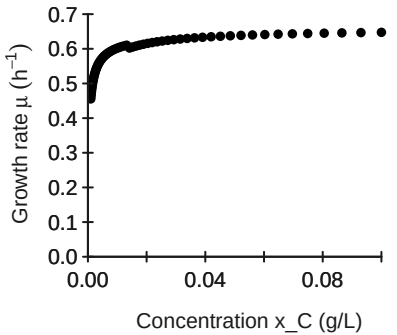
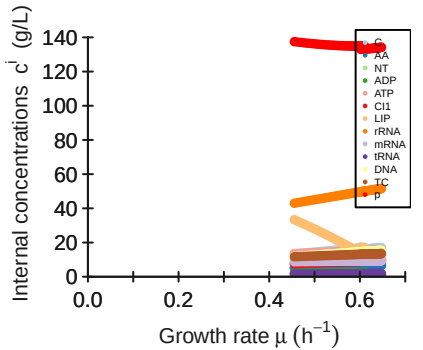
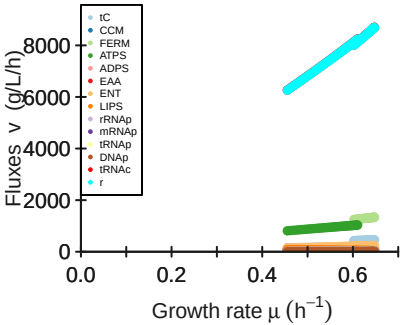
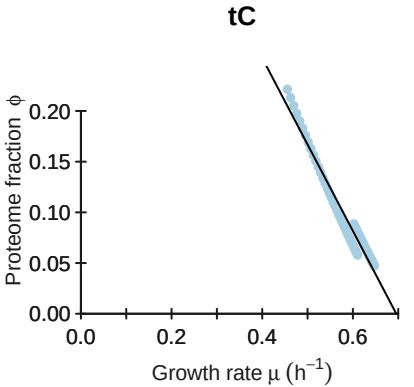
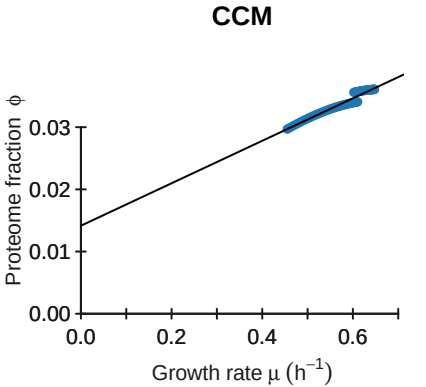
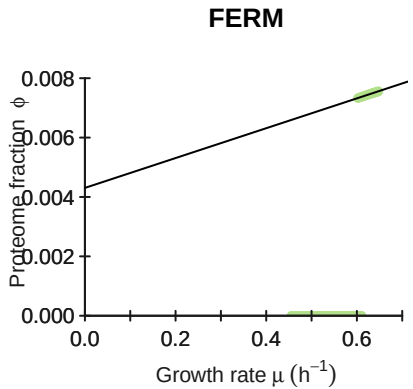

Growth rate μ (h$^{-1}$)
Concentration x_C (g/L)

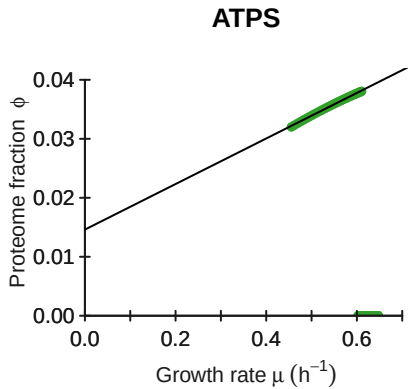

Internal concentrations $c^i$ (g/L)
Growth rate μ (h$^{-1}$)
C
AA
NT
ADP
ATP
Cl1
LIP
rRNA
mRNA
tRNA
DNA
TC
p

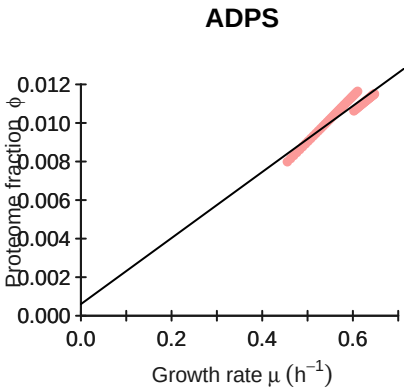

Fluxes v (g/L/h)
Growth rate μ (h$^{-1}$)
tC
CCM
FERM
ATPS
ADPS
EAA
ENT
LIPS
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r

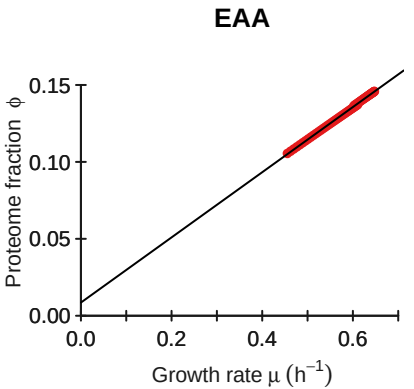

tC
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

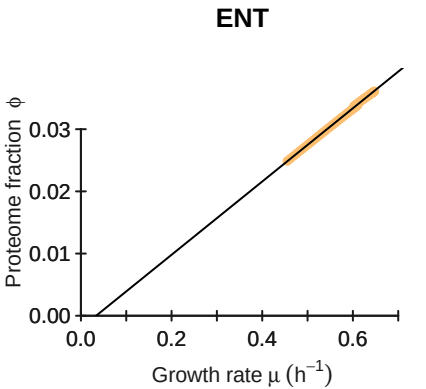

CCM
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

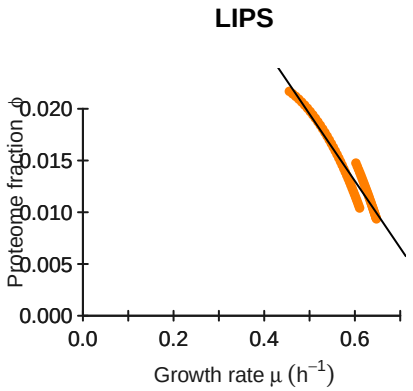

FERM
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

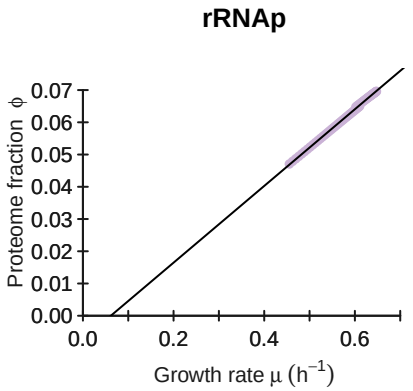

ATPS
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

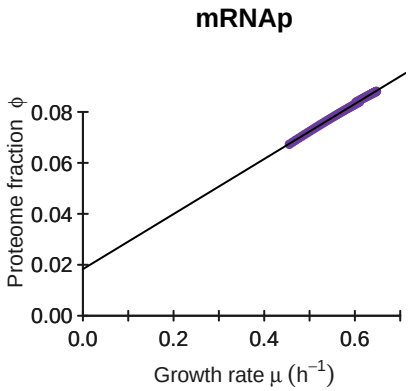

ADPS
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

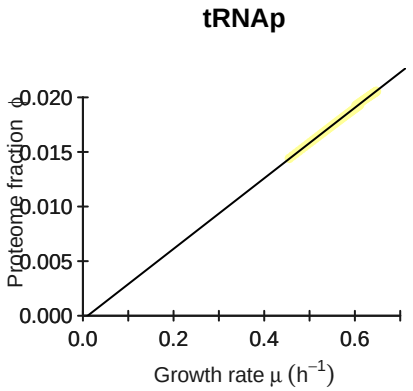

EAA
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

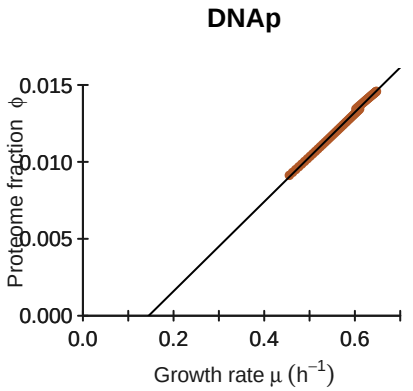

ENT
Proteome fraction ϕ
Growth rate μ (h$^{-1}$)

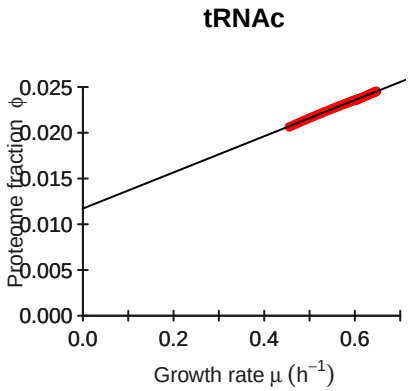

LIPS
Proteome fraction ϕ
0.000
0.005
0.010
0.015
0.020
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

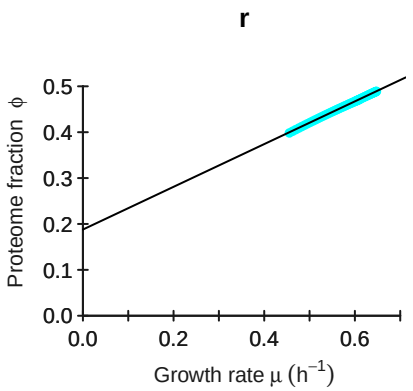

rRNAp
Proteome fraction ϕ
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

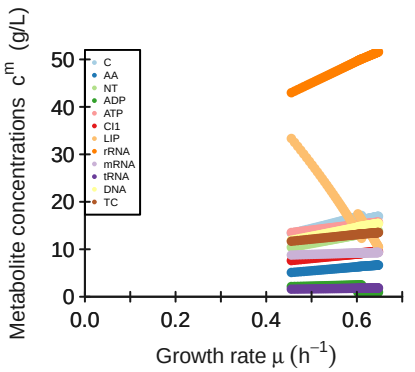

mRNAp
Proteome fraction ϕ
0.00
0.02
0.04
0.06
0.08
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

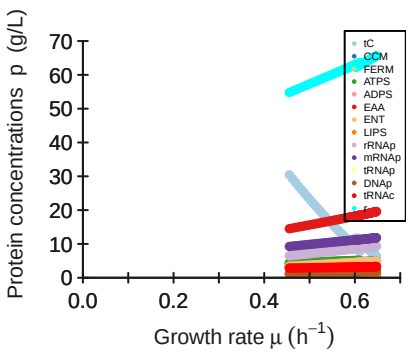

tRNAp
Proteome fraction ϕ
0.000
0.005
0.010
0.015
0.020
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

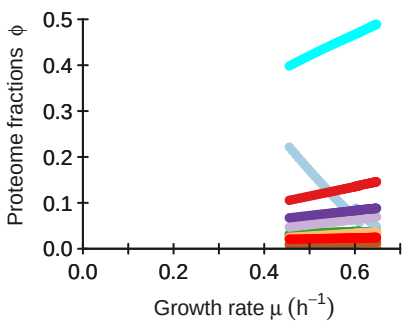

DNAp
Proteome fraction ϕ
0.000
0.005
0.010
0.015
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

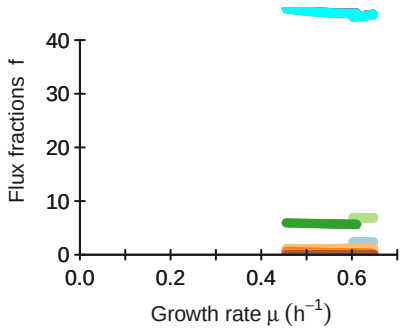

tRNAc
Proteome fraction ϕ
0.000
0.005
0.010
0.015
0.020
0.025
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

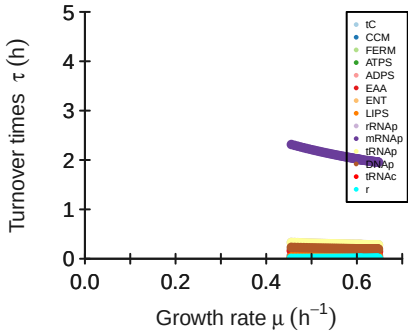

r
Proteome fraction ϕ
0.0
0.1
0.2
0.3
0.4
0.5
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

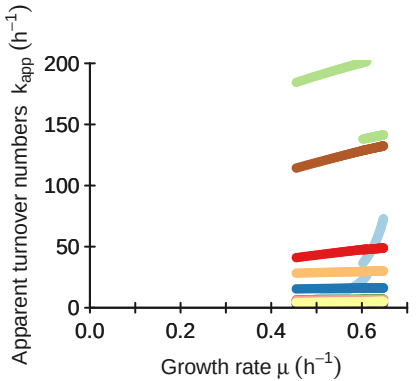

Metabolite concentrations cm (g/L)
C
AA
NT
ADP
ATP
Ci1
LIP
rRNA
mRNA
tRNA
DNA
TC
0
10
20
30
40
50
0.0
0.2
0.4
0.6
Growth rate μ (h−1)


Protein concentrations p (g/L)
tC
CCM
FERM
ATPS
ADPS
EAA
ENT
LIPS
rRNAp
mRNAp
tRNAp
DNAp
tRNAc
r
0
10
20
30
40
50
60
70
0.0
0.2
0.4
0.6
Growth rate μ (h−1)

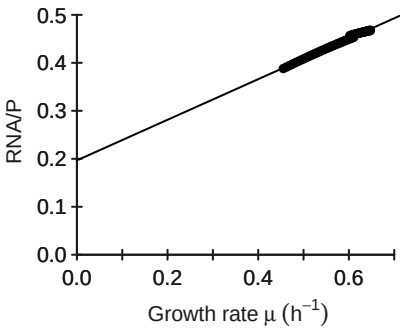

Proteome fractions ϕ
0.0
0.1
0.2
0.3
0.4
0.5
0.0
0.2
0.4
0.6
Growth rate μ (h−1)



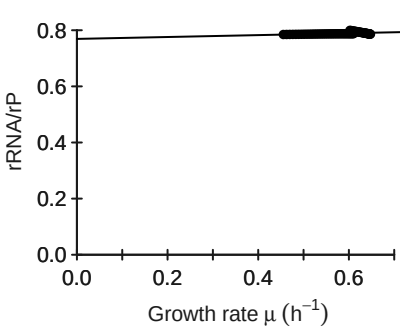



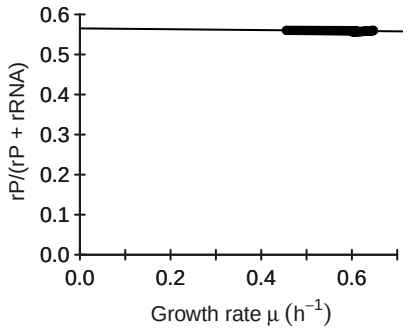

RNA/P



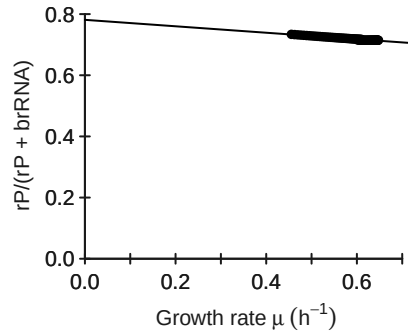

rRNA/rP

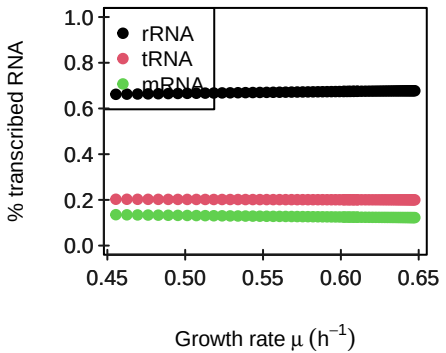


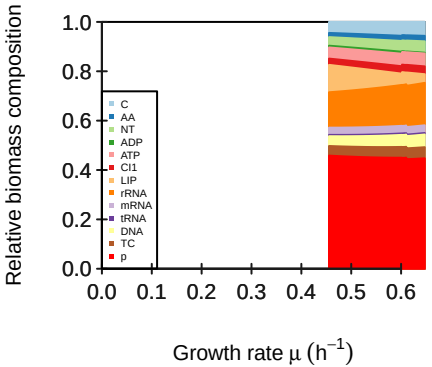

rP/(rP + rRNA)

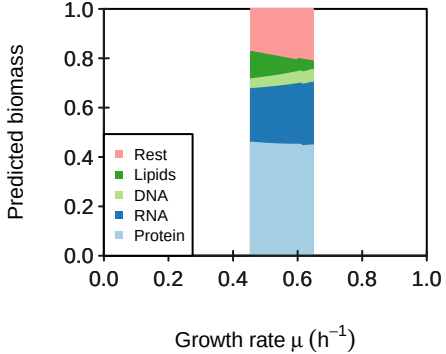


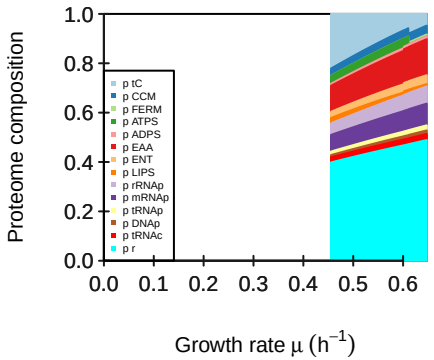

Protein mass fraction in ribosome

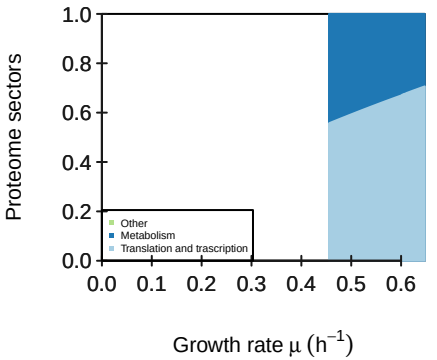


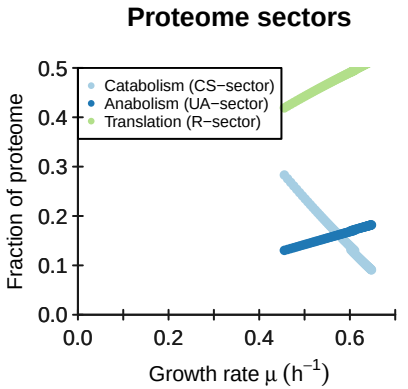




Proteome composition
1.0
0.8
0.6
0.4
0.2
0.0
0.0 0.1 0.2 0.3 0.4 0.5 0.6
p tC
p CCM
p FERM
p ATPS
p ADPS
p EAA
p ENT
p LIPS
p rRNAp
p mRNAp
p tRNAp
p DNAp
p tRNAc
p r
Growth rate μ (h−1)


Proteome sectors
1.0
0.8
0.6
0.4
0.2
0.0
0.0 0.1 0.2 0.3 0.4 0.5 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
Catabolism (CS−sector)
Anabolism (UA−sector)
Translation (R−sector)
Growth rate μ (h−1)

# M

| | tC | CCM | FERM | ATPS | ADPS | EAA | ENT | LIPS | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **C** | 1 | −1 | −0.2 | −0.02 | 0 | −0.5 | −0.167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **AA** | 0 | 0 | 0 | 0 | 0 | 1 | −0.167 | 0 | 0 | 0 | 0 | 0 | −0.01 | 0 |
| **NT** | 0 | 0 | 0 | 0 | −1 | 0 | 0.334 | 0 | −1 | −1 | −1 | −1 | 0 | 0 |
| **ADP** | 0 | 0 | −0.8 | −0.98 | 1 | 0 | 0.666 | 0.82 | 0 | 0 | 0 | 0 | 0.05 | 0.05 |
| **ATP** | 0 | 0 | 0.8 | 0.98 | 0 | 0 | −0.666 | −0.82 | 0 | 0 | 0 | 0 | −0.05 | −0.05 |
| **CI1** | 0 | 1 | 0 | 0 | 0 | −0.5 | 0 | −0.18 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 | 0 | 0 | 0 | 0 | 0 |
| **rRNA** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| **mRNA** | 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 | 1 | 0 | −0.94 | 0.94 |
| **DNA** | 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 | 0.95 | −0.95 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.01 |

# K

| | tC | CCM | FERM | ATPS | ADPS | EAA | ENT | LIPS | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **x_C** | 0.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_W** | 0 | 0 | 5 | 4.5 | 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 |
| **C** | 0 | 4 | 4 | 3.6 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **AA** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| **NT** | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 0 | 0 |
| **ADP** | 0 | 0 | 1 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ATP** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | 2 |
| **Cl1** | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 0 | 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 |
| **mRNA** | 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 | 1 | 0 |
| **DNA** | 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 | 2 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# KA

| | tC | CCM | FERM | ATPS | ADPS | EAA | ENT | LIPS | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **x_C** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **x_W** | 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 |
| **C** | 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 |
| **NT** | 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 |
| **ATP** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cl1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **LIP** | 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 | 50 |
| **mRNA** | 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 |
| **DNA** | 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 |
| **p** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# kcat

| | tC | CCM | FERM | ATPS | ADPS | EAA | ENT | LIPS | rRNAp | mRNAp | tRNAp | DNAp | tRNAc | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **kcatf** | 734 | 20 | 3320 | 332 | 9 | 10 | 109 | 41 | 7 | 1 | 7 | 10 | 7351 | 446 |
| **kcatb** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Keq

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

# phi input

| | [,3] | [,4] | [,5] | [,6] | [,7] | [,8] | [,9] | [,10] | [,11] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0575035063113605 | 0.0364656381486676 | 0.00701262272089762 | 0.231416549789621 | 0.032258064516129 | 0.0434782608695652 | 0.0597475455820477 | 0.0298737727910238 | 0.00995792426367462 | 0.002805 |

average saturation input

3

# minimal phi constraint

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