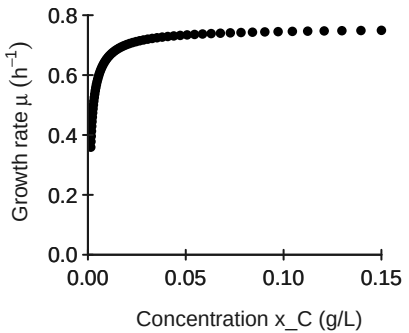
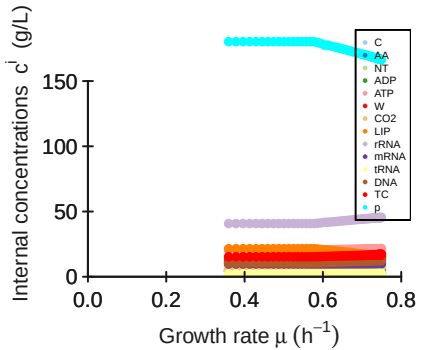
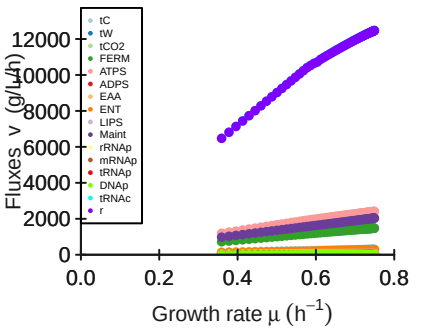
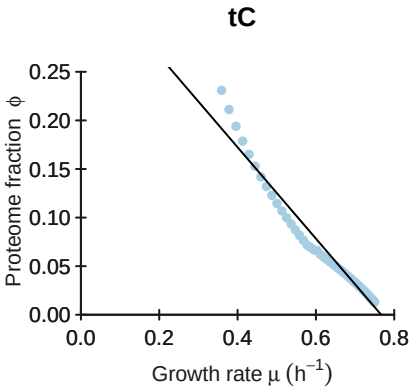
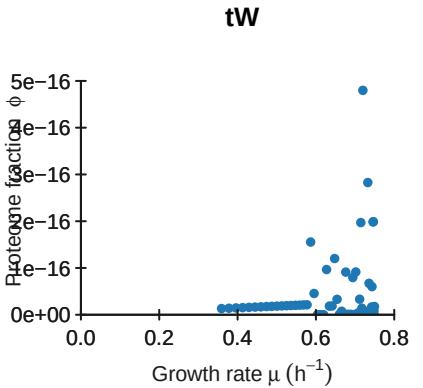
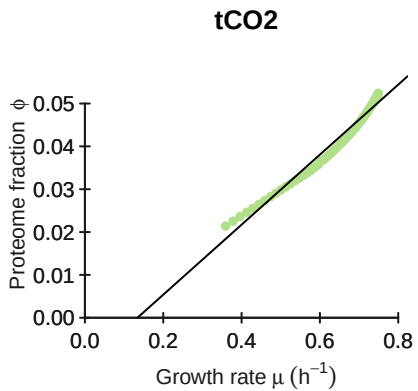

Growth rate μ (h$^{-1}$)
Concentration x_C (g/L)

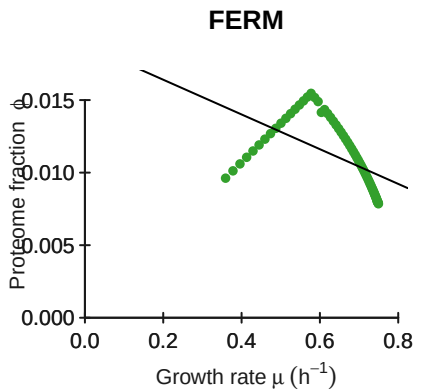

Internal concentrations $c^i$ (g/L)
C
AA
NT
ADP
ATP
W
CO2
LIP
rRNA
mRNA
tRNA
DNA
TC
p
Growth rate μ (h$^{-1}$)

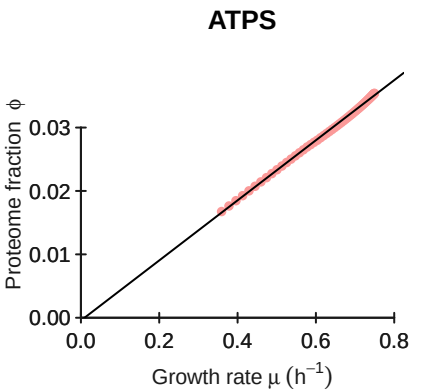

Fluxes v (g/L/h)
tC
tW
tCO2
FERM
ATPS
ADPS
EAA
ENT
LIPS
Maint
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r
Growth rate μ (h$^{-1}$)

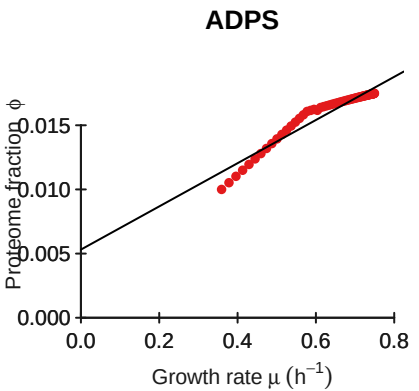

tC
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

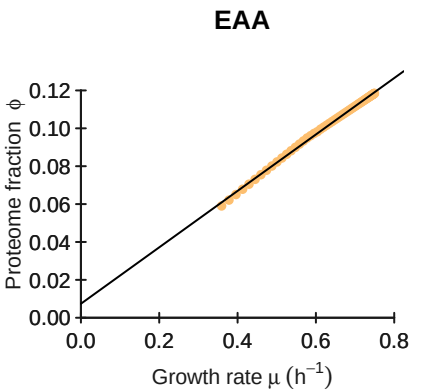

tW
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

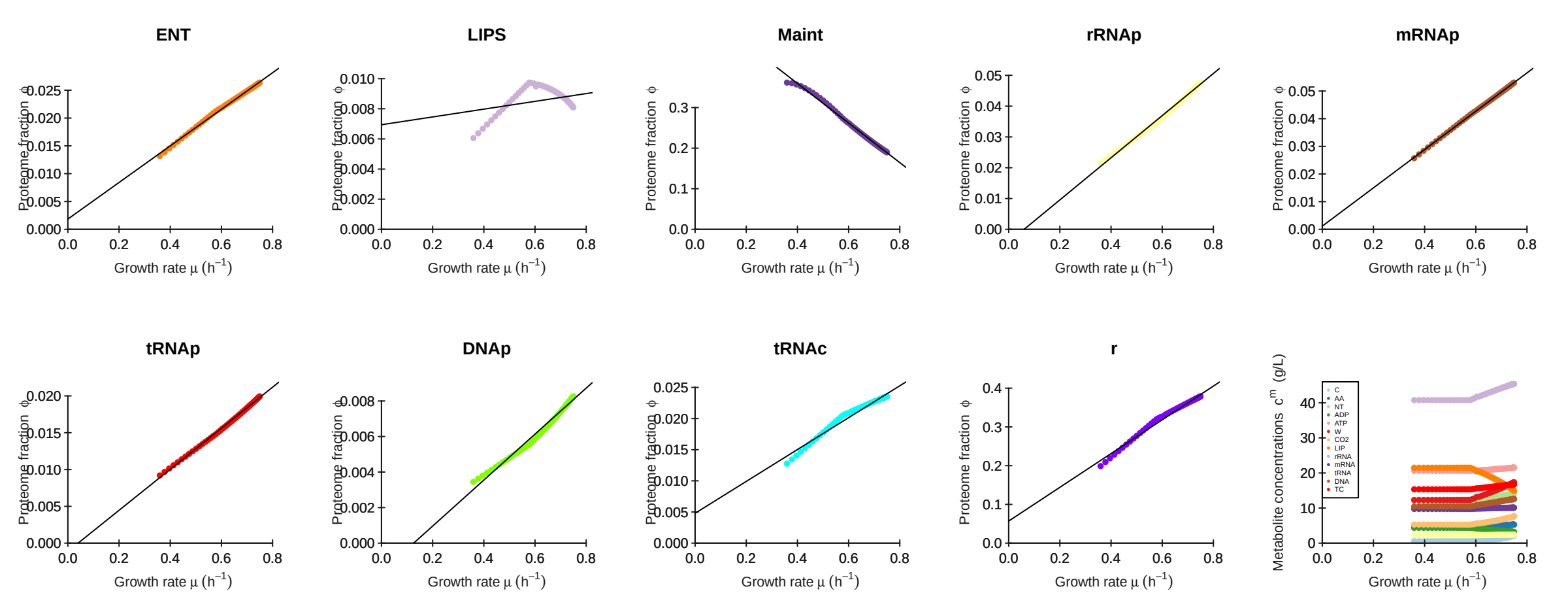

tCO2
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

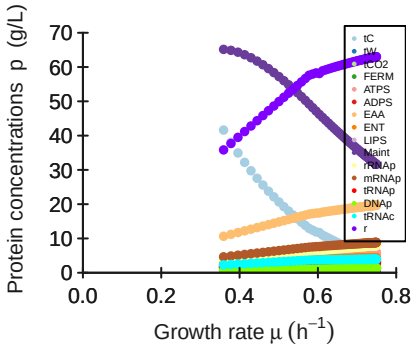

FERM
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

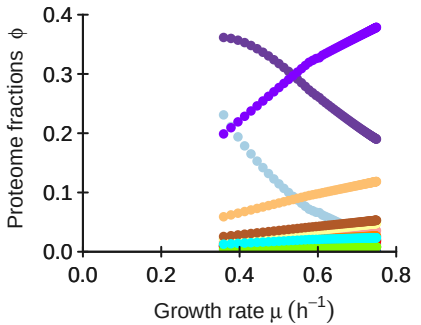

ATPS
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

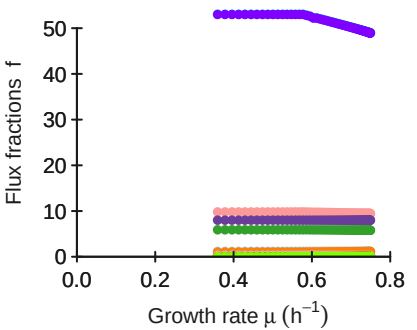

ADPS
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

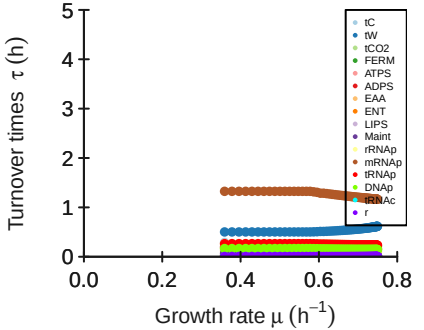

EAA
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

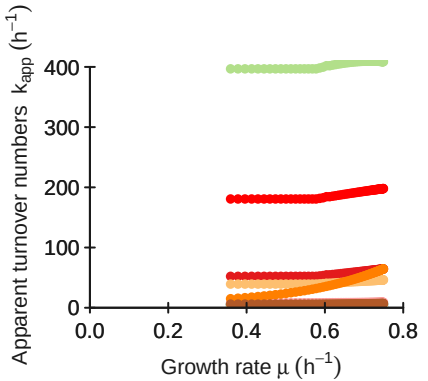

ENT
LIPS
Maint
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)
Metabolite concentrations c$^{m}$ (g/L)
C
AA
NT
ADP
ATP
W
CO2
LIP
rRNA
mRNA
tRNA
DNA
TC

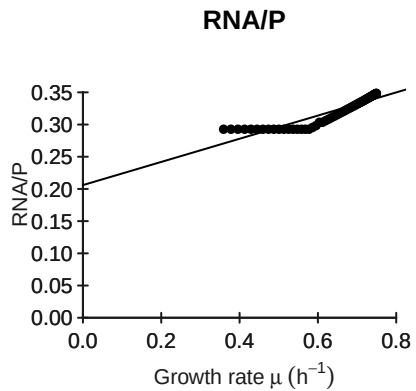

Protein concentrations p (g/L)
Growth rate μ (h$^{-1}$)
tC
tW
tCO2
FERM
ATPS
ADPS
EAA
ENT
LIPS
Maint
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r

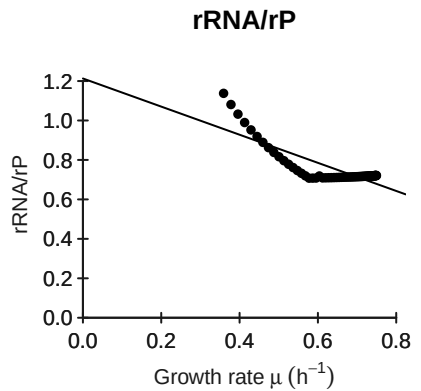

Proteome fractions ϕ
Growth rate μ (h$^{-1}$)

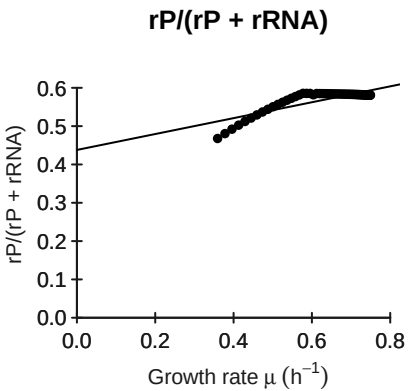

Flux fractions f
Growth rate μ (h$^{-1}$)

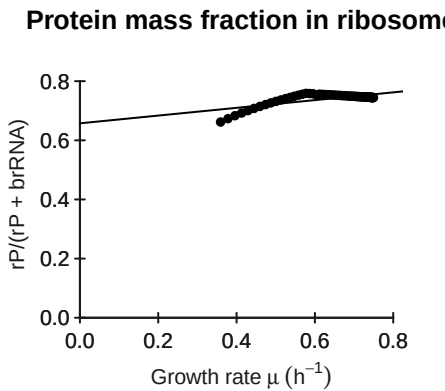

Turnover times τ (h)
Growth rate μ (h$^{-1}$)
tC
tW
tCO2
FERM
ATPS
ADPS
EAA
ENT
LIPS
Maint
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r

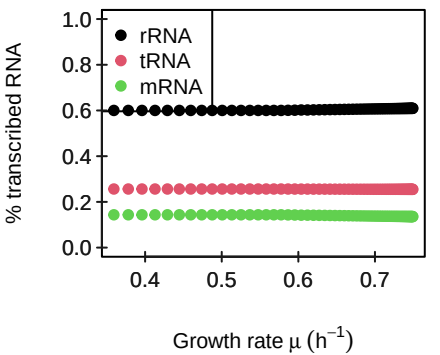

Apparent turnover numbers $k_{app}$ (h$^{-1}$)
Growth rate μ (h$^{-1}$)

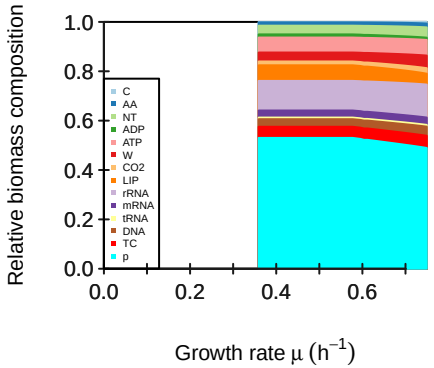

RNA/P
RNA/P
Growth rate μ (h$^{-1}$)

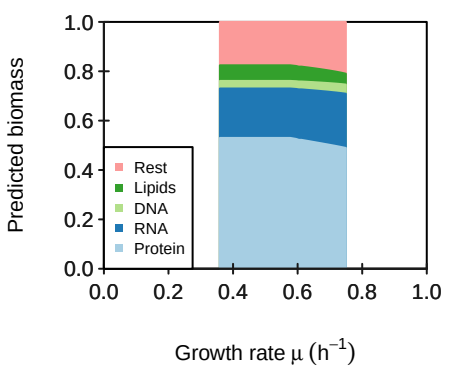

rRNA/rP
rRNA/rP
Growth rate μ (h$^{-1}$)

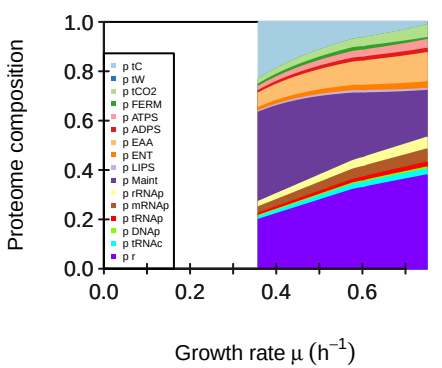

rP/(rP + rRNA)
rP/(rP + rRNA)
Growth rate μ (h$^{-1}$)

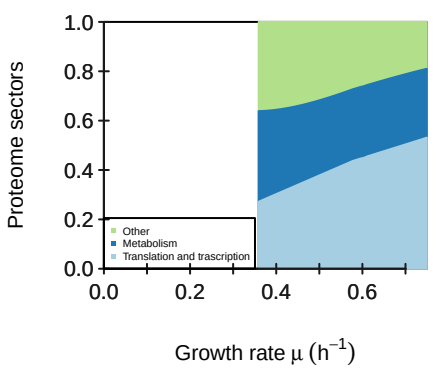

Protein mass fraction in ribosome
rP/(rP + brRNA)
Growth rate μ (h$^{-1}$)

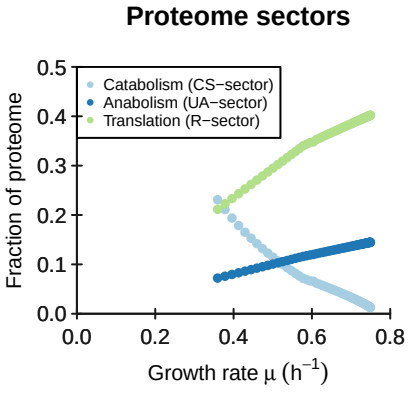

% transcribed RNA
rRNA
tRNA
mRNA
Growth rate μ (h$^{-1}$)


Relative biomass composition
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
C
AA
NT
ADP
ATP
W
CO2
LIP
rRNA
mRNA
tRNA
DNA
TC
p
Growth rate μ (h−1)


Predicted biomass
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
Rest
Lipids
DNA
RNA
Protein
Growth rate μ (h−1)


Proteome composition
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
p tC
p tW
p tCO2
p FERM
p ATPS
p ADPS
p EAA
p ENT
p LIPS
p Maint
p rRNAp
p mRNAp
p tRNAp
p DNAp
p tRNAc
p r
Growth rate μ (h−1)


Proteome sectors
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
Other
Metabolism
Translation and trascription
Growth rate μ (h−1)


Proteome sectors
Fraction of proteome
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.2
0.4
0.6
0.8
Catabolism (CS−sector)
Anabolism (UA−sector)
Translation (R−sector)
Growth rate μ (h−1)

# M

| | tC | tW | tCO2 | FERM | ATPS | ADPS | EAA | ENT | LIPS | Maint | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **C** | 1 | 0 | 0 | −0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **AA** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | −0.167 | 0 | 0 | 0 | 0 | 0 | 0 | −0.01 | 0 |
| **NT** | 0 | 0 | 0 | 0 | 0 | −1 | 0 | 0.334 | 0 | 0 | −1 | −1 | −1 | −1 | 0 | 0 |
| **ADP** | 0 | 0 | 0 | −0.8 | −0.98 | 1 | 0 | 0.666 | 0.82 | 1 | 0 | 0 | 0 | 0 | 0.05 | 0.05 |
| **ATP** | 0 | 0 | 0 | 0.8 | 0.98 | 0 | 0 | −0.666 | −0.82 | −1 | 0 | 0 | 0 | 0 | −0.05 | −0.05 |
| **W** | 0 | −1 | 0 | 0.2 | −0.02 | 0 | −1 | −0.167 | −0.18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO2** | 0 | 0 | −1 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **rRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| **mRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **tRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | −0.94 | 0.94 |
| **DNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| **TC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.95 | −0.95 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 |

# K

| | tC | tW | tCO2 | FERM | ATPS | ADPS | EAA | ENT | LIPS | Maint | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **x_C** | 0.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_W** | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_CO2** | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **C** | 4 | 0 | 0 | 2 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **AA** | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| **NT** | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 12 | 0 | 0 | 6 | 6 | 6 | 6 | 0 | 0 |
| **ADP** | 0 | 0 | 0 | 1 | 0.9 | 2 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ATP** | 0 | 0 | 0 | 7 | 6.3 | 0 | 0 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 4 | 4 |
| **W** | 0 | 4 | 0 | 7 | 6.3 | 0 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO2** | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **rRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **mRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **tRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **DNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# KA

| | tC | tW | tCO2 | FERM | ATPS | ADPS | EAA | ENT | LIPS | Maint | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **x_C** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.005 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_W** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_CO2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **C** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **AA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NT** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ADP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ATP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **W** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 60 | 60 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **rRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 |
| **mRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| **tRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **DNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 8 | 8 | 0 | 0 |
| **TC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# kcat

| | tC | tW | tCO2 | FERM | ATPS | ADPS | EAA | ENT | LIPS | Maint | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **kcatf** | 1079 | 10 | 34 | 8910 | 891 | 14 | 12 | 217 | 73 | 79 | 10 | 2 | 10 | 16 | 14679 | 792 |
| **kcatb** | 108 | 1 | 3 | 891 | 89 | 1 | 1 | 22 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Keq

| | [,1] | [,2] | [,3] | [,4] | [,5] | [,6] | [,7] | [,8] | [,9] | [,10] | [,11] | [,12] | [,13] | [,14] | [,15] | [,16] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **[1,]** | 799.259259259259 | 7.5 | 11.3333333333333 | 245 | 11.123595505618 | 4.66666666666667 | 36 | 2.46590909090909 | 45.625 | Inf | Inf | Inf | Inf | Inf | Inf | Inf |

# phi input

| | [,1] | [,2] | [,3] | [,4] | [,5] | [,6] | [,7] | [,8] | [,9] | [,10] | [,11] | [,12] | [,13] | [,14] | [,15] | [,16] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1,] | 0.002 | 0.02 | 0.01 | 0.041 | 0.046 | 0.005 | 0.165 | 0.023 | 0.031 | 0.277 | 0.0426 | 0.0213 | 0.0071 | 0.002 | 0.023 | 0.284 |

**average saturation input**

2

# minimal phi constraint

| | [,1] | [,2] | [,3] | [,4] | [,5] | [,6] | [,7] | [,8] | [,9] | [,10] | [,11] | [,12] | [,13] | [,14] | [,15] | [,16] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1,] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# minimal f constraint

| | [,1] | [,2] | [,3] | [,4] | [,5] | [,6] | [,7] | [,8] | [,9] | [,10] | [,11] | [,12] | [,13] | [,14] | [,15] | [,16] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1,] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |