EASTERN GOLDFIELDS COLLEGE

GENERAL 11 INTEGRATED SCIENCE

**Task 13 - Water Rocket Design Investigation**

**MARKING KEY**

**PART ONE – PLANNING AND DESIGNING**

1. List three factors that impact the launch distance of rockets, and explain how they impact the launch distance. *(3 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| One mark per factor. For example: Weight of rocket, Size of bottle, Shape of nose cone, Shape of bottle | 1-3 |
| **TOTAL** | **3** |

1. State the:
   1. independent variable *(1 mark)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Independent variable correctly specified | 1 |
| **TOTAL** | **1** |

* 1. dependent variable *(1 mark)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Dependent variable correctly specified | 1 |
| **TOTAL** | **1** |

1. Create a hypothesis for your experiment*(22 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Hypothesis mentions clear relationship between IV and DV | 1-2 |
| Hypothesis is actually testable |
| **TOTAL** | **2** |

1. State three controlled variables, and explain why they must be controlled.*(4 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| One mark per correct controlled variable | 1-3 |
| Explains that CV allow you to see true impact of IV on DV | 1 |
| **TOTAL** | **4** |

1. The design of your rockets.
   1. a sketch of your two designs on the A3 sheet of paper; include the measurements and design features that are unique to your rocket *(5 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| Nose cone is aerodynamic | 1 |
| Weight distribution specified | 1 |
| Overall body shape is aerodynamic | 1 |
| Specifies fin size and location | 1 |
| Specifies volume of water to be used | 1 |
| **TOTAL** | **5** |

* 1. Next to each feature of your rocket design – the features that are the same between your two rockets - include why you have chosen that particular weight/shape (refer to Newton’s laws and other scientific concepts)  *(5 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| Justification for nose cone is reasonable, and refers to forces | 1-2 |
| Justification for fins is reasonable, and relates to rocket stability | 1-2 |
| Justification for weight distribution is reasonable | 1 |
| **TOTAL** | **5** |

1. Write a step by step method of how you are going to measure the launch distance of your rockets and record your data. *(3 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| Specific details given for measurements, etc | 1-3 |
| Repeat trials included |
| Formatting and language is appropriate (numbered steps, concise, impersonal) |
| **TOTAL** | **3** |

**BUILD AND TEST YOUR ROCKET**

1. You must now build the rocket(s) that you have designed. You will be marked on whether your rocket(s) match your design and the effort put into their assembly. *(2 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| Rocket is rushed and poor quality | 1, or |
| Rocket is well-built and follows design plans | 2 |
| **TOTAL** | **2** |

1. Rocket launches and data collection. *(2 marks)*

|  |  |
| --- | --- |
| 1. **Description** | **Marks** |
| Follows method | 1-2 |
| Employs safe investigation practises |
| **TOTAL** | **2** |

1. In the space below create a table for your results.  *(5 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Formatting (logical layout and neat) | 1 |
| Headings include enough detail, or title included | 1 |
| Units included | 1 |
| Multiple trials recorded | 1 |
| Average calculated accurately | 1 |
| **TOTAL** | **5** |

**ANALYSIS**

1. Describe the trend shown by your results. *(2 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| States which rocket travelled further | 1-2 |
| Refers to data |
| **TOTAL** | **2** |

1. Explain your results using your scientific knowledge of rocket design. In other words – explain why the rockets flew the way they did.  *(3 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Generalised description for rocket flight. May not use appropriate vocabulary. | 1, or |
| Describes and briefly explains trends using relevant scientific concepts (may list forces) | 2, or |
| Analyses experimental data to describe trends and explains these using relevant scientific concepts (refers to forces) | 3 |
| **TOTAL** | **3** |

1. Use Newton’s first law of motion to explain why the rocket did not continue to rise into the sky.

*(2 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| States Newton’s First Law | 1-2 |
| States that gravity or drag was a force acting on the rocket, bringing it back to the ground |
| **TOTAL** | **2** |

1. Using Newton’s Third Law of motion, explain why the rocket took off from the ground. *(2 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| States Newton’s Third Law | 1-2 |
| States that the pushing of the water out the back of the rocket caused the opposite reaction of the rocket moving forward |
| **TOTAL** | **2** |

1. Describe two limitations in your experiment, and explain how they could be altered to improve the reliability of your data. *(4 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| One mark for each limitation, one mark for how each could be improved. E.g.:   * Wind inconsistent and affected flight – launch indoors * Water leaking out of rocket, altering fuel – seal * Any appropriate example | 1-2 |
| **TOTAL** | **4** |

1. Write a scientific conclusion for this experiment. *(3 marks)*

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Refers to hypothesis | 1-2 |
| States trend/evidence as concluding statement about experiment |
| **TOTAL** | **2** |