

Mass change during a chemical reaction

Name: _____

Aim: To observe the production of gas in a chemical reaction and compare the mass of the system when the gas is contained and when it is allowed to escape.

Materials (per group):

2 x conical flasks (100–250 mL)
2 x balloons
Measuring cylinder
Digital scales
Spoon (to measure 5 g of bicarbonate of soda)
Petri dish (to measure bicarb)
White vinegar
Funnel
Marker

Method:

Part A – Gas Escapes (open system)

Label this flask 'A'.

1. Measure and pour 50 mL of vinegar, at room temperature, into flask A.
2. Weigh the conical flask with the vinegar in it. Record this mass.
3. Add 5 g of bicarbonate of soda directly into flask A and quickly place it on the scale.
4. Observe the reaction. Record any visible changes (e.g. bubbles, fizzing).
5. Record the final mass of flask A after the reaction finishes.

Note: the initial mass of reaction for Flask A is the mass of the conical flask with vinegar in it + 5 g of bicarb.

Part B – Gas is Contained (closed system)

Label a second flask 'B'.

1. Measure and pour 50 mL of vinegar, at room temperature, into flask B.
2. Place 5 g of bicarbonate of soda **into a balloon** using a spoon or funnel.
3. Secure the balloon tightly over the mouth of flask B **without tipping in the powder yet**.
4. Weigh the combined system (flask B + vinegar + balloon + bicarb inside balloon). Record this initial mass.
5. Lift the balloon to let the bicarb fall into the vinegar and observe the reaction.
6. Once the reaction has stopped and the balloon has inflated, weigh the system again. Record the final mass.



Figure 1 – flask with balloon attached.

Results Table:

Flask	Initial Mass (g)	Final Mass (g)	Initial – final mass (g)	Observations during reaction
A				
B				

Discussion Questions:

What did you observe when the vinegar and bicarb reacted in each setup?

Questions

1. Which flask(s) had a change in total mass?

2. Why do you think the mass changed in Flask A?

3. Why did the balloon inflate in Part B? What does that tell you about the reaction?

4. Why do you think the mass stayed the same in Part B, even though the appearance of the flask changed?

7. Suppose you sealed Flask A completely with a tight stopper (instead of using a balloon), so that no gas could escape and the flask couldn't expand.
- a. What do you think would happen during the reaction? Explain using the particle theory to discuss what is going on inside the flask.

- b. What might eventually happen to the stopper or the flask? Research the word "**pressure**" and use it in your response.

- c. What does this tell you about the importance of safety consideration when a sealed chemical reaction produces gas particles.
- Hint: Think about how gas particles move and spread out after they form, and what happens when they collide with the walls of a sealed container.*

- d. Describe how things may change if the vinegar, in the sealed flask A, was heated to 60 °C instead of 25 °C before adding the bicarbonate of soda into the flask. Justify your answer using your chemical knowledge of particle theory and kinetic energy.

[Solutions](#)