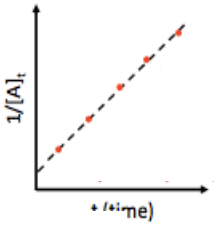
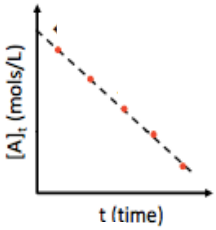
NSM 12C PAL Worksheet Rate Laws Name: _____

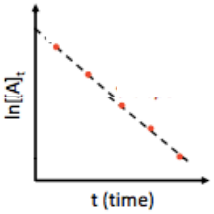
Directions: In the space provided next to each item, identify if the graph, units of the rate constant k, and half life belongs a 0^{th}, 1^{st}, or 2^{nd} order reaction. Note: The items may not be listed in order.



ORDER _____



ORDER _____



ORDER _____

$M \cdot s^{-1}$ **ORDER** _____

s^{-1} **ORDER** _____

$M^{-1} \cdot s^{-1}$ **ORDER** _____

$t_{\frac{1}{2}} = \frac{\ln 2}{k}$ **ORDER** _____

$t_{1/2} = \frac{1}{k[A]_0}$ **ORDER** _____

$t_{\frac{1}{2}} = \frac{[A]_o}{2 \times k}$ **ORDER** _____

1. For the reaction 3 ClO^- (aq) → ClO_3^- (aq) + 2 Cl^- (aq) doubling the concentration of ClO^- quadruples the initial rate of formation of ClO_3^-. What is the rate expression for the reaction?

2. The reaction $C_6H_5N_2Cl$ (aq) + H_2O (l) → C_6H_5OH (aq) + N_2 (g) + HCl (aq) is first order in $C_6H_5N_2Cl$ and zero order in H2O. What is the rate expression?

3. What is the overall order of reaction for each of the following?
   A) Rate = $k[NO_2]^2$

   B) Rate = k

   C) Rate = $k[NO]^2[O_2]$

4. For the reaction 2 NO (g) + Cl_2 (g) $\rightarrow$ 2 NOCl (g) If the concentration of NO is tripled, the rate of the reaction increases by a factor of nine. If the concentration of Cl2 is cut in half, the rate of the reaction is decreased to half the original rate. Find the order of reaction for each reactant and write the rate expression for the reaction.

5. A reaction has the experimental rate law of Rate = $k[A]^2$.
   A) What happens to the rate if the concentration of A is tripled?

   B) What happens to the rate if the concentration if A is reduced to one fourth the initial concentration?

6. A student conducts an experiment for the reaction 2A + B$\rightarrow$ C + D and obtains the data below. Use the data to determine the rate law and the overall order for the reaction.

Run	Initial [A]	Initial [B]	Initial Rate ($M \cdot min^{-1}$)
1	0.0200 M	0.0200 M	0.00800
2	0.0400 M	0.0200 M	0.01600
3	0.0200 M	0.0100 M	0.00800

7. Describe four conditions that affect the rate of a reaction and use the principles of the collision theory to explain why each factor affects the rate as it does.