Reversible and Irreversible Processes

Process 1: A block slides down an inclined plane with friction and no restraining forces.
Process 2: A cold canned drink is left in a warmer room where its temperature rises as a result of heat transfer.
Are these processes reversible or irreversible?

Answer: 1) irreversible; 2) irreversible.

Explanation: 1) As the block slides down the plane, two things happen, (a) the potential energy of the block decreases, and (b) the block and plane warm up because of the friction between them. The potential energy that has been released can be stored in some form in the surroundings (e.g., perhaps in a spring). When we restore the system to its original condition, we must (a) restore the potential energy by lifting the block back to its original elevation, and (b) cool the block and plane back to their original temperatures. The potential energy may be restored by returning the energy that was stored during the original process as the block decreased its elevation and released potential energy. The portion of the surroundings in which this energy had been stored would then return to its original condition as the elevation of the block is restored to its original condition. In order to cool the block and plane to their original temperatures, we have to remove heat from the block and plane. When this heat is transferred to the surroundings, something in the surroundings has to change its state (e.g., perhaps we warm up some water in the surroundings). This change in the surroundings is permanent and cannot be undone. Hence, the original process is irreversible.
2) The process cannot be reversed because it involves heat transfer through a finite temperature difference. Heat cannot flow from a lower to a higher temperature.