“Humpty Dumpty sat on a wall.  
Humpty Dumpty had a great fall  
All the king’s horses and all the king’s men  
Couldn’t put Humpty Dumpty together again”

* Martin Schullinger-Krause (PH202 Winter 2008)
Adiabatic ("not passable") processes
(no heat is gained or lost by the system \( Q = 0 \), i.e. system perfectly isolated)

\[ Q = 0 \text{ and so } \Delta U = -W \]

\[ P V = \text{constant (isothermal)} \]

\[ P V^\gamma = \text{constant (adiabatic)} \]

\[ \gamma = \frac{C_P}{C_V} \]

For a monoatomic gas
therefore \( \gamma = \frac{5}{3} \)
If an amount of heat $Q$ flows into a system at constant temperature, then the change in entropy is

$$\Delta S = \frac{Q}{T}.$$ 

Every irreversible process increases the total entropy of the universe. Reversible processes do not increase the total entropy of the universe.
Example: An ice cube at 0.0 °C is slowly melting. What is the change in the ice cube’s entropy for each 1.00 g of ice that melts?

To melt ice requires $Q = mL_f$ joules of heat. To melt one gram of ice requires 333.7 J of energy.

The entropy change is

$$\Delta S = \frac{Q}{T} = \frac{333.7 \text{ J}}{273 \text{ K}} = 1.22 \text{ J/K}.$$
\[ \Delta S_{hot} = \frac{Q}{T} = \frac{-300 \text{ J}}{300 \text{ K}} = -1 \text{ J/K}. \]

\[ \Delta S_{cold} = \frac{Q}{T} = \frac{+300 \text{ J}}{5 \text{ K}} = 60 \text{ J/K}. \]

http://www.youtube.com/watch?v=Xa6Pctf23tQ
A microstate specifies the state of each constituent particle in a thermodynamic system. A macrostate is determined by the values of the thermodynamic state variables.