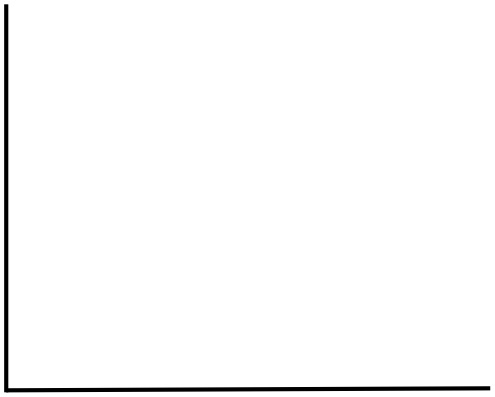
Name:_____Date:_____Block:_____

Integrated Rate Laws WS (Homework)

1. The decomposition of hydrogen peroxide was studied, and the following data were obtained at a particular temperature:

Time (s)	$[H_2O_2]$ (mol/L)
0	1.00
120	0.91
300	0.78
600	0.59
1200	0.37
1800	0.22
2400	0.13
3000	0.082
3600	0.050



Determine the following:

a. The order of H_2O_2

b. Based on the order of reactant, sketch the graph that produces the most linear line

c. Rate law

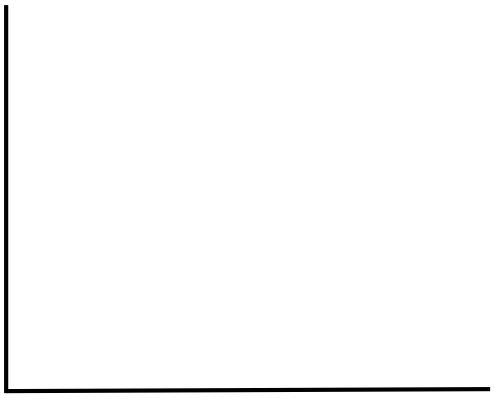
d. Integrated rate law

e. Value of rate constant with proper units

f. Calculate $[H_2O_2]$ at 4000. s after the start of the reaction

2. The rate of the reaction: $NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)$ depends only on the concentration of nitrogen dioxide below 225°C. At a temperature below 225°C, the following data were collected:

Time (s)	$[NO_2]$ (mol/L)
0	0.500
1.20×10^3	0.444
3.00×10^3	0.381
4.50×10^3	0.340
9.00×10^3	0.250
1.80×10^4	0.174



Determine the following:

a. The order of NO_2

b. Based on the order of reactant, sketch the graph that produces the most linear line

c. Rate law

d. Integrated rate law

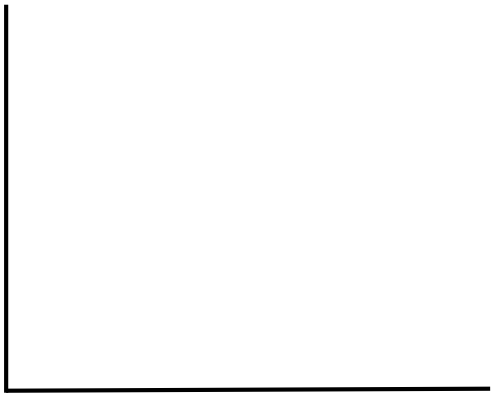
e. Value of the rate constant with proper units

f. Calculate $[NO_2]$ at 2.70×10^4 s after the start of the reaction

3. The rate of the reaction: $O(g) + NO_2(g) \rightarrow NO(g) + O_2(g)$ was studied at a certain temperature.

   a. In one experiment, NO_2 was in large excess, at a concentration of 1.0×10^{13} molecules/cm^3 with the following data collected:

Time (s)	[O] (atoms/cm^3)
0	5.0×10^9
1.0×10^{-2}	1.9×10^9
2.0×10^{-2}	6.8×10^8
3.0×10^{-2}	2.5×10^8



   What is the order of the reaction with respect to oxygen atoms? Based on the order of reactant, sketch the graph that produces the most linear line.

   b. The reaction is known to be first order with respect to NO_2. Determine the overall rate law and the value of the rate constant.

4. A certain first-order reaction is 45.0% complete in 65 s. What are the values of the rate constant and the half-life for this process?