Step 1 - Hydrolysis Reactions
C breakdown of particulate and high molecular weight organics into soluble organics and long chain volatile fatty acids.

Step 2 - Acid Forming Phase
C fermentative reactions produce short chain volatile fatty acids (VFA's), acetic acid, and some H₂.

Step 3 - Methane Forming Phase
C aceticlastic methanogens split acetic acid into methane and CO₂.
C hydrogen oxidizing methanogens combine hydrogen and CO₂ to produce methane.
Intermediates

- v________ f_______ a_________ - measure of acids to alkalinity is a useful process indicator (should be < 0.1 for mesophilic systems and < 0.4 - 0.5 for thermophilic systems)
- a____________ - should be very low for a well functioning anaerobic process
  - about 70% of CH₄ is from acetate (acetoclastic methanogens)
  - both acetate and propionate follow A___________ kinetics
- p________________ - may account for about 20% of CH₄ produced
  - broken down to acetate and H₂
  - low propionate levels are indicative of a well functioning process
  - H₂ will inhibit propionate conversion (product inhibition)
  - acetate will inhibit propionate conversion
  - s___________ considerations: for low H₂ concentrations need hydrogen oxidizing methanogens in close proximity to hydrogen producers
  - propionate is inhibitory at high concentrations (5,000 - 8,000 mg/L)
  - u___________ form most inhibitory
- H_____________ , H₂
  - very insoluble \( H= 8 \times 10^{-4} \text{M/atm} \) (1.4 mg/L @ 35 deg C)
  - if need <100 ppm H₂ and average d___________ between bacteria is 100µ there will be less than 1 molecule of H₂ between every two bacteria
  - much of H₂ f___________ can not be measured due to interspecies hydrogen transfer
  - spatial considerations have been overcome by systems with dense biofilms and granules
  - hydrogen may not be in equilibrium w/ bulk liquid or gas phase
  - difficult to measure concentration and flux
  - may be useful as a p__________ indicator
- Anaerobic toxicity assay
  - use serum bottles, place e_______ substrate (e.g., acetate or ethanol) and biomass
  - measure gas production as a function of initial substrate concentration
  - can calculate EC₅₀ : concentration that causes 50% inhibition