Unit 1 Criterion B and C Formative Assessment : Buggy Lab

Unit Statement of Inquiry: Effective communication in science depends upon the development of coherent and consistent standards for measurement.

Investigation Question: How does the number of rotations of a wheel affect the distance travelled for a buggy?

Criterion B: Design an Investigation

Task: Design an investigation to answer the inquiry question above. Format your product in the way that best fulfills the requirements of this rubric. Below is the rubric on which you will be assessed.

Level	Level descriptor	Task Specific Clarification
0	The product does not reach a standard described by any of the descriptors below.	
1-2	The student is able to: i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable hypothesis iii. **outline** the variables iv. **design** a method, with limited success.	i. **State** the nature of your task. "How does ____ affect _____?" **Define** relevant terms. Then, **explain** the relationship (including mathematical) between these and any other physics concepts you are exploring to answer your question. ii. **Formulate** your hypothesis. **Explain** one or more scientific principle(s) which inform your prediction. **Explain** how you will know your prediction is supported. What will your data show? iii. **Identify** the variables that will allow you to answer your research question. **Describe** the range of your IV and what trend you expect in your DV as a result. **Describe** how you'll ensure your data are reliable. How will you minimize error? iv. **Identify** essential materials. **Design** a safe and detailed step by step procedure. **Create** an appropriate data table for raw data. Include additional tables for calculated data if needed.
3-4	The student is able to: i. **outline** a problem or question to be tested by a scientific investigation ii. **formulate** a testable hypothesis using scientific reasoning iii. **outline** how to manipulate the variables, and **outline** how relevant data will be collected iv. **design** a safe method in which he or she selects materials and equipment.	
5-6	The student is able to: i. **describe** a problem or question to be tested by a scientific investigation ii. **formulate** and **explain** a testable hypothesis using scientific reasoning iii. **describe** how to manipulate the variables, and **describe** how sufficient, relevant data will be collected iv. **design** a complete and safe method in which he or she selects appropriate materials and equipment.	
7-8	The student is able to: i. **explain** a problem or question to be tested by a scientific investigation ii. **formulate** and **explain** a testable hypothesis using correct scientific reasoning iii. **explain** how to manipulate the variables, and **explain** how sufficient, relevant data will be collected iv. **design** a logical, complete and safe method in which he or she selects appropriate materials and equipment.	

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Criterion C: Processing and Evaluating

Level	Level descriptor	Task Specific Clarification
0	The student **does not** reach a standard identified by any of the descriptors below.	
1–2	The student is able to: i. **collect and present** data in numerical and/or visual forms ii. **interpret** data iii. **state** the validity of a hypothesis based on the outcome of a scientific investigation iv. **state** the validity of the method based on the outcome of a scientific investigation v. **state** improvements or extensions to the method.	i. **Present** all raw qualitative and quantitative data in an **organized** manner (headings, units, etc.). Also include calculated data with sample calculations. Create a meaningful graph of relationships.
3–4	The student is able to: i. **correctly collect and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results iii. **outline** the validity of a hypothesis based on the outcome of a scientific investigation iv. **outline** the validity of the method based on the outcome of a scientific investigation v. **outline** improvements or extensions to the method that would benefit the scientific investigation.	ii. **Interpret and explain** <u>all</u> of your results using scientific reasoning. 'Speak in numbers' to establish trends, relationships, and outliers. **State** a conclusion based on your variables and scientific principles. iii. **Evaluate** your conclusion against your hypothesis. To what extent do your data support or fail to support your hypothesis? Cite data to support.
5–6	The student is able to: i. **correctly collect, organize and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results **using scientific reasoning** iii. **discuss** the validity of a hypothesis based on the outcome of a scientific investigation iv. **discuss** the validity of the method based on the outcome of a scientific investigation v. **describe** improvements or extensions to the method that would benefit the scientific investigation.	iv. **Explain** to what extent your <u>plan</u> led to a valid conclusion, and explain how well your <u>execution</u> contributed to reliable data. Identify sources and types of error in both and their impact on the data.
7–8	The student is able to: i. **correctly collect, organize, transform and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results **using correct scientific reasoning** iii. **evaluate** the validity of a hypothesis based on the outcome of a scientific investigation iv. **evaluate** the validity of the method based on the outcome of a scientific investigation v. **explain** improvements or extensions to the method that would benefit the scientific investigation.	v. **Explain** improvements to the method and execution which address all sources of error cited in Civ. Propose extensions which could enrich the discussion around the research question.

Unit 4 Criterion B Design and Investigation PLAN: Buggy Lab

Unit Statement of Inquiry: Effective communication in science depends upon the development of coherent and consistent standards for measurement.

Task: Design an investigation to answer the investigation question below. Format your product in the way that best fulfills the requirements of this rubric.

Planning Instructions: Complete this document in order to have your materials made available. REMINDER: This document does NOT replace your Criterion B. It represents the essential elements and information needed for you to carry out the investigation. You are still expected to convey the appropriate level of detail in your Criterion B.

i. Investigation Question: How does the number of rotations of a wheel affect the distance travelled for a buggy?

Relevant Concepts / Formulas / Relationships:

ii. **Hypothesis** - Write this in a way that includes **both** of your variables *and* a scientific principle (think *If...then...because*).

iii. **Variables** - Identify your **IV** and **DV**, **range** of IV (have a rationale for this!), and number of **trials** (have a rationale!)

iv. **Procedure** -

Materials - specify any items or measurements specific to YOUR investigation (basic materials will be provided)

Steps - Provide numbered steps to carry out one trial.

Data Table: Feel free to attach one or show a digital data table

Approval: _____