

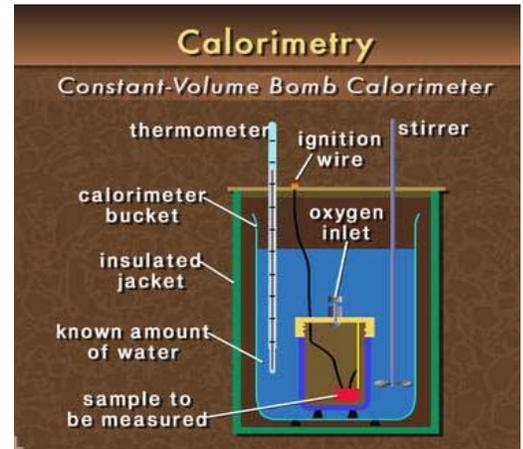
Calories are a unit of measurement for energy. As units of measurement go, the calorie is somewhat of an antique. The calorie was developed in the early 19<sup>th</sup> century, long before the current metric system was created. About the only people who regularly measure energy in calories are nutritionists. Many people think the calorie is the worldwide energy unit because the only energy information they see is on food nutrition labels, which are provided by nutritionists. However, the joule is the SI unit that scientists use to measure energy.

One calorie is the amount of energy needed to increase the temperature of one gram of water by 1.0 °C. One calorie is not enough to get someone out of bed in the morning. Food labels list energy in a deceptively similar unit: food calories. Food calories are not the same as calories. Sometimes food calories are written as “Calories.” The capital ‘C’ distinguishes them from the other type of calories.

One food calorie is equivalent to one kilocalorie. Thus, one Calorie is one thousand times the energy of one calorie. The unit symbol for Calories is “Cal.” For converting to metric, 1 Cal = 4.2 kJ.

The amount of energy in a food product can be estimated by combusting a dry sample of it in a calorimeter. The energy released is calculated from the temperature rise of the water surrounding the combustion chamber. The process the human body uses to get energy out of food is called cellular respiration. Although many reactions are involved, the overall reaction is a simple combustion during which the glucose from food reacts with oxygen to produce carbon dioxide and water. Burning the food in the calorimeter is similar, but the energy values are higher than the body can get out of the same food because the human body is less efficient.

Food calories listed on nutrition labels can be found by adding up the calories for each constituent item. Food labels show calories from each of three sources: fats, carbohydrates, and proteins. The calorie content of each type of food can be calculated from these conversion factors: fat, 9 Cal/g; carbohydrate, 4 Cal/g; and protein, 4 Cal/g. These conversion factors can be applied to the nutrition label from a box of spaghetti.



A calorimeter measures heat released by a reaction.

Nutrition Facts	
Valeur nutritive	
Per 1/5 of package (91 g) / pour 1/5 au paquet (91 g)	
Amount Teneur	% Daily Value % valeur quotidienne
<b>Calories / Calories</b> 330	
<b>Fat / Lipides</b> 2 g	3 %
Saturates / saturés 0.5 g + Trans / trans 0 g	3 %
<b>Cholesterol / Cholestérol</b> 0 mg	
<b>Sodium / Sodium</b> 2 mg	1 %
<b>Carbohydrate / Glucides</b> 65 g	22 %
Fibre / Fibres 9 g	36 %
Sugars / Sucres 3 g	
<b>Protein / Protéines</b> 13 g	
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	0 %
Calcium / Calcium	2 %
Iron / Fer	50 %

One serving of spaghetti provides 330 Cal of energy.

$$\begin{array}{r} \text{Fat: } 2\text{ g} \times 9\text{ Cal/g} \qquad \qquad = 18\text{ Cal} \\ \text{Carbohydrates: } 65\text{ g} \times 4\text{ Cal/g} = 260\text{ Cal} \\ \text{Protein: } 13\text{ g} \times 4\text{ Cal/g} \qquad \qquad = 52\text{ Cal} \\ \hline \text{Total:} \qquad \qquad \qquad \qquad \qquad \qquad 330 \end{array}$$

Thus, 330 Calories is the value shown on the label.

The table shows how many calories a person burns in an hour for several everyday activities.

Energy Expended By a 70-kg (154-lb) Person	
Activity	Energy Expended Cal/hr
Sleeping	60
Sitting	100
Walking	200
Swimming	500
Running	550

Some activities require more energy usage than others.

People cannot convert all of the energy they get from food into energy they can use for activities. How much usable energy does a person get from one Calorie? Only about 20% of the energy intake is converted to usable energy. In other words, eating one Calorie of food only gives a person 0.2 Calories of usable energy.

In a practical sense, how much energy does a person get from a 330 Calorie serving of spaghetti? If a person ate a 330 Cal plate of spaghetti, they would get 66 Cal of usable energy ( $330 \times 20\% = 66$ ). A 70-kg person burns about one Calorie climbing 10 stairs. That means that one 330 Calorie serving of spaghetti would give a 70-kg person enough energy to climb up to about the 66<sup>th</sup> floor of a high-rise building.