Percent Composition Lab (Water in Popcorn)   Name:_____

https://www.youtube.com/watch?v=KjcWQLVizUk   Period:

Background:

People have been fascinated by popcorn for centuries. Some Native Americans believed that a spirit lived inside each kernel of popcorn. When heated, the spirit grew angry and would eventually burst out of its home and into the air as a disgruntled puff of steam. A less charming but more scientific explanation exists for why popcorn pops.

Popcorn is a type of maize, or corn, and is a member of the grass family. Popcorn is a whole grain and is made up of three components: the germ, endosperm, and pericarp (or hull). Of the 4 most common types of corn—sweet, dent (also known as field), flint (also known as Indian corn), and popcorn—only popcorn pops! Popcorn differs from other types of corn in that its hull has just the right thickness to allow it to burst open.

Each kernel of popcorn contains a small drop of water stored inside a circle of soft starch. **Popcorn needs between 13.5-14% moisture to pop. (#2)** The soft starch is surrounded by the kernel's hard outer surface. As the kernel heats up, the water begins to expand and at 100ºC the water turns into steam and changes the starch inside each kernel into a super-hot gelatinous goop. The kernel continues to heat to about 175ºC. The pressure inside the grain will reach 135 pounds per square inch before finally bursting the hull open. **Therefore, popcorn kernels pop because of the natural moisture inside each kernel changing from a liquid to a gas which takes up more space than liquid. (#1)**

As it explodes, steam inside the kernel is released. The soft starch inside the popcorn becomes inflated and spills out, cooling immediately and forming into the odd shape we know and love.

PreLab Questions:

1. Why does a popcorn kernel pop?

_____2. What does the % moisture have to be in order for a popcorn to pop?

_____ grams 3. If you have 250. grams of popcorn what mass is water? (Solve using proportion given below.)

$$\frac{14}{100} = \frac{x}{250.}$$

Safety:

Tie back long hair.

Wear goggles.

Use tongs or wear gloves or use hot pad or towel when picking up hot beaker.

Alert teacher if glassware breaks –let teacher pick up broken glass.

Materials:

Tongs, hotpad, safety gloves or towel	Goggles	Beaker	Foil
Weigh boat or paper towel for kernels	Popcorn	Tongs	Vegetable Oil

Procedures:

1. Put enough oil to coat the bottom of the beaker.
2. Measure the mass of the beaker, lid and oil. Record mass is data table.
3. Obtain popcorn kernels and measure their mass. (Zero out weigh boat/paper towel then add kernels.) Record mass is data table.
4. Add previous two masses and record in data table.
5. Light Bunsen burner. (Tie back long hair, never leave flame unattended.)

6. Place the flame under the ring and gauze on the ring stand. Place the beaker/popcorn with lid on the ring and heat/cook.

7. Once kernels begin to pop, softly shake the beaker.

8. After the kernels finish popping, leave beaker/lid and contents to cool.

9. Measure the mass of the beaker/lid/popped corn/oil. Record mass is data table.

10. Wash all equipment and dispose of popcorn. Lab popcorn is unsanitary and should not be eaten. Sanitary popcorn is provided in the classroom.

11. Answer all questions and complete all calculations.

Data Table

2.	Mass of beaker + lid + oil	
3.	Mass of popcorn kernels	
4.	Mass of beaker + lid + popcorn kernels + oil (add above two)	
9.	Mass of beaker + lid + **popped** corn + oil	

Calculations and Conclusion Questions

_____1. Calculate the mass of water in your popcorn. Show work.

(Mass of beaker + lid + popcorn kernels + oil - Mass of beaker + lid + **popped** corn + oil)

_____2. Find the percent water in the original kernels. Show work.

%   =   (answer to #1 above / #3 from chart) X 100

_____3. Use your value from question #2 as the experimental value and calculate the percent error. Show work.
(accepted value = 14%)

Percent error = Accepted value - Experimental value   X 100
                                    Accepted value

Conclusion: The mass of popcorn _____ (increases/decreases) as it pops due to water being

_____ (gained/lost) inside of the kernel. Typically, popcorn kernels will be _____ % water

by mass but ours calculated out to be _____ % water by mass.