



## The first law of thermodynamics in real life

A doctor leading a weight loss group responded to a question posed by her group as to why they were unable to lose weight. She said it was all because of the Law of Conservation of Mass, also known as the Law of Thermodynamics. “This law of physics”, Dr. Val Jones wrote, “states that matter cannot be created or destroyed, although it may be rearranged”. That means that to lose weight, someone else has to gain it, since fat cannot be destroyed only rearranged. So, give your fat to someone else, she said. To that end, she’s been baking cookies.

Of course, that was all in fun and the law of thermodynamics doesn’t really work that way. The most important part of the Law of Thermodynamics is left off.

Did you catch it?

As is often the case when science is dumbed down into sound bites, it becomes wrong. Such is the case in the distortion of the Law of Thermodynamics which has been simplified into the popular wisdom: “Calories in = calories out”.

While it might seem inconceivable, this simplified maxim is little more than superstition and urban legend.

The first Law of Thermodynamics, or energy balance, basically states that in a closed system, energy can neither be created nor destroyed, only transformed or transferred.

The human body is not a machine. There are countless, wildly varying, variables involved. Understanding this helps to explain why calories cannot be balanced like a chequebook, and why people never seem to gain or lose weight precisely as calculated.

Balance in an open system, like the human body, is when all energy going into the system equals all energy leaving the system plus the storage of energy within the system. But energy in any thermodynamic system includes kinetic energy, potential energy, internal energy, and flow energy, as well as heat and work processes.

In other words, in real life, balancing energy includes a lot more than just the calories we eat and the calories we burn according to those exercise charts.

(Taken from <http://junkfoodscience.blogspot.com/2008/10/first-law-of-thermodynamics-in-real.html>)

## EXERCISES

### 1 True or false?

- a. When science is dumbed down it is often misinterpreted.  T  F
- b. The human body can be thought of as a closed system.  T  F
- c. If you perfectly balance the calories you eat with the calories you burn you can lose weight.  T  F
- d. According to the misconception of the first paragraph, if you lose weight, someone else has to gain it.  T  F

### 2 Find the mistake in each sentence and correct.

- a. Matter can be created or destroyed.
- b. When science is dumbed down it becomes right.
- c. The human body is like a machine.
- d. People always gain or lose weight precisely as calculated.

### 3 Match questions and answers.

QUESTIONS		ANSWERS	
A	What is a balanced open system?	1	The first law of thermodynamics.
B	How many forms of energy are there in a thermodynamic open system like the human body?	2	It is a system in which all energy going into the system equals all energy leaving the system plus the storage of energy within the system.
C	Which physics law is popularly simplified in “calories in = calories out”?	3	In a thermodynamic open system such as the human body, kinetic energy, potential energy, internal energy, and flow energy, as well as heat and work processes, may all be present.
A .....		B .....	
		C .....	