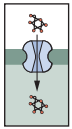
TRANSPORT

carbon



$r_{transport} \approx 200\ sugars \cdot sec^{-1} \cdot transp$ BNID: 103693

$m_{carbon} \approx \frac{1}{2}\ m_{dry} \approx 0.15\ p$ BNID: 100649

$N_{carbon} \approx m_{carbon} \frac{1\ carbon}{12\ Da} \times \frac{6 \times 10^{11}\ Da}{1\ pg} \approx 10^{10}\ carbon \cdot cell^{-1}$

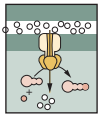
$N_{transporters} \approx \frac{10^{10}\ carbon}{cell} \times \frac{1\ sugar}{6\ carbon} \times \frac{1\ sec}{200\ sugars} \times \frac{1\ cell}{6000\ sec} \approx 10^{3}\ transporters$

nitrogen

water

ENERGY PRODUCTION

ATP Synthesis



Assuming protein synthesis primary consumer of ATP

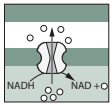
$N_{peptide\ bonds} \approx 3 \times 10^{6}\ proteins \times \frac{300\ peptide\ bonds}{1\ protein} \approx 10^{10}\ amino\ acids$

$N_{ATP} \approx \frac{4\ ATP}{peptide\ bond} \times 10^{10}\ peptide\ bonds \approx 5 \times 10^{10}\ ATP$ BNID: 101442

$r_{ATP\ synthesis} \approx 300 \cdot sec^{-1} \cdot synthase^{-1}$ BNID: 114701

$N_{ATP\ synthases} \approx \frac{5 \times 10^{10}\ ATP}{1\ cell} \times \frac{1\ sec}{300\ ATP} \times \frac{1\ cell}{6000\ sec} \approx 3 \times 10^{4}\ synthetases$

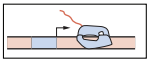
proton gradient



$r_{proton\ use\ for\ ATP\ synthesis} \approx N_{ATP\ synthases} \times \frac{300\ ATP}{1\ sec} \times \frac{4\ protons}{1\ ATP} \approx \frac{4 \times 10^{7}\ protons}{1\ sec}$ BNID: 114701 BNID: 103390

$r_{proton\ transport} \approx 5000\ protons \cdot sec^{-1} \cdot electron\ transport\ complex^{-1}$ BNID: 114704; 114687

$N_{electron\ transport\ complexes} \approx \frac{4 \times 10^{7}\ protons}{1\ sec} \times \frac{1\ sec}{5000\ protons} \approx 10^{4}\ complexes$



$N_{rRNA\ genes} \approx 3000\ nucleotides$

$r_{RNAP\ loading} \approx 1\ RNAP \cdot sec^{-1}$ BNID: 111997 $L_{RNAP\ footprint} \approx 40\ nucleotides$ BNID: 107873

$r_{transcription} \approx 40\ nucleotides \cdot sec^{-1}$ BNID: 111871