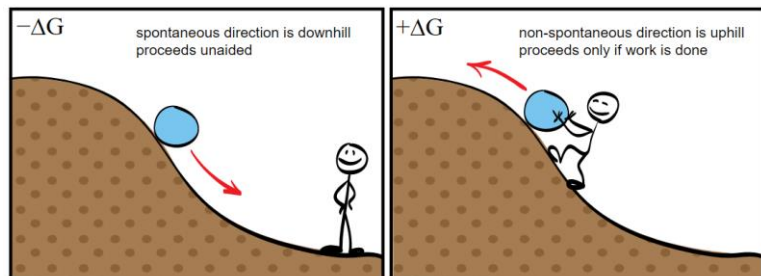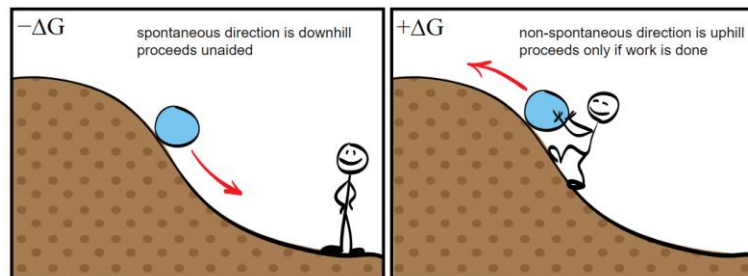## THERMODYNAMICS:
Will the reaction happen under these conditions?

Spontaneous | **YES** or **NO** | *Nonspontaneous*

FAST or **SLOW**

KINETICS: *IF* a reaction can occur, what is the <u>speed</u> of the reaction?

$-\Delta G$ spontaneous direction is downhill proceeds unaided

$+\Delta G$ non-spontaneous direction is uphill proceeds only if work is done

What is Driving the Spontaneity?		
Enthalpy driven	Enthalpy change overcomes decrease in entropy	$\Delta H° = -$
Entropy driven	Entropy change overcomes endothermic enthalpy	$\Delta S° = +$
Both	Enthalpy and entropy both favorable	$\Delta H° = -$ AND $\Delta S° = +$
Neither	Never spontaneous b/c enthalpy and entropy are both unfavorable.	$\Delta H° = +$ AND $\Delta S° = -$

Favorable		
Enthalpy	Entropy	Gibbs Free Energy
$\Delta H° = -$ Exothermic	$\Delta S° = +$ Increase in entropy	$\Delta G° = -$ Spontaneous Thermodynamically Favorable
NOT Favorable		
Enthalpy	Entropy	Gibbs Free Energy
$\Delta H° = +$ Endothermic	$\Delta S° = -$ Decrease in entropy	$\Delta G° = +$ Non-spontaneous NOT thermodynamically Favorable