Equations Live Here

Physics 4A

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December 2022

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Chapter 1

Equations for Moment of Inertia Lab

Theoretical Times

Theoretical time for solid cylinder at 5°

$$\sqrt{\frac{2(1+0.5)\cdot 1.000}{9.8\sin(5)}} = 1.8741\ sec$$

Theoretical time for hollow cylinder at 5°

$$\sqrt{\frac{2(1+1)\cdot 1.000}{9.8\sin(5)}} = 2.1641\ sec$$

Theoretical time for sphere at 5°

$$\sqrt{\frac{2(1+\frac{2}{5})\cdot 1.000}{9.8\sin(5)}} = 1.8106\ sec$$

Theoretical time for solid cylinder at 10°

$$\sqrt{\frac{2(1+0.5)\cdot 1.000}{9.8\sin(10)}} = 1.3330\ sec$$

Theoretical time for hollow cylinder at 10°

$$\sqrt{\frac{2(1+1)\cdot 1.000}{9.8\sin(10)}} = 1.5392\ sec$$

Theoretical time for sphere at 10°

$$\sqrt{\frac{2(1+\frac{2}{5})\cdot 1.000}{9.8\sin(10)}} = 1.2878\ sec$$

RSS Error

Greatest contributors are used to calculate RSS error

$$\text{RSS} = \sqrt{\left(\frac{0.00005\ sec}{1.2037\ sec}\right)^2 + \left(\frac{0.0005m}{1.000m}\right)^2 + \left(\frac{0.00005m}{0.0255m}\right)^2} \times 100\% = 1.02\%$$

Back-End Error

Percent error should be used because we are calculating a theoretical value and comparing an experimental value with that number rather than comparing two unknown experimental values.

$$\%\text{error} = \frac{|E-K|}{K} \times 100\%$$

Where E = experimental value and K = theoretical value.

$$\%\text{error for solid cylinder at } 5° = \frac{|1.9279\ sec - 1.8741\ sec|}{1.8741\ sec} \times 100\% = 2.87\%$$

$$\%\text{error for hollow cylinder at } 5° = \frac{|\ 2.1946 sec - 2.1641\ sec|}{2.1641\ sec} \times 100\% = 1.41\%$$

$$\%\text{error for sphere at } 5° = \frac{|1.8141\ sec - 1.8106\ sec|}{1.8106\ sec} \times 100\% = 0.19\%$$

$$\%\text{error for solid cylinder at } 10° = \frac{|1.2564\ sec - 1.3330\ sec|}{1.3330\ sec} \times 100\% = 5.75\%$$

$$\%\text{error for hollow cylinder at } 10° = \frac{|1.4367\ sec - 1.5392\ sec|}{1.5392\ sec} \times 100\% = 6.66\%$$

$$\%\text{error for sphere at } 10° = \frac{|1.2151\ sec - 1.2878\ sec|}{1.2878\ sec} \times 100\% = 5.65\%$$