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**Mastery Questions (Submitted to Dropbox):**

For the following questions, you may need physical constants that aren’t listed. They can be found either in your book or on the internet. Or, ask and we’ll find them together.

**Mastery #1**: The following data was collected for the reaction of nitrogen gas and chlorine gas to form nitrogen trichloride gas.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Initial Nitrogen (atm) | Initial Chlorine (atm) | Initial Rate (atm/min) | Temp (K) |
| 1 | 0.250 | 0.250 | 0.012 | 300 K |
| 2 | 0.500 | 0.500 | 0.047 | 300 K |
| 3 | 0.500 | 0.250 | 0.011 | 300 K |
| 4 | 0.250 | 0.500 | 0.072 | 500 K |

0.666 atm of nitrogen gas and 0.333 atm of chlorine gas are put in a 2 L flask at 400 K. What is the initial rate of the reaction?

E3 / E1 -> 0.011 / 0.012 = { k \* [0.500]X \* [0.250]Y } / { k \* [0.250]X \* [0.250]Y }

0.91667 = 2x

-0.126 = X

E2 / E3 -> 0.047 / 0.011 = { k \* [0.500]X \* [0.500]Y } / { k \* [0.500]X \* [0.250]Y }

4.273 = 2Y

2.095 = Y

Initial Rate = k \* [N3]-0.126 \* [Cl2]2.095

Using Equation 1 -> 0.012 (atm / min) = k \* [0.250 atm]-0.126 \* [0.250 atm]­2.095

0.184 ( 1 /(atm \* min)) = k

Initial Rate = 0.184 ( 1 /(atm \* min)) \* [0.666 atm]-0.126 \* [0.333 atm]­2.095-> **0.0193 atm /min**

**Mastery #2**: The following data was collected for the reaction of nitrogen gas and chlorine gas to form nitrogen trichloride gas.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Initial Nitrogen (atm) | Initial Chlorine (atm) | Initial Rate (atm/min) | Temp (K) |
| 1 | 0.250 | 0.250 | 0.012 | 300 K |
| 2 | 0.500 | 0.500 | 0.047 | 300 K |
| 3 | 0.500 | 0.250 | 0.011 | 300 K |
| 4 | 0.250 | 0.500 | 0.072 | 500 K |

0.666 atm of nitrogen gas and 0.333 atm of chlorine gas are put in a 2 L flask at 400 K. How much nitrogen trichloride would be produced after 10 minutes?

` 0.0193 atm /min \* 10 min = **0.193 atm**