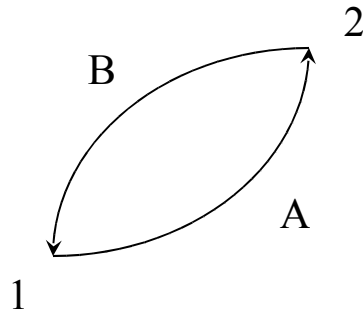


ENTROPY



$$\oint \left(\frac{\delta Q}{T} \right)_{\text{rev}} = \int_1^2 \left(\frac{\delta Q}{T} \right)_A + \int_2^1 \left(\frac{\delta Q}{T} \right)_B = 0$$

$$\left. \begin{aligned} \int_1^2 \left(\frac{\delta Q}{T} \right)_A &= - \int_2^1 \left(\frac{\delta Q}{T} \right)_B \\ &= \int_1^2 \left(\frac{\delta Q}{T} \right)_B \end{aligned} \right\} \begin{array}{l} \text{Does not depend on} \\ \text{path; thermodynamic} \\ \textbf{property!} \end{array}$$

Let's call this property **entropy, S**

$$dS \equiv \left(\frac{\delta Q}{T} \right)_{\text{rev}}$$

Entropy , S = extensive property

Specific entropy, s = intensive property

$$\int_1^2 dS = S_2 - S_1 = \int_1^2 \left(\frac{\delta Q}{T} \right)_{\text{rev}}$$

We have actually defined entropy change

- From statistical thermodynamics, entropy $\sim$ measure of molecular **disorder**
- **Work** is an ordered form of energy (High quality)
- No *entropy transfer* along with work transfer
- **Heat** is a disordered form of energy (Low quality)
- *Entropy is transferred* along with heat transfer

“Entropy = zero for pure crystal at 0 K”

Third Law of Thermodynamics

Entropy with a 0 K reference is called *absolute entropy*