20.181:hw11 sols

Solutions to HW 11

Part 1:

To complete the code shell provided, you had to insert something like the following code snippet:

```
            tau_new = (a_i_old[rxn] / (a_i_new[rxn]+eps)) * (tau_i[rxn]
- t_cur) + t_cur
            tau_i[rxn] = tau_new
            a_i_old[rxn] = a_i_new[rxn]
```

note that you can't update a_i until after you've calculated a new tau.

Part 2:

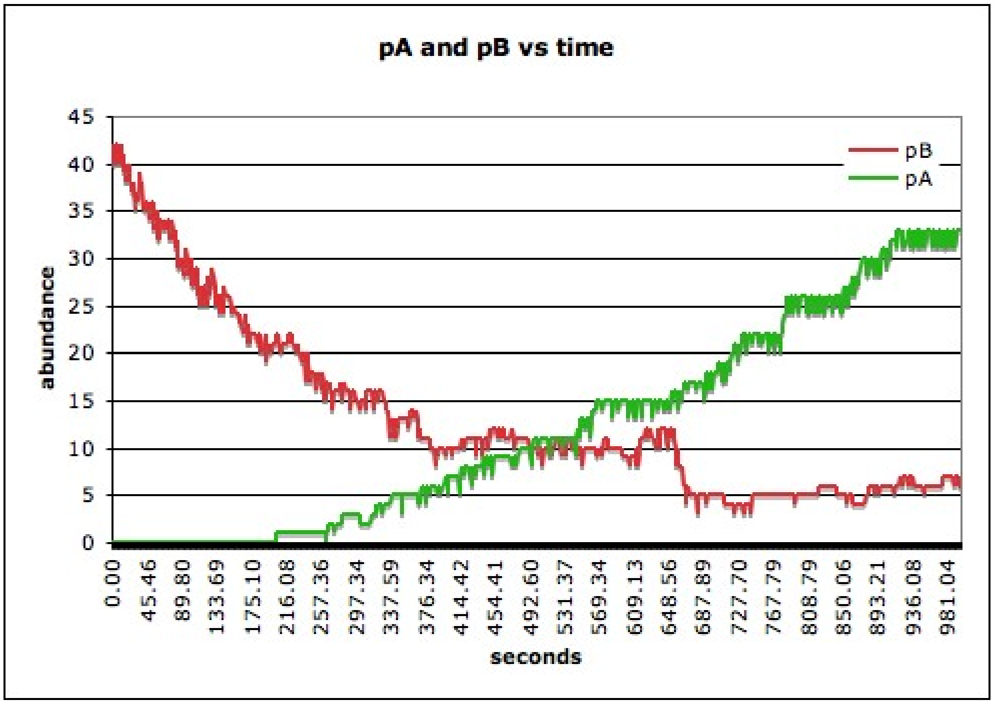
An easy way to solve this question is with dimensional analysis. If you've never heard of dimensional analysis before, it's essentially a fancy way of saying: manipulate the data to produce a value with the correct units; more often than not, this value will also be the correct quantity.

For instance, we know that we're trying to calculate the probability per unit time that a particle collision causes a reaction. Our solution should therefore be in units of [1/time] (probabilities are unitless!).

There is only one way to combine the given data so as to produce our desired units:

$$\frac{1 \times 10^9}{M \cdot sec} \cdot \frac{1\ mole}{6.023 \times 10^{23}} \cdot \frac{1}{1 \times 10^{-15}\ L} = 1.66\ sec^{-1}$$

Part 3:



Observe above a "switching event," where pA and pB "switch" steady states. Note that neither the original abundances of pA nor pB are steady state values - the proteins settle into their steady states towards the end of the simulation.

Part 4:

See above :)