

EQUILIBRIUM

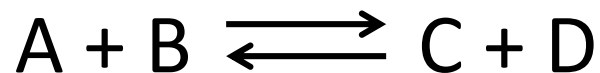
Chemical Equilibrium



REVERSIBLE REACTIONS

- Forward Rxn: $A + B \rightarrow C + D$
- Reverse Rxn: $A + B \leftarrow C + D$

- Written as:

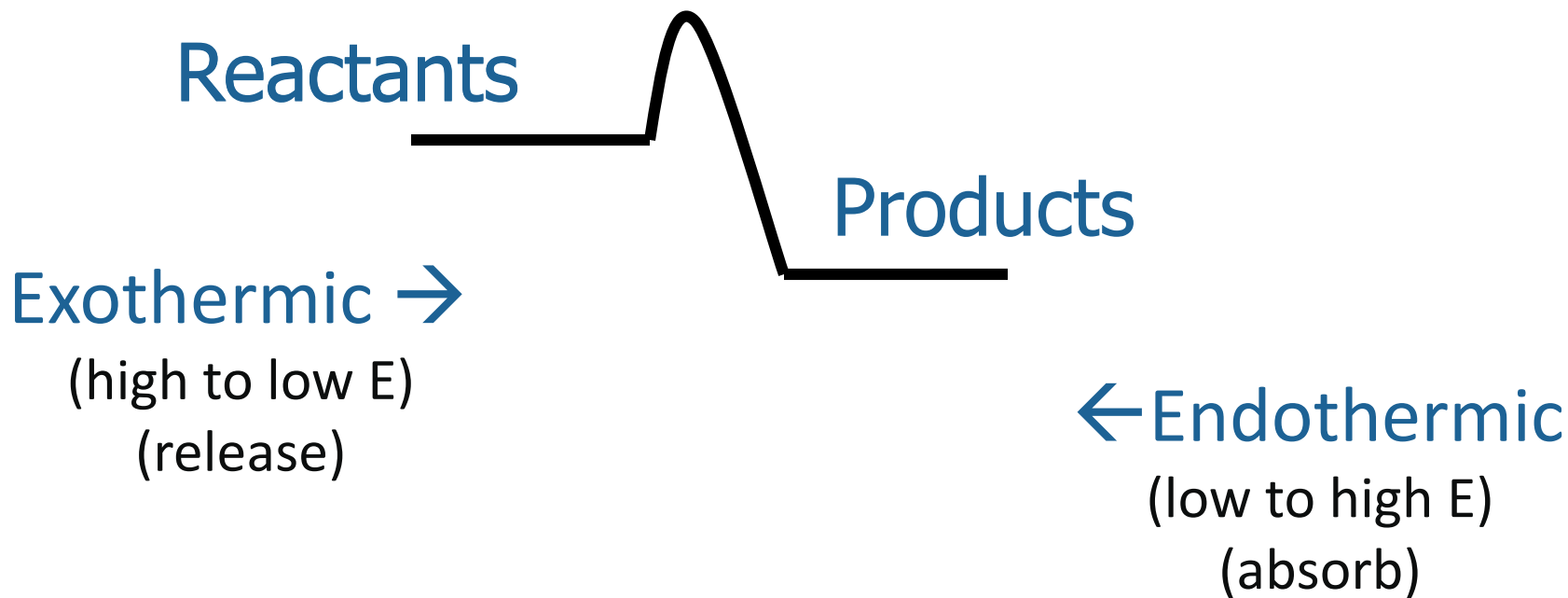


OR



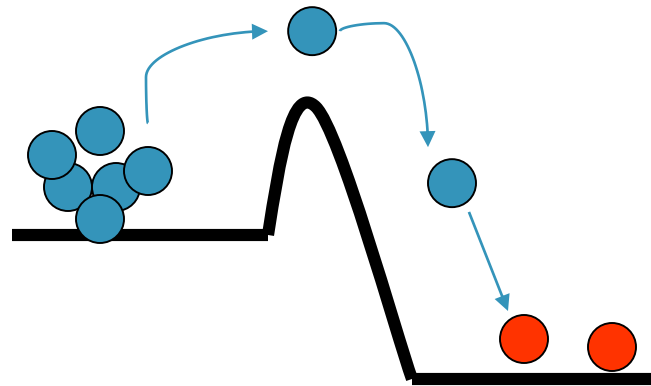
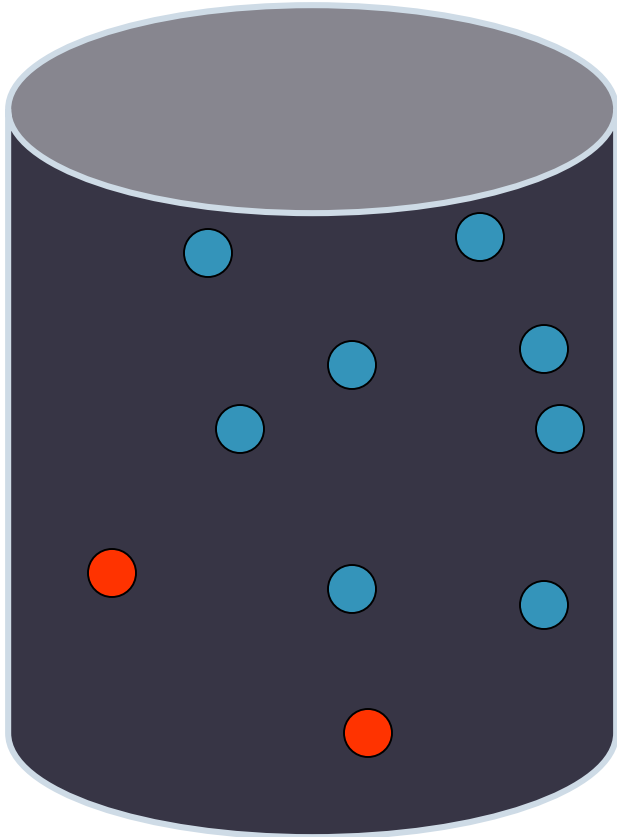
ENERGY CONSIDERATIONS

- A reversible reaction has both an endothermic rxn and an exothermic rxn



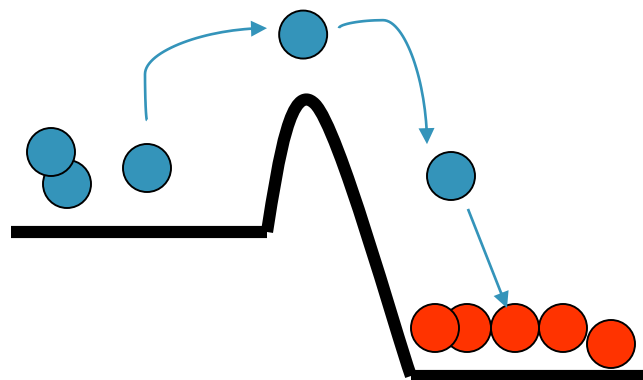
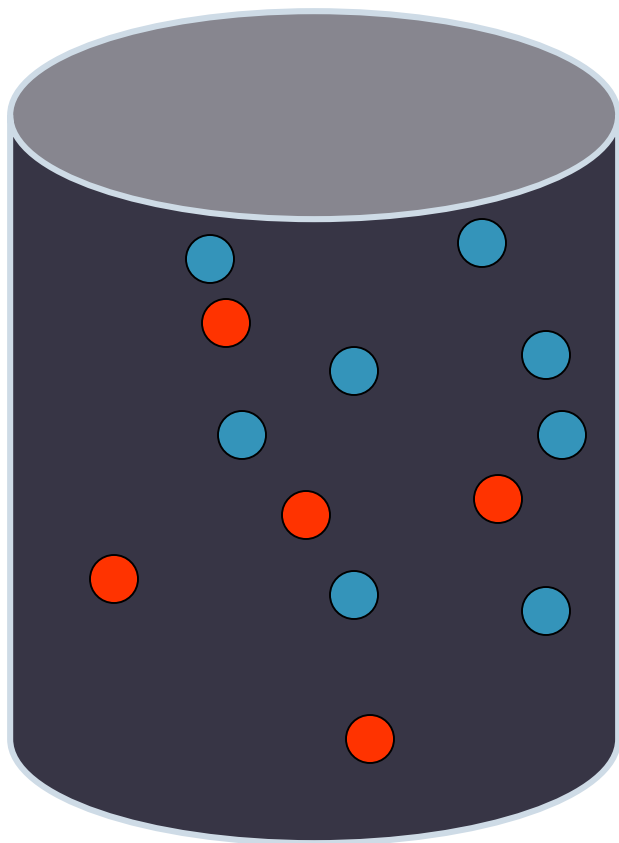
CHEMICAL EQUILIBRIUM

- *At first when a reaction begins, the reactants begin forming products*



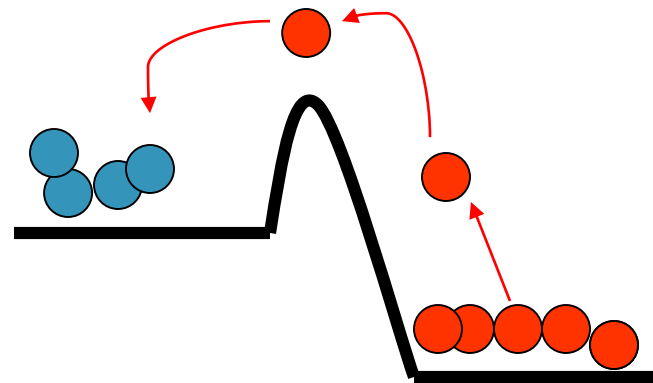
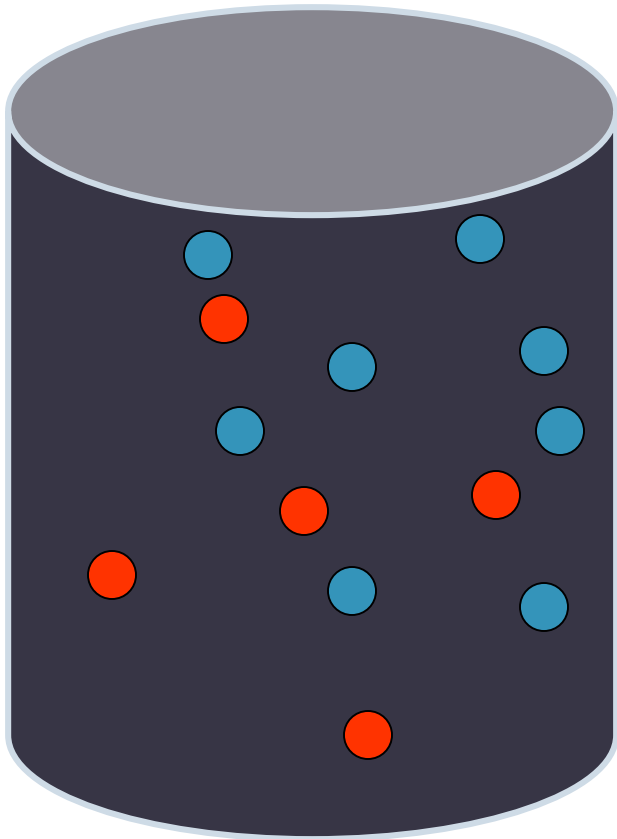
CHEMICAL EQUILIBRIUM

- *As the reactants are used up, the rate of the forward reaction slows down*



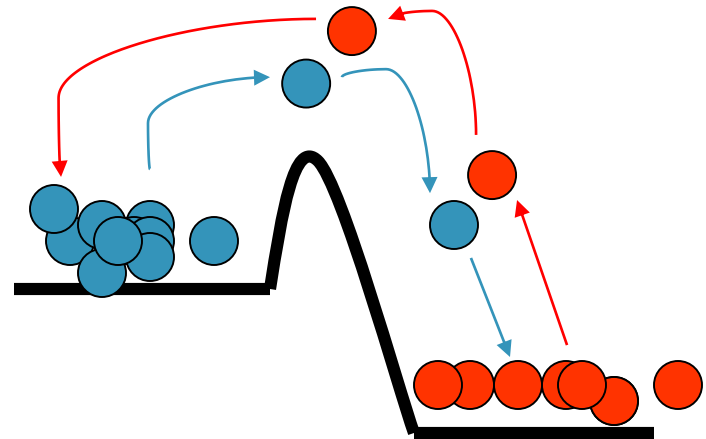
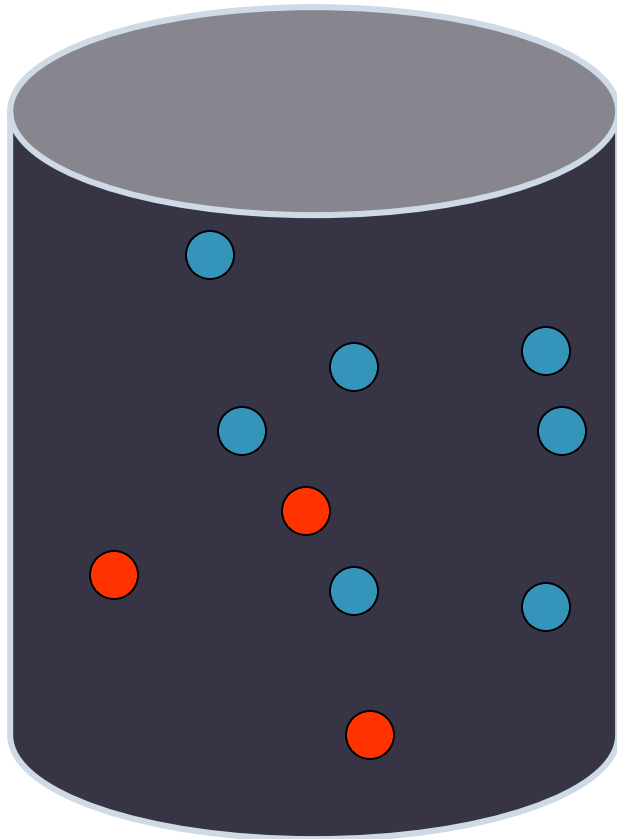
CHEMICAL EQUILIBRIUM

- *When there are more products, the reverse reaction rate begins to increase*



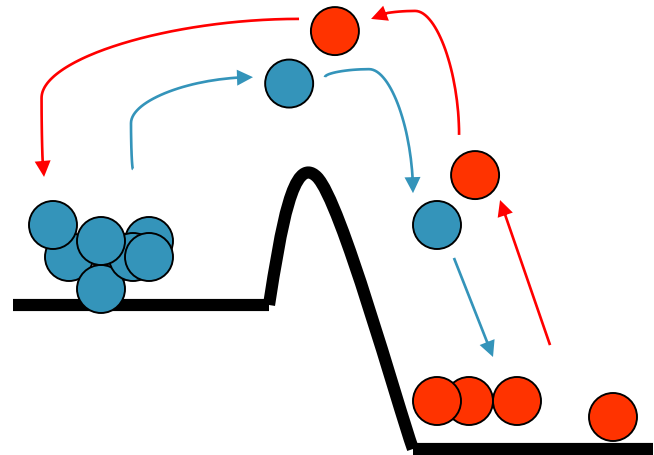
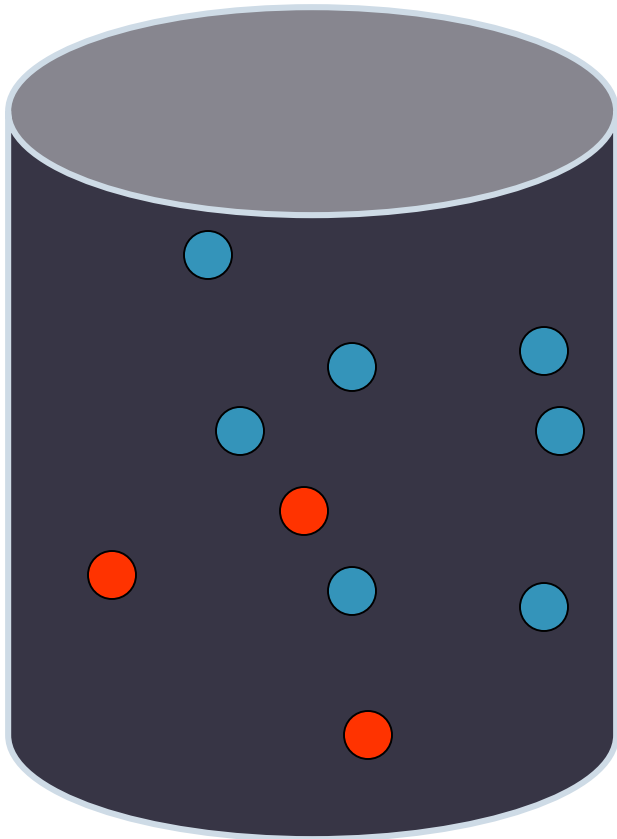
CHEMICAL EQUILIBRIUM

- *The forward and reverse reactions are happening at the same time*



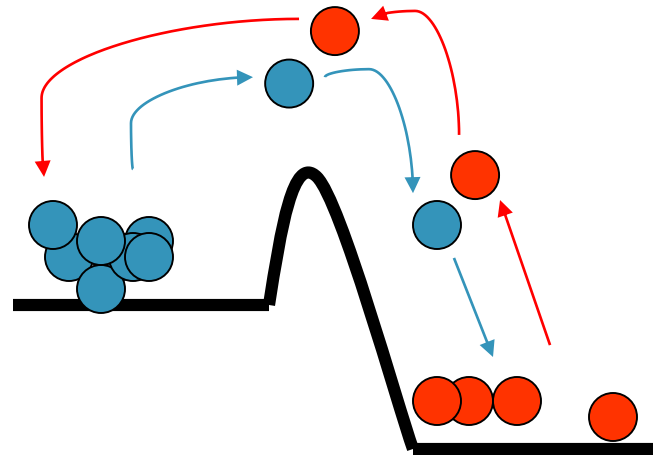
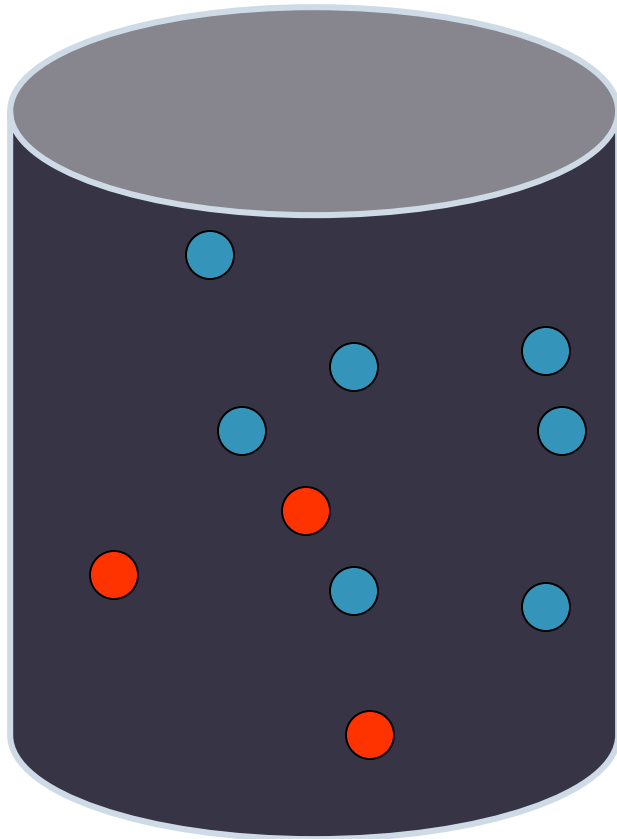
CHEMICAL EQUILIBRIUM

- When the rate forward = the rate reverse you have chemical equilibrium



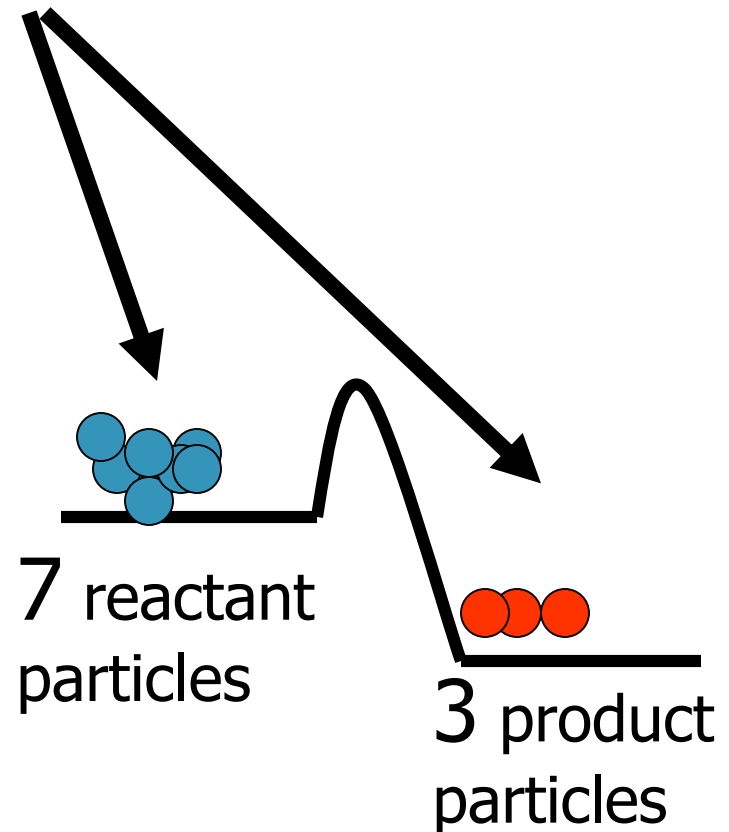
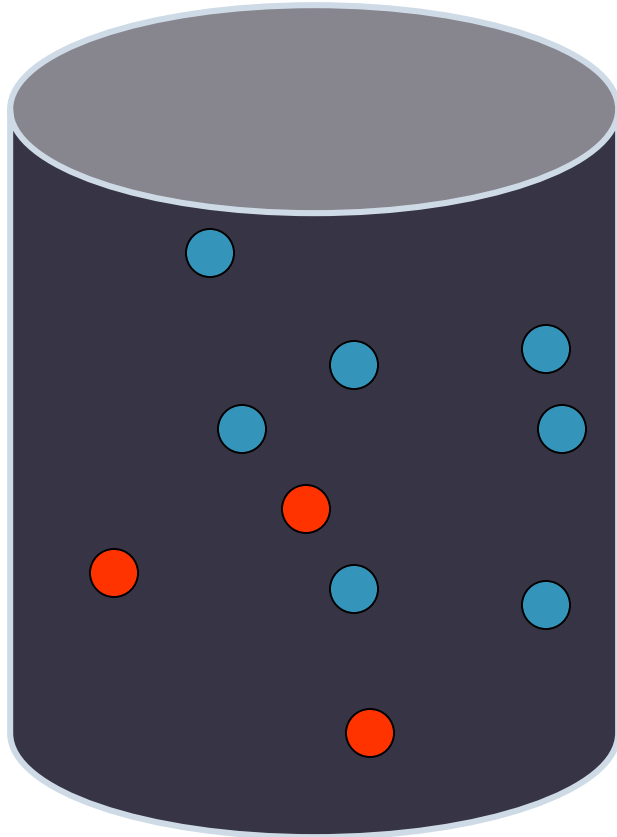
CHEMICAL EQUILIBRIUM

- *The rate forward = the rate reverse, as long as the factors that control rates stay the same*



CHEMICAL EQUILIBRIUM

- If a system is in chemical equilibrium then the concentrations of the reactants and products must be constant



DYNAMIC EQUILIBRIUM

- When concentration of reactants and of products are *constant*
- When rate of forward reaction is *equal* to the rate of the reverse
 - $\text{Rate}_{R \rightarrow P} = \text{Rate}_{P \rightarrow R}$

