# Acid-Base Physiology

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1 Bond Graph Modelling
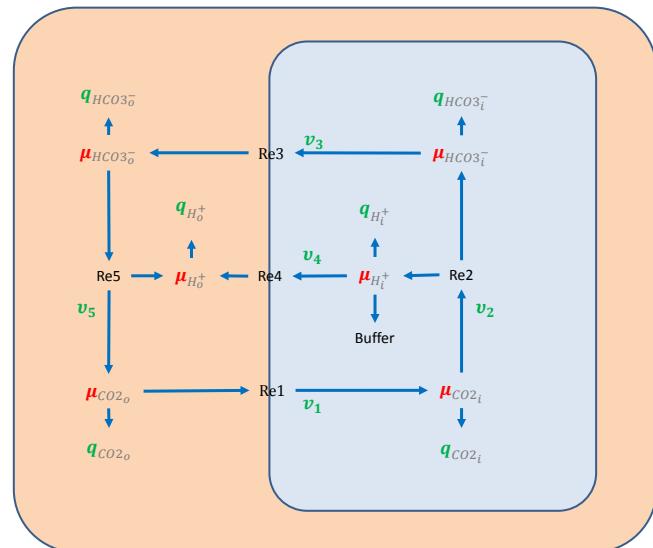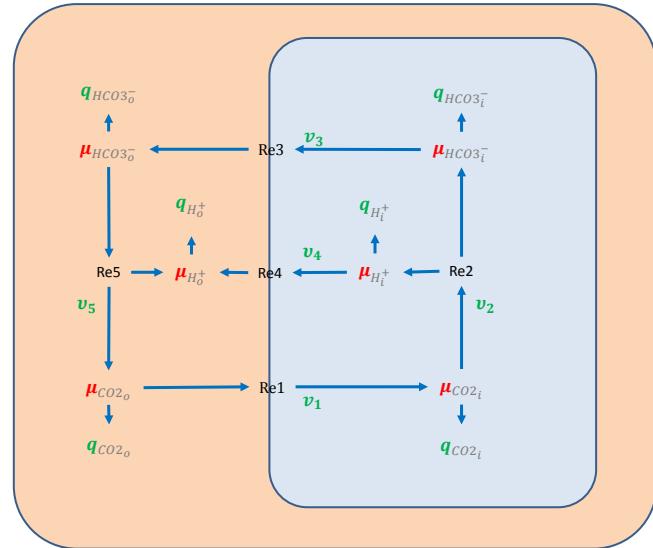
1.1 The biomolecular cycle
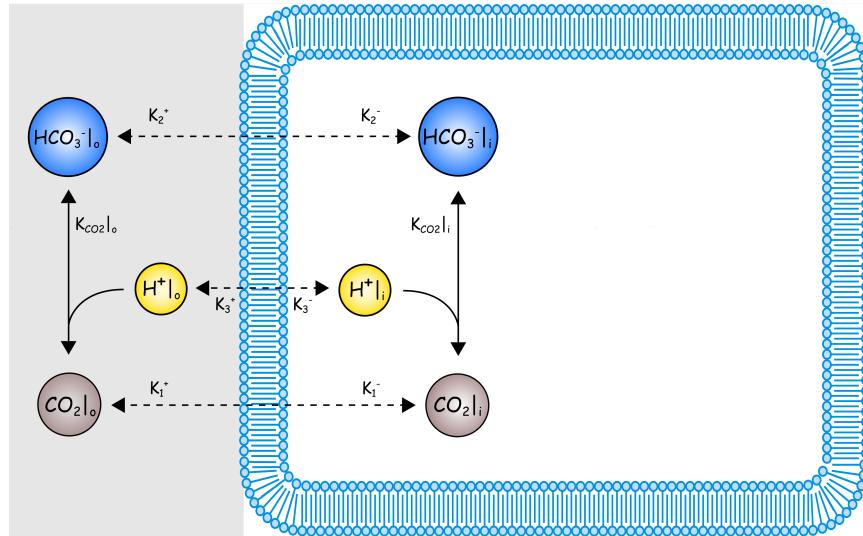
1.2 Causal analysis

1.3 Parameters

Table 1: Reaction Parameters

Reaction	κ
Re1	6e−5
Re2	4050
Re3	5e−9
Re4	0
Re5	0

Table 2: Species Parameters

Species	K
$CO_2(int)$	0.00000926
$HCO_3^-(int)$	0.108
$H^+(int)$	0.108
$CO_2(ext)$	0.00000926
$HCO_3^-(ext)$	0.108
$H^+(ext)$	0.108

2 Simulation

Simulation

Property	Value	Unit
Starting po...	0	second
Ending point	1000	second
Point interval	1	second

Solvers

Graphs

Property	Value

Parameters

Property	Value	Unit
epsilon	0.999999999999977	dimensionless
F	96485	C_per_mol
K	0.001	mol_per_m3
k	0	per_s
M_CO2	0.921597461686196	mol_per_m3_s
M_HCO3	0	mol_per_m3_s
P_CO2	6e-05	m_per_s
P_HCO3	5e-09	m_per_s
pH_i	7.40011251333274	dimensionless
Q	0	mol_per_m3
q_CO2_i	3.5254358381475e-06	mol_per_m3
q_CO2_o	1.28	mol_per_m3
q_H_i	3.98004045681545e-05	mol_per_m3
q_H_i'	3.12463551361807e-06	mol_per_m3/second
q_HCO3_i	8.85778895063873e-05	mol_per_m3

Simulation

Property	Value	Unit
Starting po...	0	second
Ending point	1000	second
Point interval	1	second

Solvers

Graphs

Property	Value
▶ ☑	**AcidBase.t	AcidBase.pH_i**
▶ ☐	**AcidBase.t	AcidBase.pH_o**

Parameters

Property	Value	Unit
▼ **AcidBase**		
K_CO2_i	9.26e-11	m3_per_mol
K_H_i	0.108	m3_per_mol
K_HCO3_i	0.108	m3_per_mol
K_Re_1	6e-05	m_per_s
K_Re_2	40500	mol_per_m3_s
K_Re_3	5e-09	m_per_s
K_Re_7	0	m_per_s
pH_i	7.37146247913006	dimensionless
pH_o	7.69897000433602	dimensionless
q_CO2_i	-7.71580398166429e-10	mol_per_m3
q_CO2_i'	7.04733636641088e-10	mol_per_m3/second
q_CO2_o	0	mol_per_m3
q_H_i	4.25145435656126e-05	mol_per_m3
q_H_i'	-1.49195749961259e-10	mol_per_m3/second