# General things

## Functions

Nernst potential

Hill function

## General parameters

| Parameter | Value | Unit | Desc. |
| --- | --- | --- | --- |
| F | 96485 | C/mol | Faraday constant |
| T | 310 | K | Absolute temperature |
| R | 8.314 | J/molK | Universal gas constant |
|  | 26.71 | mV | Thermal voltage (=) |
|  | 1.0 |  | Plasma membrane capacitance |
|  | 1.812 | mM/V | Mitochondrial inner membrane capacitance |
|  | 0.0003 | - | Mitochondrial free calcium fraction |
|  | 1E-5 | - | Mitochondrial proton buffering factor |
|  |  |  | Cytosolic volume |
|  |  |  | Mitochondrial volume |
|  |  |  | Network SR volume |
|  |  |  | Junctional SR volume |
|  |  |  | Subspace volume |
|  | $1.534 ^{-4} $ |  | Capacitance area |
|  |  |  | Plasma membrane capacitance |
|  |  |  | Extracellualr potassium |
|  |  |  | Extracellualr sodium |
|  |  |  | Extracellualr calcium |
|  |  |  | Inner membrane capacitance |
|  |  |  | Inner membrane conductance |

## Fixed concentrations

| Parameter | Value | Unit | Desc. |
| --- | --- | --- | --- |
|  | 7 |  | CytosoliWc pH |
|  | 7.3-7.8 |  | Mitochondrial pH |
|  | 0.006 | mM | Tissue oxygen concentration |
|  | 1.0 | mM | Cytosolic magnesium concentration |
|  | 0.4 | mM | Mitochondrial magnesium concentration |
|  | 8.6512 | mM | Sum of mitochondrial inorganic phosphate |
|  | 1 | mM | Sum of mitochondrial NAD and NADH |
|  | 1.5 | mM | Sum of mitochondrial ATP and ADP |
|  | 0.1 | mM | Sum of mitochondrial NADPH plus NADP |
|  | 1E-4 | mM | Cytosolic calcium concentration |

## Initial conditions of state variables

| State variable | Value | Unit |
| --- | --- | --- |
|  | 0.02738 | μM |
|  | 15.8 | μM |
|  | 193 | mV |
|  | 965 | μM |
|  | 0.0697 | μM |
|  | 8280 | μM |
|  | 121 | μM |
|  | 130 | μM |
|  | 16.1 | μM |
|  | 37 | μM |
|  | 235 | μM |
|  | 228 | μM |
|  | 1.28 | μM |
|  | 98.5 | μM |
|  | 6.39E-3 | μM |
|  | 4.83E-5 | μM |
|  | 0.0823 | μM |
|  | 2.83E-4 | μM |
|  | 1650 | μM |
|  | 1650 | μM |
|  | 24.3 | μM |
|  | 49.9 | μM |
|  | 0.676 | μM |
|  | 0.0264 | μM |

## Acid-base equilibria and binding polynomials[[1]](#footnote-24)

For both cytoplasmic and mitochondrial compartments.

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 1E-5 | - | mitochondria [H^+] buffering capacity |
|  | 6.48 | - | pK of ATP acid dissociation constant |
|  | 6.38 | - | pK of ADP acid dissociation constant |
|  | 6.75 | - | pKa of phosphate acid dissociation constant |
|  | 4.19 | - | pK of ATP magnesium dissociation constant |
|  | 3.25 | - | pK of ADP magnesium dissociation constant |
|  | 5.2 | - | pK of succinic acid dissociation constant |
|  | 14 |  | pK of water acid dissociation constant |

1. Wei AC, Aon MA, O’Rourke B, Winslow RL, Cortassa S. Mitochondrial energetics, pH regulation, and ion dynamics: a computational-experimental approach. Biophys J. 2011;100(12):2894-903. [PMC3123977](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3123977/) [↑](#footnote-ref-24)