

Heat is an energy transfer between a system and its surroundings that is the result of random motion in the surroundings. Note the difference between a work process and a heat process. In the former, there must be organized motion in the surroundings, but in the latter, the energy transfer is a result of random motion in the surroundings. When a glass of water is placed on a hot plate, energy will spontaneously leave the hot plate and cause the internal energy of the water to increase. Heat will always flow spontaneously from the system at higher temperature to the system at lower temperature, but heat can be made to flow in the opposite direction as well if work is done in the process. For example, a refrigerator relies on work done by its compressor to move heat from a cold freezer into a warm kitchen.

Heat is a term that is used all the time in everyday life. In this context, it's okay to talk about the "amount of heat in a hot object," but in the classroom it is important that we emphasize the precise meaning of this term. A hot object may contain a lot of internal energy, but it does not contain heat. Unfortunately, physics textbooks are often guilty of sloppy usage. Phrases like "as friction slowed the block, heat was generated in the sliding surface" are not difficult to find. As the block slows, the organized motion of the block does work on the sliding surface and increases its internal energy. Such sloppy usage masks the essential difference between a work process and a heat process, and a solid grasp of the first law of thermodynamics cannot be achieved without understanding this distinction.