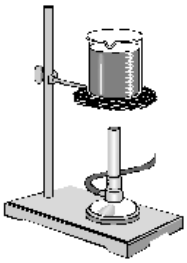
Ms. Randall
Regents Chemistry
Lab Activity: Conservation of Matter-Analyzing Popcorn

Background: The ***law of conservation of mass*** states that the mass of an isolated system will always remain constant, regardless of the processes acting inside the system. The matter *cannot be created or destroyed, it only changes form.* Basically this means that in a closed system: REACTANTS MASSES = PRODUCTS MASSES. (a la chemists Antoine Lavoisier and Mikhail Lomonosov. In this lab we will focus on proving the Law of Conservation of Mass/Matter to be correct. We will use our measuring skills to identify the mass of popcorn before and after it is popped. We will compare these measurements and use them as evidence to support or refute the aforementioned law.

Research question: Does the Law of Conservation of Mass/Matter hold true in the matter of popping popcorn?

Lab Safety: Goggles must be worn at all times! Please pull all hair back and remove loose clothing such as sweatshirts.



Materials:
Bunsen burner, wire gauze, ring stand, iron ring, hot pad
125 ml Florence flask
10 ml graduated cylinder
Hot gloves
Transfer pipette
Aluminum foil
oil
Popcorn

Procedure:

1. Record the mass of 16 kernels of popcorn.
2. Using the water displacement method, find the volume of 16 kernels. Dry the kernels.
3. Add ½ pipette full of oil and the 16 kernels to an empty; dry 125-ml Florence flask.
4. Determine the mass of the flask, oil, and 16 kernels of popcorn.
5. Cover the mouth of the flask with Aluminum foil and poke a small hole in the foil.
6. Place the flask on the wire gauze. Turn on the Bunsen burner with Ms. Randall.
7. **Watch** carefully so the popcorn does not burn. Record your observations.
8. Turn off the burner. Remove the flask using a hot mitt when most of the kernels have popped. DO NOT LET THE POPCORN BURN OR YOU WILL NEED TO START OVER!
9. Let the flask cool on the hot pad, remove the foil and reweigh the flask.
10. Clean all glassware. Throw out any uneaten popped corn.

Data:

Starting Volume of water _____ml
Volume of Water and 16 Popcorn Kernels _____ml
Volume of 16 Popcorn Kernels _____ml
Average Volume of One Popcorn Kernel _____ml

Mass of the 16 kernels of popcorn _____g
Mass of flask, oil and 16 kernels of un-popped corn _____g
Mass of flask, oil and 16 kernels of popped corn _____g

Analysis:

How did the average mass of the popcorn before popping compare to the mass of the popcorn after it was popped? Calculate the change in mass and the percent change in mass(m) using these formulas:

a. Change in Mass (Δm)

$$\Delta m = \text{Mass flask}_{\text{popped}} - \text{Mass flask}_{\text{unpopped}}$$

b. Percent Change in Mass

$$\frac{\Delta m}{\text{Mass}_{\text{unpopped kernels}}} \times 100\%$$

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Lab conclusion: Conservation of Matter-Analyzing Popcorn

<u>Conclusion questions</u> to be answered in Google classroom

Read the following:

POPCORN…
What makes it pop?

Popcorn pops because of its 13.5% water content, its starchy interior, and its non-porous shell. When we heat up the kernels the water molecules also heat up. This causes them to move faster, expand and change into a gas. The pressure inside the shell is so great that it causes the water vapor to condense again and combine with the starch of the kernel to make a jelly-like mixture. As we continue to add heat to the kernel, the pressure eventually becomes too great for the shell to contain the expanded and heated water and starch jelly-like mixture. The kernel then pops, releasing the pressurized liquid water and starch. The starch rearranges itself molecularly into the white crunchy poof you eat; the water, because it is now depressurized but still quite hot, is turned into water vapor.

1. Since the law of conservation of mass is always in effect, how can you explain this difference? Think about what you observed while you were heating the popcorn.

2. List a three ways that the experiment could be changed in order to capture the mass that appears to have been "lost" during this experiment.

3. Was the process of popping corn a physical or chemical change or both? Provide your reasoning for your answer using evidence from the reading passage and your observations from the activity.