Bomb Calorimeter

$\Delta E = q + w$

Bomb Calorimeter doesn't permit the burning sample to expand (*the "bomb" is very strong*).

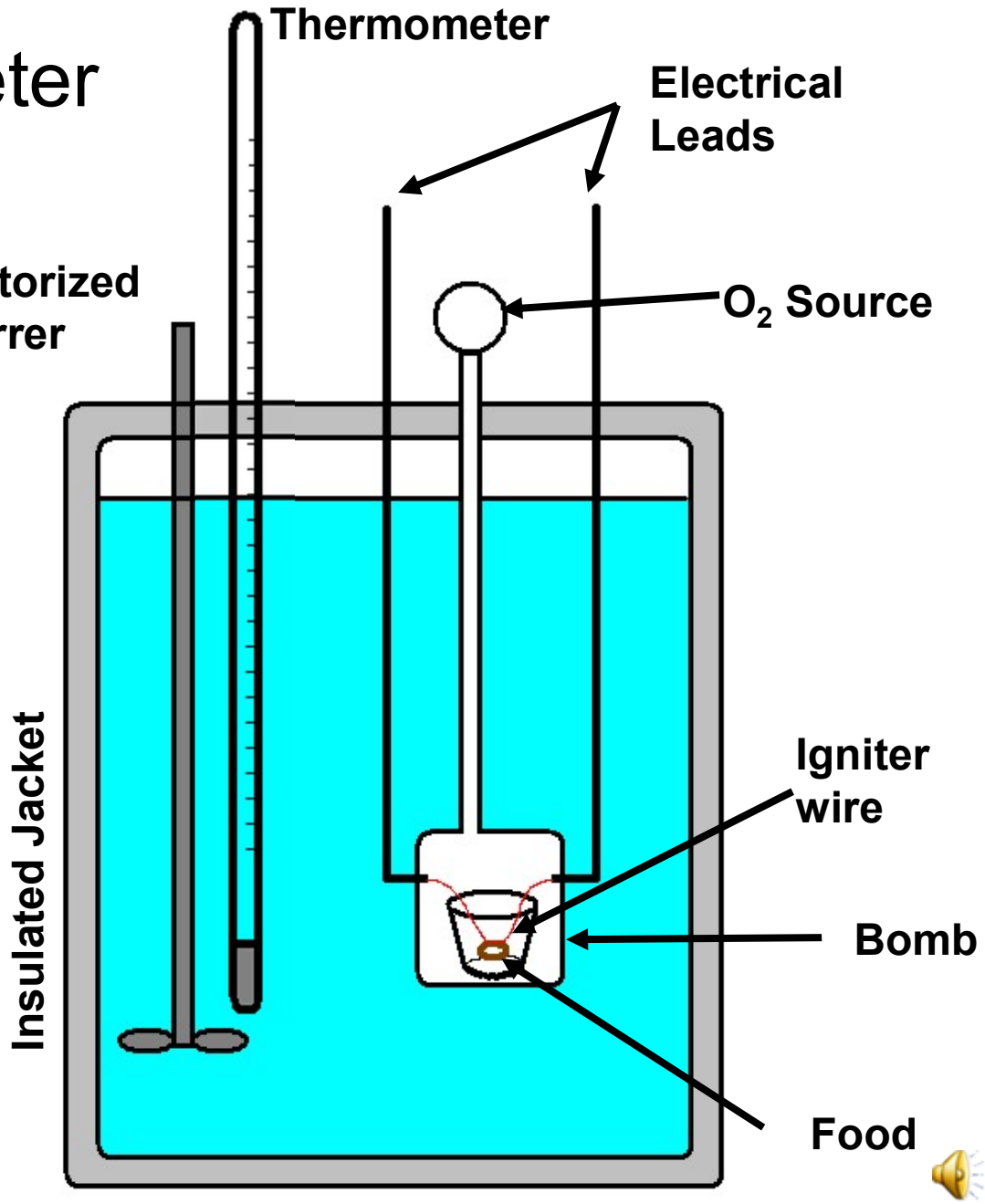
No expansion, ...

No ΔV...

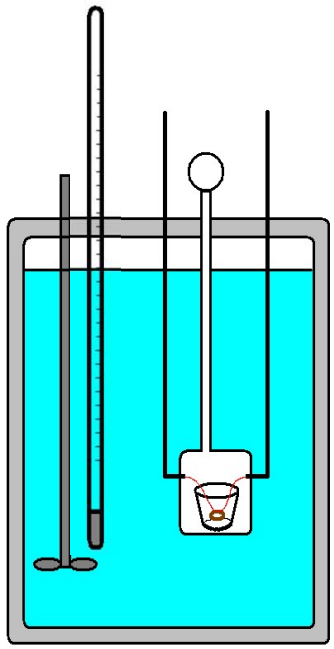
No work done.

$\Delta E = q$

Heat collected is equal to the actual amount of energy available from the food material.



Bomb Calorimeter (Problem 6.45)

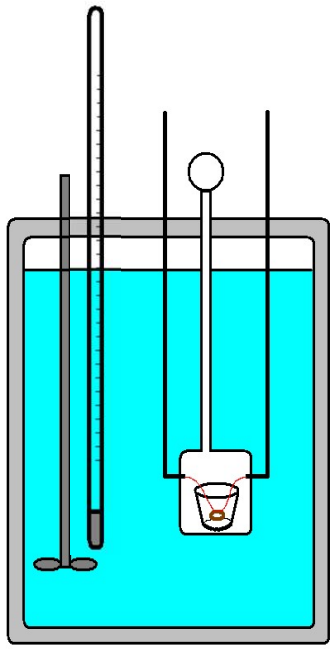


A chemical engineer studying the properties of fuels placed **1.500 g of a hydrocarbon** in the bomb of a calorimeter and filled it with O_2 gas.

The bomb was immersed in **2.500 L of water** and the reaction initiated. The water temperature rose from **20.00°C to 23.55** °C.

If the calorimeter (excluding the water) has a **heat capacity of 403 J/ °C**, what was the heat of combustion per gram of the fuel?

Bomb Calorimeter (Problem 6.45)



Heat Lost
(hydrocarbon)

$$\begin{array}{r} -37133 \text{ J} \\ +\ -1430.65 \text{ J} \\ \hline -38563.65 \text{ J} \end{array}$$

What was the heat of combustion ***per gram*** of the fuel?

$$\frac{-38563.65 \text{ J}}{1.500 \text{ g}_{fuel}} = -25710 \text{ J/g}$$

Heat gained ***(water)***

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

$$q = 2500.\text{g} \times 4.184 \text{J/g}^{\circ}\text{C} \times 3.55^{\circ}\text{C}$$

$$q = 37133 \text{ J}$$

Heat gained ***(calorimeter)***

$$q = C_{calorimeter} \times \Delta T$$

$$q = 403 \text{J/}^{\circ}\text{C} \times 3.55^{\circ}\text{C}$$

$$q = 1430.65 \text{ J}$$