Week 9 Recitation

Chapter 5 Review

Chapter 8: The Motions of Biological Molecules

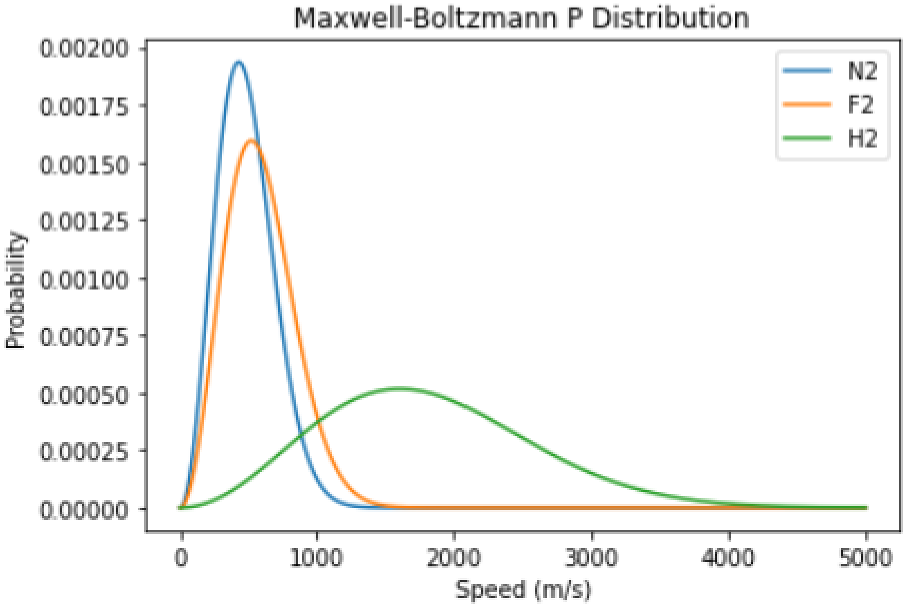
Updates

- Assignment 6 is graded, key pending for Assignment 7
- The syllabus did not mention Chapter 8, so lump that in with 9 and 10
- Election Day is November 3rd
- Assignment 8 due November 2nd
- Made a case to postpone Exam II to November 6th

Questions?

Chapter 5 Review

Maxwell-Boltzmann statistics:



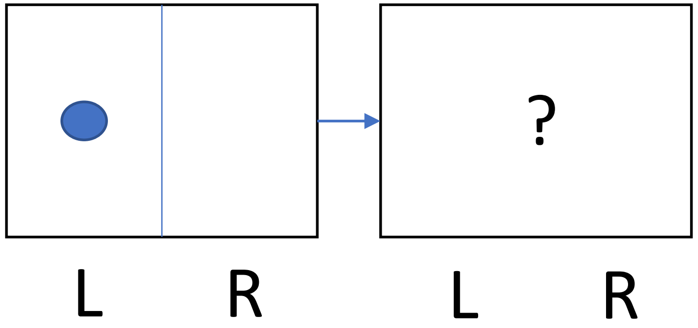
$$v_{mp} = \sqrt{\frac{2RT}{M}} \quad \bar{v} = \sqrt{\frac{8RT}{\pi M}} \quad v_{rms} = \sqrt{\frac{3RT}{M}}$$

$$Q = \sum_i g_i e^{-E_i/k_B T} \qquad v = \frac{1[PA] + \cdots n[PA_n]}{Q}$$

Entropy:

A measure of disorder

$$\Delta S = S_2 - S_1 = k_B \ln(W_2) - k_B \ln(W_1)$$



If two molecules? $2^2 \therefore 2^{nN_A}$

Random Walk:

For N steps of 1(q) or 0(p): $(q + p)^N$

If P(q) = P(p), then mean d = 0

$\langle d^2 \rangle = Nl^2$, sqrt if asked!

Polymer Dim:

Linear: $\langle h^2 \rangle = Nl^2$

Open random: $\langle R^2 \rangle = \frac{Nl^2}{6}$

Circular random: $\langle R^2 \rangle = \frac{Nl^2}{12}$

H-C Transitions:

Binomial, $(q + p)^N$, but σ

1. C = 1
2. H→H = s
3. C→H = σs
4. H(n≤2)CH = 0

If CCCCCC…C, then:

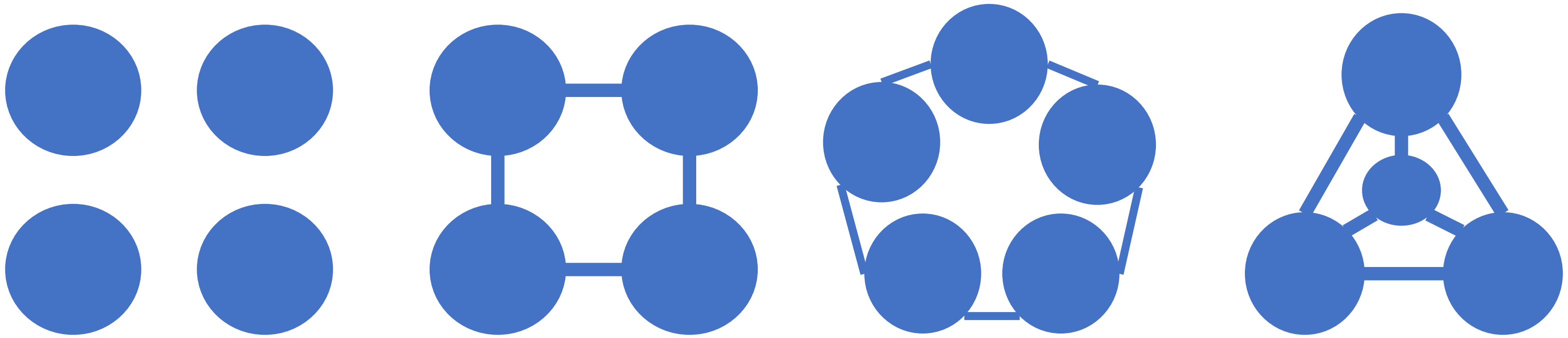
Initiation: σs, where

σ < 1

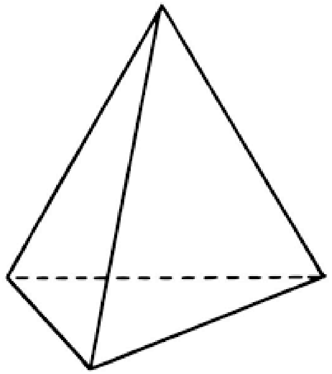
Obs: n+3 correlation

Chapter 5 Review

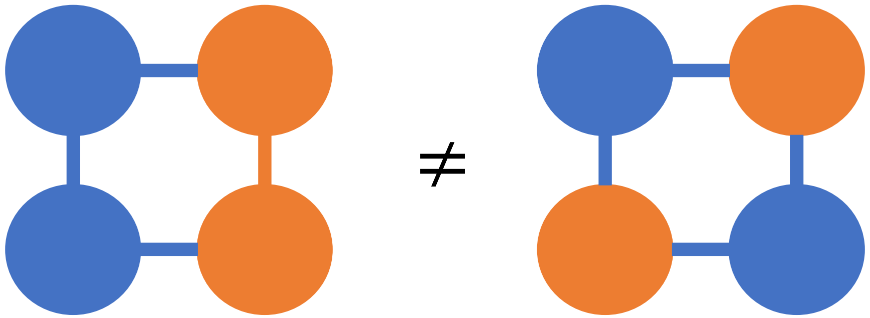
Binding arrays (representative example):



Lines = dependent
No lines = independent



Question: How many cooperative interfaces does TRAP have?

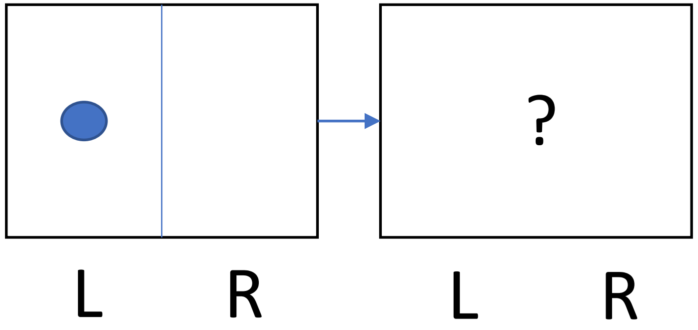


$[PL_2]$ $[PL_2]$

- Review the basics of ITC e.g. how and why it works, what do the data say, etc.
- Review TRAP, will advocate to keep the questions appropriate for this class!
- Did not discuss K or Y, previous slideshow a better resource for studying.

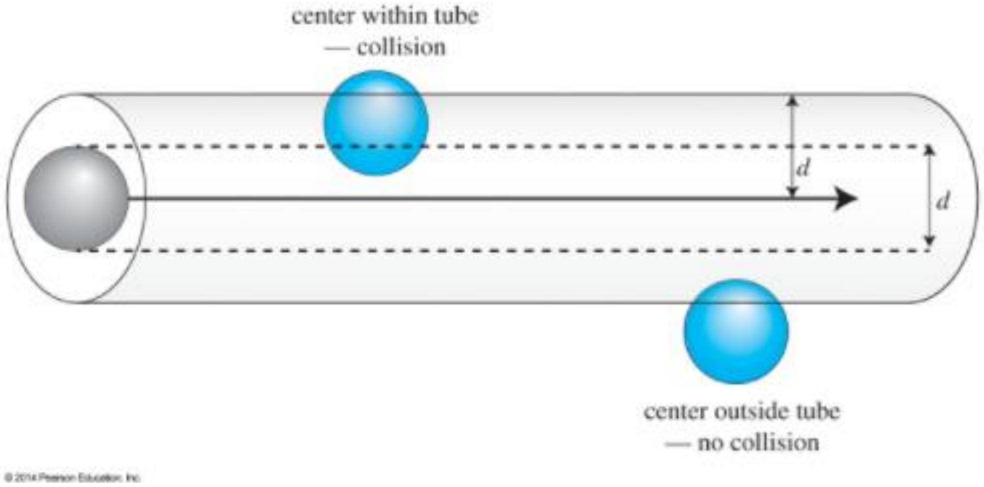
Chapter 8: Collisions

Diffusion: The movement of molecules along a concentration gradient



Entropy of this process?

Rate of this process?



$$N = N_A p \pi d^2 t \sqrt{\frac{16}{\pi RTM}}$$

$$z = \frac{N}{t} = N_A p \pi d^2 \sqrt{\frac{16}{\pi RTM}}$$

Average distance between collisions:

$$\lambda = \frac{\langle v \rangle}{z} = \frac{RT}{\sqrt{2} N_A p \sigma}$$

Molecular orbitals are not hard spheres ∴ sub. πd^2 with σ

Chapter 8: Fick's First Law

Fick's First Law:

$$J_x = -D\left(\frac{dc}{dx}\right)$$

Where:

J_x = x-component flux (solute moving through unit area per unit time)

dc/dx = rate of concentration change along x axis (+/-)

Concept check:

If dc/dx is positive, then this law states the flux will be   w/ respect to x.

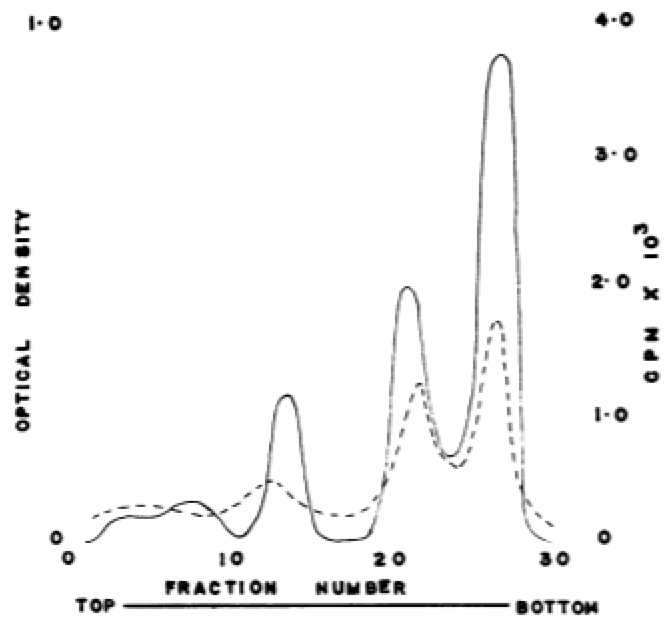
D = diffusion coefficient

Concept check:

In a system with no external forces acting upon it, can D be negative?

Trivia: Sedimentation and A(U)C

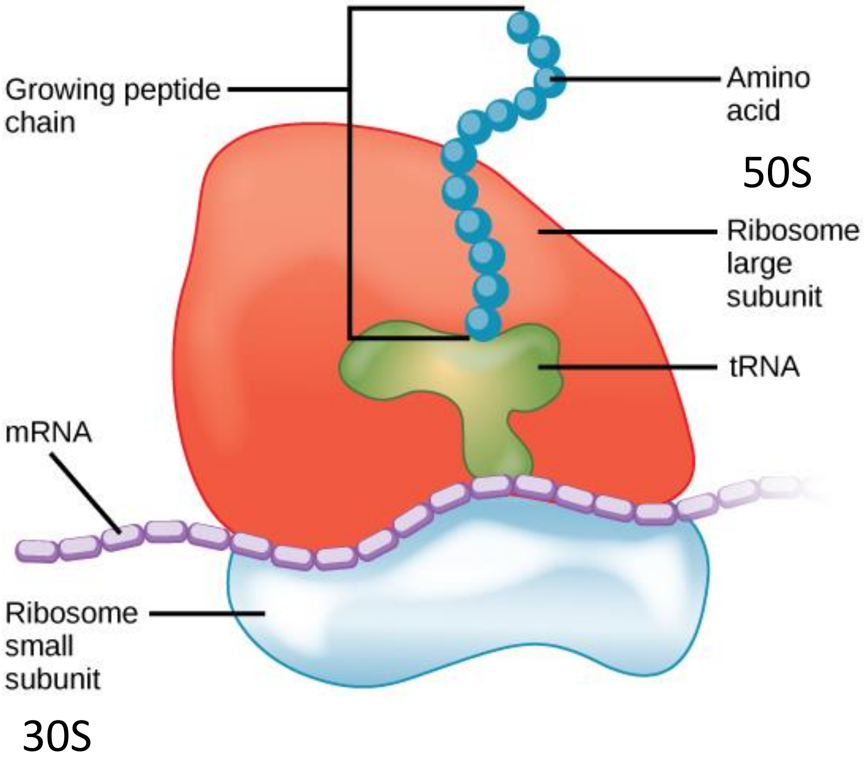
Ever wonder why the (prokaryotic) 70S ribosome has a 50S and 30S subunit?



Trnka et al. 1967

$$s = \frac{v_t}{a_{rot}} = \frac{m_B(1 - v_B \rho_A)}{f}$$

$$D = \frac{k_B T}{f} \text{ and } f = 6\pi\eta r$$



Questions?

Have a good week!