**Period of a Mass on a Spring**

AP Physics 1

A mass is attached to an ideal spring of unknown spring constant which is hung vertically from a stationary support. The mass is pulled down a small distance and released, causing it to oscillate in simple harmonic motion. The mass of the spring is varied and the period recorded. The data is shown below.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mass (kg) | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 |
| Period (s) | 0.140 | 0.199 | 0.243 | 0.281 | 0.314 | 0.344 | 0.372 | 0.397 |
|  |  |  |  |  |  |  |  |  |

1. Graph the data on the graph below. Be sure to choose an appropriate scale.



2. What is the relationship between the period and the mass?

3. What quantities should be graphed to produce a straight line?

4. Use the third row to calculate values for the quantities you chose in step 3.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mass (kg) | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 |
| Period (s) | 0.140 | 0.199 | 0.243 | 0.281 | 0.314 | 0.344 | 0.372 | 0.397 |
|  |  |  |  |  |  |  |  |  |

5. Plot the data again so that it makes a straight line. Label both axis, including appropriate units and chose a reasonable scale.



6. Calculate the slope of the line. Show all of your work below.

7. The equation for the period *T* of a mass on a spring is $T=2π\sqrt{\frac{m}{k}}$ where *m* is the mass on the spring and *k* is the spring constant. Use the slope of your line to calculate the spring constant *k*. Show all of your work below.