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|  | **12 ATAR Physics**   |  |  | | --- | --- | | **Circular Motion Validation** | **4.0%** |   **Term 4 - 2017** |

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| Student name: |  |

**Experimental outline:**

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| When the plastic tube is moved in a small circle above your head, the rubber cork moves around in a horizontal circle at the end of a string that passes through the tube and has a mass hanger with slotted masses suspended from its lower end. | Circ motion set-up |

**Experimental data: Table 1**

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|  | **Radius (m)** | **Time for 10 revolutions (s)** | | **Period (s)** | **Period2 ( )** |
| **Trial 1** | **Trial 2** |
| **1** | 0.20 | 2.03 | 2.25 |  |  |
| **2** | 0.34 | 2.61 | 2.55 |  |  |
| **3** | 0.42 | 3.17 | 3.22 |  |  |
| **4** | 0.49 | 3.41 | 3.59 |  |  |
| **5** | 0.53 | 3.54 | 3.64 |  |  |
| **6** | 0.69 | 3.90 | 3.71 |  |  |
| **7** | 0.75 | 4.22 | 4.39 |  |  |
| **8** | 1.02 | 5.09 | 5.05 |  |  |

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| **1.** The mass of the rubber stopper was measured as 22.6 grams. Write the correct mass in kg. **(1 mark)** | kg |

**2.** Complete table 1, rows 2 to 7, for period and period2. **(4 marks)**

**3.** Complete table 1, rows 1 and 8, for period and period2. Write the values of period2 using the correct significant figures. **(3 marks)**

**4.** Use the data from table 1 to sketch a graph of radius (r) versus period2 (T2) on the graph paper provided on the next page.

1. Show appropriate labels and units. **(2 marks)**
2. Carefully plot the data from table1. **(3 marks)**
3. Sketch the best-fit line for this data. **(2 marks)**

**5.** Calculate the gradient of your graph.

1. Show the points used on the graph. **(1 mark)**
2. Calculate the gradient of the line including correct units. **(4 marks)**
3. Write the equation of the straight line below. **(3 marks)**

**6.** Why have we chosen to graph r v’s T2 and not r v’s T? **(3 marks)**

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**7.** What can you say about the relationship between r and T2? **(3 marks)**

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Graph of radius (m) versus period2 (T2)

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| --- |
| graph paper |

**8.** Calculate the speed of the 2-holed rubber stopper for the first data point of table 1. **(3 marks)**

**9.** Calculate the centripetal force (Fc) acting on the 2-holed rubber stopper for the first data point of table 1. **(3 marks)**

**10.** Given that the mass of the slotted masses is 350 grams, compare the value of Fc (above) to that of the weight. Express the comparison value as a percentage difference. **(5 marks)**

**11.** The three main formulae used in this experiment are:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | v = | 2π**r** | Fc = | **M**v2 | F = | mg |  |
|  | T | r |  |

1. Use these to show: **(4 marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | r = | mg | T2 |  |
|  | 4π2**M** |  |

Where **M** = mass of stopper and m = slotted masses

1. Use the formula shown in 11(a) to calculate a theoretical value for the gradient and use this value to compare with the value calculated in 5(b). Express the difference as percentage value. **(4 marks)**

**12.** Briefly explain why 10 revolutions were used. **(2 marks)**

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**13.** List two sources of error that you encountered during this experiment and explain how they affected your results. **(4 marks)**

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