

Doritos Lab

name: _____

Objective: To experimentally determine the number of Calories in Doritos chips and to compare our measured result to the actual number of Calories in the chips.

Procedure: Observe the set up as shown by the teacher. Set up your own ring stand and connect a glass rod to your can and suspend it above the table as shown. You will need a piece of aluminum foil approximately 6 x 6 inches. Tongs will also be needed.

Make sure that you

1. Find the mass of your dry can.
2. Add approximately 100 mL deionized water. All water into the can, not on the top of the can!
3. Mass the can with the water.
4. Prepare set up as shown in the diagram.
5. Measure your initial water temperature. 3 significant figures.
6. Mass your Doritos on the balance.
7. Get a metal tongs or tweezers to hold the chip gently.
8. Set chip on fire and IMMEDIATELY move the burning chip under the can to heat the water up.
9. Record the HIGHEST water temperature.
10. When chip ash cools off throw it away.
11. Wipe off the thermometer and tools using soap and water.
12. The soot on the can will stain your fingerprints, put into the trash as shown.

Using the Nutritional Label on the chips

Serving size in grams: _____ g

Calories in one serving: _____ C

| Data Table | |
|-----------------------|------------------------------------|
| Mass of the empty can | Mass of the chips |
| Mass of can + water | Start Temp of water (nearest 10th) |
| Mass of water (start) | End Temp of water (nearest 10th) |

CALCULATIONS (9 x 2 = 18 points): USE LOTS OF PAPER, use units in all math!

- Determine the amount of heat gained by your water from the burning chip. Use the proper heat formula and use correct units.
- Convert that number of joules in question one into Calories. This is your measured value of Calories.
- Calculate how many Calories were in your chip. This is your actual value of Calories.
- Determine your % Error for this experiment - number of Calories absorbed by the water vs. the number of Calories that are really in your particular chip.
- Explain where this error came from. Be sure to recognize if your error is under or over and make sure your explanation reflects this.
- Draw a bomb calorimeter with labels. Explain how it works and why a real one is better than the can calorimeter. Write at least 3 full sentences. (it's not the cost.)

More questions continued on next page

Number 7, 8 & 9 are thermochemistry problems that are unrelated to the lab you just did.

7. Ice has a specific heat capacity constant of 2.10 J/g·K. How much energy does it take to convert a 74.50 gram ice cube from your home freezer at -6.00°C to body temperature of 37.0°C? (note this is a 3 step thermochem problem - warming ice, melting ice, and warming up the water. Sum the joules.)
8. If you have 150.75 grams of aluminum at -12.00°C and it gets warmed to a warm 46.05°C, how much energy IN FOOD CALORIES is needed to do this? (The C of Al is 0.897 J/g·K) (hint: What is the melting point for water and for aluminum?)
9. Calculate the energy in joules required to: warm up 2.25 liters of water from 292 Kelvin, at standard pressure, to the boiling point, then vaporize 0.757 liters of that water into steam. (hint, this is a difficult 2 step problem, a diagram will help. You must use ALL UNITS, pay attention to the masses, sum the joules)

| YOUR LAB REPORT | PARTS TO EACH SECTION | POINTS |
|------------------------|--|------------------|
| cover | Title and descriptive introduction | 1 + 1 |
| 2 | data table | 1 |
| 3 | calculations and problems | 2 x 9 = 18 |
| 4 | <p>Conclusion - this is a total retelling of the work you did and the knowledge you gained.</p> <p>Make sure you include YOUR DATA POINTS to tell your story.</p> <p>Tell the general plan of the lab. Tell what you measured, and then tell what you calculated. What was your percent error, and explain where it came from.</p> <p>What can you conclude about calorimeters made from cans vs. professional ones?</p> | 4 |
| Lab due on: _____ | | Total points: 25 |