

# Moisture Content of Popcorn - Statistical Analysis

## Introduction:

Many times when an experiment is done it is difficult to determine what is the correct or "best" answer. When data is collected, the results of individual trials will give a range of values. In this experiment, you will collect data for fifteen samples and use basic statistics to analyze the data and arrive at a "best" answer.

## Purpose:

The purpose of this experiment is to determine the moisture content of popcorn and to use basic statistics to analyze the results.

## Equipment/Materials:

popcorn	buret clamp
24-hole well plate	Bunsen burner
stirring rod	balance (11 or 0.1 mg sensitivity)

## Safety:

- An apron and goggles should be worn in the lab.
- Care must be taken not to touch the heated flask in this experiment.
- Eating food in the lab is not permitted.

**Procedure:**

1. Select 20 kernels of popcorn. Place each kernel in a well of a well plate. If more than one variety is available, also note the brand used. Additional kernels are used in case samples are burned or scorched.
2. Determine the mass of each kernel, and record the mass in your data table.
3. Using a few unweighed kernels, practice popping them. A standard buret clamp makes a convenient handle for the flask. Heat the flask gently and keep the popcorn kernel in constant motion. As soon as the kernel pops, invert the flask and let the popped kernel fall onto the lab table. If it sticks, a stirring rod may be used to dislodge it.
4. When you are satisfied with your technique, begin popping the weighed samples. Return each popped kernel to its position in the well plate. Continue until you have 15 popped kernels that are not burned or scorched.
5. Determine the mass of each kernel after popping. Record this mass in your data table.

**Calculations:**

1. Determine the mass lost by each kernel of popcorn and the percent of mass lost. For the 15 kernels that you have selected, calculate the average or mean percent mass lost.
2. Subtract the mean percent mass lost from each individual percent mass lost. Record this value in the data table. Finally, square this final value and record the value in the data table.
3. Using the formula provided on the data sheet, calculate the standard deviation for the percent mass lost.
4. In a "normal" distribution, 67 % or  $2/3$  of the samples are within  $\pm$  one standard deviation of the mean. Determine the number of trials that fall within this range for your data.

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

## Moisture Content of Popcorn

### Statistical Analysis

#### Data/Calculations:

Trial #	Mass Before	Mass After	Mass Lost	% Mass Lost	Mass Lost - Mean	(Mass Lost - Mean) <sup>2</sup>
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
Totals:						

$$\text{Mean} = \sum x/n$$

x = individual data

$$\text{Standard Deviation} = \frac{\sum (x - \bar{x})^2}{(n - 1)}$$

n = number of samples

**Questions:**

1. What was the nature of the mass lost? What indications did you have for this?
2. How many of your samples showed a mass loss that was +/- one standard deviation from the average mass lost?
3. Using the average mass of a popcorn kernel, how many kernels would you expect to find in a one-pound bag of popcorn?
4. If more than one brand of popcorn were tested, was there a difference in the moisture content? How might this affect popping?