Teacher’s Guide: What is the Pop in Popcorn?

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BSC 307

**1. Purpose**

Popcorn is one of the most popular snacks in America but nobody really understands why it goes from a kernel to an amazing snack. Through different experiments students will determine what the actual reason it pops is. Concepts of heating and pressure will be tied into this lab.

**2. Objectives**

• Understand that when heated there is a physical change in water (goes from a liquid to a gas).

• Comprehend how heat can cause pressure.

• Demonstrate an understanding of the scientific method by correctly creating a hypothesis, accurately performing measurements, collecting data, and using the data to form a conclusion.

• Calculate percentages based on data they collected.

**3. State Standards**

Stage I

11A3- Conduct inquiry investigation, using technologies for observing and measuring directly statistically-valid trials, and accurately and precisely recording all data.

12D2- Apply scientific inquiries or technological designs to defining the factors of pressure and its equilibrium, identifying how particles in a fluid can exert pressure.

**4. Materials**

Overall Materials:

-4 Balances

-4 Flasks

-4 Graduated cylinders

-aluminum

-4 Sharp probes

-Bag of kernels

-Cooking oil

-4 Hot plates

-4 plastic weighing cups

-8 Safety glasses

-4 Stop watches

-4 oven mitts

At each lab setup:

-1 Balance

-1 Flask

-1 Graduated cylinder

-aluminum

-1 Sharp probe (Use ahead of time)

-40 regular kernels

-20 saturated kernels (have to put in water overnight)

-10 broken in half kernels (To save time I did this myself, also reduced any safety risk by giving students a sharp object.)

-40 cooked kernels (have to prepare ahead of time by cooking in oven at 200o F for 90 minutes).

-Cooking oil

-plastic weighing cup

-1 Hot plate

-2 Safety glasses

-1 Stop watch

-1 oven mitt

**5. Time/length of lab**

-Power point with fun facts/ pre lab/ turn on hot plate – ten minutes

-Observation and data recording of lab – 20 minutes

-Analysis of data/group discussion – 10 minutes

-Clean up – five minutes

**6. Safety issues**

For the lab portion, students will be required to wear safety goggles while the hot plates are on and the water is being heated. This is to help prevent hot water from being splashed into the student’s eyes. Students should use oven mitts when handling anything that could be hot. When everyone is done using the hot plates that is when students can take off the glasses.

**7. Prelab/postlab discussion guide**

Prelab-Follow the PowerPoint then go over the introduction. Have students write there hypothesis then ask them about it.

Postlab-

1. Why is popcorn usually sold in tightly sealed containers?

Answer should be along the lines of preventing the kernel from drying out. Anything dealing with you don’t want the kernel to experience the elements is a good answer.

2. What caused the loss of mass when the kernels popped?

The kernel before heating had moisture in it. When heated the moisture is being released by evaporation. That is why it is losing mass.

3. Why were the kernels that were broken in half less likely to pop?

There was no pressure build up. Being broken means the shell can’t hold in the moisture/evaporation. So that moisture escapes without the kernel popping.

4. Why were the kernels less likely to pop after they had been heated for 90 minutes?

By precooking them the kernels dried up. This means that the moisture in the kernel won’t build up pressure and make the kernel pop.

5. Why were the kernels less likely to pop after being saturated over night?

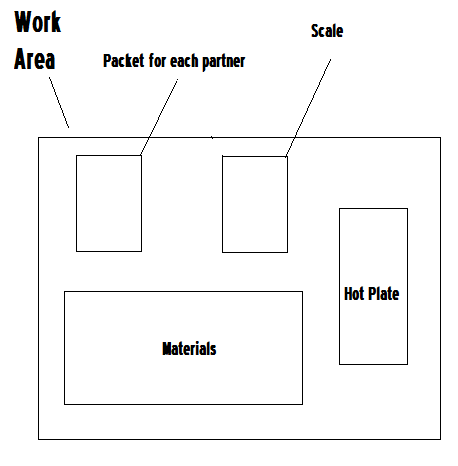
Kernels are less likely to pop because they have become over saturated from sitting in water. The ideal moisture content is 14%. Anymore would throw off the balance.

**8. Special Notes**

-An ideal kernel has 14% moisture.

-An ideal kernel has an inside pressure of 9 atm before it bursts.

**9. Diagram of the lab set up**

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**Each student will receive the materials listed above. The cooking oil will be shared by everyone though. Day before lab the teacher has to cook some kernels ahead of time, soak some kernels, and break kernels in half.**