

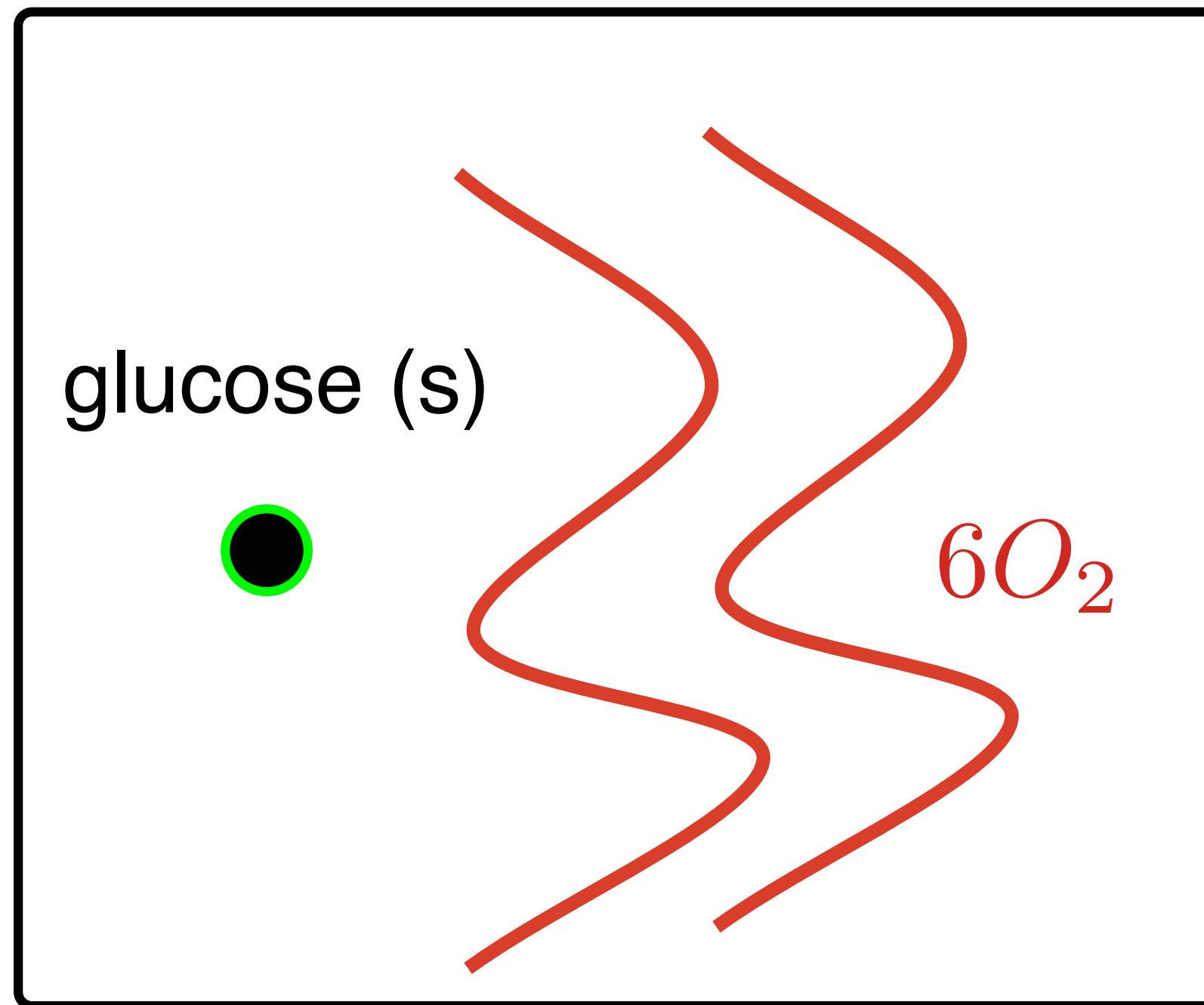
# Definitions of Thermodynamic Potentials

Function of state		Differential	Natural variables	First derivatives	
Internal energy	$U$	$dU = TdS - pdV$	$U = U(S, V)$	$T = \left(\frac{\partial U}{\partial S}\right)_V,$	$p = -\left(\frac{\partial U}{\partial V}\right)_S$
Enthalpy	$H = U + pV$	$dH = TdS + Vdp$	$H = H(S, p)$	$T = \left(\frac{\partial H}{\partial S}\right)_p,$	$V = \left(\frac{\partial H}{\partial p}\right)_S$
Helmholtz function	$F = U - TS$	$dF = -SdT - pdV$	$F = F(T, V)$	$S = -\left(\frac{\partial F}{\partial T}\right)_V,$	$p = -\left(\frac{\partial F}{\partial V}\right)_T$
Gibbs function	$G = H - TS$	$dG = -SdT + Vdp$	$G = G(T, p)$	$S = -\left(\frac{\partial G}{\partial T}\right)_p,$	$V = \left(\frac{\partial G}{\partial p}\right)_T$

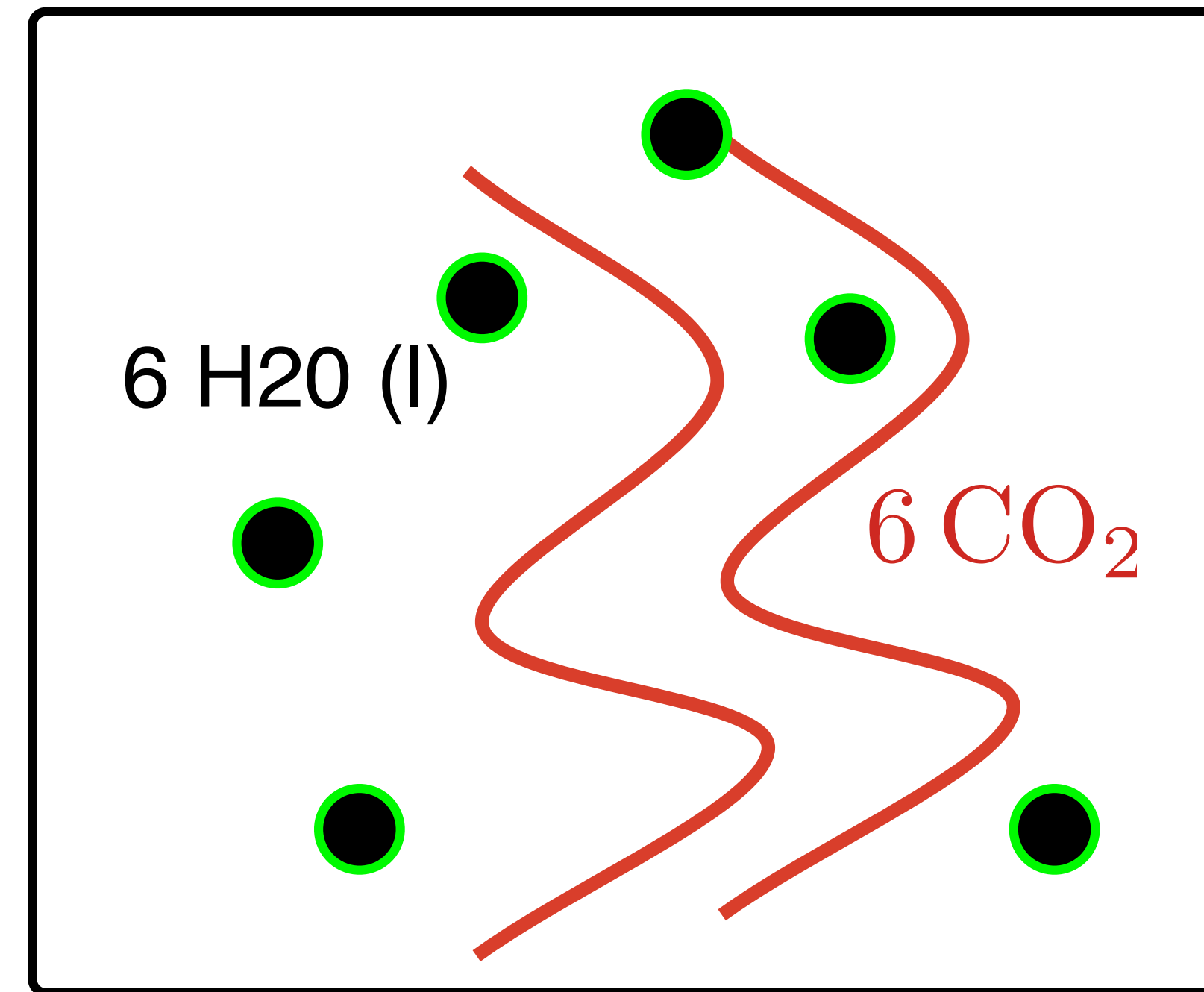
# Oxidation of Glucose Cartoon

---

Before



After



Surroundings at Temperature T

$$Q = T\Delta S$$

