

Table S1: pH and electrical potential ($\Delta\phi$) in each of the eight cellular compartments included in Recon 1. *Variability in peroxisomal pH and $\Delta\phi$ was accounted for by adding uncertainty to standard transformed Gibbs energy estimates for peroxisomal metabolites and reactions (see Sections A.3.1 and A.3.2).

| Compartment | pH | $\Delta\phi$ (mV) | References |
|-----------------------|----------------|-------------------|--------------------------------|
| Cytosol and nucleus | 7.20 | 0 | (4) |
| Extracellular fluid | 7.40 | 30 | (7), (21, 22) |
| Golgi apparatus | 6.35 | 0 | (6), (25, 26) |
| Lysosomes | 5.50 | 19 | (6), (28) |
| Mitochondria | 8.00 | -155 | (67), (20) |
| Endoplasmic reticulum | 7.20 | 0 | (6), (26) |
| Peroxisomes* | 7.00 ± 1.2 | 12 ± 74 | (11, 12, 13, 14, 15), (16, 18) |

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