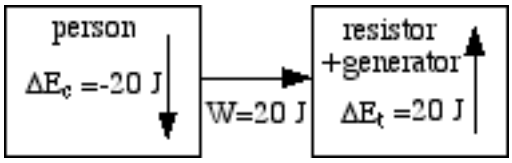
Energy Diagrams and Conservation of Energy

$\Delta E = W$

Situation 1: A person does 20 J of work turning the handle of a generator. 20 J of thermal energy are produced in the resistor, and 20 J of chemical energy are consumed in the person.

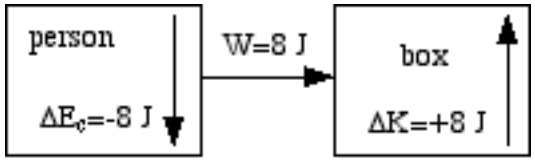


Subsystems

person: $\Delta E_c = -20\ \text{J}$

generator +resistor: $\Delta E_t = +20\ \text{J}$

Situation 2: A person pushes a box across a very very smooth table (no friction). The person exerts a force of 4 N over a distance of 2m, doing 8 J of work and 8 J of chemical energy are consumed in her body. The box gains 8 J of kinetic energy.

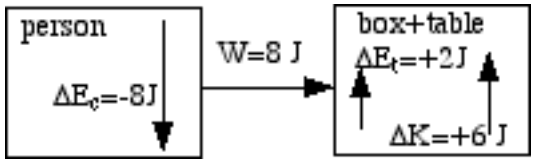


Subsystems

person: $\Delta E_c = -8\ \text{J}$

box: $\Delta K = +8\ \text{J}$

Situation 3: A person pushes a box across the a table whose surface is not smooth. 8 J (4 N over 2 m) of work are done by the person, and 2 J of work are done by friction (1 N over 2 m). The box gains 6 J of kinetic energy and as a result of the work done by friction 2 J of thermal energy are produced in the box and the table. 8 J of chemical energy are consumed within the person.



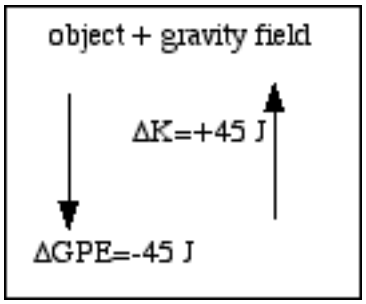
Subsystems

person: $\Delta E_c = -8\ \text{J}$

box + table: $\Delta K + \Delta E_t = +8\ \text{J}$

$6\ \text{J} + 2\ \text{J} = 8\ \text{J}$

Situation 4: An object , while falling, loses 45 J of gravitational potential energy and gains 45 J of kinetic energy.



Note: This is a closed system. W=0 (no transfer externally).

System
object+ gravity field: $\Delta K + \Delta GPE = 0$