Answer on Question #64835, Physics / Other

2000 calories of heat are given to a thermodynamic system and the system does 3350 joule of external work. In this process the internal energy of the system is increased by 5030 joules. Calculate the value of the conversion factor J.

Solution:

The first law of thermodynamics defines the internal energy (E) as equal to the difference of the heat transfer (Q) into a system and the work (W) done by the system.

$$E_2 - E_1 = Q - W$$

In our case,

$$\Delta E = E_2 - E_1 = 5030 \text{ J}$$
$$W = 3350 \text{ J}$$

Thus,

$$Q = \Delta E + W = 5030 + 3350 = 8380 \text{ J}$$

From given,

$$Q = 2000 \text{ cal}$$

The conversion factor J is

$$k = \frac{8380}{2000} = 4.19$$

Answer: 1 cal = 4.19 J