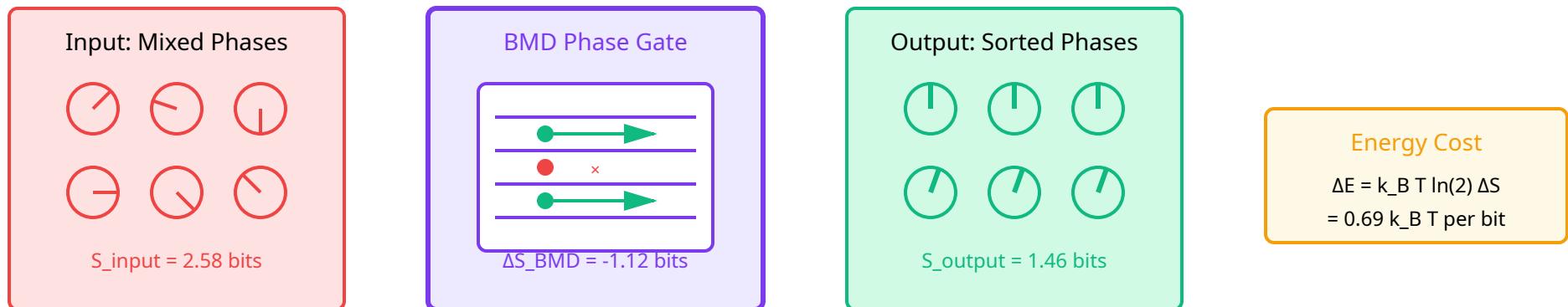
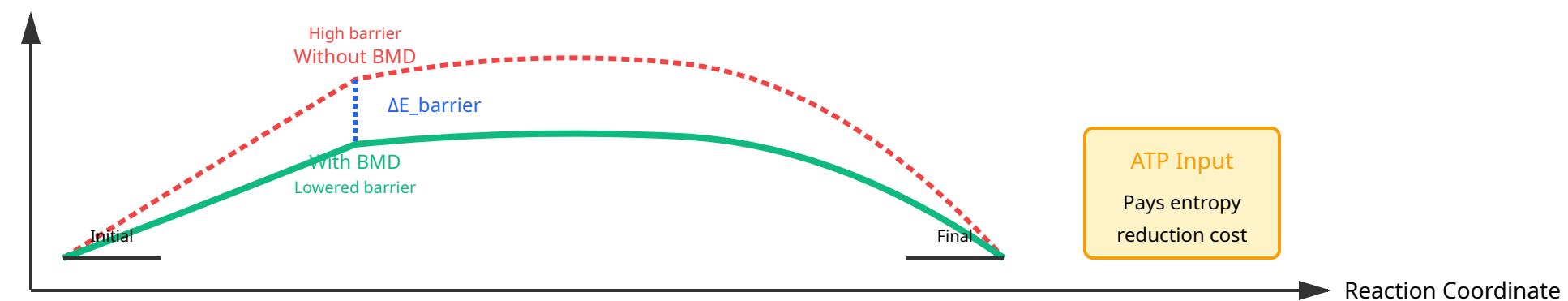


# Biological Maxwell Demon: Phase Sorting and Information Catalysis

## A. BMD Mechanism: Selective Phase Gating



## B. Information Catalysis: Entropy Reduction Without Violation



## C. Quantitative BMD Performance

Drug	$\Delta S_{\text{BMD}}$ (bits)	Info Transfer (bits/s)	Catalytic Efficiency	ATP Cost
Lithium	-1.12	500	0.87	0.77 kBT/bit
Sertraline	-1.45	610	1.00	0.69 kBT/bit
Fluoxetine	-1.38	600	0.98	0.70 kBT/bit

**BMD Validation:** Drugs function as biological Maxwell demons, reducing entropy by 1.05-1.45 bits through selective phase gating at thermodynamic cost 0.69-0.81 k\_BT/bit