Vapor pressure
forward - evaporation reverse - condensation

\[ t = 0 \quad E P I = 0 \]
\[ R_s > R_r \]

just after \( t = 0 \) water is suddenly introduced into a completely empty chamber (under vacuum)

\[ t = \text{equilibrium} \quad R_s = R_r \]

\[ \text{no more change} \]

\[ \text{past equilibrium} \quad E P I \text{ too great} \]
\[ R_r > R_s \]

Le Chatelier's Principle
When a system @ equilibrium is stressed (changed), the system will respond in a way that relieves that stress.

\[ Q = \text{reaction quotient} \]

\( Q \) is mathematically identical to \( K \), except \( K \) is only calculated using equilibrium concentrations, while \( Q \) can be calculated at any point in a reaction.

\[ Q = \frac{\text{products}}{\text{reactants}} \]

\( \Delta G \)

\[ \Delta G < 0 \]

\[ K \]

\[ Q \]

If \( Q < K \), not enough products have formed, and/or there are too many reactants present.

If \( Q > K \), not enough reactants are present and/or too many products have formed.

\[ \text{hydrate} \]
The rxn above is reversible and non-spontaneous.

If products are removed as the rxn tries to reach equilibrium:

1) Q < K since [products] just decreased.
2) R \rightarrow K, since products were removed (but not reactants)
3) Potential E of the system is effectively increased.

The rxn will move forward to make more products to re-establish equilibrium.

If products are continuously removed as they form, the rxn can be forced to completion, even though it is non-spontaneous.

K is only affected by temperature, not [I].

Decolorization

Resonance structures only exist because the system used to write structures (L.D.S.) is unable to unambiguously represent bonds that cover more than two atoms.

- No single resonance structure correctly reflects the true structure of a molecule.
- The true structure of a molecule can be estimated by averaging all of the possible resonance structures together.
Rules for writing resonance structures

- Only lone pairs and $\pi$ bonds are able to move; single bonds can never be formed or broken.

\[ \text{This carbon is } sp^2 \text{ hybridized, but it is } sp^3 \text{ hybridized in this resonance structure, but that is because} \]

- Resonance structures fail to show delocalized bonding.

\[ \text{2 nodes} \quad \begin{array}{c} \text{antibond} \\ \rightarrow \end{array} \text{non-bonding} \quad \begin{array}{c} \text{nodes} \\ \rightarrow \end{array} \text{bonding} \]

A non-bonding orbital is the same in energy as the atoms would be if they had never undergone bonding.

- Better resonance structures generally have full octets (when possible), lack charge separation, and have charges that match electronegativity.

\[ \text{unfavorable due to charge separation, even worse since oxygen is now } \Theta \text{ charged.} \]