

Calorimetry

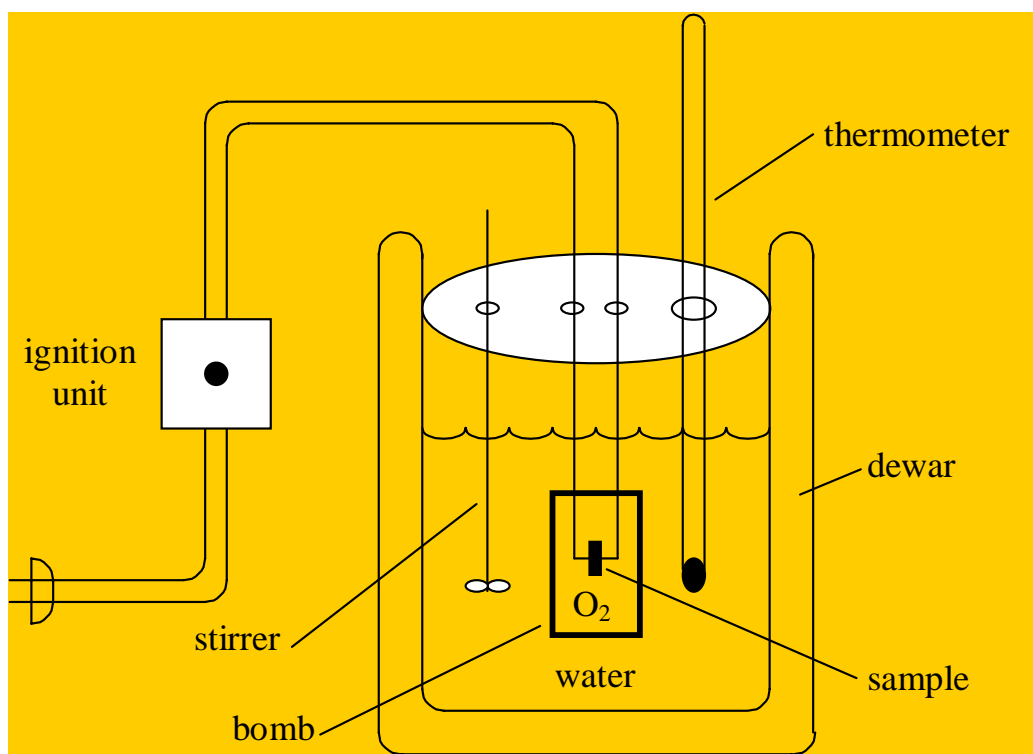
Water absorbs heat and the temperature increases.

[A bathtub of water will absorb more heat than a cup of water]

Specific Heat-

The amount of heat absorbed to raise the temperature of one gram of water by 1 degree Celsius.

Bomb Calorimeter- device used to measure heat exchange in a chemical reaction



When a chemical reaction occurs in the coffee cup calorimeter, the heat of the reaction is absorbed by the water. The change in the water temperature is used to calculate the amount of heat that has been released (or absorbed).

When a peanut is burned, heat is released.

The heat is absorbed by the water (in the calorimeter).

The amount of heat is calculated using the specific heat of water:

$$\text{Amt. of heat} = (\text{specific heat}_{\text{H}_2\text{O}}) \times (\text{mass}_{\text{H}_2\text{O}}) \times (\text{temp change})$$

Example calculation:

- mass of peanut burned = 0.255 g
- 5.2°C temp increase = 5.2°C
- mass of water in calorimeter = 200 g

Amount of heat is calculated in calories per gram:

$$q = (1 \text{ cal/g} \cdot ^\circ\text{C}) \times (200 \text{ g}) \times (5.2^\circ\text{C}) = \underline{1040 \text{ cal}} = \underline{1.04 \text{ kcal}}$$

Amount of heat per gram:

$$1040 \text{ cal} / 0.225 \text{ g} = \underline{4622 \text{ cal/g}} = \underline{4.6 \text{ Cal/g}}$$

Manufacturer's Claim:

- 150 Cal per serving = (150,000 Cal or 150 kcal)
- 1 serving = 28 g
- 150 Cal/28g = 5.4 Cal/g