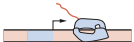


RNA SYNTHESIS

(A)  $r_{\text{transcription}} \approx 40 \text{ nucleotides / (sec} \times \text{polymerase)}$ BNID: 111871 $N_{\text{RNAP}} \approx N_{\text{RNAP}}^{(\text{rRNA})} + N_{\text{RNAP}}^{(\text{mRNA})} + N_{\text{RNAP}}^{(\text{tRNA})} \approx 1000 \text{ RNAP}$

rRNA synthesis

$$L_{\text{rRNA genes}} \approx 4500 \text{ nucleotides} \quad \text{BNID: 108093}$$

$$r_{\text{RNAP loading}} \approx 1 / \text{sec} \quad \text{BNID: 111997}$$

$$L_{\text{RNAP footprint}} \approx 40 \text{ nucleotides} \quad \text{BNID: 107873}$$

$$\rho_{\text{RNAP}} \approx \frac{1 \text{ RNAP}}{L_{\text{RNAP footprint}} + \frac{r_{\text{transcription}}}{r_{\text{RNAP loading}}}} \approx \frac{1 \text{ RNAP}}{80 \text{ nucleotides}}$$

$$N_{\text{RNAP}}^{(\text{rRNA})} \approx L_{\text{rRNA genes}} \times N_{\text{rRNA genes}} \times \rho_{\text{RNAP}} \approx 500 \text{ RNAP}$$

mRNA synthesis

$$\text{BNID: 104186;106254}$$

$$N_{\text{mRNA}} \approx \frac{1 \text{ mRNA}}{1000 \text{ proteins}} \times 3 \times 10^6 \text{ proteins} \approx 3000 \text{ mRNA (at steady state)}$$

$$r_{\text{degradation}} \approx 1 \text{ mRNA} / 300 \text{ s} \quad \text{BNID: 111927}$$

$$L_{\text{mRNA}} \approx 1000 \text{ nucleotides} \quad \text{BNID: 100022}$$

$$N_{\text{RNAP}}^{(\text{mRNA})} \approx \frac{N_{\text{mRNA}} \times r_{\text{degradation}} \times L_{\text{mRNA}}}{r_{\text{transcription}}} \approx 250 \text{ RNAP}$$

tRNA synthesis

$$\text{BNID: 108611}$$

$$N_{\text{tRNA}} \approx 4 \times 10^5 \text{ tRNA / cell}$$

$$\text{BNID: 102340}$$

$$L_{\text{tRNA}} \approx 80 \text{ nucleotides / tRNA}$$

$$N_{\text{RNAP}}^{(\text{tRNA})} \approx \frac{N_{\text{tRNA}} \times L_{\text{tRNA}}}{r_{\text{transcription}} \times t_{\text{division}}} \approx 150 \text{ RNAP}$$

(B)

