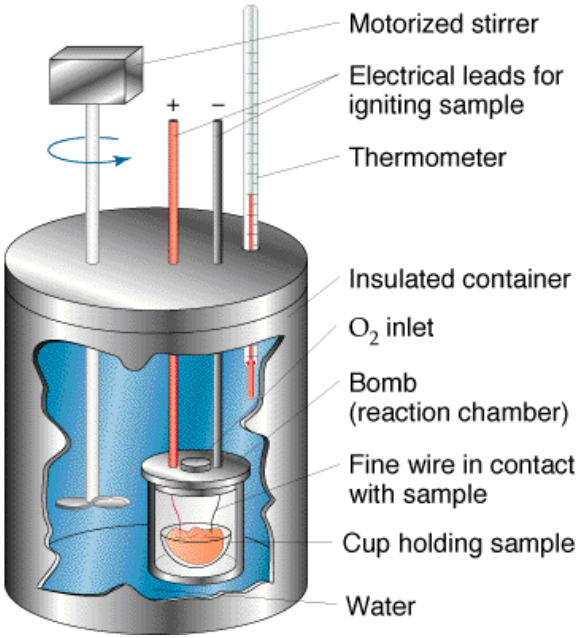
Food Calorimetry

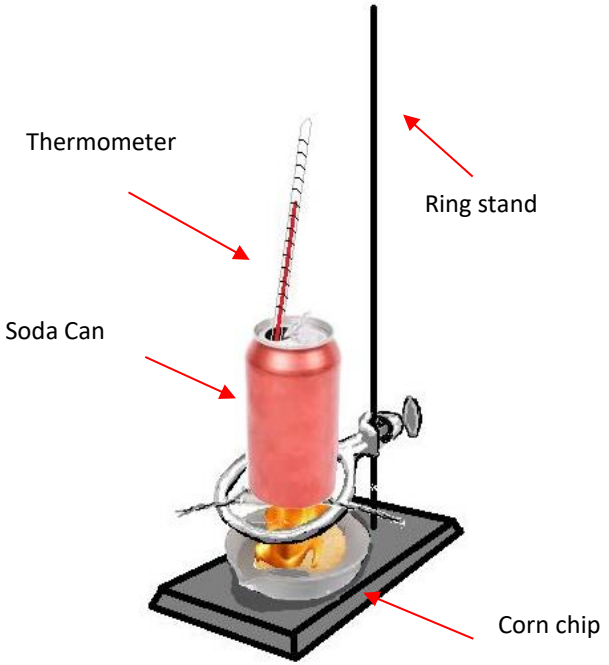
Using a calorimeter to determine the number of calories in food

Calorimeter:

- An insulated device used to measure the absorption or release of heat in chemical or physical processes
- Calorimeters may be simple- such as soda cans or complex like a bomb calorimeter
- In this lab we use a soda can

Solving for Heat Changes

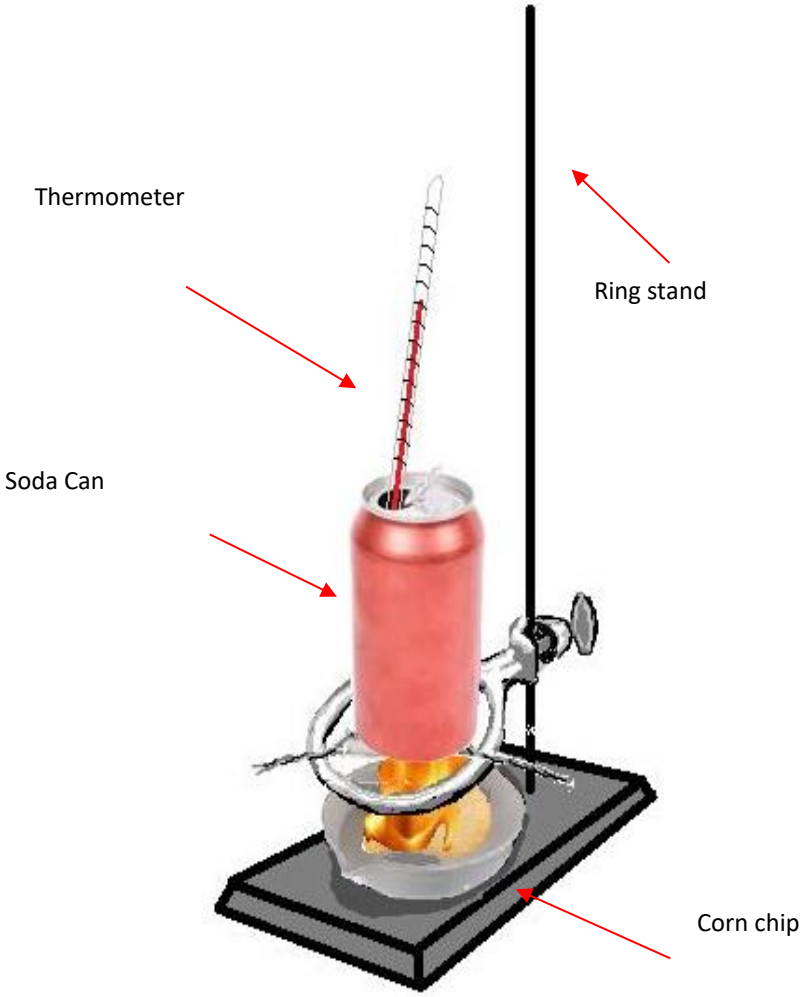




Food Calorimetry:

- Used to determine how much energy is contained in different kinds of food.
- The burning of a food sample releases energy in the form of light and heat.
- We can use water to measure the amount of heat released when food is burned.

Solving for Heat Changes



Food Calorimetry:

A potato chip with a mass of 11.5 g was placed in an aluminum dish under a soda can that contained 50.0 g water at 22.0°C

The chip was lit on fire with a match and allowed to burn until the flame went out.

The water in the soda can reached a temperature of 92.0°C

The final mass of the burned chip was 2.5 g

Heat Gained by Water:

$$q_{water} = m_{water} \cdot c_{water} \cdot \Delta T_{water}$$

Where:

$q_{water} = heat\ (cal) gained\ by\ water$

$m_{water} = mass\ of\ the\ water$

$c_{water} = \frac{1.00\ calorie}{g \cdot {}^{o}C}$

$\Delta T_{water} = T_2 - T_1$

Heat Gained by the Water

Water

$T_1 = 22.0\ ^oC$

$T_2 = 92.0\ ^oC$

$\Delta T = 70.0\ ^oC$

$m = 50.\ g$

$c = 1.00\ cal/g^oC$

$$q = m \cdot c \cdot \Delta T$$

$$q = 50.\ \cancel{g} \cdot 1.00\ \frac{cal}{\cancel{g} \cdot \cancel{^oC}} \cdot 70.0\ \cancel{^oC}$$

$$q = 3500\ cal = 35\ Kcal$$

So the heat gained by the water = 3500 calories

Heat contained in the Chip

Heat gained by the water = Heat lost by the chip

Potato Chip

$q_{chip} = 3500$ cal

$m_{initial} = 11.5$ g

$m_{final} = 2.5$ g

$\Delta m = 9.0$ g

$$Heat\ in\ the\ chip = \frac{calories}{g}$$

$$Heat\ in\ chip = \frac{3500\ cal}{9.0\ g} = \frac{388.8\ cal}{g}$$

$$Heat\ in\ chip = \frac{3500\ cal}{9.0\ g} = \frac{390\ cal}{g}$$