

**2019 Year 11 Physics**

**Task 9: Investigation - Pendulums**

**Investigation: Validation Test**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_/20

1. Why does changing the starting position not influence the time it takes for the pendulum to complete a period? (2)

**The velocity of a swing that is positioned higher, is faster than one that is positioned lower. (1)**

**This means that the periods end up being the same (1)**

1. The equation is derived from 2 equations; Gravitational field strength, and Kepler’s 3rd law show how these two equations combine to show how period is related to gravity. (4)

Rearranging:

Therefore:

Cancelling out common factors, M & r2

Swapping out T2 and g

Taking the square root of both sides and substituting L with r gives

Rearranging:

(1mark)

(1 mark)

(1 mark)

(1 mark)

1. While the changing the mass does not change the period of the pendulum, describe how using a larger mass may reduce the error in your results. (2)

A larger mass will have more momentum, which means it is less likely to be influenced by external factors (1)

Such as wind resistance or internal friction of the pivot. (1)

1. Ben has left the physics class, and for something to do on the weekend, travels to Mars. While there he investigates the relationship between period and length on mars. He uses several different lengths, and times how long it takes for the pendulum to swing ten times. His results are presented below. (12)

|  |  |  |
| --- | --- | --- |
| Length | 10 Periods |  |
| (mm) | (seconds) |  |
| 200 | 14.44 |  |
| 400 | 21.5 |  |
| 700 | 28.1 |  |
| 1000 | 32.3 |  |
| 1400 | 37.8 |  |

1. On the graph below plot the length versus the period of the swing. (3)

**Title (1)**

**Axes and labels (1)**

**Points plotted (1)**

Period (seconds)

Length of pendulum (m)

1. On the graph below plot the length versus the period of the swing squared. (3)

**Title (1)**

**Axes and labels (1)**

**Points plotted (1)**

Period squared (seconds)

Length of pendulum (m)

1. Draw a line of best fit on the above graph (part (b)).

**As shown above (1)**

1. **Using** the line of best fit drawn on part (b) state what the gradient is between the time and the square of the period. (3)

**From graph Rise: 15.8, run: 1.5 (2 marks)**

**Rise/run = 10.533 (1 mark)**

1. The relationship between the gradient (c) and gravity (g) is calculate what the gravity is, when on Mars. (2)

**Goes to: (1 mark)**

**Therefore (1 mark)**

End of Test