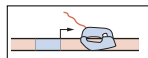


RNA SYNTHESIS

(A)



$$r_{\text{transcription}} \approx 40 \text{ nucleotides / sec} \quad \text{BNID: 111871}$$

rRNA synthesis

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

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

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

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

$$N_{\text{RNAP}}^{(\text{rRNA})} \approx \frac{L_{\text{rRNA genes}}}{L_{\text{between RNAP}}} \times N_{\text{rRNA genes}} \approx 400 \text{ RNAP}$$

mRNA synthesis

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

$$N_{\text{mRNA}} \approx \frac{1 \text{ mRNA}}{1000 \text{ proteins}} \times 3 \times 10^6 \text{ proteins}$$

$$\approx 3000 \text{ mRNA (at steady state)}$$

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

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

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

tRNA synthesis

$$\text{BNID: 105280}$$

$$N_{\text{tRNA}} \approx \frac{3000}{\text{amino acid}} \times 20 \text{ amino acids}$$

$$\approx 6 \times 10^4 \text{ tRNA}$$

$$L_{\text{tRNA}} \approx 80 \text{ nucleotides} \quad \text{BNID: 102340}$$

$$N_{\text{RNAP}}^{(\text{tRNA})} \approx \frac{N_{\text{tRNA}} \times L_{\text{tRNA}}}{r_{\text{transcription}} \times t_{\text{division}}} \approx 20 \text{ RNAP}$$

$$N_{\text{RNAP}} \approx N_{\text{RNAP}}^{(\text{rRNA})} + N_{\text{RNAP}}^{(\text{mRNA})} + N_{\text{RNAP}}^{(\text{tRNA})} \approx 1000 \text{ RNAP}$$

(B)

(C)

10^5

10^4