Percentage of Water in Popcorn

Popcorn pops because of the natural moisture inside each kernel. When the internal water is heated above 100°C, the liquid water changes to a gas, which takes up much more space than the liquid, so the kernel expands rapidly.

The percentage of water in popcorn can be determined by the following equation.

*initial mass — final mass*

——— *^ 100 = percentage of H2O in unpopped popcorn initial mass*

The popping process works best when the kernels are first coated with a small amount of vegetable oil. Make sure you account for the presence of this oil when measuring masses. In this lab, you will design a procedure for determining the percentage of water in three samples of popcorn. The popcorn is for testing only, and *must not* be eaten.

Purpose

* **Measure** the masses of various combinations of a beaker, oil, and popcorn kernels using laboratory equipment.
* **Determine** the percentages of water in popcorn kernels.
* **Compare** experimental data from three brands of popcorn.

Materials

* aluminum foil (1 sheet)
* beaker, 250 mL
* Bunsen burner with gas tubing and striker
* kernels of popcorn (20 each brand)
* vegetable oil to coat the bottom of the beaker
* ring stand, iron ring, and wire gauze
* Electronic scale
* Tongs

**Always wear safety goggles and a lab apron to protect your eyes and clothing.** If you get a chemical in your eyes, immediately flush



the chemical out at the eyewash station while calling to your teacher. Know the locations of the emergency lab shower and the eyewash station and the procedures for using them.

**When using a Bunsen burner, confine long hair and loose clothing.** If your clothing catches on fire, WALK to the emergency lab shower and use



it to put out the fire. When heating a substance in a test tube, the mouth of the test tube should point away from where you and others are standing. Watch the test tube at all times to prevent the contents from boiling over.

Procedure

1. As you are conducting the experiment, record at least five qualitative observations that occur.
2. Measure the mass of a 250 mL beaker. Record the mass in the Data Table.
3. Add a small amount of vegetable oil to the beaker to coat the bottom of it. You need just enough oil to cover the kernels so they don’t burn. Measure the mass of the beaker and oil. Record the mass in the Data Table.
4. Add 20 kernels of brand A popcorn to the beaker. Shake the beaker gently to coat the kernels with oil. Measure the mass of the beaker, oil, and popcorn. Record the mass in the Data Table.
5. Subtract the mass found in step 3 from the mass found in step 4 to obtain the mass of 20 unpopped kernels. Record the mass in the Data Table.
6. Cover the beaker loosely with the aluminum foil. Punch a few small holes in the aluminum foil to let moisture escape. These holes should not be large enough to let the popping corn pass through.
7. Heat the popcorn until the majority of the kernels have popped. It is likely that not all kernels will pop. Stop heating before the popcorn burns!!! The popcorn pops more efficiently if the beaker is held firmly with tongs and gently shaken side to side on the wire gauze.
8. Remove the aluminum foil from the beaker and allow the beaker to cool for a few minutes. Then, measure the mass of the beaker, oil, and popped corn. Record the mass in the Data Table.
9. Subtract the mass in step 8 from the mass in step 3 to obtain the mass of the 20 popped kernels. Record the mass in the Data Table.
10. Subtract the mass in step 9 from the mass in step 5 to determine the mass of water that escaped when the corn popped. Record the mass in the Data Table.
11. Calculate the percentage of water in the popcorn. Show all work and record the final percentage in your data table.
12. Dispose of the popcorn in the designated container. Remove the aluminum foil, and set it aside. Clean the outside of the beaker, and dry it well. You do not need to dump out the oil left inside the beaker, add just enough for the next trial.
13. Repeat steps 3–12 for brand B popcorn.
14. Repeat steps 3–12 for brand C popcorn.

Disposal



1. Dispose of popped popcorn in the discard container. Aluminum foil can be disposed of in the trash bin. Do not eat the popcorn.
2. Clean beakers. Return beakers and other equipment to the proper place.
3. Clean all work surfaces and lab stations thoroughly before leaving the lab.

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| Data Table | | | |
|  | Popcorn Brand A | Popcorn Brand B | Popcorn Brand C |
| Mass of 250 mL beaker (g) |  |  |  |
| Mass of beaker +  oil (g) |  |  |  |
| Mass of beaker + oil +  20 kernels (before) (g) |  |  |  |
| Mass of 20 kernels (before) (g) |  |  |  |
| Mass of beaker + oil +  20 kernels (after) (g) |  |  |  |
| Mass of 20 kernels (after) (g) |  |  |  |
| Mass of water in 20 kernels (g) |  |  |  |
| Percentage of water in popcorn |  |  |  |

# Analysis

A well thought out evaluation of data collected. Identify all trends or outliers in the data. Did you achieve the results expected? Compare the three brands of popcorn and their percentage of water. Do you think there is a correlation between name brand popcorn and water content? Reflect upon the experiment and identify at least two possible errors that affected your measurements. As you reflect back upon the procedure and how you communicated and worked with your partner, identify at least two suggestions for improvement in the future that would improve your results, and make the lab run more efficiently.

Analysis needs to be in essay format using complete sentences with appropriate grammar and punctuation. Do not repeat the steps from your procedure.