Revista Brasileira de Ensino de Física
https://doi.org/ 10.1590/1806-9126-RBEF-2025-0414

Suplementary Material to “Problem-solving in pre-service physics teacher education: A didactic analysis of the role and use of metacognitive skills”

Appendice A: Problem scenario 1: Maxwell's Demon

Imagine a container at a constant temperature and pressure, divided into two chambers by a partition. A hypothetical agent, often referred to as "Maxwell's Demon," possesses perfect knowledge of the position and velocity of every gas particle within the container. This demon can operate a small, massless door in the partition, opening it to allow only fast-moving particles to pass from one chamber to the other, and only slow-moving particles to pass in the opposite direction. Over time, this selective process leads to an accumulation of fast-moving particles on one side, increasing its average kinetic energy (and thus, temperature), while the slow-moving particles accumulate on the other side, decreasing its average kinetic energy. This outcome appears to create a temperature difference from an initially uniform state without the expenditure of work, a seeming violation of the second law of thermodynamics.