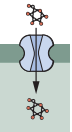


# carbon transport



$$m_c^{(cell)} \approx \frac{m_{dry}}{2} \approx 0.15 \text{ pg} \quad \text{BNID: 100649}$$

cellular carbon mass

$$am_c \approx 12 \text{ Da} \approx 2 \times 10^{-11} \text{ pg / C}$$

atomic mass

$$N_c^{(cell)} \approx \frac{m_c^{(cell)}}{am_c} \approx \frac{0.15 \text{ pg}}{\text{cell}} \times \frac{1 \text{ C}}{2 \times 10^{-11} \text{ pg}} \approx 1 \times 10^{10} \text{ C / cell}$$

carbon atoms per cell

$$N_c^{(sugar)} \approx 5 \text{ C / sugar}$$

carbon atoms per sugar

$$r_{transport} \approx \frac{200 \text{ sugars / sec}}{\text{transporter}} \quad \text{BNID: 103693}$$

sugar transport rate

$$N_{transporters} \approx \frac{N_c^{(cell)}}{N_c^{(sugar)} \times r_{transport} \times t_{division}} \approx \frac{10^{10} \frac{\text{C}}{\text{cell}}}{5 \frac{\text{C}}{\text{sugar}} \times 200 \frac{\text{sugars}}{\text{sec} \times \text{transporter}} \times 5000 \frac{\text{sec}}{\text{cell}}} \approx 2000 \text{ transporters}$$

number of carbon transporter complexes