# SCIENCE GRADE 6
# FIZZY EXPERIMENT
# CRITERIA B - Summative Assessment

## ASSESSMENT TASK:

Your **goal** is to learn how to plan a lab experiment and practice data collection, analysis and interpretation. You will review chemical reactions and evidence of their occurrences.

In **criteria B** you will be assessed on the following:

- **describe** a problem or question to be tested by a scientific investigation
- **outline** a testable hypothesis and explain it using scientific reasoning
- **describe** how to manipulate the variables, and describe how data will be collected
- **design** scientific investigations

## TASK SPECIFIC DETAILS:

### Fizzy Lab – Designing with Criterion B

**Introduction** – Atoms typically do not exist in the singular state. Those atomic elements are constantly interacting, forming bonds and breaking them just as rapidly. Often, when certain elements combine together, energy is given off or absorbed and a new substance is made. This is known as a chemical reaction.

**STEP 1: Strand - i. describe** a problem or question to be tested by a scientific investigation - For this strand, you need to describe the problem that you are addressing in this experiment. Complete these steps:

Watch this video: https://www.youtube.com/watch?v=nvQnQ2OjmRU

What were your observations?

1.
2.
3.

A chemical reaction is occurring when the Baking soda is being mixed into the vinegar. This is why you see bubbles; this is just one sign that a chemical reaction may be occurring.

Read Chem4Kids page on reactions

List 3 ways you may be able to change this reaction:

1.
2.
3.

Each of these three changes to a reaction are known as *variables* that can change the "rate of reaction". This means that these changes may make the reaction speed up or slow down. Think about which variable you would like to test. You may choose to either change the temperature of the vinegar solution or the concentration amount of the Bicarbonate soda.

**Describe the problem:**

I want to investigate or test...

**Variables:** Variables are the part of your experiment that you will change and measure. In a scientific inquiry you will change only one type of thing, and only measure one type of thing. The independent variable is the one you purposely change and the dependent variable is what changes and is measured.

**Fill in your Variables:**

| |
|---|
| Independent variable (hint: what you are doing to change the rate of reaction) - |
| Dependent variable (hint: does reaction rate speed up or slow down) - |

**Question:** Write an experimental question based on the problem you are trying to solve

Example question starters: "We will investigate…" or "What will happen if…"

Question:

**STEP 2: Strand - ii. outline** a testable hypothesis and explain it using scientific reasoning

**Hypothesis:** Make sure the statement is **testable** *(meaning: can you do this experiment with the supplies and collect specific data)*. A typical hypothesis is an "If ….then" statement, without personal pronouns. Look at your question again and then based on your research, determine what you think will happen. An

example structure is **IF** (independent variable) **THEN** (how the dependent variable changes) **BECAUSE** (Scientific explanation)**.**

**Hypothesis:**

| |
|---|
| If |

**STEP 3: Strand - iii. describe** how to manipulate the variables, and describe how data will be collected

**Explain what data you will collect and how that data will be collected.**
In this experiment, you will study the effect that temperature OR amount of bicarbonate soda (concentration) have on the rate of a chemical reaction. An example: "The changes in the concentration of bicarbonate soda may change the rate of reaction for each trial. The rate will be measured using a timer. This information will be collected within a data table."

| | |
|---|---|
| What data are you collecting and putting in a data table? | |
| What tool(s) are being used to record data? | Equipment list: |

**STEP 4: Strand - iv. design** scientific investigations

**Materials:** Make a list of all items used in the lab, including quantities. For example, do not list "vinegar" as a material. A better way is to list "300 ml of vinegar". **Note: You will need to wear gloves for this lab**

| |
|---|
| |

**Procedure:** Lists the steps to complete in order to carry out the investigation. Your procedure should be written so that anyone else could **repeat the experiment**. Be as specific as possible with your procedural steps.

1.
2.
3.

**STEP 5 - Data Collection, Interpretation and Conclusion**

**Data Table Title:**

| Independent Variable: | Dependent Variable: |
|---|---|
| | |
| | |
| | |
| | |
| | |

**Interpret data –** look at the data in the table. Notice changes that occurred in each experimental trial. Think about why these changes happened. Discuss the data patterns using proper science vocabulary.

Example data sentence starters: “The data shows that…” or “The data suggests…”

Put your understanding (interpretation) of the data here:

**Conclusion** - The conclusion needs to discuss 3 main parts. Read each section and then put your response in the box. Your responses should be at least 2-3 sentences each.

State your hypothesis and discuss if it was valid. How do you know if it was valid? For a hypothesis to be valid you must answer two questions about the hypothesis: 1. How was the hypothesis tested in your experiment? 2. Can the hypothesis be proven false (how might you do this)?

Discuss the validity of the method. What does this mean?

- Briefly explain the experiment design.
- Summarize the collected data, give 1 or 2 specific examples from your data table.
- Explain any conclusions you may have reached based on the data you found.

Describe improvements to the experiment. How do you do this?

- Point out sources of error in the procedure.
- Point out sources of error in the data collection.
- Explain how you would improve the experiment - give one idea to correct a procedural error; give one way to fix an error in collecting data.

## ASSESSMENT RUBRIC:

### Criteria B

| | **Descriptors** | | | |
|---|---|---|---|---|
| **Achievement Level** | i. Describe a problem or question to be tested by a scientific investigation | ii. Outline a testable hypothesis and explain it using scientific reasoning | iii. Describe how to manipulate the variables, and describe how data will be collected | iv. Design scientific investigations |
| **1-2** | A problem has been stated as a question. | The hypothesis outlined, but limited. | Variables are stated. | A procedure is written for the lab. |
| **3-4** | A problem has been stated as a research question that connects to the topic. | The hypothesis is testable, and includes variables. | Variables have some details. How the independent variable will be manipulated is stated. How to measure the dependent variable is stated. Data table is present. | The procedure written is safe and materials are listed. |
| **5-6** | Some details have been stated in the problem. A research question is presented that connects to the topic. The variables are stated. | The hypothesis is testable, and variables included have details. The hypothesis is supported with scientific reasoning in the "because" portion. | Variables have most details. How the independent variable will be manipulated is stated. How to measure and collect data from the dependent variable is described. Data table is organized. | The procedure written is safe and complete. Materials are listed with appropriate quantity amounts. |
| **7-8** | Key details have been stated in the problem. A research question is presented that connects to the topic. The variables are defined and specific. | The hypothesis is testable, and variables included have specific details. Variables have defined changes such as "increase" and "decrease". The hypothesis is supported with correct scientific reasoning in the "because" portion. | Variables have specific details. How the independent variable will be manipulated is described. How to measure and collect relevant data from the dependent variable is described. Controlled variable(s) are discussed. Data table is organized with correct units. | The procedure written is safe, complete and thorough.How to collect and record data is included in the procedure Materials are listed with appropriate quantity amounts. |

## COMMAND TERMS:

**Describe:** Give a detailed account or picture of a situation, event, pattern or process.

**Outline:** Give a brief account or summary.

**Design:** Produce a plan, simulation or model.