Distillation Theory

- Distillation is used to separate liquids or a liquid from a solid by __________  ____________.
- More volatile component is vaporized and condensed leaving less volatile components behind.
- Boiling Point: The temperature at which a liquid's vapor pressure equals the external pressure (usually atmospheric pressure- 1 atm or 760 mm Hg). BP like MP is intrinsic property of a substance.

Microscale
Binary Liquid-Vapor Temperature-Composition Diagrams

How to Read the Diagram

Mixture of 15% A and 85%
• READ bp of liquid composition curve: boils at X°

VAPOR IS IN LOWER BOILING COMPONENT, BUT IT ALSO CONTAINS HIGHER BOILING COMPONENT.

Composition after one simple distillation

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Simple Distillation One vaporization-condensation cycle.

Fractional Distillation Many vaporization-condensation cycle
Additional Notes on Fractional Distillations:

- Theoretical Plates:
  - The number of liquid-vapor condensation cycles that occur in a distillation. It is also related to the number of steps that are drawn on vapor composition diagram.
  - Simple distillations often will have just one liquid-vapor condensation cycle.
  - Fractional distillation has many theoretical plates.
  - The closer the BP between two compounds the more theoretical plates required to separate the components.

- H.E.T.P (height equivalent to one theoretical plate) is a measurement of the column efficiency. We can take the column length and divide by the H.E.T.P to get the number of theoretical plates.
Non-Ideal Behavior: Azeptropes

1. Minimum Boiling Point Azeotropes

2. Maximum Boiling Point Azeotropes