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|  | **Year 11 Physics**  Investigation: (TITLE OF INVESTIGATION) |

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| **Name:** | **Partner/s:** | **Mark / 60** |

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| **Background information** |
| *Use secondary sources to provide an introduction to the investigation.*  *Include a summary of the relevant theory, and specific data values where necessary.*  *This should include enough information that no new information other than the data and its analysis is presented anywhere else.*  *Provide in line citations for information obtained from secondary sources (textbooks, websites, scientific journal articles). Include a full reference for each source in the References section at the end of the report.* |

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| **Research Question** |
| *Enter your focused research question in this space.*  *“What is the effect of \_\_\_\_\_\_\_\_\_\_(IV)\_\_\_\_\_\_\_\_\_\_ on the \_\_\_\_\_\_\_\_\_\_(DV)\_\_\_\_\_\_\_\_\_\_ , which indicates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ?”*  *Other options include (context specific)*   * *What factors affect …?* * *How does … change over time?*   What is the effect of the mass of a stationary object compared to the final speed as a result of sticky collision |

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| **Hypothesis** |
| *It is predicted that as the mass of the hit (stationary glider increases) the velocity because of the collision between the two gliders would be lower as force transferred from the incoming glider remains the same whilst the mass of the stationary glider increases. Newton’s second law of motion (F = m\*a) would show that as a result the acceleration of the glider would be lower resulting in a lower speed.* |

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| **Definition of variables** |
| **Independent variable**  *State what you changed AND what specific values you used.*  *Explain why these values were chosen – why are they relevant?*  The independent variable is the mass of the stationary glider |
| **Dependent variable**  *State what will be directly measured.*  *Explain if there is any calculation required to get from the measurements to a rate/derived value that will be used for the Conclusion.* |
| **Controlled variables**  *List at least three variables that must be controlled (stay the same) – include the value that was used.* |

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| **Materials and equipment** | | |
| **Quantity / volume required** | **Apparatus / material** | **Uncertainty of apparatus** |
| 2 x | Air track Gliders, same mass | *Record the uncertainty of any equipment used to measure a value.*  *The symbol to use before the uncertainty value is ±*  *Include the units for the uncertainty value (same as for the measured value)* |
| 1 x | Compression Spring |  |
| 2 x | Photogates and clocks |  |
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| **Method** |
| *Present a clear method with numbered steps and specific values for all measurements. They should also be written in past tense and without the use of personal pronouns.*  *Include directions for repeated trials if necessary.*  *If possible, include a labelled diagram or photograph of the equipment as set up.* |

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| **Quantitative data table** | | | | |
| Mass of Stationary Glider (kg) | Velocity of Combined Gliders (m/s) | | | *Average Velocity of combined* |
| Trial 1 | Trial 2 | Trial 3 |
| 0.2 | 0.643 | 0.617 | 0.664 | 0.6416 |
| 0.3 | 0.528 | 0.552 | 0.514 | 0.5317 |
| *0.4* | 0.396 | 0.395 | 0.451 | 0.4141 |
| *0.5* | 0.424 | 0.391 | 0.396 | 0.4036 |
| *0.6* | 0.354 | 0.324 | 0.362 | 0.3465 |

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| **Graph of quantitative data** |
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| **Analysis and discussion of results** |
| *The discussion will have three paragraphs. In the first paragraph, describe the trends and patterns seen in the graph. Try to be specific, but don’t explain why it happened (yet). You can refer to equations of trendlines here.*  *In the second paragraph, discuss how clear the trend is. Think about how close the data points are to the trend line or R2 value. If values were calculated for variation (eg. standard deviation, or max‒min), discuss these here too. This should include your discussion of* ***precision*** *and* ***accuracy****.*  *In the third paragraph, explain why the results turned out the way they did. It is important to explain this with reference to the relevant scientific theories. This is a scientific argument, so it must be supported by information from secondary sources. Provide a citation for information obtained from secondary sources.* |

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| **Evaluation – To be completed in class under test conditions** |
| **Error Source 1:** |
| **Error Type (systematic/random):** |
| **Effect on results:** |
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| **Suggested improvements/ways to minimise:** |
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| **Evaluation – To be completed in class under test conditions** |
| **Error Source 2:** |
| **Error Type (systematic/random):** |
| **Effect on results:** |
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| **Suggested improvements/ways to minimise:** |
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| **Conclusion – To be completed in class under test conditions.** |
| *The conclusion should start with a specific answer to the research question.*  *THEN*  *Include a judgement of the level of support for the hypothesis. The data may not support the hypothesis – this is fine. Remember, a hypothesis CAN be supported or not supported, but it CANNOT be proven or disproven.*  *Decide on this based on these main things – how clear the trend is in the graph, how well the results agree with other scientific studies, the effect of your errors on results, and how well-designed the experiment is.* |

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| **References** |
| *Use a recognised system for referencing to present a full reference for each secondary source used in the investigation.*  *List the references in alphabetical order.*  *An online reference generator is available at:* [*https://org.slasa.asn.au/harvard*](https://org.slasa.asn.au/harvard) |