball	Length (m) Total	Period (s) 10 swings	Period (s) 1 swing	g (m/s²)	Weight (N)
1	58	65.5	6.31	0.68655	16.18	1.618	10.35321	0.55
2	58	65.7	6.35	0.68875	16.33	1.633	10.19645	0.53
3	58	65.8	6.40	0.69000	16.10	1.610	10.50890	0.54
4	58	65.9	6.41	0.69105	16.24	1.624	10.34421	0.54
5	58	65.7	6.21	0.68805	16.29	1.629	10.28617	0.55
6	58	66.1	6.30	0.6925	15.88	1.588	10.84123	0.55
7	57	66.0	6.21	0.69105	16.07	1.607	10.56422	0.53
8	57	66.3	6.26	0.69430	16.02	1.602	10.60026	0.52
9	57	66.2	6.18	0.69290	15.94	1.594	10.76598	0.51
10	58	66.2	6.28	0.69340	16.02	1.602	10.66642	0.52
mean	57.7	65.94	6.291	0.69085	16.107	1.6107		0.534
SD	0.48305	0.26331	0.07923	0.00251	0.14999	0.01499		0.0143
SE	0.15275	0.08327	0.02505	7.9913×10^{-4}	0.0474	0.00474		0.00452

$$g = 4\pi^2 \frac{l}{T^2}$$

$$g \approx 10.51277 \text{ m/s}^2 \approx \boxed{g = 10.5 \text{ m/s}^2}$$

$$\delta g = \sqrt{\delta g_l^2 + \delta g_T^2}$$

$$\delta g \approx 0.06304531 \approx \boxed{\delta g = 0.1 \text{ m/s}^2}$$

$$\delta g_l = \frac{4\pi^2}{T^2} \delta l$$

$$\delta g_l \approx 0.01209649$$

$$\delta g_T = -8\pi^2 \frac{l}{T^3} \delta T$$

$$\delta g_T \approx \text{~~0.06187395~~ } 0.06187395$$

$$\text{Result: } g = \boxed{10.5 \pm 0.1 \text{ m/s}^2}$$

Procedure:

- Measure

- Mass of Tennis Ball
- Weight of Tennis Ball w/ scale
- Length of string from Ball to end w/ meter stick
- Diameter of Ball w/ calipers
- Period of 10 swings w/ stopwatch

- Setup

- Attach a string to a tennis Ball w/ a loop on the other end.
- Suspend the tennis ball by the string such that the tennis ball is only touching the string

Our measurement only had one decimal place as we had to estimate that due to the stick being obstructed by the ball

- Analysis

- Derive the length from the tip of the string to the center of the ball from the length & diameter measurements

- Measure Period by deviating the tennis ball from equilibrium by less than 5° off the vertical.

- Calculate g from the formula of

$$g = 4\pi^2 \frac{l}{T^2} \text{ \& the means of measurements}$$

- Derive δg from δT and δl

- Derive the time of one period from the measurement of 10.

- Find the mean, SE, SD of all measurements