**INQUIRY WORK SAMPLE:**

**Rocket Flight**

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

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_

Lab partner: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lab partner: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**PART I: IDENTIFYING & DEFINING A PROBLEM TO BE SOLVED**

Based on observations and scientific principles, formulate the statement of a

practical problem that can be addressed through the process of engineering design.

* What is the main objective (purpose) of this lab?

Develop a question and a hypothesis to test related to rocket flight.

**Ex**. How does a rocket made out of metal fly compared to one made out of paper?

I hypothesize that the paper rocket would fly farther than the metal rocket because…

* Identify two scientific concepts we have discussed in class that relate to this lab?

Concept #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How does this concept relate to the lab?

Concept #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How does this concept relate to the lab?

* Constraints are the rules or restrictions that your design must follow. Some examples of constraints have been provided. Complete the remainder of the table below.

|  |  |
| --- | --- |
| **CONSTRAINTS** | |
| Rocket Size: | Rocket must be able to fit onto the launch tube |
| No added propellant: | You must use the air bladder alone to propel the rocket |
| Rocket weight: | Must be supported free standing on the launch tube |
|  |  |

**PART II: GENERATING POSSIBLE SOLUTIONS**

Evaluate and select a solution from a range of possible options, and

Defend that solution for testing using trade-offs, criteria and constraints.

* Within the charts below, sketch three possible designs and identify the supplies required, advantages, and disadvantages of each design. (At this point, you should not have actually built any of these three designs.)

|  |  |  |  |
| --- | --- | --- | --- |
| **POSSIBLE DESIGN #1** | Design sketch | Materials needed | Advantages  •  •  Disadvantages  •  • |

|  |  |  |  |
| --- | --- | --- | --- |
| **POSSIBLE DESIGN #2** | Design sketch | Materials needed | Advantages  •  •  Disadvantages  •  • |

|  |  |  |  |
| --- | --- | --- | --- |
| **POSSIBLE DESIGN #3** | Design sketch | Materials needed | Advantages  •  •  Disadvantages  •  • |

* Complete a trade-off analysis by completing the table below. The trade-off analysis for the first feature has already been completed as an example.

TRADE-OFF ANALYSIS

|  |  |  |
| --- | --- | --- |
| **FEATURE** | **ADVANTAGE** | **DISADVANTAGES** |
| **EX.** Large fins | Straighter flight path | Add extra weight |
|  |  |  |
|  |  |  |
|  |  |  |

* From your possible designs on the previous page, choose one design to create. The selected design will become Prototype #1. Circle your choice.

Design #1 Design #2 Design #3

* Why did you choose to start with this selected design as your prototype?

**PART III: TESTING SOLUTION(S) AND COLLECTING DATA**

Create and test or otherwise analyze solution(s) by collecting, organizing,

and displaying data to facilitate the analysis and interpretation of results.

* After building Prototype #1, draw a sketch of it in the chart below. Then create a written description of that same completed prototype. (Your sketch may look a lot like the “possible design” you already sketched and selected to build within Part II. However, if you had to make changes in the process of building the prototype, it may be different from your initial plan.)

|  |  |  |
| --- | --- | --- |
| **PROTOTYPE #1 DESIGN** | Sketch of prototype #1 | Written description of prototype #1 |

* Distance rocket successfully flew (or other data relevant to your hypothesis):
* Choose one feature of your prototype rocket design that you feel you could change in order to test your hypothesis. You will actually change this selected feature and then retest its ability to fly. This new design will become Prototype #2.

Feature to be changed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Following your construction of Prototype #2, draw a sketch of it in the chart below. Then create a written description of that same completed prototype.

|  |  |  |
| --- | --- | --- |
| **PROTOTYPE #2 DESIGN** | Sketch of prototype #2 | Written description of prototype #2 |

* Distance rocket successfully flew (or other data relevant to your hypothesis):

**PART IV: ANALYZING AND INTERPRETING RESULTS**

Summarize and analyze data, evaluate the proposed solution,

identify uncertainties, and suggest design improvements.

* Summary/Conclusion:
  + Summarize relative data from Prototype #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Summarize relative data from Prototype #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Analysis/Conclusion:
  + Feature changed in Part III: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Prototype most effective (circle answer): Prototype #1 Prototype #2
  + Did changing the feature help you test your hypothesis?
* From the results you obtained while testing your prototype(s), use the space below to write a description of the rocket design you think could fulfill your hypothesis the best.
* Identify two potential strengths and two potential weaknesses this ideal design would likely have.

Strength #1:

Strength #2:

Weakness #1:

Weakness #2

* If you were able to modify other features on one of your prototypes, what other feature(s) would you change and test?
* What were some places that you may have made mistakes throughout this lab?