Energy content of food

Science Background

Energy released

The energy realized during burning of an item of food can be calculated by using the following formula:

Energy release from food per gram (J) = heat absorbed by water / mass of food sample.

Where heat absorbed by water is calculated by using

$$Q = m * c * \Delta T$$

where m the mass of water heated, c the specific heat of water (4.2 $J*g^{-1}*deg^{-1}$, the number of joule taken to raise the temperature of 1 g of water by 1 °C) and ΔT the temperature rise.

1 mL of water has a mass of 1 g. If the number is more than 1000 J/g, express it as kilojoules (kJ): 1 kilojoule = 1000 joules.

Finally knowing the mass (in g) of the burnt item (the final mass – the initial mass) the energy content per gram (J/g) can be calculated.

Calories

In dealing with energy content of food, it might be useful to use the **calorie** as a unit of measurement. Most students recognize this unit from commercials on television and labels of food and already associate this unit with the energy content. When asked, most students are able to mention the average daily energy need for humans.

A calorie (per definition) is the energy (in joule) necessary to increase the temperature of 1 gram of water by 1 degree. In order to use calories as a unit, you simply have to omit c from Q = c * m * ΔT. The resulting value for Q will then be in calories.

On the next page, you can find a table of approximate energy content of some biological molecules.

Energy of food

The energy content of different type of food is summarized in the table below. Each type of food has a specific role to play in metabolism.

Food	Energy content (per gram)
Fats	9 kcal/g (37.7 kJ/g)
Alcohol	7 kcal/g (29.3 kJ/g)
Protein	4 kcal/g (16.7 kJ/g)
Carbohydrates	4 kcal/g (16.7 kJ/g)
Fibre	2 kcal/g (8 kJ/g)
Vitamins and Minerals	Nil
Water	Nil

The medium day demand for the energy is about 2000-3000 kcal. The energy consumption depends on the person gender, age and lifestyle.