

Human Biochemistry

Introduction

What we look at

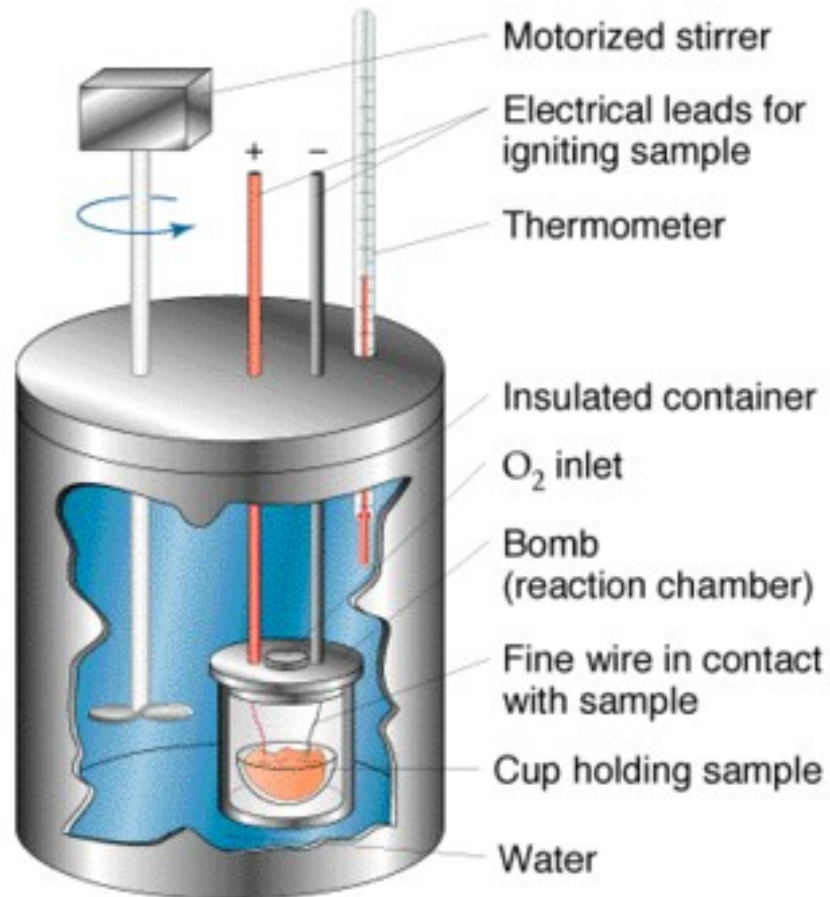
- Energy
- Proteins
- Carbohydrates
- Lipids
- Micronutrients and Macronutrients
- Hormones
- Enzymes (AHL)
- Nucleic Acids (AHL)
- Respiration (AHL)

Energy

- We derive our energy from the oxidation of food
 - Fats (37 kJ g⁻¹)
 - Carbohydrates → CO₂ + H₂O + energy
 - Proteins (17 kJ g⁻¹)
- Males have a RDI of 10500 kJ, females 8000 kJ
- Lipids have a greater ratio of H:O than carbohydrates (16:1 compared to 2:1)

Calculating Energy from Food

- Use calorimeter



Question 1

1.00 g cereal raises the temperature of 400 cm³ water in an insulated food calorimeter from 23.7 °C to 33.4 °C. Calculate the energy value per gram of the cereal, assuming the heat capacity of the calorimeter is negligible and given the specific heat of water = 4.18 J g⁻¹ C⁻¹.

solution

Heat produced = heat absorbed by water

$$= (m \times c \times \Delta T)_{\text{water}}$$

$$= [400 \text{ g} \times 4.18 \text{ J g}^{-1} \text{ C}^{-1} \times (33.4 - 23.7) \text{ }^{\circ}\text{C}]$$

$$= 16.2 \text{ kJ per gram of cereal.}$$

Question 2

A large apple weighs 150 g. In a laboratory investigation, a 15.0 g sample of the apple, on complete combustion, raises the temperature of 200 g water in a glass container by 45.3 °C. Calculate the energy value of the whole apple. The heat capacity of the glass calorimeter = 89.1 J °C⁻¹ and the specific heat of water = 4.18 J g⁻¹ °C⁻¹.

solution

Heat produced = heat absorbed by water + heat absorbed by calorimeter

$$= (m \times c \times \Delta T)_{\text{water}} + (m \times c \times \Delta T)_{\text{calorimeter}}$$

$$= (200 \text{ g} \times 4.18 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1} \times 45.3 \text{ }^{\circ}\text{C}) + (89.1 \text{ J }^{\circ}\text{C}^{-1} \times 45.3 \text{ }^{\circ}\text{C})$$

$$= (37871 + 4036) \text{ J}$$

$$= 41907 \text{ J}$$

$$= 41.9 \text{ kJ (produced by 15.0 g of apple)}$$

Thus the energy value of the 150 g apple is 419 kJ.