

Notes Compartmental Analysis
Differential Equations

Key Terms:

Amount : The amount of substance in a compartment at any time t .

$$X(t) = \text{Amount of some substance at some time}$$

Flow Rate: The rate at which some volume enters a compartment

$$(\text{Volume}/\text{Time})$$

Exit Rate: The rate at which some volume exits a compartment

$$(\text{Volume}/\text{Time})$$

Concentration: The amount of some substance given a volume

$$(\text{Amount}/\text{Volume})$$

Input Rate: Rate at which a substance enters the compartment at some time

$$(\text{Volume}/\text{Time}) * (\text{Amount}/\text{Volume}) = (\text{Amount} / \text{Time})$$

Output Rate: Rate at which a substance leaves the compartment at some time (concentration at time t multiplied by exit rate). If we assume that the mixture at any time t is uniform than the calculation is

$$(\text{Amount}/\text{Volume}) * (\text{Exit Rate})$$

Derivative: Rate of change in the amount of substance in the compartment with respect to time

$$dx/dt = \text{Input Rate} - \text{Output Rate}$$