Biology _____ **Instructor: Barton Clark.**
Casa Grande High School **name here please** **period 2, 3, 4, 6** **October, 2024**

Lab: Determining the energy density of an alternative biofuel feedstock. 20 pts.

Objective: Students will initiate the combustion reaction using Dorito Corn chips as a feedstock and attempt to capture the heat released with a known mass of water. From the change in temperature of the water and through repeated trials, students will estimate the energy density of these bio-fuels in standard energy-density units of joules/gram.

Warm up: Critical thinking. Take a moment, and considering all of those times as a kid when you were playing with matches, think about how much energy might be released by burning this corn chip.

- Guestimate by how much the temperature of the water will rise due to burning 1 chip _____
- Guestimate how many joules will be released in this process. _____

Directions for each trial

1. Weigh empty 250 ml beaker
2. Add water (1/2 -2/3 full) then weigh it again
3. Subtract 1 from 2 to determine mass of H_2O
4. Take initial temp of H_2O
5. Weigh one, unburned chip (whole)
6. Light the chip on fire.. let it burn until done.
7. Record the final temperature of the water.
8. Weigh the burned chip (black, pure carbon now).
9. Determine the **ΔQ** for each trial.

Trial 1	Trial 2	Trial 3	Trial 4	Trial 5

Use the Specific Heat Equation to determine heat absorbed by water from the burning corn chip.

$\Delta Q = m \cdot \Delta T \cdot Cp$

Determine the energy density by creating a graph with the joules of heat captured on the Y axis and the Mass of each chip on the X axis.

Determine the efficiency of your system by adding up all of the weights of the burned chips (now just Carbon) and how much heat would have been gained had this mass burned as well.. (divide the energy you captured by the total energy that SHOULD have been produced to determine the efficiency of the system)

1. Show your math for each calculation on the back of this sheet.
2. Graph your data. Use Excel or google sheets (or a similar professional program) to plot mass of each chip on the X-axis and Heat absorbed in each case. This should be a series of "dots" on a graph. Be sure to label all axis, including units and put a meaningful title at the top of the graph as well.
3. Print your graph out and use a ruler to estimate the "best fit" straight line graph through the data.
4. Using two points on the graph which are NOT your data points, determine the slope of the line. Be sure to include units. (show your math for that calculation somewhere on the graph).
5. Staple your completed graph to this sheet to hand in.

Extra credit: Based on the advertised serving size of these chips (and the advertised calories per serving) determine the percent efficiency of energy capture of our Thermal Energy Containment Systems.