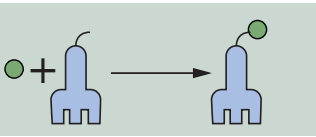
tRNA charging



$$N_{\text{amino-acyl tRNA}} \approx 3\times10^{6}\ \text{proteins} \times \frac{300\ \text{amino acids}}{1\ \text{protein}} \times \frac{1\ \text{amino-acyl tRNA}}{1\ \text{amino acid}}$$

$$\approx 1\times10^{9}\ \text{amino-acyl tRNAs/cell}$$

minimum number of charged tRNA per cell

$$r_{\text{tRNA supply}} \approx \frac{N_{\text{amino-acyl tRNA}}}{t_{\text{division}}} = \frac{10^{9}\ \text{amino-acyl tRNAs / cell}}{5000\ \text{sec}}$$

$$\approx 2\times10^{5}\ \frac{\text{amino-acyl tRNAs}}{1\ \text{sec}}$$

rate of charged tRNA consumption/supply to ribosomes

$$r_{\text{tRNA charging}} \approx \frac{20\ \text{amino-acyl tRNA}}{\text{tRNA synthetase} \times \text{sec}}$$

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rate of tRNA charging

$$N_{\text{tRNA synthetase}} \approx \frac{r_{\text{tRNA supply}}}{r_{\text{tRNA charging}}}$$

$$\approx 1\times10^{4}\ \text{tRNA synthetases / cell}$$

number of tRNA synthetase complexes