Science 9

Scientific Method Lab

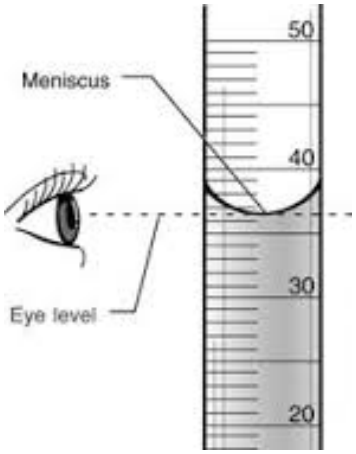
Name:
Date:
Block:

Question:
What will happen to the *size of the balloon* when the same amount of _____ but different amounts of _____ are combined?

Hypothesis:
IF the same amount of vinegar is combined with _____ baking soda, **THEN** what will happen is _____ _____
BECAUSE _____ _____

Experimental Design:

1. Materials
   - _____
   - _____
   - _____
   - _____
   - _____
   - _____
   - _____
   - _____
   - _____
   - _____
2. Procedure
   a) CLEAN everything you'll be using (it may be contaminated with other chemicals)
   b) Use the graduated cylinder to measure 50.0 mL of vinegar. Carefully pour the 50.0 mL of vinegar into the Erlenmeyer flask.
      i. Use the eye dropper to be as EXACT as possible!
      ii. Make sure you are reading the correct number of mL on the graduated cylinder…
      How many mL would this be? _____
      The CURVED LINE a liquid forms at its top in a graduated cylinder is called a _____.
      The correct liquid measurement is the number at the _____ of the meniscus curve!!!!



   c) Use the digital scale to measure 2.0 grams of baking soda
      i. Turn digital scale ON
      ii. Make sure it is set to read in GRAMS
      iii. Put a weigh boat on it, then set it to ZERO (or TARE)
      iv. Add baking soda, using the scoopula to be as EXACT as possible
   d) Bend the weigh boat and pour the baking soda into the balloon.
   e) Carefully place the balloon on the mouth of the Erlenmeyer flask, then tip the balloon over so that the baking soda falls in to the vinegar
   f) Hold on to the base of the balloon so that the carbon dioxide that is produced is trapped.
   g) Use a ruler to measure out the height of the balloon from the opening of the Erlenmeyer flask to the top of the balloon
   h) Repeat these steps for the baking soda measures of 4.0 g and 6.0 g.

3. Safety Considerations
    - What safety hazards are there? What precautions should you take?

    - What safety equipment should you use and why?

Experiment:
Now carry it out!

Data & Observations:
Suggestion: Use a RULER to measure the height of each balloon. Use a table to compare the results:

Amount of Vinegar	**Amount of Baking Soda**	**Height of Balloon when Baking Soda and Vinegar were combined (Quantitative Observations)**
50.0 mL	2.0 g	
50.0 mL	4.0 g	
50.0 mL	6.0 g	

What are some **qualitative observations** you can make from this experiment? Discuss at least two qualitative observations in your response

Error Analysis:

What is a source of error?
Discuss the changes and suggestions you would make to the procedure in order to improve the experiment to get better results. A source of error is issues with the procedure of a lab that may introduce errors or cannot be controlled for, but perhaps improved upon. These could include:

a) Impurities (from previous experiments, or that cannot be completely rid of)
b) Human reaction time
c) Limitations to measuring techniques (i.e. 1 drop – can you be certain that each drop size is the exact same?)
d) Etc…

What is NOT a source of Error?

a) Avoid using human errors
b) Measuring improperly
c) Malfunctioning equipment
d) Mistakes or oversights on the part of the scientist
e) Not following procedure
f) Punching numbers into your calculator incorrectly
g) Etc…

What are some sources of error in this experiment? Be specific!

How may these sources of error affect your results? Be specific!

	Emerging	Developing	Proficient	Extending
Questioning and Predicting	Safety hazards and equipment are not accurately identified Hypothesis does not relate to the question and explanation is not relevant Not all data recorded is relevant; a few key pieces missing. Units of measurement are missing or incorrect.	Safety hazards and equipment are somewhat accurately identified Hypothesis somewhat relates to the question and a brief explanation is provided Most data recorded is relevant, but some is still missing. Some units of measurement are included.	Safety hazards and equipment are accurately identified Hypothesis is relevant to the question, though, explanation needs to be expanded on All data recorded is relevant. Most units of measurement are included.	Safety hazards and equipment are accurately identified and explanations of precautionary measures are accurately identified Hypothesis is relevant to the question and provides a reasonable scientific explanation All data recorded is relevant. All units of measurement are included.

Clean-Up:

Clean up your station and call the teacher over for your lab clean-up check

	Emerging	Developing	Proficient	Extending
Planning and Conducting	The lab may be started on time but is not completed before the designated end time. Significant teacher assistance is required. Equipment is rarely handled correctly/safely. Lab is completed with a few safety mistakes. A few reminders are needed to keep safety glasses on. Reminders are needed to return equipment. The lab is conducted by certain individuals, while other members are off task.	The lab is started on time but is not completed before the designated end time. Some teacher assistance is required. Equipment is occasionally handled correctly and safely. A few reminders are needed to keep safety glasses on. Some equipment is properly cleaned/returned. The lab bench is wiped down. The lab is conducted by certain individuals, while the other members of the group observe. Everyone is treated with respect.	The lab is started on time and completed by the designated end time. The lab is completed with minor teacher assistance. Equipment is mostly handled correctly and safely. Safety goggles are almost always worn. Almost all equipment is properly cleaned/returned. The lab bench is wiped down and clean. The lab is conducted between group members, but someone is taking the lead. Everyone is treated equally and with respect.	The lab is started on time and completed efficiently. The lab is completed independently, without teacher assistance. All equipment is handled correctly/safely. Safety goggles are worn at all times. All equipment is cleaned and returned. The lab bench is wiped down and clean. The lab is conducted collaboratively between your group members. Everyone is treated equally and with respect.

Variables:

What was the **independent variable** in this experiment?

What was the **dependent variable** in this experiment?

What was the **controlled variable** in this experiment?

Conclusion

Write a **short paragraph conclusion** about this lab. Be sure to answer these questions in your paragraph:

a. What did you discover?
b. Was your hypothesis supported or not supported?
c. What factors may have affected your results?
d. If you were to redo the experiment, what changes would you make?
e. What can you conclude in this experiment?

	Emerging	Developing	Proficient	Extending
Communicating	The student cannot connect their observations and data to their hypothesis. The students lack understanding of the connection between variables. Suggested procedural adjustments lack concrete detail and/or are unrelated to the errors identified. Many grammatical errors; ideas are presented in a jumbled manner. Little scientific vocabulary is used correctly.	The student makes some connections between their observations, data, and hypothesis. The student has some understanding of the connection between variables. Procedures are described to improve the accuracy and precision of the lab, but lack detail or aren't entirely related to the errors identified. Some grammatical errors; ideas presented somewhat logically. Some scientific vocabulary is used correctly.	The student correctly connects their observations and data to their hypothesis. The student can accurately identify the relationship between variables. Procedures to improve the accuracy and precision of the lab are described in some detail. The recommendations mostly correspond to the errors identified. Few grammatical errors; ideas presented logically. Scientific vocabulary is used correctly.	The student correctly connects their observations and data to their hypothesis. The student can clearly articulate the relationship between variables. Very specific procedures are described to improve the accuracy and precision of the lab. The recommendations correspond to the errors identified. No grammatical errors; logical flow of ideas. Scientific vocabulary is used correctly.