notes.tex

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Cell volume	$1\mu\text{m}^3$
Length of DNA	1550 μm
Length of DNA	$5 \cdot 10^6$ bp
Average protein size	360 AAs
Av. diameter of protein	5 nm
Conc. of proteins	5-8mM
Diameter of ribosome	20 nm
Volume fraction of proteins	17%
Volume fraction of all RNA	6%
Volume fraction of mRNA	.2%
Volume fraction of DNA	1%
Volume fraction of ribosomes	8%
Number of mRNA molecules	4 000
Number of rRNA molecules	18 000
Number of tRNA molecules	200 000
Number of all proteins	3 500 000
Number of amino acids	10^9
Number of free amino acids	6 000 000
Number of ribosomes	40 000
Half-life mRNA	5 min
Half-life E.Coli	30 min
Conc. 1 protein in cell	1 nM
Translation rate / ribosome	13.8 $\frac{\text{codons}}{\text{ribosome}\cdot s}$
Translation rate / ribosome	41.4 $\frac{\text{bps}}{\text{ribosome}\cdot s}$

Diffusion time across a distace d in the E.Coli cell:

$$t_{\text{diffusion}} = \frac{d^2}{2D} \tag{1}$$

where D is diffusion const. (Typically of the order .1-10 $\mu m^2/s$)

On-time is the time it takes for diffusing particle to find its target in the volume V

$$\frac{1}{\tau_{on}} = \frac{4\pi D \epsilon N}{V} \tag{2}$$

I think N is number of particles needed for turning on.

Searching along DNA, we get

$$t_{on} = \frac{L^2}{D} \tag{3}$$