**GENERAL INTEGRATED SCIENCE – UNIT 2**

**TASK 11 – Practical Investigation**

**Building a Model Water Rocket**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 13 %**

**DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MARK: \_\_\_\_ / \_\_\_\_ = \_\_\_\_\_%**

Important Information for Students:

1. There are THREE sections in this test – Designing, Testing and Analysis.
2. This is a closed-book practical assessment (no notes are allowed).
3. The time allowed to complete the practical is two (2) periods.
4. Plan your experiment and rocket design on the **separate** A3 sheet provided.
5. Write your answers to the questions in space provided.

|  |  |  |
| --- | --- | --- |
| Sections | **Marks Allocation** | **Your Total** |
| **A - Design and Build** | 12 |  |
| **B - Practical Investigation** | 13 |  |
| **B - Analysis of results** | 9 |  |
| **TOTAL** | 34 |  |

**Introduction**

At its simplest, a water rocket is basically an upside down fizzy drinks bottle, which has had a nose cone and some fins added. The bottle has some water in which will provide the thrust to push the rocket along. The actual fuel of the rocket is provided by compressed air which is inserted into the bottle by means of a bike pump or compressor.

Some of the factors that affect the launch distance include:

|  |  |
| --- | --- |
| * Volume of water | * Size of the bottle |
| * Weight | * Aerodynamics (shape of the nose cone and body) |

**Task**

Choose the factor you think is most important in making the rocket go as far as possible. This is the factor you are going to change and then test to find the optimum specification for a water bottle rocket. Once you have decided this, you can design your experiment, build your rocket(s) and then test them.

1. What factor are you going to change and how do you think it will affect the flight of the rocket?

**Hypothesis:** (2 marks)

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1. What factor are you going to change and how?

**Independent Variable:** (1 mark)

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1. What are you going to measure and how?

**Dependent Variable:** (1 mark)

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1. What factors are you going to keep the same?

**Controlled Variables:** (1 mark)

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1. **The design of your rocket.**
2. Provide a sketch of your design on the A3 sheet of paper; include the design features that are unique to your rocket and measurements. (5 marks)
3. Next to each feature of your design, include why you have chosen the features (the science behind the design. (5 marks)
4. **Build your rocket.**  (2 marks)
5. **Method of testing your rocket.** (3 marks)

In the space below write a step by step method of how you are going to test your rocket designs and collect data to support/disprove your hypothesis. (HINT: Draft before you write it here!)

1. **Results** (3 marks)

In the space below create a table for your results, include any processing of results and identify any outliers.

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

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1. Explain the trend in your results using your scientific knowledge of rocket design. (3 marks)

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1. What improvements could be made to your testing method to improve the reliability of your results? (Reliability is how you would achieve consistent results) (2 marks)

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1. What conclusion can you make from your results? (2 marks)

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**Marking Key**

1. What factor are you going to change and how do you think it will affect the flight of the rocket?

**Hypothesis:** (2 marks)

* Mentioning independent (1)
* Mentioning dependent (1)

1. What factor are you going to change and how?

**Independent Variable:** (1 mark)

* Mentioning independent, must be specific (1)

1. What are you going to measure and how?

**Dependent Variable:** (1 mark)

* Mentioning dependent, must be specific (1)

1. What factors are you going to keep the same?

**Controlled Variables:** (3 mark)

* Listing controlled variables (max 3)
* Max 2 if not specific

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

* Nose cone aerodynamic (1)
* Body shape aerodynamic (1)
* Fins, size and location (1)
* Volume of water used (1)
* Weight distribution / CoM (1)

1. Next to each feature of your design, include why you have chosen the features (the science behind the design. (5 marks)

* Explanation for each point above (max 1 point each)

1. **Build your rocket.** (2 marks)

* Well-constructed with care and attention (1)
* Not accurately measured, rushed (1)

1. **Method of testing your rocket.** (3 marks)

In the space below write a step by step method of how you are going to test your rocket designs and collect data to support/disprove your hypothesis. (HINT: Draft before you write it here!)

* Logical order
* Easy to follow

1. **Results** (3 marks)

In the space below create a table for your results, include any processing of results and identify any outliers.

* Table drawn, data recorded (1)
* Heading and correctly labelled data (1)
* Average calculated (1)
* Outliers recorded OR three trials performed (1 if no average)

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

* Trend named (1)
* Description / comparison of results (1)

1. Explain the trend in your results using your scientific knowledge of rocket design. (3 marks)

* Basic description (1)
* Trend related to design (2)
* Scientific knowledge used (3)

1. What improvements could be made to your testing method to improve the reliability of your results? (Reliability is how you would achieve consistent results) (2 marks)

* Naming 1 improvement (1)
* How it improves reliability (1)

1. What conclusion can you make from your results? (2 marks)

* Description of effect that variable had on results (1)
* Relating back to hypothesis (1)