Kinetic Theory Applied: Evaporation, Vapor Pressure, Boiling Point, Partial Pressure, Humidity, Dew Point

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1 Evaporation.

As a glass of water heats up, the average velocity of the particles will increase. This is so since $K = 1/2m\bar{v}^2 = 3/2NkT$, (the mass,$m$, of each particle stays the same, as does the number of particles, N, and Boltzmann's Constant,k).

As the average velocity gets higher, some particles escape the liquid water phase and go into the vapor phase. This is when evaporation occurs.

2 Vapor Pressure

Vapor pressure is short for *saturated vapor pressure*. This state exists when the vapor and liquid phases are in equilibrium.

3 Boiling Point

Boiling point is when the external pressure is equal to the vapor pressure. When the bubbles in the liquid can rise up into the external pressure without being pushed back into the liquid, then evaporation occurs. (Vapor pressure is greater than external pressure.)

4 Partial Pressure

Partial pressure exists when you have a mixture of different particles.

5 Humidity

Humidity is defined as a percentage,

$$h = \frac{Partial\ pressure}{Vapor\ pressure} \tag{1}$$

The vapor pressure at a certain temperature is obtainable from a chart.

6 Dew Point

Dew point occurs when the partial pressure is equal to the vapor pressure. When the partial pressure is greater than the vapor pressure, then mist or fog forms because the air can no longer saturate all the water.

6.0.1 Example: Mass of water formed

7 Reference

Giancoli. *Physics for Dorks, 3rd Ed.* — really, I didn't really understand v.p. to this level until G.