TFCPHYSICS 91F

Lab 4

Lab 4 - Hooke's Law

**Part 1: Validating Hooke’s Law**

|  |  |  |
| --- | --- | --- |
| **Mass added (g)** | **Weight (N)** | **Extension (mm)** |
| 100g | 0.98 | 18 |
| 150g | 1.47 | 26 |
| 200g | 1.96 | 34 |
| 250g | 2.45 | 42 |
| 300g | 2.94 | 50 |

*Table 1*



f)the spring constant = 0.0612$Nmm^{-1}$

g) applied force v/s extension is a straight line

**Part 2: Determining Unknown Masses**

* Following the steps in part 1, place the red mass on the spring and determine the extension .
* Repeat the procedure 3 times and list the values as shown in the box below.
* Follow the same procedure for blue mass as well

|  |  |
| --- | --- |
| **Mass added (g)** | **Extension (mm)** |
| red | 62 |
|  | 62 |
|  | 62 |
| blue | 39 |
|  | 39 |
|  | 39 |

* Using the value of k from part 1 in the equation ,

$F = k x$

$k$= 0.0612$Nmm^{-1}$

* For red mass, m \* g = 0.0612 \* 62

 m = (0.0612 \* 62) / 9.8

**red mass = 387.183g**

* For red mass, m \* g = 0.0612 \* 39

 m = (0.0612 \* 39) / 9.8

**blue mass =243.551g**

**Part 3: Determining Unknown Value of Gravity**

|  |  |  |
| --- | --- | --- |
| **Mass added (g)** | **Extension (mm)** | **Unknown** $g$ |
|  300g | 72 | 14.68 |
|  387.183g | 89 | 14.067 |
| 243.551g | 56 | 14.07 |

$F = k x$

$k$= 0.0612$Nmm^{-1}$

unknown $g$ =$14.272 ms^{-2}$

**Part 4: Analysing Systems of Springs**

**Two Springs in Parallel**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| $k\_{1}$ ($Nm^{-1})$ | $k\_{2}$ ($Nm^{-1})$ | F (N) | Extension (m) | Total $k$ ($Nm^{-1})$ |
| 200 | 200 | 100 N | 0.250 | 400 |
| 200 | 400 | 100 N | 0.167 | 598.802 |
| 400 | 600 | 100 N | 0.100 | 1000 |
| 200 | 600 | 100 N | 0.125 | 800 |

*Table 2*

d) F = kx

Ftotal = k1 x + k2 x

 = (k1 + k2)x

**Two Springs in Series**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| $k\_{1}$ ($Nm^{-1})$ | $k\_{2}$ ($Nm^{-1})$ | F (N) | Extension (m) | Total $k$ ($Nm^{-1})$ |
| 400 | 400 | 100 N | 0.500 | 200.00 |
| 200 | 400 | 100 N | 0.750 | 133.33 |
| 600 | 400 | 100 N | 0.417 | 239.81 |
| 200 | 600 | 100 N | 0.667 | 149.93 |

*Table 3*

h)

F = kx

Ftotal =(k1k2)/(k1+k2) x

 Student 3 has correct model