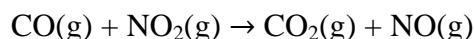


Quiz 4 2008
Chemistry 112

1. For the reaction



find the orders with respect to CO and NO₂ and **write a rate law** that reflects these results. The following data should be useful:

Experiment	[CO] ₀ in moles	[NO ₂] ₀ in moles	Initial rate(moles/s)
1	5.1×10^{-4}	0.35×10^{-4}	3.4×10^{-8}
2	5.1×10^{-4}	0.70×10^{-4}	6.8×10^{-8}
3	5.1×10^{-4}	1.05×10^{-4}	10.2×10^{-8}
4	1.0×10^{-3}	0.35×10^{-4}	6.8×10^{-8}
5	1.5×10^{-3}	0.35×10^{-4}	10.2×10^{-8}

Using the natal rates method we demonstrated in class, we can see that this reaction is first order in CO and NO₂. The rate law can then be written as $v=k[\text{CO}][\text{NO}_2]$.

2. The following table shows the pressure of a gaseous reactant, called A, vs. time for a particular reaction:

Pressure of A in millibars	Time in seconds
8.20	0
5.72	1000
4.08	2000
2.83	3000
2.07	4000

a) Is this reaction first order in A? (Hint: use what you know about the half life.)

Yes. The half life is constant.

b) Estimate the half life. $t_{1/2} = 2000 \text{ s}$

c) Assuming that A is the only substance in the rate law, what is the value of the rate constant?

$k = \ln 2 / t_{1/2} = 0.693 / 2000 \text{ s} = 3.5 \times 10^{-4} \text{ s}^{-1}$. Since 2000 s is an estimate, the SF are not absolutely clear. I'd say you can depend on two SF.

3. Rank the following classes of chemical species in order of increasing stability. If the substances in a particular class have similar stability, the put them together in a group, e.g., A,B < C, etc.

Reactants, Products, Catalysts, Intermediates, Transition States

Transition States < Intermediates < Reactants, Products, Catalysts