

# Supra Self-Learning Modules in Chemical Engineering

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## Contents of First 5 Modules

### 1. Basic Information and Stoichiometry (Study Time 30 hrs.)

1. Units, Dimensions, and Conversions
2. Dimensional Homogeneity and Analysis
3. Dimensionless Groups and Analysis
4. Pressure and Temperature
5. Process and Process Units
6. Mass, Density, Volume, and Mole
7. Chemical Equations and Stoichiometry

### 2. Material Balances (Study Time 34 hrs.)

1. General Balance Equation
2. Material Balances Without Chemical Reaction
  - i. Distillation
  - ii. Mixing/Settling
  - iii. Drying/Evaporation
  - iv. Absorption
  - v. Extraction
  - vi. Crystallization
  - vii. Adsorption
3. Material Balances Without Chemical Reaction - With Recycle, Bypass, Purge
  - i. Distillation
  - ii. Drying/Evaporation
  - iii. Combination of Units
4. Material Balances With Chemical Reaction
  - i. Recycle
  - ii. Purge
  - iii. Multiple Equipment
  - iv. Combustion

### 3. Gases, Vapors, and Liquids (Study Time 34 hrs.)

1. Pure Components
  - i. PVT Relations
  - ii. Ideal Gases
  - iii. Real Gases
  - iv. Vapor Pressure
2. Mixtures
  - i. Ideal Gases
  - ii. Real Gases
3. Ideal Solutions
  - i. Phase Rule
  - ii.  $t / P$ - $x$ - $y$  Diagrams
  - iii. Raoult's & Henry's Laws
4. Humidity and Saturation
  - i. Air + Water System
  - ii. Air + Solvent System

### 4. Energy Balances (Study Time 33 hrs.)

1. Heat Effects
  - i. Without Phase Change
  - ii. With Phase Change
  - iii. With Water & Steam
2. General Energy Balance Equation
  - i. First Law of Thermodynamics
  - ii. Application To Processes
  - iii. Mechanical Energy Balance
3. Energy Balances With Reaction
  - i. Enthalpy of Formation
  - ii. Enthalpy of Reaction
  - iii. Enthalpy of Combustion
  - iv. Adiabatic Flame Temperature
  - v. Application To Processes
4. Enthalpy of Solution & Mixing
  - i. Application To Processes
5. Heating Values of Fossil Fuels
  - i. Coal
  - ii. Petroleum
  - iii. Gas

### 5. Material and Energy Balances (Study Time 15 hrs.)

- Application To Processes

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