Chem 142 Quiz 2 Spring 2015

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor: Martin Larter

1. The gas phase decomposition of NO2 to form NO and O2 was studied at 383°C and the following data was collected.

|  |  |  |  |
| --- | --- | --- | --- |
| Time (s) | [NO2],M | ln[NO2] | 1/[NO2], M-1 |
| 0.0 | 0.100 | -2.30258509299 | 10 |
| 5.0 | 0.017 | -4.07454193493 | 58.8235294118 |
| 10.0 | 0.0090 | -4.71053070165 | 111.111111111 |
| 15.0 | 0.0062 | -5.08320598693 | 161.290322581 |
| 20.0 | 0.0047 | -5.36019277027 | 212.765957447 |

1. Graph the data and determine the order of this reaction with respect to [NO2] and calculate the rate constant.
2. Calculate, using the appropriate equation, the time required for the [NO2] to reach 0.00037 M





Second order reaction

1. Chemists commonly use the rule of thumb that an increase of 10 K in temperature doubles the rate of a reaction. What must the activation energy be for this statement to be true for a temperature increase from 25 ̊C to 35 ̊C?

In the reaction:

A (g) + B(g) 🡪 C (g) + D (g) ΔH reaction= -10.0 kJ

1. Describe two factors that determine whether a collision between A and B results in a reaction
2. The kinetic energy of the molecules - A certain minimum energy must be available for a reaction to occur. (Activation energy)
3. The orientation of the molecules relative to one another - Even very energetic collisions may not lead to a reaction if the molecules are not oriented properly.
4. How would a decrease in temperature affect the rate of the reaction shown above? Explain your answer
5. A decrease in temperature would decrease the rate.
6. Fewer molecules would have the energy necessary for reaction (fewer effective collisions).
7. Explain why a catalyst increases the rate of reaction but does not change the value of the equilibrium constant for that reaction.
8. A catalyst increases the rate by providing an alternate pathway that has a lower activation energy.
9. The value of the equilibrium constant does not change, since a catalyst does not affect the energies (or concentrations) of the reactants and products.