Table S2. Optimized respiration parameters. Parameters were allowed to vary between "Min." and "Max." values obtained or approximated from literature. "Reaction #s" are the reactions associated with each rate parameter, with numbering corresponding to that in Table S1, which is continued from the previous model [1]. "Optimal" are the optimized parameter values that best reproduce O_2 consumption dynamics of aerobic, exponential phase *E. coli* measured in this study.

#	Parameter	Parameter description/reaction involved	Reaction #s	Min.	Max.	Optimal	Units	Ref.
1	$k_{Cyo,cat}$	Cytochrome *bo* terminal oxidase	180	18.3	150	126	s^{-1}	[2-4]
2	$k_{Cyd,cat}$	Cytochrome *bd* terminal oxidase	181	12	469	393	s^{-1}	[2,4,5]
3	$k_{NDH1,cat}$	NADH dehydrogenase I	182	50	600	492	s^{-1}	[6,7]
4	$k_{NDH2,cat}$	NADH dehydrogenase II	183	17.1	474	218	s^{-1}	[8,9]
5	$[Cyo]_0$	Initial concentration of cytochrome *bo*	--	1.58×10^{-8}	1.58×10^{-6}	5.89×10^{-7}	M	[10][a]
6	$[Cyd]_0$	Initial concentration of cytochrome *bd*	--	1.06×10^{-8}	1.06×10^{-6}	9.54×10^{-7}	M	[10][a]
7	$[Q_8]_0$	Initial concentration of ubiquinone-8	--	4.48×10^{-5}	4.48×10^{-3}	4.24×10^{-3}	M	[11][a,b]
8	$[Q_8H_2]_0$	Initial concentration of ubiquinol-8	--	4.48×10^{-5}	4.48×10^{-3}	9.26×10^{-5}	M	[11][a,b]
9	$[NDH1]_0$	Initial concentration of NADH dehydrogenase I	--	2.70×10^{-8}	2.70×10^{-6}	1.87×10^{-6}	M	[12][a]
10	$[NDH2]_0$	Initial concentration of NADH dehydrogenase II	--	3.05×10^{-9}	3.05×10^{-7}	2.95×10^{-7}	M	[13][a]

a. Species concentrations were allowed to vary within one order of magnitude in either direction of the value calculated from literature, as the concentrations were typically reported in molecules/cell, and were converted to intracellular concentrations assuming a cell volume of 3.2×10^{-15} L [14].

b. The concentrations of ubiquinone-8 and ubiquinol-8 were reported to be approximately 1 μmol/g dry cell weight [11], which was converted to an intracellular concentration by assuming a cell density of 448 gDW/L [12].

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