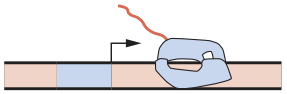
## RNA synthesis



$r_{transcription} \approx 40$ nucleotides / (sec×polymerase)

BNID: 111871

RNA polymerase transcription rate

### rRNA synthesis

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

summed nucleotide length of rRNA

$r_{RNAP\ loading} \approx 1$ / sec BNID: 102362

promoter loading rate

$$L_{RNAP\ spacing} \approx \frac{r_{transcription}}{r_{RNAP\ loading}} \approx 40 \text{ nucleotides}$$

average spacing between RNA polymerase

$$N_{RNAP}^{(rRNA)} \approx L_{rRNA\ genes} \times N_{rRNA\ genes} \times L_{RNAP\ spacing} \approx 1000 \text{ RNAP}$$

### mRNA synthesis

$$N_{mRNA} \approx \frac{1 \text{ mRNA}}{1000 \text{ proteins}} \times 3\times10^{6} \text{ proteins}$$

BNID: 104186; 106254

number of mRNA molecules per cell

$\approx$3000 mRNA (at steady state)

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

mRNA degradation rate

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

average length of mRNA

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

### tRNA synthesis

$N_{tRNA} \approx 4\times10^{5}$ tRNA / cell BNID: 108611

number of tRNA molecules per cell

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

average length of tRNA

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

$$N_{RNAP} \approx N_{RNAP}^{(rRNA)} + N_{RNAP}^{(mRNA)} + N_{RNAP}^{(tRNA)} \approx 1500 \text{ RNAP}$$

total number of RNAP complexes